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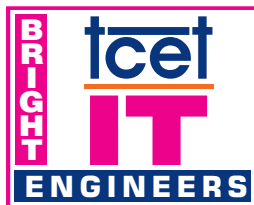
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e-Conference on Artificial Intelligence and Machine Learning (eC-AI & ML) 2020:

Research Opportunities and Applications in the field of Engineering & Science

**November 27th & 28th 2020
Friday & Saturday**

Organized by



Department of Information Technology

Editors

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**e-Conference on Artificial Intelligence and Machine Learning
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PREFACE

“E-Conference on Artificial Intelligence and Machine Learning (EC-AI&ML 2020)” is a platform for conducting conferences with an objective of strengthening the research culture by bringing together academicians, scientists, researchers in the domain of Artificial Intelligent and Machine Learning. The event was conducted online on 27th to 28th November 2020.

“E-Conference on Artificial Intelligence and Machine Learning (EC-AI&ML 2020)” is an international forum to present research on computational approaches to learning. AI& ML is a one of the thrust areas identified by AICTE. The E-conference will provide platform to the authors and attendees for collaborations and networking among universities and institutions from India and abroad for promoting research and trending technologies

The E-conference covers research in the areas of artificial intelligence, machine learning, and deep learning applications in health care, agriculture, business and security. It also includes research in core concepts of computer networks, intelligent system design and deployment, real-time systems, WSN, sensors and sensor nodes, software-defined networking (SDN) and network function virtualization (NFV).

The aim of this conference is to promote basic and advanced research into applied investigation and convert applied investigation into practice. This conference will also create awareness about the importance of basic research in the fields of Artificial Intelligence and Machine Learning.

TCET has strong belief in quality and relation building. A lot of care is taken for branding the event. Total 40 papers were received and 37 papers were presented in two days. Around 400 participants and delegates from India and abroad including Industry personnel have attended the two days program.

We appreciate the efforts of all the members of the organizing and editorial committee for supporting the event and extending their cooperation to make it a grand & successful event.

Team- EC-AI & ML-2020
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Intelligence Algorithm Extracts, Process for the Quality Speech & Different Sound Signals in Security & Detection Applications

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Abstract. Speech analysis creates wide application in security & forensic detection and it is source of accurate speech detection. This intelligence algorithm based on speech analysis will analyses accurate vocal pitch across the full spectrum of speech & sound signals. Intelligence algorithm will easily extract the speech or sound signals for particular duration from previous recordings of a person, bird or animal's sound after that it will analyses the voice signals and calculate the different specifications of the voice signals like pitch, volume & stereo. Intelligence algorithm will improve the quality of voice signals using different methodologies like autocorrelation, histogram spread & cumulative sum.

Keywords: *Intelligence, Algorithm, Speech Signal, Quality of Voice (QoV).*

I. INTRODUCTION

The speech or sound signals are broadly classified into Continuous Time Signal and Discrete Time Signal. The speech signal gives oscillations that propagate as an acoustic wave, generally through air as a medium. There are different ways to record sound waves. The human have the hearing voice frequencies from 20 Hz to 20 kHz are called as audio frequencies. The range of audio frequencies of different animals and birds varies from 10 Hz to 150 kHz. The table 1 shows the range of frequencies of different birds & animals. Please note that the first paragraph of a section or subsection is not indented.

Noise is the unwanted signals added to the speech signals. This is unwanted extra added component in sound. Mostly natural sound frequencies are complex in nature with different range of frequency components. The acoustic is the combination of kind of sound frequencies. Generally sound signals generated by human are called soundscape is the part of acoustic signals.

The speech signals generated by human like sound waves are generated by different sources like vibrating diaphragm of the stereo speaker. Sound can propagate through a medium as longitudinal waves and also transverse wave in solids. There are medium through which sound travels are different but at the reception sound can be represented by two physical quantities pressure and time.

This is simple representation of sound waves which is in form of sinusoidal waves of different frequencies.

Table 1. Frequency range of different birds, animals

Name	Range of frequencies
Rabbit	96Hz-49kHz
Horse	55Hz-33.5kHz
Cow	23Hz-35kHz
Owl	200Hz-12kHz
Sheep	125Hz-42.5kHz
Dog	64Hz-44kHz
Elephant	17Hz-10.5kHz

II. MEASURES OF ANALYSIS FOR SPEECH OR VOICE FREQUENCIES

The speech signal is clear in terms of intensity range so can be recorded, giving broad-spectrum and obtained for analysis purpose. To analyze the speech signals of human, bird or animals over time the temporal envelope and temporal fine structure as perceptually relevant analysis is best method. There are aspects like loudness, pitch and timbre perception and spatial hearing will help in speech analysis and leads to detection of voice of human, bird or animal & the measurements can be utilized in security applications based on speech or sound.

The main task is to record the sound generated by different means of communication or by different medium. To analyze the signals need to input the signals like we can analyse different signals are airborne microphone signal, contact microphone signal, filtered signals, LPC residue signal, speech material.

There are measures of analysis of different sound signals generated by many sources but, frequency and loudness are the major characteristics of sound can be utilized for the analysis.

III. ARTIFICIAL INTELLIGENCE ALGORITHM FOR ANALYSIS FOR SPEECH OR VOICE FREQUENCIES

In this algorithm the input is sound signal transducer by microphone and further saved as recorded sound file. In this algorithm the recorded sound file converted to wave file for further processing.

To analysis of different sound waves the sampling rate should be proper to achieve the Nyquist Rate. If we want to convert continuous sound into digital or discrete form then digitization is process where first stage is sampling after acquisition of sound signal. These signals are sampled at particular sampling rate in Hz or KHz it should be twice of input signal. The different sound samples can be collected at different

sampling rate, here in this algorithm sampling rate is 18000 Hz and sampling scale maximum amplitude is one. The following figures 1, 2 & 3 showing input signals with centre frequency, right channel and left channel frequency in both the channels negative peak and positive peak of amplitude with respect to different time limit. The signals are sinusoidal continuous signals.

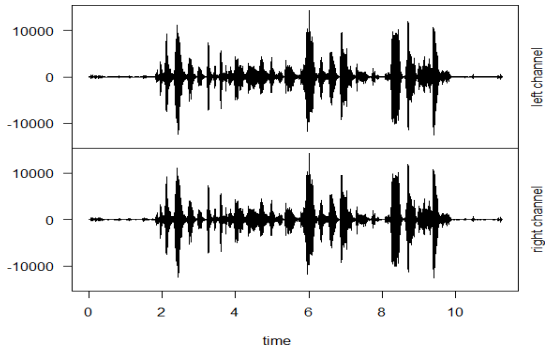


Fig. 1. A figure shows input signal stereo plot for ten seconds.

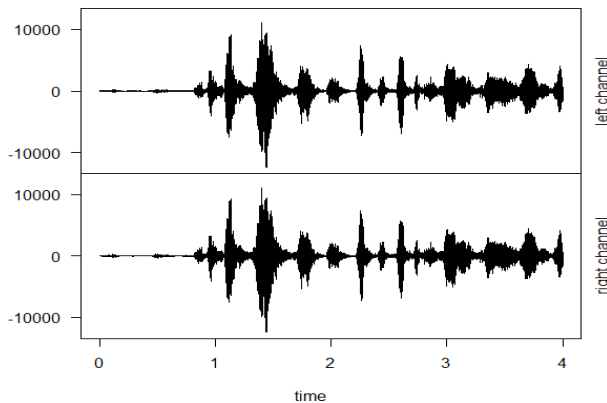


Fig. 2. A figure shows input signal stereo plot for four seconds.

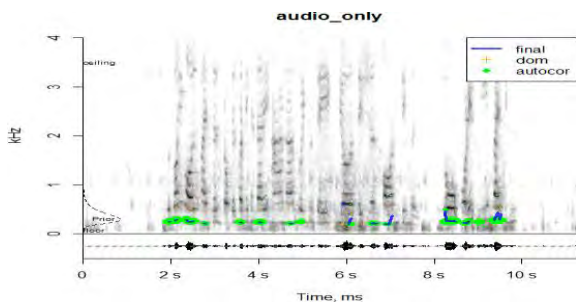


Fig. 3. A figure shows sampled signal at sampling rate of 18000 for time ten seconds.

The Fourier Transform converts time domain signal into a sum of finite series of sine or cosine functions. The Fast Fourier Transform is tool of transform the signal quickly into sum of finite series basically it will convert time domain signal into frequency domain. Here the sampled signals are in discrete form so here Discrete Fourier Transform had specified frequency & amplitude at maximum at one scale.

The true value from synthesized signal is useful signal. Before applying DFT estimation of true pitch value is normalized value. After applying DFT the signal will be represented for Short Term Fourier Transform.

The whole signal no need to use for analysis as it will increase bandwidth and requires more time for analysis. The information can be extract from small time duration

signal. The solution is DFT on successive sections along the signal. A window is then convolved along the signal and a DFT is computed at each sampled signal. The whole transformation is part of analysis of sound signal. Short Term Fourier Transform followed by averaging data frames then transformed & average transformed signal displayed in figure 4 below.

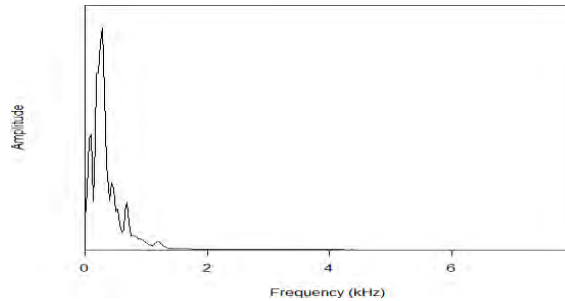


Fig. 4. A figure shows average data frame with frequencies and their strength

IV. QUALITY OF VOICE (QOV)

In pitch Perturbation pathological voices tend to show unusually large cycle-to-cycle fluctuations in the fundamental period. The phenomenon of cycle-to-cycle fluctuations in the fundamental period is referred to variously as pitch perturbation, fundamental frequency perturbation, or vocal jitter. Percent jitter is defined as mean jitter divided by the mean period, multiplied by 100.

Amplitude perturbation, or vocal shimmer, is defined as cycle-to-cycle fluctuation in the amplitudes of adjacent pitch pulses. The simplest is mean shimmer, which is simply the average absolute difference in amplitude between adjacent pitch pulses. Methods based running averages are also in widespread use.

Due, in part, to a variety of technical problems in measuring perturbation from natural speech signals, there is no consistent evidence for a straightforward relationship between perturbation values measured from natural speech and perceptual dimensions such as roughness, hoarseness, or overall severity of dysphonic prompting some investigators to question the utility of perturbation measures for characterizing voice quality[1].

V. AUTOCORRELATION FOR VOICE DETERMINATION

After transform spectrum to Power Density Function, need to process each frame after storing. The fundamental frequency in the sampled voice signal is Pitch. For finding the speech signal that is actual Pitch from the spectrum here the function of autocorrelation is deployed. The autocorrelation function computes the two speech signals at the highest peak of sinusoidal signal amplitude. The first signal is actual discrete sampled signal and second is same signal delayed by some time duration. The result of autocorrelation function is a measure of Pitch Amplitude. Here the difference will lead to detection of required speech samples.

The loudness analysis is measure of intensity of speech. Skew analysis is a measure of asymmetry of the probability distribution of real valued random variables in spectrum. Sweep is cumulative sum signal for some duration will give pure speech signal over that duration of spectrum.

VI. CONCLUSION

Speech is important feature of human, in various applications like security and detection we need clear voice signal for detection. Intelligence algorithm has extracted, processed & analyzed by deploying autocorrelation function. Figure 6 shows the output of autocorrelation function. Autocorrelation function clear the noise and improved quality signal further analyzed using histogram spread spectrum.

The analysis part displayed using different plots, figure 7 shows polyphonic pitch, autocorrelation function, smoothness, cepstrum method, short term phase spectrum and measure of sub-harmonics.

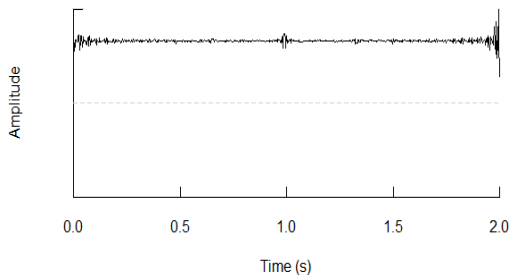


Fig. 6. A figure shows output of autocorrelation function

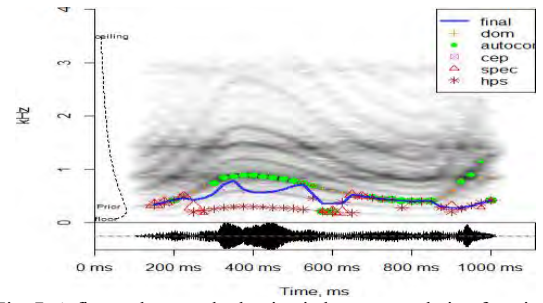


Fig. 7. A figure shows polyphonic pitch, autocorrelation function, smoothness, cepstrum method, short term phase spectrum and measure of sub-harmonics.

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Machine Learning Algorithms for Analysis and Prediction of Depression

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Abstract-Today, depression is one of the critical mental health problems faced by humans of all ages and gender. In this era of increasing technology, it causes a life of less physical work, continuous pressure on one's life, which creates a risk of intellectual disturbance. The work culture, peer pressure, stressful life, emotional imbalance, family disturbances, and social life is resulting in depression. Depression may also sometimes lead to a heart attack. Depression causes adverse effects and becomes a serious medical problem in how individuals feel and act in everyday life. This psychological state causes feelings of sadness, anxiety, loss of interest in things and jobs, and could barely result in suicide. In this paper, the analysis of different Machine Learning Algorithms has been done and compared them by selecting various parameters and then showing which algorithm is more accurate for predicting depression.

Keywords: *Machine Learning, Depression, XGBoost, SVM, Logistic Regression, Random Forest*

I. INTRODUCTION

Everybody in the world is facing extensive pressure due to work, family, personal life, etc. It leads the stress in life. Due to this, it affects the individual's medical, personal, professional experience. Affecting medical life leads to emotional imbalance. Some persons easily cope up with such inequality. But some of them do not easily cope up with the situation. Because of this, they move toward mental health disease called depression.

This reason makes depression very common around the globe. Worldwide, more than 264 million people of each age have depression [1]. Depression is one of the major contributors to disability to the global burden of disease. The primary and extensive reasons for depression in men and women are as follows:

1. Women are more sensitive in interpersonal relationships, whereas men are more sensitive to their careers and goals.
2. Women tend to contemplate, which may lead to developmental illness. In contrast, Men react to hard times by supporting fishy techniques like anger, alcohol, or drug misuse.
3. Women have more emotional quotient in comparison with men, which results in relationship problems.
4. Due to work pressure and household chores, women are less aware of their physical and psychological constraints, due to that she feels more burdened.

From the analysis, it came to know that women get more affected by depression than men, due to this depression the (possible actions) reason why the person thinks of suicide. Depression can result in suicide. Depression is different from regular mood shifts, and emotions that are for a short time will lead to challenges of the standard of living. Specifically, when it lasts for a long time and with medium or high intensity, depression will become a severe psychological health problem. Nearly 8,00,000 people commit suicide each year. Suicide is the second leading cause of death in 15-29 years old [3].

The problem of depression and other psychological state conditions is increasing worldwide. During depression person feels a loss of interest and pleasure, and less energy, resulting in a decreased workflow for weeks. Many people also suffer from anxiety symptoms, less and disturbed sleep and appetite, and lots of have feelings of low self-worth, guilt, less concentration [1]. Nearly two out of three people suffering from depression do not participate or receive proper treatment [3].

Prior detection of psychological disorder helps to start treatment at an early stage and improves the person's life as well as his/her family. The psychological state handles strain in an individual's life and is very important for making choices in each life stage. The psychological condition is critical in every step of life, whether it's childhood or adulthood. An excellent psychological state will support a person to give its full potential in life. It also helps the person to cope up with stress in life. It shall increase the productivity of the people [8].

As per the prediction of the World Health Organisation (WHO), by 2030, depression will be one of the second leading disabilities [4], [5]. Although very much prepared specialists, clinical and mental medicines are accessible for depression treatment, people or families are hesitant to stand up/arrive at specialists about this problem for different social reasons. Diagnosis of depression disorder includes several visits with patient and patient's family, clinical analysis, questionnaires, which are time-consuming and need to have well-trained specialists. In this present generation of Machine learning, automated depression detection is not complicated and deployed quickly. The automation should use less resources, provide accurate results with more reachability [4].

II. LITERATURE SURVEY

Different ways to analyze depression are as follows:

Anees Ul Hassan, Jamil Hussain, Musarrat Hussain, Muhammad Sadiq, and Sungyoung Lee have proposed that people use social networking sites to express their thoughts, feelings, and many more so. Here Twitter is a social site that allows users to tweet statements up to 140 characters. The sentimental analysis helps determine the emotion behind a series of words and teaches Machine Learning techniques to analyze those meanings. Four main components are pre-processing, feature extraction, meta-learning, and training data. In pre-processing, a paragraph gets converted into sentences, and sentences get converted into words, and then from those words, stop words get removed. Stop words are useless words and do not bring enough meaning, for example. And, of, is, from, in, on, over, under, etc. are stop words. The feature detection from text is related to a name or a sequence of words that can be a feature or not [9].

Some of the feature extraction methods are N-grams, Parts of Speech (POS) Tagging, Negation, Sentiment Analyzer. In Meta-Learning, Voting is the easiest way to combine the predictions from multiple machine learning algorithms. Here three classifiers, Support Vector Machine, Naive Bayes, and Maximum Entropy classifiers, are used as learners. Training data includes training datasets, i.e., negative, positive, feature extractor, and word features. There are two datasets included, i.e., the Twitter dataset. Graph 2.1 shows the Machine Learning Algorithms with their accuracy [9].

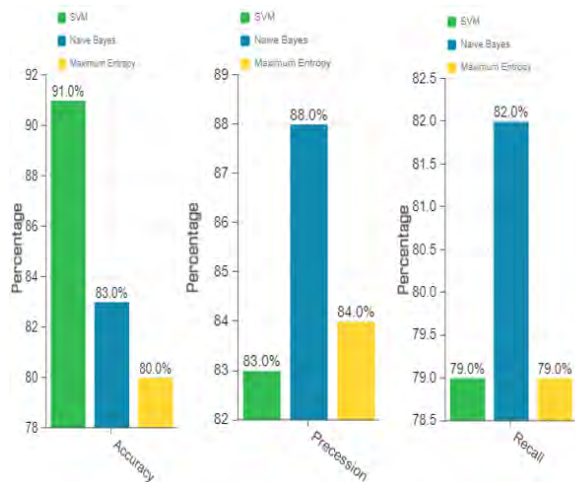


Fig 2.1: - Performance Analysis Graph

Anna Maridaki, Anastasia Pampouchidou, Kostas Marias and, Manolis Tsiknakis developed a framework based on the dataset provided by AVEC'14 for depression analysis. The proposed work presents two different motion representations: 1) Gabor Motion History Image (GMHI), and 2) Motion History Image (MHI). Various combinations of low-level features get extracted from both representations. These features get further used for training and testing with different machine learning

techniques. The proposed approach got an F1 score of 81.93%, both for MHI and GMHI, with Support Vector Machine. The achieved performance is like state-of-the-art approaches, while manages to outperform several others. Except for accomplishing a competitive performance, the proposed work explores various combinations of the investigated motion representations and classifiers [2].

PCA method decreases the feature dimensionality of the data by casting the data into a lower-dimensional space. The smaller feature set gets used as the extracted features for the classification step. The feature extraction step's feature vector is operated by a selected classifier to evaluate the system in the classification step. The machine learning algorithms Naïve Bayes, k-Nearest Neighbors, Random Forest, and Support Vector Machine gets tested. The below graph shows the F1 score results implemented in classifiers for MHI [2].

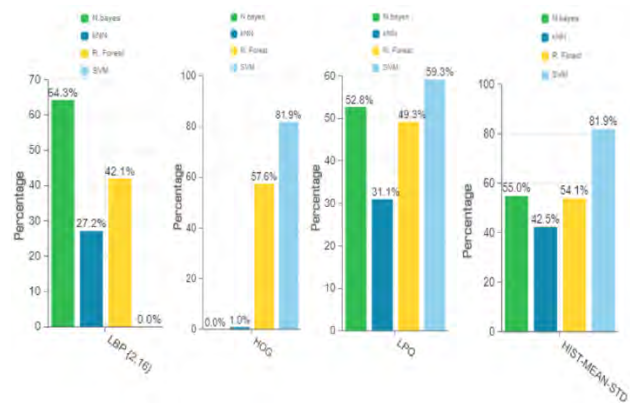


Fig 2.2: Graph for F1 score results implemented in classifiers for MHI

Vanishri Arun, Prajwal V., Murali Krishna, Arun Kumar B. V., Padma S. K, and Shyam V. Proposed a system in which they have validated an utterly unique technique for prediction of depression. They collected clinical information from the on-going Mysore studies of Natal effects on Ageing and Health (MYNAH). The participants completed a complete evaluation for psychological feature function, psychological state, and cardiometabolic disorders in south India. This model developed using the XGBoost Machine learning algorithm. The dataset's training and learning are quicker in the XGBoost Algorithm than other prediction algorithms [7].

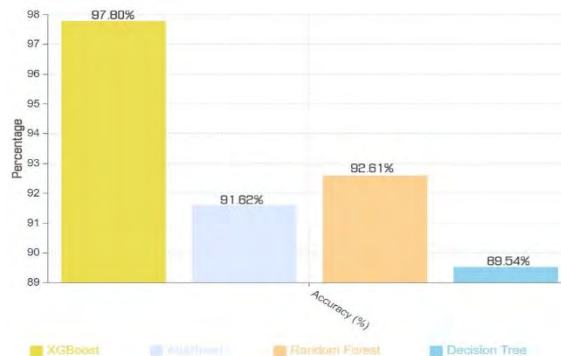


Fig 2.3: Graph of results using MYNAH cohort in various machine learning algorithms

Swati Jain, Suraj Prakash Narayan, Rupesh Kumar Dewang, Utkarsh Bhartiya, Nalini Meena, and Varun Kumar Proposed the suicidal acts system based on the depression level. In this system, they have. By filling of questionnaires, they collect real-time data. Their system uses a questionnaire similar to PHQ-9, which is an advanced version of it. It covers all characteristics or components and symptoms, leading to depression. Categorizing machine algorithms is used to train and classify it in five stages depending on severity - Minimal or none, mild, moderate, moderately, and severe. Two datasets get chosen, dataset: 1) questionnaires, 2) Twitter tweets. For dataset 1, XGBoost classifier gave the highest accuracy, i.e., 83.87 %, and Logistic Regression gave the lowest, unlike dataset 2 where Logistic regression showed the highest accuracy of 86.45 % because dataset 1 consists of 18 features, which were more than the words on which tweet gets extracted, and model gets trained. Logistic regression starts to falter when there are many features and a good number of lost data. Also, so many categorical variables are a problem for it [6].

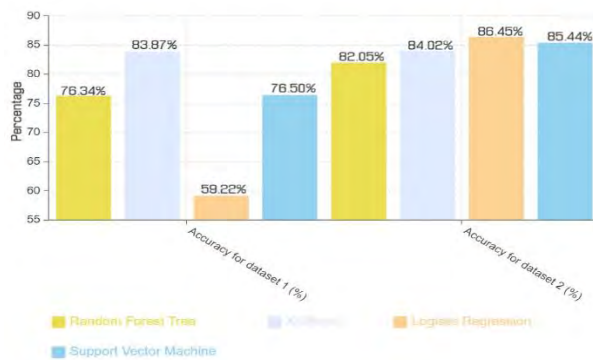


Fig 2.4: Graph for accuracy of algorithms applied to the dataset

Bhanusree Yalamanchili, Nikhil Sai Kota, Maruthi Saketh Abbaraju, Venkata Sai Sathwik Nadella and, Sandeep Varma Alluri have proposed a system in which acoustic feature gets used to training a classification model to categorize a human as Depressed or not-Depressed. DIAC-WOZ database available with the AVEC2016 challenge chosen for training the classifiers. Voice feature gets extracted using the COVAREP tool. SMOTE analysis gets used to overcoming the class imbalance, and 93% accuracy obtained with the support vector machine algorithm, which results in the Depression Classification Model (DCM). An android application cured Deployed on the WAMP server on Amazon Web Service (AWS) cloud is developed to self-assess depression using DCM and PHQ-8 questionnaire. The application was tested on real-time data of 50 persons in the supervision of a qualified psychiatrist, and 90% accuracy got obtained. Three classification techniques, namely Logistic Regression, Random Forest, and SVM, are implemented in the scikit-LEARN toolbox. The evaluation metrics are calculated individually for each classifier- over the DIACWOZ data corpus speech and shown in Fig. 2. Finally, the "Depression Classification Model

(DCM)" is generated with 93% accuracy on the validation data set using acoustic features [4].

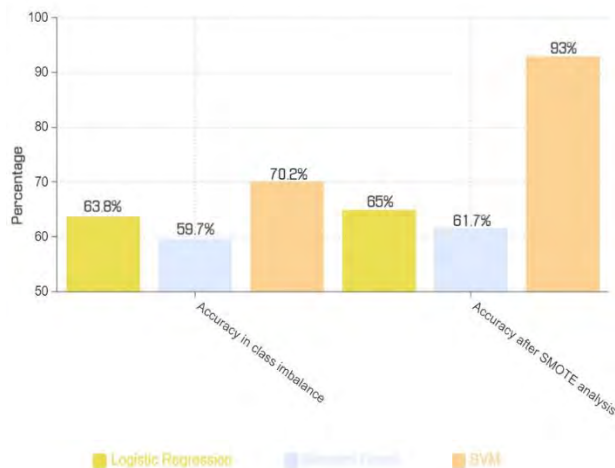


Fig 2.5: Graph for accuracy of classifiers on class imbalance and SMOTE analysis dataset

III. PROPOSED SYSTEM

As you have seen, many (or every) authors described depression and provided the solution with their end. We have also researched and understood the points written by them. Here we are going to provide our proposed solution to this.

Firstly, we will discuss "XGBoost." XGBoost is an open-source library that provides a gradient boosting framework for Java, Python, R, Perl, and Scala. It works on Linux, Windows, and macOS. The project description aims to provide a "Scalable, Portable, and Distributed Gradient Boosting Library"[10]. It took Input in Tabular format and explained in detail, but no such application of XGBoost was mentioned in the papers to predict depression.

This paper shows the smart way to predict depression using Social Media Stories, tweets, voice, searches on the browser, etc. The solution we will describe is it can be an Admin app or Add-on in the browser or an IoT device. The module's primary function is to capture data frequently, so it is necessary to refresh after some consecutive limit of time.

The working of our idea shows in the below figure.

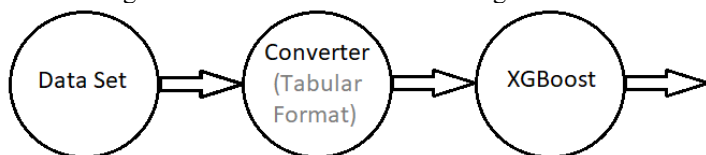


Fig 3.1: Basic Structure of Solution

In the above figure, the Data sets are Social Media Stories, tweets, voice, searches on the browser, etc. The converter is used to calculate the depressive content and convert it into Tabular format (Input can be Images,

Texts, and Voices). The last section that is Calculated Output is the part of the solution in which it processes input from XGBoost and reframes it into human-understandable language.

A brief description of the converter is as follows (why how):

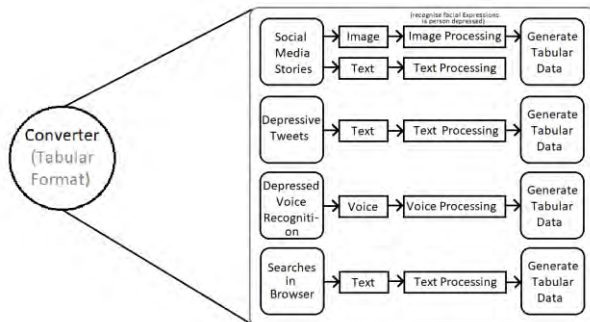


Fig 3.2: Converter Section Functions (Components of Converter)

As the XGBoost is taking input in tabular format so that the dataset's inputs are raw data, we must process it and convert it into a tabular form. Here we need the smart converter. The figure represents the converter's basic structure of converting the raw data into a tabular format. First of all, the Social media stories that have 24 hours are in image format (or a video format, mostly typical depressed person don't put a video on the story), so save it. It is necessary to process and check for depression; now, we use image processing algorithms to identify the facial expressions and check for depression of the person and generate output in tabular format to XGBoost Algorithm. Now the story of social media could also be in text format, so the text would be identified by the text processing algorithm, which checks the depressive words and generates output in tabular form for XGBoost Algorithm as it takes input only in tabular format

The next one is depressive tweets. Tweets are always in the text format so that input is already in the text format, so check the depressive words in the tweet make it in tabular form so the XGBoost could recognize the data.

Next is Depressed Voice Recognition, Here the inputs are of voice captured by phone microphone is any accessible microphone if possible, call recordings, so the algorithm for detecting depressive voice gets used. It will check the depressive voices in the recorded conversation and convert it to tabular format so that XGBoost Algorithm can recognize it.

The last one is the "Searches in Browser." It mostly happens that the depressive person searches the suicidal contents on the Internet so that the system will capture and process it in an algorithm, check depressive words, and generate output, which will be understandable to the XGBoost(tabular).

IV. FUTURE SCOPE

- As the system will be an Admin Application (so it needs to monitor the camera, stories, voice, etc., of the user), it is necessary to gain user trust. Hence tying-up with the trusted IT companies (i.e., Google, Amazon, etc.) is the best solution.
- Cloud-based data are memorizing for faster access from anywhere.
- Cloud-based parental control will also be the best part for parents to monitor their children smartly.
- Video calling depression detection, detection of suicidal activities.
- Monitoring financial loss in business, less account balance of well-earning employees, fewer marks obtained by the genius student, etc.

V. CONCLUSION

Paper reports machine learning algorithms for analysis and prediction of depression. The algorithm is implemented based on the user's social behavior and data. Future research will get conducted towards upgrading the performance of the system. This paper also discussed the methodology of machine learning. This paper studied various machine learning algorithms implemented in past years in the depression prediction combined with the machine learning algorithms and learned how they outshined.

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Analysis of Eye-Gaze Estimation Systems for different approaches of Depression Detection

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Abstract— Depression is major psychological state reason behind international Burden of illness. Its consequences ahead result in epochal charge to public health, that incarnate highest risk of dementedness, premature mortality appearing from physical conjugations and maternal depression impacts on kid growth and progress. This survey paper lines up to serve as a platform between the sub fields by delivering the first review of depression detection systems across sub-fields and devices. This paper emphasizes on the following research questions, how has depression been defined and annotated in Eye-Gaze detection systems? What kinds of depression data exists or could be obtained for depression Eye-Gaze detection systems? What (multi-modal/algorithms) indicators have been used for the automatic detection of depression using eyes? These research questions will be serving an analysis review. Therefore, this review in short touches upon every question and dedicates the foremost focus to reviewing indicators of depression and after options for depression detection systems. We tend to accomplish various attributes across algorithms, different approaches used to detect and their evaluation methodologies.

Keywords—*Depression Detection, Gaze Estimation, Depression.*

I. INTRODUCTION

Depression is a mood disorder that causes constant feeling of unhappiness and loss of interest. Additionally known as major emotional disturbance or clinical depression, it affects the way in which one person is feeling, person's behaviour and thinking may result in a range of emotional and physical issues. In teens, symptoms might add disappointment, irritability, feeling negative and valueless, anger, poor performance or poor involvement in class, feeling misunderstood and intensely sensitive, consumption of recreational drugs or alcohol, or sleeping excessively, self-injury, loss of interest in common activities, and staying away from social interaction. In contrast to mind-set change, depressive disorder could be a typical mental issue that keeps going longer and causes handicap and diminished capability ality.

In addition, at its most extreme level, it may lead to suicide. An on-going World Health Organization (WHO [1]) report assessed that 350 million individuals overall are influenced by depression. It causes more than 66% of suicides every year [2]. The suicide risk is in thirty times higher among depressed patients than that of the populace without these issues [3]. In spite of the fact that treatment of depression has demonstrated to be compelling much of the time [4], misdiagnosing depressed patients is a typical boundary [5]. In light of the WHO report, the obstructions to powerful analysis of depression incorporate an absence of assets and prepared

medical care suppliers. Also, the evaluation techniques for diagnosing depression depend almost solely on tolerant announced or clinical decisions of symptom seriousness [6], imperilling a scope of emotional predispositions. Our objective here is to research the overall qualities of sadness, which we expectation will prompt a target full of feeling detecting framework that helps clinicians in their finding and observing of clinical depression..

II. BACKGROUND

Being a necessary phase of visible appreciation and human behaviour, eye actions have lengthily been a situation of lookup interest.

The first strategies to measure a person's gaze path date lower back to the early 1900s [7]. Until recently, these applied sciences had been severely restricted via the fee of the gear required, a lack of precision and bad usability and had been solely used in very specific niches of research.

Over the closing few years, however, with speedy advances in sensor technological know-how and records processing software, eye monitoring options have end up handy to use, lightweight, efficient, and inexpensive and determined growing adoption in many fields, consisting of gaming, marketing, car technology, military, and healthcare [8].

Abnormal eye moves can be used as behavioural biomarkers for the analysis of a number of mental health troubles [9, 10, 11]. Oculomotor dysfunctions and gaze peculiarities are found, for example, in victims of anxiousness ailment [11], depression [9], bipolar disease [12], borderline character sickness [13]. Certain psychological sicknesses, including depression and schizophrenia, would already be able to be distinguished naturally through eye tracking [9, 10, and 12] and relating techniques have been filed as licenses [14]

Following figure 1 provides an introductory overview of common eye tracking measures and the categories of inferences:

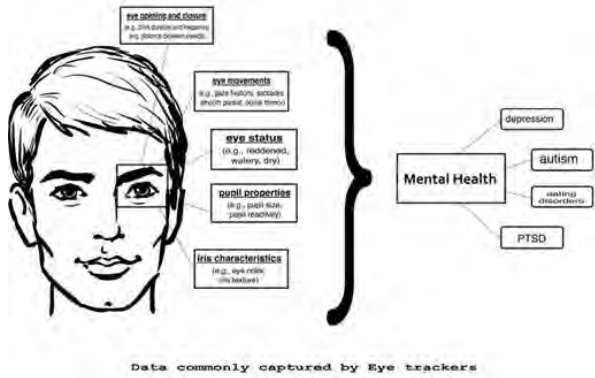


Figure 1.

Literature Review Table:

Table No.1

Author	Paper Title	Journal	Proposal Technique	Advantages	Shortcomings
1.Sharifa Alghowinm 2.Roland Goecke 3.Michael Wagner 4.Gordon Parker 5.Michael Breakspea	Eye Movement Analysis for Depression Detection [2013]	IEEE	<ul style="list-style-type: none"> Features were extracted like horizontal, vertical, and eyelid movement. Use GMM for classification and hybrid classifier that combines GMM with SVM for the frame-by-frame features. 	<ul style="list-style-type: none"> Eye movement patterns using Active Appearance Models for recognizing depression from video data Initial manual gender splitting influences the recognition rate. 	Limitation is the fairly small number of (depressed and control) subjects.
1.Anuradha Kar 2.Peter Corcoran	A Review and Analysis of Eye Gaze Estimation Systems, Algorithms and Performance Evaluation Methods in Consumer Platforms [2017]		<ul style="list-style-type: none"> Identification of numerous platform specific elements that influence gaze monitoring accuracy. The research work on algorithms that are implemented for gaze tracking using different platforms like : 1. Desktop based systems 2. TV and large display panels 3. Head-mounted setups 4. Automotive 5. Hand-Held devices 	Analysis of the literature leads to the identification of several platform specific factors that influence gaze tracking accuracy	Limitations arising due to gaze tracking camera quality, random illumination changes, user wearing glasses and platform vibrations are not well characterized in contemporary eye gaze research.

Table No.2

1.Xiaowei Li, Tong Cao, Shuting Sun, Bin Hu* 2.Martyn Ratcliffe	Classification Study on Eye Movement Data: Towards A New Approach in Depression Detection	IEEE	<ul style="list-style-type: none"> For eye movement data Extract features. Feature Selection using Correlation-based Feature 	Eye movement can be used as a simple and effective new approach to detect depression by	Eye movement data performs slightly worse than EEG on depression detection[19,24]
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	[2016]		Selection (CFS), with the search method Best-First. •Classification of data using machine learning methods.	machine learning classification analysis.	
1.Sarmad Algawwam 2.Mohammed Benaissa	Depression Detection From Eye Blink Features [2018]	IEEE	<ul style="list-style-type: none"> Investigate whether eye blink features hold distinctive power for detecting depression Eye blink features extracted from video using facial landmark tracker. Facial landmark detection unstable under certain conditions in that author propose facial landmark stabilization method Peak detection 	Advantage is that eye-blink features has the potential to improve the diagnosis procedure for patients with possible depression	This study has a limitation that The AVEC 2014 and 2013 dataset does not contain ground truth annotation of eye blink rate. Hence, author relied on the reported accuracy of the proposed method for eye blink features extraction.
1.Anastasia Pampouchidou 2.Panagiotis Simos 3.Kostas Marias 4.Fabrice Meriaudea 5.Fan Yang 6.Matthew Padiaditis 7.Manolis Tsiknakis	Automatic Assessment of Depression Based on Visual Cues: A Systematic Review [2017]	IEEE	<ul style="list-style-type: none"> Non Verbal Signs for Depression Assessment Visual input, along with other types of signals, such as audio, text from transcripts, and physiological signals, the prerequisite step is that of preprocessing. Feature extraction algorithms are subsequently applied to all visual signals. Machine learning algorithms used for automatic assessment of depression Presents a quantitative meta-analysis of selected studies. 	It was further made apparent that visual cues need to be supplemented by information from other modalities to achieve clinically useful results.	Several clinical research questions remain to be addressed systematically, such as the capacity to distinguish between different depression subtypes, and MDD from other mood disorders[86]

III. SURVEY ON APPROACHES AND METHODOLOGIES:

Many early theories have been proposed to explain indicators of depression and subsequently feature for depression detection systems. Although the literature includes a wide variety of such theories, this review will focus on several key themes that emerge repeatedly in the reviewed literature. These themes are: eye movement analysis to detect depression, algorithms that are implemented for gaze tracking, classification study on eye movement, and detection of depression from eye blink features, automatic assessment of depression.

Although literature presents these topics in different contexts.

According to research [15] eye movement performance features extracted from face videos using Active Appearance Models for a binary classification task.

In this paper, it explores whether the movement of the eyes and the eyelid have the power of discrimination to detect depression. Extract eye movement features (like horizontal, vertical, and eyelid movement) from facial videos using user-specific Active Appearance Models (AAM), trained with 74 points located in the eye area. Using GMM for classification and hybrid classifiers that combines GMM with SVM for the frame-by-frame features.

In the context of analysing eye movements in a video, first the head detection techniques, then detection of eye feature points. Next, eye tracking image processing is commonly used[9]. It is often the case that the best feature to track is the contour between the iris and the sclera, known as the limbus [16]. In addition, Active Appearance Models such as semi-automatic approaches – a generative method for modelling transformable visual objects – can be trained to model and track the eyes [17]. In the AAM approach, the selected images of different eye differentiation (e.g. open, half open, closed eye) has to be annotated, before an eye AAM model can be trained[9]. That model is used to detect and track the eyes throughout the video

Advantage is that eye movement patterns using Active Appearance Models to identify depression from video data and early manual gender segmentation affects recognition rate. The limitation is that a significantly lower number of subjects (depressed and control).

Earlier studies [18] analysed that an evaluation is introduced for the lookup on eye gaze estimation methods and applications, which has improved in numerous approaches over the previous two decades. Several typical eye gaze use-cases are identified: desktop, TV, head mounted, automotive, and handheld devices. Identification of numerous platform specific elements that influence gaze monitoring accuracy.

A key result from this overview is the recognition of a want to increase standardized methodologies for the overall performance assessment of gaze monitoring structures and acquire consistency in their specification and comparative evaluation.

To tackle this need, the thought of a methodological framework for sensible contrast of special gaze monitoring structures is proposed.

A. Quick overview on eye movements, gaze monitoring structures and accuracy measures used in modern gazer research.

1) Video based totally eye gaze monitoring structures incorporate essentially of one or greater digital cameras, close to infra-red (NIR) LEDs and a laptop with display screen exhibiting a person interface the place the user's gaze is tracked.

The steps normally allied in passive video primarily based eye monitoring encompasses person calibration, taking pictures video frames of the face and eye areas of user, eye detection and mapping with gaze coordinates on screen.

2) The gaze region of a person relies upon each on the gaze directions and additionally on the head orientation [19]. In techniques which use PCCR techniques, if the person strikes their head with admire to the tracker-camera axis whilst making at the equal factor on the front screen, the glint vectors with recognize to the pupil centres' (for two exceptional eye places produced via head movement) will be one-of-a-kind from every other. Therefore, the estimated gaze places will be inaccurate.

3) Gaze monitoring accuracy is estimated as the common distinction between the actual stimuli positions and the measured gaze positions, which additionally offers a concept about the overall performance of the system.

B. Following is the research work on algorithms that are implemented for gaze tracking using five different platforms:

1) The 2-Dimensional regression-based method utilises the characteristics of the human eye, like eye configuration, pupil contours', tissue layer reflections can be enforced employing a single camera and a few NIR LEDs. However, these techniques are terribly susceptible to head movements and require users to grip their head ever so still employing a head rest, chin rest or bite bar.

2) 3D model-based strategies have tolerance towards user head movements and most of them enable free head motion. But the hardware necessities for implementing 3D and stereo gaze tracking strategies are high as they have many light-weight sources and multiple cameras set.

3) Cross ratio-based methods have an easement, E.g. they don't need an eye model or hardware calibration whereupon it allows free head motion. Yet they are affected by setbacks such as increased error with the distance of user and user-dependent factors.

4) Appearance model-based algorithms are non-PCCR methods that use the form and texture properties of the eyes and position of the pupils relative to the attention corners to estimate gaze. These ways have low hardware necessities that build them appropriate for implementation on platforms without a high-resolution camera or further lightweight sources. The disadvantage is that their accuracy is usually under PCCR based ways that degrade with head movements, variation in illumination levels and for the sturdy performance they have massive training image databases.

5) Shape-based methods are enforced for 2D gaze estimation with low-resolution digital camera pictures

achieving accuracy spherical 2°. However, the drawback of those ways embodies issues because of head cause variations and eye occlusions, adapting to mostly variable eye shapes, machine complexity, and problems with model data formatting.

USER PLATFORMS for GAZE IMPLEMENTING TRACKING

- A. DESKTOP BASED SYSTEMS
- B. TV AND LARGE DISPLAY PANELS
- C. HEAD-MOUNTED SETUPS
- D. AUTOMOTIVE
- E. HAND-HELD DEVICES

C. Factors limiting practical performance of gaze tracking in different user platforms and issues with diversity in gaze accuracy metrics:

A) Diversification of gaze estimation performance metrics in several user platforms

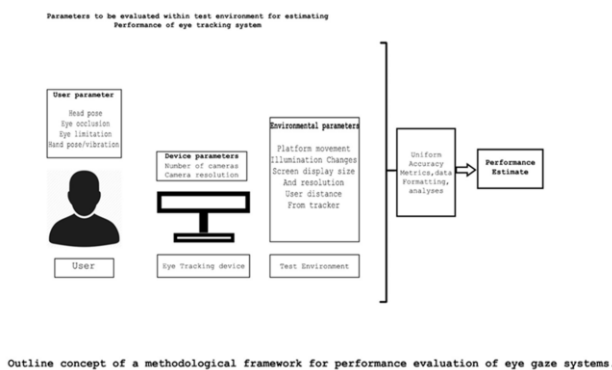
The common measures used are the angular resolution (in degrees), gaze recognition rates (in percentage), and minimum element shifts/distance between gaze and target locations. These metrics are no means related to every alternative and every analysis work defines some metrics.

B) Specific Platform factors affecting usability of eye tracking systems

Eye gaze estimation systems on numerous user platforms and applications face a broad extent of operative conditions that are seldom taken into consideration or characterised throughout their development. The sensible performance of a gaze tracking system in point of fact is also full of many factors that are common or distinctive to every platform.

A typical eye tracking setup includes of the user, gaze tracker and the tracking environment and each of these components can affect overall eye tracking performance. Below is the schematic diagram of the above mentioned set-up:

Figure No. 2



IV. METHODOLOGIES :

Past theory [20] worked on development of an objective approach on detection of depression that supports the process of diagnosis and monitoring of risk factors. The aim was to discriminate between depressed subjects and non-depressed subjects using eye movement features based on a classification technique. For eye movement data, features were extracted based on fixation, saccades, pupil size and preference for depression. Five classifiers including k-Nearest Neighbour (kNN), Naive Bayes (NB), Logistic Regression (LR), Support Vector Machine (SVM) and Random Forest (RF) are applied to classify depressed and normal categories. By analysing the classification results, assess the suitability of data related to eye movements to create a new objective approach to detecting depression.

This is a novel finding that has not been discussed in previous eye tracking studies [21, 22-25]. Furthermore, the feasibility of measuring these differences was demonstrated. In Addition, ROC analysis showed that differences in eye movement patterns could be detected not only when viewing silent and a negative expression images, but also when viewing two silent images. Therefore, it has been suggested that these differences in depressed individuals are trait-like features that can be applied in the detection of depression. Although the results are slightly worse than other methods using biological signals, for example, EEG and SMRI (both reached 90% in accuracy) [26, 27].

Previous research [28] investigated that whether eye blink features have specific power to detect depression. Eye blink features were extracted from video interviews using facial landmark tracker. With these features, the position of eye state is obtained by detecting the distance between eyelids in a gradual video frame and rapidly between the eyelids.

This eye blink detection technique has shown high accuracy rates for many datasets [29] [30] . Where, for each video frame, eye blink rate and duration features were extracted. Zface [31] has been used to track eye sights. The validity of this tracking approach for 3D registration and reconstruction from the 2D video has been supported in [31], [32]. Compared to AAM, ZFace requires no training to track facial landmarks. In the case of poor lighting or sudden subject movement, face landmark detection will be unstable. Therefore, we proposed facial landmark stabilization method

Facial landmarks tracked from video frames have been used to detect the vertical distance (d) between the eyelids that uses the position of the eye-opening [28]. The peak detection is applied to the filtered signal using SG, baseline correction and peak detection.

The study suggests that eye-blink features have the potential to improve the diagnosis process for patients with possible depression. The method described in this

study is non-invasive and usable in a wide range of clinical settings. Previous studies have shown that eye-blink features can help with depression detection [33].

However, because AAMs has been used to track the eye models using manually selected individual eye position images for training, they are not usable for clinical settings or for large number of subjects. There is a limitation in this study that The AVEC 2014 and 2013 dataset does not contain ground truth annotation of eye blink rate. Therefore, the proposed method for eye blink features extraction depends on the reported accuracy.

According to research [34] analyse that the Visual manifestations of depression, various procedures used for data collection, and existing datasets are abbreviations. Outline review methodologies and algorithms for visual feature extraction, dimensionality reduction, classification methods and decision methods for regression approaches, as well as blur strategies. A quantitative meta-analysis of reported results, strong chance to rely on performance metrics, including, identifying common trends and identifying key unresolved issues to be considered in future studies of automatic depression assessment, using visual cues alone or in combination with someone.

Non Verbal Signs for Depression Assessment is well known that depression manifests through a variety of nonverbal signs [35] [36]. A visual input (video), normalization of illumination, registration and alignment between the image sequences, and face recognition are the specific pre-processing steps required. Other types of signals, such as speech or physiological recordings, may also require pre-processing segmentation. The most popular algorithm for face detection has been proposed by Viola and Jones [37].

The feature extraction algorithms subsequently apply to all visual cues. Processes involved in feature extraction, dimensionality reduction, and fusion. The output of this processing phase generates input to the machine learning phase, where no further manipulation of features is taking place. Machine learning algorithms are used for automatic assessment of depression. Depending on the specific research goals, different types of decision methods may be applied. Classification methods are appropriate to address categorical questions (e. g, “depressed” versus “non-depressed” and low versus high depression severity). When the research question concerns the concurrent prediction of depression severity through video-derived indices, the regression approach is mainly employed. Cross validation methods are usually implemented before classification / regression step.

It was clearly elucidated that visual cues need to be complemented by information from other modalities to obtain clinically useful results. Several clinical research questions remain to be addressed systematically, such as the capacity to differentiate between different depressions subtypes, and MDD from other mood disorders [86].

V. CONCLUSIONS

The purpose of this research review is to help the reader understand the various aspects presented by the research on various eye detection techniques. This literature includes a wide variety of such theories like eye movement analysis to detect depression, algorithms that are implemented for gaze tracking, classification study on eye movement, detection of depression from eye blink features, automatic assessment of depression based on visual cues. In this paper, recently a detailed literature review has been done on eye gaze research and information in statistical format, which has been presented to highlight variations in various aspects such as platforms, setups and algorithms. We studied that in future research new features will be added and different machine learning methods will be implied in an effort to increase the detection rates, while maintaining the low computational overhead and ease of access [20].

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COVIBOT: An efficient AI-based Chatbot with Voice Assistance and Multilingualism for COVID-19.

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Abstract. The designed system “COVIBOT” is an Artificial Intelligence-based Chatbot that can describe or predict the possibility of getting infected by coronavirus based on factors such as the user's travel history, symptoms, age, postal code, severity, and health conditions. Based on the responses, COVIBOT will recommend a treatment or a course of action such as consult with your doctor, self-quarantine, or go to the hospital. This chatbot helps the patient to take proper medication and remote consultation. It is very user-friendly as it is voice interactive and is multilingual. COVIBOT can also benefit the Indian people by offering them a quick self-assessment test. The self-assessment test will enable anyone to answer a few questions to check whether the person might be at risk of being affected by the COVID-19 coronavirus.

Keywords: Chatbot, Artificial Intelligence, treatment, course of action, medication, self-assessment test, voice interactive, multilingual, remote consultation, IBM Watson, NLP.

I. Introduction.

We are all together in the fight against the COVID-19 pandemic. The COVID-19 is the most conversational and searched topic in recent times and chatbots are conversational software that artificially replicates patterns of human interaction. Also, chatbots can be found everywhere, we can find it replacing queries and FAQs on the websites and providing virtual assistance. These features make chatbots useful to spread awareness about COVID-19. These days' Chatbot's are not only used for general interaction, but they are also built and developed to be domain-specific. The data used in chatbot diversifies with the change in domain. Domain-specific or Closed-domain chatbot is designed for a specific area of interest making it thoughtful and relevant. There have been a lot of searches for the pandemic COVID-19 and people are coming across false information, so we decided on COVID-19 as our domain. [1]

COVIBOT helps the users and the health providers by giving immediate replies to the Questions asked by the user. Due to adequate Healthcare Infrastructure and facilities, which is one of the topmost concerns regarding COVID-19 treatment available in India, people are finding it difficult to get proper treatments. Establishing question-answer forums is becoming a simple way to answer those queries rather

than browsing through the list of potentially relevant documents from the web.[2]

COVIBOT plays a leading role by bridging the gap between the patient and doctor. This Chatbot uses Artificial Intelligence, which will be forecasted to help people understand what they are supposed to do when they face COVID-19 symptoms. [3]

As India has a population of more than a billion, COVIBOT will help to manage the rush of those seeking medical care and reduce the high number of walk-ins to hospitals by those who suspect they have been affected by the virus. Soon, the COVIBOT will also provide a map that will be based on postal codes to the medical authorities and decision-makers, which could help them, see where outbreaks are occurring and help them take action to contain them.

It is becoming increasingly important to develop chatbots that can best respond to the personalized needs of their users so that they can be helpful to the user in a real human way. In India, many users may not understand a particular language. COVIBOT thereby supports multiple languages including Hindi, which is one of the majorly spoken languages. COVIBOT will rapidly and radically transform in-person care to remote consultation of patients. [4]

II. Literature Survey

One of the major challenges that India as a country faces is to cater to good quality and affordable healthcare to its growing population. The World Health Report issued by WHO has ranked India's healthcare system at 112 out of 190 countries [5]. This inaccessibility of healthcare facilities especially in rural India and the intricacy in accessing means of transport further causes patients to postpone their treatment, or opt for medical facilities that may be closer but at the same time are not cost-efficient and well-matched to their medical needs. To seek more efficient ways to provide timely medical care, access and quality treatment to the patient, the role of COVIBOT comes into play which connects patients with healthcare providers, healthcare information, and treatment. One of the reviews aimed to provide an overview of the features of chatbots used by individuals for their mental health as reported in the empirical literature. It has identified 53 studies that assessed 41 different chatbots. The most common use of chatbots was delivery of therapy, training, and screening. Of the 17 chatbots providing therapy, 10 chatbots were based on cognitive behavioral therapy,

and 8 chatbots targeted people with depression and anxiety. From this research survey, they concluded that most chatbots were focused on depression, and were implemented in developed countries. The most common use of chatbots was delivery of therapy, training, and screening.[6] Due to the recent COVID-19 pandemic, social distancing will stay in India for a long time, especially for patients with chronic diseases, thereby imposing a hindrance for the population to access healthcare facilities. The proposed system COVIBOT is to create an alternative to this conventional method of visiting a hospital and making an appointment with a doctor to get a diagnosis. COVIBOT is built to be a conversational AI-based agent that motivates users to discuss their health issues and suggest treatments based on the symptoms provided by them. This chatbot system will be able to identify symptoms from user interaction. Medical chatbot has a high impact on the health culture of the country. It has improved reliability and is less prone to human errors. [7] The data released by the National Health Mission [8], amid COVID-19 shows that there has been a fall in other acute illnesses being reported during the lockdown in India. This data indicates that a reduced hospitalization case indicates a lack of access to healthcare, rather than a lack of illness. In this alarming situation, COVIBOT will act as a boon for people. By using conversational artificial intelligence, COVIBOT can treat patients without the need for a personal visit, whilst promoting social distancing and reducing the risk of COVID-19 transmission. Voice assistants make use of a natural language interface to communicate via speech. Voice technology must be tailored to be useful in the field of healthcare [9]. It is necessary to understand the sentences in dialogues. Understanding the user's inputs provide a basis to deliver an appropriate response. Each user will have different expressions to use for conversation depending on their linguistic ability and vocabulary level. [10] The solution COVIBOT includes a Multilingual Voice Application based on NaturalLanguage Processing to provide primary healthcare education and advice to chronic patients. Using AI, it converts the user's speech to text which is processed and understood using natural language processing, and an output is generated which is then converted back to speech and returned to the user. [11]

III. Related Works

Certain text-based human-computer interaction systems have been developed like ELIZA [12] that imitates a psychotherapist, and then PARRY [13] which suggests the thinking of a paranoid patient. Rajj et al., [14] conducted two separate experiments where they compared virtual human interactions and with a real human in a medical consultation scenario. Their result shows similarity in virtual and real interactions context.

A. Fadhils et al., [15] work shows how intelligent conversational systems can be used to interact with old age populations to collect information, continu-

ous monitoring of health conditions, especially after discharge from the hospital.

Amato et al., [16] present a medical recommendation system specifically designed to interact with the user, thereby acting as a medical physician. This paper aims to propose HOLMeS (Health On-Line Medical Suggestions), a novel eHealth recommendation system that leverages a chatbot to emulate human physicians in a clinical environment, to overcome the mentioned limitation of biased interaction between the user and the software. The chatbot application is implemented by the Watson Conversation Service, designed and trained via the Bluemix platform.

The HOLMeS system is composed of the following components:

HOLMeS Application-It is the core of the HOLMeS system, implements the operational logic, and orchestrates modules communications and functionalities. Developed in Python, it interacts with the user through the chat-bot, interpreting patient requests using the Watson Conversation API.

HOLMeS Chat-Bot-It is the agent designed to make the patient feel more comfortable, by interacting with it by a chat. Based on deep learning, it is designed to understand and to adapt to several interaction schemas, ranging from formal writing to more handy ones.

IBM Watson-IBM Watson (with its Conversation APIs) is the service used to establish a written conversation, simulating human interactions. Its main features include text mining and natural language processing using deep learning approaches.

Computational Cluster-It implements decision making logic. It uses the Apache Spark cluster executed over the Databricks infrastructure, to be fast enough and scalable to be effectively used in a very big clinical scenario, ensuring response time comparable to that of a human physician.

Comendador et al., [17] introduced Pharmabot, a pediatric generic medicine consultant chatbot designed to prescribe and render useful information on generic medicines for kids.

Li et al. [18] utilized IBM Watson Language Translator API to implement an automated invoice processing system for a global business that provides secure language translation between multiple languages. The system also offers a feedback system to periodically rate how accurately users' words or sentences are translated and are useful in improving the language model.

Packowski and Lakhana [19] utilized IBM's services to build a chatbot that could effectively respond to customer service requests. IBM's services that were used include Natural Language Classifier (NLC) for classifying chat messages into predetermined groups, Natural Language Understanding (NLU) for extracting keywords and entities, Language Translator for identifying what language chat messages have been written in, Watson Knowledge Studio for creating a

custom language model, and Tone Analyzer for identifying the mood of a chat message.

Proposed Methodology

The proposed methodology is based on a chatbot named COVIBOT which can describe or predict the possibility of getting infected by coronavirus or suggest a treatment to the user based on factors such as the user's travel history, symptoms, age, postal code, severity, and health conditions. Based on the responses, COVIBOT will recommend a treatment or a course of action such as consult with your doctor, self-quarantine, or go to the hospital. It will also track the location of the user using GPS. The working of COVIBOT is explained through the given three processes:

The working of COVIBOT is explained through the given three processes:

1st Process: Graphical User Interface (GUI).

Graphical user interface (GUI) is used to make the interaction between the COVIBOT and users in the easiest possible way. So GUI is a fatal element of communication with users in the modern world. The user-friendly GUI helps to do interact more easily.

2nd Process: Question and Answer.

Designed question and answer layer, in which COVIBOT asks questions to users such as travel history, symptoms, age, postal code, severity, and health conditions. These questions will be asked in regional languages based on region as well as mother tongue. Due to this the user that is connected to COVIBOT can easily elaborate on the health issue. The elaboration of health is nothing but finding the intensity of the disease by specifying the exact symptoms. These questions will be asked in regional language. Due to this more accurate answers will be obtained from the users to the COVIBOT. This leads to resolving issues such as insufficient and inaccurate usage of words while providing inputs to the system. This leads to increased inaccuracy.

3rd Process: Match question and Prepare answer.

The answers given by the user is analyzed based on keywords. Those keywords are also analyzed from the available databases. If the answer given by the user is matched with the dataset of COVIBOT, it will recommend a treatment or courses of action such as consult with your doctor, self-quarantine, or go to the hospital. Due to this the line of action to the user can be specified. By doing so primary treatment of the patient can be started. During the conversation of the user and COVIBOT, the user can also be benefitted from counseling. This might also help to build the moral support of the user.

IV. NLP WORKING IN DETAILS CONCERNING THE CHATBOT.

This system allows computers or mobile phones to communicate with humans to computers by using natural language processing (NLP). NLP is used for analyzing the language of a user on a computer, which analyses the language from the speech, rela-

tionship extraction, topic segmentation, etc. Due to this computers can communicate with the user in their regional languages. NLP extracts the required information only and responds to it in seconds.

Three analyses understand natural language. These are the identification of main linguistic relations that are completed to parse the subject into the object of the sentences. After that description of the texts is done. The semantic interpretation uses knowledge of word meaning.

The chatbot is an Entity that imitates human discussion in its particular accepted set-up together with a text or vocal language with techniques such as Natural Language Processing (NLP). This system aims to replicate a person's discussion. The development of chatbot applications can be done by making a user interface to send input and receive a response. It is a system that interacts with users by keeping the track of the state of interaction and recollecting the preceding commands.

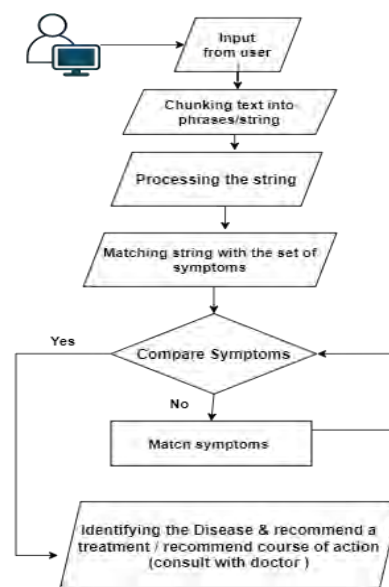


Figure 1. Flowchart for specifying the disease

Initially, the COVIBOT asks input from the user in the form of questions such as travel history, symptoms, age, and postal code, severity, and health conditions. The input from the user is then processed by Natural Language Processing (NLP) in which the text is chunked into phrases/string. In the next step, these phrases/strings are then processed. The COVIBOT has been initially provided with a database of collected information on symptoms of the disease. The input from the users is then matched with this database and searches for similar symptoms. In the next step, it compares the symptoms and if it matches exactly with the database provided by COVIBOT then it identifies the disease and recommends a treatment or in severe conditions recommend a course of action such as consult with your doctor. If the symptoms do not exactly match the Database then COVIBOT gives a message 'You may not be infected by the viruses

and in case of much discomfort the user may consult the doctor.

Use of IBM Watson in proposed COVIBOT In this study, COVIBOT is leveraging IBM Watson Assistant, Tone Analyzer, and Speech to Text, Text to Speech, and Language Translator to develop the proposed chatbot. Ultimately, the goal of this study is to integrate the chatbot capability with a robot that has speech recognition capabilities. Speech recognition allows people to communicate more effectively with applications and allows greater accessibility for a wider range of users who may not be able to use the general mouse/keyboard method of computer/mobile interaction. Additionally, it allows users to interact in a more natural way which allows for ease in multi-tasking [27]. To fulfill the needs of users, a system should be intuitive and natural to use, and speech recognition tools play an important role in this accessibility. Next, we present the architecture and components description of the proposed chatbot.

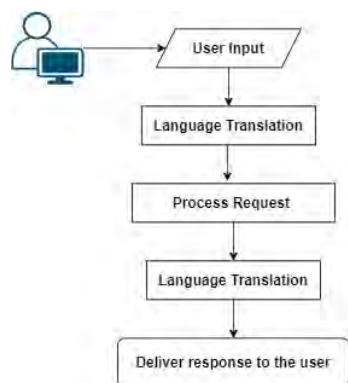


Figure 2. The general architecture of the proposed chatbot for language translation.

The working of Fig 2. The general architecture of the proposed chatbot for language translation is explained below: Accept user input in text or voice formats. Translate the received input to the desired language where necessary. Process the received or translated input to generate an appropriate response. Translate the received response back to the input or desired language where necessary. Deliver response to the user in the form of a printed text, gesture, or speech. Self-Assessment Test provided by COVIBOT

COVIBOT can also benefit the Indian people by offering them a quick self-assessment test. The self-assessment test will enable anyone to answer a few questions to check whether the person might be at risk of being affected by the COVID-19 coronavirus.

By aggregating the medical data the bot collects, the doctors can focus their efforts on the patients who are at high risk of getting severely affected by the virus. We are focusing on segmenting the audience based on the various factors such as their health conditions, travel history, and the severity. This might help the doctors to focus on attending the people who need immediate care. This also helps in directing and treating people who don't require a doctor to assist them with COVID-19 related questions and treatment. As India has a population of more than a billion, COVIBOT will help to manage the rush of those seeking medical care and reduce the high number of walk-ins to hospitals by those who suspect they have been affected by the virus. The COVIBOT will also provide a map that will be based on postal codes to the medical authorities and decision-makers, which could help them, see where outbreaks are occurring and help them take action to contain them.

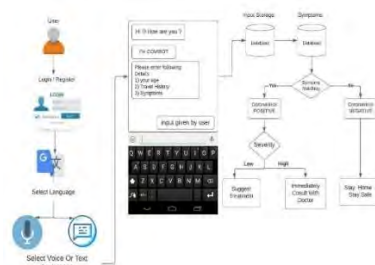


Figure 3. General working of COVIBOT.

The user has to first Register/Login for accessing the COVIBOT application.

After logging in, the user has to select a language according to his/her convenience from 22 different Indian National Languages.

The user has the option of using voice/text assistance which can be changed anytime as per the requirement.

COVIBOT would now ask questions related to the user's health and travel history and will match the responses of the user with its Database.

If the user's data matches the database of COVIBOT, the system will check the severity of Coronavirus disease, and depending on the severity, COVIBOT will recommend a treatment or a course of action such as consult with your doctor, self-quarantine, or go to the hospital.

If the user's data do not match with the database of COVIBOT, the system will suggest the user not to worry and panic. Stay Home, Stay Safe!

Discussion [20][21][22][23][24]

Table 1. Working principles of available systems for COVID-19

Points to be discussed	Aarogya Setu	Sahyog	Corona Kavach
Introduction	The Aarogya Setu is a tracking app that has been recently developed by the Gov-	India's national mapping agency, Survey of India, has developed the	Corona Kavach is a COVID-19 tracker application, created by the Union

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	ernment of India.	SAHYOG app, which will complement Aarogya Setu to meet contact tracing, public awareness, and self-assessment objectives.	Ministry of Electronics and Information Technology in collaboration with the Ministry of Health and Family Welfare.
Working	Aarogya Setu is used to find out about coronavirus infection cases using a GPS and Bluetooth – features present in all smartphones. These Smartphone features will be used by the government to determine if a person is living nearby a COVID-19 patient.	This app helps the government to improve its response system. The app will work as a key tool in helping community workers carry out door-to-door surveys, contact tracing, deliveries of essentials items, and focused public awareness campaigns.	Corona Kavach uses the contact number of the user and fetches location data of the Smartphone. This data is then matched with his/her movements with the Indian Council of Medical Research (ICMR) data on the backend.
Tracing	Arogya Setu traces the coronavirus infection cases using a GPS and Bluetooth – features present in all Smartphone's	The app will work as a key tool in helping community workers carry out door-to-door surveys, contact tracing.	The Corona Kavach app is used for tracking the Coronavirus patient and control its spread. You are also required to answer a couple of questions.
Supported Languages	The app is available in 11 languages including English, Hindi, Bangla, and Marathi, etc.	This app supports only three languages English, Hindi, and Telugu.	This app supports English and all the regional languages of India.
Advantages	<p>1) The Aarogya Setu App works on Bluetooth-based technology and tries to determine risk based on the user's location.</p> <p>2) It keeps the user informed in case he/she has crossed paths with the positive COVID-19 case within 6-feet proximity.</p>	<p>1) Since it is complementing the Aarogya Setu app, it becomes easier to trace the contacts of COVID-19 infected persons by the Sahyog App.</p> <p>2) Information like containment areas, hotspots and biomedical waste disposals, testing labs, and quarantine camps are being integrated with Sahyog to provide relevant information.</p>	<p>1) Based on the database, Corona Kavach then tags you into categories and color-codes. Code green means you're all good, orange means you should see a doctor, yellow is for quarantine, and red means you're infected.</p> <p>2) For the unexposed, Corona Kavach offers a one-hour location tracking window to keep a check on your surroundings to let you know if and when you come into contact with someone who's already been infected by the virus. You can choose to conduct this tracking as many times as you want.</p>
Features	<p>1) The new feature uses Bluetooth contacts sharing to assess the level of risk if you have been nearby.</p> <p>2) The latest feature will enable users to assess their risk</p>	<p>1) This support system will get data from the volunteers present on the ground.</p> <p>2) Doctors, Anganwadi workers, and ASHA (Accelerated Social Health Ac-</p>	<p>1) Alert users if they are near a COVID-19 infected patient</p> <p>2) Monitor the status of the community spread of Coronavirus through users' location</p>

	<p>status about the number of people they have been near.</p>	<p>tivist) are some of the volunteers that are feeding data in the app.</p>	<p>3) Send notifications to users who have been in close contact with anyone tested positive for COVID-19 Corona Kavach app also has color coding to help people know their current status: Green: You never came nearby of Corona patients Yellow: You came nearby of Corona positive person Red: You have been declared Corona positive after tests.</p>
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In Table 1, 3 different major applications Arogya Setu, Sahyog, and Corona Kavach which are developed by the Government of India are discussed with the help of a comparative analysis table. Now we are going to discuss the proposed chatbot, COVIBOT with them. In some of the other ways, these apps need to rely on each other to gather complete data of the user which includes detection, tracking, and alerting users for coronavirus. First, we will discuss the working and reliability of these applications over each other: Arogya Setu is used to find out about coronavirus infection cases using GPS and Bluetooth. Sahyog works as a key tool in helping community workers carry out door-to-door surveys, contact tracing, deliveries of essential items, and focused public awareness campaigns. Corona Kavach uses the phone number of the user, along with the location data of the Smartphone, and matches his/her movements with the Indian Council of Medical Research (ICMR) data on the backend. It is also used to alert users if they are near a COVID-19 infected patient. How can COVIBOT be a better alternative to these applications? The proposed chatbot "COVIBOT" will not only be able to gather all these data at one place through a single application but also suggest a treatment depending on the inputs from the user. India has 22 languages that have been given the grade of National Languages which differ from state to state [25]. The applications we have discussed do not support all the languages thus all the users won't be able to access it more efficiently. India's differently-abled are left in the lurch by virus and lockdown. The government's measures, or the lack thereof, fail to ease their burden. The above-discussed applications do not have any special features for such users which is one of the major limitations [26]. COVIBOT can overcome all these limitations as it is multilingual and also supports voice assistance that can best respond to the personalized needs of the users so that they can be as helpful to the user as possible in a real human way. Due to adequate medical infrastructure which is one of the topmost concerns regarding COVID-19 treatment available in India, COVIBOT will rapidly and radically transform in-person care to remote consultation of patients.

V. CONCLUSION

The proposed system, developed and researched is an interactive chatbot developed using Artificial Intelligence. The domain was considered based on the hot topic COVID-19. Due to the requirement of interactive application and to overcome the limitations of already existing Government applications for the pandemic and also creating a user-friendly chatbot that can be accessible to most of the people in India due to its major features like voice assistance and multilingual support we have come up with COVIBOT. Nowadays chatbots are looked at from an assisting approach making them unable to establish a friendly connection with the user. Also, purely AI chatbots do not have set responses for set statements. Our approach will provide a response based on users' way of chatting as well as based on positively prepared responses. We have not only restricted our chatbot for the Covid-19 pandemic but also it can be used later for the treatment of other diseases or for providing the suggestions.

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Inevitable future: Space Colonization with 3D Printers and Artificial Intelligence

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Abstract. Charles Hull's [1] [2] breakthrough invention of 3D printing in 1984, has been at the heart of several applications including humankind's long coveted idea of space colonization. 3D printing is one of the most promising technologies for space colonization as it is versatile, economic, and efficient. It requires minimal human intervention, and allows rapid prototyping.

The focus of this research paper will be on assessing the potential role of additive manufacturing integrated with artificial intelligence on the future of space colonization. The methodologies used in this research will primarily be considering the planet Mars as the case study, since Mars has been the subject of NASA's [3] [4] many space exploration projects. The connection between 3D printing and Martian colonization can be established from the core principle of in-space manufacturing. While current methodologies to establish an extra-terrestrial settlement rely on complex methods to transport and construct an architecture through work force, additive manufacturing employs a "waste not, want not" strategy by using the resources already available on the planet that can cope with the temperamental climates on the planet. The usage of artificial intelligence assists in this concept with both the employment of robotics as well as the possible optimization and automation of the workflow on another planet. Both these factors allow an unprecedented efficiency in the concept of extra-terrestrial construction. An evaluation of the feasibility of building settlements on Mars using 3D printing and artificial intelligence is the focus of this investigation. The methodologies that form the basis of this research are interviews, web research and study of the pre-developed ideologies. [3] Such ideologies include both the analysis of additive as well as subtractive projects for appraisal and recommendation. Because of the short history of the technologies, the unpractical nature and relative lack of general awareness of this topic, the variety of usable methodologies is limited at this academic level due to organisational confidentiality and lack of availability of research archives relating to the topic. The above methods prove to be utilizable for determining possibilities in the future.

Keywords: Additive Manufacturing, 3D Printer, Artificial Intelligence

I. INTRODUCTION

You want to wake up in the morning and think the future is going to be great - and that's what being a spacefaring civilization is all about. It's about believing in the future and thinking that the future will be better than the past. And I can't think of anything more exciting than going out there and being among the stars.

- Elon Musk (SpaceX Missions)

Colonisation of outer space has been a fiction to the civilian, a trope to the author and a predilection to the scientists who believe it to be a solution to the overarching population crisis that threatens the planet. It offers a plausible, and until twenty years ago, theoretical, solution to the prophesied apocalypse.

Amongst the other planets in the solar system, Mars has always been the first choice, as it possesses many aspects that make it a viable settling ground: in particular, its atmospheric and geological features. The distance between Mars and Earth is low relative to other planets, so travelling to Mars does not require as much transportation material or cost. There are consistencies in meteorological aspects of the planet as well, such as the atmospheric and planetary density, equatorial temperatures, length of the day and a minor occurrence of the Greenhouse Effect, meaning Mars has a very close resemblance to Earth more than any other planet in the solar system.

It is evident that to realize the task of creating sustainable settlements for humans, exorbitant costs will have to be borne for the transportation of the construction material and the workforce. Besides, the distance coupled with the arbitrary and harsh environmental conditions may make it an unachievable assignment. Through this paper, the author intends to evaluate the plausible role of technology to materialize the project. 3D printers equipped with artificial intelligence, using on-site material available to construct, are the most promising choices to accomplish the insurmountable mission.

The report begins with an overview of Mars and the cosmological, meteorological, geological and physical dangers posed by the planet. It then discusses the various factors to be taken under consideration such as microgravity impacts, material management, and analyses each of these factors under influence of artificial intelligence and additive manufacturing techniques.

II. FACTORS UNDER CONSIDERATION

II.1 Microgravity Compatibility

If colonisation on other planets were hypothesized through additive manufacturing, the relative gravity



Fig. 2.2.1. 3D printer designed by the company MadeInSpace installed on the ISS (Credit: MadeInSpace)

would not be microscopic. NASA statistics show that Mars has an acceleration due to gravity of 3.711 ms^{-2} [5] compared to Earth at 9.807 ms^{-2} at an average, to four significant figures. This means that if additive manufacturing is used to print a settlement on Mars, the results that have been gained from this experiment will selectively apply to the project. Any printer designed to work without human intervention in space (using artificial intelligence) must also be built accordingly in order to be sensitive to such gravitational differences and must be programmed with responses to facilitate these changes.

On the International Space Station (ISS), the 3D printer made by the company MadeInSpace underwent stringent testing in microgravity [5], or the state of what is often taken to be synonymous with zero-g at point infinity. Microgravity essentially creates a state that makes everything in the environment weightless, so that objects are no longer impacted by the gravity from the point masses and all objects attain a state of continuous free-fall. These experiments were conducted with a variety of coupons that each serve a different purpose due to their shape and physical properties to promote the next phase of scientific space development, In-Space Manufacturing. It is a concept that intends to provide sustainable missions through impromptu production and fixes. The material used was Acrylonitrile Butadiene Styrene (ABS) plastic, and the predicted behaviour was found to be profoundly similar to that expected on Earth, making the experiment successful.

As per Q. A. Bean and K.G. Cooper et. al., the only discrepancy that was noted in the experiment and is believed by the scientists to be caused by microgravity was super-adhesion: *“Super-adhesion of the [printed] samples to the print tray during on-orbit printing was not observed while printing the ground samples and is suspected to be the effect of microgravity [during testing].”* [5]

Adhesion is an affinity of disparate particles to adhere to each other, and super-adhesion is a stronger presence noted in cyanoacrylates. This is exhibited in microgravity by the plastics. However, the author believes that this may prove to be a valuable factor when printing in reduced gravity because the structures built may have a greater tensile strength that could act as a protective shield against the temperamental weather on extra-terrestrial planets. The similarity in the ground testing and microgravity testing is an encouraging factor to prove this report’s hypothesis.

While the printer on the ISS is not artificially intelligent, its capabilities of defect correction, increased precision, consistent reproducibility, and expansive design efficiencies would enhance the quality of the products made, as well as improve the timeline by automation. While robotics would not analyse the environment of the product to be manufactured, artificial intelligence would examine each facet of production without human intervention before the process itself. In mild gravity, this is even more important as the direction of the print head, especially in Fused Deposition Modelling (FDM) printers, must constantly alter in order to maintain the prod-

uct orientation, and generally controlled by the human making the product.

III. MATERIAL MANAGEMENT

Material forms an important part of additive manufactur-



Fig. 2.2.2 - Left: MARSHA Right: Den@Mars, the two projects in the NASA 3D Printed Habitat Centennial Competition (Credit: IEEE Spectrum)

ing, because there are few categories of materials that can successfully be melted into a sufficiently mouldable liquid that solidifies as soon as it is deposited, or a solid that can be compressed under extreme pressure to form a virtually unbreakable structure. On Earth, such materials include nylon, ABS plastics and powdered metals. However, when a mission is planned on a galactic scale, we revert to what is commonly known as in-space manufacturing. On Mars, this becomes even more important because the settlers are subject to multiple hazards and radiation. The Jet Propulsion Laboratory’s (JPL) rovers earlier discovered that basalt is an important part of Martian regolith due to the presence of several volcanoes [6] on the planet’s surface, and it can be easily mined unmanned and extracted from the regolith without external intervention. It can then be converted to fibres and, mixed with graphene to form a filament that can be used as a raw material in the 3D printer. The Kennedy Space Center (KSC) at NASA earlier researched the independent use of basalt as an additive raw material. [7] The experiment conducted by KSC was remarkably successful, and this was later also used by AI Space Factory in their award-winning venture MARSHA, after being mixed with organic polymers. The structure proved to be relatively strong, but redundant against blunt-force impacts. [8] To improve both this issue and provide substantial protection against radiation, the author believes that the polymer graphene can be used. Graphene has been discussed in more detail in Radiation Shielding and Meteorological Compatibility section.

AI and robotics can help to simplify the complex mining tasks. [9] AI can help to learn more about the terrain and potentially valuable areas for mining. It can use pattern analysis, predictive algorithms, and optical vision systems to map geological data for predicting the location of resources. This AI assisted mining process can increase the efficiency, effectiveness, environmental and safety concerns in the non – conductive environment on Mars leading to reduction of expenses of up to 15%, optimization of resources of 10%, and reduction of waste and higher yield and mineral recovery of 5%. [31]

III.1 Radiation Shielding and Meteorological Compatibility

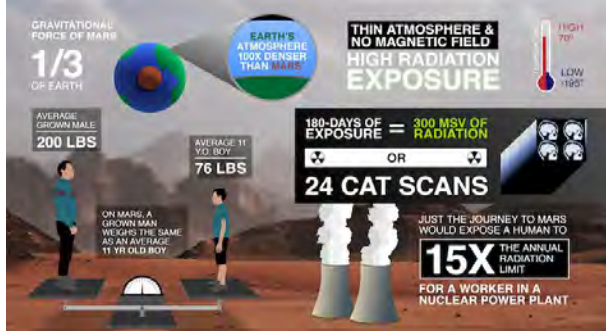


Fig. 1. Infographic depicting dangers of Mars (Credit:J Walsh/Open Spaces)

Mars as an extra-terrestrial planet has a hostile environment for humans to settle. The table gives a statistical idea of the physical features of Mars that have to be overcome before successful colonisation.

Table 2.3. Comparison of Martian and Terrestrial Physical and Geological Features

Property	Earth	Mars
Temperature/°C		
Low	-88 [10]	-153 [11]
High	58 [10]	20 [11]
Annual Exposure to Radiation/mSv	0.21 [12]	11 [13]
Acceleration due to gravity/ms ⁻²	9.807 [11]	3.711 [11]
CO ₂ content in atmosphere/%	0.04 [11]	96 [11]
Atmospheric Density	1.2256 [11]	0.0155 [11]
Dust content in atmosphere	Low [11]	High [11]

The question that arises on noting the meteorological discrepancies is, where does additive manufacturing impact or in any way offer a solution to the survival problem? How will the use of additive manufacturing to construct a settlement negate the hostile factors listed above?

3D printing company AI Space Factory used the in-space manufacturing ideology in NASA’s 3D Printed Habitat Challenge, and implemented it using basalt fibres and polylactic acid to create a raw material filament for the 3D printer to extrude. However, polylactic acid, while environmentally renewable, is subject to degradation in high quantities of radiation [14]. This would mean that, when exposed to Martian cosmic rays, the material would degrade.

In the author’s view, a better alternative to polylactic acid would be graphene, an allotrope of carbon that is structurally made of two-dimensional hexagonal lattices of carbon atoms forming a polycyclic aromatic hydrocarbon molecule. Graphene is also relatively easy to isolate, and is known to be almost 100 times stronger than steel [15], but has a very low density and is therefore easier to transport at a reduced cost. The main prop-

erty of graphene that provides a significant advantage over polylactic acid would be its radiation shielding properties. [16] Several layers of graphene can effectively nullify radiation better than concrete.

Therefore, to answer the abovementioned question, the author believes that a solid mixture of liquefied graphene and basalt fibre would effectively prove to be a viable 3D printing raw material as well as provide the structure strength, flexibility and radiation protection.

III.2 Structural Designing

Mars poses many dangers, which have to be compensated for both via the material as well as in the overall architecture and construction methods.



Fig. 2.4. The site for NASA Centennial Challenges, Right: AI Space Factory’s MARSHA, Left: Penn State’s Den@Mars (Credit: ArchDaily)

Additive manufacturing allows a solution to this problem, because the structure can be built in three dimensions as long as it obeys geometrical principles. This means that a structure can be constructed underground with greater ease, allowing greater radiation protection and physical shielding. The integration of AI means that the structure made can be far more efficiently and the computer itself, without the need of excessive manual troubleshooting, can eliminate flaws in the design. It also implies that the design can be reproduced for different Martian environments easily, as use of sensors and knowledge bases in the system can take all structural aspects including geological factors of the ground into account without exception and print with complete automation.

The structure also has to be, as mentioned earlier, resistant to the effects of lower gravity. While prospective structures have already been built on a small scale to model an additively manufactured shelter, they have not been built to resist the gravitational effects.

The scaling of the object’s size from the small test subjects to the actual implementation also needs to be proven in its effectiveness. A viable method as per the author to prove the aforementioned point would be to model the structures on a larger scaling of up to 1:5 for testing aboard the KC135 NASA Reduced Gravity Aircraft. The simulated construction process can be monitored in the Mars Simulation Laboratory at Aarhus University, Denmark, or at JPL at the California Institute of Technology.

III.3 Financial Appraisal

One of the main speculations within the venture to colonise Mars is the economic impact of such an increasingly large investment. The present suggestions for budgets estimate a total amount of \$ 100 billion by NASA, \$ 36

billion by SpaceX, and \$ 30 billion by the Mars Society, all without 3D Printing options. Based on available data [17] [18] the following compilation of comparative costing under five broad categories clearly indicates the advantages of the proposed 3D printing options.

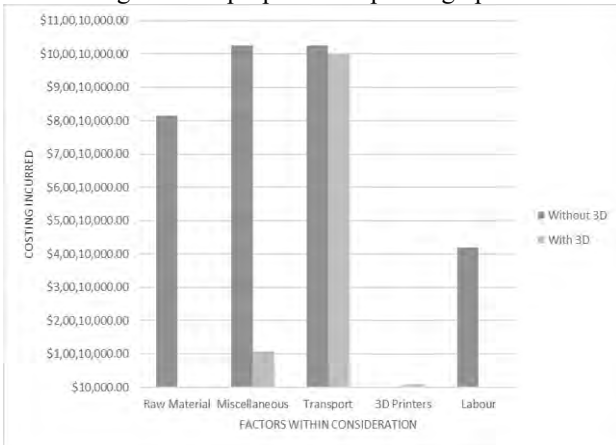


Fig. 2.5 A Comparison of the Costing Derivations With and Without the Usage of 3D Printing

Table 2.5. Financial Appraisal Table (*Miscellaneous costs include temporary colonising costs, radiation protection, food consumption, interiors and all equipment necessary.)

	With 3D	Without 3D
Raw Material	\$8,15,10,88 5.80	\$50,000.00
Miscellaneous*	\$10,26,28,07 1.20	\$1,08,39,15 0.00
Transport	\$10,26,28,07 1.20	\$10,00,00,0 00.00
3D Printers	\$0.00	\$10,00,000. 00
Labour	\$4,20,00,000 .00	\$2,82,692.3 1

The graph created by the author after intense data accumulation through websites and online data provided by agencies covers the diverse variation in costs while using 3D printing, and shows the significant reductions of the cost using additive manufacturing. The transport costs in this table have been derived from an average cost of travelling via the Falcon 9 rocket as data for the Starship rocket (the prospective vehicle for the mission designed by SpaceX) is unavailable. Assuming a larger than normal payload and material, the costing amounts to \$ 10, 00, 00, 000 with 3D printers, or \$ 10.61 billion dollars without, according to SpaceX. Over time, this could reduce considerably as per Elon Musk for individual tickets [19], but it is still a financial risk.

In the author’s view, the principle limitations of non-additive colonisations are the high material costs, in terms of reinforcement, transportation of enormous amounts of building material, labour, tools and miscellaneous equipment. Transport costs, within the essential materials, are non-negotiable; however, the raw material costs are reduced from \$ 81,510,885.80 to \$ 50,000 because of the principal material Basalt required for successfully 3D printing a house on Mars. As mentioned, basalt has been successfully proven to form a condensate that can be used as 3D printing material. Additionally, it

is resistant to the frequent dust storms, so that no supplementary protection is required, thus reducing costs. Miscellaneous costs are significantly reduced because the 3D printers itself can print most of the other items and equipment required. Labour costs are reduced from \$ 42,000,000 to \$ 282,692.31, because 3D Printers are completely automated and take much lesser time to build a complete settlement. It also proves to be a profitable venture at large.

However, the integration of AI into this equation tips these odds. Implementation of computed intelligence is expensive. [20] Each element of the designed AI system has to be customised to the set purpose. While coding AI systems is already difficult and takes several years to design and test, the scale of the project implies a large amount of hidden costs that may incur during the project at any time. So while additive manufacturing reduces the costs considerably, the financial aspects of developing customised AI software for small companies charge anywhere from \$6000 to \$300,000 per solution [21]. Developing costs increase proportionally by magnitude of the said project. A venture of this scale would cost millions of dollars in the designing phase itself, and maintenance would be a further monetary burden.

III.4 Assembly Procedures and Time Period Alterations

In 2018, the New Story charity and ICON constructions unveiled their plans to make a new 3D printed community in El Salvador and Tabasco (Mexico) for those who could not afford expensive homes. [22] [23] In the testing phase, the building time for each singular house was approximately twenty-four hours with a cost of less than 4000 USD. According to census statistics, individual homes in the United States take about six months to build for a single family home at 2000 square feet [24], hence the time taken to make a house is reduced by a factor of 180 for homes made on earth.

It is the author’s purview that the usage of 3D printers in potentially unmanned construction also requires lesser labour because of the lack of human intervention in additive manufacturing technology. As the materials used are self-hardening and the printers can be remotely controlled, the technology removes the vulnerable element of constructing a settlement. With remote accessibility, there is no risk of losing lives in alien construction, even if such a technology cannot negate the impacts of explorative ventures by the settling population. Manual labour is only required in the final stages of securing the accommodation, wherein underground detail, furniture, plumbing and other such detailed work can only be designed by humans. 3D printing, after making a framework for the housing and minor detailing cannot be extended. Assembly of a house via 3D printing also allows less wastage of resources. On a rotatory filament, the amount of material unused in the construction remains as raw material, unlike subtractive manufacturing. This allows for efficient resource utilisation.

Bringing AI into this venture, however, the timelines are altered. While AI considerably speeds up the process of

the manufacturing and removes the ‘human’ element of production in practice, the development of the software and its various entities is a time consuming process. Adjusting the compatibility of the software and customising it to work with specific protocols and 3D printers adds to the development time. Making the system as feasible as possible to a new environment with forecasting capabilities also adds to the length of the analysis stage. [32] While a normal systems life cycle ranges from six months to over four years in all phases, a system being designed to facilitate extra-terrestrial construction sites may take much longer time. Space being a remarkably obscure and unexplored environment, the preparation for unprecedented or unforeseen dangers and factors must be taken into account while designing a software to control the site.

IV. ADVANTAGES OF ADDITIVE MANUFACTURING WITHIN SPACE COLONISATION

After a thorough examination of the factors and the data available that influences the plausible settlement, the author has drawn the following deductions, unless otherwise mentioned, regarding advantages of using 3D printers and AI to create a colony on Mars.

IV.1 Microgravity Compliant Structural Responses

The experiments on the International Space Station proved that 3D printed structures in space showed similar results to those printed on Earth, with the only difference observed a property of super-adhesion caused by the lack of gravity. This alleviates the concerns attributed to the reduction of functionality of architecture printed on Mars. Although Mars does not have zero gravity, a milder form of super adhesion will attribute a greater tensile strength to the resultant structure, meaning it can withstand the natural disasters on the temperamental planet.

IV.2 Availability of Resources on Martian Soil

Additive manufacturing offers significant advantages in both material selection as well as waste minimisation, as it promotes the concept of in-space manufacturing. The material in usage can be mined on the planet itself, and any remaining material after completion is left unused. This means that finite resources required for survival on the planet are used efficiently. In-space manufacturing also reduces the payload of the travelling shuttles, so that excess material does not create a burden. The use of AI implies that materials will be used strategically and constructions created in places that have been analysed to be suitable. Any flaws in the design that use excess material or disobey protocols will be eliminated.

IV.3 Safety Integrated with In-Space Manufacturing

Additive manufacturing allows the integration of materials into a single filament or mixture for making raw material. The usage of graphene as mentioned earlier facilitates shielding against the harmful radiations. According to Cao Ke of Hong Kong University, graphene’s tensile strength is very high. Researches conducted at University De Namur [25] show that electrical conduction properties, radiation resilience are affirmative, and it is much lighter than lead, hence a combination of basalt

and graphene condensed into a 3D printing material can successfully prevaricate most cosmological threats. An incorporation of AI means added safety in terms of lesser labour requirement and greater precision in in-space manufacturing. [32] Even the combining of materials before extrusion to form the structure can be done with a very high accuracy. Accidents in construction that could occur due to remote commands are reduced.

IV.4 Customised Design

3D printing is widely used by architects and artists because it allows the freedom to create any complex design as long as it is geometrically practical. This means that, regardless of the environment the house is made in, 3D printing can successfully create any structure required to facilitate all the needs of survival. This would not be possible with subtractive architecture, which would have several manual restrictions on the design, and would also put the architects in danger. Any flaws in the construction can be removed via AI troubleshooting, and the design can be much more efficient.

IV.5 Overall Cost Reduction in Establishment

Additive manufacturing will considerably reduce the financial strain set by an interplanetary settlement mission, as the payload is reduced along with the labour required. As 3D printing is an unmanned, remote-access operation, the transportation can be modelled like the Curiosity Rover of NASA [26], reducing the overall costs. As the raw material can be mined on the planet itself, this also means a large quantity of the carried material is eliminated from the equation to only the most basic components and safety equipment, again reducing the cost to a quarter of the expectations.

IV.6 Remote Accessibility and Greater Security

In an extra-terrestrial environment that is hostile to organisms, a reduced construction time can save lives. The usage of 3D printers in potentially unmanned construction also requires lesser labour because of the lack of human intervention in additive manufacturing technology, and this can be an advantage in both saving lives. Remote accessibility also directly translates to a large reduction in labour and fewer lives risked, making 3D printers advantageous over the current technology. With the introduction of AI, this is alleviated even further since most decisions of construction are directly made by the computer rather than humans, so safety and security is ensured.

V. DISADVANTAGES OF ADDITIVE MANUFACTURING WITHIN SPACE COLONISATION

After a thorough examination of the factors and the data available that influences the plausible settlement, the author has drawn the following deductions, unless otherwise mentioned, regarding disadvantages of using 3D printers and AI to create a colony on Mars.

V.1 Microgravity Inconsistencies

Although 3D printed objects have undergone testing in microgravity in the experiments mentioned earlier, the reactions of the atmospheres and meteorological conditions on other planets are unknown. There is no stable guarantee of how the structures will react to the exist-

ence of partial gravity or the frequent storms and volcanic eruptions, proving a risk to those who settle there. Even in simulation laboratories, the conditions cannot be modelled accurately, and the expense of the mission means that the possibility of trials is too limited.

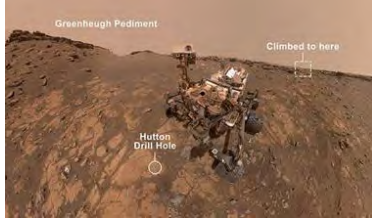


Fig. 4.2. The famed “selfie” of the Curiosity Rover at Mount Sharp on 26 February 2020 on sol 2687 of its mission. (Credit: NASA/JPL Caltech.)

V.2 Mining and Corrosion

Mining the material basalt unmanned without any human intervention is doubtless a difficult challenge that may not be achievable even with robots. Unmanned exploration missions have already proven to be challenging to use, so an entire project of unmanned construction may be too complex to work. Secondly, the isolation of basalt and graphene into a successful filament for usage without human presence would be too convoluted in practice. Lastly, a recent “selfie” of the Curiosity Rover taken by NASA engineers [27] [28] [29] showed sharp signs of corrosion and metallic reaction with the iron oxide content of Martian soil as well as significant wearing of the overall structure over the time it spent on Mars, despite being of the highest quality materials. There is no assurance of how basalt, may react differently, and prevent corrosion, proving a risk. Even as AI monitors the geology of the planet and ensures a very high precision and accuracy [31], the entirety of the process remotely is too complex to control.

V.3 Pressurisation and Temperature Fluctuation Responses

Radiation shielding is one of the most important parts of the project, because cosmic radiation and meteorological hazards account for a large portion of the dangers associated with an extra-terrestrial settlement. However, though a list of objects have been tested in microgravity on the Space Station, it is yet to be determined their response to extremely low atmospheric pressures and densities, posing danger. The rapid changes of the weather on Mars mean that sudden temperature drops and sand storms may not be contained successfully by the structures pre-designed in the NASA Centennial Challenges. Due to the excessive atmospheric inconsistencies, it can be deduced that, in spite of graphene reinforcement, the structures become vulnerable to cracks and breakages.

V.4 Precision and Accuracy

3D Printers, although they can print anything geometrically sensible, as mentioned earlier, have limitations on interiors and precision. Ideally, the larger the object to be made is, the lesser precision is incorporated in it after a certain degree. Interior designing and fittings, sanitation facilities and furniture alignments require human intervention. This means that the structure cannot be created independently by a 3D printer. Although it cre-

ates a skeletal structure and basic foundations on the inside, manual labour is required nonetheless, making it a disadvantage. While AI goes a long way in ensuring accuracy, the material itself can pose significant viscosity issues.

V.5 Delayed Responses and Uncertain Investment

Mars’ temperamental atmosphere has the potential to harm the assumed assembly procedure timings because of the risk of mechanical difficulties to the parts sent to the planet. Because the mission is unmanned, it may take too long to send relief teams to the planet for repairing any damage. Financially, 3D printing does cause a significant economic saving, but it is important to note that the investment is precarious at best because the construction cannot be tested sufficiently on Earth. Several notable accidents in space have shown that even navigating through the expanse is extremely difficult and survival on another planet with a relatively recent technology is an indeterminate wager. Any incident that occurs in space, or any failures on the planet itself will result in termination of the project, resulting in extreme monetary losses. Because the project aims to raise a settlement on another planet, the investment may not be singular or insignificant. The smallest failure may impede the venture for several decades due to the fiscal limitations.

V.6 AI Development Costs Are Very High

The integration of Artificial Intelligence into this project means that the initial development cost of the venture is raised considerably. On a scale that requires the monetary resources of several nations at best to facilitate an extra-terrestrial civilisation, the extreme investment required in the usage of AI makes the already uncertain investment riskier than anticipated. A larger investment at stake is a wager that is hazardous for all shareholders involved.

VI. REFLECTION

In the course of this project, I was compelled to re-evaluate my perception of the limits of information technology and additive manufacturing. At this academic level, it was virtually impossible to extract kernel level information on the hypothesis, but the achieved evidence proved to be sufficiently conclusive and supplied considerable weight to the arguments. Although interviews were chosen to be the principal methodology for data collection initially, the lack of specificity and accessibility of experts in the chosen fields discouraged their use. In consideration of the above arguments, this hypothesis can be concluded with the view that 3D printing indeed has the potential to become a breakthrough technology in space colonisation in the times to come. The economic and physical compatibilities of the structure strongly support the use of the technology for extra-terrestrial construction.

VII. FUTURE SCOPE

Additive manufacturing is still at a very nascent stage in terms of colonisation in Mars. This means that each day there is a breakthrough in the field, and it is yet in the testing phase. This research paper limits itself to tangible architectural and technological factors that concern themselves more with the physical resilience of the hy-

pothetical constructions rather than health and psychology. It is important to note that any structure designed in the future would require a higher focus on the immediate survival of the settlers, include oxygen retrieval, gravitational stimulations, food manufacturing and returns. There is still a very high scope to detail the edifice. Although there are limitations to 3D printing which are untested in the posed environment, the affirmative arguments are highly efficacious, and, because the process is still undergoing rapid development, the presently available data is likely to be outdated over time and the disadvantages may yet be alleviated. With the launch of the Perseverance Rover on 30 July 2020, new breakthroughs may yet be made. Carrying experiments on Earth is comparable to running a simulation where factors can be altered to check how the entity will react to changes. However, the factual results can only be established once the entity is put into the conditions in real time. In such conditions, the corrosive properties, and the 'wear and tear' from the environment occur. It is also important to note that past vehicles sent to other planets, such as the Curiosity Rover have undergone extreme corrosion [29] in the form of rusting, dust settlement and blunt force impacts from the frequent dust storms despite being made of the best materials on Earth. In-space manufacturing, although it may travel some way to reduce the corrosion and settling, may not be able to prevent it entirely. Therefore, there needs to be further research as to how the corrosion may be alleviated. In the view of Konrad Szocik et. al. [30], the political and legal implications of a project of the magnitude of an extra-terrestrial settlement has unprecedented levels of applicable judicial and ethical boundaries. It is essential to note that no singular country has the resources to support the venture without additional international support. The principle question is the viability of use of unmanned construction, remote access technology and specialized payload requires global resources and networking. This means that a project that aims to develop an entirely new civilisation cannot be withheld by any singular country or agency due to the combined intellectual and quantifiable supply allocation in the project. This poses a legal challenge.

What set of regulations should settlers abide by on relocation to another planet? While the use of additive manufacturing significantly reduces the dangers of interstellar construction, it is important to note that space itself poses extreme dangers, and that life of any settler is under constant threat. Because 3D printed homes cannot be sufficiently tested in artificial simulations on Earth, the response of the architecture to such environments is unknown.

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Prediction of Cricket Using Machine Learning Technique

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Abstract:- Cricket is one of the most popular sport played in world, and its financial is increasing each season, its viewership has increased markedly and the betting market for cricket is growing significantly every year. With cricket being a very dynamic game, bookies are depending on prediction to bet on the match results because it is a game that changes ball-by-ball. This paper investigates machine learning technology to deal with the problem of predicting cricket match results based on historical match data of the cricket. Influential features of the dataset have been identified using different machine learning technique, More importantly, machine learning techniques including Naïve Bayes, Random Forest, K-Nearest Neighbour (KNN) and Model Trees have been adopted to generate predictive models distinctive feature sets derived by the different methods. Selected machine learning techniques were applied on available data to determine a predictive model.

Keywords -Machine Learning, Cricket , Prediction, Features, Data model.

I. INTRODUCTION

Cricket is a well-known sport and with its increasing popularity and viewership, change of formats and innovations in tournament. Sports analytics is a promising research field which involves deriving valuable information about the game, based on past games played, or even games in progress. The prediction of the final outcome of the match proves very beneficial to team members, team coaches. Games tactics can be developed by coach based on the outcome of previous matches. One of the primary approaches used in sport analytics research is machine learning. Machine learning techniques are utilized to predict the match result variable by developing classification models based on certain independent variables such as player's position, weather, location, etc.[1,2,3] The process involves training the model based on previous matches played, then the developed model gets evaluated on an independent future match to measure its effectiveness. Since cricket matches are recorded using multiple independent variables within a historical dataset and one dependant variable, this problem can be dealt with using predictive analytics with machine learning. A classification algorithm will process the input dataset to construct a classification model based on the available historical matches to predict the outcome of future matches as accurately as possible.[4,7]

II. LITERATURE REVIEW:

1]Nimmagadda studied statistical techniques to predict a T20 match result while the match is in progress. He have designed a model using a statistical approach to achieve the optimum outcome. Initially a multiple regression model is tested to develop a prediction model. Using runs scored per over in the first inning and second

inning, algorithms such as Logistic Regression with multi-variable linear regression and Random Forest are used to predict the final result. 2]Pathak and Wadhwa studied the prediction of the result for cricket matches using data mining techniques. They experimented on predicting the outcome for ODI match format based on various factors such as home ground, toss decision, innings, fitness of team players and other dynamic strategies. They also implemented a Support Vector Machine (SVM) method which was used to predict the result . they also developed a tool COP (Cricket Outcome Predictor), which gives the probability for winning an ODI match.

3]Jhanwar and Pudi experimented to predict the outcome for ODI cricket matches using data mining techniques. He investigated the match result using team Player's performance individually in batting and bowling . Initially the potential of 22 players was studied using their career. statistics and KNN, Support Vector Machine (SVM), Random Forests, Logistic Regression and Decision Trees techniques were applied . To predict the outcome of the match, the relative strength of each team is studied, along with the venue of the match and toss result.

4]Kampakis and Thomas conducted an experiment to predict the outcome of cricket matches in twenty over format. A model was developed on simple prediction and then further investigation was carried out on complex features for in-depth analysis. Initially the team data was used and then player data was analyzed. Feature selection methods utilized were Chisquare testing, mutual information and Pearson correlation. The authors utilized Naive Bayes, Logistic Regression, Random Forests and Gradient Decision Trees on the selected features from the data.

5] Munir experimented twenty over format cricket matches to predict the outcome using various data mining techniques. The main aim of the study was to combine pre-game and in-game data to predict the outcome.

6]Padma studied data of One Day International Cricket matches of the Indian team and mined different association rules using market basket tools with attributes. They focussed on various things like toss result, toss winner, decision to bat first or not, which two teams are going to play, is this a home team or away team and the result of game. They analyzed matches and predicted the unfavorable cases due to which a team loses game.

7]Swartz created a simulator that simulates each ball in real time. Simulator considers the probabilities of basic features like batting, bowling, over, inning in current scenario.

III. DATA PREPARATION

A. Data Collection

This is the first and the very important step in machine learning, collecting the data. The raw data is collected from different resources and then it is converted into CVS, HTML or XLSX format for future use.

B. Data Exploring and Profiling

Once the data is collected, it is accessed including looking for trends, outliers, exceptions, incorrect, inconsistent, missing, or skewed information. This is important because data directly effects on all of your model's findings, so it is critical to be sure it does not contain unseen biases.

C. Formatting Data

The next step in great data preparation is to make sure that your data is formatted in a way that best fits your machine learning model. for example, If your model need tabular data then there is no point in giving model data which is not tabularize. To make machine learning model work properly data must be well formatted according to the need.

D. Feature Engineering

This step involves the art and science of transforming raw data into features that represent a pattern to the learning algorithms. Feature engineering is the process of using knowledge to extract feature from raw data by mining technique. These features can improve the performance of the algorithms.

E. Splitting data into training and testing sets

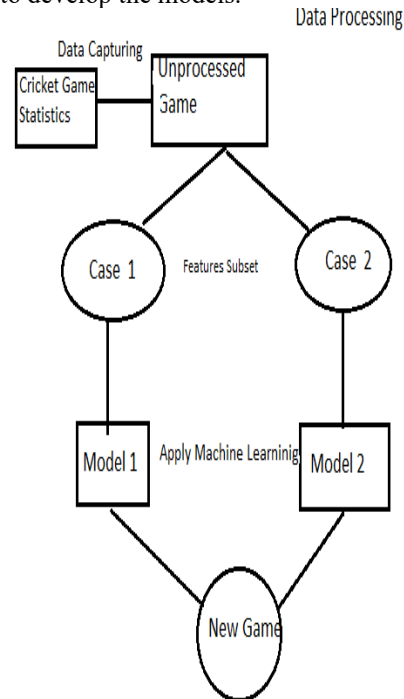
The final step is to split data into two sets one for training algorithm, and another for testing purposes. Select non-overlapping subsets of data for the training and evaluation sets in order to ensure proper testing.

IV. METHODOLOGY

This research paper attempts to discuss different machine learning techniques applied to predict the outcome of cricket matches. we have discussed the different factor effecting ongoing matches including the home ground and toss winner. The team that wins the toss depends on factors such as weather, pitch and outfield to decide whether to bat or field first, with the intention of securing a strategic advantage. Initially, the input dataset is pre-processed by eliminating any incomplete records so that there are no missing values in the dataset. Data with no match result were excluded to reduce time complexity, also we eliminate features that have no direct impact on the performance of the training phase by applying feature selection. Features including Match ID, Match date and Venue among others have been discarded prior to the training phase of the machine learning techniques. Once the input dataset has been preprocessed, they are classified according to the need and splitted accordingly

Once the dataset is split, a number of different learning algorithms are applied on the them to derive predictive models for the match result. These models are then compared so they can be utilized for prediction upcoming matches results. The machine learning algorithms that have been used to derive the predictive models are Naïve Bayes, Random Forest, K-nearest neighbour and Model Decision Tree. The choice of

these methods is based on the diverse learning they adopt to develop the models.



V. CONCLUSIONS

This paper concludes following points:

- Applying machine learning to cricket can help you predict the result of the match before it ends.
- Predata processing reduces the time complexity of model as it filter out most of the unnecessary data.
- Even after applying machine learning there is no garenty that predicted outcome will be as same as result of match because cricket is a sport where match is not finished till the last ball.
- Our research can help other to make a good cricket prediction model using machine learning technique.

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Design and Develop Data Analysis and Forecasting of The Sales Using Machine Learning

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Abstract. Data Analysis and Forecasting on Supermarket Sales Transactions is a proposed system which focus on the betterment of the sales in the business. The whole proposed system comprises mostly of 4 sections:

Exploratory Data Analysis in insights, exploratory information examination is a way to deal with breaking down informational collections to condense their principle attributes, regularly with visual techniques. Exploratory Data Analysis suggests the essential method of performing beginning assessments on data to discover plans, to spot abnormalities, to test speculation and to check doubts with the assistance of outline measurements and graphical portrayals. Customer Segmentation Theoretically we will have segments like Low Value: Customers who are less active than others, not very frequent buyer/visitor and generates very low zero - maybe negative revenue. Mid Value: In the middle of everything. Of-ten using our platform (but not as much as our High Values), fairly frequent and generates moderate revenue. High Value: The group we don't want to lose. High Revenue, Frequency and low Inactivity. Market Basket Analysis is a strategy which distinguishes the quality of relationship between sets of items bought together and recognize examples of co-event. A co-occurrence is when two or more things take place together. Time-series methods of forecasting. Forecasting is a strategy or a system for evaluating future parts of a business or the activity. It is a strategy for interpreting past information or experience into appraisals of things to come.

Keywords: *Time series, RFM model, Market Basket Analysis, Apriori Algorithm, ARIMA, SARIMA.*

I. INTRODUCTION

Data Analysis and Forecasting on Supermarket Sales Transactions which focus on the betterment of the sales in the business. We are presently observing solid outcomes from organizations that utilize Machine Learning (ML) as well as Artificial Intelligence (AI) to surpass their opposition and close more arrangements. In fact, sales teams that adopt these tools are seeing an increase in sales, what's more, plans of over half and cost diminishes of up to 60%, as showed by the Harvard Business Review. Here are just a few of the possibilities like interpret customer data, Improve sales forecasting, predict customer needs, Efficient transaction sales. For data analysis, we from the outset handle the information. So In Statistics, EDA(exploratory data analysis) is used to: Better understand the data, build an intuition about the data, generate hypothesis, find insights, Visualization. After the visualizing the data we used RFM(recency, frequency, monetary) analysis to segment the customer. The RFM model measures when people buy(Recency),

how often they buy(Frequency) and how much they buy(Monetary). While past acquisition of client can viably foresee their future buy conduct, organization can distinguish which client is commendable. To calculate RFM model score we are going to apply K-mean clustering. But we should tell how many clusters we need to K-means algorithm. To find it out, we will apply Elbow Method. Elbow Method just tells the ideal group number for ideal dormancy. For better understanding of the result we can see the mean value of Recency, Frequency and Revenue represent. With we can segment the data on the filter of low-value, mid-value and high-value. After RFM Score we need to identifies the strength of association between pairs of product purchased together and identify patterns of co-occurrence, for that we use Market Basket Analysis(MBA). A co-event is when at least two things happen together. For beneficial outcome in MBA we measure the strength of a rule by calculating the following matrices like Support, Confidence and lift[1]. After MBA we analyze sales transaction data for product shelving by Apriori Algorithm[2]. Time series is a methods of forecasting. Right now translating past information or experience into gauge of things to come. Due to the seasonal trend of time series used, the Seasonal ARIMA (SARIMA) is selected for the model development [3].

II. PROBLEM STATEMENT

The present questionable economy, organizations are attempting to receive elective approaches to stay serious. Distinctive incapable determining strategies lead to various item stock outs. So research revolves around (company size, stakeholders, solutions they want) different forecasting techniques for demand prediction through machine learning have the ability to compare it to historical sales efforts. The proposed framework can come to an obvious conclusion and better foresee what arrangements would be viable and the probability of the arrangement shutting and to what extent it will take. This understanding enables deals the executives to more readily apportion assets and anticipate deals projections.

III. PROPOSED METHODOLOGY

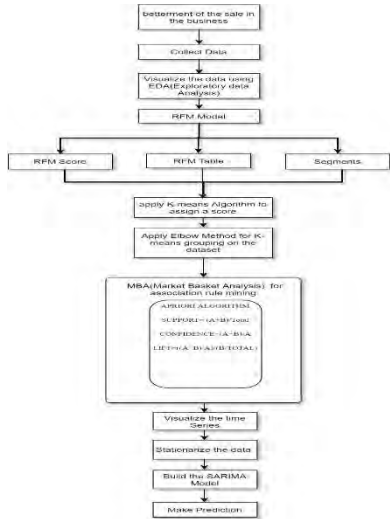


Fig.1. Data Analysis and Forecasting Architecture.

III.1 Exploratory Data Analysis(EDA)

In EDA(exploratory data analysis) the first sign that a visualization is good is that it shows you a problem in your data, detect outliers or anomalous events and find interesting relations among the variables.

Dataset Understanding:

InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Country
0	536395	85123A WHITE HANGING HEART T-LIGHT HOLDER	6	2010-12-01 08:26:00	2.55	17850.0	United Kingdom
1	536395	71053 WHITE METAL LANTERN	6	2010-12-01 08:26:00	3.39	17850.0	United Kingdom
2	536395	844068 CREAM CUPID HEARTS COAT HANGER	8	2010-12-01 08:26:00	2.75	17850.0	United Kingdom
3	536395	840296 KNITTED UNION FLAG HOT WATER BOTTLE	6	2010-12-01 08:26:00	3.39	17850.0	United Kingdom
4	536395	84029E RED WOOLLY HOTTIE WHITE HEART.	6	2010-12-01 08:26:00	3.39	17850.0	United Kingdom
5	536395	22752 SET 7 BABUSHKA NESTING BOXES	2	2010-12-01 08:26:00	7.65	17850.0	United Kingdom
6	536395	21730 GLASS STAR FROSTED T-LIGHT HOLDER	6	2010-12-01 08:26:00	4.25	17850.0	United Kingdom
7	536396	22633 HAND WARMER UNION JACK	6	2010-12-01 08:28:00	1.85	17850.0	United Kingdom
8	536396	22632 HAND WARMER RED POLKA DOT	6	2010-12-01 08:28:00	1.85	17850.0	United Kingdom
9	536397	84879 ASSORTED COLOUR BIRD ORNAMENT	32	2010-12-01 08:34:00	1.69	13047.0	United Kingdom

Fig.2. Sale transactional data of the time period of December 2010 to December 2011

Added a column Invoice Year Month to have a month wise view of the data.

InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Country	InvoiceYearMonth	Revenue	InvoiceYearMonth
0	536395	85123A WHITE HANGING HEART T-LIGHT HOLDER	6	2010-12-01 08:26:00	2.55	17850.0	United Kingdom	201012	15.30	201012
1	536395	71053 WHITE METAL LANTERN	6	2010-12-01 08:26:00	3.39	17850.0	United Kingdom	201012	20.34	201012
2	536395	844068 CREAM CUPID HEARTS COAT HANGER	8	2010-12-01 08:26:00	2.75	17850.0	United Kingdom	201012	22.00	201012
3	536395	840296 KNITTED UNION FLAG HOT WATER BOTTLE	6	2010-12-01 08:26:00	3.39	17850.0	United Kingdom	201012	20.34	201012
4	536395	84029E RED WOOLLY HOTTIE WHITE HEART.	6	2010-12-01 08:26:00	3.39	17850.0	United Kingdom	201012	20.34	201012
5	536395	22752 SET 7 BABUSHKA NESTING BOXES	2	2010-12-01 08:26:00	7.65	17850.0	United Kingdom	201012	15.30	201012
6	536395	21730 GLASS STAR FROSTED T-LIGHT HOLDER	6	2010-12-01 08:26:00	4.25	17850.0	United Kingdom	201012	25.50	201012
7	536396	22633 HAND WARMER UNION JACK	6	2010-12-01 08:28:00	1.85	17850.0	United Kingdom	201012	11.10	201012
8	536396	22632 HAND WARMER RED POLKA DOT	6	2010-12-01 08:28:00	1.85	17850.0	United Kingdom	201012	11.10	201012
9	536397	84879 ASSORTED COLOUR BIRD ORNAMENT	32	2010-12-01 08:34:00	1.69	13047.0	United Kingdom	201012	54.08	201012

Fig.3. Month wise view of the data

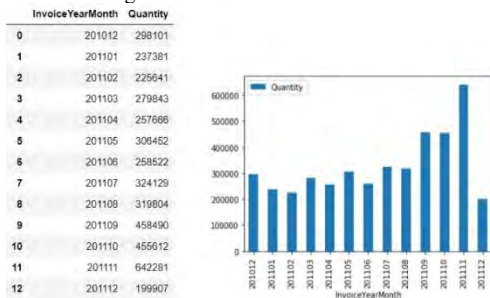


Fig.4. Monthly order count by using quantity field.

A statistical model can be used or not, yet essentially EDA is for seeing what the data can tell us past the regular showing or speculation testing task.

III.2 RFM(Recency, Frequency, Monetary) Model

For a fruitful business, taking part in a powerful battle is a key assignment for advertisers. Customarily,

advertisers should initially distinguish showcase division utilizing a scientific mode and afterward execute an effective battle intend to target gainful clients. Proposed system was expected to use RFM(recency, frequency, monetary) concept to segment customer. RFM method is used to analyzing customer value. It is generally utilized in database promoting and direct advertising and has gotten specific consideration in retail and expert administrations ventures[4]. This investigation proposes utilizing the accompanying RFM factors:

- Recency(R): when people buy.
- Frequency(F): how often they buy.
- Monetary(M): how much they buy.

```
In [8]: tx_max_purchase = tx_uk.groupby('CustomerID').InvoiceDate.max().reset_index()
In [9]: tx_max_purchase.columns = ['CustomerID', 'MaxPurchaseDate']
In [10]: tx_max_purchase['Recency'] = (tx_max_purchase['MaxPurchaseDate'] - tx_max_purchase['MaxPurchaseDate']).dt.days
In [11]: tx_user = pd.merge(tx_user, tx_max_purchase[['CustomerID', 'Recency']], on='CustomerID')
In [12]: tx_user.head()
Out[12]:
CustomerID  Recency
0      17850.0      301
1      13047.0       31
2      13740.0       96
3      15100.0      229
4      15281.0       25
```

Fig.5. Calculating Recency for each customer

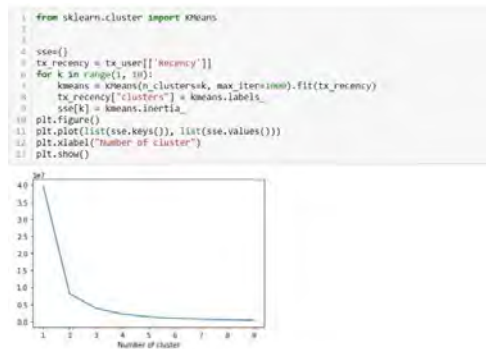


Fig.6. Calculated clusters and assigned them to each customer.

In RFM model apply K-means clustering to assign a score to the customer. Be that as it may, should advise what number of clusters we have to K-means algorithm. To discover it out, it will apply Elbow Method. The elbow technique runs k-means grouping on the dataset for a scope of qualities for k (state from 1-10) and afterward for each estimation of k processes a normal score for all bunches.

III.3 Market Basket Analysis(MBA)

Market Basket Analysis(MBA) is an ordinary case of association rule mining. Market Basket Analysis makes If-Then situation rules, for instance, in the event that thing A is acquired, at that point thing B is probably going to be bought. The standards are probabilistic in nature or, as it were, they are gotten from the frequencies of co-event in the perceptions. Among every one of the strategies for information mining, apriori algorithm is seen as better for association rule mining[5].

The key idea in the Apriori algorithm is that it accept all subsets of an incessant itemset to be visit. Similarly, for any infrequent itemset, all its super-sets must also be infrequent. In order to select the interesting rules out of

multiple possible rules from the business, proposed system is using the following measures:

Support: The primary measure called the help is the quantity of exchanges that remem-ber things for the {A} and {B} parts of the standard as a level of the all-out number ofexchanges. It is a proportion of how much of the time the assortment of things happen all together everything being equal.

$$Support = (A+B) / Total$$

Confidence: The subsequent measure called the certainty of the standard is the propor-tion of the quantity of exchanges that include all items in {B} as well as the number oftransactions that include all items in {A} to the number of transactions that include all items in {A}.

$$Confidence = \frac{(A+B)}{A} \quad (1)$$

Lift: The third measure called the lift or lift proportion is the proportion of confidenceto anticipated confidence. Expected confidence is the confidence divided by the fre- quency of B. The Lift tells us how much better a rule is at predicting the result than justassuming the result in the first place. Greater lift values indicate stronger associations.

$$Lift = ((A+B / A) / (B / Total))$$

III.4 Time Series Forecasting

Time-series methods of forecasting. Forecasting is a method or a technique for estimat-ing future aspects of a business or the operation. It is a method for translating past dataor experience into estimates of the future.

Time series involves the use of data that are indexed by equally spaced increments of time (minutes, hours, days, weeks, etc.). Due to the discrete nature of time series data, many time series data sets have a seasonal and/or trend element built into the data. The first step in time series modeling is to account for existing seasons (a recurring pattern over a fixed period of time) and/or trends (upward or downward movement in the data). Accounting for these embedded patterns is what we call making the data sta- tionary. Series is said to be stationary series if and only if the joint probability is doesn'tchange over time that is the mean and variance of the series remain constant over time. With trending data, as time increase the mean of the series either increases or decreases with time (think of the steady increase in housing prices over time). For seasonal data, the mean of the series fluctuates in accordance with the season (think of the increase and decrease in temperature every 24 hours).

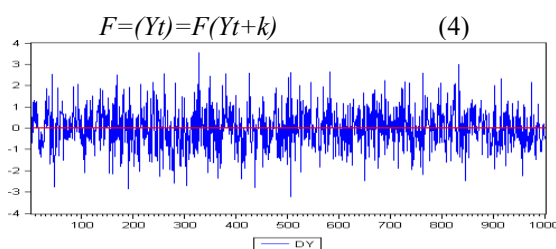


Fig.7. Making data Stationary[6].

There are two methods that can be applied to achieve stationarity, difference the data or linear regression. To take a difference, you calculate the difference between consec-utive observations. To use linear regression, you include binary indicator variables for your seasonal component in the model.

III.5 SARIMA (Seasonal Autoregressive Integrated Moving Average)

Autoregressive Integrated Moving Average, or ARIMA, is a forecasting method for univariate time series data. As its name suggests, it supports both an autoregressive and moving average elements. The integrated element refers to differencing allowing the method to support time series data with a trend.

A problem with ARIMA is that it does not support seasonal data. That is a time series with a repeating cycle. ARIMA expects data that is either not seasonal or has the seasonal component removed, e.g. seasonally adjusted via methods such as seasonal dif- ferencing.

SARIMA method is time series forecasting method for stochastic model data with sea-sonal data pattern[6].

ARIMA (p, d, q): The non-seasonal part of the model SARIMA notation is (P, D, Q) s: The seasonal part of the model

s: Seasonal factor

Seasonal Autoregressive Integrated Moving Average,

- (3) SARIMA or Seasonal ARIMA, is an extension of ARIMA that explicitly supports univariate time series data with a seasonal component. It adds three new hyperparameters to specify the auto- regression (AR), differencing (I) and moving average (MA) for the seasonal componentof the series, as well as an additional parameter for the period of the seasonality[7].

IV. PROPOSED ALGORITHM

Proposed System work for Data analysis and forecasting of the sales in the business following way:

Step 1: Get the data

Step 2: Understanding dataset

Step 3: Apply Exploratory Data Analysis to visualize data
Step 4: Apply RFM method for analyzing customer value

Step 5: Assign Score to the customer using K-means Algorithm

Step 6: Used Market Basket Analysis Technique to identifies the strength of association
Step 7: Identify the association between pairs of products purchased together

Step 8: Identify patterns of co-occurrence

Step 9: For better association rule mining apply apriori Algorithm
Step 10: Visualize the time series

Step 11: Stationaries the data

Step 12: Build SARIMA Model for seasonal component

Step 13: Make The prediction of the data.

V. CONCLUSION AND FUTURE WORK

We have a better understanding on how to improve sales with the help of transactional dataset. In statistics, as shows in fig.2 EDA is an approach to analyzing data sets to summarize their main characteristics, often with visual methods. EDA is refer to per- forming initial investigations on data to discover patterns, to spot anomalies, and to check assumption with the help of

summery statistics and graphical representations. There is a better understanding on which customers are priority and which are not and have better understanding what action are required on low priority customer to improve sales. As shows in fig.3 here it looks like 3 is the optimal one based on business requirements. We can go ahead with less or more clusters. Now we can see which products are mostly bought in pairs, which can enable the business at store level to sell these product side by side in store to improve furthermore sales.

We can see the future trends with the help of time series forecasting of each and every county and understand which country need more attention in terms of improving sales in the coming near future. The current data set spans over a year, on getting the entire up to date data we can get more reverent analysis to the current time. With such huge data we can make a more accurate time series prediction for better understanding of the trends of the Future. The knowledge of the store in

each country, if attended we can classify them on performance and your key metric being sales. More targeted analysis can be archive.

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Non-Linear Recognition Based Image Authentication Scheme Providing Flexibility and Dropping Space-Time Consumption

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Abstract: This paper presents a nonlinear way of image authentication scheme containing images, alphabets, numbers and symbols. The primary aim of this research is to develop the authentication scheme which is flexible for user to remember the password easily and it uses images at front end. The storage of selected images as a password by the user consumes large space and processing time. This paper provides a non linear approach which uses alphabets, symbols & numbers in the backend (database) to prevent large space and time consumption. The result of this newly proposed developed scheme is analyzed and it has given a productive output making an image authentication scheme acceptable.

Keywords— Alphabets, Images, Non Linear, Numbers, Recognition Based, Symbols

I. INTRODUCTION

Now a days, every system (PC or Mobile Phone) needs a strong authentication scheme to check the authenticity of the user. There are various authentication schemes developed till date but they all are having various problems due to which the users are facing many difficulties. The main purpose of this research is to develop a new, easy & secured recognition based image authentication scheme for the users which will also improve the system response time and also saves the system memory. In 1960, Fernando Corbato [1] invented the first computer password & now these passwords have many faces today.

1. Knowledge Base: The majority of organizations in the world prefer knowledge base passwords which is further divided into two types, [2] [3]
 - a. Textual Passwords: It contains the string of characters, numbers or symbols. It is a well-known & traditional secret code which is used by everyone in all type of systems. [2] [3]
 - b. Image Passwords: It is the modern type of passwords that

uses images as the primary data. It is easy for the user to remember the images as compared to the string of characters, numbers or symbols. In Image Passwords, there are two ways of authentication, [2] [3]

Recall Based: This way allows the user to create an image, graphics or drawing as a password and always used it for verification. For Example: Pattern drawing, a well-known authentication system used in the Android operating system is recall based. [2] [3]

Recognition Based: This way allows the user to select the images, graphics, from the list of given examples on the screen and recognize it at the time of verification. [2] [3]

For Example: Image selection from a given set of images are recognition-based. [2] [3]

Biometrics: It scans the body parts like faces, finger, thumb, palm prints or retina. It is considered as the most secure way of authentication and used in various banks or vaults in the world. It needs costly devices and it depends on the system which supports the biometrics scanner. [2] [3]

Token-Based: It needs a hard copy, chip, card or sticker which contains the login code to authenticate. Mostly ATM uses a token-based authentication scheme to authenticate the user. Today, various organizations other than ATM like Fast-Tag are also using such type of authentication to validate vehicles at Tolls. [2] [3]

II. LITERATURE REVIEW

Sachin Kaja and Divya Gupta [3] implemented an authentication scheme using persuasive cued click points in which an image is displayed on the screen and the user has to click at any portion of an image and set that portion as a password. In this authentication scheme, there are various positions in a single image a user can choose. For example, consider an image of a bedroom having different objects like bed, table, chair, TV; clock, etc. and the user can select any of the given objects as a password by clicking on it. R. Sudha and M. Shanmuganathan [4]

implemented an authentication scheme in which a user has to upload an image of his choice given by the server and then the server breaks that image in the grid of 7×11 . After breaking those images in pieces, all the pieces are displayed to the user and then the user has to select any one of those pieces as a password. At the time of login, the login indicator has a pre-decided format i.e. A□6 [4]. At the time of verification, the user has to use navigation arrows given on-screen to put "A" vertically in front of the password grid and similarly user has to put 6 horizontally in front of the same password grid. If the placement of "A" and 6 will be proper then the password will be correct. Shums Tabrez and Jagadeesh Sai D [5] proposed a scheme in which the combination of OTP (one-time password) and the row, column number from an image gives a password. The whole process is done by giving an image containing gridlines on the screen. For example, an image displayed on the screen contains 4 horizontal and 4 vertical gridlines dividing the images in terms of different boxes. The user has to select a box from those images which store the row and column number like block (2, 3) in the database. At the time of verification, the user has to give the OTP and to select the predefined block which commonly makes a hash tag acting as a password. Deepika Gupta, Dr. Vishal Gaur, Akhand Pratap Singh and Shikha Mathur [6] proposed a system in which the user has to move the object in a virtual given environment with the help of mouse keystrokes. That movement done by the user is acting as a password. For Example, a chessboard is given on the screen and the user has to move the chess piece at any place. The sequences of movements are captured by the system and it is stored as a password. They also suggested using a textual password along with movements to make the system more secure. Gi-Chul Yang [7] proposed a system containing pass positions in which the user has to draw a curve, a line, etc. on an image and it stores the coordinates of the same in the database. With the help of pass position concepts, if the user forgets the actual position and draws the same type of pattern anywhere in the image, the password will be accepted because the pass positions also store the relative point of the pattern drawn by the user. Subhradeep Biswas and Sudipa Biswas [8] proposed a system in which the user has to upload an image on the system. The system derives the password from that uploaded image and stored it in memory. At the time of verification, the user has to upload the same image again and the system checks the derived password from that uploaded image with the stored one. If both are the same, then the password is verified. They also suggest the two-way authentication i.e. along with image user has to enter secret text also to increase the security level. Amol Bhand, Vaibhav Desale, Swati Shirke and Suvarna Pansambal (Shirke) [9] proposed a system in which user has to upload any image of his/her choice or can select an image from the existing database. After selecting the image, the user has to select some cued click points on that image. On the basis of RGB values of the selected image, a textual password is generated and sent

on the email of the user. At the time of verification, the user has to select the cued points on the image and also enters the textual password which is generated earlier. If the user enters or selects the wrong point in the image, an alert message will be sent on the user email. Swaleha Saeed and M. Sarosh Umar [10] implemented an authentication scheme in which the user has to select an image from the given set of 16 images by entering a three-digit code written on the image. At the time of password verification, the images are displayed on the screen and below the images the balls of different colors are also given. The color of the balls goes on changing randomly at runtime. The user has to remember the ball color which is present exactly below his/her selected image. Now that ball color has to be selected in the second login phase to complete the authentication process. Zeeshan I. Khan and Dr. Vijay S. Gulhane [11] also proposed an image authentication scheme that converts images into alphanumeric-symbolic textual passwords.

III. EXISTING SYSTEM LIMITATIONS

A. Limitations of Textual Passwords:

- The main drawback of this system is that the user forgets it easily. To prevent this condition, users prefer their mobile numbers, parent's names, date of birth, etc. as a password which can be guessed easily by intruders.
- Hence, a combination of Alphabets, Numbers & Symbols is strongly recommended by various organizations for password selection creating difficult passwords but cannot be remembered by a user and creates a problem.
- To make it secure, various cryptographic algorithms must be used to encode the text which is also an overhead in the authentication scheme.

B. Limitations of Image Passwords:

- In Image Password, the main drawback is higher system storage and response time resulting in slow output and it is time-consuming for the user.
- Some users also failed to understand if the system is complicated.

C. Limitations of Image Passwords:

- In Biometrics, the main drawback is the use of external & costly hardware in the system.
- It is not flexible because it cannot be used in all types of systems.
- It also gives error in wrinkled skin users and it fails.

D. Limitations of Token Based Scheme:

- It depends on the hard copy and the users have to carry it at the time of verification.
- If the user lost it or it can be theft which creates a problem or misuse.

After observing the limitations and difficulties in the above mentioned authentication a scheme, the main objective of this project is to overcome the limitations of recognition based image passwords to make it as a good choice for the authenticators & users.

IV. SYSTEM DESIGN

The enhanced authentication scheme has two steps,

Step 1: Registration Phase / Login Phase

Initially, a user has to register its identity for the first time on this authentication scheme. For Registration, User

should enter Name (First & Last), User Id (Not Used Before by any other user) & valid Email ID.

For Login, User should be already registered by the above given process and has to enter User Id only.

Step 2: Password Selection Phase

This phase is the heart of newly implemented recognition based image authentication scheme. It contains three image Panels,

A. First Panel

It contains 26 images for the user’s selection.

The idea behind 26 images is that in the English language there are 26 alphabets (A to Z) so in the database, that selected images will be converted into its corresponding alphabets.

Image	Alphabet	Image	Alphabet
Image 1	A	Image 8	H
Image 2	B	Image 9	I
Image 3	C	Image 10	J
Image 4	D	Image 11	K
Image 5	E	Image 12	L
Image 6	F	Image 13	M
Image 7	G	Image 14	N
Image 15	O	Image 22	V
Image 16	P	Image 23	W
Image 17	Q	Image 24	X
Image 18	R	Image 25	Y
Image 19	S	Image 26	Z
Image 20	T		
Image 21	U		

Fig 1: Images and its corresponding Alphabets

B. Second Panel

It contains another 10 images for the user’s selection. The idea behind 10 images is that, in Decimal Number System, there are 10 numbers (0 to 9) so in the database that selected images will be converted into its corresponding numbers.

Image	Number	Image	Number
Image 1	0	Image 6	5
Image 2	1	Image 7	6
Image 3	2	Image 8	7
Image 4	3	Image 9	8
Image 5	4	Image 10	9

Fig 2: Images and its corresponding Numbers

C. Third Panel

It contains another 15 images for the user’s selection. The idea behind 15 images is that, 15 symbols are taken into consideration to set a password which contains symbols so in the database that selected images will be converted into its corresponding symbols.

Image	Symbol	Image	Symbol
Image 1	~	Image 9	*
Image 2	!	Image 10	(
Image 3	@	Image 11)
Image 4	#	Image 12	-
Image 5	\$	Image 13	+
Image 6	%	Image 14	[
Image 7	^	Image 15]
Image 8	&		

Fig 3: Images and its corresponding Symbols

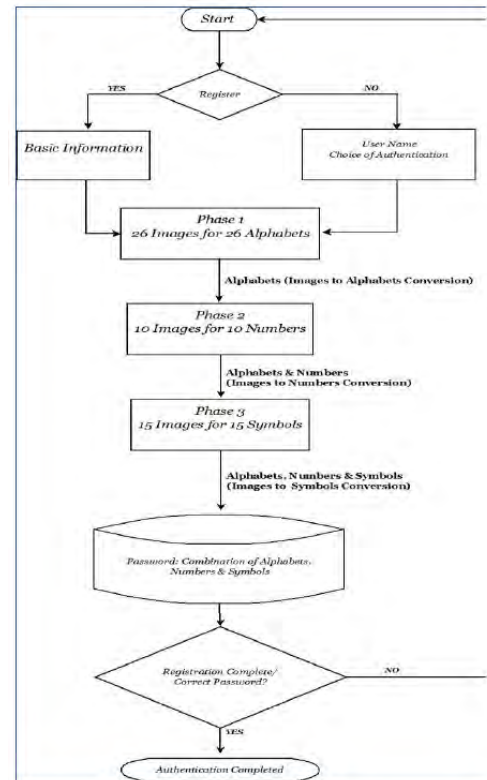


Fig.4. Flowchart of System Design

V. SYSTEM IMPLEMENTATION

The proposed system developed in Microsoft Visual Studio.

Step 1: Registration Phase / Login Phase

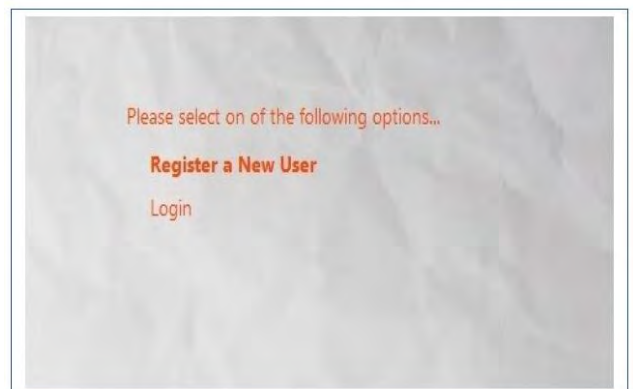


Fig.5. Home Page giving Registration & Login Options

Fig.6. Registration Form

Fig.7. Login Form having the option of Non Linear (Non Sequential) Way

Step 2: Password Selection Phase

A. First Panel



Fig.8. 26 Images to 26 English Alphabets

In the First Panel, three images are selected for taking the sample & corresponding generated alphabets are shown in the upper left corner of the first panel (Fig.8). Image 1 → A, Image 2 → B, Image 3 → C

```
public void ImageClickFirstPanel(int AlphaNum eral)
{
    string lbltxt = lblPwd.Text;
    lblPwd.Text = lbltxt + "#";
    lblResetPwd.Visible = true;
    string Alphabet = string.Empty;
    switch (AlphaNum eral)
    {
        case 1: Alphabet = "A"; break; case 2: Alphabet = "B"; break;
        case 3: Alphabet = "C"; break; case 4: Alphabet = "D"; break;
        case 5: Alphabet = "E"; break; case 6: Alphabet = "F"; break;
        case 7: Alphabet = "G"; break; case 8: Alphabet = "H"; break;
        case 9: Alphabet = "I"; break; case 10: Alphabet = "J"; break;
        case 11: Alphabet = "K"; break; case 12: Alphabet = "L"; break;
        case 13: Alphabet = "M"; break; case 14: Alphabet = "N"; break;
        case 15: Alphabet = "O"; break; case 16: Alphabet = "P"; break;
        case 17: Alphabet = "Q"; break; case 18: Alphabet = "R"; break;
        case 19: Alphabet = "S"; break; case 20: Alphabet = "T"; break;
        case 21: Alphabet = "U"; break; case 22: Alphabet = "V"; break;
        case 23: Alphabet = "W"; break; case 24: Alphabet = "X"; break;
        case 25: Alphabet = "Y"; break; case 26: Alphabet = "Z"; break;
        default: break;
    }
    GlobalVariables.PwdPanel1 += Alphabet;
}
}
```

Fig.9. Microsoft Visual Studio Code for First Panel

B. Second Panel



Fig.10. 10 Images to 10 Decimal Numbers

From the Second Panel, again three images are selected for taking the sample & corresponding generated numbers are shown in the upper left corner of the second panel (Fig.10). Image 1 → 0, Image 2 → 1, Image 6 → 5

```
public void ImageClickSecondPanel(int AlphaNum eral)
{
    string lbltxt = lblPwd.Text;
    lblPwd.Text = lbltxt + "#";
    lblResetPwd.Visible = true;
    string Alphabet = string.Empty;
    switch (AlphaNum eral)
    {
        case 0: Alphabet = "0"; break; case 1: Alphabet = "1"; break;
        case 2: Alphabet = "2"; break; case 3: Alphabet = "3"; break;
        case 4: Alphabet = "4"; break; case 5: Alphabet = "5"; break;
        case 6: Alphabet = "6"; break; case 7: Alphabet = "7"; break;
        case 8: Alphabet = "8"; break; case 9: Alphabet = "9"; break;
        default: break;
    }
    GlobalVariables.PwdPanel2 += Alphabet;
}
}
```

Fig.11. Microsoft Visual Studio Code for Second Panel

C. Third Panel



Fig.12. 15 Images to 15 Symbols

From the Third Panel, again three images are selected for taking the sample & corresponding generated symbols are shown in the upper left corner of the third panel (Fig.12). Image 5 → *, Image 9 → (, Image 10 → \$

```

public void ImageClickThirdPanel(int AlphaNum eral)
{
    string lbltxt = lblPwd.Text;
    lblPwd.Text = lbltxt + "#";
    lblResetPwd.Visible = true;
    string Alphabet = string.Empty;
    switch (AlphaNum eral)
    {
        case 0: Alphabet = "~"; break; case 1: Alphabet = "!"; break;
        case 2: Alphabet = "@"; break; case 3: Alphabet = "#"; break;
        case 4: Alphabet = "$"; break; case 5: Alphabet = "%"; break;
        case 6: Alphabet = "^"; break; case 7: Alphabet = "&"; break;
        case 8: Alphabet = "*"; break; case 9: Alphabet = "("; break;
        case 10: Alphabet = ")"; break; case 11: Alphabet = "-"; break;
        case 12: Alphabet = "+"; break; case 13: Alphabet = "["; break;
        case 14: Alphabet = "]""; break; default: break;
    }
    GlobalVariables.PwdPanel3 += Alphabet;
}
    
```

Fig.13. Microsoft Visual Studio Code for Third Panel

D. Finish Button/ Login Button

Finish Button is clicked to store the complete password in the database.

Login Button is clicked to verify the selected images. At the time of password verification, password matching algorithm is used.

Password Verification/ Matching is implemented in Non Linear Way,

Non Linear Recognition Based Password Matching

In this type, the user has to select the images in any order of its choice at the time of verification. It is the most important feature in this authentication scheme that allows the user to select images in any order.

```

{
    List<Char> storedPwdChars = Pass.ToCharArray().ToList<Char> ();
    List<Char> paramPwdChars = Pwd.ToCharArray().ToList<Char> ();
    foreach (char item in paramPwdChars)
    {
        if (storedPwdChars.IndexOf (item) != (-1))
        {
            storedPwdChars.Remove (item);
            continue;
        }
        else
        {
            IsCorrect = false;
            break;
        }
    }
    if (storedPwdChars.Count != 0 && storedPwdChars != null)
    {
        IsCorrect = false;
    }
    return IsCorrect;
}
    
```

Fig.14. Microsoft Visual Studio Code for Non Linear Password Matching

E. MS SQL Database

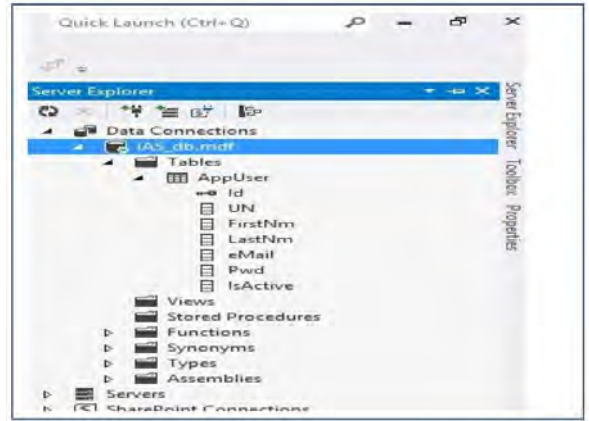


Fig.15. Structure of Database

VI. EVALUATION OF IMPLEMENTED METHOD

- This Enhanced Recognition based Image authentication scheme is easy to remember for any user because the human brain can remember a large number of images rather than text.
- In this authentication scheme, the advantage is there on both sides.
 - User Side
 - ✓ It is very easy to recognize the password.
 - ✓ It gives both the options i.e. Sequential / Non-Sequential Recognition which helps the user to verify even if he/she does not remember the sequence.
 - System Side
 - ✓ A large number of images selected by the user cannot make the system memory bulky because rather than storing images in databases, its respective alphabets, numbers & symbols are stored.
 - ✓ Since the alpha-numeric-symbolic keys are stored in the database, a traditional pattern matching is used at the back end which improves system response time as compared to those systems which are storing images in databases and perform image comparison results in large response & waiting time.

VII. RESULT ANALYSIS

A. System Response Time Analysis

- A Stopwatch () function in Microsoft Visual Studio is used at the time of password verification and storage to analyze the system response time.

System Response Time Statistics

Sample	User	No. of Images	System Response Time (In Seconds)
1	User 1	3	0.007789 Secs
2	User 2	10	0.007890 Secs
3	User 3	25	0.007926 Secs
4	User 4	51	0.007941 Secs

Fig.16. Response time against number of images selected

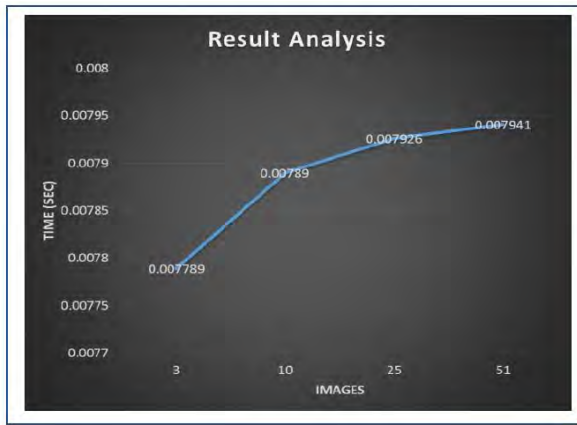


Fig.17. Graph between response time & images selected

- After analysis, it has been observed that, if user selects large number of images then also the time difference is quite small. i. e. for 10 images it takes 0.007890 sec and for 25 images it takes 0.007926 sec having a very small difference of 0.000036 sec and that is affordable for the double number of images selected.

B. System Memory Analysis

- Since images are not directly stored in the databases, its corresponding alphabets, numbers & symbols are used then it needs a small amount of memory.

System Memory Statistics

Sample	Users	Number of Images taken for password	System Memory Calculated (In bytes)
1	User 1	3	3 bytes
2	User 2	10	10 bytes
3	User 3	25	25 bytes
4	User 4	51	51 bytes

Fig.18. System memory used against number of images selected

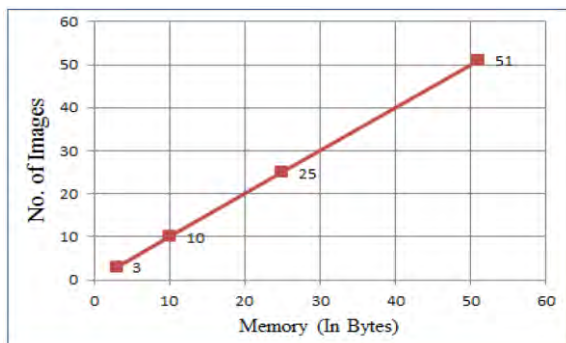


Fig.20. Graph between system memory & number of images selected

VIII. CONCLUSION

The Non Linear recognition based image authentication scheme has been implemented. This method has been proposed to prevent the difficulties of using images as a primary data in authentication scheme. With the help of this method, the system time and memory are saved at a larger level and it is also easy to remember authentication scheme for the user.

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Implicit Aspect-Based Opinion Mining and Analysis of Airline Industry Based on User Generated Reviews

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Abstract Mining opinions from reviews has been a field of ever-growing research. These include mining opinions on document level, sentence-level and even aspect level. While explicitly mentioned aspects in a user-generated review have been widely researched, very little work has been done in gathering opinions on aspects that are implied and not explicitly mentioned. In this paper, the present is a novel study for extracting and analyzing implicit aspects and opinions from airline reviews. Through this study, an airline domain-specific aspect-based corpus and a technique that augments pre-trained word embeddings for sequential with stochastic gradient descent optimized *conditional random fields* was devised and developed. The results of this method were used to extract and classify implied aspects from opinionated texts using *machine and ensemble learning*.

Index Terms – *Conditional random field, stochastic gradient descent, machine learning, ensemble learning, implicit aspects, augmenting word embeddings, classification, corpus, sequential labelling*

I. INTRODUCTION

Travel and tourism are well-liked terms amongst all generations of people. The airline industry is a key facilitator in this domain. For this industry, serving its customers with not only cost-effective but also satisfactory service options is paramount. [1] Opinions are very important to businesses and organizations because they always want to find consumer or public opinions about their products and features. [2] In this 21st information age, with constant development in social and web media, a multitude of platforms are available like *Trip Advisor, Airline Ratings* etc. for consumers to express their views on air travel. This serves in favor of the airline companies, as it becomes their one-stop to access rich customer feedback information. However, many times, due to a variety of reasons like paid promotions, fraudulent and unstructured nature of these reviews, insightful information nature of these reviews, insightful information cannot be extracted. So, a need is felt to have a mechanism that gathers cognizance in terms of the perception of customers on airline-specific aspects. [3]

Liu and Zhang et. al. defined the term opinion as “*a concept covering sentiment, evaluation, appraisal, or attitude held by a person*” [2] Aspects and entities are more like topics in a text document. Hu and Liu et. al. coined this type of analysis as feature-based sentiment analysis. [4] Aspect or entity-based analysis identifies the target of the opinion. It is a fine-grained approach to text analysis.

1.1 Paper nomenclature

In this paper, an *entity* is the *feature of the airline* and an *implicit aspect* or sub-aspect is its *attribute*. Examples for entities are food, cabin, seat, staff etc. Since these entities in themselves can have various attributes associated with them. It becomes important to divide them further into sub-aspects or implicit aspects.

For example, a sentence in a review could read “*the cabin was cold, smelly and a bit weary*”. Here, the entity *cabin* is accompanied its attributes like *temperature, fragrance and condition*. The phrases or terms like “*cold*”, “*smelly*”, and “*a bit weary*” are terms that imply an opinion to each individual attribute of the entity *cabin*. This paper devises a technique to identify airline-specific entities from such implicit phrases or terms. This approach helps in making a fine-grained analysis of opinions and maps them accurately to respective entity-implicit aspect pair.

1.2 Research motivation

Understand which passenger airline industry-specific aspects can be leveraged for implicit aspect-based opinion mining is one of the key focus of research. Also, how will these implicit aspects be engineered to be annotated in order to build a one of a kind domain specific sentiment corpus. Furthermore, what specific lexicon generation techniques can influence this type of opinion mining.

1.3 Data

Trip advisor and Airline ratings are online microblogging platforms primarily used for viewing reviews and experiences of travelers either travelling to the same destination or other, all over the globe. Usually, people before making airline ticket purchases do read reviews. [4]

In this study, 3000 reviews were collected within a time period of 1 month with an aim to study public’s opinion with respect to 16 Airlines (see appendix A). From these 3000 reviews, after curating, only 1803 reviews were determined to be relevant for this study. Detailed statistical analysis was carried on the dataset to understand the quality of it. This statistical analysis information is available in table 1.

Number of reviews	1803
Number of sentences	9591
Average number of sentences in a review	5
Type Token Ratio [5]	0.27
Most common word	Flight
Average word length	7
Labelled unique word corpus size	3280

Table 1. Dataset Statistics

In summary, the goal of this study is to extract implied aspects and opinions from airline reviews. To achieve this goal, a new dataset was created, which to my knowledge, is the first time a dataset specifically for implicit aspects of airline reviews is created. Using a *supervised lexicon-based technique*, few experiments were run to gather insightful information about airline-based implied aspects and opinions. The results of which were favorable for the study. Further in this paper, discussions are on methodology, issues and challenges, experimental setup and evaluations/results of this approach.

II. METHODOLOGY

The methodology of this study consists of multiple modules. Each module was developed keeping in mind that the dataset is fresh, new and one of kind. So, the methodology pipeline includes *data collection, corpus statistics, annotation, feature engineering, sequence labelling, and classification tasks*.

a. Entity and Aspect selection

Post dataset statistical analysis, the two annotators carefully read about 500 reviews. Features of the passenger aircraft, services offered by the airlines both in and off the flight were formulated in a list. After curating the list, a data-driven decision led to enlist entities into 8 categories. The representation of these 8 implicit entity-aspect pairs can be found in table 2.

Entity	Implicit Aspect(s)
Food	Service
	Temperature
	Taste
Entertainment	Visual
	Audio
	General
Cabin	Condition
	Fragrance
	Size
In-flight service	Temperature
	Operations
	Facility
Off-flight service	Ticketing
	General
	Facility
Staff	Behaviour
	General

Seat	Operations
	Comfort
Possession	Handling
	General

Table 2. Entity-wise implicit aspect list

b. Data Annotation

Manual annotation and labelling of all the reviews using Doccano [6] annotation tool was conducted. An inter-annotator agreement guideline [7] was also set up. (See appendix A). Annotation was done on two levels i.e. *entity level* and *implicit aspect level*. So, using Cohen’s Kappa coefficient [8] the annotators’ agreement level was determined. The results of the Kappa coefficient are available in the Evaluation section.

c. Feature Engineering

The feature engineering task was divided in two methods, one to capture word features and the other to gather numeric representations of the word features. (See Appendix B)

Augmenting Word Embeddings

The numeric representations like count vectorizer and TF-IDF are more frequency based and lack contextual information [9] The dataset for this study being small and limited, a need was felt to augment. So, a pre-trained word embedding model with word vector representation of the dataset. So, pre-trained Glove [10] vectors trained on user-generated were used. These pre-trained vectors were augmented with Word2Vec [11], [12] for corpus embeddings. Also, the parameters augmented are one’s that considered maximum distance between focus word and its contextual neighbor. (See appendix D)

Word Features	Parts-of-speech tags; Dependency parsing
Numeric word representation	Count Vectorizer; Term Frequency – Inverse Document Frequency; Augmenting Word Embeddings

Table.3 Feature Engineering Tasks

Sequence Labelling with Conditional Random Fields

Sequence Labelling is a supervised learning task where a label is assigned to each element of a sequence. For our study, to extract words and classify them into respective entities, a conditional random fields algorithm was selected. Conditional random fields [13] adjust to a variety of statistically correlated features as input just like a sequential classifier. Also, like a generative probabilistic model it trades-off decisions at different sequence to obtain a global optimal labelling. (See appendix E).

The CRF model was optimized using stochastic gradient descent with L2 regularization. This is done to maximize the likelihood of the CRF and be represented as follows,

$$\log P(Y|X) = w \cdot \varphi(Y, X) - \left(\log \sum_{y_T} e^{w\varphi(Y, X)} \right) [eq. 1]$$

After taking derivatives on the above equation, we get below,

$$\frac{d}{dw} \log P(Y|X) = \varphi(Y, X) - L^2 \sum_{Y^T} P(Y^T|X) \varphi(Y^T, X) \text{ [eq. 2]}$$

Where it means $\varphi(Y, X)$ to add correct feature and subtract $P(Y^T|X)$ which is expectation of features and L2 is a regularization penalty term.

Classification for implicit aspect extraction

The aspect extraction task needed classifier models that could accurately predict the aspect. Different algorithms were used to classify and compare how accurate each model was to classify these sub-aspects. Algorithms like Support Vector Machine, Decision Trees, Random Forest, a bagging ensemble learning algorithm Voting Classifier and a boosting ensemble learning algorithm XGBOOST were used. (See appendix F)

III. DATA SETUP

a. Data Preprocessing

Using standard pre-processing techniques like removing domain-specific stop words, removal of unnecessary punctuations, spell correction, converting numbers to words, and word standardization. The motivation for doing so was to avoid misleading the training model. Also, since the data was user-generated, there were many contractions of words, for example, “couldn’t”, “can’t”, “aren’t”, “I’m” etc., were seen quite often in the texts. So, fixing these contraction words was also a part of the study. Words like “couldn’t” were replaced by “could not”. (See Appendix G)

b. Corpus Statistics

The data being user-generated was raw and unstructured. It is the first time this group of reviews was considered text mining and analysis. So, two statistical strategies, viz, type-token ratio [5] and Zipf’s distribution [14] were used to determine variability in the dataset.

Type Token ratio (TTR) is represented as follows, (See Appendix H)

$$TTR = \frac{(\text{number of types})}{(\text{number of tokens})} \text{ [eq. 3]}$$

Source	TTR Score
Trip Advisor	0.35
Airline Ratings	0.37

Table 4 Type Token Ratio Scores

TTR Scores are low for both data sources, this means that there are many repeated terms in the corpus. (See appendix H) Zipf’s law states that a relationship between frequency of word (f) and its position in the list i.e. its rank (r) is inversely proportional to one another.

$$f \propto \frac{1}{r} \text{ [eq. 4]}$$

c. Manual Annotation

As explained in the methodology, the annotation was done on two levels using Doccano software[6] There are detailed examples and explanation of this manual annotation strategy.

INPUT: “Overall the experience was comfortable and spacious with delicious meals”

Output: [(“experience was comfortable”, “Inflight”), (“spacious”, cabin), (“delicious meals”, “food”)]

Table 5. Detailed example of Level 1 annotation

Once, entity-level tuples were tagged containing a word or word phrases with entity-name, as seen in Table 5. After completing entity level annotation, another fine-grained approach to classify entity-wise word or word phrases to their respective implied aspects was conducted, details of which are available in table 6.

INPUT: [(“experience was comfortable”, Inflight), (“spacious”, cabin), (“delicious meals”, “food”)]

OUTPUT: [[(“experience”, inflight-operations), (“comfortable”, inflight-operations)], [(“spacious”, cabin-size)], [(“delicious”, food-taste), (“meals”, food-service)]]

Table 6. Detailed example of Level 2 annotation

d. Inter-Annotator Agreement

As explained in the methodology of this experimental study, after adhering with the guidelines in the inter-annotator agreement, and using SK-Learn Kappa score library, the Cohen’s Kappa [8] score for level of agreement was calculated.

IV. EXPERIMENTAL SETUP

a. Training Data Preparation

The experiment study used techniques described in the methodology section for preparing the training data. Taking an example sentence, this process will be explained in detail

Example sentence: “Overall, the experience was comfortable and spacious with delicious meals.”

Entity Level		
Entity	Word/Phrases	
In-flight service	Experience	was comfortable
Cabin	Spacious	
Food	Delicious meals	
Implicit Level		
Aspect	Word	
Inflight Operations	Experience	
Inflight Operations	Comfortable	
Cabin Size	Spacious	
Food Taste	Delicious	
Food Service	Meals	

Table 7. Annotated and labelled list of example sentence

From this review, words like experience, comfortable, spacious, delicious, and meals were identified as aspect terms and their semantic and syntactic information was extracted by parsing them through off-the-shelf state of the

art models like Stanford Core NLP API [15] to extract part-of-speech (POS) tags and dependency tags and Vader for sentiment score. (See appendix B)Using these techniques, a list of features was generated which consisted of main-word, main-word POS tag, dependent word, dependent word POS tag, main-word sentiment score, dependent word sentiment score, dependency tag, previous, and next wordFor the task of sequence labelling to identify the entity a word or word phrase belongs to, the tuples were added with their respective labels i.e. the label added to a tuple was the label that word belonged to.

For example, Tuple, (“delicious”, “JJ”, “meals”, “NNS”, 0.6, 0.0, “advmod”, “spacious”, “meals”) has main word *food*, so a new entry to this was made as “f”, which became the Y or dependent variable. After getting results from the CRF model, the entity-id i.e. if it was classified as “food” so its id was “f”.

Entity	Entity-ID
Food	f
Cabin	c
Entertainment	e
Staff	st
Seat	s
Off-flight	o
In-flight	i
Possession	p

Table 8. Entity ID List

Once the correct entity is identified, the next step is to classify which aspect is mentioned in the sentence. Then to the word feature tuple, ENTITY-ID is added to the training data and it is then vectorized.

b. Count Vectorization

For this experiment study, since the methodology does try to keep certain punctuations and special characters, a need is felt to create its own tokenizer. The results for an example sentence, as follows

Sentence: “so overall I highly recommend this airline”

Vectors: {“so”:5, “overall”:3, “I”:2, “highly”:1, “recommend”:4, “this”:6, “airline”:0}

c. TF-IDF Vectorization

For this experiment study, the TF-IDF score for the words in the feature sets was calculated using sci-kit TF-IDF vectorizer. Table 9 has the result of TF-IDF scores for all corpus words.

Word	TF-IDF score
Basic	0.965545
Redemption	0.965545
Rescue	0.958253

Table 9. TF-IDF Vectorization

d. Augmented Word Embeddings

As mentioned in the methodology, the corpus of this experimental study was small. So, a word embedding model using Word2Vec for the corpus was trained. And a pre-trained Twitter Glove Embeddings consisting of a vocabulary size of 1.2 million words and 27 billion tokenized twitter words with a 100-dimensional vector was selected.

Using the algorithm 1, a set of new vector embeddings were merged using pre-trained Glove and corpus Word2Vec embeddings.

```

Algorithm 1 Word embedding vector generation using pre-trained glove
vectors
Inputs
S = [W1, W2, W3, ..., Wn], Input sentence S contains n words
path = path where downloaded embeddings are stored
GloveVec = Pretrained Glove Vectors
Output
Word2Vec Embedding Model

// Load the Glove Pre-trained Vectors
with open(path):
    gloveVec = embedding vectors // Create Word2Vec Embedding for Airline Corpus
word2vec = Word2Vec Create Model

for word, vector in zip(word2vec.index2word, word2vec.vectors) do
    | w2v = dict(word: vector)
end

// Vectors for airline Corpus are loaded
for each Wi in S do
    if Wi exists in gloveVec then
        extract vecWi MVi = vecWiend
    else if Wi exists in w2v then
        extract vecWi MVi = vecWiend
    else
        extract vecWi MVi = generate.NewvecWiend
end
    
```

With this algorithm 1, a new set of word embeddings were generated to vectorize textual information in the feature tuple.

e. Cosine Similarity Index

Along with the word embeddings, cosine similarity between main and dependent word was added as a new feature. (See Appendix D).

These new features were then used to classify opinionated texts into their respective implicit-aspect classes.

f. Handling Class Imbalance

After annotation, there was a high imbalance amongst implicit aspect classes of almost all entities. The imbalance for the entity *cabin* was handled using an oversampling technique called Synthetic Minority Oversampling Technique. [16] (See appendix F). SMOTE was performed for all 8 entities.

Results of SMOTE imbalance handling for the entity: *Cabin* is as follows

Class: {“Condition”:182, “Size”:182, “Temperature”:117, “Fragrance”:102}

This could be visualized as a scatter distribution shown in figure 3

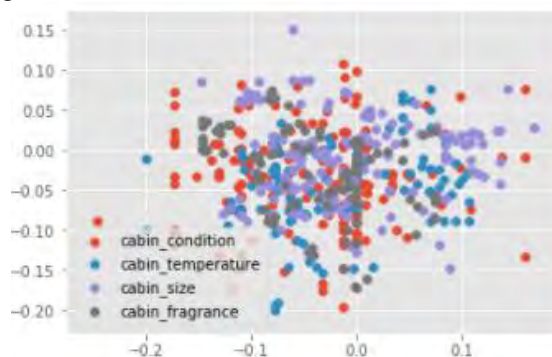


Figure 1. Cabin class imbalance rectified with SMOTE

g. Implicit Aspect Classification

A total of 8 models were created for each entity i.e. there are independent classification models for training each entity. The reason for creating 8 models is to devise a

perfect model for recognizing and classifying each *Entity* with its own *Implicit Aspect*.

This experiment study makes use of state-of-the-art classification algorithms. Three of which were ensemble learning techniques. These include Gradient boosting algorithm – XGBOOST, a Voting Bagging algorithm using three tree-based classification techniques like Decision Trees, Random Forest, and Extra Trees Classifier. And other machine learning techniques like SVM, Decision Tree.

The reason for using these different algorithms was to gather insightful information on the performance of classification which was evaluated based on ROC-AUC [17] score and F1 [18] scores. (See Appendix I)

V. EVALUATION AND RESULTS

This experimental study using state-of-the-art techniques and algorithms is a new approach to mine and extract implicit aspects from opinionated texts.

The first evaluation was for the annotation of the dataset using Cohen’s Kappa Co-efficient.

The two annotators’ agreement scores ranged from 80.48% to 82.13% for entity level and implicit aspect level annotation. (See Appendix A).

The second evaluation was for the sequence labelling task using stochastic gradient descent with L2 regularization Conditional Random Field. This was done to classify texts in 8 different entities.

The ROC-AUC score achieved for this task is 96.5% and an F1 score of 94.56%. (Appendix I)

The third evaluation was for the classification task using five different classification algorithms. (See Appendix I)

A detailed ROC-AUC score evaluation metric is available in Table 10 (Highlighted in green provides best score)

Entity	Algorithms				
	S	D	R	V	X
Food	84%	92%	94%	94.8 %	94.7 %
Cabin	75 %	75 %	85%	85.6 %	77 %
Entertainment	73.6 %	79.9 %	83.1 %	84.3 %	85.9 %
In-flight	60.3 %	70.3 %	72.2 %	74.9 %	71.2 %
Off-flight	66.4 %	86.2 %	84.9 %	84.8 %	89.8 %
Possession	66.9 %	66.9 %	70.5 %	73.3 %	73.4 %
Seat	66 %	73.7 %	75 %	75.7 %	78%
Staff	75.6 %	76.9 %	80.9 %	82.1 %	81.4 %

Table 10 ROC-AUC Scores for classification of entities

In table 10, S stands for Support Vector Machines, D for Decision Trees, R for Random Forest, V for Voting Classifier, and X for XGBOOST algorithms. In all these machine learning and ensemble learning classification algorithms, the bagging technique of ensemble using tree-

based classifiers has out-performed all other classification algorithms. (Appendix I)

VI. ISSUES AND CHALLENGES

Manual annotation was a big challenge. Being humans, everyone has a different outlook on implied meanings. One can think of words like “boarding, de-boarding, take-off”, and “landing” as in-flight operations. But, if a person takes a minute to read the review and understand the concept, “boarding”, “de-boarding”, “take-off”, and “landing” are off-flight facilities provided by the airlines. So, using corpus statistic techniques and adhering to the inter-annotator guidelines the annotators made mutually agreeable decisions. (See Appendix A)

The word *spacious* in this study made it a bit challenging for the labeling sequence task. It is a word that occurred quite frequently in the reviews. Also, if used within the same sentence or context of “cabin” it means that the “cabin” was big implying to its attribute “size” and in context of “seat”, it means that the “seat” had enough leg room implying to its attribute of “comfort”. This word has two implicit meanings. This is a double implicit problem. Such a problem was tackled by making use of T-distributed stochastic nearest neighbors for word embeddings clustering techniques [19] This clustering technique allows word distances of such words to be mapped with each implicit aspect-entity pair. Wherever the words were close, it was mapped to the respective implicit aspect-entity pair. (See appendix D).

For example, “spacious” occurs in the same vector space as of “size” for cabin and “comfort” for the seat. So, the word cosine distance between spacious, size and comfort was added as a feature to the occurrence of the word spacious.

VII. RELATED WORK AND IMPROVEMENTS

Our research concentrates on implicit aspect extraction, opinion lexicon generation, and engineering an annotated implicit aspect-based sentiment corpus that can influence implicit opinion mining from consumer reviews in the airline industry. Few studies that are done in this realm of implicit aspect-based opinion mining and extraction but very few on implicit aspect-based opinion mining

In a research study proposed by *Chinsha T C et al.*[20] the methodology proposes a syntactic based approach using dependency parsing. In other research for comparing word representations for implicit classification [21] Both these studies use *SentiWord Net* and have dataset restrictions. The present study intends to extend the results of these two papers. By using a syntactic approach to group implicit aspect synonyms for a larger dataset. As the two studies were restricted to 170 and SemEval dataset respectively.

Research dealing with the double-implicit problem in opinion mining and sentiment analysis proposes a protocol to derive a labelled corpus for implicit polarity and aspect analysis. [22] The work in this paper is limited to only Chinese restaurant reviews. The present study addresses not only the dataset limitation but also the labelling of the corpus technique by using Type/token Ratio and other

corpus statistic techniques which are explained in the experimental setup section 4.

Another study using two corpora proposed a hybrid model to support Naïve Bayes training to identify implicit aspects[23] This corpus and dictionary-based approach is limited to only adjective type words of a sentence. The present study extends this work by taking considering a combination of adjectives, adverbs, nouns, and other part-of-speech indicators and uses ensemble learning for classification A study conducted on implicit aspect indicator extraction, models relations between the polarity of a document and its opinion target using Conditional Random Field (CRF)[24] This method is limited however to only cellular device data and the entities are picked from a pre-trained Stanford CRF model. Our work extends Conditional Random Field and extends it to the airline domain

VIII. CONCLUSION AND FUTURE WORK

The present research study using a supervised machine learning approach provides a novel technique to overcome the implicit opinion and aspect mining problem. It does so by, identifying eight different airline industry-specific aspects that can be leveraged for the task of opinion mining. They include fine-grained entities like the cabin, entertainment, food, in-flight service, off-flight service, seat, staff, and possessions. The annotation is done on two levels, one on the entity level and the other is on the sub-aspect level, which allows for a more detailed label construction. The two annotators in this experiment study have a very good agreement on annotated terms. This can be reflected by Cohen's Kappa score ranging from 0.77 to 0.80. So, it can be said that the corpus derived from this study, can be used as a gold standard for implicit aspect-based mining tasks for airline reviews.

This experimental study presents a novel approach of dividing the implicit aspect-based opinion mining task into two levels, one using stochastic gradient descent with L2 regularization for improving conditional random fields to identify entities. This is done with a ROC-AUC Score of **96.58%**, F statistic score of **94.56%**, and with **0.01** degrees of a mean absolute error on testing data. The second level is to classify each entity into an implicit aspect sub-group. For this state-of-the-art machine and ensemble learning algorithms are used. From the experiments, it is found that ensemble learning outperformed the machine learning approaches. The ROC-AUC scores for ensemble learning algorithms like Voting Classifier range from **73% to 94.8%** and the boosting algorithm like XGBOOST range from **71% to 94.7%** for all eight entities. Synthetic Minority Oversampling technique proved to be an effective performance improver for the classification and extraction of implicit aspects tasks.

The scope of this experimental study is limited to a few reviews, as possible future work, another study can carry forward the methods proposed in this paper to a larger dataset. Also, another possible future work can be

implementing a neural architecture of these proposed methods.

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THIRD EYE - 360° Object Detection and Assistance for Visually Impaired People

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Abstract: Visual disability is a global issue. Visually impaired people confront several challenges every day. Many times, blindness affects a person's ability to self-navigate in known or unknown environments. The system proposed an idea to overcome the challenges of detecting objects in a known environment or room environment with the help of Artificial Intelligence. Using this system, users can search for the desired objects by giving voice commands and can be assisted to the object location. When the user wants to search any object, he/she simply gives voice command using NLP to the system. The system then identifies commands and extracts the object name to be searched. With the help of image processing, first identifies and locates the object in surrounding and navigates the user to that object using a voice assistant. **Keywords:** Artificial Intelligence, Natural Language Processing, Voice Assistant, Convolutional Neural Network (CNN), Cloud Computing firebase, Raspberry pi, Support vector Machine (SVM), Robot(prototype).

I. INTRODUCTION

Object detection and extracting their feature is a very interesting topic and also one of the most challenging problems in the computer field. Object detection from 360-degree panoramic images is mostly used in recognizing assistance and has amazing potential in automatic driving and navigation of drones, robots, and other movable devices.

The International Classification of Diseases organization has declared the statistics that show, 285 million people are visually impaired worldwide of which 39 million are blind and 246 million have low vision. This is a widely adopted disease. Visual disability is a global issue. The visually impaired people in their daily lives face innumerable challenges. Amongst which, one is to independently navigate and perform daily activities are highly affected activities. Our idea is based on the approach to aid visually impaired people with voice assistance to detect objects of the surrounding using 360° view cameras. The proposed system uses a 360° view camera of the mobile phone to assist the user in detecting desired objects in the room environment and provide localization. An artificial intelligence-based system that provides voice-based commands with object tracking to search, locate, and navigates to objects.

This paper proposes a system as well as an algorithm for detecting and locating objects in-room environment. After looking at the virtually impaired people's problems we decided to create a system that will be helpful for them to make their day to day life activities easy. After talking to many people and after taking their views that what kind

of problems they are facing we concluded that what kind of system should be designed for them. This system will be free and handy to use. It can be used by everyone having smartphones and internet connectivity with them. We will design the android app which will be helping the user to perform his or her day to day activities by helping users to recognize and find the objects they are looking for. In this application, we will use technologies like android, image processing, natural language processing, and cloud firebase and integrating this all using IoT devices like Raspberry pi and other sensors.

II. SURVEY OF LITERATURE

Many mobility aids and object detection and recognition aids have been introduced for visually challenged people for the detection of objects in there surrounding so that they can find what they want in an easy way. Different aids are based on various technologies mainly ultrasonic sensors, infrared (IR) sensors, or image sensors for the detection of obstacles [1].

The first paper that we surveyed is, PARTHA: A visually Impaired Assistance System [1]. This system is a combination of smart glove and smartphone which will be used to detect the objects and also to avoid the obstacles that come their way [1]. The smartphone is used to detect the objects around them. This system also has the navigation through which the person using the device will get the instructions of the objects they are searching for, the navigation part is based on wifi [1]. The most important part of this device is the system shares the real-time location of the blind person which improves the chances of security of the person as the location will be shared. This point makes the system more feasible [1]. The limitation in this system is that the Current indoor navigation system needs to be trained for the location before even using it. The roots are set in the system, the person needs to set the roots before using the system to make these all facilities available [1].

Now another paper was Application for the Visually Impaired People With Voice Assistant [2]. This paper talks about an application that will help visually impaired to see the object using their Smartphones [2]. The smartphone will be used to click pictures around and with this, the user and perform the activities like reading or finding things or finding their roots [2]. They will have an app that will help the user to get the guidance throughout and the app will use the voice control feedback mechanism because of which the user can perform his or her daily life task easily without seeking anyone's help [2]. The limitations that we

found is that the user needs to have a smartphone always to perform the task throughout and the instructions will have to be given always manually [2].

Another paper was, Multi-sensor – based Object Detection in Indoor Environment for Visually Impaired People [3]. This system is designed for people whose vision cannot be corrected to normal vision with standard high glasses or any type of contact lenses [3]. They have a multisensory based system which is used for object detection for the indoor environment [3]. Where their object detection will be performed on the images they capture using statistical parameters which has a support vector machine algorithm [3]. The multi-sensor here is employed by an ultrasonic sensor. Also, here infrared sensor is used to detect small objects [3]. Limitations observe in this system are limited to indoor-only, the person cannot use it when outdoor. The distance is limited to 7 feet. Their system finds obstacles in the range of only 300 cm using an ultrasonic sensor. The person always needs to have his headphones with him as their sensor is light sensitive [3].

We also came through a paper that was, Real-time Object Detection for 360-degree Panoramic Image using CNN [4]. This system is presenting real-time object detection for 360-degree panoramic images where they have used a convolutional neural network (CNN) [4]. They have also adopted the CNN- based detection framework for object detection which is having a post-processing stage to find the result. they have also proposed a novel method where they will be reusing the existing database of ordinary images, they have given the examples of imageNet and PASCAL VOC [4]. They have also demonstrated with several examples where they have proven that their method yields higher accuracy and also recall rate [4]. Limitations that we came across are, as their system has CNN which is based on YOLO's CNN structure, their system also has the limitations that YOLO has [4]. Their system cannot detect small objects also the objects which will be near to pole of the 360-degree panoramic sphere might get twisted too much to detect. They might get duplicate detections too. If their IoU threshold does not suite [4].

This was another paper using, 360° View Camera-Based Visual Assistive Technology for Contextual Scene Information [5]. This system uses a 360° view camera with a mobile device to capture surrounding scene information and provide contextual information to the user in the form of audio. The scene information from the spherical camera feed is classified by identifying objects that contain contextual information of the scene [5]. That is achieved using convolutional neural networks (CNN) for classification. The result of this paper shows 92.8% of classification accuracy. The results are reported after 10 trails where training data was shuffled randomly [5]. Some of the limitations that were founded are, No lens distortion correction was included in the system pipeline. Also, the time is taken for image capture and then data transfer over network took 7 seconds on average. This is not because of the connection type rather the internal image processing [5].

Some more papers on the above topics that we got are the Adaptive 360 Degree Image Recognition Approach to

Empower Visually Impaired [6]. They have explained the kind of problems the people who are the virtual impaired face, among which the ability to navigate and also to perform all the daily tasks is one of the most difficult jobs for these people [6]. This system is completely based on the abilities for using virtual feeds from cameras and image processing and machine learnings which will help the user the identify and detect the things objects around them which they need to find. They have audio assistance which will guide them throughout to get the objects they are finding for [6]. This system is limited to only detecting objects and might not even get a 360-degree angle. The user needs to have all the 360-degree angle to detect the image [6].

Some of the papers were based on the hardware devices that the user can wear and can use for finding the objects like, Third Eye: A Shopping Assistant for the Visually Impaired [7]. This system is a combination of cameras that can be worn also called wearable cameras also hardware accelerators and algorithms and a vision-based automatic shopping assistant these things will allow the user to detect the activities and get to know about them [7]. Here they have used the technology for human augmentation, where they will be working with the help of gloves which will guide the person to give the instructions, to click the pictures and other important stuff [7]. It is limited to a particular distance, the person will have to rotate the camera for finding the object in that case the person might miss few places which counts it to the biggest disadvantage, if the particular person who is using the device rotates everywhere properly then he or she has the chances of finding the object or else he or she might miss on few places [7].

Some papers that we came across uses the 3d technique and 3d cameras like, Quick 3D Object Detection and Localization by Dynamic Active Search with Multiple Active Cameras [8]. This system was designed to detect the known objects in the 3D environment and also to set their positions to pan-tilt-zoom cameras. It was a time back then when 3D wasn't invented so basically this was kind of the procedure to start inventing it, multiple cameras were used to click the multiple pictures facing different angle, multiple cameras were accurate than the single-camera because the multiple cameras were faster than the single-camera [8]. Some of the problems that we can find out were single cameras can't be said as accurate as multiple cameras will be said. 3D room is needed for any of the activities, there is no voice assistant which will guide the person to perform multiple activities. the objects are not more accurate or clear [8]. There is no fast detection of the object we want. If the background is green and the object is also green this method cannot be applied to it. It means this method denies working where they have the same color of the object as the color of the background [8].

III. PROPOSED METHODOLOGY

We have designed this model, especially for blind people to make their day to day activities easier. This model can

also be used by normal people as well. Now the question is how the app works and how it is going to be useful. The first step is to install the android app designed to take the pictures in 360 degrees to detect objects in the surrounding through the images taken. The android phone will be fitted on the robot. The UI of the android app will be as follows:

As we earlier told that this application can be useful for normal people as well as for the visually impaired, so the UI of the app will be designed in the way it can work automatically as well as if someone wants to use it manually it can be done as well. The main page of the application will be having Three buttons viz One will be Take Picture, another will be Upload Picture, and the last will be a Voice Input Button. It will also have a toggle menu button which will have the options like Updating the Profile if the user wishes to have his information to be feed in it, then there will be one Voice setting, for setting or tweaking any changes to be done and then there will be about us section containing the maker information.

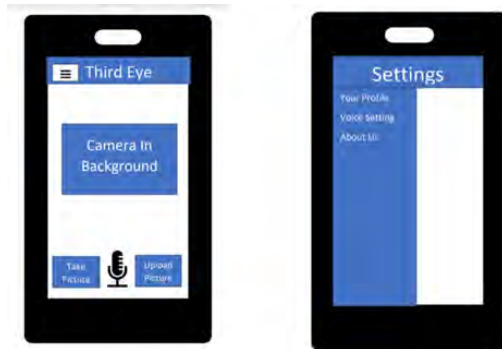


Fig. 1. Mobile UI

This is all about the UI of the application. This application will be inside the android mobile and then the application can be opened using google or Alexa voice assistance. As soon as the user tells through voice to open the application, the application will pop up and will start taking the photos of the surrounding and will make the Robot or any prototype to rotate in 360-degree fashion so that it can take 8 photos in different direction and angles so that it can sense the whole surrounding properly. As soon as the photos will be taken they will be uploaded to the Firebase system using the Internet.

Now we will study the whole proposed system using this pictorial flowchart, here as soon as the system is openly charged in standby mode and After the user’s instruction, as soon as the app opens, the robot will rotate, and it will first take pictures all over i.e in 360 degrees, the app will take probably 1-2 sec to cover each angle, and slowly it will picture from all over. After taking pictures the app will upload all the pictures to the firebase. Simultaneously the person will have to give voice input to open the app saying the name of the object to be found. The voice message will be uploaded to firebase and with the help of NLP algorithms like Support Vector Machine or Clustering and other codes, we will extract the keyword and recognize the object to be found from that spoken sentence [9].

Here in firebase, we with the help of python script and some Arduino coding that will take all the 8 images and find the picture in which the given object is visible [10]. If the object is available in the room the person will receive directions accordingly like the 8 images will be named as L1, R1, etc and that will help with the directions for the person. When the Camera module takes the photo it will label the photos accordingly, like Front-1, Front2, and similarly Right, Left, and Back. Now the direction of the object will be given to the robot and the DC motors fitted on the robot will rotate in that direction.

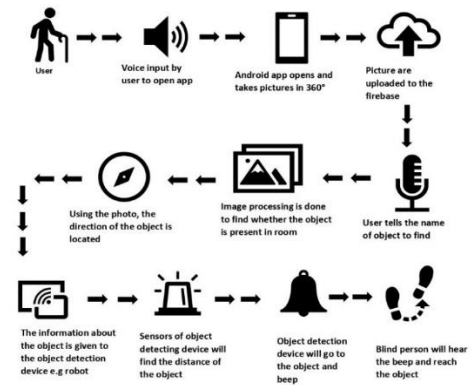


Fig. 2. Proposed System Pictorial Flowchart

Now suppose if the object is present, the location of the object will be located and then the directions will be given to the user to reach towards the object. This device will give directions to the blind person suppose there are 2 bottles in the room one green and the another blue, it will become difficult for the blind person to choose the specific color so our device will help that person with the directions that if the person has to move left or right, forward or backward such directions will be given to that person which will make his task easy without any person's help. The information of the object direction is given to the object detection device i.e. prototype in our case which is a robot. The following figure shows the working of the robot.

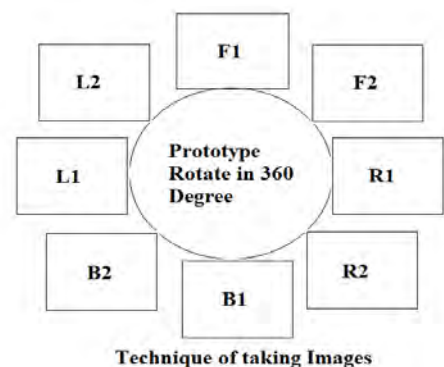


Fig. 3. Technique Used to take Images

We can see the total working of the hardware system in the above-given flowchart. As soon as the order is given to the model by the voice of the input of the user, the camera module gets activated. The Raspberry Pi which is mounted with the robot will then help the robot to do the

an object detecting device which will have an android phone, raspberry pi, and ultrasonic sensors. This system is designed to detect the objects which blind people are not able to do and will help to make their day to day life easy. This system can also be used by a normal person to find various things that will save the time of the person.

V. ACKNOWLEDGMENT

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Mitigating Impact of Disaster by Effective Method of Data Replication

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Abstract— In proposed system, all the data going into database is in structured format only. This data is very huge in amount. When this data is taken for analysis, it will not contain errors as compare to existing system or as it is happening in existing system. So the person who is going to analyze the data, can easily analyze it using any data analysis tool (here it is Informatics or ETL tool). Since the amounts of errors are reduced, this system of storing and/or keeping records will take less time for analysis. The user can easily view records, add records and update records as per their privileges. Only the administrator of the system or in our case (Database Administrator) has all the rights or permissions of doing all the necessary operations on the data. We are going to design schema for the database which we are going to use. We are going to use RDBMS concepts to transform data. Also we are going to use Normalization technique to normalize the data, so that it can easily understand as well as interpreted. Also in this system we are taking regular backup of database so that, in case of any disaster or any unfavorable situation occurs with data, we will take help of this backup to recover that data to its original state, or in short we can restore the data to its previous state. In this way we are going to design our proposed system.

I. INTRODUCTION

The definition of disaster recovery is embedded in its name, according to Wiki, this is the procedure done for a business to recover easily and have business resumption almost immediately after a disruptive event happens. These disruptions may vary; it could be a high impact one, like a terrorist attack or even a natural disaster like earthquake and it may be as minor as a computer virus attacking one computer. Planning for events like this is essential as you have to remember that you will lose money and profit even for just a few seconds of system outage. A standard should be set and all employees who are tasked to take the responsibility should know the contingency plans. Disaster recovery is a set of policies, tools and procedures to enable the recovery or continuation of vital technology infrastructure and systems following a natural or human-induced disaster. Disaster recovery focus on the IT technology systems supporting critical business functions, as opposed to business continuity, which involves keeping all essential aspects of a business functioning despite significant disruptive events. Disaster recovery can be therefore considered as a subset of business continuity. Oracle Data Guard giving you HA, data protection, and DR for enterprise data. DG provides you a multiple set of services that generate, maintain, manage, and monitoring one or more high deployment databases to enable production Oracle

databases are able to survive natural disasters and critical data corruptions. Data Guard maintaining these high deployment databases as multiple and consistent copies of the critical production database. Then, if the production db becomes unavailable because of any planned or an unplanned faults, Data Guard can be switch any high immediate deployment database to the critical prod role, less the downtime associated with the disasters. DG can be used with cloud and traditional backup A database schema is, restoration, and HA techniques to provide a higher level of data level protection and data availability. With DG, admin can definitely improve production db performance by offload the resource and backup and reporting operations to highly HA deployment systems.

II. LITERATURE SURVEY

Disaster is something that nobody wants too but it is something that occurs because of nature and human mistake. No matter what kind of disaster is, is always loss of documents in case of cooperate and life's, damage in general. A number of definitions of, Disaster 'have been proposed over time, many of them focusing on the actual hazard or event and its cost in terms of loss of life or damage to property. Fritz et. al. (1961), interpreted disaster as a state in which the social fabric is disrupted and becomes dysfunctional to a greater or lesser extent. According to Quarantelli (1998) disaster is something social in character. Whereas Gilbert (1998:11) stated disaster as the passage to a state of uncertainty. In 2002 the Commonwealth Government defined a (natural) disaster as: serious disruption to a community or region caused by the impact of a naturally occurring rapid onset event that threatens or causes death, injury or damage to property or the environment and which requires significant and coordinated multi-agency and community response. Such serious disruption can be caused by any one, or a combination of the following natural hazards: bushfire; earthquake; flood; storm; cyclone; storm surge; landslide; tsunami; meteorite strike; or tornado (Commonwealth of Australia, 2002).So disaster has different meaning but same result is same i.e. loss or damage[1].

If we talk about the business the loss is in the form of documents carrying data which are the most important entity for business. Loss of document can stop the smooth of running of business which business can't afford for this business is always ready with disaster recovery plans. Traditionally DR (Disaster Recovery) has two broad ways: firstly as a desired outcome and, secondly as a process leading to a desired outcome. According to Adger (2000), recovery' is depicted as restoration to a previous state of wellbeing in which people experience „closure'

and communities, economies and infrastructure return to the same level as they were before.

If we talk about the resilience in DR, it provides a strong theoretical basis for the relationship between prevention of disaster, responding to, recovering from and preparing for the next disaster. According to Caplan's(1964), coping with an adverse event can lead to increase coping skills, an enhanced sense of self efficacy, and an increased ability to prevent and cope with future stressors[2].

The World 10 Bank's definition of recovery refers to a process (decisions and actions) with the aim of returning to living conditions that were the same or better than before and also specifically includes the reduction of disaster risk in the definition, The World Bank (2006). A traditional method of recovery of documents using ICT approach is not best suited in today's scenario. For this reason Cloud based disaster recovery is becoming more and more popular in every sector because of its streamlined, convenient and successful in delivering a novel, continually evolving and improving solution for „full-on' data storage and recovery in the whole disaster recovery world[3].

According to Forrester "DRaaS as prepackaged solutions that provide a standard DR failover to a cloud environment that you can buy on a pay-per-use basis with varying rates based upon RPO and RTO". System Architecture using Cloud Computing in DR has been explained by Pokharel et. al. (2010). In this research author's deals with cloud based disaster recovery architecture and finds it is best as cloud offers high availability, high survivability and low unavailability and low downtime with very less cost. Cloud computing system does not only provide the low cost features but also promotes the service provider to concentrate on quality of service rather than its maintenance work.

III. PROPOSED SYSTEM

In proposed system, all the data going into database is in structured format only. This data is very huge in amount. When this data is taken for analysis, it will not contain errors as compare to existing system or as it is happening in existing system. As shown in Figure 1. Following components are implemented in this system.

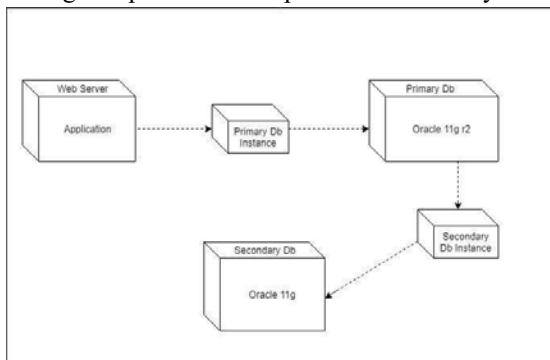


Figure1: Proposed system

The person who is going to analyze the data, can easily analyze it using any data analysis tool (here it is Informatics or ETL tool). Since the amounts of errors are

reduced, this system of storing and/or keeping records will take less time for analysis. The user can easily view records, add records and update records as per their privileges. Only the administrator of the system or in our case (Database Administrator) has all the rights or permissions of doing all the necessary operations on the data. We are going to design schema for the database which we are going to use. We are going to use RDBMS concepts to transform data. Also we are going to use Normalization technique to normalize the data, so that it can easily understand as well as interpreted. Also in this system we are taking regular backup of database so that, in case of any disaster or any unfavorable situation occurs with data, we will take help of this backup to recover that data to its original state, or in short we can restore the data to its previous state. In this way we are going to design our proposed system.

IV. ALGORITHM USED

Modern age of TCP implementations include a mechanism, known as the Nagle algorithm, which prevents the unnecessary transmission of a large number of small packets. This algorithm has proving the useful in protecting the Internet against heavy packet loads. However, many applications suffers performance problems as a result of the traditional implementation of the Nagle algorithm. Interact between the Nagle algorithm and TCP's delayed acknowledgment policy can create an especially severe problem, through a temporary "deadlock." These flaws in the Nagle algorithm have prompted many application implementers to disable it, even in cases where this is neither necessary nor wise. We categorized the applications that can and cannot disable the Nagle algorithm, and we show that for some applications that often disable the Nagle algorithm, equivalent performance can be obtained through an improved implementation of the algorithm.

We describe four possible modifications, including one novel proposal, and analyze their performance on benchmark tests. We also are describing a receiver side modification that can help in some circumstances. If an individual user of a shared, large, but finite resource with no explicit limits on consumption increases his or her demand by X%, he or she stands to gain nearly N% more of the resource. Yet if all users increase the demands by X%, the total demand may exceeded the carrying capacity of the resources, resulting in little net gain, or even a collapse. This is known as a "tragedy of the commons" [6]. A user's perceived self-interests conflict with the collective interest of all users, and might even be in conflicts with the user's actual self-interests. The Internet, as we have known it since it's in market, is a commons, and many people recognize its vulnerability to a tragedy of the commons. This has led to numerous proposals for technical mechanisms to limit the consumption, or economic mechanisms to force users to internalize costs. However, none of these mechanisms are in widespread use.

IP are also used in isolated networks (within

organization), with the potential for excessive demand, but where administrative or other constraints prevent the use of charging or admission controls. Fortunately, enlighten self-interest can promote good consumption patterns. The primary such mechanisms now used in the Internet are Jacobson's "slow start" and "congestion avoidance" algorithms for TCP [3]. While the primary motivation for these algorithms was to avoid congestive collapse of a shared network, Jacobson showed that they also improved performance for lengthy. TCP/IP connections without competing traffic. That is, for most users, their own self-interest (in employee these algorithm) coincides with the interest of the network as a whole. Even before Jacobson's work explicitly addressing congestion using feedback mechanisms, several TCP algorithms had been devised to limit the number of unnecessary packets injected into the network.

DB schema

A db schema is the internal or external structure that represents the logical view of the entire db. DB schema defines how the data is manage and keep and how the relations between them are related. It calculates all the limitations that are to be applied on the data. A db schema defines its values and the relationship between them. DB contains confidential details of the db, which can be representing by means of schema diagrams. It's the db designers who design the schema to help all users and develops and understand the database and make it helpful. The database schema, a set of related tables and other database objects, is a fundamental concept in relational databases, and it is part of the logical database structure of an Oracle database.

A schemas always associated with a user, and it can be defined as a named collection of objects owned by auser. That is why the terms "user" and "schema" are used almost synonymously in Oracle databases. A relational database schema consists of the definition of all relations with their specific attributenames, as well as a primary key. The schema further includes the definition of all the domains which are the ranges of values the attributes can take.

A db schema can be mainly divided into two parts – Physical DB Schema –This schema contains to the actual storage of data and its type of storage like files, objects, etc. It shows how the data will be stored in a supplementary storage.

Logical DB Schema –This schema contains all the logical data's that wants to be applied on the data stored. It shows tables, views, and integrity checks.

Oracle database conventions refer to defined groups of object ownership (generally associated with a "username") as schemas.

Most Oracle database installations traditionally came with a default schema called SCOTT. After the installation process has setup the sample tables, the user can log into the database with the username Scott and password tiger. The name of SCOTT schema originated with Bruce Scott, one of the first employees at the Oracle (before Software

Development Laboratories), who had a cat named tiger. Oracle Corporation has de-emphasized the use of SCOTT schema, as it uses few of the features of more recent releases of Oracle. Most recent schemas developed by Oracle corporation reference the default HR or OE schemas.

Other default schemas in Oracle are:-
 SYS (essential core database structures and utilities).
 SYSTEM (additional core database structures and utilities, and privileged account).

OUTLN (utilized to store metadata for stored outlines for stable query-optimizer execution plans).

BI, IX, HR, OE, PM and SH (expanded sample schemas containing more data and structures than the older SCOTT schema).

V. METHODOLOGY

A DG consists of one critical database and more optional databases. The databases in a DG configuration are added by Oracle and it must shown all over the world. There are limitations on where the db are situated, provide they can co-ordinate with each other. For example, you have a critical deployment db on the same system as the prod db and UAT db along with two critical deployment databases on other systems at remote locations. You can manage primary and critical deployment databases using the SQL command-line interfaces or the DG broker interfaces, including a command-line interface and a GUI interface that is integrated in Oracle Enterprise Manager.

Primary db:

A Data Guard configuration contains one critical database and also referred to as the primary db that functions in the first role. This is the db that is access by most of your applications either java or non java. The initial db can be either a single instance Oracle db or an Oracle Real App Clusters (Oracle RAC) database .

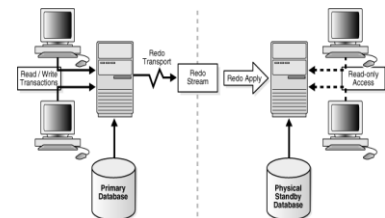


Figure2: Automatic updating of physical standby database

Secondary database:

An immediate deployment database is a process of changing contradiction copy of the primary databases. Using a backup copy of the primary databases, you can create up to nine immediate deployment databases and incorporate them in a Data Guard configuration. Once created, Data Guard automatically maintains immediate deployment database by transforming redo data from the primary database and then applying the redo to the critical deployment db. Similar to a primary db, an critical deployment db can be either a single db instance Oracle db or an Oracle Real Application Clusters db. An critical deployment database can be either a physical immediate

deployment database or a non critical immediate deployment db.

Physical immediate deployment db:

Provide an first copy of the primary db, with on the disk db structures that are equal to the primary db on a block on the block base. The db schema, including indexing, is the same db. A physical critical deployment database is kept sync with the primary db, though Re-do Apply, which recovers the re-do data, received from the primary db and applies the re-do to the physical immediate deployment database. A physical critical deployment db can be used for security purpose other than dR recovery on a

limited basis. As of Oracle Database 11g release 1 (11.1), a physical immediate deployment database can receive and apply redo while it is open for read-only access. A physical immediate deployment database can therefore be used simultaneously for data protection and reporting.

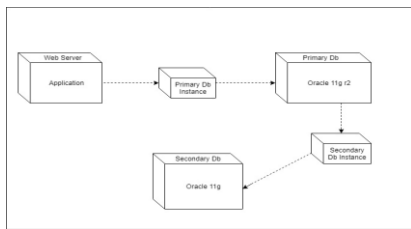


Figure3: Deployment Diagram

Backup & Recovery Overview

Simply speaking, a backup is a replica of data. This replica includes important and non-critical parts of your db such as the control file and schemas. A replica is a safety against accidental data loss and application errors; should you lose your actual data, you can use the replica to make it available again.

Replicas are divided into physical backups and logical backups. Physical backups, which are the first seen of this guide, are replicas of physical db files. In contrast, logical backups contain data that you extract using the Oracle Export utility and store in a binary file. You can use logical backups to supplement physical replica. A replica is a copy of data from your db that can be used to recreate that data. Backups can be divided into types physical and logical backups.

Physical replica is backups of the actual files from file system used in storing and regenerating your db, such as data-files, control files, and get re-do logs. Ultimately, every physical replica is a copy of files storing database information to some other file system location, whether on disk or some tape offline storage such as tape or disk. Logical replica contain logical data (for example, tables or schemas) dumped from a database with an Oracle export command tools and stored in a one-zero (binary) file, for later re-generating into a db using the actual Oracle import tools.

Types of backups

Cold Backup

In this type of backup, after the db is shut off, DB Admin

exits the SVR-MGR utility and copies the logs, data files and control files onto a storage or tape media. Once the replica has been completed the DB Admin can restart the database.

Physical Replica

The OS saves the db files onto disk or some other storage. This is useful to get back the system to an earlier point whenever needed like snapshot in file systems.

Logical Replica

In logical replica technique, the import and export tools are used to make the backup of the db. A logical backup backs-up the contents of the db. A logical replica can be used to retake the db to the last state. However, physical backup, it should not be used to create an entire OS replica, copy because recreating using the steps would make it possible to restore the loss data files. Therefore in these scenario physical type backup should be used.

Critical backup

A few servers that need to support continuity, it is impossible to take down time the db without stopping the service provided to the users. In such cases, critical backup techniques should be used. The db steps are not allowed until backup has been completed if the on-line re-do log data files are filled before they can be backups.

Which files to take backup in Oracle databases

- Datafiles (data, index, undo, temp)
- Redo Log Files (active and inactive)
- Active Logs (if running in archive log mode)
- Control files (all)
- Initialization files –(initSID.ora)

What is restore?

It is simply, copying backed up files from tape/disk to its original location.

What is recovery?

To bring database in consistent mode by applying redo logs (roll forward) and undo transactions (roll backward). Data recovery is the process of restoring data that has been lost, accidentally deleted, corrupted or made inaccessible. In enterprise IT, data recovery typically refers to the restoration of data to a desktop, laptop, server or external storage system from a replica.

Retrieval refers to the various steps involved in rollback, rolling forward and rolling back a data. Backup and retrieval in general refers to the various steps and actions involved in securing your db against data damaged and recreating the data should that damage occur. A major load of the DBA administrator is to prepare for the max of hardware, software, resource, process, or sys failure. If such a failure affects the operation of a db system, you must usually retry the db and return to exact operation as quickly as possible. Retry should secure the db and all related users from critical issues and avoid or destroy the possibility of having to immediate work manually. Regenerating processes vary depending on the type of loss that occurred, the skeleton affected, and the type of retry that you perform. If no files are damage, retrieval may

amount to no more than rebooting an instance. If data has been destroyed, recovery requires performing operation.

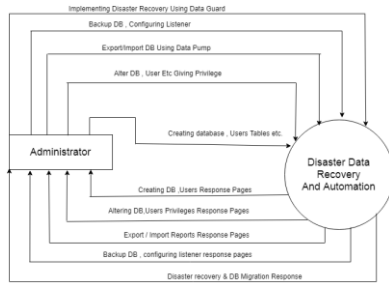


Figure4: Disaster Recovery Automation

Data Pump

Starting with Oracle 10g, Oracle has introduced an enhanced version of EXPORT and IMPORT utility known as DATA PUMP. Data Pump is similar to EXPORT and IMPORT utility. It is an utility provided by Oracle to export data and/or structure from a database into a binary file called as dump file. Using the import utility, data can be imported from the dump file into the database. In older versions of Oracle, this was called import/export utility. This utility is still available in Oracle 10g. To Use Data Pump, DBA has to create a directory in Server Machine and create a Directory Object in the database mapping to the directory created in the file system.

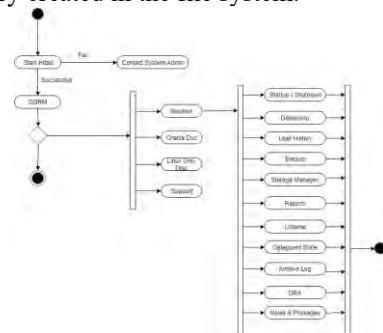


Figure4: Activity Diagram

It is a server side utility. Import/export was a client side utility. It can be started from where it is stopped. It can import/export data from one database to another without generating a dump file. It can extract only the structure of the database. It is faster because, it uses direct path loading and unloading technologies. It can be called using expdp and impdp commands as well as dbma_datapump package. EXP_FULL_DATABASE role is required to export data from schema different than others.

Advantages of Data Pump

- Better control on the job running – it provides features like start, stop and restart.
- Improved performance because of It is server side technology with parallel streams option.
- Using the parallel streams option, data pump can backup large volume of data quickly.
- Data pump is 15-50% faster than the conventional export import.

- It has the ability to estimate the job times.
- Failed jobs can be restarted.
- Using exclude/include option we can perform fine-grained object selection.
- Backup jobs can be monitored.
- It has the remapping capabilities.
- Using “Query” parameter DBA can extract the data from tables like SELECT “Content” parameter gives the flexibility for what to import/export. For example Metadata only, data or both.
- It supports full range of data types.
- It supports cross platform compatibility.
- No need to specify the buffer size like in normal exp / imp.
- It has its own performance tuning features.
- V\$session_longops view can be used for the time estimation for the data pump jobs.
- It supports interactive mode that allows the dba to monitor or interact with ongoing jobs.
- Dumps will be in compressed.
- Data can be encrypted.
- XML schemas and XML type is supported by the Data Pump.

Disadvantages of Data Pump

- Export cannot be taken on tape.
- Import will work only with Oracle 10g or above.
- Cannot use with UNIX pipes.

Logical immediate deployment database:

Contain the same logical data as the critical prod db, although the on premise organization and structure of the db is different. The logical immediate deployment database is kept sync with the first db though SQL query, which transforms the data in the redo received from the primary db into SQL queries and then executing the SQL queries on the critical deployment db. A logical critical deployment db can be used for other critical business use purposes in addition to DR requirements. This users allows to access a logical immediate deployment database for queries and reporting purposes at any time. Also, using a logical immediate deployment database, you can upgrade Oracle Database software and patch sets with almost no downtime. Thus, a logical immediate deployment database can be used simultaneously for data protection, reporting, and database upgrades the database schema, including indexes, is the same. A physical critical deployment db is keep sync with the first db, though Redo Apply, which recovers the re-do datasets, received from the first db and applies the re-do to the physical critical deployment db. A physical critical deployment db can be used for critical business purposes other than DR recovery on a limited basis. As of Oracle Database 11g release 1 (11.1), a physical immediate deployment database can receive and apply redo while it is open for read-only access. A physical immediate deployment database can therefore be used simultaneously for data protection and reporting.

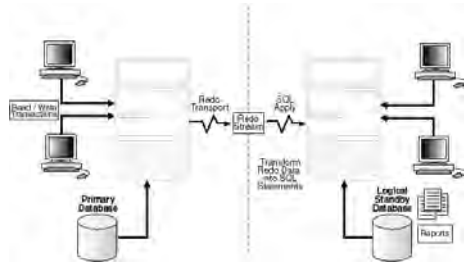


Figure5: Automatic updating of logical standby database

Snapshot immediate deployment database:

A snapshot immediate deployment database is a fully updatable immediate deployment database. Like a physical or logical immediate deployment database, a snapshot immediate deployment database receives and archives redo data from a primary database. Unlike a physical or logical immediate deployment database, a snapshot immediate deployment database does not apply the redo data that it receives. The redo data received by a snapshot immediate deployment database is not applied until the snapshot immediate deployment is replicated back into a physical critical deployment db, after first trashing any updates made to the snapshot critical deployment db. A snapshot immediate deployment database is best used in scenarios that require a temporary, updatable snapshot of a physical immediate deployment database. Note that because redo data received by a snapshot immediate deployment database is not applied until it is converted back into a physical immediate deployment, the time needed to recover from a primary database failure is directly proportional to the amount of redo data that needs to be applied.

- Disaster recovery, data protection, and high availability.
- Complete data protection.
- Efficient use of system resources.
- Flexible in data savings to balance.
- Automatic gap detection and resolution.
- Centralized and simple management.
- Integration with Oracle Database.
- Automatic role transitions.
- Create and enable DG configs, including creating up re-do services and logs apply utility service.
- Control and monitor Data Guard configurations that contain Application Clusters primary or immediate deployment databases.
- Simplify switchovers and failovers by allowing you to invoke them using either a single key click in Oracle Enterprise Manager or a single command in the DGMGRL command-line interface.
- `Enable fast-start failover to fail over automatically when the primary database becomes unavailable.

Linux

Linux is a family of free and open-source software operating systems built around the Linux kernel. There are two several flavors of Linux in which we are able to install the oracle DB.

The history of Linux began in 1991 with the commencement of a personal project by Finnish student

Linus Torvalds to create a new free operating system kernel. Since then, the resulting Linux kernel has been marked by constant growth throughout its history. Since the initial release of its source code in 1991, it has grown from a small number of C files under a license prohibiting commercial distribution to the 4.15 version in 2018 with more than 23.3 million lines of source code without comments[1] under the GNU General Public

After AT&T had dropped out of the Multics project, the Unix operating system was conceived and implemented by Ken Thompson and Dennis Ritchie (both of AT&T Bell Laboratories) in 1969 and first released in 1970. Later they rewrote it in a new programming language, C, to make it portable. The availability and portability of Unix caused it to be widely adopted, copied and modified by academic institutions and businesses.

VI. CONCLUSION

The objective of this work is to identify the possibilities in they technology and to write an algorithm to make the log shipping from production database at one location to the standby database at remote geographic location fastest. The approach behind research will be too pronged. Compressing they redo log file is used to attend optimum level in advance when the shipping of log parallel to the remote database location. Obtain data based on user-provided data this data can be actual product information, Xpath, Tags. Such obtained relevant data applied for web indexing, data mining, data harvesting, monitoring modifications to websites and differences to content information. Online retailers have never seen back in spending millions of dollars and comparable efforts for establishing their brand appearance online and earning client commitment; the clients who represent the lifeblood of the retail business. Still, there are retailers who work really difficult to collect data from the web that can help them steal clients from the competition and permanently win their businesses.

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Indian Sign Language Recognition Using Canny Edge Detection

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Abstract. In our society, it is very difficult for hearing impaired and speech impaired people to communicate with ordinary people. They use sign languages to communicate, which use visually transmitted sign patterns, generally includes hand gestures. Sign languages being difficult to learn and non-universal, there is a barrier of communication between hearing impaired and ordinary people. To break this barrier a system is required for real-time conversion of sign language to voice and vice versa. Here, we propose a real-time two-way system, for communication between hearing-impaired and normal people, which converts the Indian Sign Language (ISL) letters in to equivalent alphabet letters and vice versa. In the proposed system, using a camera, images of ISL hand gestures are captured. Then Image pre-processing is done, so that these images are ready for feature extraction. Here, a novel approach of using the Canny Edge Detection Algorithm. Once the necessary details are extracted from the image, it is matched with the data set, which is classified using Convolutional Neural Network, and the corresponding text is generated. This text is converted into a voice. Similarly, using a microphone, the voice input of an ordinary person is captured and converted into text. This text is then matched with the data set and a corresponding sign is generated. This system reduces the gap in communication between hearing-impaired and ordinary people.

Keywords: Convolutional neural network, Edge Detection, Hand Gesture, Sign to voice, Sign Language, Voice to sign.

I. INTRODUCTION

The sign language is an important technique of communication for hearing impaired and speech impaired people. It is a full-fledged natural language having its own grammar and lexicons. It makes use of gestures instead of sound to convey meanings. Sign language has nicely structured code gestures of which every gesture has a meaning assigned to it. It can be used to express complex meaning by combining basic elements. Sign language is not universal just like spoken language, it has variations and local dialects according to countries and regions. American Sign Language (ASL), British Sign Language (BSL), Indian Sign Language (ISL), etc. are some of the common sign languages in the world. This paper is based on ISL. The majority of people cannot understand sign language.

Thus, hearing impaired and speech impaired people find it difficult to communicate with normal people. So, is true

for normal people to communicate with them. There arises the need for sign language interpreters, who can translate sign language to spoken language and vice versa. But, the availability of such interpreters is limited. This resulted in the development of an automatic sign language recognition system, which could automatically translate the sign into the corresponding text or vice versa without the help of sign language interpreters.

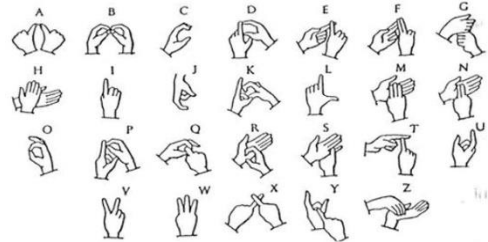


Fig. 1. Indian sign language alphabets

Over the past decade, significant research has been made in the sign language recognition system. A few of these systems based on gesture acquiring methods are given below. Hand gloves-based system: Sensors attached to glove are used for detecting hand gesture signals that are in the analog form. These analog signals are converted to a digital signal using ADC. The gloves have accelerometer and flex sensors used to detect bend signals [1]. Leap motion-based system: Leap Motion is a sensor consisting of two IR cameras and three IR LED's which detects the hand movement and converts that signal into computer commands. IR light signals are generated by LED and the camera generates 300 frames per second of data reflected by that light. These data are sent to the computer for further processing [1]. Kinect sensor-based system: Microsoft Kinect motion sensor consists of an RGB camera, depth sensor, and multi-array microphone that can be used to recognize hand movement and speech [1]. Computer Vision-based system: A web camera is used to capture images. These images are processed using different image processing techniques. Then compared with the dataset for recognition of alphabets [1]. This is the most cost-effective method.

The proposed methodology focuses on a computer vision-based two-way communication system between sign language users and non-users. The system has two modules, Sign-to-Voice (STV) and Voice-to-Sign (VTS). The process in brief for STV consists of acquiring an image using a webcam and performing image processing on it. Features extracted from the image are matched with the dataset, giving associated text, which is further converted to audio given as output. Similarly, for VTS, voice input captured using a microphone is converted to

text. Sign corresponding to text is displayed on screen for sign language users. Such a system can help in the improvement of hearing and speech impaired community via human-computer interaction

II. SURVEY OF LITERATURE

2.1 Framework:

Casam Njagi NYAGA et al. makes use of the grounded theory methodology in order to propose a framework for hand gesture sign language identification [2]. The proposed structure is introduced in a blueprint that shows the steps to be followed when designing hand motion gesture-based communication acknowledgment frameworks [2].

2.2 Computer Vision based systems:

Nishi Intwala et al. proposed a system that uses the Convolutional Neural Network algorithm for the identification and categorization of the 26 Indian sign language letters into their identical alphabet letters by capturing a real-time image of that sign and converting it to its text equivalent [3]. Here, the GrabCut algorithm for segmentation and MobileNet as image classification is used. The outcomes indicated a 96% precision for the testing pictures and a precision of 87.69% for runtime image [3].

Pranali Loke et al. proposed an inexpensive approach working from the android application, uses the HSV model for segmentation. Processing is done at the server side where the image is mapped to the corresponding gesture using neural network using MATLAB [4].

Neel Kamal Bhagat et al. proposed a new model (RGB-D) that accomplishes mapping between the depth and the RGB pixels and various models were utilized for preparing where the depth segmented static model accomplishes accuracy of 98.81 % [5].

2.3 Other Existing Systems:

Nikhita Praveen et al. presented a smart glove technique for the detection of sign language gestures. It is a two-part framework, one consisting of sensors attached to the smart glove that recognize sign giving corresponding text and other translating text to corresponding audio output [6]. The disadvantage of this technique is that it has higher equipment costs because of sensors on the hand gloves.

Harsh Vardhan Verma et al. presented a methodology for sign language gesture recognition using Microsoft Kinetic and OpenNI framework [7]. The Kinect camera makes use of a structured light technique for the generation of real-time depth maps containing discrete range measurements of the physical position [7]. The proposed framework makes use of a kinetic depth sensor to record the user's motion. The system considers the gestures as a sequence of frames and performs feature extraction on every frame and after performing other calculations the system returns the most significant results as an output [7].

2.4 Image classifier:

Comparison between Support Vector Machine (SVM) (Traditional Machine Learning approach) and Convolu-

tional Neural Network (CNN) (Deep Learning approach) is given in the table below.

Table 1. Comparison between image classifier

SVM	CNN
Higher accuracy for small-scale dataset [8].	Higher accuracy for large-scale dataset [8].
Accuracy decreases with picture size [8].	Accuracy increases with picture size [8].
Widely preferred for binary classification.	Mostly used for image classification.

Here, Convolutional Neural Network (CNN) is used for image classification. CNN is a special type of neural network, which is generally widely used in the field of image recognition [8]. The biggest difference between CNN and traditional neural network is that partial connection network is used, and the concept of local receptive field is proposed [8]. It has a strong ability to extract local features of image using convolutional kernel [8]. The CNN network structure is composed of an input layer, 2 convolutional layers, 2 pooling layers, 2 fully connected layers and output layers, a total of 8 layers [8].

2.5 Edge detectors:

Comparison between different edge operators is given in the table below.

Table 2. Comparison of different edge detectors [10]

Edge Detector	Advantages	Disadvantages
<i>Classical</i> Sobel, prewitt, Kirsch	Simple. Detects edges and their orientations.	Sensitive to noise. Inaccurate.
<i>Zero Crossing</i> Laplacian, Second direction Derivative	Detects edges and their orientations. Have fixed characteristics in all directions.	Responds to some of the existing edges. Sensitive to noise.
<i>Laplacian of Gaussian (LoG)</i> Marr-Hildreth	Finds correct places of edges. Tests wider area around the pixel [10].	Malfunctions at the corners, curves and where the gray level intensity function varies. Does not detect edges and their orientations because of using the Laplacian filter [10].
<i>Gaussian</i> Canny, Shen-Castan	Uses probability for finding error rate, Localization and response. Improves signal to noise ratio, Better detection specially in noise conditions [10].	Complex. False zero crossing. Time consuming.

Canny edge detection algorithm is computationally more expensive compared to Sobel, Prewitt and Robert's operator. However, the Canny edge detection algorithm performs better than all these operators under almost all scenarios [9].

Mamta Juneja et al. studied and compared different Image Edge Detection algorithms and examined the performance of those algorithms in different environments [10]. The performance was evaluated by examining the edge maps in comparison to each other through statistical assessment [10]. Among the various methods investigated, it was found that the Canny edge detection

algorithm has the capability of detecting both strong and weak edges, and seems to be more appropriate than other methods like Laplacian of Gaussian [10].

III. PROPOSED METHODOLOGY

The proposed system incudes real-time two-way communication system consisting of two modules: Sign-to-Voice (STV) and Voice-to-Sign (VTS).

3.1 Sign-to-Voice module (STV):

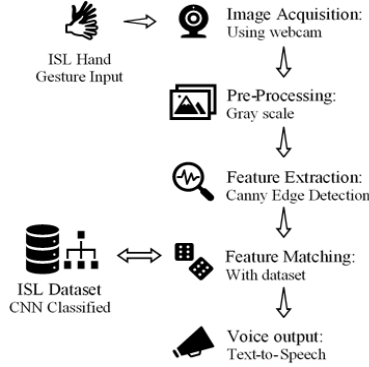


Fig. 2. Flowchart of Sign-to-Voice Module

Fig. 2 shows flowchart of STV module which includes: Image Acquisition. Input ISL hand gesture image can be captured using any camera. This image is in RGB format. Fig. 3 shows input sign gesture image in RGB format.

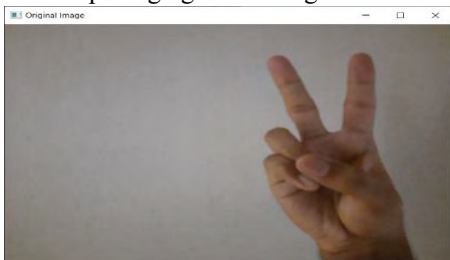


Fig. 3. Original RGB image

Image Pre-processing. The RGB format (3-Dimensional) image captured using camera is converted to a Grey-Scale (1- Dimensional) image. That means the input colour image will be converted to black and white image.



Fig. 4. Gray-scale image

Fig. 4 shows image after converting it to gray-scale. This is a one-dimensional image.

Feature Extraction. Here, Canny Edge detection algorithm (optimal edge detector) is used.

Canny Edge Detection algorithm is a multi-stage algorithm detecting a wide range of edges in images. It is composed of 5 steps [11]:

Noise Reduction. Edge detection results are highly sensitive to image noise. Hence, any noise in image is filtered out by convolving image with Gaussian smoothing filter.

Gradient computation. Compute gradient magnitude and gradient angle. It calculates edge strength(intensity) and

edge direction. The Sobel operator uses a pair of 3x3 convolution masks giving G_x and G_y i.e. gradient in x and y directions respectively. Then, the approximate absolute gradient magnitude at each point can be calculated using (1). Once, gradient in x and y directions are known, gradient angle can be easily calculated using (2).

$$G = \sqrt{G_x^2 + G_y^2} \quad (1)$$

$$\theta = \tan^{-1} \frac{G_x}{G_y} \quad (2)$$

Now, as shown in the Fig. 5, gradient angle is rounded to one of four angles which are 0° , 45° , 90° , 135° representing vertical, horizontal and two diagonals.

θ in $[0^\circ, 22.5^\circ]$ or $[157.5^\circ, 180^\circ]$ is given specific value as 0° ,

θ in $[22.5^\circ, 67.5^\circ]$ is given specific value as 45° ,

θ in $[67.5^\circ, 112.5^\circ]$ is given specific value as 90°

and

θ in $[112.5^\circ, 157.5^\circ]$ is given specific value as

135° .

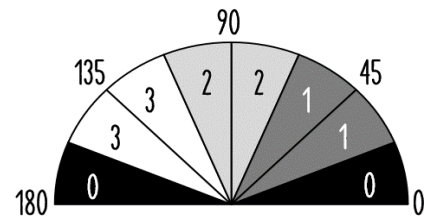


Fig. 1. Partition of edge angles into sectors

Non-maxima suppression. After applying Sober filter, we get edge image having non-uniform thickness and intensity. Non-maxima suppression is performed to thin out the edges and reduce blurring effect. Here, it compares gradient magnitude at every pixel with two neighbouring pixels depending on its rounded gradient angle. If magnitude of pixel in consideration is greater than two neighbours, it will be considered to be on edge, else it will be set to 0. This results into thinned and sharp edges

Fig. 6 shows two neighbours to be considered for comparison according to rounded gradient angle of pixel in consideration.

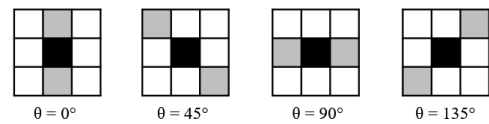


Fig. 6. Neighbors to consider for Non-maxima suppression

For example, if value of rounded gradient angle of pixel is 90° , it will set to zero if its gradient magnitude is less than gradient magnitude of pixels to its west and south.

Double threshold. As only high intensity pixels are required, pixels with weak gradient magnitude are required to be filtered out. In double threshold, high threshold and low threshold values are defined. Intensity higher than high threshold are strong pixels, lower than low threshold are reduced to 0 and intensity between both are weak pixels.

Hysteresis. Finally, hysteresis includes converting weak pixels to strong pixels. For each weak pixel, if any one of the 8-connected neighbourhood pixels is strong, that

weak pixel is converted into strong pixel. Intensity of all the remaining weak pixels are reduced to 0.



Fig. 7. Image after applying Canny Edge detection algorithm

Fig. 7 shows final image obtained after applying Canny edge detection algorithm.

Feature Matching. The resulting image after processing, is compared with the images in the dataset to recognize the corresponding meaning of gesture in text. A dataset consisting of images of ISL gestures is stored in the database. The images in dataset are also feature extracted using Canny edge detection. This dataset is fed to Convolutional Neural Network for image classification.

Voice output. Voice of corresponding sign gesture is given as output by using Text-to-Speech engine.

3.2 Voice-to-Sign (VTS):

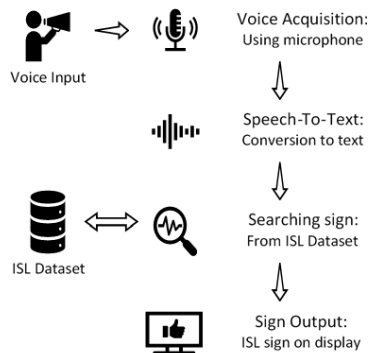


Fig. 8. Flowchart of Voice-to-Sign Module

Fig. 8 shows flowchart of VTS module which includes: Voice acquisition. Input voice of ordinary person can be captured using microphone.

Text conversion. Voice input is converted to text by using Speech-to-Text engine.

Searching sign. Sign corresponding to the text obtained is searched in the dataset.

A dataset having digitally created ISL hand gestures and their corresponding text meaning is stored in data-base.

Sign output. The sign obtained from dataset is displayed on the screen.

IV. CONCLUSION

To help and serve the hearing and speech impaired community to communicate with normal people is the primary goal of this paper. In this paper, we propose a

real-time two-way communication system that is capable of converting Sign-to-Voice and Voice-to-Sign. Using the CNN model and image processing, a robust sign language hand gesture recognition system can be developed. The proposed method provides a new approach for hand gesture recognition using canny edge detection. The multiple stages of the Canny edge detection algorithm ensure the accuracy of the system.

In the future, further research can be focused on the recognition of dynamic ISL gestures and sentence formation. Portability of the system in order to extend it to mobile phones and smart home devices.

Acknowledgment

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SKYNET - A Platform for Maximizing Career Opportunities

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Abstract. Professional networking interfaces provide a significantly improved exposure and likelihood of job opportunities as well as career-related resources. Multiple availability of such platforms lead to a lack of standardization and thereby can result in a false sense of security. A massive profile pool has also statistically incremented the probability of overlooking suited candidate profiles at a global level. This paper presents a university-level individualized professional networking platform - SKYNET for enhanced prospects of job acquisition. SKYNET proved to be a successful amalgamation between companies and colleges. It is a web application that smoothens the process of hiring and significantly improves an individual's chance of securing jobs and internships. It helps students to get a reality check to see where they stand among their peers considering various parameters such as certifications and work experience. It will provide a customized preview of student and company profiles based on needed skills and expertise. The corresponding system also supports filtration based on the job requirement and description which was achieved by a custom-designed algorithm.

Keywords: Professional networking platform, includes, extends, flowchart, use-case, dynamic real-world data, data warehousing, data mining.

I. INTRODUCTION

A professional interaction and networking platform is a unique way of providing job alerts to professionals according to their stream, qualification, preferred location, etc.

[5] They aid professional networking by enabling individuals to establish and maintain professional and appropriate contacts and resources. [4] In specific global interfaces which provide public access, one can easily experience lack of regularized framework when novice user-profiles are considered. [2] The massive profile pool further deteriorates the reaction time while increasing the privacy issues. Such drawbacks and limitations lead to lost and obscured job and internship opportunities at a global level. A hiring process can be established by implementing a user-friendly platform - SKYNET, which not only provides an enhanced framework for profile grading but also effectively improves the hiring procedure. The efficiency is notably upgraded due to utilization of filtering techniques for selecting job-specific candidate profiles. The system fundamentally aims on providing a remodeled implementation which provides a more customized

usage. The system supports user-specific profiles such as the admin, student and company coordinator. Each profile is provided with a personalized dashboard with functionalities that enable an enhanced view of the candidature quality and growth. Real-time profile and job opportunities updates provide system transparency which will be observable to the admin.

II. CHALLENGES IDENTIFIED

The challenges identified during the course of this product were data centric in particular. Under the assumption of this product being implemented across universities would lead to generation of data that would be cumbersome to keep a track of; which in turn would lead to slower response time with every user query. This solution identified was data-archiving, which in turn would contribute to data warehousing.[1] This warehouse would then be used to apply various data mining techniques to generate insights to students and companies aiding a personalized experience to SKYNET's customer base.

III. PROBLEM DEFINITION

A generic professional communication platform functions and characteristics are easily overshadowed due to the lack of standardization and privacy issues. Considering the limitations, I have modeled a system which effectively and efficiently benefits and improves the generic hiring process at a local level by promoting standardization - SKYNET. The system not only revolutionizes the generic placement protocol but also encourages profile improving strategies by providing a visualization of profile ranking and filtration.

IV. METHODOLOGY

IV.1 Flow-chart of the system

Step 1: The system initially prompts for credentials as a base for providing profile security and authentication access.

Step 2: Further the system supports a user-specific profile for the student and company. Post-login, the interface provides several functionalities depending upon the user's requirements.

Step 3: Considering the student profile, he/she will be able to maintain a public academic profile consisting of various fields and subfields mainly - Academic Details, Skillset, Projects, etc. Real-time growth and updates for any specific profile will be reflected on the student as well as company dashboard, thus supporting transparency.

Step 4: The student will also be able to compare student profiles, company profiles and corresponding position requirements via updated graphical representation.

Step 5: The system also sends notifications and alerts with respect to job description and skill set matching which works complementary with the rank calculation.

Step 6: On the company profile, the dashboard will provide functions such as viewing the student rank list and shortlisting them accordingly. The system also enables the company user to filter the pool of students based on the parameters such as specific skillset, certification or publishing criteria.

Step 7: The company profile can easily create, insert, append, delete student profiles, thus providing a real-time update on current placements.

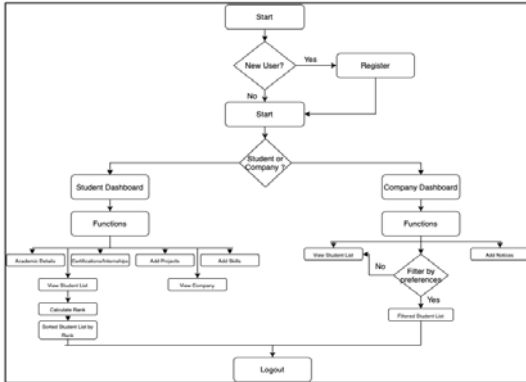


Fig.1. Flowchart of the system

IV.2 System Analysis

Elaborating the purpose and component-wise objective of the professional networking interface using a use-case diagram.

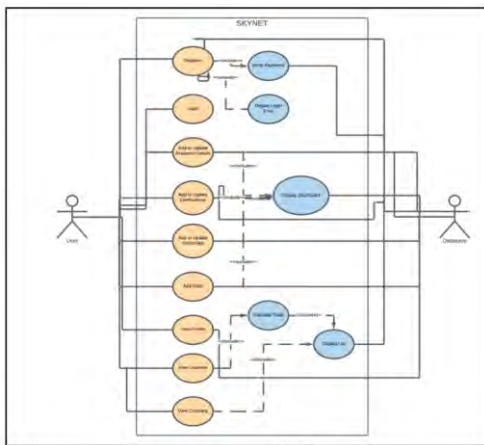


Fig.2. Use-case Diagram

The use-case diagram concisely explains the system operations and functionalities. The system makes use of academic guidelines and specifications for calculating a student rank list. There are several arguments that influence the ranking factor such as the quality of certifications, work experience, academic consistency and skillset. Accordingly, the corresponding rank list will be viewable on the company profile based on which filtering techniques have been implemented. The system will support transparency via live updates and notifications which thereby be overseen by the placement cell coordinator.

V. IMPLEMENTATION

Hardware Requirements: A system with RAM 2GB and Storage 2 GB

Software Requirements: Python, Django

Database used: MySQL

V.1 Algorithm

Parameters considered for the rank calculation

1. CGPA (Cumulative Grade Point Average)
2. Number of internships and their duration

3. Number of projects

Step 1: Initialize a dictionary to store the sorted student query objects rank_dict {}

Step 2: Consider a dictionary of students (student objects).

Step 3: For every student consider a variable; sum=0

Step 4: Using the unique student identifier uid obtain an internship object (details about all the internships),

CGPA value, project object (details about all the

projects).Step 5: CGPA are categorized into 5 categories

CGPA	Point
i. <=7.00	2
ii. 7.01 - 7.50	4
iii. 7.51 - 8.50	6
iv. 8.51 - 9.00	8
v. 9.01 - 10.00	10

Step 6: Update the sum variable to the points assigned

against the CGPA.Step 7: Updating the sum with respect to the internships:

Internships are assigned points accordingly:

Formula:

sum+=Number of internships *10

If duration (duration of every ith internship in months)

>=1 and <=3:sum+=5

Elif duration (duration of every ith internship in months)

>4 and <=6:sum+=10

Else:

sum+=15

Step 8: Update the sum variable according to the number

of projects completed.sum+= (number of projects) * 5

Step 9: Assign the value of the sum to rankrank = sum

Step 10: Save the student object, rank, internship object

and project object in the rankdictionary which will be

passed to the dynamic front-end template.

Step 11: Go back to step 2

Step 12: Display the student list according to the rank in the front-end template.

V.2 Experimental Setup



Fig.3. User Interface - Student Profile

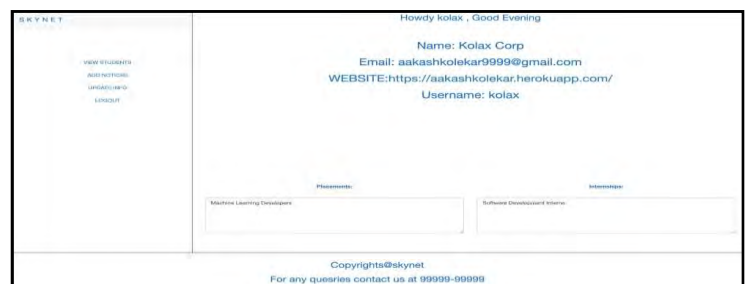


Fig.4. User Interface - Company Profile

The user interface of the proposed system is classified into two working mode profiles - student and company. The user-specific dashboard is based on dynamic data updates supporting enhanced visualization. The student rank list is formulated using certain keyword arguments.

VI. PERFORMANCE EVALUATION PARAMETER

The following are the parameters based on which the performance will be evaluated:

1. User-Friendly Interface: The interface must be easily accessible and comprehensible by the user, achieved by using user-centric personalized profiles.
2. Easy integration with existing systems: The system should portray flexibility with respect to installation and understanding.
3. Processing time: Time taken in the evaluation of candidate profiles based on the required skill sets and displaying ranking accordingly.

The accuracy of the system will be evaluated based on the required execution time. Unit tests of each program will be performed using black-box testing followed by integration, system & acceptance testing

VII. CONCLUSION

A system that enables transparency between students and the industry by building a bridge or a link between

entrepreneurs and budding engineers. The ranking system that has been developed using this project would effectively assist short-listers to choose students who meet their profile requirements. The filtering widget proves to be a boon to the ones short-listing the student and corresponding live updates would help an individual to keep track of his/her profile and improvements. The system thereby proves to be an effortless and smooth path for securing internships and jobs by providing an enhanced and customized experience.

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URJA ANALYSIS: Energy Consumption Prediction using Big Data Analysis and Machine Learning

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Abstract - The electricity grid usually overloads or is under loads in different locations at different times which essentially leads to wastage of power and poor power distribution (in rural and semi-rural areas). There is a need for a system which can smartly predict energy consumption and reduce the load on grids based on the consumer's usage pattern. Also there is a need for specific recommendations for particular consumers to help them reduce their bills.

Keywords— *Big data Analysis, Machine Learning, Smart grid, Energy forecasting, Demand side management, Dynamic Time-of-Use electricity pricing.*

I. INTRODUCTION

I.1 What is Smart Grids and DS/DR

The conception of a perspicacious grid isn't a new one, recent technological developments suggest will allow the construction of an intellectual grid. The current grid scenario is based on centralized generation, which pushes in a single direction through the network to the terminus users. As of now pattern improves by integrating bi-directional communication, distributed and utility scale renewable energy generation and energy storage etc. Balancing of electric supply and inductively authorizing at the grid has always been an immensely colossal challenge for electric utility companies. contravene this, utilities design Demand Replication (DR) and DSM programs.

Demand side management analyst the electricity consumption of a customer and helps the customer to use less electricity in peak time and help to flatten the demand curve[1].

Demand response helps a person to reduce electricity payment and electricity usage when the grid is jeopardised [2].

I.2 Motivation to apply data science in keenly intellectual grid

With the incrementing perforation of advanced sensor systems in power systems, an influx of profoundly and astronomically immense datasets presents a valuable opportunity to gain insight for ameliorating system operation and orchestrating in the context of the electric grids. The 4 Vs of Sizably voluminous Data i.e. volume , velocity , variety , and veracity come with a plethora of opportunities as challenges[3] . Astute meter data potentiates the utilities to make better decisions to optimize the load at the grid. Modern statistical techniques for data exploration enable them to better understand customer's utilization pattern, estimate consumption pattern and provide suggestions to consumers predicated on their

authentic-time transmuted demeanor. It allows them to prognosticate the power failures and negotiate pricing with the cessation users. Moreover, it provides the opportunity to the consumers to adjust their loads according to dynamic pricing in order to minimize their monthly bills.[4].;

I.3 Challenges

Demand Replication and DSM are very promising, however, there are many challenges associated with their implementation.

Forecasting: This is a conundrum because of the sundry uncertainties in electricity peak demand such as population magnification, transmuted technology, economic conditions, prevailing weather conditions. The most challenging part is that we often want to forecast the peak demand rather than the average demand, which varies on sundry features mentioned The above and precise forecast is an astronomically immense challenge. Customer Profiling: Uncertainties in analyzing and presaging the energy consumption. It is a challenging task to analyze energy consumption of customers with different energy consumption and there will be different peak price recommendations predicated on different customers.

Recommendations: Our project seeks to introduce a dynamic pricing system and it is critical to research on how the customers should be recommended so that this incipient pricing the project becomes a prosperity. To obtain an opportune recommending medium is a challenging task .

I.4 Our Contributions/Research Questions

In this project, our focus will be to optimize the load at the grid, by doing descriptive, predictive and prescriptive data analytics. Our research questions are summarized below. Our objective of this project is to answer these questions.

How is household electricity consumption affected by the following:

Consumer's demographics: We will analyze the energy consumption in households with different age categories. This would avail in determining the energy consumption and make recommendations to households predicated on the people living in that house

Static characteristics: The energy consumption pattern with veneration to different insulation types will be analyzed. With the solution to this research question, recommendation could be given to the household regarding which type of insulation type to be used so that they can lower their energy consumption.

Recommendations to the consumers

How can customers better respond to transmuting electricity pricing? : Predicated on the survey data, asking questions to the customers on how they will better respond to the transmuting electricity rates. This will avail in recommending them different aspects with which they will opt to take part in the dynamic pricing program, which ineluctably would avail them decrease their electricity utilization.

How can utilities make government authorised connections more intriguing for the denizens?: Survey data for the above question would be efficient in kenning about the consumers and recommending on the substratum of what they opiate.

Forecast short term energy consumption

What would be the future consumption, given historical consumption and certain features?: This is a critical finding, which would tell how the energy consumption could abbreviate with reverence to different characteristics. There might be certain factors that could transmute the energy consumption pattern of sundry households. This will avail determine the future trends in energy consumption and maintaining the paramouncy of the project.

How does the short-term forecasting model perform for long term forecasting?

: Utilizing different analytical methods, it is intriguing to find out if the short-term forecasting model works well for the long-term. Does precision authentically ameliorate if we utilize long periods of historical data?: Utilizing long period and short period forecasting data will let us keep the different characteristics with which the energy consumption can vary. Utilizing different model it can be additionally be tenacious which model is the most congruous for research in this domain

II. LITERATURE SURVEY

TABLE 1 : table of list of Research gap

Sr.	Title	Author & Publication	Research gap
1	An ensemble model for day-ahead electricity demand time series forecasting	W. Shen, V. Babushkin, Z. Aung, and W. L. Woon,	The new method is based on the pre-existing PSF algorithm[5].
2	Big data analytics for demand response: Clustering over space and time	C. Chelmiss, J. Kolte, and V. K. Prasanna	does not have to be confined to electricity consumption data[6].
3	Demand response targeting using big data analytic	J. Kwac and R. Rajagopal	does not have to be confined to electricity consumption data[7].

III. METHODOLOGY

- III.1 Data forecasting
 - 3.1.1 Data preprocessing

Data preprocessing is a "garbage in, garbage out process" in a data mining process. many times we do not use in range values, not feasible data changes , missing values, etc. Analysing data which has not been carefully screened for these problems can create misleading results. Thus,data is the analysis. Firing st, we will be preprocessing and cleaning our data, and abstract the houses for which we don't have most of the features. Then, we will find correlation between our target variable (energy) and sundry features, and plot them to get utilizable insights as outlined in objectives.

House Cull: We filter out the houses predicated on the following criteria: 1) The number of occupants should be between two and four. This is to maintain consistency in the energy utilization patterns because it would be inequitable to compare the energy utilization of homes with five occupants with the energy consumption of homes with only single occupant. 2)The homes should have participated in government authorised connection .This is because one of the objectives of this project was to visually examine the posture of the consumers towards kindred programs that may be initiated in higher posture like jammu kashmir in near future. After applying these two filters, the total number of houses of interest remain very low and fitter.

Re-sampling: The energy readings are recorded predicated on halfhourly intervals and weather readings are recorded predicated on hourly intervals, so we first up-sample the weather readings to match its number of rows with energy data. While re sampling, we utilize the interpolation technique to determine the incipient value. ombine data tables: We concatenate two energy and weather tables with Time as an index. This makes it more facile to process the data holistically.

Feature Extraction: We extracted the following three more features out of the subsisting data: 1) anterior i.e. (t - 1)th energy consumption value. This is to be stored in the LSTM neuron and is controlled by the keep gate as explained in section X. 2) Day of the week, starting from Sunday. This is an integer value. 3) Boolean variable, Holiday. This utilizes the holiday dataset and considers the weekends as holidays.

One sultry encoding: Features such as weather icon and day of the week etc. are the categorical features in our table, ergo, we applied one sultry encoding to these features. It signifies that categorical features have m possible values will be transformed m binary features.

Outliers abstraction: An outlier is a visual examination that appears to deviate markedly from other optical discernments in the sample. It may denote deplorable data, for example, the astute meter may not have been run correctly at that point of time. We visually examined many outliers in our dataset e.g very high values of energy consumption. These outliers deplorably affect the scaling of data so we require to abstract them beforehand. To abstract them, we calculated the 90th percentile of the data and effaced all the points above it. Utilizing this method, we ascertained that our dataset now represents 90 percent of the pristine dataset.

Handling Missing values: when we get some raw data we also get some missing values in our dataset. Typically blank or different place holders, to deal with this entire situation we remove the entire row or column which contains the missing value.

Feature cull: Use extra-tree regressor method to culla subset of features predicated on contributing weights.

Abstract correlated features: We draw a heatmap and check for correlation between features. Correlated features have to be abstracted otherwise models will inordinately corpulent them, which is not what we optate.

Feature scaling: We scale all the features from 1 to 1 utilizing MinMax scaler function of python. This is to ascertain that the objective functions assign felicitous weights to all the features.

Convert time series into supervised learning quandary: It engenders columns of lag visual examinations as well as columns of forecast visual examinations for a time series dataset in a supervised learning format. We utilize python’s shift function.

3.1.2 Applying Models.

After preprocessing our data, we apply two different time series regression models and compare their forecasting precision. For this, we will split our data into three components:

Training data: It consists of half-hourly readings between some data. This subset of our data is utilized to train our models.

Validation data: The validation dataset gives an equation of the model’s parameters. In the process we validated the module that we tested. And see the output of random data.

Testing data: It is independent of the training and validation dataset and is optically discerned by the model for the first time. It consists of half-hourly readings between dates. We fit our tuned model over this data to evaluate the results and quantify the precision.

3.1.3 Modules

In this project we are going to use 2 models, first one is LSTM networks and second one is SVR with Gaussian kernel. LSTM network is based on an artificial neuron network. LSTM unit has three gates, input gate, output gate and forget gate. We are going to use LSTM here because it handles gradient problems easily[8][9].

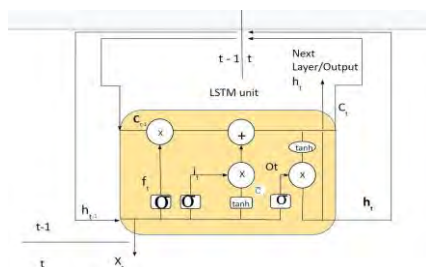


Figure 1: LSTM network[10]

The Second network we are going to use is SVM (Support vector machine). Support vector machine is a

regression method. The SVM model we are going to use is a classification model and maximal margin algorithm [11][12].

$$Z(x, y) = \exp\left(-\frac{\|x - y\|^2}{2\sigma^2}\right)$$

Equation 1: equation of gaussian function of SVM model

3.1.4 Block diagram

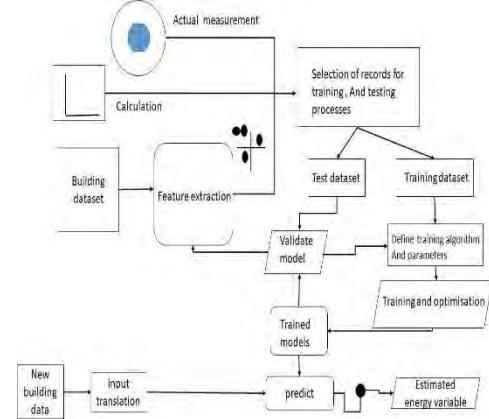


Figure 2 : learning model

IV. CONCLUSION

Based on our detailed analysis on daily household consumption we can conclude that energy consumption forecasting can be very accurate based on using prior usage data if used for shorter periods of time, this can be achieved using LSTM and SVR, LSTM has performed a little better in similar forecasting projects. Even a small amount of training data can provide us with a lower root mean square error, forecasting over a longer period of time will lead to a higher possibility of error. Hence, forecasting must be done in a shorter span of time. Based on the results from analysis over multiple surveys it can be concluded that utilities can get better results on energy consumption by keeping the consumer well informed.

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Zero Hunger

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Abstract: In the Coronavirus circumstance hungry individuals confronting food issues and loads of individuals kicked the bucket in the Coronavirus lockdown by considering this continuous issue we are attempting to give a constant answer for that. We are attempting to construct the system 'Zero Hunger' utilizing ML and IoT innovation with the mission to end food wastage and craving is a food wastage decrease based innovation in which gets surplus food from public capacity café, birthday celebrations show corridors home, and so on and convey to those who are directing NGOs.

Keywords: Sustainable goal, Food Supply Management, Food quality assurance, ML, IoT.

I. INTRODUCTION

Wastage of food is the biggest problem that has increased social and environmental awareness in the past years. Hunger is one of the most concerning issues which is in the corner for many decades. The reasons behind this issue may vary but there are lots of effective solutions. We did quite research about this issue and got to know that technology can also help us in solving this issue. Thereby, surveys were conducted with a few research papers to gain knowledge about the organization's daily prerequisites that are fulfilled and the ones that remain unfulfilled. This system is a food wastage reduction-based technology in which gets surplus food from public occasional functions and marriage, canteen, restaurant, get together (if there is a large quantity). etc and distributes to those who are conducting NGOs. For quality assurance, this system will use IoT sensors.[8] Also, many organization has conveyed their wish to ask them for necessary items such as clothing, food, etc. But there is no way to meet their needs. then the system has been developed a food donation for people. They can easily donate the food as per their capacity and the system will authorize to keep their request i.e if their needy peoples get food.[7]

Area of project:

Wasting food is a common problem in our society. Food waste management is crucial since it can improve our environmental and economic sustainability. We have identified the use of mobile technology to reduce food

waste management and built an android mobile application that allows restaurants to donate and share their foods and leftovers with people in need. Everyone enjoys the functions with a lot of food and other products and most of them left waste or unused. We all waste food for various reasons. Typically it's as a result of there has been an amendment of plans and it's out of our management, however, most of the time we tend to waste identical varieties of food for identical a pair of main reasons we've got bought or read an excessive amount of, or we've got forgotten to use it on time. Regardless of the rationale why you throw out food, you got it and currently, it's cost accounting you to throw it out. To solve this problem we come up with a system which can take request from the users who want get settle with the waste food ,they can request to donate or sell at cost to our systems managers who comes to them at given time and pick the order and further park that food to needy place where most people are without food according to need status . Hence our system takes feedbacks and gives it best to settle the need and cleaning the place and more or less doing humanity.

Introduction to Problem Statement:

Zero hunger is a food wastage reduction based technology in which gets surplus food from public function, restaurants, Birthday parties convention halls, homes (if there is a large quantity), etc. and distributes to those are conducting NGO's.

Motivation Behind Project:

The motivation behind this project is to feed the needy and hungry with untouchable edible surplus food. To bring a social change in every individual to reduce food waste and to make the World Hunger-Free. This system will reduce the amount of food wasted and being used by needy people.

Scope:

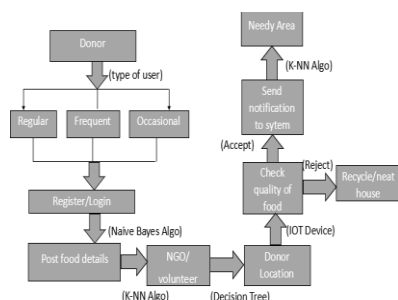
The whole scope of our project is that food should reach every person in India. No one should go hungry. And we develop "Zero hunger" system is very helpful for the social group and who are doing social activities.

II. LITERATURE SURVEY:

Sr. No	Title	Author	Description
1	Application of Machine Learning to support production planning of a food industry in the context of waste generation under uncertainty.	Alberto Garrea, MariCarmen Ruizb, Eloy Hontoriac	This study illustrates the added value that the application of advanced analysis to historical data can bring to the food industry. ML methods have provided valuable information, outperforming classical statistical methods for predicting the amount of food waste.

2	Food Wastage Reduction Mobile Application	M.S.Elavarasan Mr.C.DanielNesakumar	This paper presents ‘Helping Hands’, a new internet-based application that provides a platform for donating old stuff and leftover food to all needy people/organizations. It provides information about the motivation to come up with such an application.
3	IOT based food wastage management system	Pavan Manjunath, Pritam Gajkumar Shah	In this paper, we are focusing mainly on the food wastage measurement system in the office premises, where it provides real-time input on the wastage of the food to the employee on a live computer based dashboard.
4	SIVEQ: an Integrated System for the Valorization of Surplus Food	Davide Scazzoli, Giulia Bartezzaghi, Annalaura Silvestro, Maurizio Magarini, Marco Melacini, Giacomo	In this paper SIVEQ: a systematic solution which relies on novel technologies such as IoT and big data analytics to tackle this issue. Our system represents an added value to all actors involved, not only for NGOs who collect and redistribute surplus food.
5	Food Donation and Food Drive: Strategies to Achieve Zero Hunger	Michele F. Fontefrancesco	In this paper a food drive is a charity initiative aimed at collecting nonperishable food items to stock and distributed directly or through food banks, soup kitchens, and other charitable institutions to people in need. The initiative is part of a broader system of collection and redistribution that involves a plurality of actors of the voluntary sector.
6	Food Wastage Reduction through Donation	Divyesh Jethwa, Ayushi Agrawal, Rohan Kulkarni, Leena Raut	In this paper the product is a web application which aims to establish a link between restaurants and the charity homes/needy households to enable excess food donation

III. PROPOSED SYSTEM:



The Proposed system is a Food donation system using ML and IOT technology which will give a platform for donating left food to NGOs. All over the world food wastage is a common issue. In Marriages, social and family get together, canteens, restaurants, and functions so much food are wasted. Rather than wasting food on these things, the system can use them by donating them to NGOs. In this system, there are 3 donors like regular, frequent, occasional donor. The Donor has to register by selecting the donor type. After successful login donor will post food details including food quantity, food type, etc. The system will also predict approximate and average food details. Then using the K-NN algorithm system will find out the nearest NGO and send the request. Then NGO volunteers will accept requests. Then using the decision tree algorithm system will predict how much amount of food is available and how many food packets you should carry to take the food. Then NGO will send the volunteer to that location. Then a volunteer will check quality assurance using an IoT device like a food moisture sensor and will check the spanning time of food whether the food quality is good or bad. After checking the spanning time of food if food is good then the volunteer will collect that food and notification will be sent to the system. Then using the K-NN algorithm system will find out the nearest needy area to donate the food. If food quality is bad and not fitting in spanning time food will be sent to recycling or the neat house.[6]

IV. CONCLUSION:

Wasting food is the biggest problem in our society. So we will try to make this system to overcome this problem. There are a lot of people who find it is difficult to get two meals a day. So we are building a system to share the food that is wasted in a public function and this system will be very beneficial to NGOs and orphan school.

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A Deep Learning Model to Smart Education System

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Abstract—Deep learning methods enable software applications to develop intelligence to adapt and improve on their own as per the situation. It opens a wide range of possibilities in smart education, especially in customizing course content for each student's preferences. Learning management systems provide quantitative data in the form of reports and learning data. The teachers can refer to these data for analyzing and improving the course content and delivery. They can collect qualitative feedback in the form of surveys and discussions through cloud-based learning management systems. In the existing system, the teachers have to manually process these data to identify patterns and improve the course material. It is a time-intensive activity and hence, challenging to carry out frequently. Integrating deep learning with learning management systems can result in intelligent course material and high accuracy without any manual intervention. This paper reviews factors that influence deep learning in education, and hence this article aims to achieve deep learning on a large scale in the innovative education system with a deep learning model to prediction. The proposed architecture can reduce the development and maintenance costs of systems, reduce risks, and facilitate communication between different stakeholders.

Keywords— Educational technology, machine learning, deep learning, smart education, smart learning, learning analytics.

I. INTRODUCTION

Educational technology has evolved drastically over the years. With the advent of e-Learning and learning management systems (LMSs), learning has gone beyond the classroom's traditional model [4]. Now teachers can reach a more comprehensive through online courses. Students can access these courses from any place at any time. Nowadays, e-Learning is a complete and self-sustainable medium for imparting knowledge.

Many emerging digital technologies have played a role in advancing education [10]. Some of them are artificial intelligence (AI), machine learning (ML), and deep learning (DL). These technologies are the successive revolutions in computing and hinge on recognizing patterns based on past data and predicting future outcomes [25]. Machines utilizing AI principles are often referred to as intelligent devices because most do not learn independently. They are beneficial to data scientists and analysts tasked with collecting, analyzing, and interpreting large amounts of data. They make these processes faster and automatically.

A. Challenges

Modern technology makes educational technology (EdTech) within reach of many advanced educational systems. Most of today's educational tools do not adjust to different cultures, languages, individual learner needs, etc. Predicting the dropouts, improving teacher-training quality, and making personalized education a reality are challenges [29] in the present education system. Some of the challenges are listed below:

- a) *Personal privacy.* Parents or guardians are not comfortable sharing data on their children without a strong understanding of why it is needed.
- b) *Partiality.* Educators and teachers must remain cognizant of bias. If the data on which the existing system is trained is geared toward a specific demographic, the output will be biased.
- c) *Massive data.* Educational institutions are increasingly collecting massive amounts of data to inform the education process, and data storage becomes a significant concern.

The above challenges make greater use of technologies in the education system. EdTech needs to provide a clear value proposition to families and operate with complete *transparency*. It can help overcome bias in the classroom. An efficient approach is required to process a massive amount of educational data and predict the output.

B. Motivation

In the education system, the stakeholders are students, teachers, staff members, educators, parents, recruiters, other educational institutions, etc. The entities are library, entry-exit gates, canteens, auditoriums, laboratories, hostels, medical, classrooms, gymnasiums, etc. The educational premises may be embedded with the Internet of Things (IoT) or sensor-enabled devices. These devices can sense, capture the data in the learning environment, and send it to further educational processing applications. The data produced by these sensors/devices can be massive and unstructured, and they travel from source to destination and vice versa using a wired and wireless medium.

Educational institutions can use these data for processing for various purposes, including analytics and prediction. Recently DL techniques have been used to perform better analytics and predictions on a massive volume of data. DL leverages an artificial neural network (ANN) to build a model used to make predictions with speed, scale, and judgment that exceed human capabilities. DL is more effective than traditional ML approaches because of its larger scale training set, smaller model, and more effective detections.

This article aims to introduce DL methods in education and propose a DL model for intelligent education. The proposed DL model can predict better educational outcomes, improve teachers' training quality, and make personalized education a reality. The key contributions of this research article are listed as follows:

- It discusses and reviews the DL methods to the intelligent education system.

- It presents the proposed DL method for the intelligent education system.
- It presents the challenges and future directions of intelligent education using DL.

With the above model, faculty and educators might use the new data sources as guides for course redesign, implementing new assessments, students' behaviours, students' dropouts, and communication lines between teachers and students.

II. BACKGROUND

The use of technology across the world has become typical in the educational sector. AI, ML, and DL technologies are now commonly used in education. Hence, this section introduces the concepts of ML, DL, and the intelligent education system.

A. Machine Learning (ML)

ML refers to the collective field of all the algorithms and processes deployed to develop AI in machines [10]. These algorithms enable the machine or program to 'learn' from a set of data and use this learning to solve other tasks and problems. ML trains a machine to learn from a broad set of input data and develop an indigenous algorithm of its own to identify patterns and trends.

ML application provides systems with the ability to learn and improve from experience without being explicitly programmed automatically [15]. The learning process begins with observations or data to look for patterns in data and make better decisions in the future based on the examples it provides. By using algorithms, the machines can receive data, analyze it, and then produce an output that is within an acceptable range. Fig. 1 shows the process of how ML determines the results.



Fig. 1 How ML determines the Results.

ML algorithms are generally categorized as supervised, unsupervised, and reinforcement. *Supervised* algorithms can apply what has been learned in the past to new data using labeled examples to predict future events. *Unsupervised* algorithms are used when the information used to train is neither classified nor labeled. It explores the data and can draw inferences from datasets to describe hidden structures from unlabeled data. *Semi-supervised* algorithms fall somewhere between supervised and unsupervised learning since they use both labeled and unlabeled data for training. *Reinforcement* ML algorithms interact with their environment by producing actions and discovers errors or rewards.

The standard ML algorithms are decision trees (DT), support vector machines (SVM), Bayesian algorithms, k-nearest neighbor (KNN), random forest (RF), association rule (AR) algorithms, ensemble learning, k-means clustering, and principal component analysis (PCA).

ML algorithms have made normal operations more accessible in the education sector, faster, and more efficient than manual operations [9]. The adoption of ML has enhanced crowd-sourced tutoring and work more efficient and more accessible. ML algorithms are bound to produce the advantages of customized and personalized learning, analytics of content, grading, students' progress, etc. [28]. ML helps to identify each student's specific needs, automatic grading, and assist teachers in teaching to students. The education sector may consider the recommender system [32] as the most utilized modern times system.

B. Deep Learning (DL)

DL method is based on learning and improving by examining learning algorithms. While ML uses simple concepts, DL works with ANNs to imitate how humans think and learn. The traditional approach that detects fraud or money laundering might rely on the amount of transaction that ensues, while a DL is likely to point to fraudulent activity [30]. DL approach maps inputs to outputs and finds correlations. It can learn to approximate an unknown function $f(x) = y$, where 'x' is any input, and 'y' is any output, related at all, and a neural network finds the right 'f.'

Some examples of DL methods are *classification*, *clustering*, and *regression* [21]. DL performs object classification using *training from scratch*, *transfer learning*, and *feature extraction* ways. Fig. 2 shows the process of how deep learning determines the results.

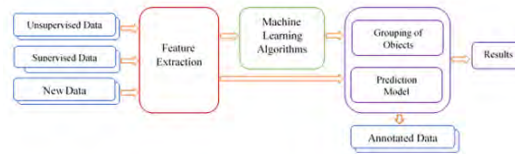


Fig. 2. How DL determines results.

DL methods are a groundbreaking tool for processing large quantities of data since the machine's performance improves as it analyzes more data [36]. DL has brought about an explosion of data in all forms - from sources like social media, internet search engines, e-commerce platforms, and among others. This enormous amount of data (or Big data) is readily accessible and shared through decision-making applications [33].

DL approach has many layers. They are input, hidden, and output layers [22]. The input layer processes a raw data input and passes it on to the next layer as output. The hidden layer processes the input layer's information by including additional information and passes on its result. The output layer takes the hidden layer's information and makes the machine's pattern even better. It continues across all levels of the neuron network. These details are shown in Fig. 3.

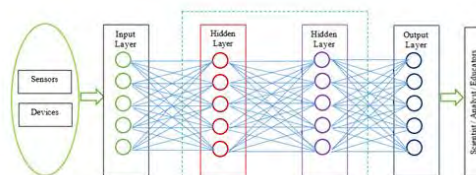


Fig. 3. Deep Learning Model

Architectures. DL networks are constructed for supervised learning (discriminative), unsupervised learning (generative learning), and the combination (hybrid) DL [20]. Convolutional neural networks (CNNs) and recurrent neural networks (RNNs) are examples of discriminative DL methods. Deep Autoencoders (AEs), deep belief networks (DBN), restricted Boltzmann machines (RBMs), generative adversarial networks (GANs), and an ensemble of DL networks (EDLNs) are examples of hybrid DL methods.

Applications. DL is used across all industries, including Commercial apps (i.e., image recognition), consumer recommendation apps, and medical research tools. Some of the DL applications [31] are automated driving, aerospace and defense, medical devices, industrial automation, etc. DL's practical uses are natural language processing (NLP), automatic speech recognition, and computer vision [35]. Modern DL techniques have led to improvements in translation and language modeling (Google Translate).

Challenges. The challenges of DL are continuous input data, transparency, and resource-demanding technology [16]. Despite all its challenges, DL discovers new, improved unstructured Big Data analytics [34] methods for those to use it.

ML vs. DL. ML uses algorithms to analyze and interpret data and, based on the learnings, make the best possible decisions. DL structures the algorithms into multiple layers to create an ANN. The critical differences are data dependencies, hardware dependencies, feature extraction, and problem-solving [6]. ML needs fewer data to train the algorithm than DL. DL requires an extensive and diverse set of data to identify the underlying structure. Besides, ML provides a faster-trained model. Most advanced DL architecture can take days to a week to train. The advantage of DL over ML is that it is highly accurate.

C. Smart Education

Smart education offers a paradigm shift in the way students access education. It uses state-of-the-art technology and helps both learners and teachers prepare themselves for tomorrow [12]. It can be done in a virtual or physical environment. It could also be a blended version of both. Smart education can also be summarized as intelligent devices to augment the learning outcome of traditional education. Using advanced learning methods such as online virtual classrooms, virtual learning environments, cloud computing, smartphones, etc., a teacher can help students learn more. Innovative learning aims to provide holistic learning to students using modern technology to fully prepare them for a fast-changing world. Teachers need to adapt to modern skills and apply them in their traditional classrooms using technology [19].

Smart Learning Environment (SLE). The SLE focuses on the online learning environment and promotes successful learning to the learners automatically. SLE requires the implementation of personalized learning [27]. The main components of SLE are learner classification and intervention feedback. The primary objective is to understand the different learners with different types of information to classify the learner, i.e., context-aware computing. In SLE, all

dynamic changes are observed, interpreted, and responded appropriately.

Smart Learning Analytics (SLA). Educational data mining (EDM) and learning analytics (LA) [5] aims to improve educational experiences by helping stakeholders to make better decisions using data. SLA considers interaction analysis as a promising way to understand the learner's behavior. SLA [23] is the measurement, collection, analysis, and reporting of data about learners and their contexts to understand and optimize learning and the environments in which it occurs.

Smart Education Model. Smart education solution [17] is designed based on the technologies available to meet stakeholders' requirements. Smart education has an education cloud platform [26] that includes an innovative campus, e-resources, intelligent devices, social communications, and system integration services. Smart education is equipped with intelligent information, interactive boards, SLE, intelligent devices, LMS, apps, data centers, dashboards, communication & collaboration, etc. The smart education model [14] allows collaboration among students, teachers, parents, administrators, and staff smartly. This model allows innovative approaches, methods, strategies, etc., to improve educational processes, useful for smart learning systems.

DL in Education. A classroom has a teacher to teach a designated subject [13]. The main issue with Online learning is the lack of such a guide. DL assists EdTech and refers to learners' engagement in critical and creative thinking, making inferences, and transferring knowledge. Modern technologies provide the platform for DL in an educational setting more effectively [13]. DL methods provide a computational architecture that combines several processing levels (layers) to learn data representations with several abstraction levels, as shown in Fig.4.

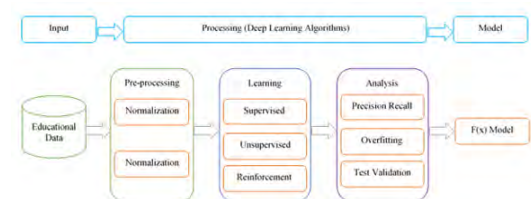


Fig. 4. DL architecture to educational data

Compared with traditional ML methods, DL methods have considerably enhanced state-of-the-art applications. DL illustrated how others might be pursued similar curriculum design improvements adapted for their contexts [8].

Learning Analytics using DL. Data Mining has emerged in the wake of higher education's ability to capture an increasing volume of data [3]. Academic analytics combines select educational institutional data, statistical analysis, and predictive modeling to create intelligence upon which teachers, students, and educators can change academic behavior. DL methods can create content analytics to dynamically restructure and optimize the content modules as per the students' needs [18]. It tracks students' learning and suggests measures for further improvements. DL methods enhance the thinking capabilities, cognitive ability, and

retention among the students, thus making them thrive in academics.

III. METHODOLOGY

The proposed work is focused on conceptualizations, models, and architectures. The conceptual model needs to be tested in the information technology domain before validating data models and reference implementations. To produce an adequate conceptual model, work must first specify the conceptual domain by identifying well-formed constructs. Academic research typically proceeds from specifying a well-formed research question.

Thus, for this research paper, the research question is: *What learning model creates an intelligence upon which teachers, students, and educators that can change academic behavior?* The critical journals identified above have selected few papers for analysis based on the above questions. The following section discusses related works to highlight the survey on DL and smart education.

A literature review was presented using a broad array of data about students and courses collected by institutions and learning analytics to improve student's success and retention [3]. Academic analytics measure, collect, decipher, report, effectively share data, and identify student strengths and weaknesses [2]. A personalized e-learning model that associates DL with process mining [1] provided the learners with learning resources that fit their individual preferences after giving an overview of both e-learning as an online educational system. Big data and AI could help universities understand student backgrounds more precisely, according to which corresponding interventions could be provided [29].

A smart education model [11] has a four-tier framework of innovative pedagogies and a smart learning environment's critical features. Sustainability offers the possibility of appropriate and responsive education to the new systemic conditions of uncertainty and complexity reflected in the headlines every day [24]. In the DL system, the data volumes involved are often huge, and a lot of computing power is required to drive the learning process. Fortunately, technologies and approaches developed in Big Data and High-Performance Computing (HPC) can be brought together to meet the need [7].

IV. DL MODEL TO SMART EDUCATION

The smart education system model uses the concept of DL, which can gauge the degree of learning, retention, and achievements of the learners and suggests improvements and corrective measures. This section discusses the proposed smart education system using DL methods.

A. Proposed Smart Education

In the smart education model, the educational system premises' entities are embedded with sensors, actuators, and transponders using wearable and fixed devices. The stakeholders are students, teachers, staff, recruiters, parents, etc. The sensors in these entities sense and capture the information about themselves and their

surrounding environment and send it to the base station (or sink) for further processing. These sensors produce a vast amount of data, travelling from source to destination and vice versa using a wired or wireless medium. Fig.5 presents an overview of the architecture of the proposed model. It uses a deep neural network (DNN) architecture loosely inspired by the structure of biological brains.

The architecture component is a key-value store for DL model metadata. Investing in high-performance, scalable compute and storage enables the architecture to grow with educational organizations' needs. Therefore, the proposed model should be able to scale automatically to avoid increases in latency. The proposed model supports comprehensive model validation. The DL model integrates security measures and governance processes into each layer. It can help mitigate the risk of breaches in data, learning and classification modules, and output.

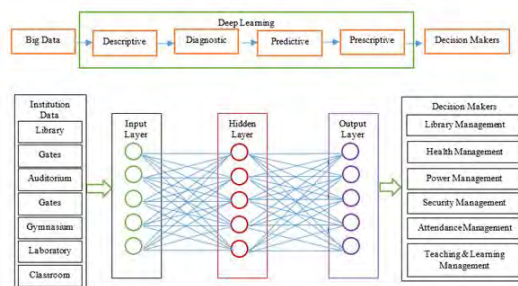


Fig.5. Proposed DL model to smart education analytics

To ensure optimal use of bandwidth and faster data transfer, educational institutions can incorporate the concept of software-defined networking (SDN). DL techniques have been used to perform better analysis and predictions using the data received from these sensors.

B. Requirements

DL algorithms can learn from historical patterns and recognize them in future transactions. DL algorithms appear more effective than humans do when it comes to the speed of information processing. Some of the requirements to build a DL model for smart education analytics are *accuracy, efficiency, scalability, and speed*.

Smart education analytics using DL starts with gathering and segmenting the data. Then the DL model is fed with training sets to predict the probability of anomaly.

- *Extract Data.* The data will be split into three different segments – training, testing, and cross-validation to ensure consistency in results.
- *Provide Training sets.* It predicts the value of some output given some input values.
- *Building Model.* IT determines how to make that prediction based on previous examples of input and output data.

C. Mapping to DL Process

Designing a DL architecture model must consider each step of the DL process in Higher Educational

Institutions (HEIs). It must be flexible to adapt to new data sources, handle workloads, and crunch through massive data. It also needs to consider overarching architecture components that provide security and governance. This architecture is often best to start as the number of DL use cases multiply. Fig. 6 shows the comprehensive DL architecture to HEIs.

Data Ingestion. The data ingestion tools must support a wide variety of heterogeneous data sources. It can support both batch and stream processing with a well-designed data pipeline.

Data Processing. For the variety of data sources, it requires data transformation, normalization, and cleansing preprocessing techniques.

Feature Engineering & Data Modeling. Features turn the inputs into something the algorithms can understand. It might involve simplifying the data, filtering it, or creating new features. Feature selection can be either done manually or automated.



Fig. 6. A comprehensive DL architecture model.

Model Fitting. A DL model is a combination of the algorithm and the training data. Examples of DL algorithms include random forest, least squares, and logistic regression. It can also support the user's DL algorithms to suit the user's needs.

Model Training. The training process uses a training dataset to "educate" the model with the training dataset and the algorithm. It predicts the trained model's output on the training dataset's inputs with the training dataset's actual output values.

Model Validation. Validation is the process of using a testing dataset to evaluate a trained model. The validation techniques are - predictive modeling, training error, test error, and cross-validation.

Deployment. The execution must be powerful enough to support repeated cycles of experimentation, testing, and tuning. It is considered the given different data, and hence the exact model may behave quite differently.

Monitoring. The monitoring function can help with model-optimization efforts.

An effective DL solution requires scalability and elasticity, and significant compute power, adequate and low-latency storage.

Features. The DL algorithms primarily use classification tasks that involve decision trees, rule induction, neural networks, and statistical inference. Some of the features identified are generating alerts from data, student groups with similar characteristics, student misuse, lurking, student outcomes, student dropouts, students' low motivation, students' mental health at work, etc.

Dataset. This DL model uses student's behavior data collected from extracted classes, gates, Wi-Fi usage, library, etc. These data included student background

information – gender, status, performance interaction, study status, etc.

Work Flow. Every entity and stakeholder are in the smart education model is embedded with multiple sensors, capturing the information about itself and its surroundings. Each of these sensors transfers this information for further processing. The data processing module converts the captured data (unstructured) into a standard format (structured) for processing. There are several steps followed in standardizing the raw data captured by the sensors. They are *data source, data size and type, data standards, data cleaning, and data restructuring*.

After completing the above steps, the sensors' raw data is converted into a standard format, identifiable and accessible by the DL system.

D. Proposed Deep Learning Model

In smart education, the learning data can be collected and sent to the server automatically. It eliminates the need for any human intervention with the help of sensors. Due to this sensor system, the tedious task of teachers and educators can be minimized. It allows them to concentrate more on teaching and learning, which the primary function of learning is. The teachers and educators can use these collected learning data for analytical purposes. A multilayer perceptron algorithm was employed to establish an efficient and convenient prediction model. The model's accuracy increased as the quantity of data, the number of training cycles, and the model's complexity increased. This algorithm was employed for model training first. The proposed deep learning model consists of input, hidden, and output layers, as shown in Fig. 7.



Fig. 7. Proposed DL model to smart education analytics

The *input layer* consists of educational messages, and training is performed with the DL algorithms. All educational data types are taken as input, such as sensor data, library, hostel, wireless, health, security, teaching & learning, and much more. Data integration is performed by collecting all data at one location. After the data collection, the next step is to store the input data into the storage system. After storage, the corresponding tool engine performs the processing of the data.

The *hidden layer* acts as a memory that stores the internal state of the educational data. When the new data arrived, the memory is updated, and decisions are made according to the current and previous input. Then DL techniques are executed, and patterns are identified as output. The obtained output is stored in the storage system. After that, the output is visualized in the form of a graphical user interface (GUI), dashboard, decision-making applications, etc.

The input layer comprised neurons of the features, and the output layer produced results with one label. The proportions of validation and training data were set at lower and higher. Each training epoch contained samples with many epochs used. Every training session was recorded to derive variations in accuracy and loss. In DL, the loss is the value that a neural network tries to minimize. According to the result, the validation data accuracy increased gradually with the number of training sessions being performed; the loss decreased gradually, after which the optimal model was established. Test data were then substituted into the multilayer perceptron model to obtain the predicted probability of results (example, dropout). Using significant variables identified through the analysis as input determined the critical factors fed to the deep neural network to predict learning failure; moreover, prediction performance could be increased.

With this prediction, a platform can be established to help students with substandard academic performance. The teachers and educators should be notified of the students for whom this applies without attaching labels and providing appropriate assistance in their learning process.

Governance. The governance layer processes the track data lineage. It maps the existing data flow and develops standard data taxonomies across the HEIs. It plans for metadata collection, integration, usage, and repository maintenance. Data governance reveals source to destination and the various processes and rules involved, and how the data is used.

Security. Along with data lineage, data security is paramount to a DL architecture. Data security includes authentication, authorization, and encryption. It must apply authentication and access controls across the entire framework, from ingestion to report delivery. Also, data security measures must be auditable. It encrypts both data at rest and data in transit.

E. Advantages

The above model may be applied in other educational activities, including automatic educational processing, teachers' speech recognition, language translation, social network filtering, students & employee image analysis, material inspection, and game programs, where they have produced results comparable to and in some cases surpassing human expert performance. Some of the proposed model's advantages are attendance management, health, hygiene, automated library management, power consumption management, security & safety management, smart teaching and learning activities, etc.

The students and teachers can keep track of their attendance and thus reduces the manual paperwork. With the sensors embedded in the wearable device, staff members can monitor their vitals and notify them if any abnormal variation (activity) is observed. All the books, journals, thesis, manuscripts, etc., in the intelligent library are equipped with sensors. It reduces the manual entry at the book-issuing counter of the library and thus saves time and cost. The sensors embedded in smart classrooms can help make a conducive teaching-learning environment by maintaining the desired temperature and humidity favorable for teaching and learning activities.

The sensors installed in the classrooms, staff rooms, laboratories, library, gymnasium, etc., can monitor and adjust to the atmospheric conditions. They can control the electrical appliances as per the preferences of the institutional users. The sensors embedded at entry and exit gates, classrooms, laboratories, gymnasiums, auditoriums, washrooms, etc., can let the door be opened/ closed only by legitimate personnel. Thus, it prevents any security breaches and trespassing.

Educational apps can transform how teaching and learning are done. Educators and administrators are transitioning to student-centered, collaborative environments that appeal to tech-savvy, visual learners. Apart from smart learning analytics, the proposed DL architecture can be used in behavioral systems, content analytics, language translations, healthcare, security, speech recognition, etc.

F. Issues and Challenges

Some of the challenges of the proposed DL model can be among the below mentioned. The *availability* of data is one of the biggest challenges faced by educational organizations. The *cost* of the infrastructure can be a significant overhead in small educational institutes. The data captured by sensors are primarily in different *formats*. The sensors embedded in the SLE capture instantaneous information generated at a *fast rate*. It needs proper storage for the data analysis purpose. The *enormous volumes* of data produced by the devices can be a big issue. The data produced by the devices are in different types and sizes. The system should be robust and capable enough to handle heterogeneous data types. The *mining* of relevant data is one of the primary prerequisites for constructing a helpful classification and prediction model. The interconnection of many devices in a network and a large volume of data transactions may lead to *network latencies* and failures. The students never want themselves to be monitored, citing *personal privacy* and other similar factors. *Security* remains the primary concern when handling a large amount of data. It should be addressed effectively in good system architecture.

V. CONCLUSION AND FUTURE ENHANCEMENTS

Educational information is highly available, as well as secured and managed consistently for privacy and liability concerns. Technologies empower administrators and educators, and they have extended the reach of student access to quality education. Interconnection of modern education with environmental, social, and economic issues, and the importance of interdisciplinary thinking and holistic insight, deep learning is particularly relevant in higher education for sustainability.

Smart learning and deep learning algorithms are used to create an intelligent educational environment. The deep learning model can predict results achieved acceptable accuracy, sensitivity, and specificity in deep learning models. Predictive analytics with deep learning helps the faculty and the parents to get alert and respond appropriately. The presented architecture may facilitate concrete architecture design of use cases in smart learning environments. Students can be helped in a better way and can be worked on their weak subjects. In

areas where transparency is paramount, it could be challenging to make a case for the hidden logic of deep learning. Future work may be focused on this issue.

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Automatic Car Insurance Using ML

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Abstract - The Vehicle insurance system is a perfect solution for those who conduct the organizations who claims the vehicle insurance. It is very arduous to manage clerical data. It deplete the lot of time bring down the details of any insurance claim. In present time, the amount of insurance claims increases day by day and due to this renovation of old claims are difficult to maintain due to this losing of data can be happens. We are introduced a vigorous computer software, which has the malleable of design to match the specific needs of clients for carry out their business goal of quality of service and earnings generation.

Keywords- Machine Learning, Damage detection, Insurance, Data leakage problem, Insurance management, Car accident detection, Image recognition, Convolutional neural networks.

I. INTRODUCTION:

Automatic car insurance using machine learning is a perfect solution for those who conduct the organizations who claims the vehicle insurance. It is very arduous to manage clerical data.[1] It drain the lot of time bring down the characteristics of any insurance claim. In present time, the amount of insurance claims increases day by day and due to this renovation of old claims are difficult to maintain due to this losing of data can be happens.[3]

We are introduced a vigorous computer software, which has the malleable of design to match the specific needs of clients for carry out their business goal of quality of service and earnings generation.[2] Insurance policy control system include a mathematical notation that represent the relationship between policies and objects and the entities that deal policies for those objects.[5] Hence it is necessary for an self-operating system, which can methodical manage the company, records, provides jiffy access and one that ameliorate the generative capacity.[7]

As a result of this self-operating system, the agility of the company are performed with in the set out time and the dependable and systematic service is clinch to its users.[4] In the damaged vehicle noticing problem make use of freeway cameras, the presence of uniformity is the silent index in difference between damaged and non-damaged vehicles.[8]

1.2 Introduction to Problem Statement:

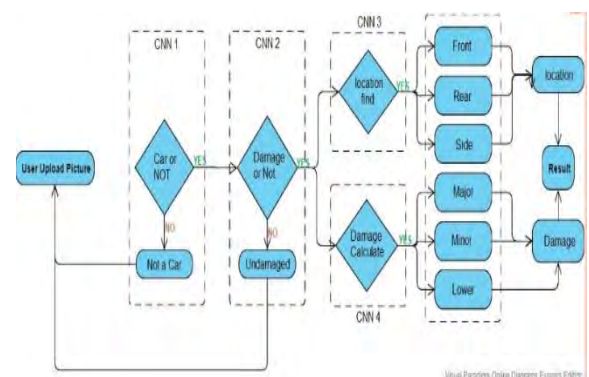
Automatic car insurance is a car insurance system that is based on insurance system in which the insurance can claim by using image, it's very easy to claims the insurance of new as well as damaged car.

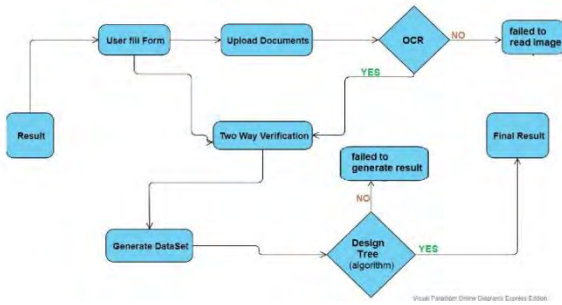
1.3 Motivation behind the Project:

Motivation behind this project is to make easy system for the insurance claims not so time consuming it is fast and secure system.

II. LITERATURE SURVEY

Sr. No	Journal	Author & Publication	Summary
1	Front-View Vehicle Damage Detection using Roadway Surveillance Camera Images	Burak Balci, Yusuf Artan, Bensu Alkan and Alperen Elihos	Car frame impairment observation out of quite photo has collect applicable need in the computer vision community in recent years.
2	An Automatic Car Accident Detection Method Based on Cooperative Vehicle Infrastructure Systems	Daxin Tian, Chuang Zhang, Xuting Duan, and Xixian Wang	In this paper, we are introduced a vigorous computer software, which has the malleable of design to match the specific needs of clients for carry out their business goal of quality of service and earnings generation.
3	Automatic Car Damage Recognition using Convolutional Neural Networks	Jeffrey de Deijn	It is very arduous to manage clerical data. It drain the lot of time bring down the characteristics of any insurance claim.





In the proposed system provides the facility for calculating the car damage in percentage. Then analysis and extract information from an image using machine learning algorithms, also check and verified the documents for checking the insurance criteria for claiming.

In our system, at first the user can upload a picture of the car or damaged car, at the CNN1, system firstly checked about the uploaded image or picture is weather a car or not a car. If the uploaded image is an image of car, at CNN2 system checks the car is really damaged or not

If system finds the damage then it goes further towards the CNN3, to find out the location where the car damaged like front side rare side or other side. After the finding the location of damage system can calculate the damage at the CNN4 in the scale of major, minor and lower. After the completion of all processes at the end when location is find as well as damage calculation both are takes place system can produce final result.

III. CONCLUSION

The main goal for proposed system is to prevent the fake accident claim and calculate the actual value of accident claim to be pass. Our system is also to provide the facility for two way verification for car owner documents and car documents with the use of proposed system to save the user as well as workers time.

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Unlocking Secret World of Child Using Face Authentication

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Abstract - Security and privacy of mobile is vital, because of widespread and growing use of connected sensible phones and every one people folk's square measure dependent on it. The nice quantity of private knowledge will leak and therefore the lack of correct controlled setting within the current mobile state of affairs. We have a tendency to specialize in an important a part of this state of affairs usage of portable by juvenile person and youngsters. We have a tendency to collect knowledge employing a parental management approach with previous consent of fogeys, the sensible phones employed by underage youngsters square measure controlled and analyzed, in order that they're really unaware of observation. This enables to understand the important, unfiltered behavior of youngsters, and to ascertain on the potential risks for privacy and security throughout their mobile interactions. Here parent head will add family member (children) account by capturing face, assign closing date supported age. Loved one login by victimization face and may access the information. The obtained results, gathered from a good pool of teens, shade new light-weight on the doubtless dangerous zones that underage youngsters cross a day, and quantitatively provides a footprint of unsafe activities. the perspective of the fogeys is additionally thought of, checking on however their perception regarding sons and daughters mobile use is correct, or if there's really a digital divide that must be crammed, via awareness, education, dialogues and higher privacy tools for the underage generations.

Key Words: Machine Learning Face authentication, Andriod, Time Limit

I. INTRODUCTION

Security can be defined as the fulfillment of several desirable properties, such as confidentiality, integrity, availability, non-repudiation, authentication. One of the properties under the computer security definition is privacy. The mobile world is growing at an outstanding rate, inflicting a true revolution within the method folks live and move on-line. The convenience of use, the convenience of wireless connections, and therefore the comparatively low entry price (at least for basic models of sensible phones) have all contributed to wide growth vary of individuals really employing a sensible phone, together with an important vary of individuals that antecedence had very little or no access to the web underage youngsters and in reliable method. Most youngsters that's ninety-six% uses mobile device. Children can access a lot of inappropriate content on the internet, such as violence, guns, sexual images, strong

language, drugs, gambling. Parent's are concerned about this, but also about the possibility of their kids engaging in relationships with internet strangers, who can be dangerous individuals trying to take advantage kids. The continual use of mobile by youngsters from tiny age itself. During this era of web world that incorporates each sensible internet also as dark internet isn't secure for innocent kid. Since the surplus use of phone by youngsters at a larger extent is harmful as a result of it will cause varied eye sight issues and should additionally cause poor tutorial .So the system presents a secure mobile. At age of two years, most kids use mobile on everyday and pay comparable tremendous screen time for mobile devices. Most 3-year-old and 4-year-old use mobile with none steerage of elder and a few square measure engaged in media multitasking. One of the threats of parental control app is that, after gathering all sorts of private information about the kid's phone usage, these data are sent over the internet to the app developer's server. Then, this information is stored remotely, in order to analyze it and to be latter accessed by the parent from a different device than the child's phone.

Project Objectives

1. The main aim of this application is to provide safety of the children.
2. Parent can see the history of website or apps that are visited by children.
3. The application is proposed to ensure security and set up time limit for access.
4. The proposed system will help the parent to show videos , poems, stories etc to their children ,so that they could see the only contents which are shown by parents
5. To track the mobile usage of children.

II. LITERATURE SURVEY

2.1 Paper Name: Parent Control System for Mobile devices:

Authors: Ahmed M. Elmogy, Khawater Elkhawiter

Description : Using electronic devices are not just limited to specific adults or to specific time or place. Children use different kinds of mobile devices with no constrains. Parents are concerned about the effect of this technical explosion on their children development. Controlling, monitoring, and managing approaches are needed to help in over-coming some of these worries. The paper presents a privacy monitoring application called Times Up. The proposed system will help the parents for controlling and helping the kids to overcome the issue. The analysis, design and implementation of the proposed application are discussed. This paper also

introduced a survey on the developed applications and approaches for controlling, managing, and monitoring the use of different electronic devices.

Accordingly, the paper summarized is some of the main research challenges facing researchers working in this area.

Advantages: It can monitor data, applications services, application available in kids mobile.

Disadvantages: No timer set.

Limitations: The application could not set up time limit.

2.2 Paper Name: User Interface Design Model For ParentalControl Application On Mobile Smart phone Using User Centered Design Method

Authors: Syafrizal Wardhana¹, Mira Kania Sabariah, ST.,MT.2, Veronikha Effendy, ST.,MT.3, Dana S. Kusumo ST.,MT

Description: The system represents a control application usage on smart-phones which can improve collaboration between children and parents which is an important concern in today's era. The importance of parents role is to provide awareness regarding the usage of application to children which will make good communication between parent and children. So the children could think and make choice on some- thing that they face while they use mobile phone. Parental control application is made to control and also to limit the use of applications that are provided by smart phones by children. But the existing system has the problem on the user interface scenario. They designed not only just to show the same component that the application block by the parents and are not designed to involve children in the process of selecting applications. Thus the chance of parents to help children know the approach of the application could probably be missed. Because the user interfaces are closely related to the tasks that are performed by users, the user interface has a role in a parental control application design. To build a better parental control application, it is necessary acceptable whenever a user interacts with the application system. The consideration in this study has mainly focused on the user interface. This design method will be used in designing the user interface is User Centered Design (UCD).

Advantages: Focus mainly on user center design.

Disadvantages: Child can change setting without consultingparents.

Limitations: Child can also change the setting done by parents.

2.3 Paper Name: Recognition on Smart phone via OptimizeSparse Representation:

Description: Face recognition is an advance element now a day's which are used in smart phone application, example face unlocking by capturing image, tagging the people and games. Sparse Representation Classification (SRC) is a state of- the-art used by face recognition algorithm, which has been shown to form many classical face recognition algorithms in Open CV. The success of SRC is due to the use of optimization, which makes SRC robust to noise and barrier. As we know that optimization is essentially intensive, SRC uses random projection matrices to reduce the dimension of the problem that come across. However random projection matrices do not provide any consistent classification accuracy. In this paper, we propose a

method to optimize the projection matrix for -based classification¹. Our evaluations, based on real experiment and publicly available databases, show that face recognition based on the optimized projection matrix can be 5- 17 percent more accurate than its random counterpart and Open CV algorithms. At Furthermore, the optimized projection matrix does not have to be calculated again and again even if new faces are added

to the training set. We implemented the SRC with the optimized projection matrix on Android smart phones and found out that the computation of residuals in SRC is a severe bottleneck up 85-90 percent".

Advantages: It uses Optimal Algorithm that is SRC Algorithm

Limitations: Poor Image Quality

4. Paper Name: The Secure Mobile Teen: looking at the secret world of children: Review (2017)

Author: Massimo Marchiori European Institute for Science, Media and Democracy and University of Padua
Description: This allows to grasp the real, unfiltered behavior of kids, and to check on the potential risks for privacy and security during their mobile interactions. For the better communication between parent and child so that unwanted activity like abuse, bully etc. Can be avoided and parent can get a Control over a child by such monitoring system

5. Paper Name: Face Recognition on Smartphone's Via Optimized Sparse Representation Classification: Review (2014)

Author: Yiran Shen^{††}, Wen Hu[†], Mingrui Yang[†], Bo Wei^{††}, Simon Lucey[†] and Chun Tung Chou[†]

Description: In this paper, the challenges of performing face recognition accurately and efficiently on smart phones by designing a new face recognition algorithm called optimal SRC (Sparse Representation Classification). The use of optimized projection matrix means that optimal SRC can achieve the same recognition accuracy using a lower dimension projection matrix. This translates to a lower computation requirement on smart phones. In addition, we propose the use of compressed residuals in order

III. IMPLEMENTATION:

The system has the following algorithms are used to implement the applications.

I. The Viola-Jones algorithm has 4 main steps, and you'll learn more about each of them in the sections that follow and the diagram is shown fig-1 :

Viola Jones is specifically used for detecting either the object detected by the camera is face or not for doing the process there is specific steps followed which is giving, once the face is kept in front of camera the algorithm check if the object is similar to the face and detect its human face or a plane vase with oval shape.

Steps:

1. Selecting Harr like feature
2. Creating an integral image
3. Running Ada-Boost training
4. Creating classifier.



fig:1

II. The LBPH algorithm has 4 main steps, and you'll learn more about each of them in the sections that follow and diagram is shown in fig -2: (Local Binary Pattern Histogram) Local Binary Pattern Histogram is the algorithm used after Viola Jones. After detection of the object detected by the camera is Face then it will apply the algorithm whether the face is similar to the face which has been registered, it will map the face with the one saved with database and the if it matched the face unlock is done and the child is taken to its respective account. The respective face which LBPH follows to authenticate user face is as follows:

Steps:

1. Start
2. Input Face Image
3. Divide Face image into Blocks.
4. Calculate Histogram for each block
5. Combining LBPH Histogram into
6. Single Histogram
7. Face Image processed
8. Recognition Result
9. End

The System has following features:

Access control on child search can be done by parents. Only needed data are accessible to child, Track history of child access and give a complete report on activity done by child so the parent will get the current progress of child and what content the child is viewing. Set time limit to access phone is the another future which will only allow child to access the mobile phone for a specific amount of time. After the time limit for the child mobile usage is finished then it block account after time limit ends. This are the following future the application will contain.

4. Architecture :

A. Parent Control:

This module consists of parent who also act like as an admin and perform various activities and detailed description is given fig-1. Family head will be the main Admin of the system and as the age group of child is between 1 years to 8 years old he/she will be reliable on his/her parents phone. The registration is done with respect to parents and the further the content for specific child account uploading is done by parent only.

1. Family head:

Family head add child face images for child login and upload videos and files . Family head consist of following modules:

a. Registration:

A registration form is a list of fields that a user will input data into and submit to a database. There are many reasons why you'd need a person to fill out a

registration form. registration module is used for the new users to register with their name and identity.

b. Logging:

Using face authentication the mobile application gets unlocked. The user can access the further services of the application. If the face is matched with the databases provides during registration only then one can access to it.

c. Set time limit:

If the child from age 0-5 is using the mobile phone, It is necessary to set the time limit .It is up to the parents to set the desired time limit.

Upload Videos/Books/Links:

It is the responsibility of the parents to make sure that the useful books or videos or links are made accessible to the child. Furthermore the child will be able to access the only content provided by the parents.

B. Child Control:

This module consist a flow which represents a system in which whenever child login in parents phone a timer is set and videos, apps which is set by parent would be able to see by the child and once time limit ends is logs out. Child login by his face image and view videos and files . It is the responsibility of the parents to make sure that the useful books or videos or links are made accessible to the child. Further-more the child will be able to access the only content provided by the parents.

Login: Using face authentication the mobile application gets unlocked. The user can access the further services of the application.

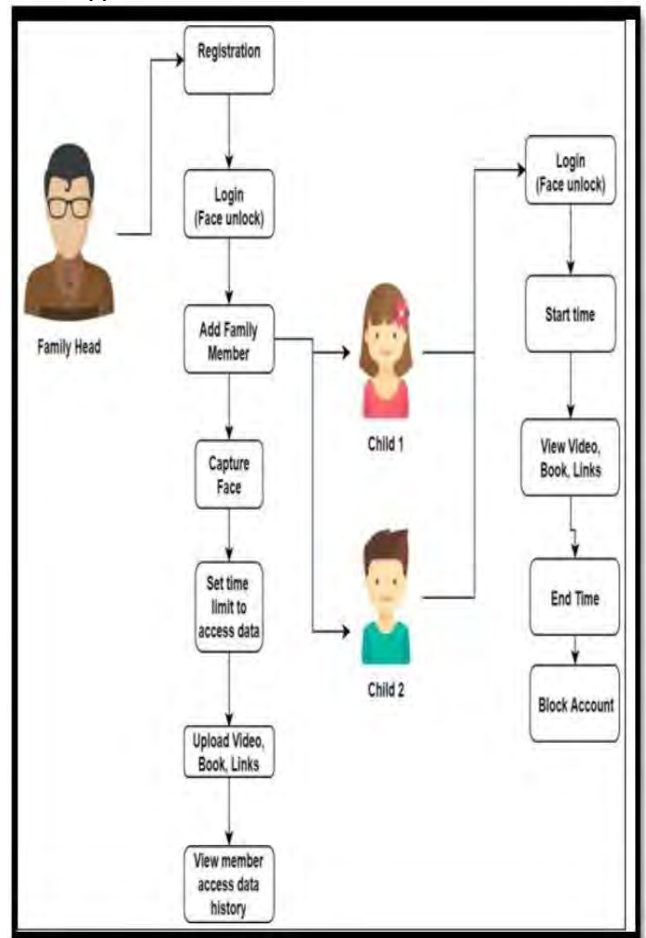
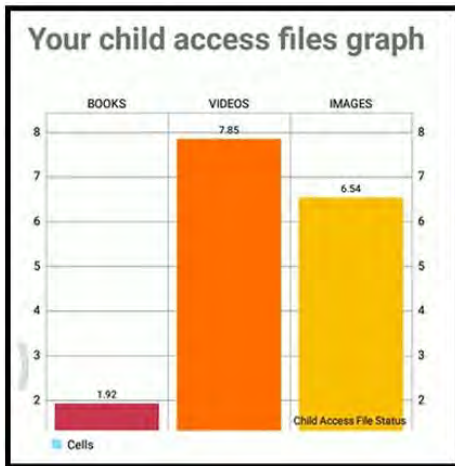


Fig2. Block diagram of Parental Control System

IV. RESULT:



By concluding, the weekly history is generated on the basis of the children activity. The generated history then forwarded to the parent's email account. Considering the ease of the user with respect to history, we are using statistical data representation for the usage. Diagrams like pie chart, histogram etc can be used so that it becomes visually more attractive. The percentage in the diagram shows the most and least used apps by the child in a particular period of time.

V. CONCLUSIONS:

The Application will help the parent as well as child for secure usage of mobile phone. The proposed system can track history of child access. The System can also set time limit to access phone whenever child uses phone.

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Depression Detection Scheme on Social Network Based on Machine Learning

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Abstract –Depression is the commonest psychiatric disorder which often leads to suicide in severe cases. Thus it is crucial that we inform ourselves of this psychiatric illness and treat its victims. This study focuses on observing different posts to discover and identify factors that reveal the depressive views of respective users. In March 2019, news media and twitter was flooded with warnings and tags like #NIMH, #TeenDepression, Facebook depression, #Mind and Me, depressed. Depression is most common in ages 15 to 29 while in women it is more dominant usually observed during postpartum depression, premenstrual syndrome. This paper tries to concentrate on the young age group who try to express their feelings via various social media sites. Often individuals express their feelings through these sites, the study aims at monitoring users to detect negative perceptions in their posts. Thus this project focuses on emotional well being of users. It majorly focuses on Sentiment analysis and extensive communication with users. It analyses various posts uploaded by users on social media in the form of image text, audio and text. Mel Frequency Cepstral Coefficient rule is used to translate speech to text. Optical Character Recognition rule is especially used for character extraction and recognition with high accuracy underneath completely different environmental circumstances. Further it predicts the level of depression in them. It involves sending positive messages to these users and subtly changing their emotions from negative to positive. Our investigations show that projected system is healthier than the progressive low level descriptor, primarily based system on deep learning based system modeling the vocal tract system data.

Keywords: *Machine Learning, Social Networks, Depression Detection*

I. INTRODUCTION

According to survey conducted by National Institute of Mental Health And Neuro Sciences (NIMHANS) in 2018, it was found that the most common illness in India is depression. Depression is increasing rapidly and we need to tackle it as soon as possible. It is very important to detect people with severe depression to prevent any mishap. Few symptoms include sadness of mood, loneliness. These are ordinary emotions, a normal person will have varying emotions both negative and positive according to his surroundings, on the contrary it seems that depressed individuals have persistent and pervasive sadness, severe lack of interest, excessive guilt, physical weakness, appetite and weight change, abnormalities in sleep and suicidal thoughts. Millions of people are often oblivious of their turmoil and continue to suffer from depression. It affects concentration level and prevents individual from achieving their true potential. This

ultimately impacts the society as a whole. The study aims at performing features selection and combinations. Challenges persist albeit significant progress. Features selection and multiple feature combinations are done to increase performance. Here we consider three types of posts i.e. Speech, Image and Text. Firstly we consider speech when user posts some speech in depression, then we apply Mel Frequency Cepstral Coefficient algorithm that pre-process the speech, after that segmentation is applied so that we get the given speech character by character, by applying MFCC feature we get words, feature selection converts each word into text and finally SVM classify that text words and apply pre-processing to remove stop words. Finally by using SVM Detect Depression related words and if count of depression related words is more than threshold then user is depressed. In that case system automatically sends motivational posts to the user. Next, text is preprocessed, stop words are removed and stemming, lemmatization is performed. SVM identifies words depicting negative sentiment. Finally OCR is applied on image posts to detect any printed or handwritten text through various processes like color processing, restoration, compression, segmentation, binarization, feature extraction. This text can be further analyzed by support vector machine.

II. EXISTING SYSTEM

In existing system Depression is handled in various ways. Treatment of depression includes using medicines, pills which increase dopamine and serotonin levels to improve mood. In counseling sessions negative thoughts are identified and treated usually by replacing negative thoughts by positive thoughts. Medicine and counseling when used simultaneously to handle depression. The active growth of audience on social media has led to a new platform for people to express emotions. If accessed properly it internet can help reach millions. Also the conventional process has very less speed. Use of technology increases speed and accuracy. A combination of conventional and modern technology can help to deal with negative perceptions and treat depression. We propose the detection of depression by machine learning models using messages, images and Speech post on a social platform. We use MFCC for converting the speech into text. The Optical Character Recognition algorithmic program is especially used for extraction and recognition of characters beneath different circumstances with greater accuracy. Once text is obtained from the Image and

speech then we tend to take away stop words and apply SVM to determine whether post is negative or positive. If the post is determining depression then system shares reports with individual and provides further help. In brief we are observing and helping users affected by depression, stress, motivation positive or happy and negative or unhappy posts of the users.

III. Proposed System

The proposed system focuses on handling large amount of data in speech, text and image format. This involves processing these forms of data to gain insights.

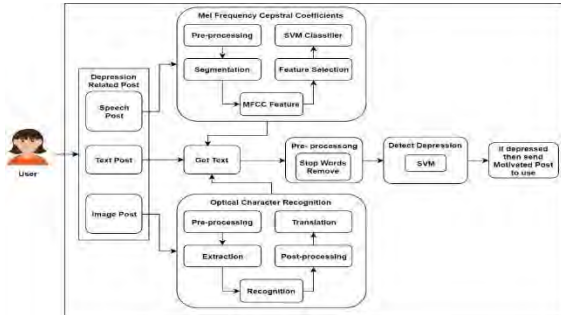


Fig1. Block diagram of depression detection system

The system architecture of proposed system is shown in Fig , which depicts various subsets and their corresponding functionalities.

Depression Related Post

This block shows the types of posts which are analyzed by the system. The analyzed input or user posts accepted are speech posts, image posts and text posts respectively. All these posts are observed to extract text date which is further analyzed to detect sentiment deviations. These posts are acquired from user activities on monitored social media sites.

Speech post Analysis using Mel Frequency Cepstral Coefficients

fig1. shows the steps to analyze speech post using the MFCC i.e. Mel Frequency Cepstral Coefficient algorithm. It goes through five phases – pre-processing of data, segmentation, extracting mfcc features, selection of features further classification is done using support vector machine. This algorithm takes voice samples as input, calculates unique coefficients corresponding to specific samples. The algorithm involves framing the signals into shorter frames, calculating periodogram and power spectrum estimation. Calculating energy in each filter by applying mel filterbank to the power spectrum. Taking logarithm and DCT of filterbank energies. DCT coefficient ranges from 2-13, rest are discarded.

$$\text{mel}(f) = 1125 \ln(1 + f/700).$$

mel(f) are mel scale frequencies measured in mels while f are normal frequencies in Hz.

Text Post Analysis

This block represents the analysis of text post from social media platforms. It goes through four phases – collecting the text, pre-processing of collected text which includes removal of stop words, detecting depression by applying

SVM. This block acquires text input from Speech post Analysis (B) and Image post analysis(D) .Further it involves sending motivational posts to effected users.

Image Post Analysis using Optical Character Recognition This block represents the analysis of image post which is performed by using OCR i.e. Optical Character Recognition algorithm. It goes through five phases – pre-processing of collected data, extraction of text from image post, recognition, post-processing and translation. It involves extracting machine encoded text from images by electro-mechanical conversions. Steps involved are Binarization, skew correction, noise removal, skeletonization. The further classification of generated output data is done by Text Post Analysis(C).

The system analyses various posts, detects depression and helps its users.

IV. EXPERIMENTAL SETUP AND RESULT

This system uses Python and Anaconda as integrated development environment. Mysql Database is used. Python is high-level programming language which is often used for good visualization, readability and large set of libraries available. System involves extensive natural language processing using NLTK. Python is majorly used for text or data processing and handling different types of input. For few instances R studio is also used. Fig2. shows distribution of sentiments using a text post. Sentiments like anger, anticipation, disgust, fear, joy, negative, positive, sadness, surprise, trust are processed to provide analysis of different posts. In Sentiment analysis we tend to verify positive, negative or neutral sentiments. Conversations among 100 – 200 users are analyzed in the above figure. Here emotion lexicon helps is associating sentiments and corresponding words.

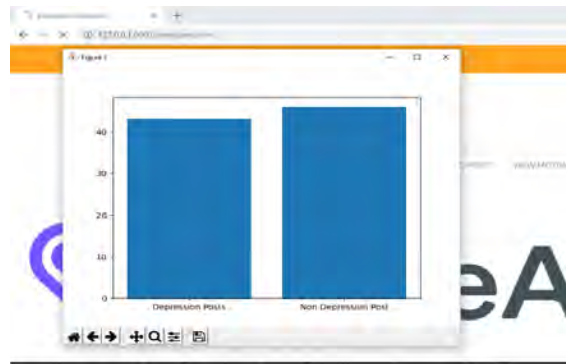


Fig 2. Observed Output

The columns depict different emotions according to word count. Each column represents emotions which are linked to the count of words related to the emotion in text. For instance about 20,000 words are linked with anger emotion.

V. CONCLUSION

In this paper, we have a tendency to try to spot the presence of depression in social media; and explore solutions of depression detection. We have a tendency to

characterize a more in-depth affiliation between depression and a language usage by applying SVM and text classification techniques. We have a tendency to know a lexicon of words additional common activities of depressed users.. In step with our findings, the language predictors of depression contained the words associated with user's preoccupation with themselves, feelings of disappointment, anxiety, anger, hostility or self-destructive thoughts, with a larger stress on the current and future. In our future work, we are going to try and examine the link between the user's temperament and their depression-related behavior mirrored in social media. Another attainable improvement would be to use recently printed language modeling strategies like BERT as input for the network and to match self trained model.

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A Survey on Covid-19 prediction using Machine Learning Algorithms

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Abstract: Machine learning algorithms are few of the important data analysis algorithms. Many outbreak prediction models for COVID-19 are used by professionals around the world for making the decision and enforcing the relevant measures to control such pandemic. Among the models for covid19 pandemic, statistical data had received more attention by the authorities. The study of the ML model demonstrates the upcoming of patients affected by covid19 which is threat to mankind. Furthermore, there are some specific inputs for each platform, including various forms of the data such as clinical data and medical imaging which can improve the performances of the introduced approaches towards the best responses in practical applications.

Keywords: COVID-19, Machine Learning, Pandemic, Models, Predictions, Deep Learning, Future forecasting

I. INTRODUCTION:

Machine learning (ML) has proved itself as a prominent field by solving many complex problems in real world. The application areas included almost all the real-world domains such as health care, autonomous vehicle, business applications, intelligent robots, gaming and image processing. Machine learning algorithms is based on trial and error method which is quite opposite to conventional algorithms.

There are four standard forecasting models, such as linear regression (LR), least absolute shrinkage and selection operator (LASSO), support vector machine (SVM), and exponential smoothing (ES) have been used in this study to forecast the threatening factors of COVID-19. Three types of predictions are made by each of the models, such as the number of newly infected cases, the number of deaths, and the number of recoveries in the next 10 days. Some other models also showed their

promising results multi-layered perceptron, MLP, and adaptive network-based fuzzy inference system, ANFIS for predicting the outbreak.

There are lots of studies performed for the prediction of different diseases using machine learning techniques such as coronary artery disease, cardiovascular disease prediction and breast cancer prediction. In short, the study is focused on live forecasting of COVID-19 confirmed cases and outbreaks.

II. LITERATURE SURVEY:

1) According to the literature survey we have gone through some of few papers and from this we have considered 4 papers. So first is 'COVID-19' future forecasting using supervised learning methods (2020) in this the techniques proposed are Linear Regression (LR), Least Absolute Shrinkage and Selection Operator(LASSO), Support Vector Machine(SVM) & Exponential Smoothing (ES) and the advantage of this techniques are ES performs best in forecasting in given nature and size of the dataset LR and LASSO also performs well for forecasting for predicting the death rate and the confirmed cases. As these are advantages and there are some disadvantages of this techniques proposed SVM produces poor results in all scenarios because of ups and downs in dataset values.

2) The next paper we have taken is 'COVID-19' outbreak prediction with machine learning (2020). In this technique proposed are Multi Layered Perceptron (MLP), Adaptive Network-based Fuzzy Inference System (ANFIS), SIR and SEIR. The advantage of this techniques are the machine learning models are reported high generalization ability for long term prediction. The only disadvantage of this is MLP produces low accuracy.

3) The next paper we have taken is 'COVID-19' deep learning approaches for diagnosis and treatment (2020) In these some deep learning methods have given positive response such as generative adversarial networks (GANs),

extreme learning machine (ELM) and long / short term memory (LSTM). From this technique it is very easy to analysis to huge dataset and help physician train machines, set algorithms or optimize the analyzed data for dealing with virus with more speed and accuracy.

4) The next paper is ‘COVID-19’ Epidemic Analysis using Machine Learning and Deep Learning Algorithms. In this polynomial regression (PR) has given a minimum root mean square error (RMSE) score. According to this model if the spread follows the predicted trend then it would be large loss of lives as it predicts the exponential growth of transmission worldwide.

Algorithm	Advantages	Disadvantages
Logistic Regression(LR)	<ul style="list-style-type: none"> - Easy to implement and straightforward. - LR-based models can be updated easily. - Does not make any assumption regarding the distribution of independent variables. -It has a nice probabilistic interpretation of model parameters. 	<ul style="list-style-type: none"> -Does not have good accuracy when input variables have complex relationships. -Does not consider the linear relationship between variables. -Key components of LR- logic models, are vulnerable to overconfidence. -May overstate the prediction accuracy due to sampling bias. -Unless multinomial, generic LR can only classify variables that have two states (i.e., dichotomous).
Support Vector Machine(SVM)	<ul style="list-style-type: none"> - More robust compared to LR. - Can handle multiple 	<ul style="list-style-type: none"> - Computationally expensive for large and

	feature spaces. - Performs well in classifying semi-structured or unstructured data, such as texts, images, etc. - Less risk of overfitting.	complex datasets. - Does not perform well if the data have noise. -The resultant model, weight and impact of variables are often difficult to understand. -Generic SVM cannot classify more than two classes unless extended.
Smoothing Exponential (ES)	- It is easy to learn and apply. - It produces accurate forecasts. -It gives more significance to recent observations	-It produces forecasts that lag behind the actual trend. -It cannot handle trends well.
Multilayer Perceptron (MLP)	- It is very useful algorithm in regression and mapping. - N-dimensional input signal mapping to M-dimensional output signal mapping is done	- Convergence in MLP are very slow. - Local minima affect the training process. - Hard to scale

Table 1: Advantages and Disadvantages of models

III. MODELS: LOGISTIC REGRESSION:

Logistic Regression (LR) is a most powerful machine learning algorithms. It comes under supervised learning. It is used for calculating categorical dependent variable using set of independent variables.

LR helps in finding the probability that a new instance belongs to a certain class. Because it is a probability the output lies between 0 and 1.

Therefore, to use the LR as a binary classifier, a threshold needs to be assigned to differentiate two classes. For example, a probability value higher than 0.50 for an input instance will classify it as 'class A'; otherwise, 'class B'. The LR model can be generated to model a categorical variable with more than two values. This generalized version of LR is known as the multinomial logistic regression.

Support Vector Machine:

Support Vector Machine (SVM) algorithm can classify both linear and non-linear data. It first maps each data item into an n-dimensional feature space where n is the number of features. It then identifies the hyperplane that separate the data items into two classes while maximizing the marginal distance for both classes and minimizing the classification errors. The marginal distance for a class is the distance between the decision hyperplane and its nearest instance which is a member of that class.

More an n- dimension space (where n is the number of features) with the values of each feature being the value of a specific coordinate. To perform the classification, we then need to find the hyperplane that differentiates the two classes by the maximum margin.

Multilayer Perceptron:

A multilayer perceptron (MLP) is type of regenerative artificial neural network (ANN). MLP consisting of neurons arranged in layers. There is at least three layers for make- up MLP which are input layer, output layer and the one or more hidden layers. Output Layer consist of single neuron, output of this layer is MLP ANN- which predict the number of patients. Input layer consist of neurons same number of dataset input. In Input layer there is 3-neuron in one layer one for in each data points which are latitude, longitude, and days of infection. The reason for selecting MLP is that which provide maximum number of patients across all locations. MLP provides high quality models and MLP takes less time as compared to complex method.

Exponential Smoothing:

Exponential Smoothing is one of the simple techniques to model time series data where the past observation are assigned weights that are exponentially decreasing over time. This method forecasting is based on previous period data. Exponential Smoothing methods specifically for univariate data. It is easily applied procedure for making some determination based on prior assumptions by the user.

IV. LEAST ABSOLUTE SHRINKAGE AND CHOICE OPERATOR (LASSO):

In this model realize patterns inside massive datasets whereas avoiding the matter of over-fitting. Estimation and variable choice area unit at the same time dole out victimation the LASSO technique, and in and of itself its usually utilized in studies in fields with massive numbers of instructive variables to scale back the variable area. This algorithmic program trades off model accuracy with model parsimony by introducing a penalty term into the target operate (which in customary simple regression is that the odd of squares of residuals). The penalty term will, for simple regression models, be created akin to a constraint on the odd of absolutely the parameter coefficients.

V. CONCLUSION:

The world is under biggest Pandemic and because of this so many lives had been passed. The future forecasting and prediction of a transmission is needed. As COVID-19 is becoming a dangerous virus in future. We needed outbreak prediction earlier. So we will be ready to face that pandemic. From this survey some models are giving positive results for predicting the transmission. Linear Regression and Multi-Layered Perceptron and Exponential Smoothing are the powerful models. Support Vector Machine and some other models are not reliable for large dataset.

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A Survey on Early Detection of Crop Diseases Using Machine Learning and Deep Learning

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Abstract - Crops are being affected by uneven climatic conditions leading to decreased agricultural yield. This affects global agricultural economy. Moreover, condition becomes even worse when the crops are infected by any disease. Agriculture not only provides food for the human existence, it is also a big source for the economy of any country. Millions of dollars are being spent to safeguard the crops annually. One method to protect the crop is early pest detection so that the crop can be protected from pest attack. If pests are detected, appropriate measures can be taken to protect the crop from a big production loss at the end. Early detection would be helpful for minimizing the usage of the pesticides and would provide guidance for the selection of the pesticides. Traditional method of examination of the fields is naked eye examination but it is very difficult to have a detailed examination in large fields. To examine the whole field, many human experts are needed which is very expensive and time consuming. Hence, an automatic system is required which can not only examine the crops to detect pest infestation but also can classify the type of pests on crops using machine learning.

Index Terms - Classification, Feature extraction, Image segmentation, Machine learning, pest detection

I. INTRODUCTION

All over the world, economic losses in the agricultural industry are spread widely, where the plants are prone to diseases. In precision agriculture, plant health monitoring and pathogen detecting pathogens are essential to reduce disease spread and facilitate effective management practice. Plant disease causes significant reduction in both the quality and quantity of agricultural products. However, food security remains threatened by several factors including climate change, the decline in pollinators, plant, and others. Plant diseases are not only a threat to food security at the global scale but can also have disastrous consequences for smallholder farmers whose livelihoods depend on healthy crops. In the developing world, more than 80 percent of the agricultural production is generated by smallholder farmers and reports of yield loss of more than 50% due to pests and diseases are common.[1] The prevention and control of plant disease have always been widely discussed because plants are exposed to outer environment and are highly prone to diseases.[8] Normally, the accurate and rapid diagnosis of disease plays an important role in controlling plant disease, since useful protection measures are often implemented after

correct diagnosis. The agricultural land mass is more than just being a feeding sourcing in today's world. Indian economy is highly dependent of agricultural productivity. Therefore, in field of agriculture, detection of disease in plants plays an important role. To detect a plant disease in very initial stage, use of automatic disease detection technique is beneficial. Disease's detection application is implemented to upgrade the agricultural sector and make available accurate treatment advice. Recently, several methodologies were developed for disease detection by performing leaf segmentation and classification like Support Vector Machine, Deep learning models, etc. Previous methodologies used the binary classifiers with pixel-wise segmentation labels. In order address this difficulty, a new multilevel classifier is proposed. In this research, a new system is proposed for detecting the diseases of plant by the leaf segmentation. The diseases symptoms are firstly seen as infection of leaf, stem, flowers etc., and the leaves are used for the research work, as the segmentation process is easy to detect the infected region. Firstly, an infected leaf image with visible symptoms is taken from Plant Village dataset [2]. Initially, the input data were collected from Plant Village datasets. After the collection of input data, pre-processing was accomplished by using CLAHE that delivers an excellent enhancement of image contrast. Then, segmentation was carried-out using ORACM algorithm for segmenting the diseased leaf portions from the green leaf region to obtain a denoised image. Besides, feature extraction is accomplished using GLCM approaches to extract the feature values from the segmented image. The output of feature extraction was given as the input for ANFIS multi classifier for classifying the normality, late blight, and early blight. At last, the proposed system performance was compared with the existing system in light of Precision, Sensitivity, F-score, and Specificity.

II. LITERATURE REVIEW

In [1] S.P Mohanty *al* developed method and identified 14 crop species and 26 diseases and a set of images under different conditions were considered for training the accuracy of the model that was reduced substantially to just above 31%. The developed model required more training diverse set of data to improvise the accuracy.

In E.C Too, *et al* [2] the results evaluated the architectures including Inception V4, VGG 16, 101 and 152 layers and DenseNets with 121 layers, ResNet with 50,101 layers. The developed architecture improved the performance of the model; improvement in the computational time was needed.

In J.G Barbedo [3] automatic recognition of diseases occurred in the plants was determined, rather than offering a definite answer, provided a very educated guess that allows users to take actions in a timely manner. An automatic recognition was not processing especially whenever the technical assistance was not available. In S. Kaur,*et al.*, [4] rule based semi-automatic system using concepts of k-means was designed and implemented that distinguished the healthy leaves from diseased leaves from the plant Village dataset. The plant village dataset was moreover considered to design and test sufficiently the large dataset that contained images with the complicated background. The developed model included real time images not only testing (self-collected dataset used in cross-domain validation) but for training as well.

V.P. Kour and Arora [5] developed model used SVM for the classification of the leaves. The classification and segmentation algorithm were optimized with the help of Particle swarm optimization method for selecting the initial parameters. Author used Particle Swarm Optimization and Support Vector Machine. The collection of images in a real-time environment emerged with a lot of problems like overlapping or clustering of leaves, the structure of the tree branches inhibits in taking images, problems during shadowing, climatic conditions.

In [6] Junde Chen et al developed model studied the transfer learning of the DCNNs for the identification of plant leaf diseases and considered using the pre-trained model learned from the typical massive datasets, and then transferred the specific task trained by own data. The developed mode intended to deploy it on mobile devices to monitor and identified the broader range of plant disease information automatically.

Aliyu Muhammad Abdu [7] The concatenating these individual lesion features results in a pathological feature vector for disease identification, thus minimizing feature size and avoiding the potentiality of dealing with descriptors that is superficial. In the developed method noting down the under real conditions, factors such as illumination variations and disease severity that may come into play with images captured in the field would affect the performance required improvement.

Davinder Singh, Naman Jain, Pranjali Jain, Pratik Kayal Sudhakar Kumawat, Nipun Batra IIT,Gujrat [8] evaluated the performance with ResnetV2 and MobileNet models. Author has created his own dataset by downloading images from Google images (2598) and done processing to detect the diseased leaf, which increased the accuracy up to 31%. Author has got wrong classification due to lack of realistic dataset. In this paper, author addressed the

problem of detection of diseased/healthy leaves in images using state of the art object detection models.

In [9], Sayyed Hamed Alizadeh Moghaddam, Mehdi Mokhtarzade, Behnam Asghari Beirami Applying the PSO algorithm, SSI globally determines some segments of the pixels' SSC, merging their involved features will not only reduce the high dimensionality of the image but also increase the class separability. Deep learning models are not used.

Author Kamal KC, Zhendong Yin † , Bo Li, Bo Ma, Mingyang Wu [10], trained six different model architectures and their variants , with the best performance attaining an accuracy of 99.74% obtained by fine-tuning deep learning model previously trained on ImageNet. VGG, ResNet , Inception, DenseNet , MobileNet , and NasNet deep learning models used on ImageNet. Fine tuning models were slightly expensive in regards to computational cost but had higher accuracy. Fine-tuned InceptionV3 achieved highest accuracy among all the models for Plantleaf dataset but was computationally expensive.

In India as well as globally most of the crops gets affected due to various diseases. Following table shows estimation of the crop losses due to insects/animal pests. Author has done survey which illustrates the dependency of the Indian population on agriculture. It shows the survey reports based on several detection techniques of image detection.

Table 1. Global estimates of crop losses due to insect pests/animal pests [11]

Crop	Cramer (1967)	Oerke et al. (1994)	Oerke and Dehne (2004)	Oerke (2006)
Wheat	5.1	9.3	9	7.9
Rice	27.5	20.7	24	15.1
Maize	13.0	14.5	15	9.6
Potatoes	5.9	16.1	18	10.9
Soybean	4.4	10.4	11	8.8
Cotton	16.0	15.4	37	12.3
Barley	3.9	8.8	7	-
Sugar beet	-	-	6	-
Coffee	-	14.9	-	-

In [12] author reviews related research papers from 2007 to 2018. The related studies are compared based image segmentation, feature extraction, feature selection and classification. In [13] author has presented a text classification method to accelerate the citation screening process of systematic reviews. The method aims to minimize the human workload involved in citation screening so that human reviewers need to manually label only a subset of the citations, while the remaining unlabeled citations are automatically labeled by the text classification method. In [14] study presents a localized

feature extraction method from the individual chlorotic and necrotic lesions minimizing feature redundancy and vector size. Color coherence vector (CCV), a feature that portrays distinct homogeneous patterns relative to the disease progression are extracted from the chlorotic region. On the other hand, local binary pattern (LPB) is extracted from the necrotic region. The set of 1,400 images of the potato plant leaves used in this study were obtained from the comprehensive PlantVillage (PV) dataset. In [15] experimental results demonstrated the model with the state-of-the-art performance on both the public dataset and our own image dataset. It achieves a validation accuracy of 91.83% on the public dataset. In [16] author has conducted experiments on the Oxford database. The database contains 8 image sequences, and 48 images in total. It covers different image changes including rotation, scale, compression, viewpoint, blur and illumination. In[17] author has proposed an efficient soybean disease identification method based on a transfer learning approach by using pre trained AlexNet and GoogleNet convolutional neural networks. CNN were trained using 649 and 550 image samples of diseased and healthy soybean leaves, respectively to identify three soybean diseases. A remote apple horizontal diameter detection hardware and software system was developed in this [18] study to achieve automatic measurement of apple growth throughout the whole growth period. ResNet-50 used with CNN. A comparative study is carried out on five types of machine learning classification techniques for recognition of plant disease is done in this [19] review. SVM classifier is used by many authors for classification of diseases when compared with other classifiers. The result shows that CNN classifier detects more number of diseases with high accuracy. GLCM used for feature extraction. Diseases not mentioned. System detects healthy leaves and 13 different diseased leaves of peach, cherry, pear, Apple and Grapevine using CNN classification technique.

A region of interest from the image is segmented from the bunch of grapes and some discriminatory features are extracted in frequency domain using Haar filter. Features are selected up to the third level of decomposition in wavelet domain and analyzed for discriminatory behavior.[20] The variation in the features of the images is related to the difference between pesticide treated and untreated grapes. These statistical features are then analyzed and used for identification of pesticide content in these samples using a support vector machine (SVM) classifier. The experimental results indicate that the proposed method is efficient for identification of untreated grapes and pesticide treated grapes from the features of the images. The accuracy of identification of pesticide treated grapes is high and the computation time is fast making this method suitable as a real time application for quality control in grapes.

III. EXISTING IMPLEMENTATION METHODOLOGY

The stages included in the detection of diseases using image processing are shown in the block diagram in the figure 1. The block diagram constitutes of data collection, pre-processing, segmentation, feature extraction, classification and the classes (normal, late blight or early blight) obtained after classification.

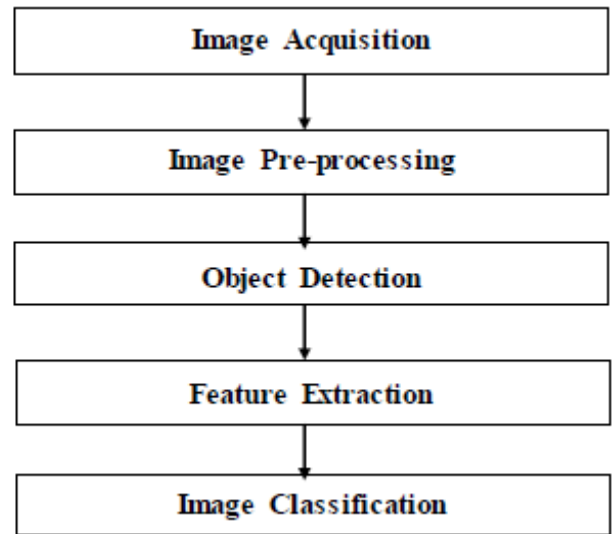


Figure 1: stages of the disease detection [11]

A. Image Acquisition

Plant Village dataset is a publicly available image database that consists of 14 crop specimens that consists of healthy plant images as well as diseased plant images of 54,306 that are controlled under the conditions of ground truths. The PlantVillage dataset consists of multiple images of same leaf with different displacements and have the mapping of 41,112 images out of 54,306 images and during the train-test splits either in the testing set or the training set that belongs to the same leaf. Among them experimental database selected images of 200 diseased leaves and 100 healthy leaves. The images are retrieved from the PlantVillage dataset, while retrieving images from the datasets, the images acquire unwanted noise on the images. Before undergoing the segmentation process, these noises must be removed.

B. Pre-processing of image

In digital image processing noise removal plays a vital role. To remove noise in an image or other object removal, different pre-processing techniques are considered. Image clipping includes cropping of the leaf image which will be an ease to process region of interest. Smoothing filter is used to sooth image so as to remove unwanted noise in the image. Also, to increase the contrast, image enhancement is carried out. The image enhancement process is performed by using CLAHE that improves the background contrast. In order to solve this issue, contrast limiting is applied. The histogram bin is specified in the contrast

limit and those pixels are clipped and distributed uniformly to other bins before histogram equalization. The unwanted noise accumulated is now removed and thus after pre-processing the collected data, segmentation is accomplished by Online Region Based Active Contour Model (ORACM) for segmenting the leaves.

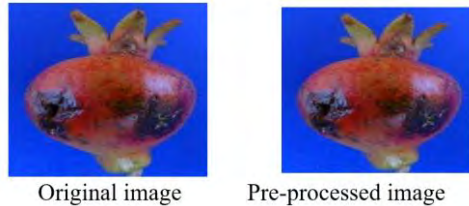


Figure 2 Preprocessing result

C. Segmentation

The process of separating or grouping of an image into different parts is used for image segmentation. There are many different ways of performing segmentation process in an image ranging from thresholding method to advanced color image segmentation methods. There are various methods for segmentation like thresholding, region based methods, and edge based, region growing methods, clustering methods depending upon classification scheme.

The RGB image is pre-processed to remove noise and distortions from image and then K-means clustering segments the image into 4 clusters. Here, k=4 is considered because it gives proper clusters than k=3 or 5. One of the clusters from obtained clusters contained majority of diseased part which is our Region of Interest. This Region of Interest (ROI) will further undergo feature extraction and classification to detect disease present in crop. Here, result is Region of Interest from original image of infected fruit or leaf.

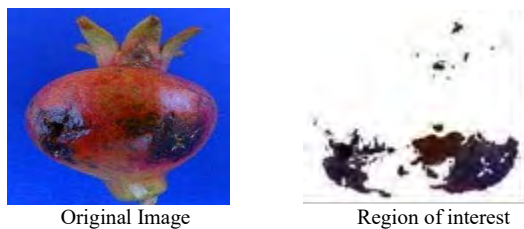


Figure 3. Segmentation Result

D. Feature Extraction

After image segmentation, feature extraction is carried-out to extract the feature values from the segmented region. Usually, feature extraction converts the large redundant data into a reduced data representation. Meanwhile, feature extraction effectively decreases the computational complexity of the system. In this research, GLCM is used for extracting numerical indicators like Inverse Difference Moment Normalized (IDMN), Skewness, Standard deviation, Entropy, and Local Binary Pattern (LBP) were calculated from the histograms of the color planes. Some of the implemented result for LBP and GLCM features as

shown in the following table for 6 images of the dataset created by us.

E. Classification

After feature extraction, classification is carried out by using Adaptive Network-Based Fuzzy Inference System (ANFIS) classification that classifies the healthy, late blight and early blight of leaves, which helps disease detection in the plants. ANFIS is a kind of Artificial Neural Network that is based on Takagi-Sugeno fuzzy inference system. Both the fuzzy logic principles and neural networks are integrated in order to capture benefits of both in a single framework. The Takagi-Sugeno type fuzzy interference system is used, where the output of each rule can be a combination of linear input variables with a constant term Adaptive Network-Based Fuzzy Inference System.

Table 2. LBP and GLCM features

No.	LBP Energy	LBP Entropy	GLCM Contrast	GLCM Dissimilarity	GLCM Homogeneity	GLCM Energy	GLCM Correlation
1	0.7685	0.84491	730.552	4.973194	0.87471	0.84286	0.82657
2	0.4905	1.69322	2208.59	12.97281	0.676165	0.56127	0.83203
3	0.5282	1.58199	1694.49	11.78218	0.710168	0.59795	0.77112
4	0.6634	1.17709	1043.64	6.709065	0.81217	0.74730	0.87669
5	0.5412	1.53239	1185.27	8.091677	0.749726	0.61348	0.87468
6	0.5607	1.49723	1275.43	8.297645	0.743107	0.66626	0.91718

IV. CONCLUSION

The early stage detections of disease and providing appropriate treatment will result into increase in yield of crop. Various methods for finding out region of interest like thresholding, edge based method (canny edge detector), region based methods, clustering method like K means clustering implemented and found K means giving better result for getting ROI. ROI can be used to extract features and get final result after classification.

Conflict of Interest: The authors declare that they have no conflict of interest.

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Natural Food Recognition and Nutrients Identification System

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Abstract— A typical Natural food recognition and nutrients identification system is estimating calorie and nutrition's of the food items consumed by the user and recording a user's eating habits. Since Food surveillance plays a significant role in health-related problems, it is becoming more necessary in our day-to-day life. The system consists of two major phases, the first phase is image classification and the second phase consist of calculating calories and nutrients of food items. In the first phase, the Food-101 dataset is used. The images of the dataset are pre-processed before training the model for classification, in which the images are first converted to grayscale and then the image is resized in dimensions of 70x70. The main aim of this phase is to identify which algorithm provides the maximum efficiency for image classification. We have implemented three specific algorithms – Resnet, SequentialNet and Google Inception V3. The accuracy of the Google Inception V3 is more efficient as compared to the other algorithms. Therefore, it is used for the food image classification part. The next phase involves calculating the calories and nutrients, for which the user has to provide the system with an image. The user will also have to provide a reference object in the image and the placing should be towards the left side of the food item. The nutrients identification will be performed on the food item by calculating the approximate mass of the food item using USDA database which is used for Food and Nutrient Database for Dietary Studies. The system based on classified food items calculates almost 68 nutritional values present in the food item. The main aim of the system is to keep the log of the food consumed by the user in their daily routines. The accuracy of our system will be acceptable and it will improve and facilitate current manual calorie and nutrients estimation systems.

Index Terms— Convolutional neural networks, Food Image recognition, Food classification

I. INTRODUCTION

In the current age, people are cognizant about their nourishment and diet to keep away from either up and coming or existing diseases. Since people are subject to advance technologies, arrangement of an application to consequently monitor the people's food consumption, helps in numerous perspectives.[1] It builds the familiarity with individuals in their nourishment propensities and diet. In the course of the recent two decades, explore has been centered around naturally perceiving the nutritional information and their healthful data from pictures caught utilizing computer vision and deep learning[2]. Image recognition is among the most important fields of image processing and computer vision. Food image classification is a distinct branch of image recognition problem[1]. This only expands the significance of legitimate arrangement of nutrients depending upon the proper natural food image classification using advanced algorithms.

With the speedy development of our society, additional attention has been paid to the standard of life, particularly the type of food that people tend to eat[3]. However, classifying food manually isn't applicable to the present

fast-tempo society any longer. An automatic food organization with enlarged accuracy, improved speed and reduced cost is desperately required.

Therefore, the aim is to develop such a system that will help to fulfil all these needs. The project aims at recognizing the food image with an efficient resolution using various algorithms of high accuracy. Next phase, we focus on identifying the nutrients and the calories of the food item with respect to the volume of the food item and calculating the value with the help of a reference object of user's choice. A system which can classify food and identify the nutrients from the image is necessary for a dietary assessment system. This paper proposes a method where we can recognise the food item and calculate the volume using contouring method in order to calculate the nutrients and calories. For the food recognition part, we use convolutional neural network to classify food images and for the detection of calories and nutrients from the food image we use contouring method. The CNNs are an effective class of neural networks that is highly effective at the task of image classifying, object detection and other computer vision problems[6]. We recognised a food dataset named 'Food101' consisting different food categories. Later part of the system which focuses on estimating the nutrients and calories which is of significance in order to have a daily track of the food intake. To calculate the volume and density of the food item - USDA database is used which is used for Food and Nutrient Database for Dietary Studies.[2] This is important as most of the teenagers eat a large amount of junk food which deteriorates their health due to which there may be high risk to their lives leading to Heart attack at a very small age. According to medical studies, overweight and obesity are generally the result of energy imbalance between the number of calories burned by the body for daily life activities and the amount of energy coming from consumed foods. The clinical treatment and prevention of overweight and obesity requires the patients to measure, record, and control daily food intake.[4]

Hence food recognition and nutrients identification system is very important for classifying the food image and thereby help in the health control. After the part of the food recognition we focus on identification of the calories and nutrients. Food logging using a web application is implemented using this project where in the food item that a person eats is first captured and uploaded to showcase the classified image and recognize the food item and process in order to get the final result of the total nutrient and calories in that food item. Food Recognition is done successfully after the research based on three algorithms- SequentialNet, ResNet and Google Inception where they can handle a large amount of data and can evaluate the features consequently. The Food 101 and

USDA dataset has been chosen as the working database for this methodology. Therefore, we aim to develop such a system that will help to fulfil all above needs. This project mainly aims at calculating the calories and nutrients with respect to volume and density in particular to a food item.

II. RELATED WORK

To ease the weaknesses of these clinical strategies, researchers have been trying to come up with improved systems. A portion of these techniques requires the individual to take a photo of the food in order to recognize the food item using the natural image using the pre-trained network model to get the maximum accuracy^[4]. Be that as it may, arranging food physically isn't pertinent to the present fast-tempo society anymore. An automatic food organization with expanded precision, improved speed and diminished cost is desperately required. In recent years, laptop vision systems are used immensely in food recognition strategies. Therefore, we plan to grow such a system, that will satisfy every one of these necessities. The recognition is significant to as most of the young people eat a lot of low-quality food which deteriorates their wellbeing and leads them to diseases like Blood pressure, Obesity, Diabetes and so forth. Because of which there might be high risk to their lives prompting heart attack at a very young age. Medical studies uncovered that overweight and obesity are commonly the aftereffect of vitality lop-sidedness between the calorie originating from the consumed food and the quantity of calories consumed by the body for a day by day life exercises. The clinical treatment and counteractive action of overweight and weight require the patients to gauge, record, and control day by day food consumption. The track of this can be maintained by recording each day meal. Recently, algorithms have been utilized to distinguish edges and shapes with extraordinary achievement. Here, motivated by this achievement the strategy is to take different food items by utilizing a CNN that distinguishes food outskirts^[9]. Despite the fact that perceiving food among many classes is an exceptionally complex issue, figuring out how to identify their fringes is frequently simpler and less subject to the thought about classes. Along these images, the technique can get the remarkable execution of CNNs and always improve through extra preparing without depending on the food recognition result. The present work intends to join a portion of the above strategies together, that makes a food classification system, that predicts the class of food the picture is in and recognizes the same. In the past few years, a variety of methods has been suggested for image classification and identification. CNN is used to automatically learn and extract features from the images which are then classified. However, the training process is very time-consuming, even using GPUs^[9].

III. LITERATURE SURVEY

Categorical Image Classification needs thousands of images to train the model for classification of food items^[1]. Various types of food with different color and texture reflect the fact that the food image recognition is considered a challenging task. Also, same food items in

different regions might have an all together a different look which makes it difficult to identify the food item. This crucial task is done using deep learning. However, deep learning has been widely used as an efficient image recognition method, and CNN is the contemporary approach for deep learning to be implemented^[3].

For the image classification Google Inception was chosen after the successful research. This algorithm implies that they are accurate enough to take in the filters where there must be a chance to be hand-made in other calculations. CNN's basic tasks are feature recognition, picture classification, and recommendation frameworks. A recommendation system can be defined as a system that will recommend items to the users/customer within an environment/system depending on their past activities^[10]. User needs to take the picture of the food using their mobile devices before and after the meal for the precise estimation of calories. The subsequent stage of the system is segmentation, each image will be broken down to separate different sections of the food image portion. Out of different tools accessible for segmentation, colour and texture segmentation tools are utilized for the successful estimation. Different food features including size, shape, shading and surface will be extracted and sent to classification step. Therefore, utilizing the above steps, segment of nourishment is recognized. At last, by evaluating the area of the food portion and utilizing some nutritional tables, the calorie estimation of the food will be extracted^[5].

BACKGROUND

The algorithms used for the system are ResNet, SequentialNet and Google Inception V3. The main task is to recognize the food item using the most efficient neural network model to recognize the food item and thereby estimate the nutrients. The main logic behind the recognition system is transfer learning and since according to the results Google Inception V3 is the most efficient algorithm with a greater accuracy, we use the transfer learning which uses a pre-trained neural network. Google Inception V3 model is divided into two parts a) Feature extraction with a convolutional neural network. b) classification part with fully-connected and softmax layers

The image will be extracted and scanned using the pre-trained model to recognize the natural food image and give us the final result. With the help of contouring we calculate the volume and therefore density in order to accurately identify the nutrients and calories as per the food image. Tensorflow is one of the libraries used for image classification in deep learning. Tensorflow is specially designed to enable fast experimentation with deep neural networks^[9].

PROPOSED SYSTEM

The objective of our system is to design an automated application to classify food items running on a smart phone with working camera that makes it easy to record food items that are consumed during the day. Our objective isn't to essentially have high accuracy, because as explained such accuracy is not possible in real. Obviously, the more accurate the system is the better the final result, and this is the reason in this paper we have

attempted to identify various food items and detect the calories in the food item accurately.

We propose a food recognition and nutrients identification system with various variant of algorithms dataset that is a food dataset that we establish containing only the images we want to train for and thereby increasing the accuracy and reducing the error rate and also to perform the testing on the trained model using the same dataset.

Here the main aim is to identify the most accurate algorithm to perform classification of the food items that are to be consumed. So, we have chosen to perform classification using 3 algorithms from the various options available. The choice of the first algorithm, is obvious SequentialNet because it is the most basic CNN algorithm. Since the main aim of the system is to provide the maximum accuracy, transfer learning algorithm is the most practical solution to go with. Therefore, we chose to go with Google Inception v3 algorithm. We would apply training of the same dataset on 3 different algorithms and compare the accuracy of the same and also conclude the best amongst the 3 algorithms.

We use stochastic gradient decent to train our model with a batch size of 120 examples, initial learning rate of 0.01 and epoch of 200. A small learning rate is very important for the model to learn and it can reduce the model's training error. The classifier we use is SequentialNet because this

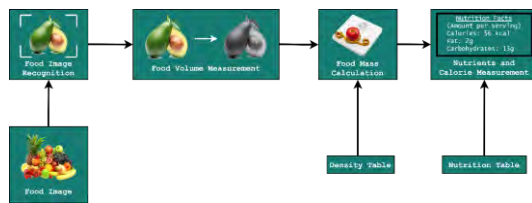


Figure 1: The Proposed Natural Food Recognition and Nutrients Identification System

which can deal with different food items classification. Given an input as a food picture, first, the CNN can achieve all the recognition steps including highlight extraction, shift and distortion invariance and classification, and afterward, gives the output.^[8]

Phase 1: Image classification

Every classification system starts with the selection of the database which is in coherence with your systems requirements. For our system we chose to go with the Food-101 dataset which contains various RGB images of different kinds of food items. The images of the dataset are pre-processed before training the model for classification. For example, we perform conversion of the images to grayscale on the dataset. In addition, it's required to resize the image for their optimal use of size 70 x70. The original dataset we use is Food-101 which is an open 120-class food image probabilistic, linear classifier is effective in the model. We train the network with the trainset of 200 images, which takes about an hour.

Now, we are using the ImageAI library of python to implement the transfer learning algorithms of deep learning. Transfer learning algorithm is a model wherein

knowledge used to solve a particular problem is used to solve a different but related problem. Google Inception v3 algorithm of transfer learning problem is used to classify the food item for the system^[10].

Residual neural network (ResNet) is an artificial neural network (ANN) of pre-trained neural network that builds on constructs obtained from pyramid cells of the cerebral cortex. It does this by skipping connections or by taking shortcuts to jump over some layers. ResNet does this using shortcut connections by directly connecting input of nth layer to some (n+x)th layer.

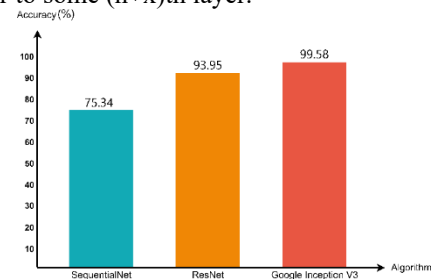


Figure 2: Comparison of the algorithms based on accuracy

The above picture shows the comparison about the accuracy and the effectiveness of the Algorithms – ResNet, Sequential Net and Google Inception V3. In order to classify the algorithm to implement for the process of image classification.

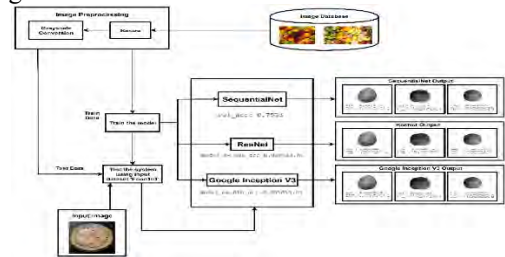


Figure 3: Image Classification

Phase 2: Calculating Calories and Nutrients of Food Items

During the initial stage the food items are captured in the form of images using a mobile device followed by a pre-processing step. In the next step various features of the food image like size shape and color are extracted which are then sent to the Google Inception V3 algorithm with the help of which the food item from the image is recognized. Finally, by estimating the area of the food portion which leads us to the volume of the food item. Using the density table, mass of the food product is calculated and using nutritional tables, the calorie value of the food will be extracted. USDA database that is Food and Nutrient Database for Dietary Studies is used to provide with both density and nutrition table of the food items. There should be a reference object in the image and its placement should be towards the left side of the food item. There is a one-time calibration process for the reference object, which is used as a size reference to measure the real-life size of food portions in the picture where the reference object could be used as per the user's convenience.

a. Food volume measurement

As explained before, in order to measure the size of the

food, two pictures must be taken: one from the top and one from the side, with the reference object towards the left of the food item in both the scenarios. The picture from the side can be used to see how deep the food goes, and is needed for measuring the food volumes. The system, which already has the dimensions of the reference object, can then use this information to measure the actual area of food item from the top picture, and can multiply this area by the depth (from the side picture) to estimate the volume of food. To calculate the surface area for a food portion, we propose to draw the contours around the edges of the food as well as the reference object. As the system knows the dimensions of the reference object beforehand it would make the simple calculation wherein it would calculate the pixels covering the reference object to actual dimensions of the object. The relationship between the pixel size to real world dimension is built which can be used to give the dimension of the food item based on pixels covering the food in the image. After that, and by using the photo from the side view, the system will extract the depth of the food, d , to calculate the food portion's volume, V , using the following equation:

$$V = TA \times d$$

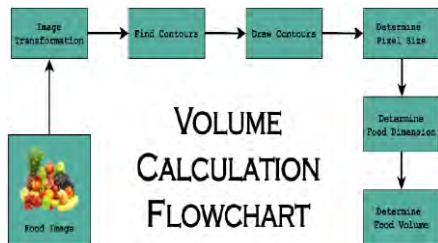


Figure 4: Volume Calculation Process

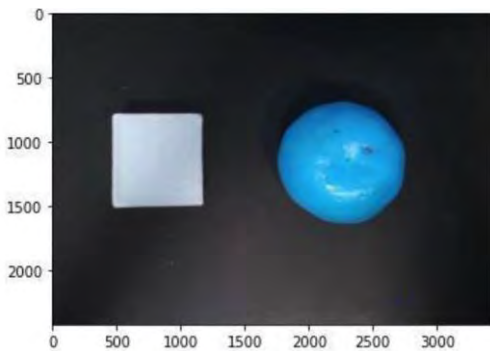


Figure 5: Gaussian Blur

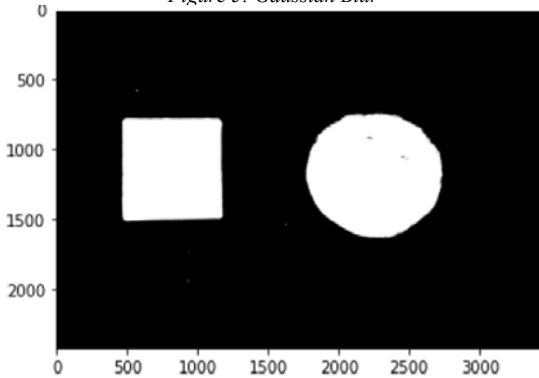


Figure 6: Edge Detection

b. Mass Calculation

The volume measurement method described above is really just an interim step in order to measure the mass of the food item in the image. Mass is what we really need since all nutritional tables are based on food mass. Once

we have the mass, we can use these tables to calculate the number of calories and other nutrition, as described next. It is known that the nutritional facts database is an important component for a useful and successful food recognition system. The data of nutritional values of foods are stored in these tables and are available from national and international health organizations. At this point, we have the measurement for the volume of each food portion, and we can use the following general mathematical equation to calculate their mass: $M = \rho V$, where M is the mass of the food portion and ρ is its density. Food density can also be obtained from readily-available tables. For example, we have used the USDA database of Food and Nutrient Database for Dietary Studies. In order to extract the density of the food item, the system needs to know the type of the food, which is done by our Google Inception based food recognition module. The system calculates the mass by having the type of food.

c. Calorie and Nutrition Measurement

Consequently, the amount of calorie and nutrition of each food can be derived using nutritional tables also provided by the USDA database of Food and Nutrient Database for Dietary Studies., and based on the following equation: $\text{Calorie in the photo} = (\text{Calorie from table} \times \text{Mass in the photo}) / \text{Mass from table}$. A total of 68 nutritional values are calculated for each food item which can be provided to the user. Google Inception v3 is an ANN of pre trained neural network used widely for image classification. The model itself is made up of symmetric and asymmetric building blocks including convolutions, average pooling, max pooling, convnets, dropouts, and fully connected layers. Batch norm is used extensively throughout the model and applied to activation units. Loss is computed using SoftMax. Agile is the methodology adopted for the system, it is because of which we can adapt the change quickly to win the market, and this is a core competency. Therefore, we will use the agile methodology in order to get the result at a faster rate and thereby do not have to repeat the procedure if we come across some default errors which happens in Waterfall Model.

VI. ANALYSIS

The proper analysis for the system will help us to improve the ability to define the scope of the project and manage the project within that scope. It will also help us to learn how to identify and sequence the tasks, estimate duration of tasks, control variances, manage costs, and utilize resources. This will also help in understanding the qualitative and quantitative techniques for identifying, analysing, and mitigating risk, as well as the best ways and times to apply these techniques to the project environment^[6]. Despite the quality detection and inspection of the food item is not strictly related to the application domain of dietary food monitoring, we have decided to include information such as the calorific and nutrients value on this application domains so that the user can have a better overview of what has been consumed by the user in the context of food image. The system will give intensive instruction in project management fundamentals across the entire project lifecycle. It will also provide demonstrated techniques and viable devices for planning, executing, and controlling an assortment of projects. It will also offer detailed and sophisticated

instruction in the critical areas of scheduling key events, controlling costs, and managing risks. The confusion matrix will show the accurately versus inaccurately named classes. From results, it is discovered that the Google Inception V3 Model is suitable for image classification. The system is meant to do a proper research of few deep learning algorithms and thereby getting the most efficient algorithm and comparatively a better accuracy. The algorithms provide features, for example, shifting and Max-pooling which give better classification rate for image classification than convolutional neural systems[7]. Convolving the image permits feature extraction, regardless of its direction and position in the image. With the help of this project, we were able to configure a natural food recognition and nutrients identification system to work (in a limited manner) to support project management. After the image classification is accurately done we calculate the volume and density of the food image thereby show the final results to the user which includes of about 68 nutritional values.

VII. RESULT AND DISCUSSION

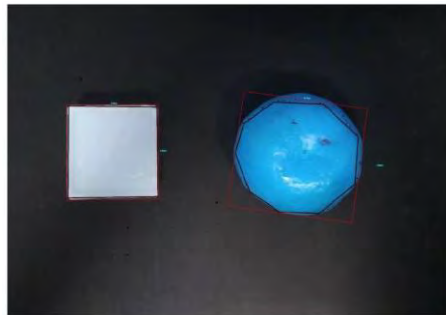


Figure 7: Output (Drawing Contours)

```
[43] print(data)
Food code          5477
Main food description  Orange, raw
WMEIA Category code  6012
WMEIA Category description  Citrus fruits
Energy (kcal)      47
...
20:4 (g)          0
20:5 n-3 (g)     0
22:5 n-3 (g)     0
22:6 n-3 (g)     0
Water (g)        86.75
[69 rows x 1 columns]
```

Figure 8: Nutritional Values

The trial method to implement the various algorithms was successful to understand which algorithm provides the best efficiency. Other algorithms like, MobileNet, Vgg19 which seem to be more efficient and will satisfy the accuracy required for the project. The part after the procedure of classification is mapping the food item names to a calorific value. This will be accomplished effectively by scratching the web for the average calories value will be considered of the food items things per unit weight[3]. The average calorie values are considered for the various classes of the food items[3]. We selected the Google Inception V3 model for the food image classification and by contouring method we were able to get the nutrients and the calorific value of the food item as well. FoodNosh helps you to keep yourself healthy on a daily basis with the help of a simple process. The process includes tracking or monitoring the food you consume by

uploading the image of the food item with the reference object of your choice. And you have to also ensure that you have given the correct dimensions of the reference object beforehand. Then the application will basically calculate the volume and the mass of the food item and from that we will get a result of almost 68 nutrient values for the same.

VIII. CONCLUSION

From the above results the transfer learning algorithms clearly improves the accuracy for the image classification. Since in transfer learning you do not need to train the classification model from scratch as it contains a pre-trained model which is not available with the basic SequentialNet 3- layer algorithm. Also, the number of layers is quite less in the SequentialNet algorithm which is a major factor resulting in less accuracy. The performance of CNNs depends heavily on multiple hyper parameters like the number of layers, number of feature maps in each layer, the use of dropouts, batch normalization, etc. Hence training of the model mainly includes adjusting the model hyper parameters by conducting lots of experiments. Thus, this paper helps in identifying and understanding the best algorithm that can be used for food image recognition.

The system consists of identifying the food items from an image using image processing and segmentation technique, food classification using Google Inceptionf algorithm, food volume measurement, and calorie measurement based on food mass and the nutritional tables. Our results provide accuracy for our proposed method in subsequently volumeand calorie measurement. In this paper, we proposed an estimation method that estimates the measure of the calories from a food item's picture by estimating the volume of the food from the picture and utilizing nutritional fact tables to measure the amount ofcalorie and nutrition in the food item.

IX. FUTURE SCOPE

For the future scope, before recognition, we can process segmentation. On the food item and it can work on CNN algorithm. Be that as it may, a huge-scale dataset is expectedto train the CNN and even a well-trained network cannot havea segmentation accuracy of 100%, which will grow the errortate of recognition. In this manner we can manufacture a bigger dataset by manual determination to improved result. We can even make sure the processing time of the image of the food item is reduced thereby a better accuracy for the colorful images of the food product. It is not always possible to implement each algorithm using transfer learning as some problems are dynamic in nature where the pre trained model would act as a disadvantage in that scenario. Here the SequentialNet would be the most appropriate choice for this type of scenario.

We can exceed the project to even processing the image of partial food item and thereby calculate the amount of food consumed and later part of the food left should be consumed by the user according to the respective diseases or requirement of the user for which they are using the application. Basically, this research project can be converted to an application project in all.

In this system the recommendation for the user works well until and unless there is a proper internet

connectivity available. If the user lives in a rural area, the application “FoodNosh” will not work up to the expectation. Thereby, storing the data of the food items in the database will be difficult in that case of the user and this will stand as a drawback for the system.

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Enhanced Machine Learning Approach to Predict Movie Success

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Abstract— Predicting movie victory is invariably a favored research topic in the film sector. ML algorithms in film sector have been adapted to modeling economic accomplishment. Hit rate of movie is of extreme importance because millions of dollars are devoted in making each of the movie. In such a case, prior understanding regarding success or failure of a movie will help the production houses and distributors as these forecasts will present idea of how to go with promotions, ads. we are using stacking approach of Ensemble Machine Learning in this paper as it gives more accurate prediction and has capabilities to well-perform on wide range of classification models. Thus it gives best results for movie prediction.

Keywords— Machine Learning, Forecast, Stacking, Movie success, Ensemble Machine Learning Algorithm

I. INTRODUCTION

Movie Success Prediction plays crucial role for producers for investment purposes. Knowing this will also help in further future decisions making. Related to this, upto now many researchs has taken place. In this paper, we suggested the Enhanced method for Movie Success Prediction and Ensemble Machine Learning Algorithm. The Paper is divided into different parts: Related work, Data Preprocessing, Methodology, Conclusion, Future Work. Using Ensemble Machine learning, we can combine predictions from two or more machine learning models on same dataset. It consists of base- model and meta-model. Base-models makes the hypothesis of the prediction and meta-models provide a clarification to hypothesis made by base-models. Support vector machines, neural networks, random forest algorithm, etc. can be used as a base and meta-model. Meta-model can be used for training.

II. LITERATURE SURVEY

Title	Author	Research Gap/Limitations
Pre-release	Parimi R., Caragea D.	Classification of new set of instances required for entire training everytime. Information learnt previously by model cannot be used further.
Predicting Success Bollywood Movies Using Machine	Sameer Ranjan Jaiswal,	No need to learn model again and again which was done in above model. It gives outcome

Learning Techniques		on the basis of mean predictions from subset tree.
A Machine Learning Approach to Predict Movie Box-Office Success	Nahid Quader, Dipanker Chaki, Osma nGaniand Haider Ali	It cannot predict the success before release as it requires pre and post release features.
Bollywood Movie Success Prediction Using Machine Learning Algorithms	Ashutosh Kanitkars	Feature scaling required, expensive from computation point of view, cannot handle missing data. Different features included in this paper which are not in previous papers.
Movies Success Prediction Using Machine Learning Algorithms and their Comparisons	Rijul Dhir, Anand Raj	Dataset containing linearly seperable features cannot be used and requires more time for training model. Handle missing values, no feature scaling required , less impacted by noise.
Predicting Bollywood Movies Success Using Machine Learning Technique.	Garima Verma, Hemraj Verma	Model is overfitted when the dataset is highly dimensional, sensitive to outliers. Useful for dataset with linearly seperable features, Less training time.
Predicting Movie Performances by Machine Learning Methods	Jong-Min Kim , Leixin Xia , Iksuk Ki, Seungjoo Lee and Keon-Hyung Lee.	Not suitable for closed loop networks.

Table.Comparison Analysis of different models.

Prediction models and mechanisms can be used to

predict the success of a movie. In this, proposed work is to develop a model or systems based upon machine Learning techniques which will help in predicting the success rate of a movie that results in minimizing uncertainty.

[1] Huge amount of data available acts as a superhighway to make the motion pictures billionaire business. This research proposes a decision support system which helps in movie investment sector using machine learning techniques that helps stockholders to prevent themselves from financial loss and gives accuracy of 84.1% for pre- released features and 89.27% for all features

[2] The authors applied SVM and Neural network on dataset for forecast. Profit is used as a basis for Movie's box office victory. Researchers show that almost 25% of movie receipts comes within the first or second week of its release. So, it is difficult to predict a movie's box-office success before its release date. Two types of features called pre-released features and post-released features are used here. Only pre-released features are considered to predict the outcome of a next movie. After releasing a film, both pre-released and post-released features will be considered for further cogitation and gives accuracy of 84.1% for pre-released features and 89.27% for all features

[3] The authors used classification and regression algorithm with the dataset containing such 16 features for predicting the success of Bollywood movie over box-office, before a movie is actually released along with the factors such as impact of movies released before week, no. of holidays present in first week of release of movie. It compares different classification and Regression algorithm in short ANN is best regression technique and KNN is best classification technique.

[4] The authors used logistic regression algorithm with the dataset containing 3 predictors to give an binary outcome to predict the movie being a Hit or Flop, before its release. Using Logistics Regression algorithm, a supervised machine leaning algorithm, it uses Music Rating of a movie as a predictor.

[5] Authors used a Bayesian variable selection method to select important variable to ROI which has not been studied in the previous movie industry researches. With the selected important variables, we analyze and compare quantile regressions, multivariate adaptive regression splines, support vector machine, and neural network methods to form an accurate forecast model of ROI using major film forecasting variables. So, the benefaction of their research proposes their strategy combining Bayesian variable selection and machine learning methods which includes quantile regression when they have an extremely skewed ROI data because there are many films with a low ROI, and some are very successful.

[6] Authors scrutinize various approaches to increase the functionality of the prediction model. Firstly, from the hypothesis of transmedia storytelling a new attribute had evolved. Such hypothesis-driven attribute discretion not only enhances the prediction

accuracy, but also increases the intelligible of a prophesy model. Further, an ensemble approach had used, which has hardly ever been acquired in the research on predicting box-office performance and finally, the proposed model, Cinema Ensemble Model (CEM), exceeds the prediction models from the past studies that use machine learning algorithms. They concluded that CEM can be largely used for commercial specialist as a robust tool for boosting commitment-making process.

[7] In this paper, Authors applied machine learning tools to develop a model which can determine if a Bollywood movie will be fortunate or not, before it is released. They gathered data from various sources like Cinemalytics, BoxOfficeIndia, YouTube and Wogma. They used a unique feature like music score of Bollywood films and highly enhances the accuracy of prediction. They differentiated the prediction in two categories, Hit and Flop. After evaluation of various classifiers, Bagging algorithm was used for developing the model.

[8] Authors presented a approach to establish a graph network between movies, thus reducing the movie independence assumption that most famous learning algorithms make. Here, Transductive algorithm is used with movie network for creating attributes required for classification. Thereafter, a classifier is learned and used to classify new movies with respect to their predicted box- office collection. This concludes that the given used method enhances the classification accuracy as compared to a fully independent setting. From the previous papers, we have seen every method has its own advantages. Thus, we combined the qualities of all and suggested the most optimized approach for accurate results that is stacking method in Ensemble Machine Learning Algorithm.

III. DATA PREPROCESSING

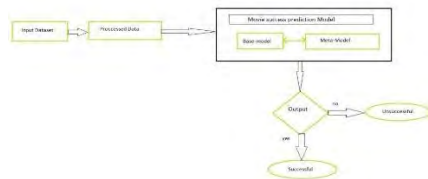
The data is collected through different sources and then combined in a particular form for preparing Dataset. We can also use different Datasets available at different online Platforms. Then the dataset is changed to CSV, HTML or XLSX formats. After this, all important libraries are imported and then the dataset is imported. For the Data Exploration to make accurate conclusions and inferences it is important for a data to be accurate. Thus, to fulfill this objective we perform Data Cleaning. In this step, we identify and handle the missing values. There can be numerous ways to do this. For example, if any independent variable containing the integers values contains one missing value, then it can be replaced with the mean of all values. The Missing categorical values are replaced by that value which is most occurred in the feature/column. For many of the computations in Machine Learning, we require the data to be in values. Hence, their arises a need to convert a categorical data into numeric data. Then next step is splitting of dataset, which is done order to evaluate the performance of Machine Learning Algorithms.

The available dataset is divided into two parts- first is Training Dataset used to fit the model whose predictions are already known. Second is Test Dataset which is used to evaluate unknown new input which is compared with the values in Training Dataset. Here, we can choose different split percentages either 80%-20%, 50%-50%, 60%-40%, etc. depending upon your convenience. Lastly, we perform normalization to handle the independent features in the dataset.

IV. METHODOLOGY

In this paper, we have described the working of Ensemble Machine Learning Algorithm. Here, we have taken a dataset containing features of movie like name of actor, actresses, produce, director, music composers, etc. along with their no. of hit and flop movie status. These are the unique features present in the paper which were not previously introduced. Thereafter, the preprocessing and data selection takes place. Data selection enables to quickly produce the results for required machine learning algorithms by eliminating useless features.

Next step after this is to load our data into Ensemble Algorithm, it will either give prediction output as Successful or Unsuccessful by considering base and meta-model. Here, we can also use Random Forest as base model or other Algorithms to make model more accurate and precise. Predictions of Base-model are taken as a input for training of meta-model and output is produced.



V. CONCLUSION

The greatest benefit of the proposed approach is that, it has achieved the greatest accuracy among all other proposed approaches.

VI. FUTURE WORK

Extending this work to future, we would like to introduce Sentimental Analysis in this. This will be very much beneficial to predict success rate of movie before release. There is huge crowd of people who watches trailer of movie before spending money on ticket. After the trailer of the movie is released on sites like YouTube, with the help of Sentimental Analysis reactions of audience can be captured and used for the predictions.

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DevOps Project Artifacts Management Using Blockchain Technology

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Abstract. There has been continuous improvement in software development technologies since 1960, as businesses want to build software cheaper and faster. DevOps being major project methodology helps to increase number of software releases but at the same extent security, trust between stakeholders is getting reduced. In software development, project artifacts, files are electronically stored highly sensitive and private information related to the project, industry, product needs to be frequently shared among peers. Sharing of these files, records between stakeholders is very challenging because the data might be revealed or tampered during the operational process, also access of every stakeholder need to be tracked. To address these challenges, a blockchain based system is the key solution. In this research, how blockchain technology can help in better project data management is discussed and proposed a blockchain based records management system for efficient file management also sharing and tracking of project artifact records. We have implemented a prototype of DevOps Project Artifacts Management System using permissioned blockchain platform Hyperledger Fabric. This system ensures privacy, security and easy accessibility and availability of all project artifacts.

Keywords: *Hyperledger Fabric, SDLC, Blockchain, version control, decentralization, DevOps, Continuous Monitoring, Continuous Integration.*

I. INTRODUCTION

The software development industry is exceptionally becoming complex, tremendous and dynamic day by day. Software development is an essential aspect of the business and is legitimately affected by some elements, including developing complexities, economic situations, changing innovation drifts just as software development improvement challenges. Organizations develop software projects are facing difficulties for making decision of picking the correct software development method [1]. They originated from the first and oldest SDLC model that is waterfall method, and their range grew significantly, it is change resistant. The scope of SDLC models is dictated by the wide range of product types-starting with the development of web applications to complex medical devices. Agile development came into play after the waterfall model. The problem with Agile methodology came into picture when things started to get difficult for the organizations who took up client services. There was very less coordination between the teams from all levels, specifically teams those were responsible for developing the service (development team) and the teams responsible for bringing the service into delivery phase/ production phase onto the customer's hand (operations team). The

operations team was not on the same pace as the development team. So, for some organization work standards, Agile methodology was found not enough [2]. DevOps is a new development technology which has emerged from Agile Methodology with collaboration between development and operations teams in every stage of life cycle. DevOps is an IT culture, it consists of various practices and the approaches that influence organizations in organizing teams, build systems and influence even the structure of the systems that you build [3]. It is software development practice in which developers and operations people work together in each stage of DevOps life cycle from development stage to production but most of the time, work is in a centralized environment in which the availability of service is not guaranteed in the presence of malicious users. In project development artifacts, files need to be carefully maintained and their track record will be stored on secured platform also it helps to create trust in this network so it avoids blame game situation. If any document is changed, then latest version should be available at each stakeholder involved in process. Improving the security, privacy, management, tracking and efficient sharing of project artifacts is the main focus of our work. Considering the recent privacy and security needs, there is a need of blockchain based efficient and secure system that can ensure secure data storage, easy data access and also ensure province to updates. We have employed permissioned blockchain technology i.e. Hyperledger fabric. Using these technologies, it is possible to create business solutions to accelerate business processes with great potential and significantly it can reduce costs. Especially in solutions where there is a need for secure, reliable and unchangeable documents in this proposed framework, where transactions are done between individuals or organizations. At an application level, even cloud systems are centralized, hence, the need for a decentralized system at the same time not compromising on security is more apparent.

II. BACKGROUND

2.1 Blockchain

Blockchain, a Distributed Ledger which is peer-to-peer, approved by consensus, is used to make business processes more secure and transparent [4]. Consensus algorithm is defined in the Smart Contracts of the Blockchain, i.e., program that automatically executes predefined actions when certain conditions in the system are satisfied. The immutable history of records maintained in the Distributed Ledger defines data

authenticity and security in the system. Computers connected to each other without a server, essentially constitute a peer-to-peer network, thereby increasing the security since there is no single point of failure. Transactions are admitted into a block only if all the peers agree to it, and all peers have access to all the records of transactions performed in the network [4].

2.2 Hyperledger Composer

Hyperledger Composer is one of the important and quickest developing activities facilitated by The Linux Foundation. It is a framework as well as an open development toolset for creating Blockchain applications quickly. Hyperledger Composer generally makes simpler the process of Blockchain use case design and deployment and radically reduce the development time from months to weeks. One of the important points of Hyperledger Composer is that it is fully open source with an open administration model that permits anybody to contribute towards the project. Hyperledger Composer supports and lives on the top of existing Hyperledger Fabric Blockchain frameworks and runtime, which helps into consideration of pluggable Blockchain agreement censuses to ensure that the transactions are approved by the policy defined by the assigned business network participants. Hyperledger Composer gives an improved area specific modeling language for demonstrating business network (Assets, Participants, and Transactions) and JavaScript for executing exchange rationale. Model documents can be written in any improvement platform but a basic electronic device called Composer-Playground. It simplifies the work by aiding the turn of events, pressing, deployment, testing of the tasks and an order line utility for scripting. Applications can be sent to the occurrences of the Hyperledger Fabric or reenacted locally in the internet browser. Hyperledger Composer takes into consideration making web, portable or local Node.js applications. Hyperledger Composer likewise incorporates composer-rest-worker (Based on Loopback innovation) to naturally create REST API for business network and hyperledger-composer code age module for Yeoman framework is utilized to produce a skeleton Angular application. Hyperledger Composer additionally has a rich arrangement of JavaScript API's to manufacture local Node.js applications[5][6].

2.3 Hyperledger Caliper

Hyperledger Caliper (GitHub, 2018) is an performance assessment benchmark framework for Blockchain and is one of the Hyperledger projects facilitated by Linux Foundation. Hyperledger Caliper permits clients to quantify the exhibition of various Blockchain solutions with predefined set of cases and create reports with a lot of execution test results. Reports delivered by Caliper contain a lot of execution metrics, for example, transactions per second (tps), transaction latency, resource usage and so forth. Caliper as of now supports following Blockchain based frameworks: Fabric, Sawtooth, Iroha and Composer. Hyperledger Caliper

design involves three Node.js layers viz: Benchmark Layer: It contains predefined benchmark test cases and pluggable benchmark module. Interface and Core Layer: It involves Blockchain NBI (collection of basic Blockchain interfaces) for installing, invoking and questioning Blockchain, Resource Monitor for observing assets (processor, memory and so on) use, Performance Analyzer for dissecting execution indicators (latency, throughput and so forth) and Report generator for producing html based reports. Caliper NBI gives activities that are needed to speak with backend Blockchain framework. Further more NBI can be utilized to compose tests for numerous Blockchain frameworks. Adaption Layer: It makes an interpretation of Blockchain NBIs into Blockchain (DLT) conventions. Hyperledger Caliper works in numerous stages. Beginning phase being Preparation stage wherein test setting is set up by introducing smart contracts. The subsequent stage is Tests Execution stage where undertakings are relegated to customers for running predefined experiments which can either be transactions count based or length based. The last stage is Performance Analysis stage where all the test results are assembled for report generation[7]. In the following sections of the paper, discussions on related work in the realm of Software Development Cycle Models, DevOps and Blockchain shall be briefly explored in Section II to understand the shortcomings of the current systems. Section III on proposed framework will explain the methodology employed in the paper to address the research gap. Section IV on Implementation and results, the implementation provides a demonstration of the proposed solution, followed by Section V, the paper concludes with future scope.

III. RELATED WORK

Now days industries are getting influenced by DevOps culture in which production servers are trying to make more releases per day. It is becoming race to increase number of releases per day per hour but security is getting less attention in this race. Without adequate involvement of the security team, rapidly deployed software changes are more likely to contain vulnerabilities. Project data like artifacts, configuration files, code repositories is critical and highly sensitive private data. This data needs to be frequently shared between the participants of the software development team. Sharing of these data between participants is very challenging because the data need to be used by concerned authority also it is useful to create trust among stakeholders using province of modification. So, there is serious need of innovation in the current project development environment like DevOps so that update or access to any file in tracked on immutable storage, files need to be stored on secure platform and decentralized way to avoid request bottlenecks. In the recent few years many authors have tried to strengthen DevOps Continuous practices as they have become an important area of software engineering research also some authors have tried to highlight the challenges of the software development practices and claimed that there are several challenges and gaps which require future research work.

Authors have classified the approaches and associated tools to facilitate continuous integration, delivery and deployment by using systematic view where in there are some try to the build and test time in Increase visibility and awareness of build and test results in CI, support (semi-) automated continuous testing, detect violations, faults, and flaws in Coadress security and scalability issues in deployment pipeline, improve dependability and reliability of deployment process.[9] Zaheer uddin Ahmed et all have tried to improve security by adding one more stage in devops stages after continuous testing by introducing security gate with tool Snyk for dependency checks and Commonly known Vulnerabilities[10] Authors have carried out review on five different businesses to find out DevOps effects and challenges, DevOps adoption and implementation in organizations that is observed to be non-trivial because of required changes in technical, organizational and cultural components. Challenges in DevOps high need of knowledge, Blurred responsibilities between development and operations, Difficulties in convincing senior control, Lack of common understanding [11]. Versioning Strategy for DevOps Implementations, covers the identity of artifacts, versioning tools, version naming conventions and traceability between artifacts variations. Also, it is attempted to convey documentation artifacts (requirements specification, diagrams, etc) and source code artifacts under version control. They have used semantic versioning approach to split distinct versions. Research study on Factors inhibiting the adoption of DevOps in large enterprise identifies the five primary elements hindering the adoption of DevOps, particularly: loss of strategic plan from senior management; lack of knowledge around DevOps; chance of disintermediation of roles; resistance to change; and silo mentality. Silos are departments employee that have a tendency to be characterized by way of a breakdown in communication, coordination and cooperation. It is vital to comprise control feedback, check and track progress against the strategic targets [12]. So, to improve security practices, it is necessary to create an environment whereby an unscheduled or unauthorized change will be identified and corrective action will be taken and the goal is to create a culture and environment that will increase delivery speed through automation and reduce costs

IV. FRAMEWORK SELECTION AND IMPLEMENTATION

4.1. Framework Selection

Before we design a blockchain system we first need to decide the type of blockchain that should be used, that is permissionless blockchain or permissioned blockchain. Here are some reasons that why we prefer Hyperledger which is permissioned blockchain over Ethereum permissionless blockchain. Permissionless blockchain in which anyone can join the network anonymously without permission, that can be problematic. In case of proposed system, identities of all participants of the network must be known. Therefore, it makes sense to use

Hyperledger that is a permissioned blockchain platform and where the identities of every participant are known. Ethereum uses proof-of-work (PoW) algorithm which is computationally expensive consensus mechanism that require lot of resources for mining and involves fees for transaction execution that could limit the usability of the system. On the other hand, Hyperledger which is a permissioned blockchain uses consensus mechanism that are not computationally expensive.

4.2. System Implementation

We have developed proposed system using permissioned blockchain for efficient storage and tracking of files which provides better security and privacy of data. Figure 1 presents the architecture of the proposed system. This application focuses different type of users: Administrator, Director, Project Manager, Developer, Tester. Administrator will be responsible for the registration of Director and other users. Framework includes Membership Management, interfaces to interact with the application, peer nodes for consensus mechanism also they hold smart contracts, blockchain and state database. Membership provider ,administrator registers users to the membership service. During registration, administrator should make sure that only valid user should be register in membership service. The membership service uses a certification authority to generate key pair for signing and encryption key pair for every user. When any stakeholder perform any transaction like create project, update files ,upload files and view files ,they issued with a symmetric encryption key (Patient Key) which is used for encryption/decryption. The front end of web application is written in HTML, CSS ,JavaScript and ReactJS. All stakeholders will use their cards to login to the system. Consensus mechanism is most important part of our blockchain application as it verifies transactions. All peers those take part in the consensus mechanism runs a consensus algorithm to check whether a transaction is valid or not. If certain number of endorsements peers reaches a consensus then transaction will be successful and then the transaction will be added to the blockchain. Here in our system we have set a network that will consists of two organizations with four peer nodes that will act as endorsing peers and committing peers simultaneously and single orderer node that will provide the ordering service. Out of these four peers three peers must reach a endorsements consensus for transaction to be successful to be added to the blockchain. Every peer node will hold blockchain known as ledger to store immutable transactions and the chaincode-business logic along with its world-state database. We have used state level database in this implementations to have simple query. All peer nodes can execute the transaction according to implemented chaincode logic. After successful execution the endorsing peers send the endorsement responses that is read write set to the client. Then client sends the transaction attached with endorsement response to the orderer which runs the ordering service. Then ordering service receives the endorsed transactions and forms the orders to create a

block. Once block is created then it will broadcast the generated block to all peers. Every peer need to verify that the transactions of the received block are signed by appropriate endorser and that enough endorsements are present (proposed system needs 3 endorsements out of 4 peers must reach the consensus). The data is stored in the distributed ledger of Hyperledger Fabric, which stores in two ways: the ledger means blockchain that contains the chain of blocks with each block holding transaction information in the form of key value pair and world state level database that stores value of all the last committed transactions according to the specific key. Here , it is not feasible to store all large data files in the blockchain as it largely degrades the performance of whole blockchain system. So, the blockchain will only hold transaction information and the World Sate database will hold data values (actual data files are stored on InPlanetary File System IPFS) which is distributed file storage. stakeholders can see if any changes that have made to the record. Following diagram 2 shows DevOps phases with the type of document created and can be stored in Blockchain.

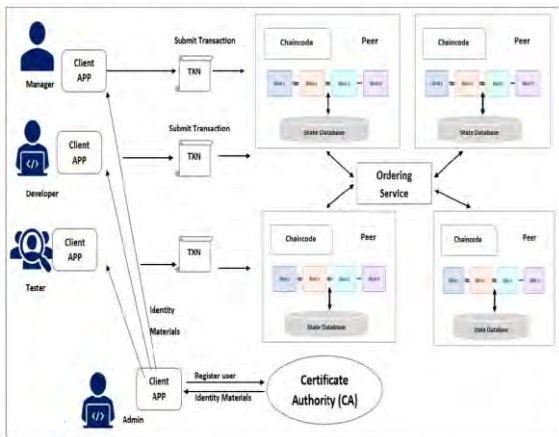


Figure 1: Architecture of Proposed System

These types of documents can be stored on blockchain so that their immutability can be achieved and all updates to them can be tracked to create trust among stakeholders of the DevOps methodology.

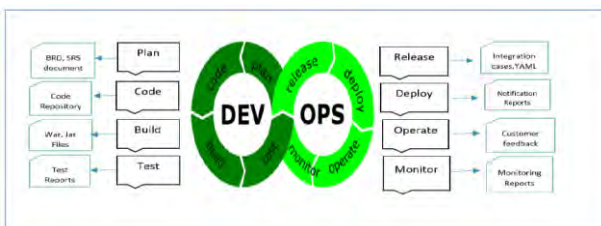


Figure 2: DevOps phases with type of document on Blockchain.

By introducing Blockchain into the solution, it is ensured that each change that occurs in DevOps environment is being logged into the blockchain.

4.2. System Functionality

Proposed system implementation is divided into two parts, Continuous development and continuous Operations. Continuous development covers the DevOps stages: planning, continuous development, Continuous

integration and testing. Continuous Operations involve continuous Operate, deployment, delivery and monitoring. Major functions in which project can be maintained are used to store software development artifacts on immutable storage so that project efficiency is increased.

Create Project : Initially project will be created by manager or admin.

Create User: In this operation ,admin creates user in which user gets uidentity materials like key pairs and certificates. Using certificate or card, user can login to the system.

Add User to Project : Once project is created then manager can add collaborators or team members to it .Only team members will be able to work on the files in that specific project.

Create File : The blockchain runs on Hyperledger Composer which is linked to the front-end ReactJS through the REST server using REST-API. It ensures superior control for the network administrator and the security of the system. Files or artifacts can be created by using corresponding tabs on front end .

Update File : If any of the stakeholders wants to update any file then he can get that file from blockchain based version control.

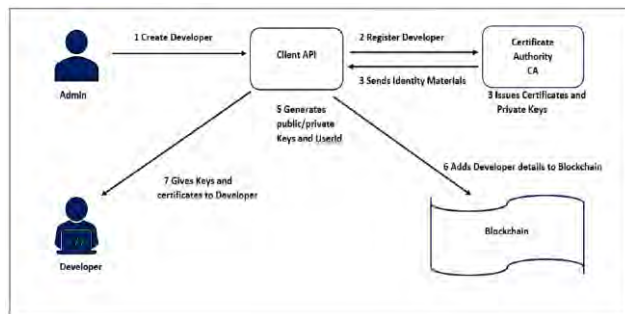


Figure 3: Process flow for creating user

We are using hyperledger fabric permissioned blockchain ,so all the users need to be registered before access is given to the system. In this system initial rights are given to admin to registers the stakeholders .When any user registered to the system ,he will be given identity materials like kiys and certificates. In this system cards are generated and those cards can be used to login to the system Figure 3 explains the flow of patient registration process. Admin send details to the membership providers which is implementation of Certificate Authority. User's Certificate and Private Key will be issued by Certificate Authority and will be sent to the client app.

Advantages of proposed work

If proposed methodology can provide following advantages. All documents history can be traced and province of any change is easily achieved. All heterogeneous, remote stakeholders can be brought

on single platform.

- All documents are stored on blockchain in tamperproof way.
- It will try to avoid blame game situation occurrence in development process.
- All latest updates can be easily available to each stakeholder so eventually fast software delivery process.

V. CONCLUSION AND FUTURE SCOPE

This paper aimed to put a state-of-the-art solution to curb and overcome the issues faced by the current software development lifecycle like DevOps, which are consolidated by the Hyperledger Fabric blockchain system very well. The imbue ment of Blockchain into the DevOps framework makes it auditable, traceable, tamper-proof, with little to no scope for fraudulence. This framework unites artifacts needed for software development under a single decentralized peer-to-peer platform, gives access to the all the stakeholders involved in the software development and creates a robust platform for DevOps from continuous development to continuous deployment by distributing it over a Blockchain, making each file transparent, authenticated and secure. File access, modification, maintenance is transparent and immutable due to the Chaincode and hence makes it forge-proof against inside as well as outside attackers or malicious users. The incorporation of the proposed framework in a in an environment of rapid software development and deployment, a well-designed, risk-based DevOps delivery implemented then it will empower compliance, enhance controls, streamline and redesign key delivery processes. This, in turn will increase an organization's

productivity and agility. This idea can also be strengthened by making it interoperable with combining different blockchain platform networks.

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Maturity Detection of Tomatoes using Deep learning

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Abstract— Agriculture 5.0 primarily constitutes the use of artificial intelligence & robotics as a hybrid technology, that can automate a major portion of agriculture. Artificial intelligence will provide a cognitive skill to a computer to detect the plant disease of various eatables such as fruits & vegetables that can lead to a potential loss of crop. Also the maturity, that is ripening status of these fruits and vegetables can be estimated to decide harvesting time or plucking of fruits and vegetables. There are numerous ways to estimate the ripening status, such as based on size, shape, texture, or color. Most of these features can be captured with image or video and decision making is made possible by applying deep learning and artificial intelligence. After the decision making the fruit or vegetables can be plucked with a robotic arm.

In this paper, we have demonstrated the use of artificial intelligence to detect the fruit or vegetable maturity specific to Tomato. We have created a customized data set of images of tomatoes and used the python script and Open CV-Library to deploy the algorithm using Google Colab.

Keywords— Deep learning, CNN, Faster R-CNN, YOLO v3

I. INTRODUCTION

Artificial Intelligence is one of the most hiking & superior technology nowadays which has limitless applications. Some of the major technologies in agriculture using artificial intelligence are autonomous tractors, agricultural robotics, controlling pest infestations, soil and crops health monitoring, AI-based drones on fields, precision farming with predictive analytics and many more [1].

UN report has predicted that the world might face a food supply crisis, due to a mismatch between the population growth & fruits and vegetable growth [1]. So, we need to increase the growth of fruits and vegetables. To achieve this we need to increase the speed of farming i.e. need to do fast farming. Fast farming with precision can be achieved with the help of cut-edge technology one of which is an artificial intelligence with robotics.

Particular features such as object detection or classification of different fruits or vegetables can be done using machine learning / deep learning - neural networks, but the accuracy and losses vary for different models and it's algorithm. Every technology has its deep classification such as neural networks has convolution neural networks (CNN), Recurrent neural network (RNN), Modular neural network (MNN), Feedforward neural network (FNN), Region-based Convolutional Networks (R-CNN), Radial basis function neural network, Multilayer perceptron, Sequence to sequence models, and YOLO (You only look Once), whereas machine learning is divided into supervised machine learning, unsupervised machine learning, reinforcement learning and more. But in general, deep learning – neural networks work better for images and videos i.e. for 2D & 3D data whereas machine learning works better for particular collected data i.e. mathematical data or numeral data.

We have used tomatoes as a primary object to investigate its maturity level and the machine learning model of tomatoes is prepared for detecting its maturity in three levels. These three levels are classified as:

Level-1: Unripened (growing stage) – 0 to 50%

Level-2: Ripened (eatable/usable stage) - 51 to 100%

Level-3: Damaged

These levels of maturity will help farmers to decide right harvesting time in automatic mode and also this may assist the robotic arm to pluck the right fruit or vegetable. This may be a part of precision agriculture which may improve decision making for harvesting time.

II. IMPLEMENTATION

We have used CNN and YOLO over our created customized datasets for training and testing of it.

Using CNN

Initially, we used CNN, which is a class of neural networks that is based on shared-weights architecture and translation invariance characteristics. CNN image classifications take an input image, process it and classify it under certain categories.

Figure 1 shows the architecture of the CNN model, which trains and tests each input image by passing it through a series of convolution layers with filters (Kernels), Pooling, fully connected (FC) layers and apply SoftMax function to classify an object with probabilistic values between 0 and 1 [2].

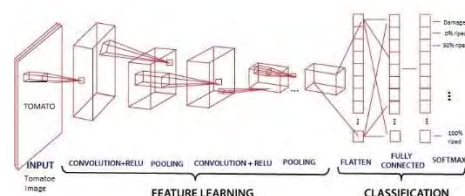


Fig. 1. CNN Flow Diagram.

CNN model over our dataset

Figure 2 shows the CNN model built on our dataset consisting of 3064 images which we used for training and 1306 images for validation followed by which we have splitted this dataset into training (70%) and testing (30%). We referred and extracted the “Fruits 360” dataset which consisted of 131 different classes of fruits and vegetables and further included our custom data into it.


```

Model: "sequential"
Layer (type)                Output Shape                Param #
-----
conv2d (Conv2D)             (None, 148, 148, 32)      896
activation (Activation)     (None, 148, 148, 32)      0
max_pooling2d (MaxPooling2D) (None, 74, 74, 32)        0
conv2d_1 (Conv2D)          (None, 72, 72, 32)        9248
activation_1 (Activation)   (None, 72, 72, 32)        0
max_pooling2d_1 (MaxPooling2 (None, 36, 36, 32)        0
conv2d_2 (Conv2D)          (None, 34, 34, 64)        18496
activation_2 (Activation)   (None, 34, 34, 64)        0
max_pooling2d_2 (MaxPooling2 (None, 17, 17, 64)        0
flatten (Flatten)           (None, 18496)              0
dense (Dense)               (None, 64)                 1183808
activation_3 (Activation)   (None, 64)                 0
dropout (Dropout)          (None, 64)                 0
dense_1 (Dense)            (None, 4)                  260
activation_4 (Activation)   (None, 4)                  0
-----
Total params: 1,212,788
Trainable params: 1,212,788
Non-trainable params: 0
    
```

Fig. 2. CNN model.

Here, we used different featuring layers such as MaxPooling 2D, Convolution 2D and ReLU, followed by flattening layers and FC layers and finally applied SoftMax activation function over it. We also used some dropout layers (data augmentation) to counter the issue of overfitting.

Flow Chart of the CNN model:

Figure 3 shows the flowchart of our CNN model which is generated as per shown in Figure 2. This flowchart is generated to help visualize what is going on inside our model while training images and thereby analyze its work flow in a simple and abstract way.

Traning of CNN model.

Figure 4 shows, how we trained the dataset for 20 epochs, where we observed a drastic reduction in loss from 0.6484 in the first epoch to 0.0767 in the last (20th) epoch, whereas an exponential increase in accuracy from 74.06% till 97.40%.

```

Epoch 1/20
75/75 [=====] - 9s 126ms/step - loss: 0.6484 - accuracy: 0.7406
Epoch 2/20
75/75 [=====] - 9s 126ms/step - loss: 0.3192 - accuracy: 0.8907
Epoch 3/20
75/75 [=====] - 10s 127ms/step - loss: 0.2387 - accuracy: 0.9180
Epoch 4/20
75/75 [=====] - 9s 126ms/step - loss: 0.1850 - accuracy: 0.9481
Epoch 5/20
75/75 [=====] - 9s 126ms/step - loss: 0.1539 - accuracy: 0.9520
Epoch 6/20
75/75 [=====] - 10s 127ms/step - loss: 0.1487 - accuracy: 0.9580
Epoch 7/20
75/75 [=====] - 10s 127ms/step - loss: 0.1077 - accuracy: 0.9633
Epoch 8/20
75/75 [=====] - 9s 124ms/step - loss: 0.1457 - accuracy: 0.9487
Epoch 9/20
75/75 [=====] - 9s 122ms/step - loss: 0.1171 - accuracy: 0.9609
Epoch 10/20
75/75 [=====] - 9s 122ms/step - loss: 0.1211 - accuracy: 0.9587
Epoch 11/20
75/75 [=====] - 9s 125ms/step - loss: 0.1293 - accuracy: 0.9636
Epoch 12/20
75/75 [=====] - 9s 123ms/step - loss: 0.0683 - accuracy: 0.9798
Epoch 13/20
75/75 [=====] - 9s 125ms/step - loss: 0.0750 - accuracy: 0.9733
Epoch 14/20
75/75 [=====] - 9s 124ms/step - loss: 0.1285 - accuracy: 0.9616
Epoch 15/20
75/75 [=====] - 10s 129ms/step - loss: 0.0948 - accuracy: 0.9717
Epoch 16/20
75/75 [=====] - 9s 125ms/step - loss: 0.1015 - accuracy: 0.9700
Epoch 17/20
75/75 [=====] - 9s 126ms/step - loss: 0.0800 - accuracy: 0.9751
Epoch 18/20
75/75 [=====] - 10s 128ms/step - loss: 0.0836 - accuracy: 0.9773
Epoch 19/20
75/75 [=====] - 10s 128ms/step - loss: 0.0692 - accuracy: 0.9767
Epoch 20/20
75/75 [=====] - 10s 129ms/step - loss: 0.0767 - accuracy: 0.9740
    
```

Fig. 3. Training of CNN Model

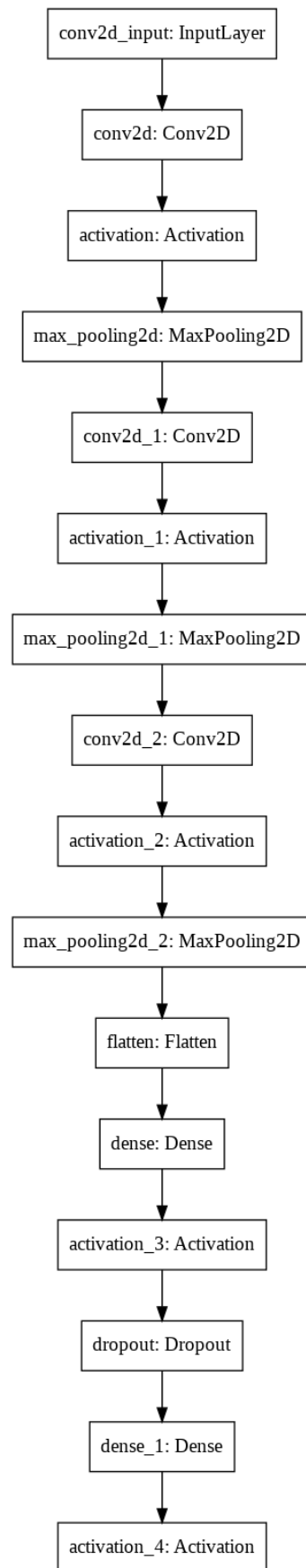


Fig. 4. Flowchart of CNN model for customized dataset.

Using YOLOv3 (You Only Look Once *version3*) CNN object detection algorithm uses regions to localize the object within the image, but in YOLO a single convolutional network predicts the bounding boxes and

accordingly assigns class probabilities for these boxes as shown in the figure 5. In YOLO, we take an image and split it into an $S \times S$ grid. We take m bounding boxes within each of the grid. The network provides a class probability and offset values, for each of the bounding box. Bounding boxes having the class probability greater than a threshold value is selected which is further used to locate the object within the image. Compared to other object detection algorithms, YOLO is faster as it is of faster magnitude (45 frames per second), which differentiates it completely from other models [6].

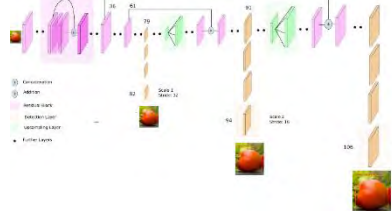


Fig. 5. Yolo v3 Architecture.

Bounding box prediction & cost function calculation

The network predicts 4 coordinates for each bounding box, t_x, t_y, t_w, t_h . If the bounding box prior has width and height p_w, p_h and the cell is offset from the top left corner of the image by (c_x, c_y) and the, sigmoid function $\sigma()$ then the predictions correspond to:

$$\begin{aligned} b_x &= \sigma(t_x) + c_x \\ b_y &= \sigma(t_y) + c_y \\ b_w &= p_w e^{t_w} \\ b_h &= p_h e^{t_h} \end{aligned}$$

YOLOv3 uses logisticts regression for predicting score for each object detected and places a bounding box. If the bounding box prior overlaps a ground truth object more than other bounding boxes, the corresponding detectness score should be 1. The default predefined threshold for bounding boxes is 0.5. For other bounding box prior with overlap greater then default threshold, they incur no cost. One boundary box is assigned to each ground truth object prior only. If a bounding box prior is not assigned, it incurs no classification and localization lost. It just incurs confidence loss on objectness. t_x and t_y are used to calculate the loss [6].

Feature Extractor Network (Darknet-53)

The network used in YOLOv3 is a hybrid approach between the network used in YOLOv2(Darknet-19) and the residual network, so it has added advantages of both coming up with some short cut connections. It has 53 convolutional layers as shown in Figure 6, so they call it Darknet-53. Darknet-53 mainly composes of 3×3 and 1×1 filters with skip connections as the residual network in ResNet [6]. In computing, the measure of computer performance mainly in the fields of scientific computations requiring floating point calculations i.e. more accurate measures that is called FLOPS (Floating Point Operations Per Second). ResNet-152 has more BFLOP (billion floating-point operations) than Darknet-53, still Darknet-53 achieves the same classification accuracy that to 2x faster.

	Type	Filters	Size	Output
1x	Convolutional	32	3×3	256×256
	Convolutional	64	$3 \times 3 / 2$	128×128
	Convolutional	32	1×1	
	Convolutional	64	3×3	
	Residual			128×128
2x	Convolutional	128	$3 \times 3 / 2$	64×64
	Convolutional	64	1×1	
	Convolutional	128	3×3	
	Residual			64×64
8x	Convolutional	256	$3 \times 3 / 2$	32×32
	Convolutional	128	1×1	
	Convolutional	256	3×3	
	Residual			32×32
8x	Convolutional	512	$3 \times 3 / 2$	16×16
	Convolutional	256	1×1	
	Convolutional	512	3×3	
	Residual			16×16
4x	Convolutional	1024	$3 \times 3 / 2$	8×8
	Convolutional	512	1×1	
	Convolutional	1024	3×3	
	Residual			8×8
	Avgpool		Global	
	Connected		1000	
	Softmax			

Fig. 6. Network of Darknet 53 [6].

Custom object dataset

We built a dataset consisting of 3500 images of 3 classes namely ripped, unripe and damaged tomato. We gave annotations to each image as per the YOLO model required (in .txt format). We made a configuration file and customized it according to our model requirements setting max-batches to 6000 (i.e. 2000 * number_of_classes).

III. RESULTS

Results using CNN

We tested our model over some images captured from our laptop camera using the OpenCV library and achieved the result as shown in Figure 7 and also tested some images which were taken randomly whose result is shown in Figure 8.

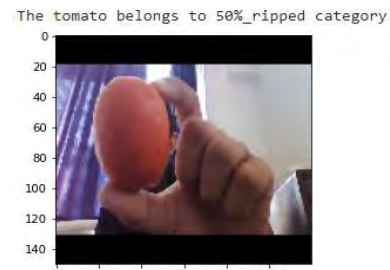


Fig. 7. Result of CNN

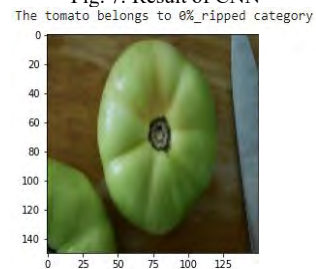


Fig. 8. Result of CNN

Figure 9. shows the accuracy vs loss graph of our CNN model. We can observe from this graph that accuracy of our model is better and consistently increasing whereas loss decreasing as the number of epochs increases.

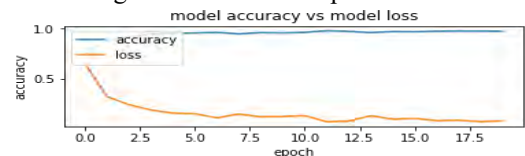


Fig. 9. Accuracy Vs Loss graph of our CNN model

From figure 4. , we can see that our CNN model is taking 9seconds/10seconds on each epoch for training which is very time-consuming, and thus it's hard to implement it in real-time applications. CNN object detection algorithm use regions to localize object within the image, so to counter these problems of CNN, we used YOLOv3 model for detecting maturity of tomatoes.

Results using YOLOv3 (You Only Look Once version3) We classified the ripening, unripe and damaging of tomato with great accuracy for ripening being 99.2%, unripe being 94.34% and for damaged being of 90.23% as shown in

Figure 10 and Figure 11. Thus, the YOLOv3 model performed better than the CNN model in terms of accuracy, loss, and mainly the time constraint, while considering the detection of tomatoes as individuals (single tomato) as well as in overlapped regions.



Fig. 10. Result of YOLO



Fig. 11. Result of YOLO

We have achieved exponential growth in our accuracy and have reduced loss from 4.87 in the first iteration of training till 0.039604 in the last (6000) iteration which can be seen referred from the Figure 12 graph.

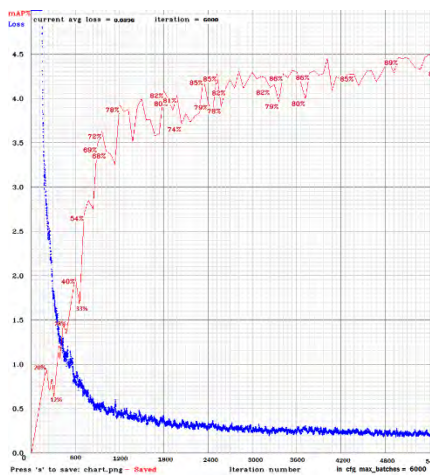


Fig. 12. Accuracy while training the model

Table. 1. Result comparison of both models

Original Image	CNN Output	Yolo v3 Output

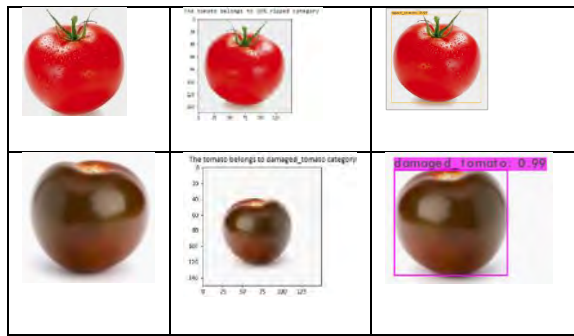


Table 1 shows us the result comparison of both CNN and YOLO v3 model over same images, whereas Table 2 and Table 3 depicts the average confidence level and average loss occurred after prediction over both the models Table. 2. Comparison of decision making and average confidence level

Actual Category	No of Images Tested on	CNN – Output		Yolo v3 - Output	
		No of right decisions	Avg Confidence level	No of right decisions	Avg Confidence level
Unripen	8	6 Unripen	91%	8 Unripen	95%
Ripen	12	9 Ripen	98%	11 Ripen	98%
Damaged	3	1 Damaged	83%	2 Damaged	91%

By observing Table 2 and Table 3, we can see that average loss and confidence level/accuracy of YOLO v3 is much better than CNN.

Table. 3. Loss Comparison of both techniques

Model	Loss
CNN	0.6484
Yolo v3:	0.039604

IV. CONCLUSION

Present work confirms the fact that detecting the maturity of tomatoes at different levels can be achieved using deep learning models CNN and YOLO with an average accuracy of 90.67% and 94.67% respectively.

Proposed work is based on the maturity level of the tomatoes. Initially, we used CNN model for training the dataset. So, we made our custom dataset by using some of the images from the fruits 360 datasets and by adding some of our images. We trained this custom model which consisted of 4 different classes for tomatoes and got a good training accuracy of 97.40% as shown in Figure 4. By doing this, we got a rough idea that this dataset can be used for classification. But due to time constraint of our CNN model, which reached approximately 9 seconds per epoch, we preferred YOLO model. Yolo v3 has a rate of more than 40 FPS along with which it provides faster execution and also has very subtle complexity which concluded us for it being the best fitted model in all the measures. So, from all the research and analysis, we get to know that the Yolo v3 can be also used for detecting the maturity of various fruits or vegetables as we did the same for tomatoes and can be further deployed into agriculture application.

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Copy-Move Forgery Detection of Digital Images using Window Based Feature Matching Approach

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Abstract: Nowadays many software is available which help us to modify or edit images. Hence the task of identifying whether an image is original or forged is becoming increasingly difficult. One of the main forgery technique is a copy-move forgery (CMF). Various methods are available for detecting CMF. The best method currently used is a mirror-reflection invariant feature transform (MIFT). Existing MIFT suffers from a high false-positive rate (FPR). This limitation of existing MIFT is elevated by proposing a new window-based feature matching technique to reduce FPR. The proposed method outperforms in terms of efficiency and accuracy.

Keywords: Multimedia forensics; Image forensics; Copy-Move Image Forgery; SIFT; MIFT; Zernike Moments.

I. INTRODUCTION

Nowadays, the authenticity of digital images plays an important role in many areas such as criminal investigation, medical imaging, journalism, news agency, forensic investigation, etc. Currently, hardware, as well as software both, are available for image editing. Images can be easily captured and modified with the help of digital cameras and open-source tools without leaving any visible traces. So, authenticity and integrity of digital images image forgery detection is the process of identifying whether an image is original or forged need to be checked. Digital image forensics is an active research area nowadays [1].

Digital image forgery detection techniques are mainly classified into two types' active methods and passive methods. In an active method, some prior information like a digital watermark and digital signatures are embedded in an image at the time of data acquisition. Any tampering done with the contents of an image can be easily detected with such a method. Whereas passive methods work in the absence of protecting techniques. They do not have any prior information inserted into the digital image which makes the detection process much harder. They detect forgery traces by analyzing the binary information of the digital image.

The three main categories of image forgery are image splicing, image retouching, and CMF [2, 3]. In image splicing, two images are combined. In image retouching, some sort of lightning or blurring is applied. Whereas in CMF a portion of the same image is copied and moved to another area of the same image. The research work in this paper belongs to CMF [4].



Fig. 1. First fake image [7]

The concept of CMF came into the picture with the appearance of the very first fake image. In the 1840s H. Bayrad created his own suicide image (Fig.1) [7]. In the 1860s another fake image came into the picture. In this image, the head of A. Lincoln was copied over J. Calhoun (Fig. 2) [8].



Fig. 2. Another fake image [8]

In CMF a portion is copied and pasted in the same image. Before pasting various pre or post-processing operations can be performed [6]. These operations can be scaling, rotation, deformation, blurring, or reflection which makes the detection process difficult because the texture, noise component, and color pattern are similar to the rest of the image. One of the examples of CMF is shown in Fig. 3.



Fig.3. An example of CMF [5]

II. RELATED WORK

The author in [10] introduced SIFT. In SIFT firstly the scale-space is generated and then with the help of derivative of Gaussian key-points are extracted. These key points are then matched for forgery detection. This method is efficient and works almost for all kinds of post-processing operations. SIFT is not suitable for mirror reflection and also fails for the flat region. X. Bo, et al [11] used SURF (Speeded-up Robust Features). SURF gives a key-point description and works on robust

features. Forgery is detected with the help of Haar wavelets. The drawback of this method lies in the localization of the tampered region. Jaber Maryam et al [12] proposed MIFT and [13] defined it. MIFT and SIFT are similar, except for a few changes which make it mirror reflection invariant. The descriptors are changed based on the direction of reflection.

II.1 Summary

The above methods have some limitations as SIFT fails for reflected images. SURF fails in localization. MIFT fails for repetitive structure. The overall limitations are listed below:

- 1 The problem in detecting a small copied region.
- 2 Localization is difficult.
- 3 Time and accuracy need to be improved.
- 4 The problem in detecting a forgery in a repetitive region.

III. PROPOSED METHOD

We propose a system to detect copy-move forgery in almost all types of images i.e. images having post-processing as scaling, rotation, and reflection. MIFT is a reflection invariant. The framework of the proposed method is shown in Fig. 4.

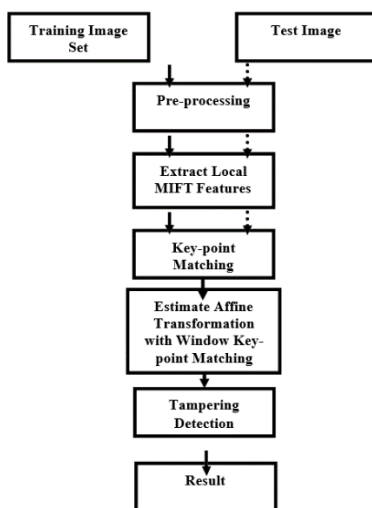


Fig.4. Proposed Method Framework

Pre-processing

In the pre-processing phase, the images are converted to grayscale as our further processing is based on gray images.

Extract local MIFT features

The features are extracted in the same way as proposed by [15] with some modifications to make it a reflection invariant.

The reflection can be in any of four directions up, down, left, or right. The two important directions are left and right. Directions up and down have the same order of bin orientation. Our main aim is to choose between left and right. The formulae to choose is as below: [13],

$$m_r = \sum_{k=1}^{(N_b-2)/2} L(n_d - k + N_b) \% N_b \quad (1)$$

$$m_l = \sum_{k=1}^{(N_b-2)/2} L(n_d + k + N_b) \% N_b \quad (2)$$

where N_b number of orientation bins. n_d dominant orientation index. L_i gradient magnitude.

Key-point Matching

For key-point matching, we will first compute the dot product of descriptors generated from the above step with its transpose. The result is then sorted to bring similar descriptor values together. Finally, the Euclidean distance between neighboring key points is computed and if the distance is smaller than a predefined threshold value, the matching is found, and these key points are stored for further processing.

Estimating affine transformation

From the descriptors generated, clusters are formed based on hierarchical agglomerative clustering and grouped using Ward’s linkage method [1,9]. A tree structure is generated and clusters having a specified number of points are used. Finally, inliers (matched points) and outliers (mismatched points) are found through the Random Sample Consensus algorithm (RANSAC) [14]. The points which satisfy a specific equation are inliers and the remaining are outliers.

Window-based Feature Matching Technique

After applying RANSAC also it is observed that detected image regions may contain mismatches, and this can be removed by using the proposed Window-based feature matching technique. This matching technique is an optimization technique, which eliminates false matches from the detected forged region in an image.

This is for eliminating all the key points which are still there and does not belong to the cloned region. To remove those key points proposed method is applied as follows.

Define the detection window for original and duplicated regions

The method starts by searching for key-point outside a small window centered at the detected key point to avoid finding the nearest neighbors of a key point from the same region.

Matching the key points

The matching will be done by calculating the nearest neighbor once a matching candidate has been found, it is accepted as a distinct matched point. The technique uses a distance threshold. A pair of points, p_{ia} (image a, Pts1) and p_{ib} (image b, Pts 2) is an inlier only when the distance between p_{ib} and the projection of p_{ia} based on the transformation matrix falls within the specified threshold. The distance metric is calculated as follows:

$$d = \sum_{i=1}^{Num} \min (D(p_i^b, \varphi(p_i^a : H)), t) \dots \dots \dots (3)$$

Increase in detection window size

As to find the correspondence in duplicated and original region areas the window size is gradually increased to fit all the true key points. The detection windows are resized horizontally and vertically to cover the key points

Finding the correspondence

The above steps are performed iteratively for locating the true duplicated region by discarding the false matches. The iterative process delivers more correspondences by covering a larger area inside the

located duplicated area. It is considered as a distinct matched key point if the ratio of the distances from the first and second nearest neighbor is smaller than the threshold. The threshold can vary from 0 to 1 a threshold closer to zero yields a more accurate result and is utilized to reduce false matches.

The iteration will go till it reaches the following condition:

$$pi < \text{threshold}$$

Where pi is the number of inliers in a region

Tampering Detection

If there are inliers, then tampering is detected, and it is localized in an image. All the outliers which are detected by the proposed window-based feature matching are removed that helps us to reduce the false-positive rate.

IV. EVALUATION PARAMETERS

The proposed method is evaluated by considering the parameters, TP, the number of tampered images, successfully “detected as tampered”. FP, the number of images falsely, “detected as tampered”. FN, the number of images falsely, “detected as non- tampered”. From these three parameters Precision, recall and F-measure are computed. Precision is the probability of the exact forgery detection while recall is the probability of forged image detection.

$$\text{Precision}(P) = \frac{TP}{TP + FP} \quad (5)$$

$$\text{Recall}(R) = \frac{TP}{TP + FN} \quad (6)$$

F1 is obtained by considering both precision and recall.

The higher the F-measure better the method performs.

$$F - \text{measure} = \frac{P * R}{\alpha * R + (1 - \alpha) * P} \quad (7)$$

V. EXPERIMENTAL RESULTS

To test the efficacy of the proposed method is evaluated on the CASIA v2.0 dataset. The CASIA v2.0 dataset has a total of 3469 copy-move forged images, out of which 1759 are tampered images and 1710 are non-tampered images. From both classes, 70% of images are used for training the classifier and the remaining 30% of images from both classes were used for testing in all experiments. The robustness of the proposed method is analyzed by considering the parameter: precision (P), recall (R), and F-measure and compared with the existing MIFT [12] method as shown in Table 1.

Table 1. Table captions should be placed above the tables. Comparison between the detection accuracies (%) of the proposed methods and existing MIFT [12] method.

Method	Proposed Method	MIFT [12]
Tampered Image	1759	1759
Non-Tampered Image	1710	1710
TP	1348	1076
TN	1687	1674

FP	23	36
FN	411	683
PRECISION (%)	98.32	96.76
RECALL (%)	76.63	61.17
F-MEASURE (%)	86.13	74.96

(4)

From Table 1, it can be observed that the proposed method outperforms the existing technique. The proposed window-based feature matching technique eliminates false matches from the detected forged region in an image. Hence improves the performance.

It also indicates that the proposed method is robust and consistent against all post-processing operations. Post-processing operations like scaling, rotation, reflection, and any combination of post-processing operations are accurately detected by the proposed method. As shown in Fig.5. post-processing operation performed on an image is: A2- reflection, B2- scaling and rotation, C2- rotation, D2- reflection, scaling and rotation.

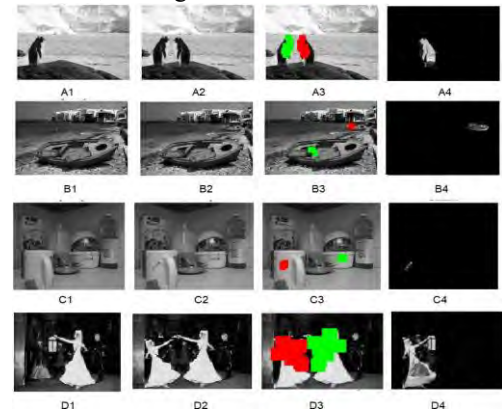


Fig.5. Detection results of the proposed scheme. From left to right, the four columns show the original images, the forged images, detected results using the proposed scheme, and the ground truth of the forged regions, respectively.

Irrespective of different post-processing operations the proposed method accurately detects a forgery in an image. The existing methods are not able to detect forgery if the copied region is small in nature, the proposed method detects it. From the literature, it is observed that the localization of the forged region is not properly done. The proposed method localizes the forged region accurately as shown in figure 5 In the localization part, the red portion shows the tampered region and a green portion is an original part of the image.

VI. CONCLUSION

This paper focuses on the detection of copy-move forgery in digital images. The main focus is to improve detection accuracy by reducing FPR. Therefore, proposed a new window-based feature matching technique that eliminates false matches from the detected forged region in an image. Hence improves the performance. From the results, it is shown that the proposed method effectively detects multiple forgeries and accurately locates the forged areas in an image also it is robust against all post-processing operations like scaling, rotation, and reflection. Furthermore, the

detection performance of the proposed technique is reasonably good than the existing standard copy-move forgery systems [12], in terms of Precision and Recall.

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Object Detecting Artificial Intelligence (ODAI)

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Abstract—The artificial intelligence and the machine learning are one of the hot topics right now in all around the world in the Technology. When we saw movies or cartoons like Iron man and Batman and their awesome technology we got amazed by this all and in Iron man, he has his own personal Artificial Intelligence which is Jarvis and we got so much fascinated by it and want to know, how actually can machine learn or understand to see or read like a human and also understand it. So, our project is based on the same thing but in this project, we select only one part to work with which is Object Detection. In this project we are trying to creating one small system which can identify and classify the objects in the real world and not only that it can also do that identification process with the real time footage. Also, we are trying to fit all Objecting Detecting System in the mobile application so, we can use our smartphone to detect the object in the real time. We are mainly focusing on the android based application because of the users' number. So, this is basic outline of the Object Detecting Artificial Intelligence (ODAI).

Keywords- Object Detection, Real-Time Object Detection, Object Detecting A.I., Neural Network, CNN

I. INTRODUCTION

There is lot innovative inventions developed in last few decades and still new and new technology is coming and changing our lives and making our work easy compared to the past. The most fascinating technology which comes to this world is the machine which can do calculations different processes and other many things digitally and that machine is computer. Then after invention of the computer the growth in researching the new innovation just sky-rocket and many new gadgets come to life like, camera, cell phones and other cool stuff which makes our work very easy. They just change the way of doing day-to-day daily work and also saves our somuch time. With help of computers the research in the A.I. field get more attention and more and more people getting interest in this new and fascinating technology field. Then many researchers and people make their own versions of theartificial intelligent machine which is can perform different types of processes respectively. Then with help of cameras and cell phone the research in the machine learning area gets the boost and people are doing very awesome job and creating more and more cool stuff. Now, there are lots of methods created by the researchers all around the world.

The Object Detection is just one part or one area in the machine learning field and artificial intelligence. The object detection is very important and also basic step to teach machine how to see and detect things. There are so many and different types of object detection models like YOLO (You Look Only Once) [1], SSD (Single Shot Detector) [2], etc. The above models use the deep learning network method which is also called as or also known as Convolutional Neural Network (CNN) [3]. In this method, the image or footage is given to the network and from that input the features or main highlighted things get extracted and with the help of the those extracted features the training is given to the system and then the model gets created. The CNN is

very powerful method to create the any object detection model. This method is now mainly used in most of the new machine learning models because of its flexible functioning.

The model in this project is mainly focused on the real- time footage and because of that the objects or the things in the real-time footage is moving and we need to identify those moving objects perfectly and correctly and for that reason the Convolutional Neural Network is used in this project. The CNN can identify those objects correctly and can extract the necessary features which are required for the training the model.

II. LITERATURE SURVEY

In order to detect the object from the input which is the image or video or any real-time footage first, we need to remove the unnecessary noise means the unwanted information which is not related to the data that we wanted for the training purpose. The same process is needed for the video footage like the image. We have to avoid unnecessary information from the video but this time it's little bit complicated than the image input. In video input, we don't that much control on the data compared to the image data. In image we can get lots of images of the data on which we want to do the training but in video there is lot unnecessary information like background or the things which are not included in our training goals. The real-time footage input is most complicated but at the same time same as the video input. The difference between the real-time footage input and video input is that, in real-time input we have to perform the all-detection processes in the real-time means now, and in video input the footage is pre-recorded. Following is the basic structure of the detection and tracking system which is used mostly.

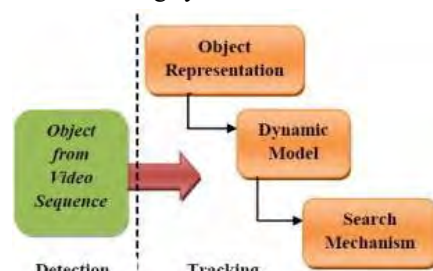


Figure 2.1 : Object Detection and Tracking model.

1) Video Target Tracking Project

In this video target tracking project, they created very decent type of model which can track the desired subject/object in the video as mentioned in target goals. The functioning of this project looks simple but it's very challenging and comparatively tough. In this project they first get the video input from their data storage then that video input is then passed to important function which is the target identification then it extracts the features from that video which related to the desired target or the set goal. After all that main thing happened which is, the training of the model, the training is done with the help of the features extracted from the video and then with help of training dataset training is done.

Then model can classify the desired target from the video and it can track that target throughout the video which is given to that model.

This video target tracking project is mainly divided into few steps which are important to track the target in the video are as follows which is shown in Fig.2.2

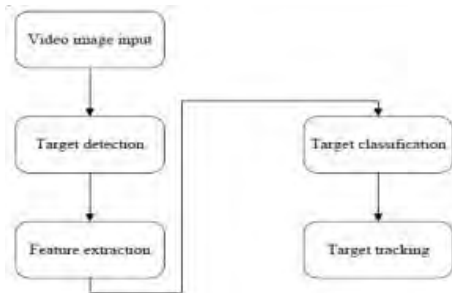


Figure 2.2: The process of video target tracking.

2) Moving object detection Using CNN Project

This moving object detection using CNN project is just similar as that of the previous project but in this project, they used the CNN technique to for detection and tracking functions. This project is more accurate than that of the first project which is mentioned above. The CNN is very useful for the feature extraction, with help of the CNN we can more accurately target the feature and filters to identify the desired object in the video. In CNN we can modify the algorithm based on our desired output then it will extract that exact features from the given data. The footage has the 2- dimensions so the it's much more easy compare to the 3- dimensional footage. This project uses the more advance technique to identify and detect the object in the video footage.

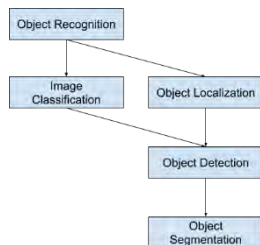


Figure 2.3: Types of CNN used for object detection model

3) Real Time Object Identification Using Neural Networkwith Caffe Model Project

In this real time object identification project [4], they perfectly demonstrated the very accurate implementation of the object detection system. This real time object detection technique is very accurate and more powerful than the previous two object detection models. This project also uses the CNN for the identification and tracking processes. But this project is very useful also it's much-much more valuable because this project has covered the very major problem or issue which many object detecting systems facing and that issue is solve by this project and that point is the "Real Time" object detection which is very difficult to do and very complicated to process. This project perfectly solves and demonstrated solution for that problem, they used the SSD (Single Shot Detector) which helps them in making in this model also this technique improves the accuracy of the model effectively. To use SSD in project effectively, they needed to learn the VGG16 model which contains the basic structure of a series of layers. That basic structure of series of layers of VGG16 is as

follows in Figure 2.4.

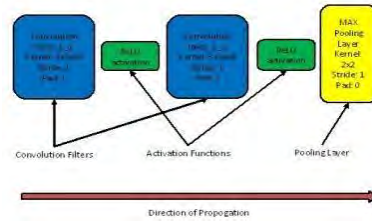


Figure 2.4: Basic structure of series of layers of VGG16 With that base VGG16 the complete functioning of the network and the needed additional feature layers are get established, that complete model of the SSD is introduce bythe Liu et al [3], which is represented in the following Figure 2.5.

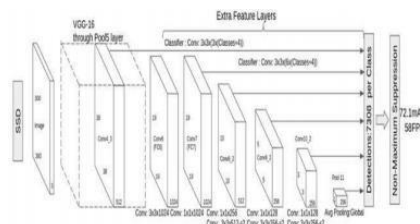


Figure 2.5: SSD300 with breakdown of layers.

III. PROPOSED METHODOLOGY

There are lots of complications in the object detection field and to solve to issues it's so complicated journey and after so many years of research we are now here, where we can detect the object in the real-time footage also, with the very high accuracy. The accuracy of the detection models before few years was very terrible compared to now and they were so poorly optimized and they can only detect object form still footage which is image. But nowadays object detection models can detect the objects in the real-time footage which is directly live footage which is captured by the various devices. As you can see in the below image, how nowadays object detecting model work. In the below example the model can detect the cat very easily and precisely also it gets further training and now it can identify the dog, cat and duck from the mix image of animals. This is the power of the object detection technology. The following image displays the full implementation of object detection inFigure. 3.1

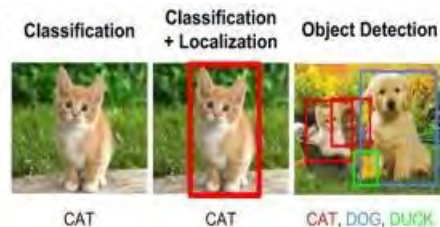


Figure 3.1: Object Detection.

The all the basic structure of this object detecting model is made up of the Convolutional Neural Network which is commonly known as the CNN. All the important stuff in this model is done by the CNN and may sound easy but it's very big and complicated. The process sound simple which is firsttake input and extract the footage and then train the model with the help of that data to identify the things then optimize that model for more accurate predictions and then use this model for predictions or object detection in the real world. The CNN is the one of the best technique which is used in

the machine learning which gives researchers more flexibility in their work and gives more ease of work.

3.1 Object Detecting A.I. Model Details

Our proposed system usage CNN (Convolution Neural Network) framework for object detection.

Convolution: It sends the image or the footage to the certain sets of the convolutional filters which then will extract the features from the given data which is image or any footage.

ReLU (Rectified Linear Unit): The ReLU is very important part in the object detection model training, this ReLU helps the model in training to do it more effectively and faster. This is also referred activation.

Pooling: The pooling is also one of the parts the object detection technique. The pooling makes the sampling process very simple and reduce the number of parameters which model needs to learn. This whole process consists of ten or hundred operations which are repeated and each layer is learning new feature. This model basically consists of two main parts within itself and the name of those parts are Object detection and Tracking respectively. The complete view of the CNN is represented in the following Figure 3.2.

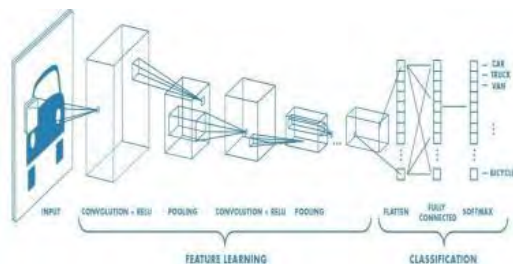


Figure 3.2: Complete view with CNN Layers

Our proposed system is as follows, in this project, we first take the input which is the footage which can be any format like image, video or real-time footage. Then this input which is the footage is send for the processing and then In this system, the video is feed to the system as an input. Frames are extracted for further processing. Then with the help of detection and tracking algorithms which are the two main things needed for this project, this footage is processed and in that process the features which are required to get the desired object tracking and detection. Those object detection steps are explained in detailed below. This object detection is also depending on so many factors and it's very important but very complicated part in this all process.

In this project, we used the TensorFlow lite because we are aiming to do all those object detection processes, which is our Object Detecting Artificial Intelligence (ODAI) model on the on small devices like smartphones. This is the only hardware where all the above related work lacks in that section and our model solve this problem. With the help of TensorFlow lite we can do all that heavy processing and put that all detection in the compact file and can easily run on phone.

3.2 Object Detecting A.I. Processing Steps

These are the steps which are required to create this Object Detecting Artificial Intelligence (ODAI):

- S-1: First, we need to load the necessary packages.
- S-2: Next we need to construct the necessary basic structure.
- S-3: Then we need to create the data with correct labels

for the training purpose and then we need to create boxes for those each classes.

S-4: Next, we need to load that trained object detection model and test it with testing data. Get the predictions and if any error, then improve the accuracy. Then after all this process we will get the final object detecting model.

S-5: then create the application for the smartphone with the help of android studio and TensorFlow lite and with the trained model.

S-6: install that application on the smartphone (For this project we create the app for android system only). Then start the app and run it, and face the camera to the object to which we want to detect and classify, the app will detect that object in the real time.

The Object Detecting Artificial Intelligence (ODAI) processing steps workflow is represented with the help of the following Figure 3.3



Figure 3.3: Processing Steps For ODAI.

IV. APPLICATIONS

- 1) Augmented Reality Gaming could improve to next level
- 2) Teaching machines for some work
- 3) Facial and Image Recognition for Social platforms as well as for security purposes. Identity Verification Through Iris Code
- 4) Searches can now be done virtually for enhanced product discoverability
- 5) Retail and Advertisement Industry might benefit from Image Recognition
- 6) Security Surveillance

V. CONCLUSION

There are lots of many other objects detecting model are created throughout the world by my people but all models even new models are limited to big machines like computers and mac but with this project we solve that issue and we try to create the object detecting model which can also run on the small devices like the smartphone. We mainly focused on the android system because of the number of users. Hopefully this new Object Detecting Artificial Intelligence (ODAI) will also bring change in this field.

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Using Deep Learning Techniques for the Classification of Slow and Fast Learners

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Abstract— Cognitive learning strategies are focused on the improvement of the learner's ability to analyze information in a deeper manner, efficiently handle new situations by transferring and applying the knowledge. These techniques result in enhanced and better-retained learning. In order to cater to the needs of different students having different levels of cognitive learning, it's very important to assess their learning ability. In this paper, a method based on deep learning is presented to classify the learners based on their past performance. This technique is taking the students past semester marks, their total failures in subjects/passing heads, and their current semester attendance. The proposed method classifies the learners into three categories namely slow, fast, and average learners. Deep learning classifier with Multi-Layer Perceptron based nodes is built for the classification. The proposed method is fully automatic and robust. The final accuracy of 90 % is achieved in the classification of the learners in their cognitive learning level.

Keywords—Deep Learning, Multi Layered Perceptron, Artificial Neural Networks, Neural Networks, Slow Learners, FastLearners, Classification, remedial Work

I. INTRODUCTION

The learning ability of a student plays a crucial role in the academics. Some students have got outstanding cognitive skills and they learn the concepts at a faster rate as compared to others. Some students face difficulties to cope up with the teaching learning process due to reasons such as low cognitive ability, low attendance, less time for the preparation due to preparation for the examination due to failure in other passing head. Teachers have to give special attention and remedial work to such slow learners. If they are identified in the early stages of the academic year, their performance can be improved significantly [1].

In this research work the case study of an engineering college affiliated to Mumbai university is considered, the institute follows a semester pattern. In order to prepare students for the better understanding of the concepts as well as to prepare them for the examinations and further hone their expertise, teacher has to know the students learning level. This process is quite tedious and after knowing students well the teachers can accordingly plan the activities for the students. In case of the semester pattern, there is less time for this acquittance period and it becomes a challenge to identify the cognitive learning level of the students.

Besides this, the various accreditation bodies such as National Assessment and Accreditation Council (NAAC) as well as National Accreditation Board (NBA) which are accrediting the higher education institutions also stress on the identification of the learning levels of the students and accordingly moulding the teaching learning process for them.

Machine learning enables computing devices to learn

without being explicitly programmed. This is a subdomain of the Artificial Intelligence (AI) that makes software programs or applications capable of precisely predicting the outcome. Deep Learning methods analyse the patterns in the data; further these patterns are modelled as complex multi-layered networks, this is the most general way to model a problem. This makes deep learning capable of solving difficult problems; which are otherwise not addressable by modular programming logic [3][4]. Deep learning refers to machine learning using deep (artificial) neural networks. There exist a couple of algorithms which implement deep learning using hidden layers other than conventional neural networks. The concept of "artificial" neural networks dates back to the 1940s. It consists of a network of artificial neurons programmed out of interconnected threshold switches. This network is referred as Artificial neural network and it can learn to recognize patterns like the human brain does [5].

For the classification of the learner as per their learning ability, conventionally a method based on a mathematical formulation was used in the institute under consideration. This method simply weights the Semester Grade Point Average Score and the Internal Assessment Marks. This method is quite simple and linear. A method based on the Deep Learning technique is proposed here. The proposed method is based on Deep Learning Technique, which uses a deep neural network to classify the students in Slow, Average and Fast learners. The performance of the proposed deep learning classifier is compared with other types of classifiers such as linear regression, Naive Bayes, decision trees and support vector machines.

II. SLOW AND FAST LEARNERS

The teaching learning process is highly dependent on the cognitive levels of the students. The methods followed, the assignments as well as the remedial work given to the students should be different for different levels of the students. In the report published by Hacettepe Üniversitesi Eğitim Fakültesi Dergisi (H. U. Journal of Education) [6] the influence of the constructivist learning approach on the cognitive learning levels of the students while learning trigonometry and on their attitudes towards mathematics was analyzed. The constructivist teaching learning process based on the students learning level was found to be better as compared to the conventional method.

Anees Sehar [6] performed a study that measured the cognitive levels of examinations questions to evaluate students' learning. Question papers from various teachers related to different subjects were collected for the analysis pertaining to the targeted cognitive levels. The analysis concluded that there are several teaching methodologies for

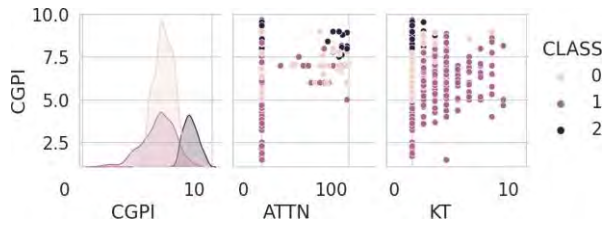


Fig. 1. The Correlation of Slow and Fast Learners Dataset

the teaching learning but the examinations were confined to the lower level of learning.

Koparan, Timur, and Bülent Güven [8] studied the effect of project-based learning approach on the secondary-school students’ statistical literacy levels and it was found that the project-based learning approach increases students’ level of cognitive learning.

In the current research the cognitive level assessment of students is performed to give a specific type of remedial work for the slow learners so that their understanding about the subject contents will improve, the fast learners will be given creative assignments to prepare them for the higher cognitive level assignments. Overall process is to boost student’s understanding about the subject and prepare them for the examinations as well as placements.

III. DEEP LEARNING FOR PATTERN RECOGNITION

Deep learning is a quite popular research domain with variety of applications. Several studies support the prominence of deep neural networks (DNNs) which exceed the performance of the previous leading standards in diverse machine learning applications [9]-[13].

Deep Learning is a set of machine learning methods designed to model data with a high level of abstraction without being explicitly programmed. Deep learning is derived from the articulation of architectures of various transformations in the nonlinear space [9],[14]. The rising interest in the deep learning research is mainly because of its conceptual as well as its technological advances. Factually, the available deep learning solutions based on the models learning are based on the consumption of immense reservoir of compute power. This huge compute capacity is made available through actual modern computers, as well as requesting the main processor (CPU) and the graphic dedicated processors (GPU) as well as cloud-based deployments [15]-[18].

Deep Learning, is considered to be the most significant innovation in the past decade in the field of pattern recognition and machine learning, has influenced the methodology of related fields like computer vision and attained enormous progress in both academy and industry. Deep learning solutions accomplished an end-to-end pattern recognition, merging previous steps of pre-processing, feature extraction, classifier design and postprocessing [19][20].

IV. PROPOSED SYSTEM AND IMPLEMENTATION

The problem under consideration is to classify a student in either of Slow, Average or Fast learner, given the

Cumulative Performance, Attendance in the current semester and total failures in the past semesters. For the classification problem of this kind, a training dataset is needed. The dataset used for this research work is explained below.

A. Description of the Dataset

For the current research a dataset of 1082 students is prepared, the dataset consists of the Cumulative Grade Point Average (CGPA) of the student, the attendance (ATTN) in the current semester till point of the evaluation and the number of failures (KT) till the current semester. The fourth column in this dataset is the class, for the training purpose the cognitive level of the students assessed by the teachers based on his/her performance is added. This data will be used for training as well as testing, using this data the class of the student has to be predicted as “Class 1- Slow Learner”, “Class 2 – Fast Learner” or “Class 0 – Average Learner”.

TABLE I. DESCRIPTION OF DATASET

Parameter	CGPI	ATTN	KT	CLASS
count	1081	1081	1081	1081
mean	6.5211	6.1173	0.67068	0.59112
std	1.23849	20.2052	1.37395	0.73237
min	1.47	0.05	0	0
25%	5.785	0.73	0	0
50%	6.446	0.8	0	0
75%	7.22	0.9	1	1
max	9.66667	100	8	2

The dataset elements and their correlation are shown in Fig.1, it can be seen, Three Classes and their candidate distribution can be seen there.

B. Deep Learning Model

Deep learning overcomes the challenges of classification problem’s workflow management by simplifying workflows while also improving accuracy, at least in many contexts. For the classification of slow and fast learners using deep learning, a Deep Neural Network using Multi Layered perceptron Nodes is used [21]. MLP are universal approximators and

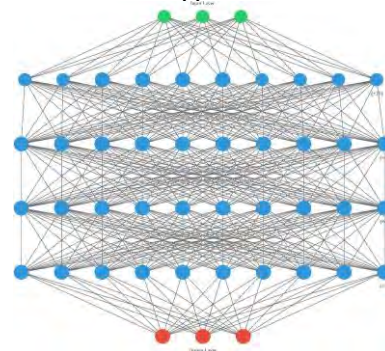
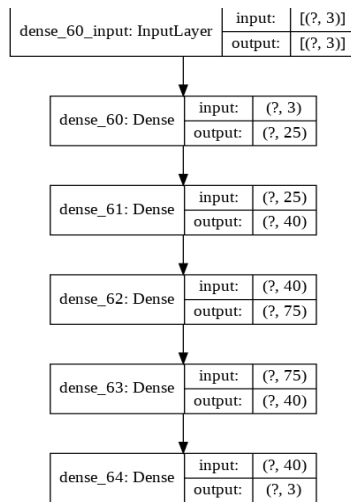


Fig. 2. The Architecture Visualization of Deep Learning Network Used for the Classification



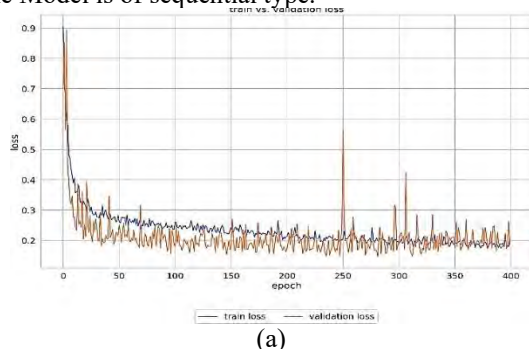
they are very good at modelling nonlinear functions. The multilayer perceptron finds common application in the classification and regression applications in many fields, such as pattern recognition, image, speech and biometric recognition and classification problems. The choice of the architecture has a great impact on the convergence of these networks [22].

For the implementation of the deep learning model, the Keras Deep Learning Library is used [23]. Keras Deep Learning Application Programming Interface is a high-level ANN library programmed in Python to build neural network models. The researchers do not have to work about the numerical techniques, tensor algebra and the mathematical aspects of optimization methods. The Keras library is built on TensorFlow 2.0 and can scale to entire tensor Processing Units (TPU) pods or a large cluster of Graphics Processing Units (GPU). The focus of Keras library is to facilitate experimentations by allowing researchers to go for quick prototyping. They can start from the simple design of model and quickly deploy the same in Keras with little delay to achieve the results, which is key for research. Keras gives huge advantage to the beginner developers, researchers and scientists. A person need not worry about low-level computations and directly delve into deep learning deployment using Keras.

A deep learning model having one input, three hidden layers and one output layer is designed in Keras. The network visualization is shown in Fig. 2. For the MLP nodes activation

Fig. 3. The Sequential MLP Deep Learning Model Visualization Plot

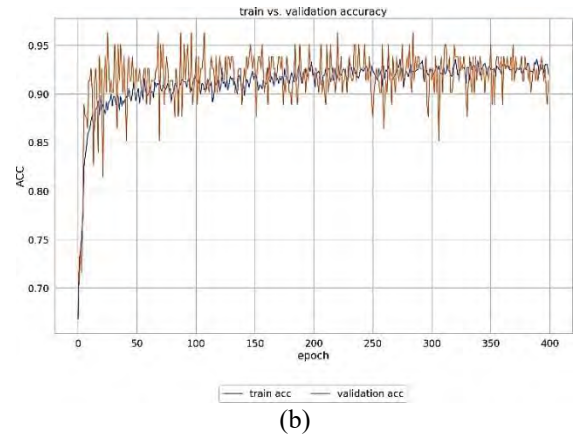
function used in rectified linear activation function (ReLU). The Keras model summary is given below. The Model is of sequential type.



(a)

Once the model is ready it is compiled and then trained.

For training purpose out of the 1081 student's data, 75% data is used for model training and testing and then the remaining 25% data is used for finding the accuracy. The deep learning network is trained with 400 epochs and batch size of '5'.



(b)

Fig. 4. Deep network Training Details – (a) Training and Validation Loss
(b) Training and Validation Accuracy for the Model Shown in Fig. 3

In the training phase the model has reached up to 95% accuracy, but the detailed analysis will be discussed in the next section.

C. Making the Model Robust to the variations in the data

One of the most common problem faced by the Deep learning researchers the overfitting of the model [24]. The overfitting means the model is virtually remembering the training data, and the performance of the of the model degrades on the real-life data, beyond the training set. This problem is solved by the regularization techniques. Regularization is a technique in which slight modifications are made to the learning algorithm so that the model generalizes in a better way. This results in the improvement of the model's performance on the unseen data [25]. To improve the performance of the current model addition of gaussian noise and dropout layers is done and the model is trained and evaluated. The results will be discussed in next section.

D. K-fold cross validation.

It is a general practice to use k-fold cross validation for the evaluation of the performance of a classification algorithm. A model's performance is given by the accuracy estimate and the reliability of the accuracy estimate is indicated by a relatively small variance over the various sets of input data. Several studies therefore recommended to repeatedly perform k-fold cross validation [26]. Cross-validation (CV) is a technique based on resampling procedure; this is used to evaluate machine learning models on a limited data sample. To implement CV, it is required to keep aside a sample/portion of the data; this sample should not be used to train the model, later this sample is used for testing/validating.

One variation of K-Fold CV is Stratified K-Fold approach. In this variation of k-fold cross-validation, stratified folds are returned, i.e., The labels are equalized to have a uniform variation. Each set containing approximately the same ratio of target labels as the complete data.

K fold CV has a single parameter referred as 'k' that indicates the number of groups that a given data sample is to be split into, hence the name K-fold cross validation. A specific value for k is chosen, e.g. k=10 becoming 10-fold cross-validation.

This procedure shuffles the dataset randomly, then splits the dataset in K-folds and on each such variation the model is tested and the final accuracy is averaged and the variance of accuracy is also calculated. For the evaluation of the model proposed in Fig. 3, K-fold cross validation with K=10 is performed for both the normal as well as regularized model. The results are given in the next section.

V. RESULTS

The Sequential deep learning model with and without regularization is implemented and tested in Keras. To compare the performance of the model other statistical classifiers are also implemented. The list is as follows

- Support Vector Machines (SVM) [27]
- Logistic Regression [28]
- Naive Bayes Classifier [29]
- K-Nearest Neighbors [30]
- Decision tree [31]

Fig. 5 shows the final performance of the Deep learning and the statistical classifiers implemented as per the discussion in Section IV. The classifiers were implemented in Keras on the Google Colab Platform [32]. Deep learning classifiers have given the best performance as they have the ability to model complex non-linear functions. The Deep Learning Classifier have given 91.51% accuracy while classifying slow, fast and average learners. The regularized deep learning classifier has given 87.08% Accuracy. Next best performance is given by Logistic regression, K-NN Classifier, Logistic regression, Decision tree and SVM. The regularization technique and K-Fold CV has further strengthened the findings and the observed performance range is up to 90% for the Deep Learning ANN Classifier. Finally, the best performance is expected from the regularized DNN classifier, the expected range is 87 to 90% of accuracy. The summary of these results is given in

Once the classifier is trained and tested, this model can be saved as a h5 file format. These models can be called in python script to predict the cognitive level of any student provided the required academic details are available. The code and the implementation for the above mentioned research is available at DOI: 10.5281/zenodo.4153494 [33].

VI. CONCLUSION

In this paper a method for classification of cognitive levels of the students based on their academic performance. The Deep learning-based approach presented here has given accuracy of 91.51 Percent, further this model was regularized, the accuracy of the regularized model was found to be in the range of 87 to 90%. K-fold and stratified K-fold cross validation was also performed on the models proposed. This process will automate the work of teachers to classify the

student's cognitive levels and they can plan their teaching learning activity accordingly to improve the understanding of the concepts at the students end.

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Technical Review of The Services Provided in The Passenger Facilitation System

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Abstract – People traveling to new cities for many reasons and want to find services according to requirements. As the requirements change from person to person and also with the reason for traveling the recommendations for the services of a particular area will also differ. The passenger facilitation system provides recommendations for every service such as accommodation, hotels, tourist places, medical centers, etc. This paper shows the study and working of passenger facilitation systems, recommender systems, and machine learning algorithms used in it. The new system is proposed based on the comparative study of various machine learning algorithms to suggest the best services to users according to his/her past experience and feedback.

Keywords: *Passenger, Facilitation, Recommendations, Machine Learning.*

I. INTRODUCTION

Everyone needs to travel to a new place. Some people travel for education, some travel for business, some for medical issues, and some people are tourists. Everyone has his/her own choices and these choices change with the reason for traveling. People should get the best facilities the way they want. For suggesting the best services to the visitors based on previous preferences and ratings passenger facilitation system is used. The passenger facilitation system is developed for visitors which is based on machine learning technologies. The user's data and previous ratings are used to recommend new services to the user. Also, data from similar users (having similar feedback for the same items or having the same preferences) is used for accurate results. This paper includes a comparative study of similar software that uses recommender systems and a detailed study of machine learning algorithms used in the proposed system.

II. LITERATURE SURVEY

1.1 E-tourism mobile location-based hybrid recommender system with context evaluation

This paper discusses the main latest tendencies for the design and development of e-tourism recommender systems. In this paper, the difficulties and unsolved problems were analyzed for use of location-based mobile e-tourism recommender systems. This research focuses on the development of a mobile location-based recommender system with context evaluation.

1.2 T-Finder: A Recommender System for Finding Passengers and Vacant Taxis

This paper presents a recommender system for both taxi drivers and people expecting to take a taxi, using the knowledge of 1) passengers' mobility patterns and 2) taxi drivers' picking-up/dropping-off behaviors learned from the GPSTrajectories of taxicabs.

1.3 An Artificial Immune System for job recommendation

This paper presents the Artificial Immune System which is a novel computational intelligence technique inspired by immunology. This paper presents a problem-oriented approach to design an immunizing solution for job recommendation problems. Finally, the corresponding computational model is presented.

1.4 A Comparative Study of Music Recommendation Systems

This research paper discusses how nowadays users have access to millions of songs available online. The problem of personalized music recommendation that it takes into consideration large amounts of data. The paper presents a comparative study of Graph-based Novelty Research On The Music Recommendation, Music Recommendation System Based on the Continuous Combination of Contextual Information, Smart-DJ: Context-aware Personalization for Music Recommendation on Smartphones.

III. INTRODUCTION

Before designing the system, we have studied the terms which apply to our system.

1.5 Recommender system

Recommender systems are the algorithms having the ability to make suggestions for relevant items to the user. There are three types of recommender systems: collaborative filtering, content-based filtering, and knowledge-based recommendations.

Collaborative Filtering Recommendation.

Collaborative filtering recommender systems give suggestions based on the preferences of similar users. It needs only the user's historical preferences on a certain item set. There are two techniques used in collaborative filtering viz. Model-based collaborative filtering and memory-based collaborative filtering. In a Model-based collaborative filtering rating, the dataset is used as a source. The information from the rating dataset is retrieved and used as a model to make recommendations. Clustering techniques are used to cluster users into similar groups and make suggestions based on group preferences to which the user belongs. Newly added information to the database is neglected by the system as there are no initial ratings available for those items. In memory-based collaborative filtering, similar users which have similar ratings for similar items are found, and then the target user's rating for the item in which the target user has never interacted is predicted.

Content-based filtering Recommendation. Content-based filtering uses item features to recommend other items similar to what the user likes, based on their previous actions or explicit feedback. Other users' feedback or preferences are not involved. Data for the recommendation process is obtained from item features and user profiles. The similarity between item feature and user profile is calculated and the item with the highest similarity with users' preferences is selected. User profile data is obtained in two ways: through explicit sources and implicit sources. Explicit data is the data which is given by the user to the system through the signup and implicit data is obtained from users browsing history, downloads, sub scare options, based on some limitations to content-based recommendation filtering. Recommendations are made based on only the users' profile without considering others feedback and preferences. Another limitation is the cold-start problem.

Knowledge-based recommendation. A recommender system is knowledge-based when it makes recommendations based not on a user's rating history, but on specific queries made by the user. Knowledge-based recommendations are not dependent on the rating, nor do they have to gather information about a particular user to give recommendations. Knowledgebase recommendation is a good choice for complex domains where no history or previous ratings are available. The data is collected explicitly when the user interacts with the system and is stored in the form of statements, rules, or analogies. For this data storage, two methods are used case-based reasoning and rule-based reasoning.

IV. COMPARATIVE STUDY OF A VARIOUS MACHINE LEARNING ALGORITHM

To find the best recommendation algorithm for the system to be proposed, comparative study of the various algorithms is done. Here a data set is selected from Kaggle and logs the customer behavior of Expedia users over time. The main aim is to predict what hotel cluster the user will book based on search attributes which are conduction on Expedia. ML algorithms used are:

1. Logistic Regression
2. Linear Discriminant analysis
3. Quadratic Discriminant analysis
4. Ada Boost
5. Gradient Boost
6. Decision Tree
7. Random Forest
8. The Aggregation Approach

In order to achieve better classification accuracy, the aggregation approach is used. The aggregation Approach relies on the count of historical booking and clicking history. Since the dataset is huge this approach exploits it by predicting the clusters based on the

frequency particular cluster was booked for the same search criteria. After performing all these techniques to the data set the accuracy is calculated foreach algorithm which is summarized in the following table:

Table 1. Performance of Machine Learning Algorithms

Type	Algorithm	Accuracy		Hyperparameters
		Feature# =7	Feature # = 2	
Decision Boundary + Logistic Regression	LDA	0.08679	0.05159	
	QDA			
	Logistic Regression	0.08171	0.04558	
Boosting	AdaBoost	0.19283	0.11066	learning_rate=0.1, n_estimates=50
	Gradient Boosting	0.18876	0.16578	learning_rate=0.1, max_depth=3
Trees	Decision Tree	0.16148	0.25906	max_depth=17
	Random Forest			
	Bagging	0.18613	0.25899	n_estimators=26
		0.18701	0.25895	n_estimators=26
Aggregation	Frequencybased	0.27***	0.31	click_relevance=0.30

V. CONCLUSION

- 1 Simple approaches like aggregation might perform better than classic ML algorithms in case of a huge dataset.
- 2 The aggregation approach gave MAPK of 0.31 whereas the traditional ML approach gave a MAPK of 0.26
- 3 The aggregation approach is computationally cheaper as compared to tree algorithms.

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EdMeet – An Android Application for Teaching and Learning

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Abstract – There was an outbreak of Corona virus in 2020. World Health Organization announced Covid-19 outbreak as worldwide pandemic on 11 March, 2020. The pandemic led to lockdown in the whole world. The schools, colleges, courts, restaurants, stadiums, parks and all other places were closed. The education of the students was at halt. Hence there arose the need for continuing the classes in order to avoid the loss that was incurred by students. At present time, the use of smartphones has increased rapidly and it has provided a way of being in touch with everyone online. Various schools, colleges and universities adopted the online mode of teaching. “EdMeet” is an android application that allows teachers to take classes online. Even if a student misses the class, he can watch the lecture later that is stored within the application. Teachers can take attendance of the students, upload notes and take quizzes within the same application. Storing the recorded lecture within the same application is the most useful feature of this application.

Keywords: Covid-19 pandemic, Lockdown, Education, Online class.

I. INTRODUCTION

The Corona virus outbreak began in Wuhan, China in December, 2019. This infectious disease had its spread in more than 180 countries. The novel Corona virus is officially named as Covid-19 pandemic by the WHO. Covid-19 spreads mainly by droplets produced as a result of coughing or sneezing of a Covid-19 infected person. This can happen in two ways: Direct contact or indirect contact. Owing to this situation, „Social Distancing“ was a preventive measure taken by the government to avoid the spread of Covid-19. Social distancing means to avoid gatherings, maintain safe distance, stay at home, avoid physical contact and avoid touching surfaces.

To avoid the spread of Covid-19, the governments across the world declared lockdown. People were insisted to stay at home and avoid gathering in public places. This situation affected the economy of the country and financial conditions of the people. Hence companies adopted the policy of „Work from home“ which allowed its employees to work at ease by staying at home. In this phase, the education of the students was also at hold. There was a need of continuing the classes of students to avoid the loss of time in their career. So schools and colleges embraced the online mode of teaching. By the time, there were multiple applications that provided the feature to take video lectures in some or other way.

In order to overcome the disadvantages of other applications and provide an all-in-one solution for teachers to take online video lectures, we have designed “EdMeet”. It allows teachers to schedule a lecture on a

specified date and time and the notification is sent to the students of that particular class. When the teacher goes live for the lecture the students are notified to attend the lecture. The lecture is stored within the same application so that students can refer it later.

This app also allows teachers to share notes, assignments, reference material within the app. When the teacher is on a live class, he or she can take attendance of students who are present in the lecture.

II. RELATED WORK

There are many video conferencing and file sharing applications that are used by teachers for the purpose of online lectures and sharing notes. Few applications are mentioned below.

1.1 Google Meet

Google Meet is developed by Google. It allows users to join pre-scheduled meetings. It integrates with G suite versions of Google calendar and Gmail. A user can join the meeting using the link or phone number shared by the person who creates the meeting link. One can join a meeting using „join“ button and can also turn on or off the microphone and camera as and when needed.

1.2 Zoom

Zoom provides video conferencing facility and one can use the app for teleconferencing and distance education. The chat system is enhanced as there are options like to chat only with the host or with all attendees. The host can record the session and share the screen during the session.

1.3 Google Classroom

Google Classroom is a free web service developed by Google and is mainly used by teachers for sharing files, videos, links to quizzes, recorded lectures, etc. A teacher can create a class and share the code with the students so that they can join the class and access the resources.

1.4 Edmodo

Edmodo is an application that enables teachers to share files, assignments, links to videos, quizzes and also communicate with students and parents.

1.5 YouTube Live

YouTube provides a service named „YouTube Live“ which enables creators to go live and share their content interact viewers in real time.

Though there are various applications which serve same

purpose but they lack some features that are essential from the teacher's or school's perspective. For example, some provide the feature of taking meeting but that is not appropriate for an online lecture.

III. PROPOSED SYSTEM

The primary aim of "EdMeet" is to integrate and overcome the disadvantages of all the applications and provide an all-in-one solution to the teachers. The disadvantages of above apps from a teacher's perspective are mentioned below.

1.6 Google Meet

In Google Meet, a teacher has to admit every student entering the class and this becomes tedious task when number of students entering the class is high. It provides a feature of recording the meeting but the teacher has to save the recording explicitly on his or her computer or on drive. When a teacher subscribes for G suite, the maximum limit of attendees in meeting is 100 otherwise the maximum number of attendees is

250. The teacher has to share the meeting link manually for every lecture he or she takes. For the sharing the link within the students' group for which there is need of other application like WhatsApp.

1.7 Zoom

The session can be recorded in Zoom but cannot be stored within the app. The link for each individual session has to be shared with every participant. All plans allow 100 participants by default in each meeting.

1.8 Google Classroom

It allows teachers to share files and take quizzes through Google Forms. Quizzes do not have specified time limit within which the students must submit a quiz.

1.9 Edmodo

It is an application within which teachers can share files and links. It doesn't have a feature of video conferencing.

1.10 YouTube Live stream

Teachers can take live lectures on YouTube but they have to provide the link explicitly to students. Even if the students can watch the videos later, but it will be difficult for them to find the order in which lectures were taken if the teacher doesn't order them correctly within a playlist.

A lecture is an educational talk in which the teacher speaks and the students listen and when teacher asks a question the students will answer. In EdMeet, the main aim is to provide a platform for teachers to take online video lectures wherein teacher can share the screen, share audio and video and take attendance. Students on their side can mark the attendance when the teacher raises the poll for attendance and answer to teacher's question by adding a comment in the comments' section. An excel sheet of students those who marked attendance will be generated at the teacher's side.

On installing the app, a user can sign up based on the role he or she plays, which mean one can be a teacher, a student or a parent. A student or a parent would need a class code before signing into the app. A teacher can sign up without the class code since he or she has the authority to create a class.

After sign up, the user can log in to the system. If he is a teacher, then he can create his own class and students in that class or join another class using code shared by another teacher. He can schedule a lecture at a particular date and time using the option from menu and notification of the same will be sent to the students. The teacher can raise a poll for taking attendance and later he will receive excel sheet containing names of students who marked the attendance. The lecture will be stored within the app so that students can refer it later.

If the user is a student, then he will be added to the class using the class code which he specified during sign up. He will get notified when the teacher schedules a lecture. He can mark attendance when the teacher raises the poll for attendance. He can access resources uploaded by teacher and attempt quizzes. Even if a student misses live lecture, he can watch it later within the same app.

If the user is a parent, then he will be added to the class of his child using class code which he specified during sign up. A parent will only receive notices that a teacher will upload in the parents' section. A parent can communicate with the teacher about the progress of his child.

IV. FEATURES

1.11 Store video lectures within the same application

The teachers won't have to store the recording explicitly on their desktop or drive. Students don't have to search for lecture recordings in order they were taken.

1.12 Record the attendance

On one click, teacher can take attendance of the class.

1.13 Share resources

Teachers can upload resources useful to students. Notes, reference material, assignments, quizzes, etc. can be shared. Students can access these resources at any point of time.

1.14 Notices

Important notices regarding exams, fees or some office related work can be shared with parents.

V. IMPLEMENTATION

1.15 Software

This app is developed using Android Studio 4.1.

1.16 Design

We follow three steps for designing the user interface of the app.

Select the Views

In this step, we need to select the views that are appropriate for a particular user in-terface. Different views can be ImageView, TextView and button.

Position the Views

For obtaining the desired user interface, we need to position the views appropriate-ly using different layouts like LinearLayout, RealtiveLayout and ConstraintLayout.

Style the Views

To make the user interface user friendly and attractive to eye sight, we providepadding, margin and colors to the view.

1.17 Coding in Android Studio

We develop the app in Android Studio and write codes for .XML file, .java file and define various activities that are essential for proper functioning of the app.

1.18 Testing and deploying the app

Before deploying the app on playstore, we would test the app on various smartphones and finally would deploy it on playstore.

2 Future Work

2.1 Creating larger group for an entire school

In the next version of this app, we will add a feature such that a group can be added to a larger group. A school can use this platform to bring all their students on one platform. One class can be added to a larger group of school.

2.2 Designation

In future, the app would include user permissions or authorities based on their designation in school or college. For example, the head of department can control the classes under his department. The principal of school or college can have control over all the classes i.e. groups in his school or college. Different authorities would be provided based on their designation. Designations can be principal, head of department, assistant professor, lab assistant, teacher, office staff, etc.

2.3 Chat

We shall be adding a feature of chat in the future version wherein the teacher and the students can chat within the app.

2.4 Calendar

A calendar within the app will be useful for multiple teachers to plan events for a particular class and schedule it accordingly so that there will be no clash.

VI. CONCLUSION

This paper proposes an android application for teaching and learning. The main aim of this application is to provide a platform for teachers to take online lectures. This app is unique since it integrates features of other applications and overcomes the disadvantages of those apps. The app will contain an attractive and user-friendly user interface. There can be three types of users of this application; those are teacher, student and parent. We have developed this app owing to situation of Covid-19 pandemic and the need for online learning.

VII. ACKNOWLEDGEMENT

The project is in progress and has been developed under the guidance of our Project Guide, Prof. Mangesh Balpande. We would like to thank him for his constant support and guidance which indeed helped us in completion of project and gain more knowledge through research and study. We would like to thank our Head of Department, Dr. Vinayak A. Bharadi and Project coordinator, Prof. Priyanka Bandagale for coordinating with us throughout the project.

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Mobile App for Better Intensive Care of Newborn Babies

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Abstract— Proposed system, namely NEST (Neonatal Service Tech.), specifically designed for the better Neonatal intensive care of newborn babies. A variety of operational changes can be done through NEST. Doctors and nurses can interact with NICU (Neonatal Intensive Care Unit) environment through NEST mobile app. It allows user to control the NICU environment, according to baby's behavior and biological changes from giving location. It alerts user in emergencies through messaging. Also, we present an innovative mobile app design and case study to show how NEST can be used for better care of newborn babies.

Keywords— Neonatal, Intensive care, Operational changes.

I. INTRODUCTION

A neonatal intensive care unit or an intensive care nursery is a unit in the care of ill or new-born infants. Newborn babies who need intensive care are often put in this special surveillance of the hospital i.e. NICU (Neonatal Intensive Care Unit) access infants by using the portholes, limited opening of large door as this interferes with maintaining air, temperature. In this paper, we present NEST (Neonatal Service Tech.)-mobile app for better intensive care, an online controller of NICU. Only parents of infants, doctor and hospital management department can use the NEST mobile app. Also, we present innovative mobile app design through NEST. Many mobile interfaces exist between different type of user according to their requirements and service provided by hospital management. Depending on this service, NEST mobile app provides a registration form through which user allows to use this app according to their user type. Parents can be considered as system user as they can access the app by the code given by management. Furthermore, Parents can see their child's environmental condition of NICU through NEST's monitor bar present in app. Moreover, the NEST mobile app provides a control unit through which doctor can control the NICU environment according to infant's condition and need. Hospital management department work as an admin system user and can assign permission and accounts of system users like doctors and parents. The basic structure of the NEST mobile app is given in figure 1.

The rest of the paper is organized as follows. Section 2 gives a detailed description of the NEST mobile app we designed in the intensive care of newborn infants. In section

3 we discuss app design of NEST. And at last we outline, conclusion in section 4.

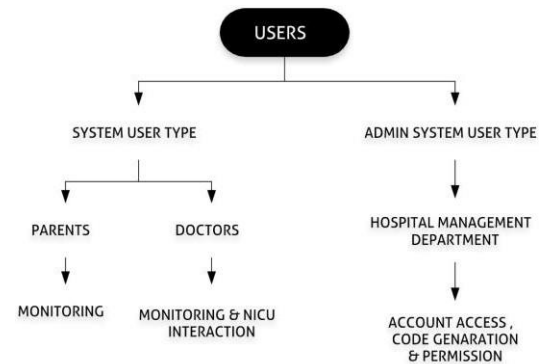


Figure 1: Basic structure of NEST mobile app

II. NEST : A MOBILE APP FOR INTENSIVE CARE

In this paper we present the working of an online mobile app conceived for the intensive care of newborn infants. NEST (Neonatal Intensive Service Tech.) is online mobile app for monitoring newborn infants and to control the NICU environment according to the suitability and condition of infants. Basically, NICU is designed to provide a safe, controlled space for infants to live while their vital organs develop. Unlike a simple bassinet, a NICU provides an environment that can be adjusted to provide the ideal temperature as well as the perfect amount of oxygen, humidity and light. A NICU work on the principal of thermo-electricity. It has a thermostat which maintains a constant temperature by creating a thermal gradient. In addition to climate control, a NICU offers protection from allergens, germs, excessive noises and light levels that might cause harm. A NICU's ability to control humidity also allows it to protect a baby's skin from losing too much water and becoming brittle or creaking. A NICU can include equipment to track a range of things including a baby's temperature and heart rate. This monitoring allows nurses and doctors to constantly track a baby's health status.

NEST app allows parents and doctors to monitor infants and based on that doctor can take required decision. In following discussion, we shall concentrate on the function of

NEST mobile app. Two different user interfaces exist in NEST namely system user, admin system user. Admin system user can create system users, add accounts, assign permission. In this case Hospital management department is an admin system user, whereas Parents and Doctors can be considered as System user as they can access NEST app

by the code provided by Hospital management department. Based on the type of service NEST provides a form through which user can register their name. After the successful registration user allowed to use NEST. User confirmation process be checked by hospital department, as hospital management department is admin system user. NEST mobile app for parents and Doctors is described in section A and section B respectively.

A. Structure of NEST for parents

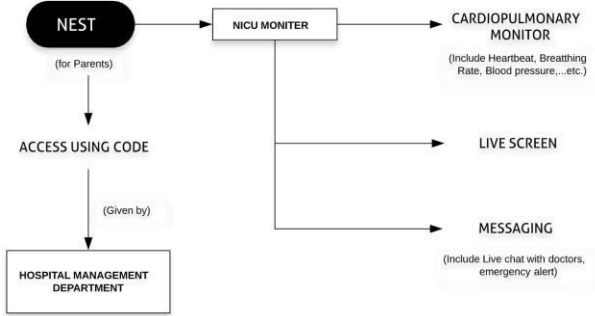


Figure 2: Interface of NEST app for parents

Parents are only allowed to monitor their child. A NICU can include equipment to trace a range of things, including a baby’s temperature, humidity, heart rate, pulse rate, NEST app constantly and simultaneously tracks baby’s health status and displays information on cardiopulmonary monitor for parents. NEST has a messaging system through which parents can communicate with respective child’s doctor and it alert parents in emergency situation of their child. Figure 2 shows the interface of the NEST app for parents.

B. Structure of NEST for Doctors

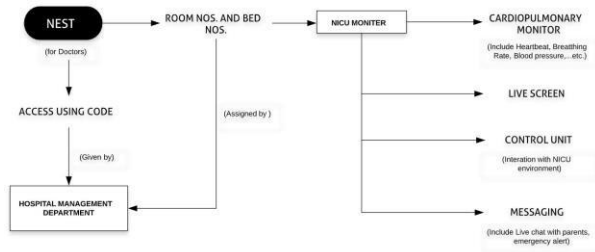


Figure 3: Interface of NEST app for doctors

An NICU’s ability to control humidity also allows it to protect a baby’s skin from losing too much water and becoming brittle or cracking. A NICU can include equipment to track a range of things, including a baby’s temperature and heart rate. Beyond just offering information about a baby’s vitals, a NICU will be also either be open on top or have portal holes on the sides that allow it to be used in combination with various medical procedures and interventions. There are different types of NICU is present in the NHS, and they are named depending on the level of

specialist care they offer. However, staff will be specially

trained to look after parent’s baby. Therefore, Doctors and nurses both can use the NEST mobile app. The confirmation process is same as that of parents, explained in section A. Doctor and nurses are assign a specific room no. or bed no. as per the hospital management staff’s decision. NEST’s monitoring allows nurses and doctors to constantly track a baby’s health status. Figure 3 shows the interface of the NEST for doctors. NEST’s provides controller through which Doctor and nurses can alter the NICU’s temperature, humidity, etc., based on the baby’s condition. In addition, NEST provides messaging through which doctors can communicate with respectively baby’s parents.

III. DESIGN OF NEST MOBILE APP

The deliverables produced by UX designers vary according to their role in the design team and also depending on the methods and tools used by each role. A UX design process typically follows something similar to a design thinking approach, which consists of basic phases listed below:

A. *Emphatize with the users (Learning about the audience)*
 Birth of an infant is challenging for all parents. Intense emotions and particularly acute when an infant is born prematurely or with health problems and admitted to a NICU. According to the survey on parents proposed by Sydney Local Health District, we came up with conclusion to create our prototype by considering all their responses.

B. *Ideate (Generating ideas for design)*

The product and its feature gain significance when users interact with them. The basic idea behind the NEST app design was to create an environment such that it includes both pre and postnatal care. Basic design generation is given in figure 4. Therefore, we our team have decided to include messaging and control units of NICU in NEST mobile app.

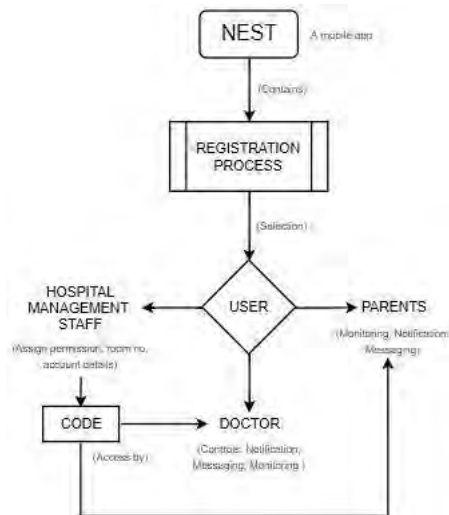


Figure 4: Basic design generation of NEST

C. Prototyping and looks

A finished prototype must focus on function, structure, process and provides the simplest elements and a framework of the app. Prototype of NEST mobile app is prepared by using a browser-based UI and UX design application called figma, which support team working on every phase of design process. Design of NEST is given in the figure below:

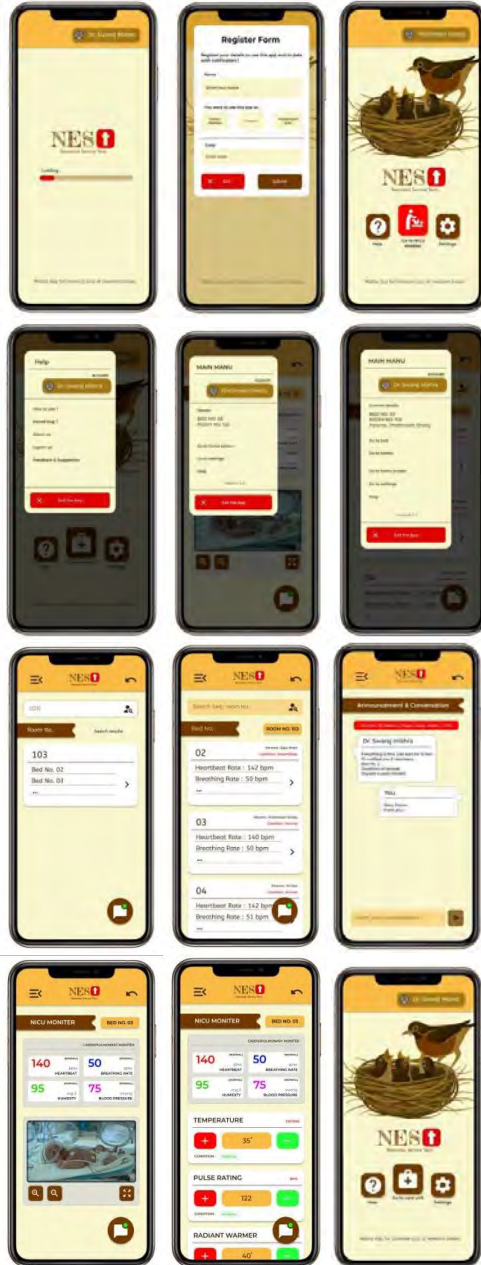


Figure 5: Design of NEST mobile app

IV. CONCLUSION

This paper presents the working and design of a NICU controller (NEST mobile app) conceived for intensive care of newborn infants. The NEST mobile app offers unprecedented flexibility and impact for delivering critical messages through NEST'S messaging system. Nest offers unparalleled visual impact for empowering users. Its intuitive graphics enhance the message, while its architecture easily integrates with NICU's technology. NICU monitor in NEST app simply displays Heartbeat, humidity, pulse rate, breathing rate. The condition of NICU'S can be controlled by doctors from anywhere as per need and can be given an update to parents as per condition by a doctor. Parents can ask their query as well.

V. ACKNOWLEDGMENT

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Health-Bot (Healthcare Chatbot)

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Abstract—Chatbots are computer programs that interact with users using the native language. The chatbot stores information in a database to identify keywords from sentences and then decides on a question and answers the question. With chatbots one can communicate with text or voice interface and get feedback on artificial intelligence. Usually, bot chat will contact a real person. Chatbots are used in applications such as e-commerce customer service, call centres and online games. Chatbots are programs designed to automatically connect to received messages. Chatbots can be programmed to respond in the same way each time, responding differently to messages that contain specific keywords and using machine learning to modify their responses to suit the situation. A growing number of hospitals, nursing homes, and even private institutions are currently using online Chatbots for personal services on their sites. These bots interact with potential patients who visit the site, help them find specialists, book their appointments, and get them the right treatment. This health interview program will help hospitals provide online health care support 24 × 7, answering in-depth and general questions. By asking a series of questions it helps patients to direct what they want.

Keywords—Cloud computing, Artificial Intelligence, Healthcare, Emergency situation, Remote area, E-health, HealthBot.

I. INTRODUCTION

1.1 Background

In developing countries like India, the healthcare scenario is considerably worse, and focusing on this realistic issue particularly in delivering healthcare services for rural and remote communities so, "What e-health solution may be designed to fulfill the prognosis and remedy needs of rural and far off groups in India?" India has more than 800 million smartphone users considering the population of India we can say approximately 57% percent of the population are smartphone users. In rural areas, approximately 25% of the population are smart phone users. According to the Internet & Mobile Association of India (IAMAI), there are 227 million internet users in the nation. Emerging technologies such as cloud computing have increasingly been pushed to shift the role of the healthcare professionals and industries towards meeting more accurate, prompt, and real-time treatment. It an affordable, configurable, and scalable platform for enabling e-health solutions possible, for linking medical information and practitioners who are geographically dispersed, enabling online communication about medical issues, diagnosis, and treatment. Our work, therefore, aims to develop and evaluate a general

approach to e-health utilizing online services and cloud computing for effective patient consultation and health diagnosis. Whilst we focus on the improvement and assessment of one context-sensitive cloud-primarily e-health solution for the case of rural communities in India, we specify the layout closer to a much broader applicability.

1.2 Problem Statement

The main intention behind developing the application is to provide healthcare services in dispersed areas of India and identify the gaps emerging in implementing cloud computing in the healthcare industry. The main problem in rural areas is limited internet connectivity and slow internet services. People in rural areas don't have sufficient knowledge about using a healthcare application on their smartphone.

1.3 Objective

Our main objective is to spread awareness and make the application easily reachable to every person in the village. In rural areas of India, people don't have access to health services, we're filling this gap by connecting them with nearby doctors as well as doctors in urban areas via our application.

1.4 Methodology

In this paper, for gathering public data and public opinion we conducted a survey where respondents are basic people who can suggest us what they want in a healthcare application. Survey was conducted using online Google Form. Conducted in order to gather large size of information in a short period of time, reflect emotions and experiences, and explore issues with a greater focus, for studying issues that have developed over a specific period of time and also, to get acquainted with other problems faced by civilians while using healthcare applications. We explored and surveyed constructively criticized comments of users in existing healthcare applications available on google play store.

II. PROPOSED SYSTEM

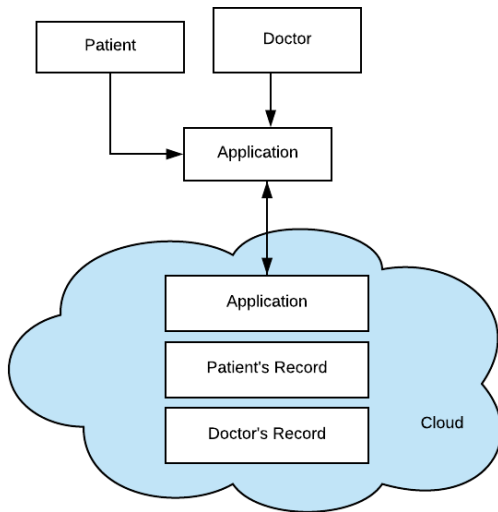


Fig 2.1

The application is made for the social cause i.e. it connects people from geographically dispersed areas with doctors where they are unreachable.

2.1 Application Modules:

- **Admin module**

The role of admin is to add all the updates to the map with nearby medicals and laboratories, also add information regarding free campaigns and schemes released by government and also look up for the maintenance of the application. The main function of the admin is to monitor the doctors on daily basis and analyze experience and feedback provided by the patients. Admin can also block users if they are booking fake appointments with the doctor.

- **Patient module**

Patients can convey their problem to a chatbot for common day to day healthcare issues and get instant remedy from the HealthBot. It can suggest common medicines for normal health problems like normal fever, cold, headache, etc. Patients can also seek help from doctors via the application with a text message as well as a video calling option with the doctor.

- **Doctors module**

Doctors can respond to patients using the application and if necessary, can interact with patients via video call. Doctors can view the medical history of the patient for better understanding of the problem. In case of any emergency doctors can communicate with patients circle of care.

2.2 Artificial Intelligence - HealthBot

The term artificial intelligence is used to indicate development of algorithms that should execute tasks that

are typically performed by human beings and are, therefore, associated with intelligent behavior. Colloquially, the term is applied to a machine that mimics cognitive functions, such as learning and problem-solving. In our application as of now we are using AI for making chatbot.

2.3 Cloud Computing – Data Warehouse

The global computer market is expanding to 64.7 billion by 2025 from USD 28.1 billion out by 2020 to a CAGR (Compound annual growth rate) of 18.1%. The development of distributed medical services in the field of computer business can be considered flexible, for example, advanced approaches in the medical care environment increased distribution of IT medical care arrangements, and cloud-based areas, including improved capacity, flexibility, and flexibility. However, information protection and security concerns just as complex guidelines governing cloud server cloud can reduce market development. In the healthcare sector, where data serves as the main asset today, data storage and management are more costly, thus raising additional costs associated with the demand for expensive servers. In such cases, cloud computing helps to store incorrect data and backup due to its failures. Also, many health care providers offer video conferencing services.

2.4 Working of Application

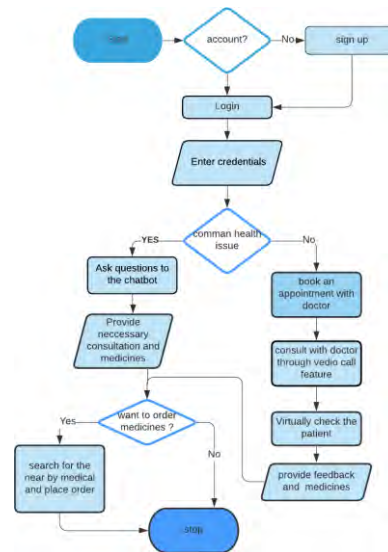


Fig 2.2

The patient will register on the application or login if already registered and the same for the doctor. The menu with all the features will be visible to both. According to his requirement user can decide whether he wants assistance by HealthBot or by the doctor itself if he asks the bot to reply to his problem then the bot will ask for all the symptoms faced by the patient and then act accordingly or also in case HealthBot isn't aware of the

solution to the problems it will suggest to contact the concerned doctor. If the patient is willing to communicate then, can book the appointment and get checked via video calling feature and follow the prescription given by the doctor and provide the feedback accordingly.

The user can also keep himself/herself updated about the various healthcare activities going on and avail the benefits of the same like free eye cataract campaign, yoga training sessions. Users can also browse on the map feature to locate the nearby hospitals, medical shop, bloodbanks, etc.

All the patient and doctor data will be remotely stored and accessed from the cloud and even some data of the application will be stored on cloud so that the application can work fast with low internet connectivity.

2.5 Algorithms used

Multinomial Naive Bayes is the classic algorithm for text classification and NLP used for chatbot.

2.6 Datasets for AI chatbot (HealthBot) Dataset for disease and their symptoms –Kaggle

Healthcare analytics – Kaggle

III. RELATED WORK

[1] Private Cloud Solution for Rural Healthcare by Mrs. Deepa Lakshmi. Methodology was project provides health care and medical services to people living in rural areas by developing a mobile based application which helps connect to doctors. Key Findings are a chat between doctors and patients is analysed for a chatbot to provide replies like a doctor. Gap found was cloud can only be accessed by high speed internet

[2] Cloud Computing in HealthCare Industry by Mrs. G Nikhita Reddy Vanga Methodology is Primary health care is presented by the Alma-Ata declaration as essential health care based on practical, scientifically sound and socially acceptable methods and technology, which is universally accessible to individuals, family and the community through their full participation and at the cost they can afford. Physicians can stay in touch with their patients and examine them effectively was the main feature. Gap identified is Ethical and Privacy Laws, Data Security, Loss of Connectivity, Lack of Standards

[3] Applications of cloud computing in Health Systems by Mr. Hamid Moghaddasi. Facilitated access to the e-health services and big data in health systems was the Methodology .key findings are Implementing cloud computing systems in health care so we can serve to facilitate and improve the quality of patient care. Gap was Synchronize these systems so that the system can communicate with other outside systems to ensure the maintenance and continuity of care.

IV. RESULT

In this age of science and technology, people are becoming easier and convenient ways to unravel their everyday problems. Health care is additionally getting the eye of engineers and researchers, and that they are developing a helpful system to save lot of lives and look after life. This paper demonstrates a mobile application-based health care tool which will be a lover like company for the masses.

V. CONCLUSION

Using the app, they will find many conveniences which will change the way people react in emergencies. rather than being panic, people may find a fast and effective thanks to solving with the assistance of this app. within the future, we hope to figure extensively on this to develop it to a replacement level for the betterment of individuals, especially the poor. We also are looking forward to using AI in helping people detecting diseases- supported symptoms more accurately. This way, it's hoped that a mobile-based health care system is going to be a useful part and parcel of the everyday in everyone's life.

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Trust Based Farmer Consumer E-Commerce Model

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Abstract—The system will boost the supply chain by removing middle man will minimize food wastage and increases availability of organic food to consumers at proper rates. Complete profit is available to farmer makes direct connection of farmer with consumer reduces the farmer suicide rate of farmers due to burden of loan by the costing of material required for conventional farming stops the damage of environment due to conventional farming leads to good healthy, diseases free life, boosts the immunity to fight against viral infections also enhances lifestyle of farmers. Trust based means it makes a close connection, good relationships of famers-consumers so the consumers can anytime cross-verify the farming process, components used, etc by visiting to farmer at any time so that consumers have fully assurity that they are getting quality product which is value to their money also it helps to development of nation.

Keywords—*trust based, conventional farming, middle man, immunity*

INTRODUCTION

We all know that we are going through a hard time the situation is getting worst day by day due to the COVID-19 pandemic an urgent solution or treatment is required to control & stop it but we are not fortunate enough we don't have solution till now. The infected victims are getting recovered by simply boosting their immunity making their immune system more stronger to fight with the virus. We suffer with cough/cold/fever and viral infection frequently due to change in climate or getting in contact with the infected one this is our immunity is not strong or good enough to fight with the virus. Our immunity is weak and becoming more weaker due to the consumption of the inorganic components which are cultivated using

conventional farming practices. This conventional farming not only affects our health but also the environment, causes pollution too as it consists of the usage of urea, DAP, chemical fertilizers, etc harmful components.

Farmers switch toward conventional farming as they don't have customers for organic products so they don't get much profit to fulfill their basic needs. The costing of the components used for conventional is high which makes the farmers to take loans but due to unpredictable bad weather conditions they don't get good crops so don't get much money so they again take loan this way the loan amount increases higher and then they have to take horrible steps like suicide.

Nowadays people are getting aware, serious about their health so they are going toward organic products they search on e-commerce platforms, shops, etc but the products available there are very high cost also these platforms don't give assurity of the product quality. So the nobel customer have no alternative then buying from them but the customer gets cheated on the name of organic as they charge high, no quality assurity of these products. So an approach is needed to fill this gap between farmer and consumer.

After identifying, analyzing these serious issues we have came up with the solution that our system directly connects the farmers and consumers together with no middle man involved so that the consumers get the good quality organic product with assurity at proper rates. Complete profit is available to farmers which helps them to fulfill their need, increases their living standard. The consumers gets quality organic products which leads to healthy lifestyle, protects them from is harmful causes diseases slows down their

immunity to fight against viral infections. Protects nature from damage, harmful effects caused by components used and conventional farming methods. In this work we are intending to focus on good relation between farmer and consumer also the amount of organic products cultivated is directly sold to consumers which stops wastage of food and fasters the food supply chain.

I. BACKGROUND

we don't have a dedicated/specific research papers so based on the facts and figures with the relation and coordination with the topic we have gathered these informations:-

We all are facing the Covid-19 pandemic we know how serious is the issues and we require a urgent solution on it but till now there is no strong solution / vaccine available , the victims are curred by boosting there immunity. People get infected with the virus due to weak immunity their immune system is not strong enough to fight with the virus. We frequently get sick with cough/cold/fever due to climate change our weak immunity does not adopt it easily and we become sick. Our immunity is weak due to consumption of inorganic products which is cultivated using conventional farming practices which decreases our immunity.

Farmers go towards the conventional process because they don't get enough profit to fulfill there needs by doing organic as they don't have a customer for it. The conventional farming involves the usage of DAP, urea, fertilizers which causes soil pollution, water pollution and air pollution, it makes the soil barren, reduces the ground water level. The products cultivated with conventional farming when consumed causes various health diseases like blood pressure, various heart diseases and most important it decreases our immunity and makes it weak. Nowadays people are getting aware towards their health and they are gently switching towards the organic ones. People look for organic products on various e-commerce platforms but their prices are very high and no assurity of the quality , components used. The nobel consumers on the name of organic pay high amounts to ecommerce websites but their is no assurity of its quality and the real face (farmers) behind it get only a small percentage of it. Their is no trust on the quality, components used to cultivate the products sold on existing e-commerce platforms. Our country faces hunger issues even though we grow very high amount of crops, cerils, etc where as lots and lots of products gets wasted daily this is due to cold and weak supply chain.

II. METHODOLOGY

The customer will register by creating a account with the system. The Farmer will directly login to system by their username and password because a dedicated/common farmer will be there for perticular area customers. The Farmer will upload a product with its details like price, type, qty, etc. enter the quantity and place the order, choose payment option. The Farmer will receive the order details

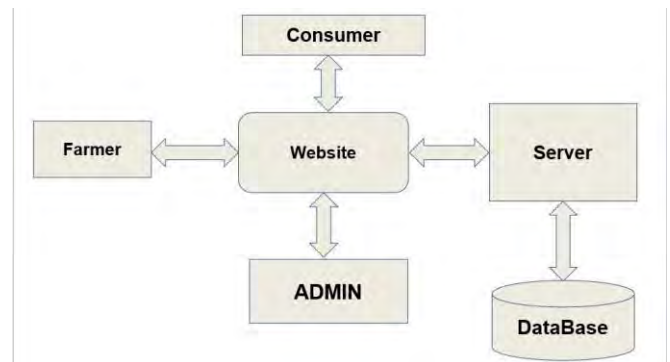


Fig 1. Overall Structure Of System

The Customer will login to system and see the available products by the farmer select the products then and then do confirmation. The Farmer can modify the details of products and also can delete the products. After the confirmation from farmer the customer will receive the products.

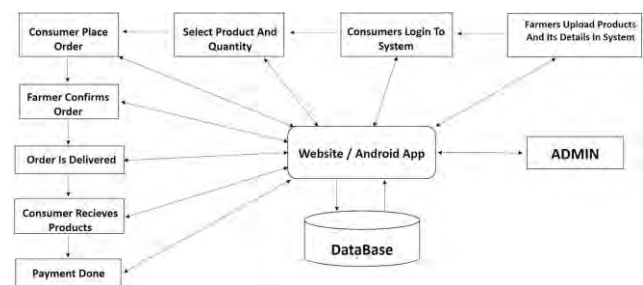


Fig 2. Flow of System

III. RESULTS

Builds a trust based system by connecting the Farmer and consumer together. Direct supply from Farmer to Consumers. Reduces the burden of loan on Farmers by providing complete benefit to them. Leads to a healthy and disease free environment improves the health ratio index.

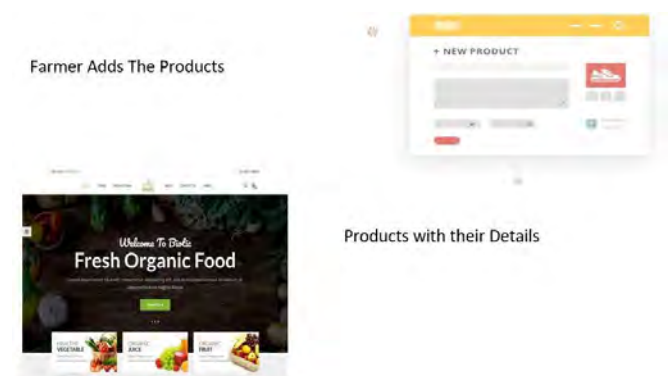


Fig 3. Working model farmers end

Increases the standard of farmers by providing a healthy and good lifestyle. Reduces the damage to the environment by

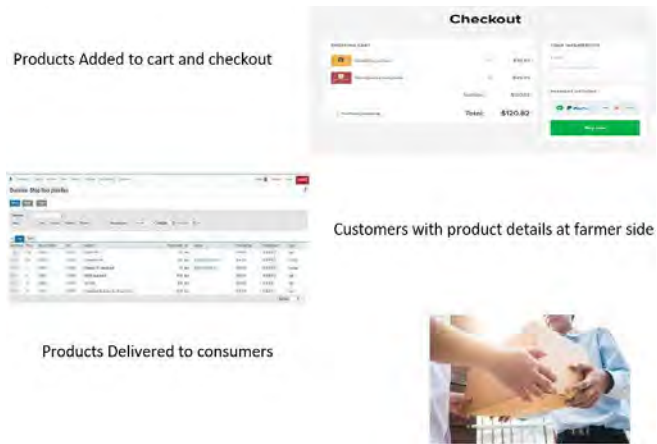


Fig 4. Working model consumer end

the conventional farming process. Consumption of Organic products increases the immunity to fight against viral fever and harmful viruses. Best quality and affordable organic products available to consumers. Helps in the growth and development of Nation.

IV. CONCLUSION

The proposed system will make the food supply chain faster and minimize the wastage of food by directly connecting the farmer and consumer together with no involvement of middle men. This will solve the problem of availability of good quality organic food to consumers at proper rate and direct profit will be available to farmer which will result in the better lifestyle of famers, good

quality organic food will boost immunity to fight against viral infections. The process of organic farming will stop the danger to the environment which is caused due to conventional processes. And as the system name says “ trust based “ so the consumers and farmers will have contact and good relation with their meet and greet and this will enable the consumers to any time cross verify the process, products used by farmer for cultivation by simply visiting to them, this will lead to healthy diseases free lifestyle, enhance the standards of farmers and help in the growth & development of nation.

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RFID and Face Recognition Verified Temperature Monitoring Contactless Attendance System

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Abstract— The institutions and organization generally use fingerprint recognition and signature-based attendance system to mark the attendance. The fingerprint recognition system is secure and reliable but in both the process user has to get in contact with the surface of the attendance system, which can cause the spread of viruses and bacteria among the people, for example, diseases like COVID-19, influenza and the common cold can spread through getting in contact with a contaminated surface. So, in the pandemic of COVID-19 and other future infections, uses of such systems are not feasible. For that, this paper presents the model which is secure, reliable and contactless. The model is consist of serially connected face recognition and Radio Frequency Identification (RFID) module for marking the attendance, Infrared thermal sensor for scanning body temperature and FAR Ultraviolet-C light container for self-sanitization of the complete module.

Keywords— Facial Recognition, RFID, IR Thermal Sensor, FAR Ultraviolet-C.

I. INTRODUCTION

The behaviour of workers in a company is judged on the basis of their job performance, particular assessment role which is tracked by their daily attendance. Members will be kept responsible for observing their proper work schedule in order to ensure adequate service, good workplace ethics, and to achieve expected productivity and functional expectations within the organization. If the person is unable to satisfy these conditions and duties, he/she shall refer them to his / her supervisor.

In assessing the performance of the students within the class, the same scenario can be observed. The student must follow the percentage and schedule of attendance required to assist educators in evaluating each student's failure and strength in the class.

For such organizations, the secured, reliable and fast attendance system is required. The current tradition of tracking the attendance is fingerprint recognition but there are some challenges to this technology such as FAR and FRR, the value of FRR of face recognition is 0.019 which can reduce the accuracy in some extent. Another main challenge to this system is that number of people used to touch the

surface of attendance system which can make the surface contaminated, different types of viruses and bacteria can sustain on that surface for a long time and transfer to the others easily. To overcome from these challenges, we have developed our model based on RFID technology which is a contactless process and has better accuracy than face recognition as it has only 0.005 FRR value, to make the model more secure we have integrated face recognition based verification so that there is no chance of false attendance. As our system is contactless there is no chance of spreading the virus through a contact although we have attached FAR-UVC light container for automatic sanitization of the system. In most of the viral infections, fever is a common symptom so to reduce community spread of virus we have to integrate IR thermal sensor which and detect the higher body temperature.

II. LITERATURE REVIEW

In most of Institution, organization and hospitals the attendance tracking system is the manual signing on the attendance sheet or fingerprint recognition based attendance. Manual signing on the sheet can be prone to bogus attendance as it is not secure, reliable and it takes a lot of manual efforts to keep the data of the attendance

Comparatively biometric attendance system such as fingerprint recognition is secure and reliable which makes it most popular in the market with the market share of around 50% [10], although it offers easy and reliable process the system has some challenges like false acceptance (FAR) i.e. a person that was not registered previously was falsely enrolled for attendance, false rejections (FRR) i.e. system failed to identify some registered users. These challenges can happen due to improper placement of finger, dirty finger or some injury to the finger, which can reduce the accuracy of the system up to 2.56% [11].

One hidden factor of this attendance systems is they are not contactless process so that user will get in contact with the surface of the systems, which can lead to spreading viruses among the community. Contagious diseases such as COVID-19, Influenza and Common Cold can transmit through the physical contact with the surfaces touched by the infected person [13]. As per research, the basic reproductive

rate (R0) of COVID-19 in India is approximately 2.09 [12]. So, in such cases, it is necessary to have contactless, secure and reliable attendance system.

system as it is contactless, cost-effective, fast and has

and above, as per research 550 microns of aluminium foil can reflect 75% of UVC light. Due to this maximum light get to concentrate on our system which can save power and use less electricity [19].

III. PROPOSED METHODOLOGY

A. Registration Process

For registration of users, the system will have an integrated website from which registration of individual face and RFID card can be done. Our system has HD camera module attach with raspberry pi 3 which can capture high- quality pictures of the face. We are using NODE MCU ESP-8266 with inbuilt wi-fi module as well as our system has RFID-RC522 module for registering the users by using their unique RFID tags, after successful registration the ID and personal information of the user can be reflected to the database and website using wi-fi communication.

In face recognition and registration process initially, our system must have the ability to detect the faces in the images and video frame, OpenCV is an open-source machine learning library helps in detection of objects in the frame moreover Haar cascade classifier is an adaptive machine learning-based approach in which cascade function is trained by some positive and negative images, in our case we are providing images of the faces and after training of the classifier it can extract the features from the new image of the face and detects the particular faces in the video frame.

a long lifespan [14]. This system has some reliability issues like RFID scanner can only identify the ID of the particular tag but it cannot recognize the person who is marking the attendance, in such scenario people can mark bogus attendance of others by using RFID card of a particular friend and other people [2].

TABLE I. False Rejections (FRR) value

Types of attendance system	FRR value
Fingerprint Recognition	0.019
RFID	0.005

TABLE I. Features of RFID Tags

Feature-s	Types of RFID Tag		
	Passive Tag	Active Tag	Semi-passive Tag
Operational range	Low Frequency-10cm High Frequency-1 m Ultra-High Frequency- 12m	Low Frequency-10cm High Frequency-1 m Ultra-High Frequency- 12m	Low Frequency-10cm High Frequency-1 m Ultra-High Frequency- 12m
Battery	No	Yes	Yes
Cost of system	Cheap	Very Expensive	Expensive
lifespan	20 years	5-10 years	10 years

Most of the institutions are using RFID based attendance

There are several algorithms and function for face recognition, LBPH (Local Binary Patterns Histograms) is one of them with the accuracy of around 98.5% [16]. Local Binary Pattern (LBP) is a basic but very effective texture operator that marks an image's pixels by thresholding each pixel's neighbourhood and considers the outcome as a binary number and Local Binary Pattern (LBP) can be used together with histograms so that we can represent the face images in the form of the simple data vector. Mainly there are 4 parameters used by LBPH algorithm they are as follow:

- Radius: the local circular binary prototype can be created by using radius as a parameter and it represents the radius around the central pixels, generally it is set to 1.
- Neighbors: the number of sampling points to create the local binary pattern of the circular. Bear in mind: the more you have sampling points, the greater the cost of computation. Typically it is set at 8.
- Grid X: In the horizontal direction, the number of cells. The further cells, the better the grid, the larger the vector of the resulting function dimensionality. Typically it is set at 8.
- Grid Y: the vertical direction of the number of cells. The further cells, the better the grid, the larger the vector of the resulting function dimensionality. Typically it is set at 8.

The first computational step of the LBPH algorithm is to create an intermediate image that better describes the original image, then the intermediate image is used for extracting the histogram for that image is divided into

TABLE II. The execution time of different attendance System

Types of attendance system	Average Execution Time (seconds)
Fingerprint Recognition	4.29
Manual Entry	18.48
RFID	0.2
Bar Code	2

To overcome the reliability issues of the RFID we can integrate voice password with attendance system however it is easily sharable with others, so it is not the perfect solution to the problem [2]. Face recognition is the technology which we can integrate to the RFID attendance system as a validation process, it makes the process more secure as we provide the same ID to both systems.

We are considering our system for institution and organizations; hence the system must have better performance as well as less costing. For that we are using RFID-RC522, NODE MCU ESP-8266 [15] and Raspberry Pi module. Raspberry Pi 3 is integrated with quad-core 1.2GHz 64-bit CPU along with 1GB RAM and 400MHz GUP which can easily handle all computations during the facial recognition process [16].

IR Thermal sensor-based thermometer can scan body temperature as accurate as digital thermometer without any

contact with our body. By which we can detect symptoms like fever and prevent that person to get in contact with other people [17].

Based on recent research we get to know that 207-222nm FAR-UVC light can efficiently kill the COVID-19 viruses without harm to exposed human tissues, the result says that 90% of virus inactivation can be happened in only 8 minutes of FAR-UVC light bombarding and 99.99% of virus inactivation in just 25 minutes [18].

To ensure more safety from FAR-UVC light we can build a container having multiple inner layers of 550 microns multiple grids using Grid X and Grid Y parameter and then histogram can be generated from each grid.

To perform a face recognition of a new input image, the LBPH algorithm uses the input image histogram to represent the image from the training database as the algorithm is trained with the face images and their particular labels which are same as the IDs we obtained from the registration of individual RFID tag, we can compare two histograms to find the matching image as the input image and return the image which has the closest histogram. there are various ways to compare histograms such as Euclidean distance and absolute value. In this scenario, we can generate the ID of the user from the face recognition process.

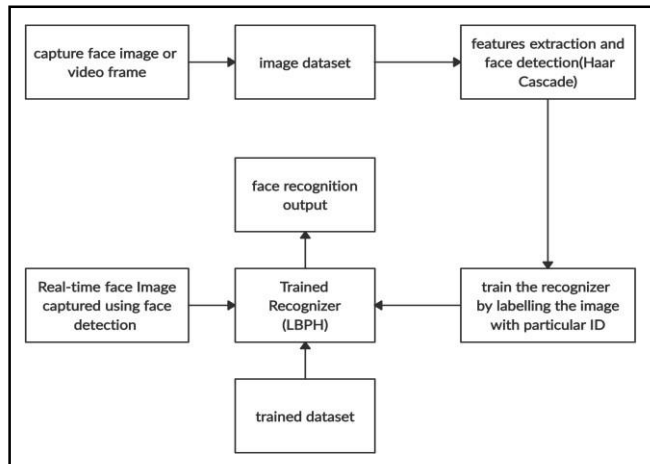


Fig. 1. Block diagram of the face recognition process

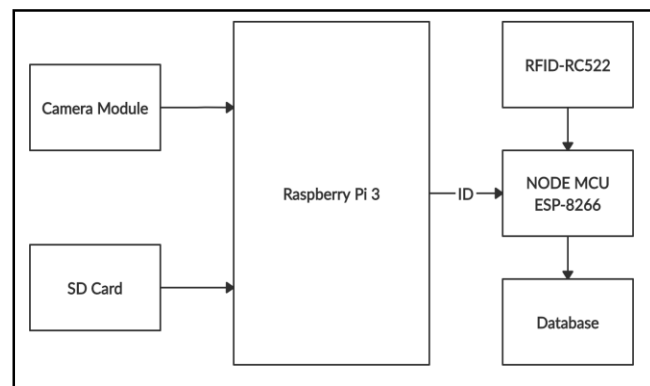


Fig. 2. Serial Communication between Raspberry Pi and ESP-8266

B. Verification Process

The system will work on the concept of Verification of two ID's, Face recognition and RFID respectively [1]. When user will try to mark attendance, the individual face will be Recognize by the system, ID that is assigned to the face will be transferred to the ESP 8266 by the serial communication where the ID will be verified with the ID of RFID card which is scanned by the user via RFID-RC522 during the face recognition process, if both the ID's are matched then verification will be done, otherwise, attendance will not mark by the system.

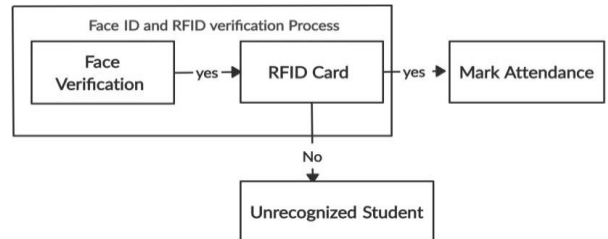


Fig. 1. Block Diagram of the Verification Process

C. Body Temperature Screening

Our system will be integrated with Infrared Red thermal scanning sensor, which will automatically measure the body temperature of the user during the attendance process and if body temperature is above normal temperature then the buzzer will initialize.

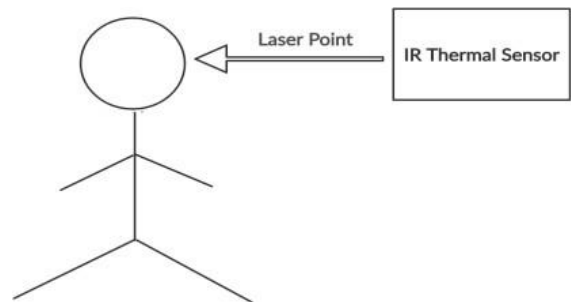


Fig. 2. Temperature Screening

D. Self-Sanitizing Process

After Fix interval of time, UV light arm will come over the system and bombard 222nm FAR-Ultraviolet-C rays, which can kill 99.99% germs on the system. UV light will fix under a box-like structure coated with the aluminium foil so that UV rays cannot leak. Movement of Robot like arm will be control through DC motors having gears, we are using DC motors with gears to ensure correct movement of the arm, Gears have the mechanism to lock motion of DC motors while they are in steady state.

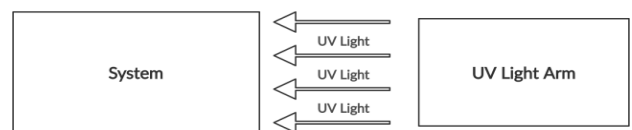


Fig. 3. Sanitization by using UV light

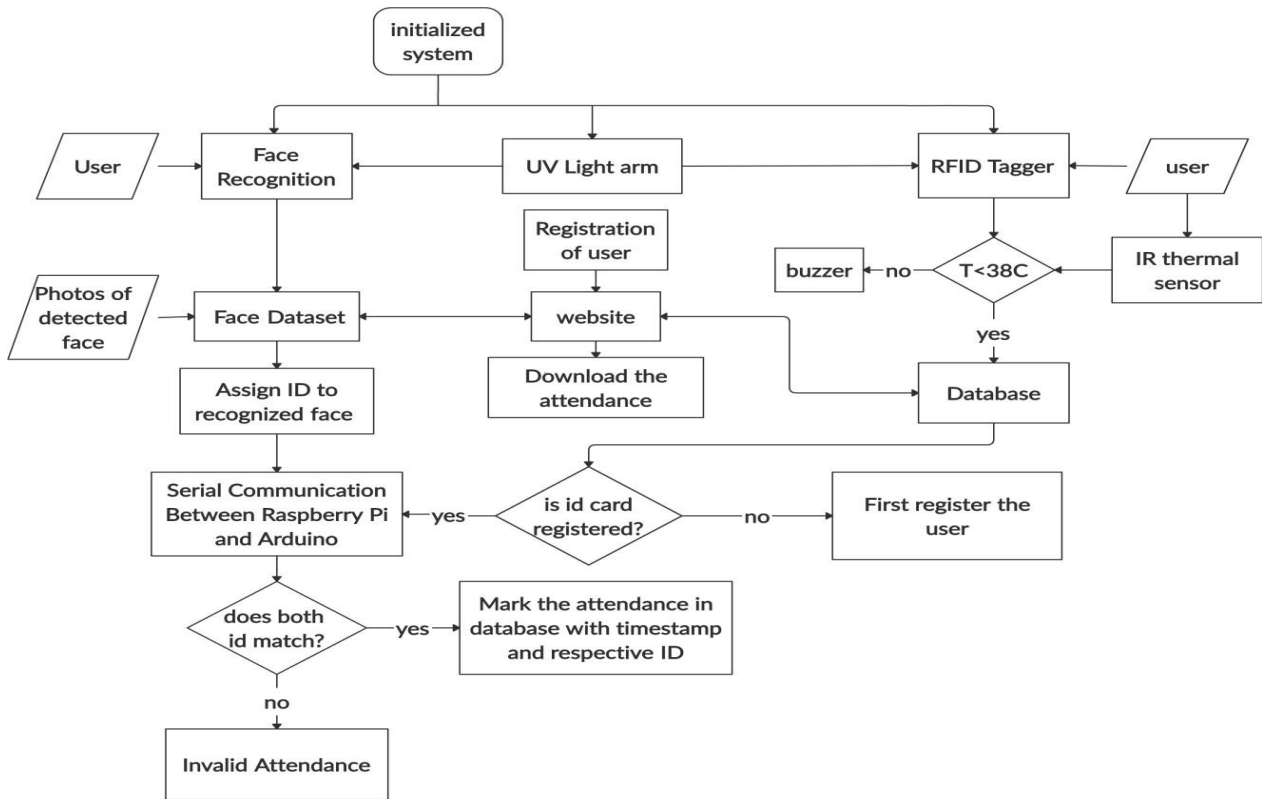


Fig. 4. Flowchart of the Proposed Model

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Analytic and Reporting System for ASHA Workers in India

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Abstract-Asha Workers are hired by the Government of India for the non-availability of doctors and nurses in rural areas of India. They are paid based on information collected from rural people and submitted to the Department of Health. We will be able to deliver their payment to them without any hassle and find out the status of the service so that it is convenient for everyone. and take biometric from people. They can easily convey the collected information to the health department.

Keywords-Medical care services, website, households, application system, voucher, vaccination, map

I. INTRODUCTION

Nowadays, with many health problems in the world, it would be very difficult to provide home-based medical care services in the villages of Maharashtra. In this way, ASHA (Accredited Social Health Activist) workers are active in the village every time and its works to provide medical facilities at home. In this case, ASHA Workers have to go to every house and get information about the people in the house and register it. Due to documents take so many times. They report the total number of visits. The salary is calculated according to the number of households uploaded to the ASHA Workers website in the same way as the number of household members uploaded to the website. In this paper is explored that the ASHA workers have to face the problem and also the solution to it. ASHA Workers work in a given area. When they are working, they may encounter signature problems while uploading information. Also, it is becoming very difficult to handle all this information. So, considering all these problems, we are developed in this application system. We want to design some forms for ASHA workers so that the information of patients can be uploaded quickly by filling the forms. And so far, ASHA was getting a salary by submitting vouchers. We want to do that online. Similarly, if ASHA has visited a house for vaccination, you will see on the map whether she has reached any area of the village so far Information can be handled easily as paperwork is reduced. In this way, it will easily understand the salary of the workers and how much area they have visited with the help of a map. So, this system is important for ASHA workers in India.

ASHA workers are work in the government of India for the unavailability of doctors and nurses in rural areas. ASHA workers provide medical services at a home to home. The work of ASHA Workers is very important to go to a

given specific area. Going from house to house giving medical advice to people as well as information about new schemes. ASHA Workers records them by asking them for his health information. These records are documented. So it was difficult to handle the information of the visitors. While uploading more information on the website, sometimes there is a problem with the signature. It was also difficult to understand where ASHA Worker had visited. So, ASHA workers required more time to complete their works. And the overall system is complicated to work and understand.

This system is being built keeping all these things in mind. In this application, different forms have been designed for ASHA workers. With the help of these forms, ASHA workers can fill up and upload people's health-related forms. This application has two sides, one is the user side and the other is the admin side. On the user side, ASHA Workers use ASHA's biometric figure print to fill in people's information and also easily understand which area they have visited. And ASHA gets a payment receipt from work. The information filled in by ASHA Workers is stored in the database. Similarly, the other side is the admin side. When new health schemes come into it, different forms are created. This daily report is generated from the work of ASHA Workers. Once the report is generated, their payment receipt is generated from this work. A Biometric system is provided for authentication purposes. Using the Google API and ML, they will know exactly where the vaccination has taken place, where they will be specified. In return, all this information is stored in the database. Admins and users will use their credentials to use the system. So, it is very useful for ASHA workers in India. Problem-related to the payments of ASHA's overcome. And easy to explore the information about the new scheme. If ASHA has visited a house for vaccination, you will see on the map whether she has reached any area of the village so far. So, this system is unique, effective, and affordable.

II.LITERATURE SURVEY

In [1], authors have mentioned Upasana measures following parameter ECG (ElectroCardiogram), SpO2 rate (Saturation of Peripheral Oxygen), Pulse Rate, Blood Pressure, Body Temperature, etc. The ASHA worker will visit all the villagers in her village one by one. She will connect the electrodes from UPASANA to the body of the patient. Then she will assign a unique ID to the patient using the numeric keypad provided in the device. After ensuring that the patient is not moving and is seated comfortably so that the medical artifacts are reduced, the ASHA worker will press the MEASURE button. With just one button

the readings from all the devices will be taken automatically. Thus, it is simple for the ASHA worker to understand and use. Also, we have provided an mp3 player which will play pre-recorded instructions, so that the ASHA worker can learn to use the device. The language of the instructions can be chosen by the ASHA worker. After measuring all the biomedical data, it can be stored in the device memory by pressing the STORE button. This device logs the data samples along with a timestamp and a unique ID that identifies the patient. Later on, the ASHA worker can go to a nearby Primary health care center having internet access and transfer the data stored on the device to cloud storage such as Google drive. To transfer data to the computer via the LAN cable the TRANSFER button has to be pressed. Doctors can remotely access this data and he can analyse it to identify health conditions. The software interface was created so that both the ASHA worker and the Doctor can use the same platform with unique login ids and passwords to upload and view the data respectively. In case the doctor finds some abnormalities, he can ask the ASHA worker to bring the patient to the hospital, or else he can give instructions to the ASHA worker on how to diagnose and give proper treatment to the patient concerned.

In [2], Authors wrote in their reports that most of the people in rural areas get medical services from the community healthcare center which is operated by ANM or ASHA workers. This paper was created on a mobile app and is implemented by taking care of ANM or ASHA guidelines.

In [3], The authors of this paper state that child health screening is a fundamental component for the health of the people as well as in it to detect neonatal screening, infection related diseases and nutritional examination in the body. Similarly, sometimes it can be a mistake to take documentary information from people. From this they are given a lot of clinical training or education. With all these needs in mind, we have created a low-cost screening platform. That platform is called Baby Naapp, in which communicative health workers start a system in which information is authorized to be collected from undocumented children. The system works on smartphone cameras, machine vision software, and augmented reality. It has a mobile app. In that app, they automatically create traditional weighing scales and custom baby blankets using children's height and weight. We have created a camera based app that automatically collects child's Middle Upper Arm Circumference (MUAC) information. It uses standard malnutrition fertilizers. Also, the heart rate of young children is monitored using a pulse oximeter device. Children are still being monitored using the thermal camera module. All this data is being digitally uploaded to the central server by clinicians and the public health office.

In [4], Authors have analyzed that India's result in the field of maternal and child healthcare does not improve up to the mark. They suggested that each and every worker should be trained from time to time by video conferencing or creating mobile based

In [5] authors have analyzed that the application is made for

ASHA workers. To stop the uncertified users from utilizing the application, ASHA will login through credentials, which are provided by medical supervisors working at primary health care centers. If an ASHA worker clicks on the login page then all the information is collected in the database. The collected information contains the name of ASHA worker, Contract number, village unique ID, unique identification number etc. Information is also useful for online work.

IV.EXISTING METHODOLOGY

The system designed for ASHA Workers in India. The reason for making this system is that ASHA will reduce the load of workers and make the work easier. This system is unique, easy to handle and effective, affordable. ASHA Workers from the Government of India visit the homes of people in the village to provide health advice. They think about people's health. They take all the information from him and send it to the government. We have created this system keeping all these things in mind. Hopefully this will reduce the paperwork of the workers and make it easier to handle the record. Also, the salary problem that comes to them will be overcome and it will also be possible to see in which area they have visited. This means that the problem of salary and the area visited will be removed and it will be easier for ASHA Workers to reach out to the newly arrived scheme people. All this process can be done only by authorized user i.e. ASHA Workers Biometric system is used for authentication. This system is very safe for ASHA workers.

V.PROPOSED METHODOLOGY

The system of ASHA workers in India has two sides, one is the user side and the other is the admin side. Let's first look at the user side. The user side is the ASHA Workers side. Users can login with the help of username and password. If one of the hopes is not registered, they will sign up. After this login process, enter ASHA in the homepage. After that you can submit the information forms of the people surveyed. You can also see which areas they have surveyed. And their work will generate a salary receipt. And biometric figure print has to be used while submitting all this information. When all this is done, all the information will be stored in the database.

The other side is the admin side. In this, authorized users will enter the system. They can login and sign up. Will then enter the homepage. When new health schemes come into it, different forms are created. This daily report is generated from the work of ASHA Workers. Once the report is generated, their payment receipt is generated from this work. Biometric systems are provided for authentication purposes. With the help of Google API ASHA visited areas easily understood. In return, all this information is stored in the database.

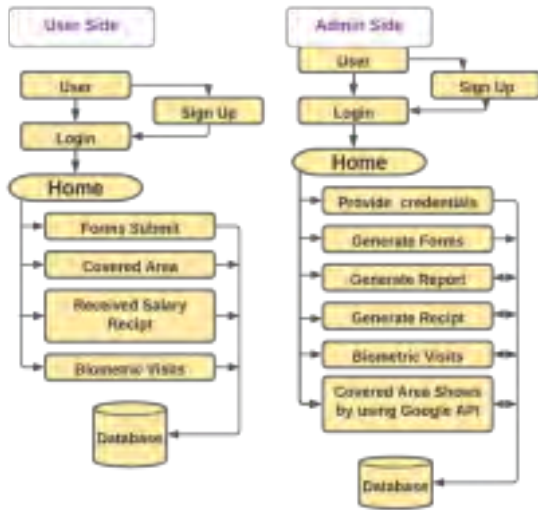


Fig.: System Architecture

Expected Outcomes-After our project completion we will be ready to get the analysis of the data. ASHA workers convey the medical services and the medical schemes in rural areas. So, after implementation of the project we can track the ASHA workers, we can check how many patients they attended, payment receipt to ASHA worker for collecting payment, and patient

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registration. There will be a login ID and Password for every ASHA worker to register patients/receipt submission/information of latest schemes etc. So, by using this app all data is analyzed easily and it will be convenient for the government as well as workers and peoples.

V.CONCLUSION

We are developing an application for ASHA users to track the ASHA workers and eliminate the possibility of copying the same person's information by using biometric. The use of the biometric system will not allow ASHA workers to submit a report of the same person and abuse the payment system. The system will provide a salary sheet for ASHA workers once they submit the peoples' information form. The system will also create a graph to illustrate and assess the hidden meaning in ASHA workers' salary data. The application will also allow the admin to track the ASHA workers' movement using Google Maps to keep track of the area surveyed by the particular worker.

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Health Examination & Risk Prediction Using Semi-Supervised Learning

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Abstract—Data mining is the process of extracting knowledge from large amount of database. Medical databases have accumulated vast amounts of information concerning patients and their medical conditions. Analysis of these data will give new medical information. Data mining is a technique where we extract information from raw data, in our project we will be making prediction for patients having health records. Medical data contains digitally stored health information of patients, such as observations, laboratory tests, medical reports, psychological conditions, allergies and individual's information. Analysis on this data would be useful for diagnosis of the further patients. It would effectively help to prevent as well as to cure particular disease. The algorithm we are using is graph based semi-supervised learning algorithm for risk predictions to classify a progressively developing situation with the majority of the data unlabeled. In the end we will be generating a graph which will help us to give summary about patients and risk of diseases. The major problem is unlabeled data, in dataset there is huge data which is unlabeled. Most existing methods do not consider this data. It gives less accuracy in predicting the risk. Accuracy is most important in case of health related scenarios. So, in this paper we proposed a method to take consideration of the unlabeled data and use it for predicting the results of the upcoming data. We propose a dynamic dataset approach in this paper. As the result of new data is generated it would be stored in dataset for further analysis. It improves the accuracy of the predicting the risk of the further patients

Keywords— *Data mining, machine learning, semi-supervised learning, prediction, health examination, graph based, disease, risk prediction*

I. INTRODUCTION

The process of digging large amount of data and finding some useful information, patterns or hidden connections is used in every sector. The term data mining was coined after 1990s and which comprises statics, artificial intelligence, machine learning. Data mining is evolving constantly as the volume of data produced is multiplied by 2 every two years. But it is not necessary that more data means more knowledge, it should be relevant. Data mining helps to filter chaotic, noisy data and segregates the relevant data on which we can work. Eventually we can predict some factors from this raw data.

In this paper we are discussing a technique through which we can mine the Health records to find out some interesting patterns, graphs basically the relevant data. This extracted information from health records will be useful to predict the risk associated to patient for particular disease. In this paper we are taking the help of semi supervise learning. Learning refers to how machine acquires the knowledge in

training process and how it applies that knowledge in testing process to classify or predict some relevant data. Mainly there are 3 types of learning:

1. Supervised learning: Here data is labeled before training, so it is easy for the machine to understand and classify.
2. Unsupervised learning: In this type data is not labeled, most of the classification is done using clustering techniques.
3. Semi-Supervised learning: This learning overcomes the problem of supervised learning that is the dataset has to be hand-labeled either by a Machine Learning Engineer or a Data Scientist and problem of unsupervised learning that is limited range of application.

This algorithm is trained upon a combination of labeled and unlabeled data. Typically, this combination will contain a very small amount of labeled data and a very large amount of unlabeled data. Semi supervised learning makes 3 assumptions about data which are Continuity assumption, cluster assumption, manifold assumption. The major problem with healthcare/medical data is unlabeled data. Most existing methods do not consider this data. It gives less accuracy in predicting the risk. Accuracy is most important in case of health related scenarios. So, in this paper algorithm we are using to build an application is Semi supervised Heterogeneous Graph.

This proposed method will take consideration of the unlabeled data and use it for predicting the results of the upcoming data. We propose a dynamic dataset approach in this paper. As the result of new data is generated it would be stored in dataset for further analysis. It improves the accuracy of the predicting the risk of the further patients.

II. RELATED WORK

This section reviews various research done in filed of health examination and data mining. Many researchers have applied different methods and algorithm in process to make their system more accurate. We have reviewed various work and gathered information which could help our system to result in more accurate results.

In [1] a recursive algorithm is suggested and the result of crossway is provided. It overcomes the

problem of not considering the unlabeled data. They formulated the work of disease prediction as a grouping issue using the Death reason value as tags, concerning the health-related death a major risk. To handle diversity, it traverse a graph based on Health diagnosis results, where training items in various categories are arranged as different types of nodes and their interim connections as links. It proposes a semi-supervised graph-based algorithm as a proof based disease prediction perspective to mining health diagnosis. To take on huge unlabeled data, it highlight a semi-supervised learning method that makes use of labeled as well as unlabeled occurrences. In addition, it is able to study a supplementary $K + 1$ unspecified class for the candidates who do not belong to the K known high-risk disease classes.

In [2] we observed various data mining methods that has been applied for health data because there's huge data in this area since it's become necessary to use data mining methods to assist in judgment support and prediction in the field of Health to detect the type of disease. This paper highlights onto different data processing approach that are used for pharmaceutical dataset for various diseases which are already recognized and diagnosed for human health. The medical data processing makes business intelligence which is of great advantage for analyzing and curing of the disease. Various data mining approaches are discussed in this paper in detail. This paper highlight various Data processing approaches like clustering, classification, association and also highlights connected work to experiment and predict human disease. It gives us a fair knowledge about the data mining approaches to be used in our project.

In [3] author compared various data mining utilization in the healthcare sector for withdraw valuable information. Developing effective data processing tools for an application could reduce the price and time constraint in terms of human resources and expertise. The prediction of disease using data processing utilization could be a difficult task but it heavily lower the manual work and increases the analysis precision. Traversing knowledge from the pharmaceutical data is such a risk task because the data found are irrelevant, large and noisy too. During this context, data processing tools are accessible in studying the pharmaceutical data and it is more interesting. The aim of data mining utilization is to show that data are numbers, text or facts. It might be processed by a computer into knowledge or data. It is analyzed from this study that a mix of over one data

processing approach than one approach for determine or predicting diseases in health maintenance sector could capitulate more brilliant solutions. The main aim of data mining utilization in health maintenance systems is to unfold robotic tool for analyzing and expand alike health maintenance information.

In [4] it is analyzed that the support vector machine due to its uniform limit is generally suggested by a lot of the researches to overcome over-fitting of data. With some of the assistance of its kernel method it can combine to make a skillful deduction system. It also assumes the important number code, and it is determined honestly by the answer. In clustering models k-means based predicting and forms of it also produce satisfying outcomes. The decision of data mining approaches is done on the basis of the character of the data in dataset. If the dataset is with not labeled characteristics then the clustering methods are best suited for pattern. If the dataset consists of the labeled characteristics then the classification methods is suggested for best prediction. It also suggests Medical data processing Techniques for Health care Systems. Data processing can represent new biomedical and healthcare details for clinical preference.

III. PROPOSED WORK

A. Overview of our approach

The proposed system utilizes the concepts of data mining. There are different algorithms in data mining, the proposed system uses graph based semi supervised algorithm for this project. The overall approach of our system is shown in the figure 1. The system is a java application. The problem definition of our proposed system is as follows:

- 1) It becomes very tedious job when it comes to frequent health checkups. System will help to predict disease based on patient's symptoms.
- 2) To record and maintain proper classification of medical data.
- 3) To consider unlabeled data during disease prediction.
- 4) Key challenge in health data examination is heterogeneity of data.

We have used following approach to examine:

- 1) Collecting dataset in which various health records of patients are available.
- 2) Segregating and preprocessing the selected data.
- 3) Take input in the form of new data from patient.
- 4) Discretized values are regenerated into 0/1 binary based on positive or negative symptom.
- 5) Classification is done on the basis of physical and mental health of patient.
- 6) Type node according to category.
- 7) Link the attribute and record the typed node.

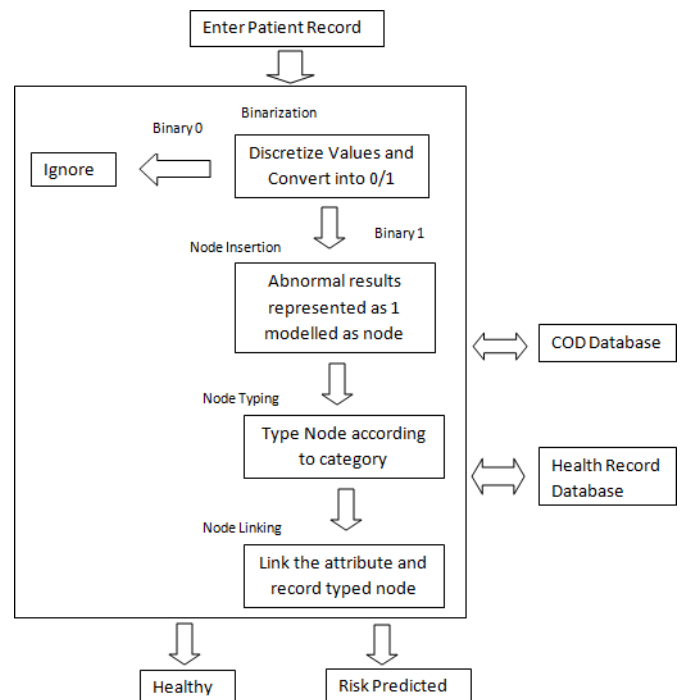


Fig 1. Block Diagram

B. Requirement Analysis

For proper working of the proposed application user's system must satisfy following requirements:

1. Software Requirements

- Operating System: Windows 10
- Front End: NetBeans IDE 7.0
- Coding Language: Java 8 and above, JDK 1.6
- Back End: MySQL

2. Hardware Requirements

- 250 GB hard disk
- Min 512 MB RAM
- Intel Pentium IV 2.4GHz

C. Design Phase

1. Design Goals

- The system should be minimalistic, that is less complex to use.
- Maintain proper classification which will eventually help to reduce the amount of unlabeled data.
- To use the previous record efficiently to predict the risk associated with new record of patient.
- Prediction should be inclined towards more accuracy and less errors.
- The health examination using semi supervised learning will help to analyze record classification.
- Proper analysis of the records classification leads to generation of labelled data.

2. Design Choices

- The system is made for the administrator staff having high privileges in hospitals.
- It uses the records of previous patients as well as new records to generate predictions.

3. Architecture and Implementation

The system is developed using JAVA, JDK 1.6 which can work fine on windows 10. The dashboard/homepage of the application consist of four buttons which work for viewing patients records, adding patients record, adding disease record and show the graph.

The system is developed in java as it is platform independent and robust. To store the dataset of existing records as well as new records MySQL is used. User enters the details of patient with 32 parameters including distinct patient Id. This data will be processed with existing data and prediction graph is generated.

The process flow is as follows:

1. **Binarization:** It is data preprocessing phase in which all the record value are discretized and regenerated into 0 and 1. This helps to cluster

the records into two main groups. The group having value 0 is ignored whereas the group having value 1 is sent for the next step.

2. **Node Insertion:** The every element which comes in this process through binarization is modeled as node for the graph. Also, the abnormal results represented as 1 modeled as node.
3. **Node Typing:** Now the next process is node typing in which each node is typed that is categorized according to the category of examination such as physical test, mental tests etc. In addition, a new type of nodes is introduced to represent individual records.
4. **Link Insertion:** Every feature type node is now associated to a record type node serve as the record that the observation was formerly from.

In our project we used graph based learning algorithm for risk prediction. This algorithm is effective in giving accurate results. It is based on semi supervised learning. Our project deals with the unlabeled data for the prediction. We use graph based learning algorithm to use the unlabeled data for the prediction. It helps to improve the results of risk prediction. Primary data is stored in database will be labeled data. The working of this algorithm in our project is as new data gets into the database it labels the data by performing prediction on the basis of available data. It is stored in database as temporary risk of the patient but it is not the final risk. In short it makes the new unlabeled data as labeled for prediction. So by using this algorithm we make the full database labeled. While predicting the risk of particular patient it uses full database as training dataset for predicting risk of particular patient.

D. Analysis Phase

1. Dataset

The dataset we used for training purpose consists of about 1222 patient's data. The data consists of six types of diseases. The system is trained based on the dataset and we used 400 records for testing purpose.

2. Accuracy for patient with disease

The patients with the disease are correctly predicted with the accuracy of approximately 88.87 % It has predicted false positive rate of 10.87 %.

3. Accuracy for patient with no disease

The patients with no disease are predicted with accuracy of approximately 89.13 % and it has depicted false positive rate of approximately 11. %.

Table 1 Confusion Matrix

Prediction \ Actual	Dengue	Malaria	Pneumonia	Viral Fever	Typhoid	Swine flu	No Disease
Dengue	90.74%	0.0%	1.85%	5.55%	0.0%	0.0%	1.85%
Malaria	2.77%	88.88%	0.0%	2.77%	2.77%	2.77%	0.0%
Pneumonia	0.0%	5.4%	83.78%	0.0%	2.7%	2.7%	5.4%
Viral Fever	1.36%	0.0%	1.36%	86.3%	2.73%	2.73%	5.47%
Typhoid	0.0%	1.61%	0.0%	3.22%	93.54%	0.0%	1.61%
Swine flu	5%	0.0%	0.0%	2.5%	2.5%	90%	0.0%
No Disease	1.08%	1.08%	1.08%	4.34%	1.08%	2.17%	89.13%

4. Accuracy of the System

The accuracy of the system is calculated by combining both the predicted accuracy of patient with certain disease and patient with no disease. So, according to the results the system accuracy comes to 88.5%

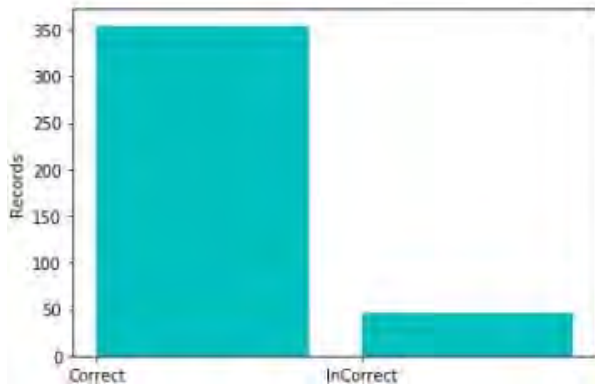


Fig2. Accuracy of System

IV. RESULT

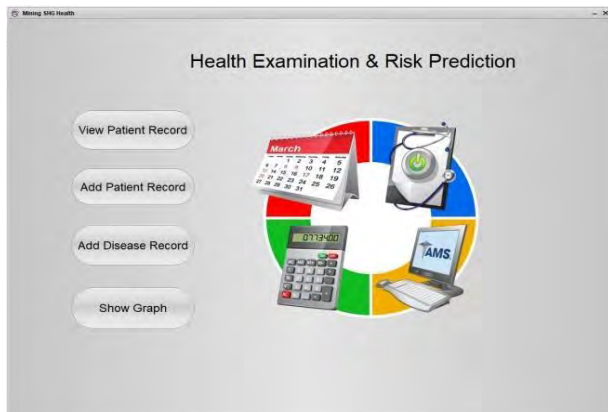


Fig 3.Main Screen

Fig 3.shows the primary view of the proposed system with various menu options to add patient record, view patient record, add disease record and to show graphs.



Fig 4.Add Health Record

Fig 4.depicts the health data entry page from where the patient’s physical, mental and lab tests data can be recorded.



Fig 5.Binarization

Fig 5.indicates the patient’s data converted into binary format. The positive symptoms are indicated by 1 and negative symptoms are indicated by 0. The classification is done as biomedical, physical and mental data.

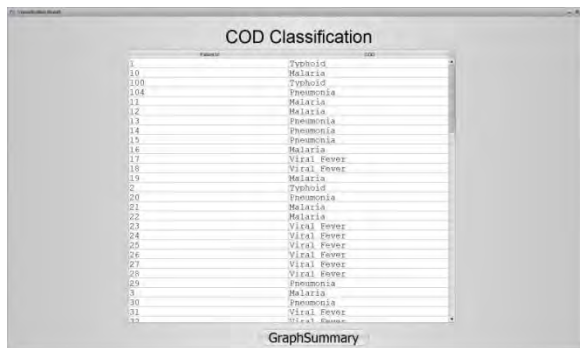


Fig 6. Prediction

Fig 6 depicts the cause of death or disease at risk for particular patient mapped by patient id.

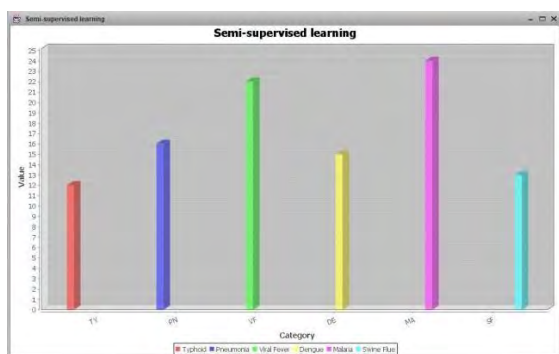


Fig 7. Graph Summary

Fig 7 depicts the graph summary of the patients and the disease.

V. CONCLUSION

Data mining is playing an important role in every sector for creating recommendation system, prediction system and other applications. In Health sector using data mining techniques such as machine learning is quite difficult task since the data generated in this sector is diverse, noisy and also it has large quantity of unlabeled data. In this paper we have implemented the semi supervised graph based algorithm to overcome the challenges of large data. The proposed system uses the health examination records to predict the risk associated with health of patient. This will help the participants to know the possibilities in advance so that they can start the treatment as early as possible. Thus, the efficient algorithm and effective classification lead us get accuracy of 88.5%. Thus, blending the data from different origins can be processed through effective algorithms to accomplish useful prediction.

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Social Media Sentiment Analysis Using Big data

For textual and visual data

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Abstract— Social media have become one of the best platforms where users can share their views, feelings, opinions and advice on different business. People usually give reviews in text form and with growing social media videos are becoming a new source of reviews. People opinion matters a lot to analyze how the product will impact the business. Sentiment analysis on social media determines the distribution and preference of huge population towards specific topic. These days, the applications of such sentiment analysis can be easily observed during elections, movie reviews, brand endorsements and many other fields. In this project, we are going to do the memory computation framework 'Apache Spark' to extract social media data and perform sentiment analysis of textual and visual data. The primary aim is to provide a method for analyzing sentiment from the social media for better analysis of the specific data so both the text and video sentiment analysis is done. This paper reports on the design of a sentiment analysis system and extracting vast number of social media data.

Keywords— Sentiment Analysis, Big Data, Hadoop, Pyspark

I. INTRODUCTION

Some of the popular social media sites such as Twitter, Facebook, YouTube as well as e-commerce sites as in Flipcart and Amazon, have resulted in generating large set of data. People are now sharing their views and opinions on these social media sites. The increase in use of internet has made people around

the world to share their views globally using social media applications. So, people's decisions depend on the reviews and opinions. Large volume of such data is generated each day on social media which can be analyzed to make optimize decisions. The use of emotion recognition systems have great potential in intelligent systems and in decision making process. For

example, a recommendation system for tourism using context or emotion was presented in [6]. Similarly in online gaming, health care, marketing, feedback

assesments of customers, automatic emotion recognition systems are very useful. Sentiment analysis helps us to understand a person's behaviour towards a specific topic. Size of the data matters in extracting the data, as the size of the data is small it is very easy to analyze the data, but if the size of the data is huge, then it is quite difficult to analyze the data.

As, all the data from the social media will be in the unstructured or in semi-structured format. It turns out to be the

biggest challenge in analyzing this type of data to carry further survey. The powerful framework that has been efficient in processing large amount of data is Hadoop, which is considered to be the efficient for distributed storage of large set of data and distributed processing of data.

Unstructured data can be in the form of text and video, so

with the help of Hadoop the analysis of such type of data will be done. Textual and visual data can be extracted from Facebook, Twitter and Youtube for sentiment analysis. In our proposed system, text data from tweets and visual data from youtube is used to perform sentiment analysis.

II. BIG DATA

Big Data refers to the massive amount of the data generated everyday through various data sources for business needs to reveal insights for optimized decision making. Bigdata can be structured, semi structured, unstructured, complex or real time data. The major sources of bigdata includes social media, machine data which includes sensors such as road cameras, satellites, medical devices, games and transactional data like invoices, storage records, delivery receipts and payment orders. With increasing use of internet and social media, huge amount of structured and unstructured data is generated that can be helpful for business organizations to learn more about their customer needs and use this knowledge to improve their business. The three main characteristics of Bigdata is Volume, Velocity and Variety.

Volume of Data Bigdata includes huge amount of data coming

from variety of data sources. Facebook alone generates 500 terabytes of data everyday. High volume of data is created everyday by mobile devices, security cameras, satellites, medical devices.

A. Velocity of Data

Speed of data generated everyday is known as velocity of data. Stock trading algorithms generate data in high frequency, transactions of millions of customers is supported by E-commerce and internet banking, huge number of users involved in online gaming producing multiple inputs.

B. Variety of Data

Big data is not just numbers or strings, it consist of images, video, audio, text, real time streaming data, 3D data, log reports and many more unstructured data.

The need to analyze such huge volume and variety of data is increasing day by day. OLAP tools were used for business analytics in traditional methods. But these reactive analytic tools cannot be used for Big Data analytics. To solve this problem, Yahoo released Hadoop as an open source project in 2008. Today Hadoop is developed as framework for distributed computing by non-profit organization Apache. Hadoop Distributed File System and Map-Reduce processing tools are widely used for handling Big Data in IT, finance, health care, pharmaceutical industry and telecommunication. However, the Map-Reduce processing is not designed for iterative data processing or iterative data analysis as explain in [1]. The solution to the problem was to use Apache Spark[2].

III. APACHE SPARK

Apache Spark is an open source distributed framework and has become one of the key cluster-computing frameworks in the world. It has a thriving open-source community and is the most active Apache project at the instant. Spark provides faster and easy-to-use analytics than Hadoop Map Reduce. Spark allows you to run programs up to 100x faster in memory, or 10x faster on disk, than Hadoop. Spark supports applications in java, python, R. Spark runs anywhere like on Hadoop, Mesos, standalone, or in the cloud.

Spark combines streaming and complex analytics and powers a stack of libraries including SQL and DataFrames, MLlib for machine learning, GraphX, and Spark Streaming. These libraries can be combined seamlessly in the same application.

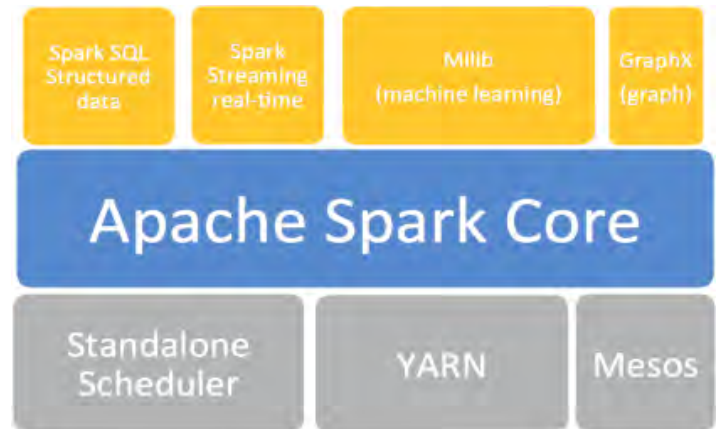


Fig. 1 Spark Stack

Spark consist of three main data structures, RDD, data frames and SQL schema. Spark introduces the concept of an immutable, fault-tolerant, distributed collection of partitioned records that can be operated in parallel, called as RDD (Resilient Distributed Dataset). each partition is the subset of the data from which the partition is created. If any partition is lost during the process they can still be created from the original datasets. Despite its beauty in processing big data, RDD remains a touch distal from the data structures that people are familiar with, e.g., SQL schema, data frame. The recent release of Spark introduces DataFrame into its ecosystem. The columnar organized data structure is conceptually similar to a data-frame in R and it also offers relational data operations like SQL.

IV. LITERATURE REVIEW

In today's world, automatic emotion recognition systems are getting popular in every field from E-commerce to health care, from online gaming systems to pharmaceutical industry. With increase in the use of social media, reviews about products in the form of text and video has increased. In this section we will discuss various sentiment analysis techniques and their application in real world.

[3][4] proposes an emotion-aware- e-health systems where various keywords were searched from feedback from the patients and emotions were recognized from these keywords. It was text based sentiment analysis. [5] describes an intelligent tutoring system integrating emotion-aware framework in which students are allowed to express their emotions using texts or emoticons. A healthcare recommender system called iDoctor was introduced in [7] using a text sentiment analysis based on emotions. In [8], Ng et al. used the CNN with the transfer learning from the ImageNet to recognize emotions from static images. Data set used was the 2015 Emotion Recognition sub-challenge dataset of static facial expression, the authors

achieved 55.6% accuracy. In [12], a customized CNN network for lung image patch classification was used where a 2D CNN model was designed to extract discriminative features from training samples and perform classification at the same time.

Ng et al. used the CNN to recognize emotions from static images with the transfer learning from the ImageNet [13]. The authors used the 2015 Emotion Recognition sub-challenge dataset of static facial expression and they achieved 55.6% accuracy. In [14] Deep Neural Networks with Relativity Learning (DNNRL) model was developed to recognize emotion from face images using the FER-2013 database. An interlaced derivative pattern (IDP) and the ELM based emotion recognition system from images was introduced in [15]. The authors used eNTERFACE database.

V. PROPOSED METHODOLOGY

From the above literature review, we see that the existing systems were not evaluated in Big Data. Therefore, in this paper, we propose, a system that will work well using Big data. This section is divided into two parts. Each section explain the working of text and video emotion recognition technique proposed in this paper.

1. Text Sentiment Analysis

Predicting sentiments of streaming social media data, that is, short text, is a difficult task as these text arrive at huge number. Twitter has become very popular where a number of user expresses their views regarding some topic in comments or tweets. The traditional methods are inefficient to handle text streams from social media. In this paper, we propose an in-memory processing technique using spark for faster prediction of streaming text data. The figure 2 shows overall block diagram of text sentiment analysis.

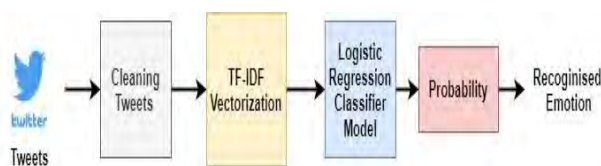


Fig. 2 The overall block diagram of proposed text sentiment analysis system.

First step is to clean the tweets after they arrive and store cleaned tweets in a file for further processing. Cleaning consist of removal of stopwords and punctuations that are not required for feature generation. These clean tweets are provided to the trained model for classification of sentiments associated with each tweets which is explained later. Logistic Regression algorithm is used for classification which is provided by Pyspark’s MLLib.

Logistic Regression

Logistic Regression(LR) is a popular methods in machine learning and data mining that is used for classification of large scale data[9]. It is a probability based prediction technique that is used to assign observations to discrete set of classes.

The figure 3 shows several pre-processing modules, the framework is composed of.

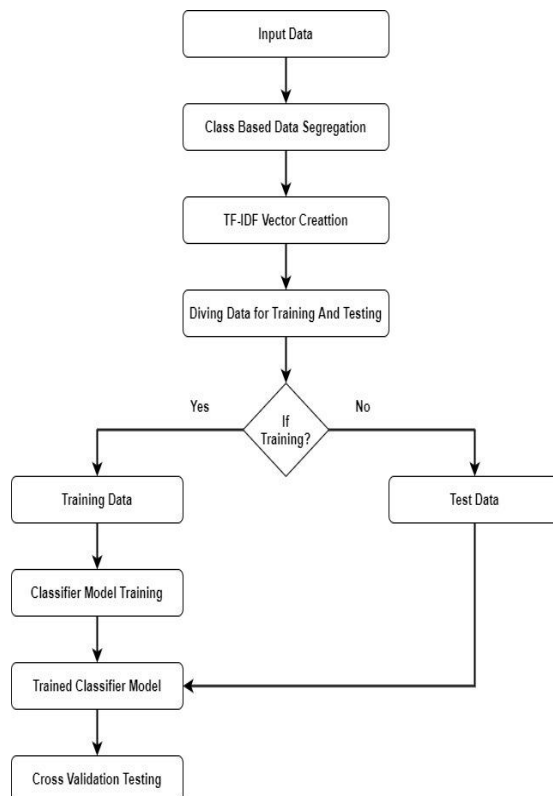


Fig. 3 Sentiment Analysis of Text Framework

The first phase of training framework separates the data on the basis of the class. The dataset consist of labeled tweets, 1 for positive and 0 for negative, hence the input data is divided into

two categories, positive text and negative text. In the next phase, the text is converted into vectors which is performed by identifying the TF-IDF values of the text. Term Frequency/ Inverted Document Frequency (TF-IDF) [10] is a statistics based technique that is widely used in information retrieval. TF_IDF can be used to identify the significance of a word inside a text document by comparing it with text in a huge document corpus. It identifies the weightage of words and hence identifies the relative importance of the word in document or corpus. [11] shows the calculation for TF-IDF.

Term Frequency:

TF measures how frequently a term appears in a document and it is calculated as shown below.

$$TF(t) = \frac{\text{(Number of times term } t \text{ appears in a document)}}{\text{(Total number of terms in the document)}}$$

Inverse Document Frequency:

IDF measures how important a term is.

$$IDF(t) = \log_e(\text{Total number of documents} / \text{Number of documents with term } t \text{ in it})$$

After the calculation of TF/IDF, the next phase is to divide the data into training data and testing data. Dataset is divided in the ratio of 4:1 i.e 80% of the data is used for training and 20% of the data is used for testing. Then the training data is sent to logistic regression classifier for training.

2. Video Sentiment Analysis

Figure 4 shows an overall block diagram of proposed video sentiment analysis system. There are two main steps in the system. The steps are pre-processing and deep networks using the CNN which will be explained later.

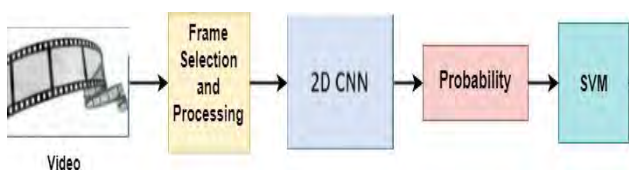


Fig. 4 The overall block diagram of proposed video sentiment analysis system.

Video signal preprocessing

Figure 5 shows the preprocessing steps of the video signal in the proposed system.

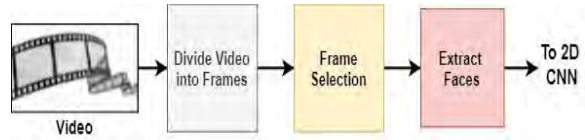


Fig. 5 Video Processing

Step 1: Divide the video into frames of 0.25 sec.

Step 2: Convert the frames into grayscale so that we get a 2D matrix.

Step 3: Detection of the frames containing faces. In the proposed system we used python’s dlib library to perform this task which is Histogram of Oriented Gradient Based(HOG) detector combined with linear classifier.

Step 4: Extracting faces from frames.

In this step, we first crop the detected faces and resize it to 48*48 pixel.

Step 5: The frames with faces

CNN Framework

In Deep Learning, for Convolution Neural Network(CNN) is most commonly used for analysing images. It is a very good learning technique because it learns local and spatial textures of the signals by applying convolution and non-linearity operations [16]. In our proposed system, we use a 2D CNN for the video signal. Figure 6 shows the basic structure of a 2D CNN followed by the softmax in the proposed system for video

signals.

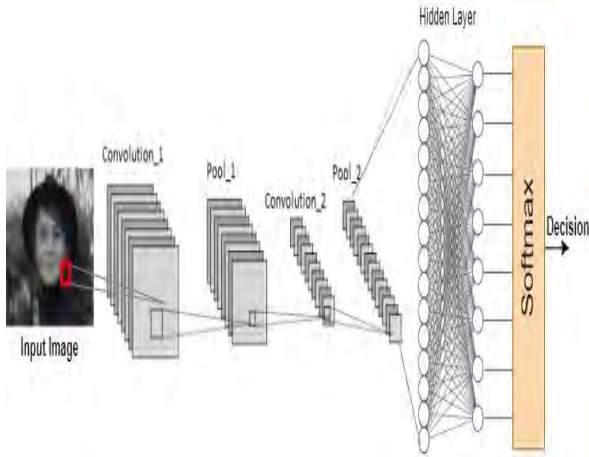


Fig. 6 The structure of the basic 2D CNN architecture for video signals.

In the proposed system for video sentiment analysis, we used a 2D CNN model with 8 convolution layers and 4 pooling layers. Table 1 shows this CNN architecture details. A softmax function is applied to the output of the fully-connected layer. In the proposed architecture, a max pooling is used for downward sampling. The pooling is obtained in every 2×2 , with a stride of 2.

Tabel 1: Summary of the layer in CNN used to implement classifier.

Conv2d_5 (Conv2D)	(None,11,11,256)	295168
Batch_normalization_4(Batch)	(None,11,11,256)	1024
Conv2d_6 (Conv2D)	(None,11,11,256)	590080
Batch_normalization_5(Batch)	(None,11,11,256)	1024
Max_pooling2d_3 (MaxPooling2)	(None,5,5,256)	0
Dropout_3(Dropout)	(None,5,5,256)	0
Conv2d_7 (Conv2D)	(None,5,5,512)	1180160
Batch_normalization_6 (Batch)	(None,5,5,512)	2048
Conv2d_8 (Conv2D)	(None,5,5,512)	2359808
Batch_normalization_7 (Batch)	(None,5,5,512)	2048
Max_pooling2d_4 (MaxPooling2)	(None,2,2,512)	0
Dropout_4(Dropout)	(None,2,2,512)	0
Flatten_1 (Flatten)	(None, 2048)	0
Dense_1 (Dense)	(None, 512)	1049088
Dropout_5(Dropout)	(None, 512)	0
Dense_2 (Dense)	(None, 256)	131328
Dropout_6(Dropout)	(None, 256)	0
Dense_3 (Dense)	(None, 128)	32896
Dropout_7(Dropout)	(None, 128)	0
Dense_4 (Dense)	(None, 7)	903
Max_pooling2d_3 (MaxPooling2)	(None,5,5,256)	0
Total params: 5,905,863		
Trainable params: 5,902,151		
Non-trainable params: 3, 712		

Layer (type)	Output Shape	Param #
Conv2d_1 (Conv2D)	(None,46,46,64)	640
Conv2d_2 (Conv2D)	(None,46,46,64)	36928
Batch_normalization_1(Batch)	(None,46,46,64)	256
Max_pooling2d_1 (MaxPooling2)	(None,23,23,64)	0
Dropout_1 (Dropout)	(None,23,23,64)	0
Conv2d_3 (Conv2D)	(None,23,23,128)	73856
Batch_normalization_2(Batch)	(None,23,23,128)	512
Conv2d_4 (Conv2D)	(None,23,23,128)	147584
Batch_normalization_23(Batch)	(None,23,23,128)	512
Max_pooling2d_2 (MaxPooling2)	(None,11,11,128)	0
Dropout_2(Dropout)	(None,11,11,128)	0

VI. EXPERIMENT AND RESULTS

This section is divided into two each of which presents a description of datasets used in the experiments, some experimental setups, results, and discussion for textual and visual emotion recognition system respectively.

A. Emotion recognition from Text

Data and setup

Hadoop 3.0 was used as the base file system and PySpark was used as the preferred language to implement Logistic

Regression Classifier. The proposed method of Text sentiment analysis was evaluated using Bigdata of emotions. Dataset contain an already fetched, clean and labeled tweets. Tweets are labeled as 1 for positive tweets and 0 for negative tweets. 80% of the data was used for training and 20% data was used for testing. The tweets were fetched using Twitter API and the emotions are classified into one of the two categories[1-positive, 0-negative]. Figure 7 shows the fetched tweets with recognized emotions.

Meaningful words	Prediction
[rt, u201craucy, pelosi, sudden, does, u2019t, like, payroll, tax, cut, obama, proposed, thought, brilli, u2026, n]	1.0
[rt, obama, administration, oversaw, 8, yr, bull, run, stock, market, ended, today, n]	0.0
[leave, guy, fraud, u2026, n]	0.0
[journalism, days, n]	0.0
[lenon, mental, breakdown, john, kashch, would, say, anything, bad, trum, u2026]	0.0
[rt, 77, americans, confident, trump, administration, u2019s, ability, handle, coronavirus, n]	0.0
[38, americans, w, u2026, n]	0.0
[rt, tom, hanks, fine, no, full, seasons, obama, president, n]	0.0
[still, obama, pee, size, brain, n]	0.0
[rt, u201craucy, pelosi, sudden, does, u2019t, like, payroll, tax, cut, obama, proposed, thought, brilli, u2026, n]	1.0
[scariest, part, whole, thing, unknown, aren, u2019t, testing, people, means, data, hanstron, u2026]	0.0
[rt, obama, created, global, pandemic, response, team, ebola, crisis, orange, dump, along, traitor, bolton, get, u2026, n]	1.0
[rt, perspective, n]	0.0
[2009, nfl, outbreak, killed, 284, 800, people, 70, times, many, covid, 19, n]	0.0
[ncaa, tournament, ban, fan, u2026, n]	0.0
[rt, imagine, different, barack, obama, president, ask, 8, year, republican, trump, meltdown, ob, u2026, n]	0.0
[rt, free, press, everyone, know, china, power, crush, us, politicians, gave, u2026, n]	0.0
[rt, u201craucy, pelosi, sudden, does, u2019t, like, payroll, tax, cut, obama, proposed, thought, brilli, u2026, n]	1.0
[rt, obama, administration, covered, report, showing, 3, 5, billion, foreign, aid, never, reached, intended, destina, u2026, n]	0.0
[rt, asked, trump, supporter, name, one, thing, anything, obama, black, community, course, ca, u2026, n]	0.0

Fig. 7 Fetched tweets with Emotion Prediction

Experimental Results and Discussion

The Receiver Operating Characteristics (ROC) plot for the proposed work in presented in figures 8. It could be observed that the proposed technique exhibits high true positive levels and low false positive levels, making the prediction robust. Hence the proposed technique is considered to be a reliable and robust method for sentiment prediction.

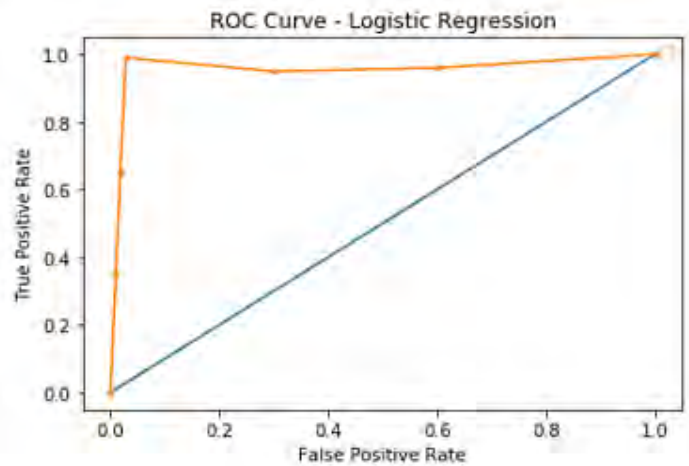


Fig.8 ROC Curve

The figure 9 shows the confusion matrix for text sentiment analysis system. Test data of 574 labeled tweets were used to test the model. The confusion matrix shows the performance of the proposed logistic regression model for text sentiment analysis. It can be seen that the model made 563 correct predictions out of total 574 data. The showed 98% accuracy in testing phase.

		Actual Values	
		Positive (1)	Negative (0)
Predicted Values	Positive (1)	282	8
	Negative (0)	3	277

Fig.9 Confusion matrix

B. Emotion recognition from video

Data and setup

The proposed model for video sentiment analysis was evaluated using Facial Emotion Recognition 2013(FER2013) dataset [16]. The data consists of 48x48 pixel grayscale images of faces and the emotion in faces is classified to one of seven categories (0=Angry, 1=Disgust, 2=Fear, 3=Happy, 4=Sad, 5=Surprise, 6=Neutral).

Experimental Results and Discussion

The video stream was first divided into frames and frames were converted into grayscale images of 48x48 pixels. The figure 10 shows original image frame and the frame after preprocessing.



Original frame



Processed frame

Fig.10 Image Preprocessing

Figure 11 Shows the Confusion matrix of the system using the FER2013 database. The numbers represent accuracies. The diagonal dark-shadowed numbers are the correct recognition accuracies of individual emotions, while the light-shadowed numbers are the confused accuracy in the range between 5% and 50%. The model achieved accuracy of 66.36%.

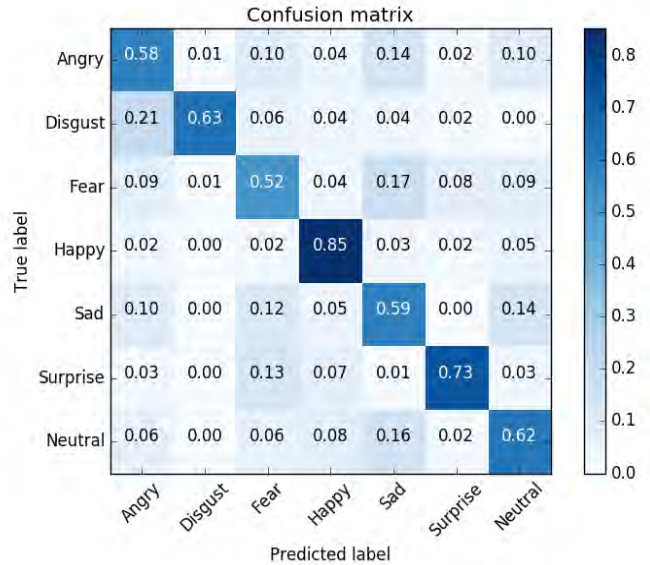


Fig.11 Confusion matrix

VII. CONCLUSION

This work presents an effective sentiment prediction technique in Big Data, using Spark and machine learning. Logistic regression, a classification algorithm was used with pyspark for text sentiment analysis. 2D CNN model was used for analyzing image frames of video. The proposed model for text and video sentiment analysis has been identified to provide better accuracy levels. The proposed technique analyzes text in terms of positive and negative sentiments and classify image frames of video to one of seven categories(Angry, Disgust, Fear, Happy, Sad, Surprise, Neutral). Hence future extension of the proposed work can be extended to include neutral sentiment for text and video analysis model can be trained with additional data to achieve higher accuracy.

The models will give us an effective output which is easy to understand. These models can be used in application useful for decision making in various domains. With the use of bigdata, pyspark and machine learning algorithms models have achieved great accuracies and it becomes easy to process the data in less time.

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