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Organised by
School of Computer Science,
MIT-World Peace University (MIT-WPU),
Kothrud, Pune, Maharashtra, India

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Organised by:

School of Computer Science, MIT-World Peace University (MIT-WPU), Kothrud, Pune, Maharashtra, India

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Institutionalising the People's Vehicle

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ABSTRACT

Exploiting the Object Detection Methodology, the solution is expected to detect vehicles, obstacles or threats in the vicinity; also read the lane markings. It has the potential to ensure safety by monitoring and complying to lane discipline using cameras and sensors. With defined thresholds, the solution ensures an immediate guided action in case of any breach (example a Buzzer Alert to the Driver). This will help drivers to remain alert and prevent potential mishaps.

Keywords - Deep Learning, Object Detection, Sensors, Distance Measurement, White Line Tracing, Sensors.

I. INTRODUCTION

Technology is getting smarter by the day and human expectations are growing exponentially in this area. Technology which was considered as a luxury till a few years back has been commoditized and is part of every-day life and has entered every industry and sector. Automobile Sector is leading the adoption of tech in the areas of Machine Learning and Artificial Intelligence. Unfortunately, high end technology is limited to luxury brands and that is where our solution will bridge the gap in getting this tech to people's vehicles. Today Automobile Industry is investing millions in safety of their passengers. With this paper, we are attempting to provide detailed solution for passenger's safety.

The solution will continuously monitor the "lanes" on the road it will also detect the objects surrounding the vehicle in which the smart solution is installed. Secondly, it will be a boon for people who can't avoid their phones while driving; however artificial intelligence will help them by giving alerts. The main objective of this research is to mainly focus on roads, moving objects, distance measurement and giving timely alerts.

II. DATASET

The research is based on using images as training dataset. Camera will capture live stream and solution will take action as soon as objects are detected.

A. Dataset Description

Dataset used in our research was taken from COCO. COCO stands for Common Objects in Context. It consists of 90 classes from vehicle to household items. Since COCO dataset has many capabilities like object detection, captioning detection etc., we have only

used the object detection part of it. The downloaded zip file size was 1.4 GB which consist of image and text which holds the name of classes. The images are more than 1 million.

B. Data Preprocesing

For every problem to get resolved it is very important to get the right dataset. The story doesn't add even after getting the data. One has to understand the data and later take needed steps on pre-processing. So, for every problem statement pre-processing step will differ. In this research we have taken pre-processing steps like converting the classes into numeric categories. The reason we had to do this was for the model to understand the given categories. Hence, each label has a given allocated category to it. Once the object is detected, we can reverse the process from category to labels.

III. METHODOLOGY

The methodology approach is twofold, Deep Learning Model configured along with hardware

A. Deep Learning Model

For any research to be implemented in real world, it is necessary to have a strong deep learning network with possibly highest accuracy. Considering that this research is expected to apply on vehicles, our main objective is to detect objects with a combination of cameras and sensor. For Proof of concept (POC), a trial model is created to analyze the authenticity of the solution in real world, we have implemented pre-trained model with the programming language of Python.

There are few important libraries in Python which we have implemented in our research.

1. Python – It is one of the languages which is used by many data scientist and analyst to solve day to day problems. It is one of the powerful languages to solve CNN because it gives many ready to go libraries. It is very efficient and reliable to implement it.

2. Pre-Trained Model- It is the model which is already trained and available for assessments - Advantage of using a Pre-trained model is it save time and complexity while training the model. Disadvantage is it may not give 100% accuracy.

3. Resnet-18 – It is the image classifier model trained on COCO dataset. It is a Convolutional Neural Network which has 18 deep layers. It can classify 1000 object classification. It takes the input of 224*224.

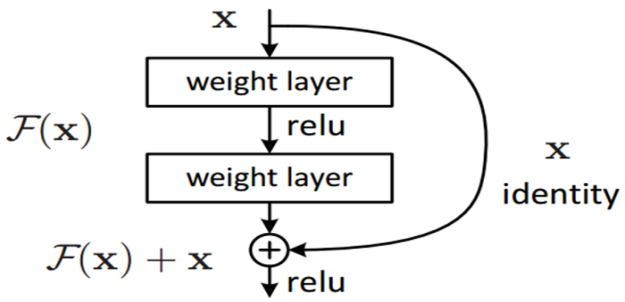


Image Source – [2]

4. TensorFlow Model – It is a google developed library which can predict many problem statements. It is the framework which creates the deep learning network that solves the object detection problems. There are many pre-trained models with TensorFlow which is called as "Model Zoo". It is a handy framework which depends on few libraries like PIL (Python Imaging Library), matplotlib etc.

5. Detecting Lane Marking - We have added the images and videos of lane marking (white lane on road) available on Kaggle and converted it into RGB to HSV, the motive was for line segmentation. Since it is relatively simpler to

work with greyscale where pixels are represented with a single value to represent background with 0 - 255.[7]

B. Hardware

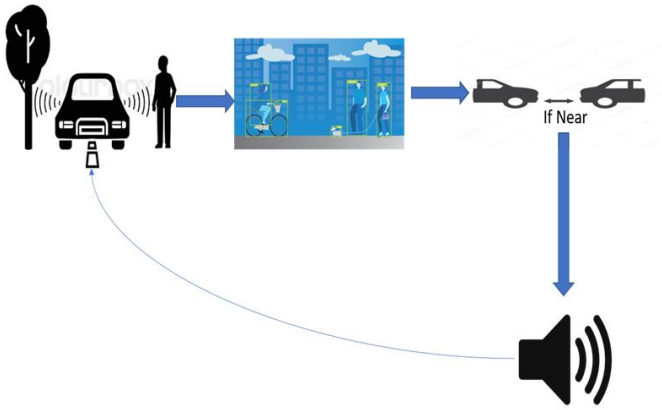
To implement the above solution in real world, it is essential to have reliable hardware to support it.
We have used modules like Raspberry Controller, USB camera and Ultrasonic sensors to conclude our POC.

1. Raspberry Pi- It is a key hardware component to implement our deep learning model. The camera and sensors are configured here. We have used Raspberry Pi version 4 which have SD card slot expanded up to 64 GB and processor of 8 GB.
2. Camera- USB Cameras with 5 Megapixels resolution captures and detects objects. In a standard 4wheeler, a set of 4 cameras are used to have a complete 360-degree view. With each camera on each side attached to a USB connector with the help of Expansion board.
3. Sensors. – To detect the obstacle or threat, an ultrasonic sensor is attached to Raspberry Pi with the help of Jumper wires. Here, a threshold is set for measuring distance. Threshold is set about 40 centimeters wherein if another vehicle comes less than the threshold value then it will alert the user.
4. Speaker- It is used to alert the driver when the object is near and threshold is breached. It will alert even if the car is compromising the lane discipline

These were the components used for building Proof of concept. Every module of the hardware and deep learning model was optimally used to achieve the set objectives of the solution. Software was converted to Tensor Flow lite to get feasible for Raspberry pi to process it.

IV. EXPERTISE SYSTEM.

Here is the workflow of our very own.



A. Workflow Steps

- The camera and sensors would start as soon as the driver starts the car
- After moving, camera will start capturing real stream and pre-trained model set in the raspberry pi will help to detect objects.
- In parallel, Sensors will detect the distance between two objects
- If object is detected closer to the vehicle or breaching set parameters, it will alert the driver with the speaker
- Cameras and Sensors continue to run in the background to monitor and find the objects.
- Ultrasonic sensors will be configured for accurate and precise measurement
- Camera will be on all four sides capturing and detecting objects
- Speaker will alert the user when objects breach parameters

V. CONCLUSION

After testing the whole process, Evaluation of resnet model is 89.6% [4], retrained comes with its pros and cons and cannot be implemented in real life scenario where value of life is important.

We can therefore conclude that Pre-trained model is efficient for the purpose of a POC. For safety purposes it is inevitable that the required models will have to be trained so that it captures more classes. The processing speed for detecting objects in real time should be faster and efficient.

Future scope

The scope is to implement in real time scenario and in real time vehicle. Training our model, we will implement with Deep Learning concept. Implementing our CNN model by training our objects with more set of training, validating and testing images. We can also apply for self-braking system in case when distance is too close and there is no gesture from driver.

We have taken the following reference for our research. Authors have worked on similar lines and it helped us to do more research on similar lines.

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Audio Assistance for Visually Impaired Using Image Captioning

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ABSTRACT

Blind people navigate safely through a familiar room based on a strong judgement about the location of objects. If something has been moved, added or removed, it can present difficulty and potentially a danger. Human eyes are one of the most important body parts that help humans to understand and interact with their surroundings. Most learning and recognition of objects around us is accomplished using the eyes and their biological capabilities. Given the recent advancement of imaging systems and the ever-increasing processing power of microprocessors, developing audio assistance systems for the visually impaired using image captioning is possible. In the initial system, we propose a system consisting of a camera-equipped microprocessor to capture the images and generate descriptive text out of them. This will ultimately help the visually impaired to perform their day-to-day activity independently.

Keywords : CNN, RNN, Image Captioning, Text-To-Speech, Raspberry Pi

I. INTRODUCTION

Over 40 million people in the world are blind, and over 120 million people have significant low Vision conditions that cannot be corrected, cured or treated by conventional refraction, medicine or surgery. This number is expected to double by the year 2020(World Health Organization, 2004). Most common and current mobility devices for the blind provide information in either tactile or auditory form. Of these the most used are the long cane and the guide dog, the limitations of which include effective range and cost, respectively. Human eyes are one of the most important body parts that help humans to understand and interact with their surroundings. Most learning and recognition of objects around us is accomplished using the eyes. Given the recent advancement of imaging systems and the ever-increasing processing power of microprocessors, a machine vision aiding system for the blind can be a reality. Blind and visually impaired people navigate safely through.

People can extract data from almost everything that surrounds them. For example, when you hear a sound, it can describe it using natural language. When it comes to machines, they cannot do that readily. Humans can make use in that way of every sense they possess. Now imagine if one of those senses is missing. Machine learning applications can help, for instance, deaf people when it comes to written information by using a text-to-speech algorithm to "read" to them.

There is a great need to integrate visually impaired persons into society. This work proposes one method that we believe can go a long way in achieving this objective. If blind people can recognize their surroundings, especially people around them, then we think that their quality of life will improve greatly.

II. LITERATURE REVIEW

Adela Puscasiu in [1] this paper presents a composite model, consisting of a deep convolutional neural network for feature extraction that makes use of transfer learning, and a recurrent neural network for building the descriptions. Due to the lack of efficiency of the device optimum results not achieved.

Varsha Kesavan [2] in this paper has done a comparative study between different pre-trained CNN models like inception v3, vgg16, resnet with and without attention model. A Comparative Study between the models is done. But the Conclusion did not have a proper result.

Faruk Ahmed [3] in this paper, has presented the outcome of the experiment of image captioning systems. The design and implementation of a system embedded in an RPi3 is part of the experiment. This system uses API calls that are network dependent which results in the delay of output.

Cristian Iorga in [4] this paper presents a model of Deep Convolutional Neural Networks (CNN) for image recognition. Use CNN system the large ImageNet dataset of 14 million images and 1000 classes in order to learn feature selection. Dataset Used: UC Merced Landa. They have achieved an accuracy of0.87.

III. PROPOSED WORK

The aim of the project is to make an assistive technology for blind people which would assist them to travel independently and hassle-free. The main objective of our project is to develop a system that will help them to understand and adapt to the changes in their immediate surroundings. The frame is extracted from the video after a certain interval to caption it. This caption is then converted to audio format using the text-to-speech technique. With audio assistance from our device, blind people can visualize the event occurring around them. Although there are some limitations that are pertained, users will have to charge the device regularly, output depends on the quality of the frame that is being used to generate output. To reduce the latency of response in the initial phase device is to be used in offline mode, hence the dataset used in the machine learning model is to be updated in regular intervals. Adding to the above instances, it is assumed that the device is used in ample light so that input video would be of good quality and would enhance the accuracy of output. The placement and position of the camera are crucial for achieving optimum results.

IV. PROPOSED ARCHITECTURE

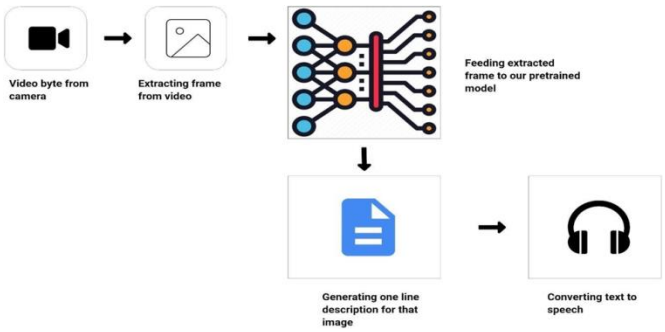

Fig.1

The proposed system includes a wearable device that helps visually impaired people to move around and get their day-to-day tasks done independently like every other person [3]. The wearable device will be a

pouch that contains a Raspberry Pi, a camera module connected to Raspberry Pi and an audio jack that will be worn by the visually impaired user.

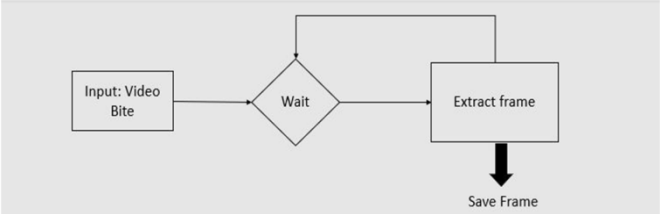

Fig.2

V. PHASES

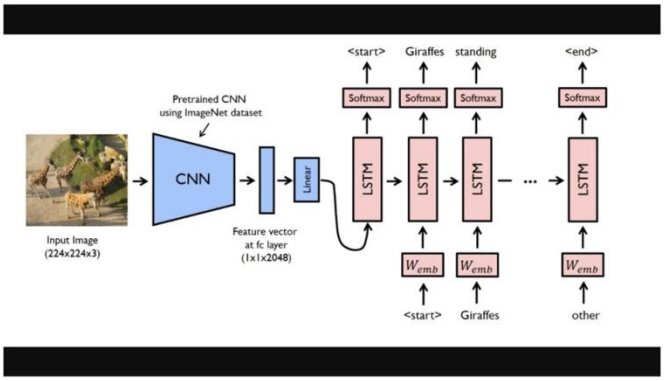

Fig.3

A. The dataset:

The dataset used for training and testing the model is MSCOCO, which stands for "Microsoft- Common Objects in Context" [5]. It was originally made available in 2014, its last revision being in 2015. This dataset is specifically created for usage in the type of problem addressed in this paper. According to its website, it "is large-scale object detection, segmentation, and captioning dataset". It contains more than 80000 labelled images, making it one of the most popular datasets for image-relatedprojects.

What makes it a perfect fit for the problem at hand is that it has five different labels each containing one written description for each image. It is also made use of the "separate" dataset that is represented by all the labels (captions) for training and testing the decoder.

B. The data pre-processing:

Data pre-processing represents a very important step in every machine learning algorithm. Skipping this part results in the model raising an error because it does not receive the expected input. This application requires two different types of data preparation: one for the deep convolutional neural network encoder and one for the deep recurrent neural networkdecoder.

Given that the deep convolutional neural network encoder is based on the Inception- v3 model [2], the images must be resized to the expected format, i.e. (299, 299) and the pixels must be brought in the [-1, 1] range. TensorFlow offers the "image" module for processing images, which allows for them to be read into memory, decoded as jpeg and resized. The application of the Inception-v3 of the Keras high-level API offers the "preprocess_input" method, which normalizes the pixels in the desired range, mentioned above [1]. Data preparation for the language generatordecoder,

i.e. the deep recurrent neural network requires the pre-processing of the textual data, i.e. the captions. For this part, the module "pre-processing" and its methods, offered by Keras, are used.

The steps performed are:

- Caption tokenization, i.e., splitting the captions by white spaces, ending up only with the unique words.
- Vocabulary size limitation: the vocabulary size is limited to the top 5000 words, to save memory. Converting text into a sequence of numbers, Word-index mapping, Padding all the sequences to the length of the longest one. The result is a vector of a sequence of integers, padded to be of the same length with the longest caption that was present in the dataset. This result is depicted in the image below:

```
[ ] sample_caption = torch.Tensor(sample_caption).long()
    print(sample_caption)

    tensor([   0,    3,   98,  754,    3,  396,   39,    3, 1009,  207,  139,    3,
             753,   18,    1])
```

Fig.4

C. The Encoder-Decoder Architecture:

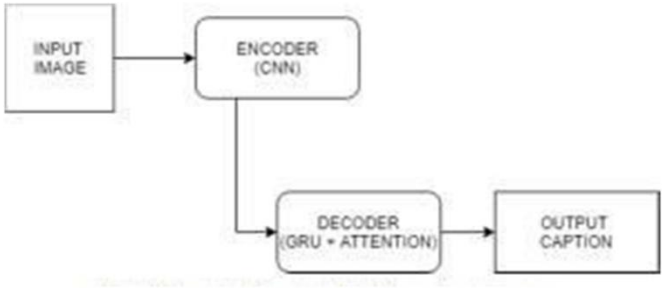

Fig.5

The Encoder-Decoder architecture is widely used in applications such as machine translation, by using two Recurrent Neural Networks. The main idea behind this architecture is to resize the input vector required by the second network. In this case, the first neural network is of convolutional type, while the second is a Recurrent Neural Network. The vector output of the first neural network is the input of the second one. A general schematic of this architecture is showcased below:

The attention mechanism, as described in the paper [4], acts as an interface between the encoder and the decoder. This is needed because without it, the data fed into the decoder would be just one vector representation. The attention mechanism offers information from every hidden state of the encoder, aiding the decoder in focusing on the useful parts.

D. The training phase:

The training phase is self-explanatory. This is how the algorithms are learning to map the function parameters. This is the most complex step, both computationally and programmatically. This consists of backpropagation of the data through the algorithm several times and requires some parameters to be set up and some functions to be chosen.

1) Loading ML model in raspberrypi

After training the model on a GPU enabled machine, we can load that model on raspberry pi directly.

2) Connecting Camera Module to raspberrypi

Fig.6

3) Text-To-Speech

Our paper's main purpose is describing the brief given by the ML model to blind people in speech format. We can convert the text generated by the model to voice by using.

```
pip3 install gTTS pyttsx3 playsound
```

Fig.7

python.

i) Installing requiredlibraries

ii) Open Python file andimport:

```
import gtts
from playsound import playsound
```

Fig.8

iii) It's pretty straightforward to use this library, you just need to pass text to the gTTS object that is an interface to Google Translate's Text-to-Speech API:

```
# make request to google to get synthesis
tts = gtts.gTTS("Hello world")
```

Fig.9

iv) Up to this point, we have sent the text and retrieved the actual audio speech, let us save this audio to a file:

```
# play the audio file
playsound("hello.mp3")
tts.save( hello.mp3 )
```

Fig.10

VI. HARDWARE AND SOFTWARE REQUIREMENTS

Hardware Requirement:

1) Raspberry Pi 4Model:

Raspberry Pi is a cost-effective, credit card sized. Computer that connects to a computer monitor or television. It's quite beneficial for both personal and commercial use.

Fig.11

Model B of the Raspberry Pi 4 features a 1.5GHz quad-core 64bit ARM Cortex- A7 Processor, 1 GB or 2 GB or 4 GB SDRAM, complete Gigabit Ethernet, Bluetooth. of dual-band 802.11ac, two USB 3.0 and two USB 2.0 and supports up to 2 monitors of 4K resolution.

[4] Fig 2 depicts a Raspberry Pi 4 Model B. First needed to configure the Raspberry Pi from the programming side to communication mode and then upload the code which is in the python programming language. The online simulation mode is after the compilation program. The online simulation model is used to check how the program is running step bystep.

2) CameraModule:

Fig.12

The Raspberry Pi requires a camera module to take high-definition videos and images which is later used as inputs for various training and analyzing purposes. It also supports 1080 p30, 720p60 and VGA90 video types and still captures. Capturing the video using the camera module is easy with OpenCV, as it does not require any additional software.

Software Requirement:

- Google Collab: It allows anybody to write and execute arbitrary python code through the browser and is especially well suited to machine learning, data analysis
- Tensor Flow Lite: It is an open-source deep learning framework for on-device inference.
- Keras: It is an open-source software library that provides a Python interface for artificial neural networks.
- OpenCV: It is a library of programming functions mainly aimed at real-time computer vision.
- PyTorch: It is an open-source machine learning library based on the Torch library, used for applications such as computer vision and natural language processing.

Functional Specification:

- COCO Dataset API (Only Used for model Training)
- Camera
- Earphone

- Google Text-to-Speech (GTTS): Text-to-Audio conversion.

Interactions:

- Continuous Video input is taken from the camera.
- After a certain interval frame is extracted and captioned.
- The text-to-speech module gives audio as an output.

VII. CONCLUSION

This Project report presents a synopsis of enabling a real-world experience through a speech-based feedback system. The idea of a device that includes a Raspberry Pi 4 and camera module to provide a brief description of the surrounding. Similarly, objects present in front of the user are identified and communicated to the person who is using the device. In a study conducted, it was found that visually impaired people had difficulty in identifying whether there are any hindrances in front of them. Our project solves these challenges and aids the visually impaired to get their tasks done in the same manner as that of a normal person. Our project, therefore, is aiming to make the living of the visually impaired easier as well as help them get through their daily activities without meeting any dangerous obstacles and wish to incorporate several new features to the system likenavigation.

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Hand Sanitizer Market During and After Covid-19 Outbreak -in India

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ABSTRACT

The recent pandemic SARS-CoV-2 (COVID-19) has affected lives globally. Medical advisories suggest the use of alcohol based hand- sanitizers to slow down the virus transmission. Hand sanitizers are used to get rid of bacteria quickly. The recommendation for effective sanitization use of hand sanitizer in community settings was developed based on data from number of careful studies and research. Many studies conclude that Hand Sanitizers work well in Medical settings like hospitals, where hands generally come in contact with germs but not heavily soiled or greasy hands. Many studies also conclude that sanitizers with 60-95% of alcohol concentration are more effective at killing germs than those with lesser concentration. Hand Sanitizers with low or no alcohol concentration may not work well for many types of germs and merely reduce the growth of germs rather than killing them. Here we will be study and analyze the use of hand sanitizers after careful study and observations on data before and after Covid-19. The main objective of this paper is to predict the use of hand sanitizer in near future by using linear regression machine learning algorithms based on past values.

Keywords - Sanitizer, alcohol concentration, market research, linear regression, market prediction, Machine Learning techniques

I. INTRODUCTION

Hand sanitizer, also known as hand antiseptic or hand rub is applied and rubbed on the hands to remove pathogens (disease causing organisms). These come in foam, gel, or liquid form. But they are recommended only when soap and water are not available. The Covid-19 pandemic has transformed the growth of sanitizer market in India drastically. Dabur India Ltd., Emami Ltd., Dettol, Lifebuoy, The Himalaya Drug Co., Savlon, Godrej, Multani, are some of the major market participants. The increasing incidences of pandemic will offer immense growth opportunities. Aiming to help players strengthen their market foothold, this hand sanitizer forecast study will provide a detailed analysis of the market changes before and after the pandemic. The report also empowers the industries to focus on the competitive landscape and insights into the product. For predicting use of hand sanitizer, we proposed Machine learning supervised algorithm Linear Regression.

II. RELATED WORK

We went through various research papers and articles to find that after COVID-19 the market for sanitizer

has shown tremendous growth. It is one of the major market in concern after the Pandemic.
The demand for hand hygiene products has been rapidly exceeding the supply in both online as well as on ground. Shifting consumer preferences towards convenient hygiene products such as sanitizers is expected to host the market. In addition, the recent COVID-19 pandemic since of 2019 has boosted the market for hand sanitizer.

Jain Arpita in 2020 in "Hand Sanitizer Market Share, Growth Factors and Forecast Analysis to2026". Hand Sanitizer Market report published by Value Market Research provides a detailed market analysis including market size, share, value, growth, and trends for the period 2019-2026. This report covers regional and country market in detail. [Year-2020] [1]

Pallavi Singh , Ipshita Potlia , Shitanshu Malhotra , Himagi Dubey , Himanshu Chauhan, in , "Hand Sanitizer an Alternative to Hand Washing- A Review Literature". Published on July 19 , 2020, evaluated that using soap and water for washing hands are more practical and effective than using sanitizer for oily and greasy hands. But if used correctly , an alcohol-based sanitizer in appropriate volume can eliminate certain types of micro-organisms. The study also suggest to use Sanitizers with alcohol content between 60 to 95% in form of ethanol, isopropanol, or n-propanol. [2].

Jane Lee Jia Jing, Thong Pei Yi, Rajendra J.C. Bose, Jason R. McCarthy, Nagendran Tharmalingam and Thiagarajan Madeshwaran in "Hand Sanitizers: A Review on Formulation Aspects, Adverse Effects, and Regulations" concluded that the use of ABHS is becoming more common because of rapidly and efficiently killing of microorganisms. It is very important to select ABHS with appropriate alcohol concentration [3].

Astrid Schneider Et.al offered linear regression model on medical data. It enables the description and representation of relationships among multiple factors. It expedites the description of predict relevant risk factors and the computation of risk scores [7].

G.K.Uyanik and N.Guler suggested a study on multiple linear regression analysis. This analysis carried out by considering student's data with more than one independent variable [8]

III. DATA SET AND IT'S DESCRIPTION IN MARKET

Data collection: we gathered market data through extensive database of reliable secondary sources online.

As a part of our primary data analysis, we collected raw data from wits. World bank and took it under pre-processing. We conducted exhaustive studies with verified intelligence regarding the market size, share, key drivers, and forecast along with supply chains. The data we got was much balanced and well categorized. Then we began with Data cleaning, Pre-processing, removing unwanted columns and feature selection.

IV. DATA EXTRACTION

Dataset Description:
We have worked on the dataset of India. Our data set consist of Export data of India to about 88 countries in the year 2018 and 2019. The dataset consist of 9 attributes listed below:

1. Reporter country
2. Trade flow (Import / Export)
3. Product code
4. Product description
5. Year

6. Partner
7. Trade value (1000 USD)
8. Quantity

Reporter country is the country whose data for export market is being considered in the report. Trade flow is the import/export information. Product code and product description gives the detail of product being analysed. Year dataset tell us about the year we are analysing. Partner attribute tells you about the Partner country in the export and import market. Trade value in 1000USD gives us the idea of the trade profit being earned by the reporter country and Quantity is simply the quantity being imported / exported to the partner country.

V. RESEARCH METHODS

We used observation, exploratory analysis and proposed experiment method for this work using Machine Learning Linear regression algorithm.

A. LINEAR REGRESSION THEORY

Linear regression is of two types:
simple linear regression and multiple linear regression. For our study, we required simple linear regression model, which will analyse the relations between independent variable and dependent variable. Our independent variable will be use of hand sanitizer in near future. Our independent variables will be more than one like period, trade value, situation (pandemic/on pandemic), etc. We will set the model of dependent variable y and the independent variable x (i=1,2,3……) that will influence the variable y and the predict the development trend of y ,Simple linear regression model will be expressed as followed: 0 1 y =+ + a ax e y is the dependent variable and x is the independent variable. 0 a , the constant term, is the intercept of the regression line on the vertical axis and 1 a is regression coefficient that is the slope of the regression line. e is the random error which will be used to express the effect of random factors on dependent variable.[6]

B. PROCESSING AND FEATURE SELECTION

We only studied and applied algorithms on the Export market data of India. Hence, focusing on Export the Import data was automatically eliminated. Along with that for clear calculation and observation we have considered the data of 10 countries out of 88 countries.

The final dataset is a clearer representation of sample data. We selected the final data sets after careful observations and analysis from various sources.

VI. EXPLORATORY ANALYSIS

- For year 2018 :-

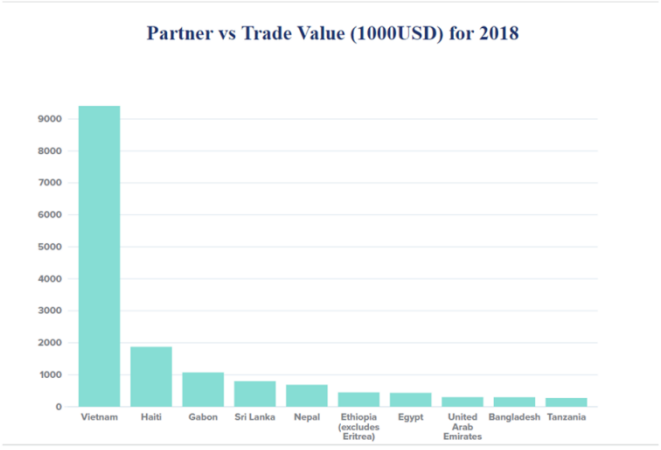

Figure 1. Trade value in year 2018

The graphs above show the trade value in export market from India to various other countries in the year 2018. It was comparatively low as to 2019.

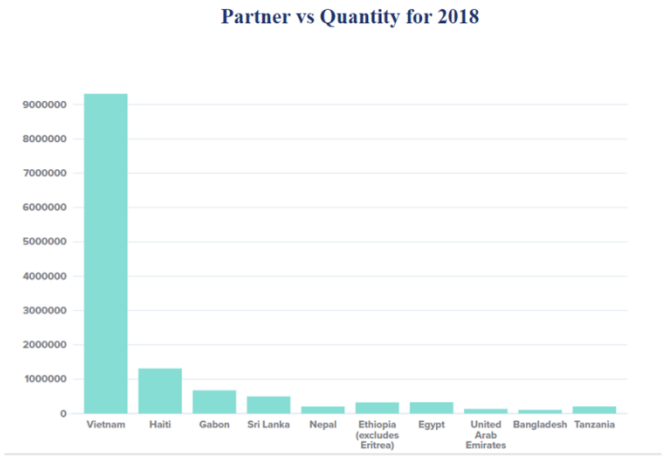

Figure 2. Export quantity in year 2018

The above graph shows the Quantity (in Kgs) of Hand Sanitizer being exported from India to the analyzed countries in the year of 2018. It is again low as compared to the year 2019.

- For year 2019 :-

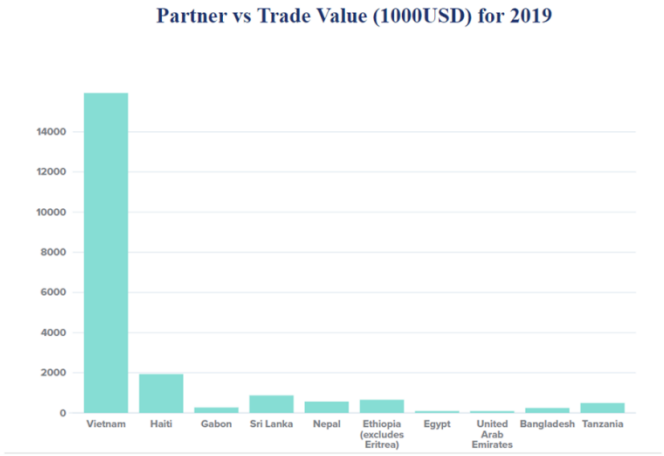

Figure 3. Trade value in year 2019

The above graph shows the trade value in export market from India to various other countries in the year 2019. It clearly shows a considerable increase as compared to the year 2018.

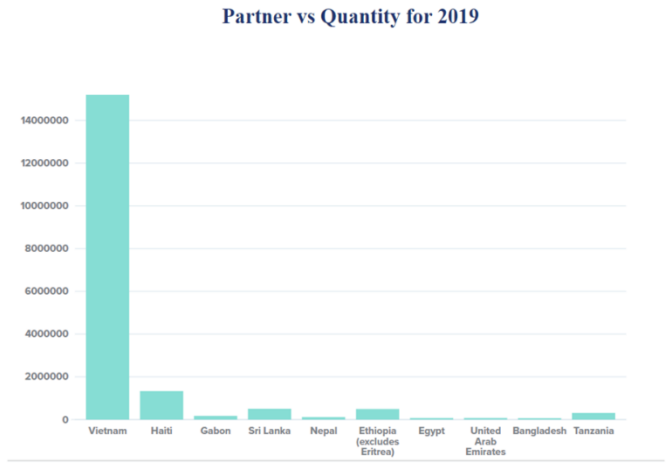

Figure 4. Export quantity in year 2019

The above graph shows the Quantity (in Kgs) of Hand Sanitizer being exported from India to the analyzed countries in the year of 2019. It again shows a considerable increase as compared to the year 2018.

Partner	Trade Value 1000USD 2018	Trade Value 1000USD 2019	% INCREASE IN TRADE FROM 2018 TO 2019
Vietnam	15934.59	9407.69	40.96
Haiti	1936.26	1873.93	3.219
Sri Lanka	873.39	798.04	8.627
Ethiopia(excludes Eritrea	656.33	447.78	31.775
Nepal	685.88	566.10	17.463
Tanzania	494.93	273.68	44.703
United Arab Emirates	415.80	300.12	27.821
Gabon	1072.33	272.32	74.604
Egypt, Arab Rep.	432.86	93.69	78.355
Bangladesh	297.41	246.69	17.053
			AVG.= 30.858

Figure 5. Calculation for percentage increase in trade value (1000USD) from year 2018 to 2019.

The above table shows the data for the selected countries.

Partner	QUANTITY (2018) (IN KGS)	QUANTITY (2019) (IN KGS)	% INCREASE IN QUATITY FROM 2018 TO 2019
Vietnam	1.51984e+007	9.31289e+006	79.71
Haiti	1.335e+006	1.312e+006	0.64
Sri Lanka	505841	496455	1.85
Ethiopia(excludes Eritrea)	494880	323588	34.61
Nepal	203376	118263	41.86
Tanzania	313804	205805	34.41
United Arab Emirates	179156	133555	25.45
Gabon	675000	175000	74.07
Egypt, Arab Rep.	329010	75021	77.19
Bangladesh	106526	66864	37.23
			AVG. = 40.702

Figure 6. Calculation for Percentage increase in Quantity exported from year 2018 to 2019.

From the above graphs we can conclude that the export trade flow from India has increased for about 30.858% from year 2018 to year 2019. And the increase in the Quantity exported has increased by about 17-18%.

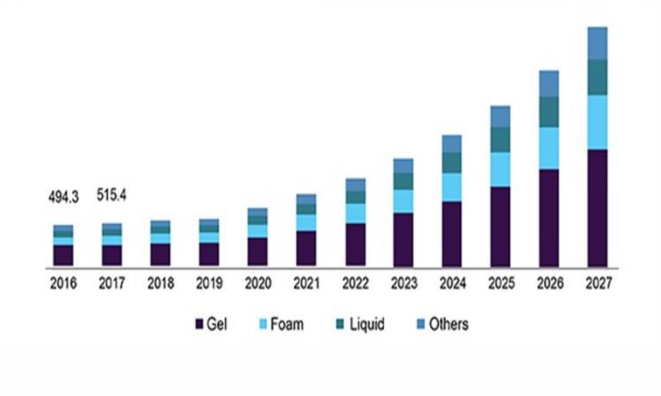

Figure 7. Hand sanitizer market year wise chart

The above graph shows the hand sanitizer market analysis from year 2016 to year 2027. This graph visibly shows the growth of hand sanitizer market in the successive years.

[**Source**:grandviewresearch.com/industry-analysis/hand-sanitizer-market]

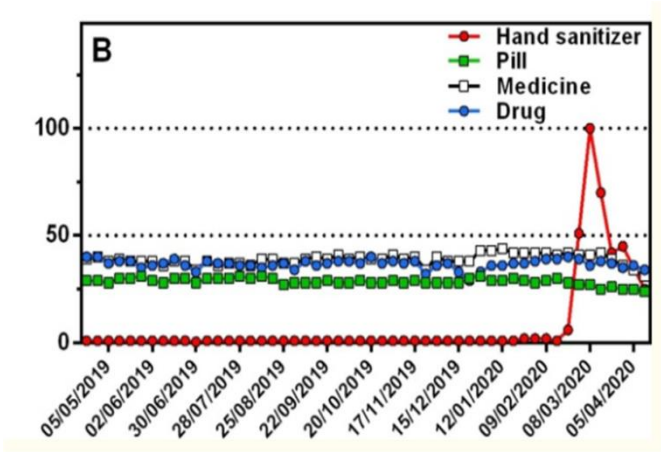

Figure 8. Extracted from Google trends as per 20 April 2020, shows the rapid increase in sales of Hand Sanitizer as compared to pills, medicine, drugs.

This Graph clearly shows that public demand for hand Sanitizer is increasing tremendously as compared to other products compared in graphs.

VII. RESULT AND DISCUSSION

After careful study,as per our research taking in consideration almost 88 countries, the hand sanitizer export from India went upto 30.858% in just one year from 2018 to 2019 and a similar trend is expected in the coming years. Along with this the global hand sanitizer market which valued USD 2.7 billion in 2019 is expected to grow at CAGR 22.6% from 2020-2027.

The hand sanitizer market growth in India can be credited by increasing awareness among people for healthy lifestyle and wellness with The key driver for the market being COVID-19. We felt that, the Indian hand sanitizer market is expected to surpass USD 280.10 million by 2030. The hand sanitizer market is categorized in parts on the basis of it's state into Gel, Foam, Liquid and spray. From these Gel has the most boosting effect in the market in 2019.

In the year 2019 West India dominated the hand sanitizer market and the region is still expected to show immense growth in the market. Some major players being Hindustan Unilever Ltd., Dabur India Ltd., Himalaya Company Pvt. Ltd., ITC Ltd., Dettol Pvt. Ltm., etc.

With this, the companies have even adopted market strategies and technological innovation to increase their shares. For example Procter and Gamble (P&G) ,in June 2020 announced to realease newly invented "Safeguard Sanitizer". With this the company is also to increase the manufacture capacity upto 45,000 liters for safeguard hand sanitizer per week.

Such implementation ideas by leading companies are expected to proof considerable opportunities for hand sanitizer market.

COVID-19 has offered hand sanitizer companies to expand their growth and market as best as they can.

VIII. CONCLUSION

Now, COVID-19 being major concern drives people's attention to take care of their hygiene and thus driving the sanitizer market uphill. Based on the bar plots plotted we come to conclusion that after COVID-19 all sorts of hand sanitizer companies in India have shown drastic upliftment and the same is expected in the near future. The growing concern of people regarding hygiene after COVID-19 is offering huge profit in the sanitization products. However, the market implemented industrial shutdown but the hand sanitization market has shown growth even during the pandemic period.

As per our research and analysis, the hand sanitizer market is expected to be fueled with the constant growing concern of the public regarding hygiene.

The hand sanitizer market has shown approximately 30.858%growth from the year 2018 (i.e. before COVID-19) to the year 2019 (during COVID-19) in India.

We propose supervised machine learning algorithm, linear regression for systematic analysis and forecasting of use of hand sanitizer.

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Identification of Proper Restaurant Place : By Extracting Customer Reviews

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ABSTRACT

Now a days ordering food online by using different application is normal for us . Some of the popular names of the apps are as ZOMATO, SWIGGY , UBER EATS etc. Many customers' visits a restaurant based on reviews given by the customer or user in different apps. The growth of restaurants and hotel is mainly based on the reviews provided by the customers. India is quite famous for its diverse multi cuisine available in a large number of restaurants and hotels. In this paper we will , collect data from a online application and check in which area peoples are more attached to a particular type of cuisine. So, this paper focuses on analysing the Zomato restaurant data for a city in India to predict the place for new restaurant by using various supervised Machine Learning algorithms based on existing data. And build predictive model with best accuracy.

Keywords: Zomato, Science and Technology, Machine learning algorithms, accuracy.

I. INTRODUCTION

Now a days everyone has a unique style and taste of eating some peoples like South Indian food some likes Punjabi Food and some likes Marwari food .In growing country like INDIA restaurants , resort and hotel play a big role and there business depends upon the reviews given by the customer .

So basically the main objective of this project is to find in a city like BANGALORE , PUNE , DELHI etc. In particular area which cuisine is more famous and what people eat more. Higher ratings lead to higher profit margins. Notations of the ratings usually are stars or numbers scaling between 1 and 5.

Different machine learning algorithms like SVM, Linear regression, Decision Tree, Random Forest can be used to predict the most rated food in a particular area.

II. RELATED WORK

Various researches and students have published related work in national and international research papers, thesis to understand the objective, types of algorithm they have used and various techniques for pre-processing, Feature.

James Huang, Stephanie Rogers, and Eunkwang Joo have used LDA & Python scripts to improve restaurants ratings they said" Based off of the Online LDA algorithm, we have been able to show what users care about most in their reviews of restaurants, and have been able to pinpoint the areas of interest for specific restaurants. Overall, it turned out that

users care most about service, and subsequently value, take out, and decor" [1]

Gayathri.T1 used J48 , Multilayer Perceptron and Naïve Bayes to improve and review the rating of hotels and obtained highest 84.42% accuracy in Naïve Bayes. She says "To find the trigger to improve ratings, a sample record of poor rating is taken and modified to reduce the price range to one. This sample record is tested on J48 Zomato model. It was found that there was no change in rating. Whereas when the country code was changed there was change in rating " [2]

V. B. Raut and D. D. Londhe, "Opinion Mining and Summarization of Hotel Reviews," The reviews are scraped from ww.tripadvisor.com using web crawler. The reviews are distinguished into positive and negative polarity using sentiwordnet and various machine learning algorithm are used to check their accuracy. [3]

"Random Forest Model for Predicting Grayscale Digits on Images" Stanley Ziweritin1 , Uchenna Chikwendu Anyimukwu Ugboaja & Chidiebere Moses Osu3.They uses Random forest technique and says "The experimental results proved to be highly accurate in prediction and errors converges as required when more trees are grown and added to the forest space. We therefore; evidently conclude that the RF classification tree model performed better as required than the random regression model". [4]

Chandresh make his project and concluded this "From this data processing, we can get this following conclusion: There are 105624 restaurants registered on Zomato Apps based in India. Almost 18% of registered restaurants in India are located at New Delhi (19611 restaurants), 13% in Mumbai (14026 restaurants), 7% in Bengaluru (8507 restaurants). 1080 Restaurants in India having Excellent rating type. 11695 Restaurants having Very Good as Rating Type and 336 with Poor Rating. 104 Restaurants having rating above 4.8 and 84 above 4.5" [5]

Coronary Illness Prediction and Analysis of Various Machine Learning Techniques Banumathi P. And , Miraclin Joyce Pamila J.C. discuss about Various Techniques in their conclusion they said "The proposal uses the Random, IJSRCSE All Rights Reserved 33 forest and neural network for anticipating coronary illness and it compared against different ML procedures. Experimental results on foreseeing coronary illness show that the proposed random forest gives 90.16% accuracy which is better compared to artificial neural network and also high f measure esteem than ML procedures this because it constructs a decision tree for every 13 attributes. [6]

III. DATA SET DESCRIPTION

For this analysis, we will be using Zomato Bangalore Restaurants dataset present on kaggle. The dataset contains all the details of the restaurants listed on Zomato website as of 15th March 2019.

IV. RESEARCH METHODS

We used observation, exploratory analysis and proposed experiment method for this work using Machine Learning Linear regression algorithm.

4.1 About supervised Machine learning classification algorithms.

1. LOGISTIC REGRESSION

Logistic Regression is perfectly match with the placement prediction objective of the research. In case of placement prediction the problem is simple binary problem. The sigmoid function will give result 1 or 0 for placement prediction. It maps predictions to the probabilities.

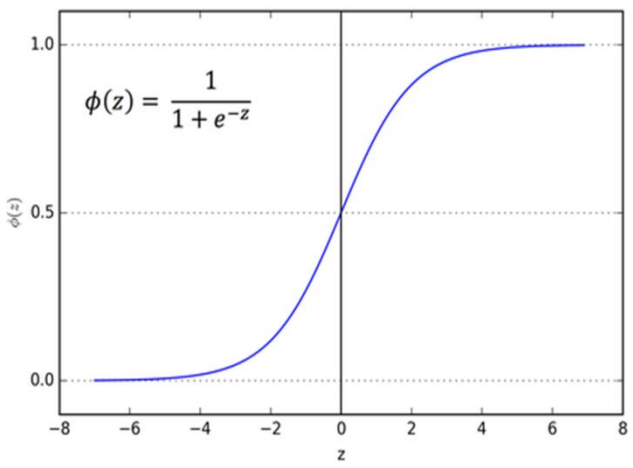


Fig. 1. Logistics Regression Function

The logistics regression equation is

Y = e^(B0 + B1X1 + . . . + BnXn) / 1 + e^(B0 + B1X1 + . . . + BnXn)

Where Y is dependent variable (predicted output), B0 is bias term, X is independent variable, n = number of observations, B1 is coefficient to input value X. Logistic regression is a linear regression but logistic regression uses more complex cost function compare to linear regression.

2. DECISION TREE

It works by creating a tree-like structure by dividing the dataset into several smaller subsets based on various conditions. The components of the decision tree are the decision nodes, leaf nodes and the branches. Nodes having multiple branches are the decision nodes, nodes with zero branches are called the leaf nodes, and the topmost node is called the root node of the tree. The nodes are connected to each other through branches. The root and decision nodes are created by computing the entropy and information gain for the dataset [5].

3. RANDOM FOREST

Random Forests builds many classification trees. While classifying a new vector from an input vector, the input vector kept down each of the trees in the forest. Then each tree gives a classification, i.e. tree "votes" for that class. The forest chooses the classification having the most votes [6]. Random forests are fast, and it do not over fit. Random Forest Classifiers are more accurate and efficient as the computation is done with a number of classifiers and the best among them is chosen by the model.

4. SUPPORT VECTOR MACHINE

Given a set of training examples, each marked as belonging to one or the other of two categories, an SVM training algorithm builds a model that assigns new examples to one category or the other, making it a nonprobabilistic binary linear classifier [8]. In SVM, each data item is plotted as a point in n dimensional space with the value of each feature being the value of a particular coordinate. Then, classification carried out by finding the hyper-plane that differentiates the two classes. When two data classes are linearly separable, many hyper-planes could be drawn to separate the two classes. All the hyper-planes can classify the data into two classes, and the best among all the hyper-planes is selected by the SVM classifier for the prediction model. One reasonable standard for judging the quality of these hyper-planes is via their margin lengths [7].

4.2 Pre-processing

- Cleaned the data which is not for our use.
- Attributes with null values were dropped from ratings columns and were replaced in the other columns with a numerical value.
- Label Encoder – For categorical variables this is perfect method to convert them into numeric values , best used when having multiple categories . We had various categorical values converted them into numeric for further use in algorithms .

4.3 Feature Selection

Let's start by deleting the unnecessary or redundant features. For data analysis, we do not need the

contact details of the restaurant so, deleting the following features :

url, phone, Name , Online_order ,Book_table, Rest_type , Approx. cost of two people, Listed_in(type)Listed_in(city)

Some of these columns may look like they are important but all of the same information could be found in other columns with lesser complexity. The Columns being used are as follows:

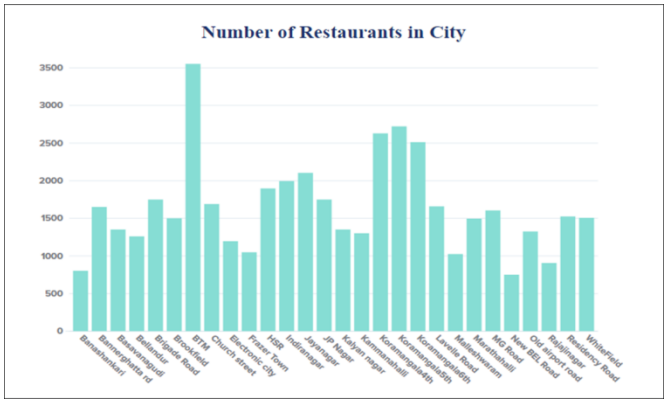
Address, Dish_like, Menu, Review_list Votes Location ,Cuisine

V. EXPLORATORY DATA ANALYSIS

We predominantly used Python scripts. Specifically, we used the Gensim Python Library, which is a topic modeling tool for documents. We used PyGal for data visualization.

In this graph we will see in which particular area more Hotels and Restaurants are there which get highest booking in whole Bangalore.

1. Number of restaurants in whole City

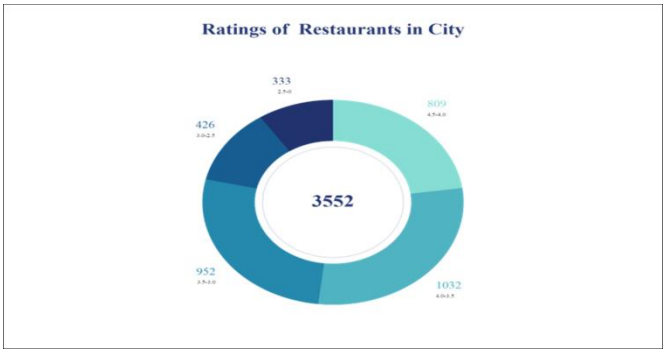


BTM has the highest number of restaurants, followed by Koramangala 7th Block. New BEL Road has the least number of restaurants, followed by Banashankari.

It seems that the main foodies live in BTM and Koramangala.

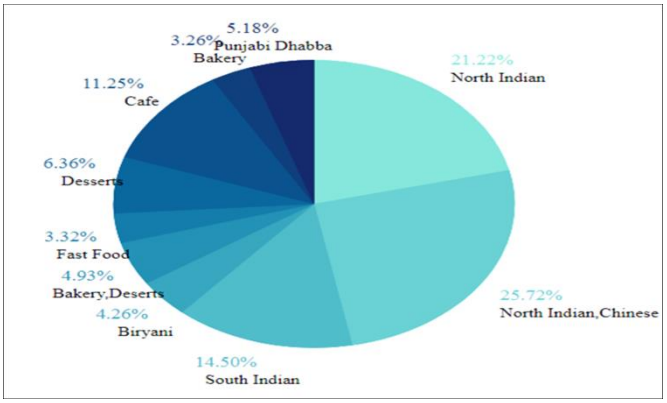
Now we will look for Restaurants RATINGS in BTM

2. Rating wise Restaurants



We can see that the number of restaurants with the rating between 3.5 and 4 are the highest. We will look into its dependencies further.

3. Ten Favourite cuisines of Peoples in BTM



As we can see in the above chart in BTM area Locals are fan of North Indian food & Chinese food ,also there is a good percentage of peoples attracting towards South Indian food.

4. Approx percentage of population in BTM ordering Online food

By the above graph we can conclude that there is good population there who are ordering food online using different applications.

5.1 Key Findings

ONLINE ORDERS	Percentage
Yes	46.6%(approx)
No	53.4%(approx)
Cuisine	Percentage (Approx)
North Indian+Chinese	25.72%
North Indian	21.22%
South India	14.50%

VI. RESULT AND DISCUSSION

In this research we have considered a particular area and by reviews of customer conclude that what is the favourite cuisine of people living there. This will help business personals to open a new restaurants there . Such analysis is essential part of planning before establishing a venture like that of a restaurant. Having an prior idea about the area and public choice of the area helps to set up a business as per the immediate choices of the people and hence profiting the business faster. We have proposed the use of Supervised Machine Learning Algorithms to predict the proper place for new restaurant.

VII. CONCLUSION

On the basis of past customer reviews of restaurants and food .We concluded that in a particular area which in a particular area which type food type is more liked and hence, which menu can be more profitable for a restaurant .This will help out a business owner to easily establish a good profit-earning restaurant.

main motive of a business is to attract people of their zone as per their interests. Zomato dataset helped us to create classification model for restaurant rating. It was found that Multilayer perception work well with this dataset.

In the above paper in BTM area a person can open a new restaurant of North India, Chinese & South Indian food.

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Artificial Intelligent (AI) Based Smart Dustbin

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ABSTRACT

The government of India launched newly designed smart and developed city concept. For this, to make newly developed cities to be actually smart the garbage collection system have to be newly developed and designed for new changed cities and now the people need easy accessibility for the garbage collecting and towards the waste management.

It will provide the AI based waste collecting process solution. This will also help for managing the waste collecting. It will check the Waste garbage in particular area and collect it by using sensor. If the waste level crosses 90% of the container then it will move automatically to the garbage drop point and empty the whole garbage waste. On the drop point one person will connect dustbin to the garbage collector. After dropping the Waste into garbage collector dustbin will come to the collect point automatically.

Keyword: Garbage, IOT, Sensor, Dry/Waste, Dustbin, GPS, Smart Dustbin, Dry/Wet Compartment, AI

I. INTRODUCTION

In India cities are growing but they are not well designed with the proper garbage collection systems. Also, the newly developed cities are increasing and putting the pressure on existing garbage collection infrastructure which is not developing like cities. The gov of India started smart and clean city project.

This system will provide the Information Technology based solution for the waste collection with the best accessibility, and it will also set the time period for the planning for disposing collected waste.

The Government of India had also launched the "**Swachh Bharat Abhiyan**". In this mission the Smart Dustbin concept can also help to increase the speed of cleanness in smarter way. Our Dustbin can do garbage collection by its own.

1. Types of waste - Dry/Wet.
2. It will check type of waste using sensor that the garbage is Dry/Wet.
3. According to that it will divide the garbage into separate compartment.
4. After Separation it will move to next area to collect waste.
5. One Person from the Management team can change the area of Dustbin.
6. After changing the area of waste, it will move automatically to Specified area.

II. LITERATURE REVIEW

"Dustbin waste management system" [1] which is published in 2018 by the D.Naveenreddy, I.V.Sudarsan Reddy, M.Pavan Reddy. This concept is based on IOT which can calculate and display the waste percentage on the screens and if the waste percentage is fulfilled then it will send the message to waste collector vehicle for the collection of that particular waste in dustbin it also start the alarm when dustbin is full.

"An Intelligent Approach to Fulfill Swatchh Bharat Mission [2]" it is published on the 2017 by Priyam Parikh,Dr.Rupesh Vasani,Akshar Raval. This concept is attaching the dustbin at the one place and it will calculate the total percentage og the waste in the particular dustbin if the dustbin get filled then it will send the message to vehicle man for the collection of the waste into dustbin it will also send the particular address of that dustbin to the vehicle operator he will came there and collect all waste into dustbin.

"SMART GARBAGE COLLECTOR AND DISPOSER [3]" published in 2018 by Thiyagesan M, Shyam Shankaran R, Ravi M, Viswesh Kumar N and This project depicts the model of a smart trash can for malls, airports, hospitals, schools and colleges. The Smart garbage collector and disposer is nothing but a normal dustbin modified with the help of embedded system enhancing it to be intelligent

III. PROPOSED MODEL: LAYERED ARCHITECTURE OF SMART DUSTBIN:

1. Increase access towards the waste disposing
2. Effective for the time and fuel cost.
3. It will provide the accurate data of collecting garbage in specified area. For eg- (Office, University, etc.)
4. Smart Dustbin also drop the all garbage to the specified drop point.

This Model has divided into three layers:

1. Server layer:

Server can locate live location of every dustbin with the help of GPS location and Server can also know the waste collection percentage of dustbin. Server is also able to change the particular collection area of dustbin. Server can also send the query to the dustbin if a particular dustbin should come to the dropping point.

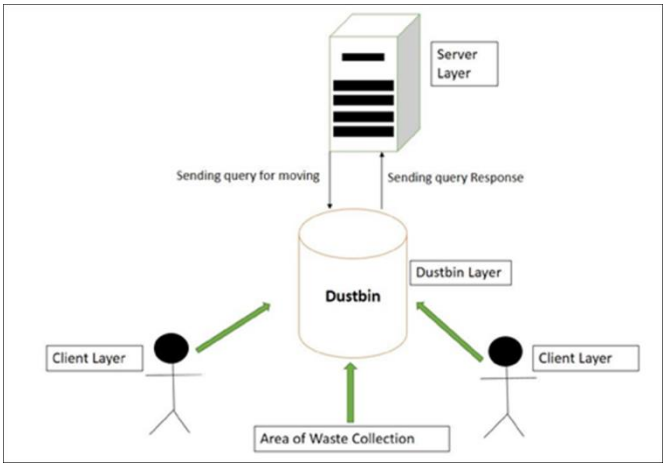
2. Dustbin Layer:

This layer includes the some Wi-Fi and Internet accessible. Dustbin will contains some sensor which helps to senses the types of waste into Dry or Wet and collect it into two separate compartments. It also checks fill up status of dustbin and move to the dropping point by own and drop all collected garbage into garbage collector with the help of one person who will connect it with garbage collector. It will also transfer the current location on server.

3. Client layer:

Clients can access dustbin physically only if they want to throw some garbage waste in the dustbin. The **"Smart Bin"** can move into the specific area as the dustbin location is not fixed and Client can go near the bin and put all the waste into dustbin compartments.

Figure 1 : Architecture of Smart Dustbin



❖ **Working Principle of Smart Bin**:

D is percentage of Dry waste and W is Percentage of Wet Waste and X is current fill up status and A is total percentage of waste collection. Researcher are going to calculate X value using formula below formula:

$$X=(D+W)$$

And fill up status of dustbin will calculate using below formula:

$$A=X/2$$

Here A means the percentage of waste collected. The authors are assuming total waste into two types. Now the question is how we are going for waste collection optimally. For this following scheduling Algorithm can be used.

a. Fixed Scheduling:

This Fixed algorithm process will start in fixed time laps. For example collecting waste after two days. Here researchers will use the Travelling salesman problem algorithm for route planning.

b. Priority Scheduling:

This priority algorithm the waste will be collect on Priority. Area wise like if we consider the College Campus the Entrance part and office area consider in priority area then we can send the dustbin over there first and after that other area will be cleaned.

c. Average Threshold Scheduling:

With this algorithm firstly we will calculate the average of waste collection status level. if total is more than 70% then start the waste collecting process and in this algorithm collect waste according to the Priority algorithm.

d. Dustbin Fixed Collection Area Scheduling:

This algorithm authors can fix the collection of the dustbins and they will move only in particular fixed area.

IV. STRUCTURE OF SMART DUSTBIN

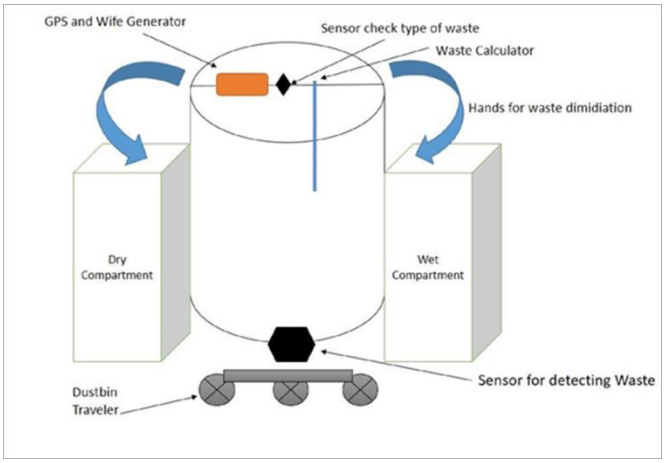


Figure 2: Smart Dustbin Structure

This Diagram represent the basic structure of Smart dustbin here traveller is used for the move the dustbin from one location to another. While traveling to another location sensor at the bottom it will sense the waste on the road and using the hands of smart dustbin it will collect. Here we give another sensor to differentiate collected waste into two types mainly Dry and Wet. After differentiating it will put by hands into two different compartments and using percentage calculator, we will calculate the collected waste into dustbin. WIFI and GPS locator also used to send the current location to the server and accepting and sending queries.

V. BENEFITS OF PROPOSED SOLUTION:

1. This system will provide accessibility.
2. When dustbin will change location, it will sent the current location to the server.
3. This system will save the fuel and time with the planning.
4. This will also decrease the man power and budget of waste collection
5. It will run on the electrical power and generate less pollution.
6. Researcher can plan and design the collection process.

VI. FUTURE SCOPE OF WORK

1. In Future authors proposed to increase the area of garbage collections.
2. This mechanism can be used in vehicle to collect garbage on the city roads.
3. Garbage collector is maintained and manage by the human we can create it fully AI based.

VII. CONCLUSION

The proposed system utilities are that the government will be able to use these statistics for design and policy. If the proposed model will setup properly it will surely make the cities clean in modern way. It will also reduce the time that is required to collect the garbage resulting in less manpower and fuel use and save the cost. It can also provide analysis of data to manage garbage collection routes and the location of dustbins more effectively.

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Leaf Classification Techniques for Medicinal Plants : A Detailed Survey

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ABSTRACT

Leaf classification is an important use case and has been explored by main researchers. The main features focused for leaf classification in previous work were shape and texture. In this paper we have discussed the comparative study of different technologies used for feature extraction and selection. We observed that less amount of work is done on Medicinal leaves data. As India is a rich country for being the habitat for a variety of medicinal plants it will be helpful if we can detect such leaves for better use which will be our part of future work after comparing and finding best method and model use for leaf classification.

Keywords – Feature extraction, canny edge detector, Gabor wavelet, PCA, PNN, leaf classification

I. INTRODUCTION

to Herbal medicinal plants are known to treat myriad of diseases and illness. India is home to many Ayurvedic herbs and plants. These plants are not just grown in off-forests but may be found all over in India. Leaves of plants like Tulsi, Ashwagandha, Peppermint and many more are known to be home remedies since ages. Current Covid situation has also taught us to boost our immunity by including medicinal plants in our daily dose. It is important for us to be able to recognize a medicinal plant in our vicinity so that we can use it for our health benefits. Recognition of medicinal leaf can also help prevent adulteration and better quality control while preparing Ayurvedic medicines. Leaf classification, thereby, becomes an important application of using AI in medicine. In this paper, we have done an extensive survey of AI techniques used for classification of leaf.

II. RELATED WORK

In this section, we present our survey done on work related to Leaf classification. There are different approaches, considering different features and their analysis on leaves sample. Collection of these leaves data in some work is done manually or using dataset available on internet.

In [1], the leaves data for Artificial Neural Network model was collected with help of digital cameras or scanners. Data collected was very huge with 1800 leaves of 32 types of plant species. The feature extraction of leaves was done without human intervention using PCA (Principal Component Analysis) and 12 features were extracted. Basic physical features were length, width, diameter, leaf area, leaf perimeter, vein feature and some digital feature. Images were convert from RGB to binary form. The author proposed the classification model

using PNN which is derived from RBF (Radial basis function) and ANN (Artificial Neural Network). PNN is user for classification and pattern recognition. PNN is easy and fast for training the model and gives the result with an accuracy greater than 90% [1].

There are many plant species with unique shape, texture and margin. The development of classification model using shape and texture analysis is done by Thibaut Beghin, James In this paper [5], the main task of feature extraction of leaves sample was done by canny edge detector [16]. This edge detector extract 17 features and 15 features were used out of it. Some of them were Perimeter, Area, Orientation, compactness, complexity, filled area, convex area, length, width and etc. Data use for classification model was flavia dataset [14] which consist of 1800 scans images of leaves that belong to 32 species from which 22 species were used for building classification model. After image processing and feature extraction with the help of canny edge detector author applied SVM (Support Vector Machine) algorithm classifier on flavia data And for Test data they have used around 10 samples for each species. Result of the overall accuracy of the system is 85% to 87% considering worst and best cases of the model [5, 8]. The development of classification model using shape and texture analysis is done by Thibaut Beghin, James S. Cope, Paolo Remagnino, and Sarah Barman in 2010 [2]. The data collected for this process was manually in the Royal Botanic Gardens, Kew, UK which contains 3 to 10 leaves from each of 18 different species. Here, Shape analysis is done with the help of contour signature of the leaves [2]. Contour signature is use to showing ridge and valley using contour outline which can help in recognizing shape of leaves. Distance calculated for this process is Jeffrey distance. Shape based analysis can classify more efficiently by first classifying lobed and unlobed leaves. Similarly, for recognizing the macro texture of leaves was done with the help of sober operator. Sober operator is use for computer vision within edge detection algorithm and creates emphasize the image edges. In this paper [2], classification using sober operator was 62.9% and the result of contour-based method was quite good up to 75%. The best result was given by considering both shape and texture analysis with overall rate of 81.5%.

In paper [3], feature extraction of leaf is done using gabor wavelets filter. Gabor wavelet filter is use for Shape and texture analysis. With shape and texture, colour and contour analysis is also taken into consideration for classifying plant leaf. LDA (Linear Discriminant Analysis) technique is use for feature reduction and pattern classification. Leaves data was trained on K-nearest neighbour algorithm and cross validation was performed for more accurate results. The collection of leaves sample were collected with the help of vivo camera. Correctness rate of the model was approx. 84%.

In paper [4], the author has worked on 1600 images of 100 different species with 16 images of each species and iris plant dataset was used to build the model. Features extracted of leaves were leave margin, height, width, texture and shape. Three features types were separately analyse: shape, texture, and margin which then combined using a probabilistic framework. The texture and margin features use histogram accumulation, while a centroid contour distance curve (CCDC) is used for the shape [4]. Previously published methods are used to generate separate posterior probability vectors for each feature, using data associated with the k-Nearest Neighbour classifier. This model is also trained on KNN classifier and also done cross validation for better accuracy. KNN classifier was trained on the 1600 images of 100 species which increases the accuracy and tested the model on fisher's iris dataset with 3 tree species. The PROP and WPROP density estimation methods were tested and both density estimators achieved a 96% mean accuracy of classification.

In this paper [7] by author T. Le, D. Tran and N. Pham, Leaf identification is done by kernel based approach. Kernel based approach was performed in two phases: First phase include the pre-processing of image and path by patch feature extraction of leaves. In Second phase training of images is done. Kernel descriptor is use to reduce the effect of size in terms of feature dependence without altering the effective feature and work on the area of leaf which is actually important for leaf identification. The work done by author was on two dataset: First was Flavia dataset consisting images of 32 plant species [14] and second dataset was Imageclef 2013 [15] which contains different organs (leaf, flower, stem) of 250 plant species in France. Result using KDES (Kernel descriptor) and SVM on Flavia dataset was having average accuracy of 97.5 % and on Imageclef 2013 dataset was less average accuracy with 58 % [7]. It concludes that the method use in this paper works well on dataset having no background and only leaf image and not if background and other leaf organs are present in the image.

In yet another paper by author E. Elhariri, N. El-Bendary and A. E. Hassanien [8], Task was divided into 3 phases: Pre-Processing, Feature Extraction and Classification Phase. Color, shape, texture, vein physical features were extracted and analyze. This paper uses the approach of Random forest and LDA (Linear Discriminant Analysis) classification algorithm and also perform the comparative analysis between the both algorithms. Random forest is a classification and regression algorithm which is give more accuracy on large dataset. The dataset consists of 340 images with 30 plant species which was downloaded from UCI-Machine learning repository and trained the data on LDA and RF algorithm with 10-folded cross validation. The result of work showed that LDA achieved classification accuracy of 92.65 % against the RF that achieved accuracy of 88.82 % with combination of shape, first order texture, Gray Level Co-occurrence Matrix (GLCM), HSV color moments, and vein features [8].

In paper [13], authors have divided the work in three phases: Pre-processing, Feature extraction and classification. In pre-processing, Images were converted into binary formats, morphological operation were performed and image were resize. They performed Feature extraction with the help of HOG (Histogram of Oriented Gradients) and SURF (Speeded up Robust Features) [13]. HOG is a descriptor which mainly focuses on the structure or the shape of an object whereas SURF focuses on features related to texture and vein. Strongest features were normalized and combined for building classification model. Image data was then trained and tested using KNN algorithm. Precision rate of the Performed work was 0.96 [13].

We have also tabulated the comparative study of all the above works in Table I

III. FEATURE EXTRACTION TECHNIQUES

1. Shape, edge and margin Analysis:

The most effective way to analyse and extract all these 3 features is contour approach. Contour is a tool which joins all the coordinates including boundary and perform shape analysis and edge detection. Shape analysis consist features as size, perimeter, circularity and compactness. Contour tool is also use for object detection and recognition.

2. Texture and colour analysis :

Texture is the spatial and visual quality of an image based on the co-occurrence matrix.

Macro-Texture analysis and feature extraction can be done using multiple approach as GLCM (Gray Level Co-occurrence Matrix) which is used to estimate the joint probability distribution for the grayscale values in an image and SURF (Speeded up Robust Features) is a descriptor that provide a unique and robust description of an image feature, e.g. describing the

intensity distribution of the pixels within the neighborhood of the point of interest.

3. Vein analysis :

Vein analysis is done by emphasizing the edges within the margin which mainly done using sobel operator, CNN (Convolutional Neural Network) and many other approaches.

IV. PROPOSED DIAGRAM

The proposed system architecture is given in figure I. In our system, the process will be divided into 4 tasks as image annotation, image pre-processing, feature extraction and Training and testing the model. The dataset use will be of medicinal leaves which consist of 30 plant species containing around 1500 images [17]. Then we will be labelling each leaf in the dataset using labelling or any other online annotation tool. Images will be then resized, converted to gray scale, enhance image and then perform feature extraction using different method as Canny Edge detector or by performing PCA and applying neural network to select important features regarding texture, shape, size, margin, etc. After the feature extraction process neural network can applied on data to train, as neural network works efficiently on large dataset and increases the performance of model. Performance of the model will be then check by testing the model on test data.

V. CONCLUSION AND FUTURE WORK

In this survey we address the problem of insufficient Image collection of each classes to train the data which results in incorrect classification of plant species [2, 3, 4, and 11]. Work done on building classification model using Machine learning algorithms is quite traditional approach as it reduces the performance of test data and less efficient to train huge data. Major features for leaf recognition which are considered in many papers are shape, texture, vein and margin. Large number of leaves data for each plant species should be used for training to increase the performance of classification model. The effective classification technique use for leaf detection and classification can do using ANN (Artificial Neural Network) as it works well on huge amount of data. Neural Network also automated the feature extraction, effective feature selection from image, classification and segmentation task. The best method from all the paper was proposed by author Wu [1], In which Neural network was use for training huge data where effective feature selection was done using Principal Component Analysis with the highest average accuracy.

From an experimental point of view, there are many medicinal plants which are useful in many ways such as drug formulation, production of herbal products, and medicines to cure many common ailments and diseases. Our contribution will be on mmedicinal leaves data with 30 different medical plant species each consist of 50 images which will help to identify useful medical plant species [17]. We will mainly focus on the features as: Shape, Texture, Margin, and Vein. The data then can be trained using neural network technique for effective result

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TABLE I: Comparative Study

Paper	Dataset	No. of Images	No. of Classes	Technique for feature extraction	Features	Classification Approach	Accuracy
[1]	Manually collection using digital camera	1800	32	PCA(Principal component analysis)	Vein, leaf area, size, Leaf perimeter	PNN(Probabilistic Neural Network) In MATLAB	>90%
[2]	Manually collection in Royal Botanic Gardens,UK	110	18	Contour Signature(Shape and margin analysis), Sober operator(macro texture analysis)	Shape, margin, texture, colour	Increment Classification Approach	81.5%
[3]	Manually collection of data	-	20	Gabor Wavelet	Shape and Texture	LDA (Linear Discriminant Analysis) and K-Nearest Neighbour Algorithm	84%
[4]	Manual collection and fisher's iris dataset	1600	100	Contour(shape analysis)	Shape, Texture, Margin, length, width	K-Nearest Neighbour Classifier	96%
[5]	Flavia dataset	1800	32 (worked on 22)	Canny edge detector	Margin, Shape, size, Texture, Area	SVM (Support Vector Machine)	85% to 87%
[8]	UCI – Machine Learning Repository	380	30	Statistical method	Colour, Shape, Area, Texture, Margin, vein	LDA (Linear Discriminant Analysis) and Random forest	LDA : 92.65% Random Forest : 88.82

[13]	Ayurvedic leaf datasets (Western ghat India)	200	20	HOG (Histogram of Oriented Gradients) and SURF (Speeded Up Robust Features)	Shape, Texture, Vein	K-Nearest Neighbour	Average precision rate : 0.96

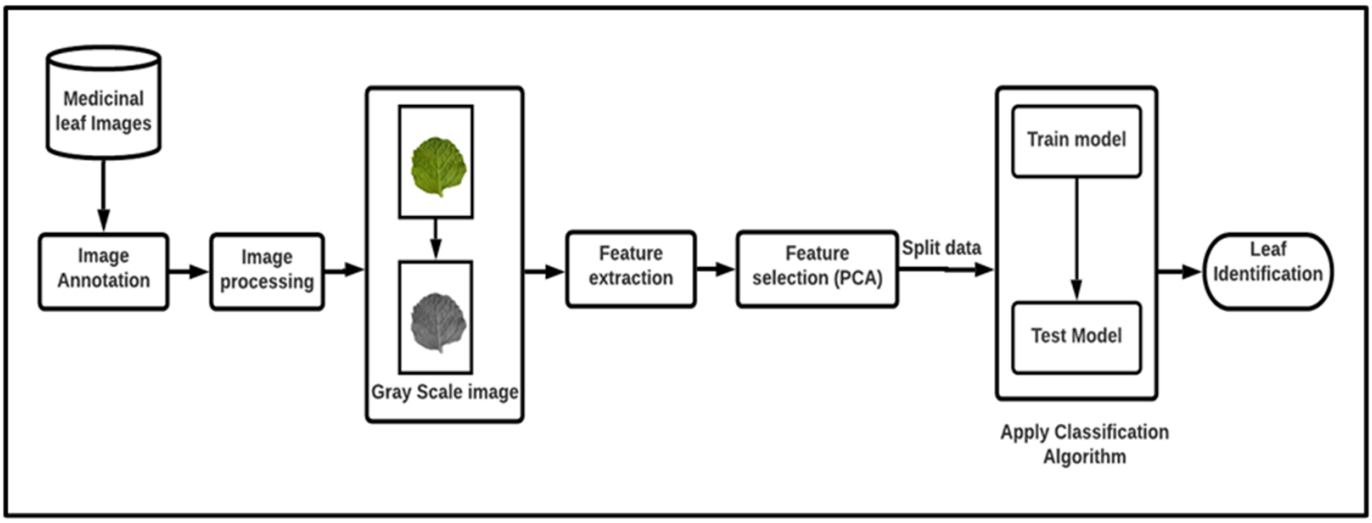

Fig I: Proposed Architecture for Leaf Classification

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Digitization of Data Using OCR

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ABSTRACT

In this modern world we hear buzzwords like Artificial Intelligence and Machine Learning whose application in the tech industries not only mesmerises us but creates an important landmark on human minds. Interestingly the second part of both the words, that is intelligence and learning respectively , are quite entangled with each other. They emphasise on the importance of the past data. As we all learn from the data our ancestors produced and we are creating new for our future generations. Unfortunately our ancestors could not keep that data on computer or on the cloud due to lack of resources. Instead, they put it on rocks and paper. This paper is an attempt to develop a system which will digitize the data on paper to be consumed in Machine Learning Models to achieve better precision in predictions. This system starts with just clicking a clear photo of a bill / printed document / invoice or any data on paper. Then it will be preprocessed for better end results by adjusting its saturation, brightness and other characteristics. This will then allow us to go further and call the Google's Vision AI API (Application Program Interface) which has the capability to read the document and return back the text which may or may not be in a linear fashion. Hence this text needs to be post processed in a way in which it could be further used for storing or utilizing it in the Machine Learning Models.

Keywords : Artificial Intelligence; Machine Learning; Data; Digitize; Preprocessed; Google Vision AI API; Machine Learning Models.

I. INTRODUCTION

Welcome to the era of Data , where you will hear the words like data collection , data analysis, data mining, data preprocessing and many more.. It is no surprise to us anymore that the use of the historical data in prediction helped many industries and businesses to predict their cash flow, sales, production, identify potential customers and their credibility; the list is ever increasing. However, data does not process itself, neither does it find patterns in itself. This is where Artificial Intelligence and Machine Learning swoop in to save the day, yet they are nothing without that data. Reason is simple: the more the data, the more precise the prediction is. For example, predicting the sales of mobile on a monthly basis may be easy if we have last year's sales report however predicting today's weather might not be precise even after consuming years of weather reports. Many business functions like Cash Flow are complex to predict and demand years of data to be fairly close to reality in predictions. We humans have been creating and collecting lots of data; in past few years, for instance we have created more than 50000 Exabytes of data

which in layman's term is 7,853,654,484,114,286 (more than 7 quadrillion) images in the year 2020 itself. Now this data consists of photos / bills & invoices / search engine data / production data so on and so forth. There are some business cycles which can't be predicted in a few years' data which demands digitization of the data that still exists on paper and has no digital address of its own . The Indian government has taken a lot of efforts to digitize our revenue department where all the lands are digitally mapped to something called 7/12. We can imagine the efforts of reading each of the transcripts and digitizing it with human efforts. OCR has provided us with a choice now either to get a team of trained personals to work day and night to read the transcripts and digitize them or use AI and Machine Learning so it will literally be like the Idiom in Hindi "Lohe Ko Loha Katta Hai".

II. PROPOSED SYSTEM

We are at a point where OCRs (Optical Character Recognition) have already been constructed by the current tech giants which provide us the text from the images. With the help of these OCR APIs we can fetch the plain text quite precisely. However, results are a function of quality of the image. To achieve better results we shall use some basic but important preprocessing techniques such as (A) Binarization, (B) Skew Correction, (C) Noise Removal, (D) Thinning & Skeletonization. After correcting the image in all possible ways we will be sending it to the Google Vision AI API which is a cloud base OCR provided by google which further provides us with the set of texts that is detected by the OCR. As these texts are not perfectly detected in the order as they appear in the photo , we will have to go through post processing to achieve the similar arrangement of the sentences and words[2]. "Et Voila ! ", you have digitized the photo . The following system can be further improved and advanced to make it capable of reading a human written handwriting on the bills and prescription.

III. FLOW CHART & FIGURES

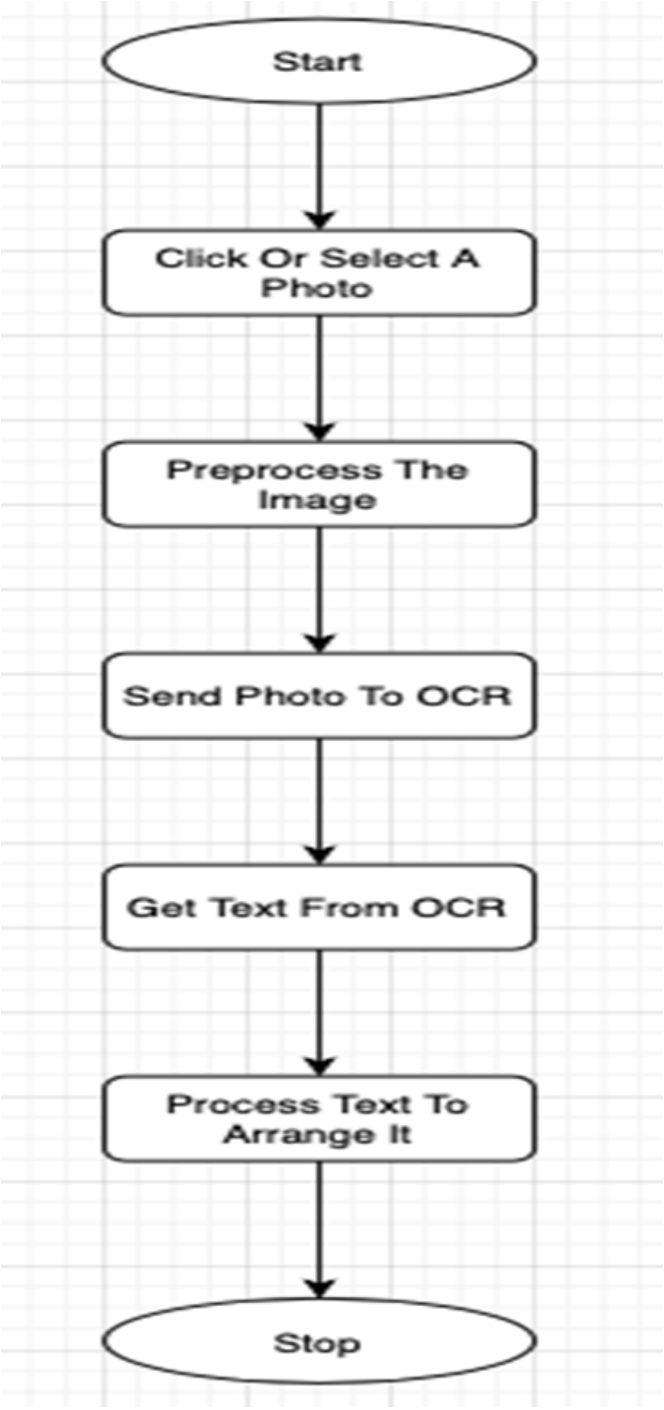

Figure 1.0

Figure 1.1

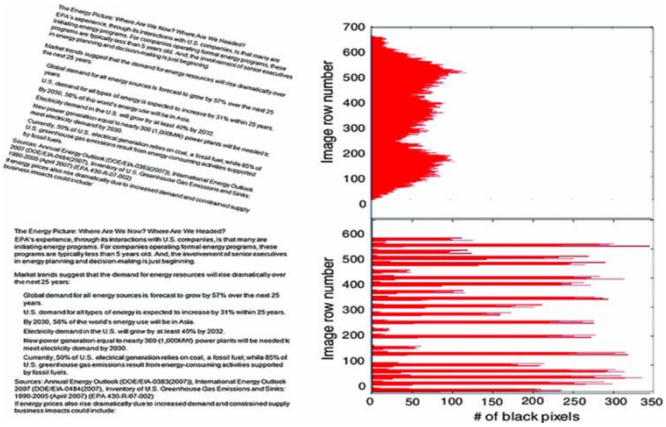

Figure 1.2

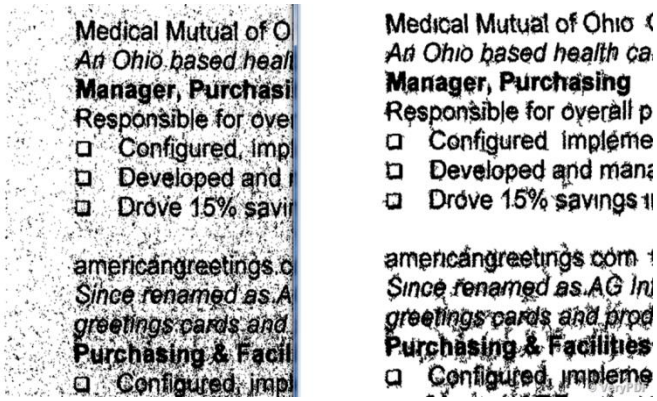

Figure 1.3

Figure 1.4

IV. WORKING

A. Getting Started (Figure 1.0)

The system of digitizing starts with a simple step of clicking / selecting / scanning an image of whichever paper document you wanna digitize. Then comes the preprocessing whose techniques we will be looking into after a few lines. Now that taken care of we send the image to any Optical Character Recognition (OCR) system which may be cloud based or in house developed system. This will then send us text back in return which may or may not be arranged in a desirable arrangement. So to achieve that we will have to do some processing on the text to get the favourable output. This is how we will digitize your data from a photo of a paper in no time and without putting as much cost and time as you would put in for a person to sit and enter the data manually.

B. Image Preprocessing

As mentioned above regarding preprocessing there are some most basic and important techniques we will be going through.

- Binarization (Figure 1.1) : This Method in layman's term is to make the image into a black and white image. Black pixel value = 0 and white pixel = 255 . The threshold is considered as 127 as it is the midpoint of range 0 - 255 . If the pixel is greater than threshold it will be considered as white pixel, else considered black pixel[3].
- Skew Correction (Figure 1.2) : While clicking a photo it may be slightly skewed (Having an oblique or slanting direction or position). To overcome this skewness is very important to get the text in a proper sequence. There are many methods like (a) Projection Profile Method , (b) Hough Transformation Method , (c) Topline Method, (d) Scanline Method[4]. For our application we will be going with the first

method Projection Profile Method which is the easiest and most widely used.

- Noise Removal (Figure 1.3) : Noise removal is used to soften the image by removing the dots / patches which have a higher contrast than the rest of the image. This process can be performed on both the colored and binary images[5].
- Thinning & Skeletonization (Figure 1.4) : This one method is an optional process . If we are using the OCR to read printed text then there is no need of thinning but if we are using it to detect a handwritten text then, due to diverse styles and different stroke width while writing we will have to implement thinning and skeletonization on it[6].

V. COSTING

The cost of digitizing 10 photos is as less as buying a ₹1 chocolate. For every month you get 1000 images free and then the rate of digitizing 1 photo defers between $0.0006 - $0.0015[7].

VI. CONCLUSION

Data insufficiency is a major game changer for precise predictions by any Machine Learning Models. Our current business functions being global became ever complex and needed assistance from AI/ML to perform predictions for them to make meaningful decisions. With advancement of OCRs technologies we can help businesses by providing them with their historical data available for predictions. And it can be achieved in seconds and at very nominal cost. Further we can train the OCR to read even hand written scripts with the same accuracy and speed, So sky is the only limit for OCR and how it could help confidence level of predictive models!

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Study of Role of Artificial Intelligence and its Implementation in Fast Recovery in Mental Illness

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ABSTRACT

A new area under research is being explored where Artificial Intelligence (AI) and Machine learning can better help in detection, diagnosis and treatment of mental illness. Artificial Intelligence technology is helping in medicine for physical health from last decade or even more than that. Researchers are trying to find the way where in AI will be of great help in the discipline of mental health. Mobile apps, AI and Machine learning programs have potential to help to continuously observe the mental status of patients and would be better to treat patients on time. Sometimes saving the life of patients. The whole world is facing COVID situation since one year and many mental health problems raised because of this situation.

AI can be thought as a great help in fast recovery of such patients. Artificial intelligence has the potential to reshape how we diagnose and understand mental health. Using AI techniques and tools better solutions in mental health problems which are commonly reported can be developed. Psychiatrists and Counselors will be beneficiaries of these tools and techniques.

Recent study in this field has focused on main point that Government has very less data for such patients, although number of such patients are increasing.

Keywords: Artificial Intelligence, Mental Health, Mental illness, AI techniques and tools, Psychological problems

I. INTRODUCTION

A. About mental illness and Mental Health

Mental illness can be thought of as health problems which involve -

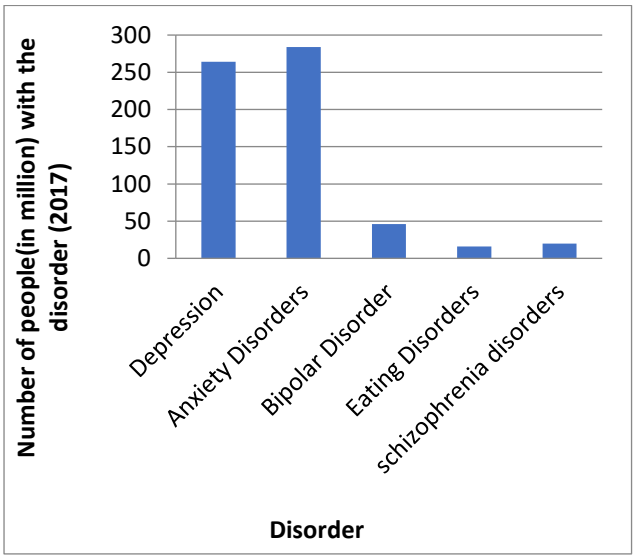
- Significant emotional and behavioral changes.
- Social, professional, or family activities are slowed.
- Relationships Problems.
- Adaptable to change and adversity.

Mental health includes day-to-day activities functioning effectively and properly.

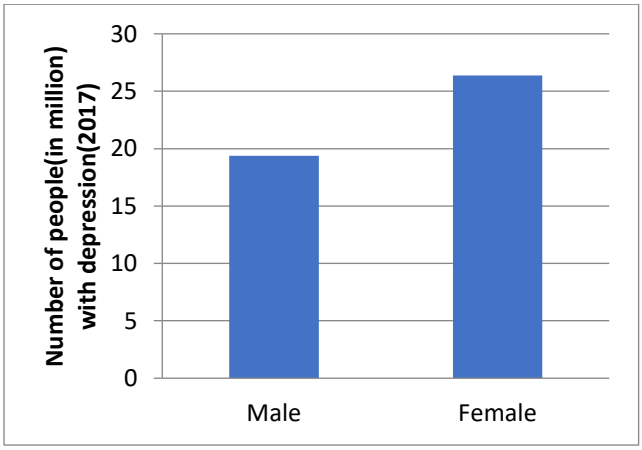
B. Mental health problems that are commonly reported

The most commonly reported types of mental health issues are

- Anxiety disorders
- Mood disorders
- Schizophrenia disorders



Mental Health Global Population Statistics
[10]



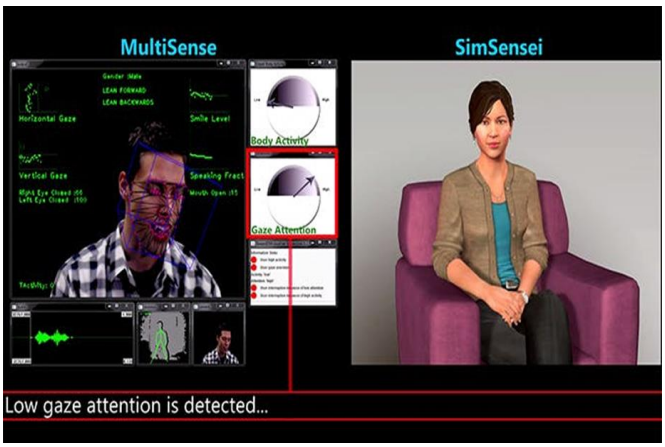
Depression Statistics (India)
[10]

C. An appeal of AI in mental health

The International Committee of the NGO noted in its 2017 report that while utilizing Chatbots and AI apps in health care results with mixed report. AI tools, Apps and robots which are sometimes expensive are using predefined script and do not have their own understanding and they follow a pre-defined script. Therefore, sometimes they are not always ready to understand the user and his or her intent. Therefore, some experts suggest that this medium should be utilized in collaboration with a person's therapist to confirm that no information should be mixed.

A virtual therapist called Ellie designed to treat people with depression and veterans with post-traumatic stress disorder (PTSD) was also launched and tested by the Institute of Creative Technologies (ICT) at the University of Southern California.
Ellie functions through a Trojan horse using different algorithms to work out her questions and motions. Patient is observed through a webcam and microphone which allow her to watch the patient and provides her feedback and decides when to ask certain questions to patients.

Kinect sensor therapy is useful to cure mental illness. The Kinect sensor therapy shows the patient's body posture, head nodes, eye movements etc. on the screen.



[6]

II. ARTIFICIAL INTELLIGENCE BENEFITS IN DEALING WITH THE MENTAL HEALTH CRISIS

AI can be viewed as a powerful tool to help in dealing with mental health

1. Support mental health workers

AI can help professionals in their work. Algorithms can analyze data and can rapidly than humans, suggest possible treatments, by monitoring patient's progress and alert the human professional of any concerns.

2. 24/7 access

Due to a shortage of human mental health professionals, it can take months for an appointment to be made. If patients live in a region where there are not enough mental health professionals, the wait will be even longer. AI provides a tool that an individual can access 24 hours a day, 7 days a week, without waiting for an appointment.

3. Not expensive

The cost of care prevents certain individuals from seeking assistance. Artificial smart tools could be a more accessible option.

4. Comfort talking to a bot

Even though it may take time for some people to feel comfortable speaking to a robot, the anonymity of an AI algorithm can be positive. What might be hard to share with a face-to-face therapist is easier for some to reveal to a robot.

III. TREATMENT MADE EASY USING AI

There are several potential benefits to using AI to help manage depression, starting with better access to coordinated care. Technology can help in Cognitive Behavioral Therapy which is very effective in mental disorders.

1. Convenience

The ability to access mental state resources that are convenient and low cost are major benefits of apps and programs created with AI. Most psychological state apps and platforms available provide resources users can access anywhere from a smartphone, tablet, or laptop. They're also available at any time. You'll be able to use the apps day or night, on weekends, holidays, or the other time that works for your schedule.

Compared to the cost of therapy fees, as well as taking into account missed work, travel and other needs, these applications are also inexpensive or free alternatives.

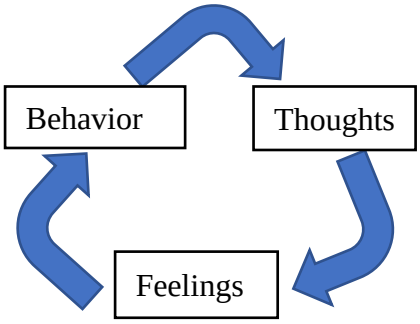
2. Connection

AI can connect people to the assistance they have in situations where they otherwise wouldn't have access. In rural and remote areas, psychological state resources are often few and much between. Furthermore, the available resources might not have the capacity to fulfill the stress of the full community. The ability to access and use mental state resources that are designed using computing may be a lifeline of hope for people in areas where there's little to no affordable, accessible, and available help.

3. Anonymity

The ability to keep up one's privacy when discussing psychological state as well as the pliability to try to do so when it's convenient and from one's own space makes these AI-designed applications for attractive and possibly useful in depression.

IV. AI BOTS AND APPLICATIONS IN DEPRESSION: DIAGNOSTIC TOOLS



Cognitive Behavioral Therapy (CBT) Model:

[9]

Here are some examples of popular AI-based tools which are available to help people deal with depression. While applications cannot diagnose or treat a mental health problem, they can be complementary to individuals working with a physician or mental health professional.

1. WoeBot

WoeBot launched in the summer of 2017 and is cited as an automated conversational agent, also called a chatbot.

2. Wysa

Wysa is a man-made intelligence-based, "emotionally intelligent" bot that the corporate says can "help you manage your emotions and thoughts."

Like WoeBot, Wysa's designed supported principles of CBT to assist users challenge and alter thoughts and behaviors. Wysa also integrates dialectic behavioral therapy (DBT), meditation practices and motivational interviewing into chats.

3. Tess

Tess of X2AI is described as "a psychological artificial intelligence that administers highly personalize psycho educational and health recalls on demand."

4. Youper

This is free app for IOS and Android which uses AI chatbot technology to assist users to talk about their symptoms, behaviors, and thought patterns. The corporate call. Youper as an "emotional health assistant," which gives personalized feedback and insights.

V. LIMITATIONS

With the help of Applications (Mobile Apps) and programs which uses AI technique, faster and timely help can be given to people facing mental depression and at least risk is minimized to some extent. Also, it will help to greater extent to Psychiatrist and Counselors.

According to a survey conducted of quite 700 psychiatrists, most of them believe that AI techniques will be most beneficial in their clinical practice and can become most useful in documentation. Many of them were not convinced for usage of those technologies because they think that the use of these technologies is having risks in keeping privacy of patients facing mental illness. Knowledge engineers will have to train doctors and counselors for how to use the mentioned applications and should agree for usage of it.

VI. FUTURE SCOPE: CHALLENGES THAT MUST BE OVERCOMED

Although AI techniques are assisting a lot in addressing the mental state crisis, more and more challenges are coming forward in this area maintaining privacy of data of people facing such problems is a major concern while using technology. Some standard regulations must be set for these applications, Psychological professionals will play key role in development of AI techniques. Expert systems can be developed by knowledge Engineers where Psychiatrist and Counselors will be experts where

these experts will explore the ways of treating Mental Health and Mental illness. Machine Learning algorithms can be thought of for more better results.

VII. CONCLUSION

Using AI and Machine Learning techniques, researchers and various companies are doing continuous efforts in finding ways that will help to detect, diagnose and to find treatment for mental illness and predict depression. Also they are studying and analyzing how to use technology to explore how facial expressions, change in tone and language of words could indicate a risk of suicide and to save precious human life. Implementing these technologies to reach to people facing mental health problems and would be of great help for them to live happier life is a great challenge. Also it can save many lives trying to commit suicide because by getting timely help using AI techniques.

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Study of Voice Controlled Personal Assistants

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ABSTRACT

Artificial Intelligence's purpose is to create human interaction with computers and other electronic devices much easier and practical, and also to form a technology that helps computers and machines to function in an intelligent manner. Nowadays, Virtual assistants are trained to adapt human speech and reciprocate via produced voices. People can ask them queries, information or control office or home appliances as well as devices. It's also useful for multimedia playback, and managing other vital errands like sending emails, creating to-do lists, and even managing calendars with commands that are voiced. Many companies like Amazon, Apple, Google, Microsoft are utilizing dialogue systems technology to train various varieties of virtual personal assistants. As of recent years, the talents and usage of virtual assistants are known and are escalating swiftly, with new products getting launched within the market frequently it has created a robust weight on both email and voice user interfaces.

Keywords - Virtual Personal Assistant, Artificial Intelligence, Voice Recognition, Internet of things.

I. INTRODUCTION

In this era of the Information Age, The digitalization of the world has made sure that humans do not need to be dependent on anyone else for help, they could depend on a far more efficient and reliable system which can take care of their everyday tasks. The computers, mobiles, laptops, etc., have become a part of us and they make our daily life better and easy, It could carry out almost all of the simplest tasks like Arithmetic Calculations to Complex tasks such as writing programs to reduce tedious work that would take endless hours of time.

A computer system that is able to have a conversation with humans using a voice is known as Dialogue system or Conversational system. It is used to help users accomplish their tasks more effectively via voice commands or communication. These dialogue systems are widely used in various devices such as smart-phones, Computers, smart TVs, Autonomous cars. Also, these dialogue systems can sustain a wide range of applications in education, healthcare ,business initiatives and entertainment, etc. These devices are known by numerous names such as, personal voice assistants, virtual personal assistants or voice assistants

II. MATERIALS AND METHODS

A. Virtual Assitants with IOT

The accuracy of ML algorithms, voluminous training data,[13] have improved over the years and also the

introduction of the elements to add personalized touch of humanity to the voice recognition softwares. The AI-powered virtual assistants like- Siri, Cortana, Amazon Alexa, and Google Assistant are now capable of handling speech at a 100% precision rate. It suggests that The Internet of Things has a phenomenal relationship with virtual digital assistants.. The Internet of Things is the linking of physical objects that contain embedded technology to communicate and sense or interact internally or the external environment.

The IoT Applications links every single thing from humans to processes to various objects. The IoT automates tasks without man-made interference. In simpler words it means it monitors objects remotely using Natural Language Processing (NLP) via VAs. For Example, In the smart phone or speakers like Alexa or Google Assistant they help in the management of these smart devices.[12] The touch-screen interface has made life easier, particularly for seniors. With visual impairment or reduced mobility in pictures it's a bit easier, yet screen readers, which have formed an area for the easily accessible interface, they still suffer with some issues.[12] The voice-responsive virtual interface that is Voice controlled personal assistants are a great addition to many such communities.

Fig.1 A Virtual Assistant with IOT [1]

B. Setting up a Custom Skill for any Laboratory Instrument Interaction (Amazon)

The demanding computing service like Amazon Lambda, Amazon Web Services are usually operated to host a routine skill which will interact with the laboratory system shadows and will react to the received speech commands. Once the skill is available, Amazon customers can see it in the Alexa App and choose to enable and use it.[2] Using this option on an Alexa-compatible device allows the following operations to be carried out:

1. The user's command that is known as speech is sent to the Alexa service which exists in cloud.[3]
2. Alexa identifies the request received, denotes the OneshotTideIntent intent for the "Tide Pooler" skill.[3]
3. It then assembles this data into a request which depends upon various cases and situations. Here in this example its specifically an IntentRequest. Alexa sends this IntentRequest to whichever service defined for the Tide Pooler skill. The request includes the value "Pune" under "City".[3]
4. This Tide Pooler service receives the data in form of a request and does the required deed. [3]
5. Tide Pooler provides the Alexa service with systematic reply in form of a text that later she conveys to the user using her voice.[3]

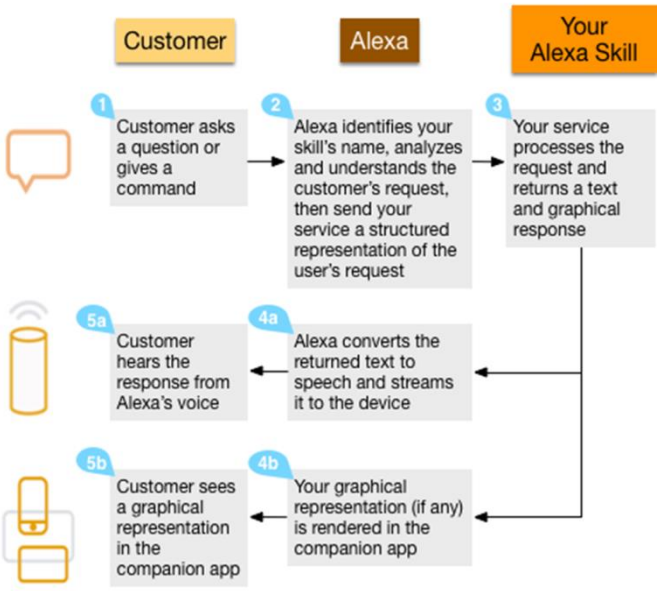

Fig.2 Alexa Custom Skills [2]

C. Creation of a Voice Interaction Interface

The Alexa Skills Kit most commonly known as ASK is a software development framework. ASK permits you to create content, called skills who act as apps for Alexa. Due to its interactive voice feature, Alexa offers its users a hands-free means of communicating with the help of skills. Users can use their voices to accomplish their daily responsibilities like checking the news, match scores, listening to music, or playing games.[7] Users can also use their voice to control devices that are connected to the cloud[[7]

For instance, users can have Alexa turn on the lights or change the temperature of the electronic heater or air conditioning.[7] Skills are compatable on almost every Alexa-enabled device, such as Amazon Echo, etc, or any other Alexa-enabled devices built by other manufacturers. In addition to vocal interaction, skills may include corresponding visuals and tactical interactions as well.[7]

Fig.3 Alexa skills kit [3]

III. INTELLIGENT PERSONAL ASSISTANTS

There are four smart personal assistants Google Assistant, Amazon's Alexa, Apple's Siri, and Microsoft's Cortana that have been established to assist people in managing time vows and accomplishing tasks. [8]

A. Google Assistant

Google Assistant is Apple's version of Siri or Amazon's Alexa or Microsoft's Cortana. It was launched in 2016 & has made excellent progress so far making it the most dynamic and advanced virtual assistant out there. Google's Assistant is not only available with Google's hardware but it's also made available for various devices like wireless headphones, Smart Fridges, Smart Cars & Smart Speakers.

Earlier Google Assistant was an extension of Google Now but now, Google has completely killed Google Now. Google Assistant responds to both text-based & voice-based conversations. After invoking Google Assistant with commands like - "Hey Google" or "Ok Google", it can help you with voice searching & voice commands, letting you complete any number of tasks. Once you've started talking to Google Assistant, it will keep on listening for your commands without needing to be invoked again with wake words like "OK Google". It can also recognize your voice and differentiate it from other's voices by keeping voice profiles

Here are some things Google Assistant can help you with :-

1. If you've lost your way and can't find your way back to home , Google Assistant can help you. Just say something like - "Get me Home" and it will guide you through the best route with the help of Google Maps.
2. You can listen to the latest news headlines instead of reading them on your own by asking Google Assistant. Just say - "Play the News".
3. You can queue up your favorite TV Shows or Movies on Netflix by asking Google - "Play Friends on Netflix". For this to work, You'll need to have Netflix app installed in your phone
4. You can also use Google Assistant to check for appointments or read out your Emails by saying - "Read out my Mails" or "Check for today's Appointments".

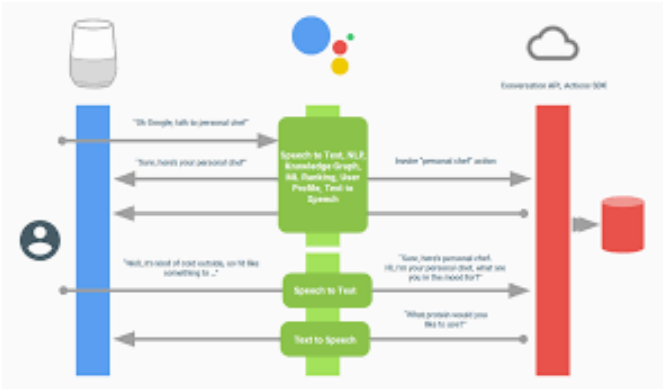

Fig.4 Google Assistant Action SDK Workflow [4]

B. Cortana

Technically speaking, Cortana wasn't supposed to exist for another 500 years, But on April 2, 2014 Microsoft launched it on Windows 10 (pre-2004 update). With Google Home and Apple Siri in competition, Microsoft decided to take a different approach with its exclusive take based on an Artificially intelligent character from a video game series named Halo.

Fig.5 Cortana [5]

Cortana is a personal digital assistant that helps you with your daily tasks like searching for information on the web, giving heads-up of upcoming events, setting reminders, managing meetings, recognizing natural voice without the requirement for keyboard input and giving smart answers by using Bing search engine. Cortana is able to do this by continuously learning your habits & interests. Apart from that she has a good sense of humor and she's smart & witty while closely resembling a human assistant. This is the story of Cortana & how she came into existence.

In order to invoke Cortana, users simply need to say "Hey, Cortana!" and make a command or request, like "set a reminder for 4.15 PM" or "read my email from Alan" or "search for the best voice assistant". While speaking to a PC, Cortana's window will automatically be pulled up.

C. Siri

Just like Google Assistant, Siri is a personal voice assistant which was specifically made for Apple users. Siri is available on all of the Apple devices like - iPhone, iPod Touch, iPad, Apple Watch, Home Pod and Mac. What makes Siri stand out from other voice assistants is that Siri offers a seamless way of interacting with the user. You can ask her questions, You can tell her to set reminders, find or do things you need and she'll do all of the things you've asked her for on your behalf and hands-free just like a human assistant would. Siri has access to all the built-in apps like mail, contacts, maps, safari , etc. and she'll call upon those apps for you whenever it is required.

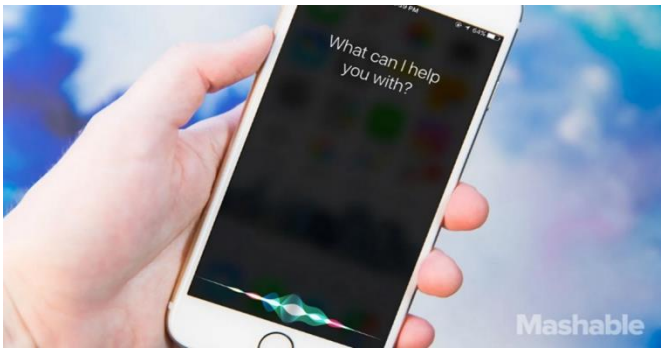

Fig.6 Siri [6]

You can invoke Siri by saying "Hey Siri" to the apple device you're using. You can invoke her using buttons too, you just need to hold down the Home button for 2-3 seconds to launch Siri on your iPhone. Siri is pretty clever, fast and at times really funny too. She can do a lot. She can help you when you're out and about, with sports and entertainment information, getting organized, phone class and messages, giving you tips about certain things,

answering your questions, giving you directions, setting an alarm, flip a coin, finding a book by a specific author. She will also tell you when a good restaurant is nearby exponents.

IV.CONCLUSION

In today's digital world where user experience and performance of the system play the most important roles, One thing is for sure that Personal Voice Assistant technology is here to stay for a long time. Just a simple thought of talking to a device and getting some tasks done is an appealing innovation in itself. The usage of Artificial Intelligence in user's day-to-day lives is directing the shift towards voice based applications. Unlike Alexa, Siri and Google Assistant which are software based systems, There're many Hardware Based Systems out there known as Smart Speakers. These devices use the Voice Recognition technology and they respond to similar commands or wake words such as , "Hey Google!" , "Hey Alexa!". This technology is growing exponentially and some experts even predict that this voice technology will be integrated with almost every application out there in the near future.

We can predict, this is only the beginning of Voice technology as we will definitely be seeing major advancement in the field of Artificial Intelligence in the upcoming years and there will be major changes with the user interface as well. With this ever-evolving technology of Artificial Intelligence, Companies need to start honing these skills and learn how to use Voice technology to have better interaction with their customers.

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Artificial Intelligence and Our Future

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ABSTRACT

The intellectual potentiality which is exhibited by technologies is known as Artificial Intelligence (AI). Man-made Intelligence has fully-fledged to be widespread in the modern-day world. It is the imitation of natural (i.e., human) intelligence in machines. It is a set of algorithms that are automated and programmed to study and mimic the activities of humans. As AI technologies continue to grow, they will enable robots and machines to perform all the tasks that humans do and will have a great impact on our quality of life.

Keywords - Artificial Intelligence, Machines, Revolution, Humans, Innovation, Robots, Collaboration

I. INTRODUCTION

Intelligence can be defined as an overall capacity for reasoning, analysing, problem-solving, memorising and learning.

It is the capacity of the mind specifically to understand principles, truths, grasp facts or meanings, gain knowledge and put it into practice. It is also the ability to judge, comprehend and conceptually understand. Intelligence integrates perceptive functions like insight, awareness, acuity, attention, planning, speech or memory.

A. Intelligence of Humans

Human Intelligence (HI) is natural intelligence. It is the state of the mind that is made up of skills to learn from experience, adaptation to new circumstances, management of intangible or concrete notions and therefore the ability to vary one's milieu using the gained knowledge. Human intelligence can provide several types of data and information. It can provide data on specific facts, which can be another anthropological issue, or, which they had access to and also on interpersonal relationships.

B. Intelligence of Robots

Artificial Intelligence (intelligence of robots) is the man-made version of Human Intelligence. It is the study and design of Smart Mediators (or Intelligent Agents). These intelligent agents can analyse the environments and produce actions that maximize success.

AI research uses tools and insights from many arenas including computer science, psychology, philosophy, neuroscience, linguistics, operations research, economics, probability, optimization and logic.

AI research overlaps with tasks such as robotics, control systems, arrangement, data mining, logistics, speech recognition, facial recognition and many others.

II. AI TECHNOLOGY – REVOLUTION OR EVOLUTION

In history, we had the First Industrial Revolution – a colossal transition to new manufacturing processes and revolutionized the way goods were produced. We then thrived during the Second Industrial Revolution, a phase of rapid standardization and industrialization of goods and services, including areas such as railroad networks, sewage systems, electrification, maritime, automobile and many more. Now, with the increasing need for Digitalisation, we can say that AI is indeed becoming the Third Industrial Revolution.

What is this World of Artificial Intelligence?

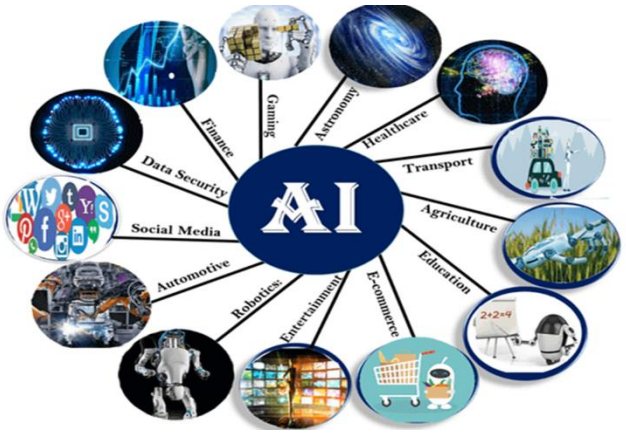
After decoding the Nazi encryption machine **"Enigma"** and helping the Allied Forces win World War II, mathematician Alan Turing changed history a second time with a simple question: "Can machines think?"

Turing's paper "Computing Machinery and Intelligence" (1950), and its consequent Turing Test, established the fundamental vision of artificial intelligence. In its essence, AI is the branch of computer science that aims to answer Turing's question in the affirmative. It is the endeavour to replicate or simulate human intelligence in machines.

Peter Norvig and Stuart Russell go on to explore four different approaches that have historically defined the field of AI:

- Thinking humanly
- Thinking rationally
- Acting humanly
- Acting rationally

Norvig and Russell focus particularly on rational agents that act to achieve the best outcome, noting "all the skills needed for the Turing Test also allow an agent to act rationally."



Artificial Intelligence is classified into two broad categories:

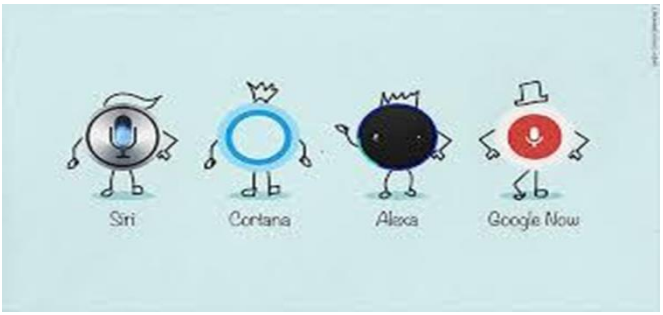
A. Narrow Artificial Intelligence

It is also known as **Weak AI**. This category of artificial intelligence functions within a limited context and is a replication and recreation of human acumen and intellect.

It is mainly efficient in executing a single task competently. Although these machines may seem intelligent yet they are operating under constraints and restrictions than even the most basic natural intelligence.
This type of AI is the most fruitful realization of technological advancement to date.

Narrow AI has undergone abundant discoveries in the last decade. It has had noteworthy social assistances and has also donated to the fiscal vitality of the whole world.

E.g., Google Search, Image Recognition Software, I-phone's Siri, Amazon's Alexa, Window's Cortana, Google Assistant, self-driving cars, etc.



B. Artificial General Intelligence

It is also known as **Strong AI**. This category of artificial intelligence is seen in cinemas, like The Matrix or The Terminator or The Transformers and many others. AGI machines have wide-ranging intelligence and are much like human beings. These AGI machines can proficiently perform various complicated tasks.

The creation and construction of human-level intelligent machines is an expedition for AGI because it has been uptight with lots of struggle and difficulty. AGI has been a source of inspiration for dystopian fantasy, where super-intelligent robots are swarming to rule over humanity, nevertheless, experts have agreed that it is nothing that we want to stress about anytime soon.

{"Everything we love about civilization is a product of intelligence; amplifying our human intelligence with artificial intelligence has the potential of helping civilization flourish like never before – as long as we manage to keep the technology beneficial." -**Max Tegmark, President of the Future of Life Institute**}

Artificial Intelligence is expanding the borders of its functionalities. There are many benefits of AI such as **24/7 Disposal, Everyday Applications, Easy handling of monotonous tasks, Medical applications, Hazardous exploration, Faster Decisions, Reduction of Error, etc.**

We should always keep in mind that when we look at the positive side of a thing, we should never be negligent towards the negative side of it. Despite having several advantages of AI, it also has some hazards involved that we cannot leave unnoticed.

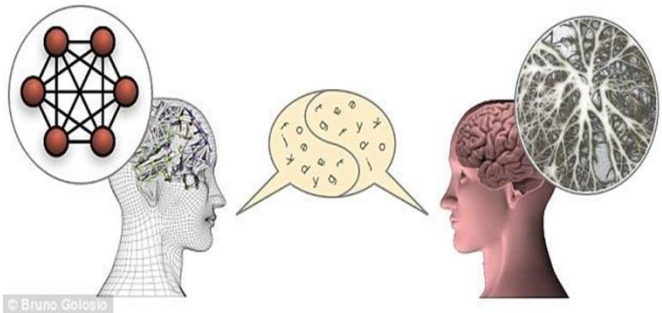
AI has disadvantages and these are **High Implementation Cost, cannot replace folks, cannot improve with Experience, lacking out of the box thinking, Risk of Unemployment** et al.

(The above image gives us an idea of how intelligent robots are going to replace human labour in near future.)

III. ARTIFICIAL AND HUMAN INTELLIGENCE – A RIVALRY OR A TEAMWORK

The question between computer science and human intelligence isn't a matter of who will triumph? But how have they connected and the way will they co-exist?

Reckoning on the way we use AI, the long haul of companies and also the human workforce might be hypothetically renovated by this ersatz intelligence because it rapidly develops, empowering machines to do all the work that we do.



If AI robots can do our jobs in the coming years, exactly how we do them or in a more efficient way then where can human beings fit in the scenario?

Considering the current state of AI competence and speed of expansion, it is crucial to contemplate the possible implications and opportunities of AI, as well as vigorously shape the progress and usage of this amazing technology in such a way that aids mankind instead of destructing it.

Impacts of Artificial Intelligence on our Future:

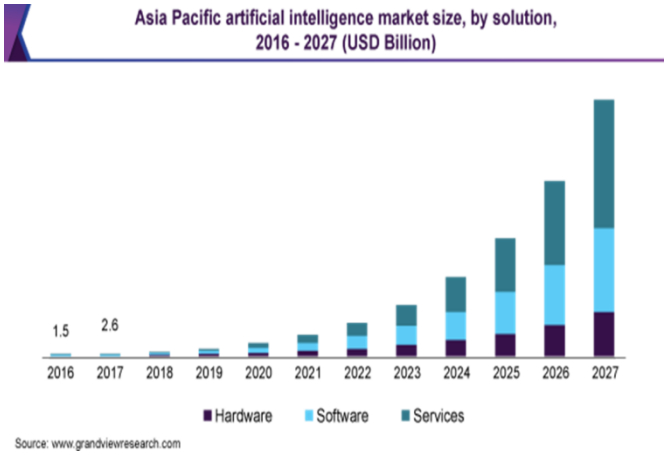
- Mechanization of tasks - This mechanization of tasks across a wide-ranging business transforming from labour-intensive to digital is a huge impact of AI. This automation of tasks can raise productivity growth by 0.8 to 1.4% (says a study). These types of tasks require a large degree of consumption (interpretation) of vast amounts of information that a computer is mandatory because it becomes difficult for humans to intervene.
- Innovative Opportunities - AI and ML have broken new trades, businesses and prospects for the workforce. Such an instance is Digital Engineering. It is becoming an emerging occupation that led to the rapid progress of technology. This field of engineering is still evolving.
- Process model – AI can open various business opportunities and improve production and involvement within the organisation which might surge demand for output and initiate the creation of a brand-new process model. This will surely improve the standard of living.
- Scope for Innovation - With AI and robotics taking a number of the mundane and labour-intensive tasks out of our hands, experts have sufficient time to have thinking, delivering ingenious and innovative actions and solutions their prime objective.

In the era of Artificial Intelligence, understanding the function of labour beyond merely sustaining a standard of living is even more important. It becomes a mirrored image of the elemental human need for participation, co-creation and contribution and thus, must not be overlooked. AI has the potential to enable the creation of a hyper-productive Human-Robot organisation that doesn't exclude humans within the course of performing tasks, but rather empowers us and promotes our benefits through teamwork and cooperation.

Faith and Trust are the most vital factors in a human-centred AI system. To encourage human confidence in AI, it's necessary to own a previous understanding under what conditions the AI system works brilliantly and under what situations it makes the correct choices. It is also important to keep up a balanced attitude in handling AI systems.

(This picture is of Sophia – the world's first AI Robot Citizen.)

The question that arises is: How are we responding and adapting to these changes formed by AI?
This is the Real AI crisis indeed. Yes, AI is creepy because if we do not know how much it is proficient and sit idly by letting our jobs to be fully overridden by AI then it is going cost too much for us.



(Above figure is the graph on the increasing market size of AI in the coming years.)

AI specialists see a less severe result. They believe that in the long run, people will still have some tasks alongside smart systems: either the technology will not be adequate to take over entirely, or the decisions will have human interventions that are very essential to hand over completely to a machine. Yet, most specialists and professionals, irrespective of being optimistic or not, expressed concerns about the long-term impact of these new AI tools on the essential elements of being human.

Rise of the Robots – Many experts say that Artificial Intelligence and Robotics can eliminate humanity if it falls into the wrong hands. However, we are on the safer side as none of the AI systems is made at that level that can destroy or enslave human civilization.
So, we need to follow the 3Cs i.e., Complacency, Competency and Cooperation to keep up with this AI Revolution on a global level.

IV. COLLABORATION: HUMAN AND ARTIFICIAL INTELLIGENCE

- **Artificial Intelligence can boost our power of analysis and reasoning abilities and heighten our creativity.**

To gain from this HI-AI partnership, leading companies must realize how humans can effectively augment machines, how machines can improve best what humans do, and how to reshape commercial processes to support this enterprise.

Humans need to perform three crucial roles for preventing robots from harming them: Training, Explaining and Sustaining.

Training – Massive training data sets are combined to teach machine-transition apps to handle colloquial terminologies, to create medical applications for spotting ailments/detecting diseases, to support financial governing, etc. Also, AI systems and machines must be skilled to interact best with Homo sapiens.

Explaining – As AIs progressively deduce the processes that are impervious, they also require human experts to describe their conduct to non-expert users. They are known as "explainers" and they are especially important in those industries which are evidence-based.

Sustaining – Apart from training AI and explaining AI outcomes, companies need "sustainers". Sustainers are those people who can continuously work to ensure that AI systems are functioning properly, safely and reliably.

Human Intelligence (HI) is unique because of its unequalled ability to distinguish between what is right or wrong, to adapt according to the surroundings, how to think new ideas, etc.
HI defines us as moral and rational human beings and our relationship with everything on earth.
With the help of this collaboration of HI and AI, we are at the brink of enhancing our potential to a great extent and it would be the most momentous scientific

development in the history of Computer Science and Technology.

V. CONCLUSION

We know that many activities at the Human-Robot interconnection call for people to do innovative and diverse tasks and to perceive things in different ways. Efficient machines and robots are helping *Homo sapiens* expand and enhance their skills in numerous ways. These machines can increase the cognitive strengths of human beings and extend their physical as well as mental capabilities.

Starting from our phones to huge machinery, AI is moving at a great pace. Although Humans have created Robots with Artificial Intelligence yet they cannot create a human being with all the rationality and ethics. It is therefore proposed that as there is an inherent synthesis between HI and AI, development in the field of Education, Medicine, Agriculture, Land and Labour can be brought under the ambits of Artificial Intelligence along with human acumen in a sustained and constructive manner for the progress of mankind. Care must be taken that at no point in time, there should be a competitive engagement between AI and HI that would lead to extreme radicalism and obliteration of sustainability.

The strange irony of AI is that the Best systems happen to be those which are Least Explicable today.

I become surprised each day thinking about how AI is moulding our world at a faster rate. Apart from the risks involved in AI, we are enthralled by the capabilities of AI machines in today's time. Hopefully, this work of mine will elucidate the amelioration of our lives with AI. Adding to it, the most important point, i.e., we need to understand the effects of AI on us as global citizens. We should not be fully dependent on Artificial Intelligence for doing our work. We need to know how to use this man-made gift in the right way. Once we grasp this notion thoroughly, it would be awesome to create a better and much more wonderful world for our future generations to happily live in.

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Regulating the Usage of Social Media Using Artificial Intelligence

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ABSTRACT

Due to the advent of Social Media in the last decade humankind has seen a lot of technological advancements which has made life better. Social media started with the intention of connecting people around the world within seconds. An update of a discovery made by the researchers far in the Antarctic continent or the latest happenings of a protest in Myanmar is just a click away from us. But at the same time the amount of hatred and negativity spread through social media is a matter of great concern. Our research paper is inspired by a documentary 'The Social Dilemma' which opened the eyes of the public by revealing how the social media business is run around the world. The paper is mainly concerned with Online Content Moderation with the help of Artificial Intelligence tools which will help in curbing Cyber bullying and Fake News along with the need for Artificial Intelligence in India's National Security. The paper also covers how to reduce the screen time of the users.

Keywords - The Social Dilemma, Artificial Intelligence, Online Content Moderation, Cyber bullying, Fake News.

I. INTRODUCTION

The Internet has become an integral part of human society in the past few decades. It has impacted organizations across all sectors thus positively impacting the economy of a country. With time there has been an exponential growth in the number of people benefiting from the internet which indicates huge amounts of data being stored and transferred around the globe every second. An extensive study by Cisco describes the growth of users and traffic around the globe in their Annual Internet Report.

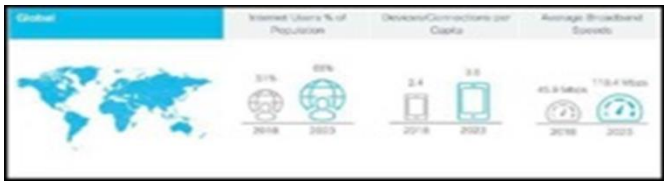

Fig 1: Cisco Annual Internet White Paper 2020

However, as the number of users are increasing every year there has been a potential concern over a negative influence of the data being transferred. This has triggered a wider discussion among the policy makers, company stakeholders and the government. The negative influence mainly is spread by the harmful content over the internet which includes child abuse content.

content which promotes terrorist activities, violent or illegal or offensive material concerning any cultural or religious beliefs. The fact is determining or classifying such content by the machine is challenging. Such scenarios have given rise to a growing awareness within the internet companies of their responsibilities to filter such content before it goes over the internet. This will not only protect the privacy of the users but also help in filtering undesirable content. In the present day, classifying and determining harmful

content is labour intensive in many internet companies which is expensive and time consuming but with AI in perspective algorithms or applications must be developed to scrutinize such content before it goes public.

II. LITERATURE REVIEW

The authors have observed that in the existing internet world the data to be it in any form is not filtered or moderated in such a manner that they still hurt or offend or have a negative influence per say in the society. Social media plays a vital role in influencing the mass on taking an action. Spreading of fake news which leads to protest on the streets is one of the major drawbacks of the influence of social media firms like Facbeook, Instagram, Twitter etc. have started taking the responsibility to moderate but despite all these efforts the problem still exists. Therefore, in this research paper the authors have found that there is an increasse in the need of moderation on the social media content being shared. In this paper the authors have tried to do an extensive research on various ways in which the content can be moderated and resolve the mentioned problems.

III. NEED FOR ONLINE MODERATION

A governance system also known as moderation or filtration is required over the content sharing platforms to prevent abuse, aggression or content that the users prefer to avoid. The practice of Moderation on websites like Wikipedia would not be beneficial as it is an open encyclopedia which gives information on any topic but on the other hand moderation on websites like Facebook, Instagram, Twitter etc. is necessary because these are websites where harmful content is shared or posted deliberately in the form of advertisements, memes or just general posts. The two examples are not necessarily a conflict but are a matter of concern when it comes to companies to filter what actually matters and what content if removed won't make a big difference.

Perhaps, Keep moderation is necessary to mitigate harm and support a pro-social behaviour in the society which ultimately motivates economic goals for such companies. Online Content Moderation must be considered essential to avert Cyberbullying and spreading of Fake News.

IV. SCREEN TIME AND ITS IMPACT

A screen could be of any device be it a TV, mobile phone or a tablet. In this era of technology these devices have governed our lives and without these devices our world would turn upside down. Screen time defines the number of hours or minutes we spend in front of the screen of any device for work or for entertainment purposes. Using these devices in our day to life is gradually causing health related issues, family relations and what not. According to a study at the Harvard Medical Digital devices interfere with everything from sleep to creativity. The study shows that children are the most affected by the increase in screen time. They have observed that a good night's sleep is essential to any human to work in their full potential. The study concludes that we as humans need to be more flexible with the change in technology and develop a habit of using the devices in the right manner.

Fig 2: Google - Ideal Screen Time

V. AI SPECIFIC CHALLENGES IN ONLINE CONTENT MODERATION

Online Content Moderation using AI has its own set of challenges and complexities. It is generally expected to deliver higher standards of results as compared to humans. In addition to this there exists multiple techniques ranging from random forest and Markov Models to support vector machines and neural networks. Neural Networks and Deep learning are inherently unexplainable as they replicate how the human brain learns such that even the AI developers find it difficult to comprehend. Deploying AI in filtering has its own pros and cons as every model or technique gives unique results and there are times that developers themselves do not understand why a particular output was given. The difficulty is illustrated in a test case scenario where the machine was given to differentiate huskies from wolves. The study showed that the algorithm was seemingly accurate at identifying the two animals but a deeper analysis revealed that it was simply learning that photographs of wolves are clicked in snowy regions. Due to such complexity of Neural networks and Deep learning where there are millions of interconnected neurons it is extremely difficult to come up with an explainable result set.

However, incorporating an explainable data set has been an ongoing research itself. Neural Saliency Techniques is considered to increase the explain ability of image and video moderation. These attention mechanisms can identify regions and features in an image which was highlighted during classification. Generally measuring the moderation of any online content is difficult but if powered by AI there could be substantial results. Nevertheless, AI has the potential to have a significant impact on Online Content Moderation in 3 ways.

1) Advanced AI based algorithms can be used to increase pre-moderation stage to improve the accuracy.
2) AI can be used to analyze the training data to improve pre-moderation performance.
3) AI can augment human moderators to increase productivity and to reduce the harmful effects of content moderation.

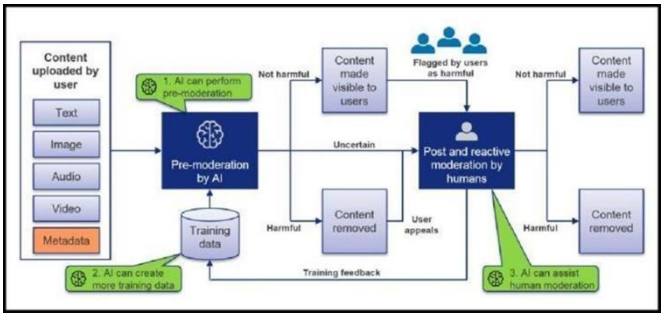

Fig 3: Cambridge Consultants - workflow of Content Moderation

VI. TYPES OF FILTER ALGORITHMS AND ITS WORKING

The techniques used to filter content differ depending on the media to be analyzed. A filter can work at different levels of complexity, spanning from simply comparing contents against a blacklist, to more sophisticated techniques employing complex AI techniques.

A. Machine Learning (ML)

AI deployed systems in moderation generally use Machine Learning (ML) which is becoming more dominant in recent times. They adopt the following 3 approaches:

1. Supervised Learning
2. Unsupervised Learning
3. Reinforcement Learning.

All 3 mentioned ways have their own pros and cons but with the help of all 3 approaches the machine can be trained to filter the content.

B. Neural Networks

Neural networks consist of a set of nodes called neurons which are laid out in multiple layers and interconnected. They depict the biological neurons which transmit information. In case of filtering, the input may represent any point on an image or a text. The training of the network starts from telling the network whether the output is right or wrong based on which the algorithm is updated by making few changes in the calculations and interconnection of neurons.

C. Metadata Filtering

Metadata filtering uses the information (metadata) that accompanies another set of data, providing information about that item. Typical examples of metadata are as follows: book's title, author and publisher; a song's title, performer, and length; a movie's title, performers; However, it is considered that metadata filtering of unwanted content is often inaccurate and easily manipulated to avoid detection.

D. Hash Function Algorithm

A hash function/hashing method takes a file as input and generates a small record that is uniquely linked to the file. For a different file every time a different hash would be produced. Major drawback of Hash based filtering is that if there is any change in a data item like changing the file format, compressing it, deleting a few words from a text or even shortening a song by second will produce an entirely different hash. Hash-based filtering can only identify exact matches of unwanted files.

E. Blacklisting

The blacklist approach is a text-based filtering technique which involves creating and maintaining a dataset of unwanted textual content. Incoming texts are then compared with the dataset to spot similarities and then they are either rejected, deleted, or flagged. Blacklisting approaches can be hacked by misspelling the undesired words or combining texts with graphics, such as emoji's.

F. Natural Language Processing

Natural Language Processing (NLP) is the subfield of computer science which studies how to equip computer systems to handle the language naturally spoken by humans. In textual filtering, natural language processing is needed whenever the simple occurrence of certain word patterns is insufficient to classify the relevant textual items as needed. Just like Neural Networks, Natural Language Processing is complex to understand and comprehend.

VII. PRECECISION OF FILTER ALGORITHMS

The evaluation of Content Filtering Systems on standard metrics is in order to determine their accuracy. Filtering can be viewed as a binary classification task whose purpose is to assess whether a given item belongs to a positive class or to a negative class (e.g., the message is harmful or non-harmful, infringing IP or not). A filtering system's positive or negative answer can be evaluated as follows: 1) true positive (TP): Item is classified as harmful. 2)true negative (TN): Item is classified as non-harmful. 3)false positive (FP): Item is classified as harmful but is not. 4)false negative (FN): Item is classified as non-harmful but is harmful.

VIII.NEED FOR AI IN NATIONAL SECURITY - THE INDIA PERSPECTIVE

As we know recently in a controversial move, the cybercrime cell of the Ministry of Home Affairs (MHA) has started a new programme under which: - Citizens can participate as volunteers to identify, flag and report to the Government Illegal and unlawful content. Which includes terrorism, radicalisation, rapes, unlawful and outrageous sexual content and anti-national activities. Under this programme, the

MHA's INDIAN CYBER CELL COORDINATION CENTRE (I4C) acts as a nodal point. It has been blatantly mentioned that the personal details of these volunteers will be kept confidential. This move is welcome especially after recent soar in use of social media to beget anti- national sentiments amongst masses and to exhort turmoil in our peace loving country. Social media is also being used to circulate deceptive knowledge to influence masses.

Currently the components of the I4C scheme includes:

1) National Cyber Crime Threat Analytics Unit.
2) National Cybercrime Unit.
3) Platform for Joint Cybercrime Investigation Team.
4) National Cybercrime Forensic Laboratory Ecosystem.
5) National Cyber Training Center.
6) Cybercrime Ecosystem Management Unit.

However there is a myriad of shortcomings that is still to be addressed.

1. There is no legal definition of anti-national content or activity, either by the government or the judiciary.
2. Giving people the option to report fellow citizens gives too much power without adequate checks and balances.
3. Government must impute a fair share in the national budget to development of and research in application of Artificial Intelligence to effectively counter Cybercrime.

IX. AI AND COUNTERTERRORISM

Terrorism has its root spread throughout human history. However, with time, the channels to harness terror in the socialized world have been undergoing radical renaissance. The madmen with dreadful visions have left no stone unturned to perpetrate horrors on the civilized world. If the USA has it's 9/11 then India has its own 26/11 that constantly reminds us that perpetual and impregnable security of our borders via land, sea and air is indispensable. Especially for a country like India, which shares 3,323 kilometers of its border with a hostile nation "PAKSTAN" considered as "Cradle of Global Terrorism". Extensive research in Artificial Intelligence, Deep Learning and Robotics has allowed and will continue to allow new capabilities that will improve military strategies assertively. Implementation of autonomous weapons and surveillance systems based on AI and robotics will not only improve accuracy of results but will also save precious human lives. Major global superpowers like the USA and China continue aggressively, to compete in the sphere of Artificial Intelligence. In India, as of now, D.R.D.O. has a laboratory specifically dedicated to artificial intelligence called CENTER FOR ARTIFICIAL INTELLIGENCE AND ROBOTICS.

X. COLLECTION AND ANALYSIS OF DATA

There is a myriad of surveillance equipment like the security cameras and satellites capturing an infinite array of photos and videos every day. India has perpetual surveillance over its massive land boundary of 15,200 kilometres and coastline of 7,516.6 kilometres. This results in an overflow of data which is too extensive for any human force to analyse and determine suspicious or hostile activities. For intelligence agencies it creates both a challenge and an opportunity. Computer-assisted intelligence analysis, leveraging machine learning, could be a game changer in such a scenario. Automated analysis based on machine learning has already given accurate results in variegated experiments. In 2015, image recognition systems developed by Microsoft and Google outperformed human competitors. These machine- learning based techniques are already being adopted by U.S. intelligence agencies to Automatically analyse satellite reconnaissance photographs.

Research and implementation of analogous technologies by Indian Intelligence on its massive reconnaissance archives could be a game changer. It would enable us to keep impregnable eyes on our 15,200 kilometres land boundary and 7,516.6 kilometres of coastline everyday 24/7.

XI. DIGITAL DATABSE FOR AI IMPLEMENTATION

India has established a wide range of surveillance and data gathering advanced tools. And, through database-centric schemes like National Intelligence Grid (NATGRID), Network Traffic Analysis System (NETRA) and the Crime and Criminal Tracking Network & Systems (CCTNS), law enforcement agencies have achieved centrally a
Lawful Intercept and Monitoring (LIM) system. Post 2008 Mumbai terror attack, these mechanisms got a big boost. However, India must keep progressing and analysing to maintain a state-of-the-art infrastructure, knowledge as well as proficient work force.

XII. CONCLUSION

The above-mentioned approaches are currently being used in filtering out all the unwanted content from the internet by few Social Media Giants but not many. The time taken to train the machine and then to re-correct the algorithm is a time-consuming process but with time or over a few years these approaches if used by the social media firms could make a difference in the society. This
will not only reduce crimes but also have an impact over the health of an individual. Every method is complex in its own way but if the right algorithms are used the moderation of online content is possible. For all this to happen the world needs volunteers who will willingly work on such problems and come up with more efficient ways of filtering the data.

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Cryptocurrency : Legality, Investment and Usage

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ABSTRACT

From 1680-1980 paper currency gained popularity and is used across the world that is how modern currency came into existence. Modern currency includes paper currency, coins, cards, and digital wallets and all of this is controlled by banks and governments which means all transactions are observed by the centralized regulatory authority. In the year 2009 cryptocurrency was born as a form of digital payment currency. Cryptocurrency value is increasing another way we can mine cryptocurrencies like bitcoin. Over the years there has been an ongoing debate regarding its use, whether it is a good and/ or safe investment, is it legal to use cryptocurrency the same way we use paper currency, etc. This paper gatherers information by analyzing and studying the different laws, legality, trading, and how different countries have used it as an approach to boost their economy, some countries have allowed individuals to trade without their profits being taxable, while those of business profits are and how some countries have allowed its use but are banned by the banks.

Keywords: Crypto Currency, Banks, Legalize, Investment, Taxable

I. INTRODUCTION

A cryptocurrency, cryptocurrency, or crypto is digital or virtual money created from code. It is an encrypted string of data or a hash encoded to signify one unit of money. It is an asset designed as a medium of exchange wherein individual coin possession records are held on a ledger. Existing in a kind of computerized database using strong cryptography to secure dealings records, to regulate the creation of extra coins, and to verify the transfer of coin ownership. Bitcoin is the first cryptocurrency released in 2009 and later many cryptocurrencies came into existence. In simple words, payment can be exchanged using cryptocurrency for online goods and services.

Cryptocurrency works using blockchain, where blockchain is a technology that records and manages transactions. More than 6,700 cryptocurrencies are in trade today with a total value of $1.6 trillion. People around the world have various opinions and perspectives regarding investment in cryptocurrencies where many believe it to be profitable whereas some call it the, “greater fool investment theory”.
Cryptocurrency is popular among its supporters because of the technology behind it and the blockchain method which is more secure than the

regular transaction method. Although cryptocurrency is legal in some countries and illegal in some, it seems most people treat it as a volatile buy. Cryptocurrency exposes you to the risk of the threat, but as you "*Risk hai, toh ishq hai*", it can be a very good investment choice.

II. ABOUT CRYPTOCURRENCY

Suppose you face some error like a technical issue while doing a transaction, or the account gets hacked or the amount is exceeded in the account. Now imagine a transaction between two individuals, one of them having a bitcoin app, and his transactions are done in a few seconds since there is no fund limit transfer, accounts cannot be hacked and there's no central point of failure.

A cryptocurrency is a digital or virtual currency that is a medium of exchange without a physical embodiment. Cryptocurrencies work in a decentralized manner. The features like – little to no transaction costs, 24/7 access to money, no limits on purchase and withdrawals, freedom for anyone to use, faster international transactions make cryptocurrency special. Crypto is a method that uses encryption and decryption to secure communication.

A. Five global cryptocurrency exchanges

Because of its legal status, Bitcoin is gaining popularity. Several websites sell bitcoin and altcoin trading services, but just a handful of them are the most trustworthy group in terms of ease of use and popularity. Cryptocurrency exchanges function similarly to stock exchanges, enabling investors to purchase, sell, or hold cryptocurrencies. Since it is difficult to track the movement of funds in cryptocurrency, governments around the world are taking various measures to control cryptocurrency transactions.

Here are some of the cryptocurrency exchange platforms that have gained prominence:

1) WazirX

The word Wazir comes from the game of chess where it means queen piece, and it's the strongest piece in chess since it can make any desired move. So the company believes in providing the most powerful piece of cryptocurrency for trading.

WazirX is a Bitcoin crypto trading exchange in India offered by Zanmai Labs Pvt. It was released on 7th March 2018. One can buy bitcoin and 100+ cryptocurrencies in INR in India instantly through UPI/IMPS. It is said to be one of the secured and trusted cryptocurrency exchange apps. It's built by a team of traders and blockchain believers and has advanced security features like 2FA and in-app passcode.

Current version available on play store: 2.12 (as of 11th March 2021)

Number of downloads:1M+

Play Store rating:4.4

App permissions required: camera, telephone, storage

Website:https://wazirx.com/

2) Bitbns

It claims to be a reliable app in terms of security for cryptocurrency trading. For a better trading experience, it provides margin trading, stop-limit orders, P2P INR mechanism, etc. Bitbns is offered by Bitbns cryptocurrency trading exchange India, which is a part of Buyhatke Internet Pvt. Ltd- the parent organization. It was released on 21st January 2018. Bitbns, which currently lists 98 cryptocurrencies, enables users to buy and sell cryptocurrencies at the best available prices and offers better trading convenience.

Current version available on play store: 4.4.10 (as of 11th March 2021)

Number of downloads:100K+

Play Store rating:3.1

App permissions required: camera, storage

Website:https://bitbns.com/

3) Zebpay

Zebpay has been in the business of cryptocurrencies since 2014 and has conducted $3 Billion worth of transactions since its inception. Zebpay is offered by Zebruary Technologies Pvt. Ltd. and released on 8th August 2014. It allows users to instantly purchase Bitcoin and several altcoins with guaranteed execution and minimal slippage. Controls to block all outgoing transactions with the Disable Outgoing Transactions feature are among the robust security mechanisms. It aims to bring the power of decentralized digital finance to everybody.

Current version available on play store: 3.12.02 (as of 11th March 2021)

Number of downloads:1M+

Play Store rating:3.4

App permissions required: camera, contact, storage

Website:https://zebpay.com/in/

4) CoinSwitch

CoinSwitch acts as a crypto trading aggregator, partnered with many wallet services, cryptocurrency exchanges, etc. It was released on 31st May 2020 and is a trading platform that has processed more and $5 billion taking care of trust and security concerns.

Current version available on play store: 2.2.0 (as of 11th March 2021)

Number of downloads:1M+

Play Store rating:3.8

App permissions required: camera, microphone, storage

Website:https://coinswitch.co/

5) Giottus

Giottus is a cryptocurrency platform that is led by the all-Indian team- IIM Calcutta behind this venture. It is owned by Giottus Technologies Pvt. Ltd and is released on 1st February 2021. Giottus Cold wallets are protected by a 100% cyber-theft insurance policy. They've also partnered up with Bitgo, a global custodial service leader, to provide insurance for your savings. It offers free instant deposit and withdrawal of Rupees 24 hours a day, 7 days a week, with transactions taking just 10 seconds.

Current version available on play store: 2.1.25 (as of 11th March 2021)

Number of downloads:50K+

Play Store rating:4

App permissions required: camera, storage

Website:https://www.giottus.com/

B. Five global cryptocurrencies

1) Bitcoin

Bitcoin is a cryptocurrency that was launched in January 2009. There are no actual bitcoins; instead, balances are stored on a public ledger that anyone can see. A vast amount of computational power is used to verify all bitcoin transactions. Individual bitcoins are not valuable as commodities since they are not distributed or guaranteed by any banks or governments. Despite the fact that it is not legal tender, Bitcoin is incredibly common and has spurred the development of hundreds of other cryptocurrencies known as altcoins. "BTC" is a common abbreviation for Bitcoin.

Current price:$56,557.48 (As on 12th March,2021)

Market cap: $1,059,720,601,417 (As on 12th March,2021)

Website: www.bitcoin.org

Market cap is the current price x circulating supply.

It is the total market value of a cryptocurrency circulating supply.

2) Ethereum

Ethereum is an open-source, decentralised blockchain with smart contract features. The platform's native cryptocurrency is Ether (ETH). After Bitcoin, it is the second-largest cryptocurrency

in terms of market capitalization. The Ethereum blockchain is the most commonly used.
Current price: $1,812.59(As on 12th March,2021)
Market cap: $207,661,786,339 (As on 12th March,2021)
Website: www.ethereum.org

3) Binance coin

Binance is a cryptocurrency exchange that offers a trading network for a range of digital currencies. In terms of trading volume, Binance was the largest cryptocurrency exchange in the world in January 2018.
Current price: $282.62(As on 12th March,2021)
Market cap: $43,615,274,516 (As on 12th March,2021)
Website: www.binance.com

4) Tether

Tether is referred to as a stablecoin because it was produced with the intention of always being worth $1.00, with $1.00 in reserves for each tether released. Tether Limited, on the other hand, argues that tether owners have no contractual rights, other legal claims, or promise that their tethers will be reclaimed or exchanged for dollars.
Current price: $1.00 (As on 12th March,2021)
Market cap: $38,111,032,905 (As on 12th March,2021)
Website: www.tether.to

5) Cardano

Cardano is a cryptocurrency and open source project that seeks to create a shared blockchain network for smart contracts. Cardano's internal cryptocurrency is named Ada. The Cardano Foundation, based in Zug, Switzerland, oversees and supervises the project's production. It was only released on the 14th of October, 2020.
Current price: $1.11(As on 12th March,2021)
Market cap: $35,493,389,646 (As on 12th March,2021)
Website: www.cardano.org

III. LEGALITY

A. Four Countries where cryptocurrency is considered legal with taxation.

Japan, is one of the world's fastest-growing technology markets, has very little option but to legalize cryptocurrencies sooner or later. as of April 2017, accepts Bitcoin and other digital currencies as legitimate property under the Payment Services Act. the government has put into effect a PSA (Payment Services Act)-based program that allows some cryptocurrencies and exchanges to be used for transactions and trading. In Asia, Japan is now largely viewed as a hub for cryptocurrency trade activities. Japan has the most advanced regulatory climate for cryptocurrency in the world

Germany is among the few European countries that not only acknowledgments but are also actively involved in blockchain advancement. Germany has entirely authorized bitcoin to allow citizens to trade in this cryptocurrency. The German government's acknowledgment of Bitcoin has increased the appeal of these coins to the global market. As part of the country's wider blockchain policy, the German government has introduced new laws to introduce all-electronic tokens. The new law, according to the country's ministry of finance, relaxes requirements that issuers and shareholders of shares register transactions with a paper certificate.

In 2013, the US accepted bitcoin as a digital virtual currency that can be used for payment. In September 2015, the CFTC classified it as a commodity. Only if the selling of crypto constitutes a sale of securities under federal or state law, or if it is deemed a money exchange under state law, is it regulated. Same as a property, Bitcoin is also taxable. To clarify, bitcoin is legal in the United States, however, the legality of other cryptocurrencies is uncertain. The Commodity Futures Trading Commission has approved digital

currencies as commodities and it will continue to do so. Any digital currency exchanged in the United States that is labeled as a security, and also any trading platform that meets the Securities and Exchange Commission's definition of exchange should be registered. The regulatory framework also includes tax legislation and accountability laws for FINCEN between financial markets and individuals and companies with which they do business.

Under Canadian legislation, digital money is classified as an asset. As a result, according to the Financial Consumer Service, "you must disclose any profits or losses from selling or purchasing digital currency when you file your taxes." Any gains or liabilities arising from this may be net revenue or capital for the taxpayer. Canada is allowing the use of cryptocurrency. According to the Government of Canada website on digital currency, digital currencies can be used to purchase products and services on the Internet and in shops that support digital currencies. You can also purchase and sell digital currency on open markets, called digital currency or cryptocurrency exchanges. However, cryptocurrencies are not known to be legal tender in Canada. According to the Financial Consumer Agency of Canada, only the Canadian dollar is considered the official currency of Canada. The Currency of Act describes legal tenders' as 'banknotes issued by the Bank of Canada under the Bank of Canada Act' and 'coins issued under the Royal Canadian Mint Act.'

B. Four Countries where cryptocurrency is considered illegal

Algeria is one of the countries in Northern Africa that has outright banned the use of cryptocurrencies. It is illegal to buy, sell, use, or store as such digital currencies. The term "virtual currency" refers to the money that is traded over the internet. It is distinguished by the lack of tangible assistance such as coins, checks, cheques, or credit card payments. Any violation of this section is subject to the relevant laws and regulations.

Bolivia is one of the few nations that has outright banned cryptocurrencies. According to the authorities, the resolution was passed to shield residents from some form of Ponzi or pyramid scheme. Any currency not issued and regulated by a country or an approved body is forbidden. Despite recent opposition to the bill, there is still insufficient 'force' to reverse it.

North Macedonia seems to be the only European country that forbids the use of cryptocurrencies such as Bitcoin, Ethereum, and many others. Investing in cryptocurrencies is banned, and national banks have cautioned that crypto transfers are related to illegal activity. The Central Bank also cautioned its people that speculating in cryptocurrency is a risky business because the markets where these transactions take place aren't controlled and regulated by-laws

Morocco also outright outlawed Bitcoin and other cryptocurrencies. You will be fined or even imprisoned if you possess, sell, or have something to do with the crypto room, depending on the seriousness of the offense. These rules won't change for this country any time soon, and if you're from there, you can forget about all this entirely.

IV. INVESTMENT

A. How it works: Investment in cryptocurrency

Cryptocurrencies are digital assets that people use to invest in and make online transactions. To buy “coins” or “tokens” of a cryptocurrency, you must first exchange real money, such as dollars. Cryptocurrencies are unique in that they can't be duplicated, making them simple to monitor and recognize as they're exchanged.

B. Mining in cryptocurrencies

The word "crypto mining" refers to the process of obtaining cryptocurrencies by the use of computers to solve cryptographic equations. Validating data blocks and applying transaction records to a shared record (ledger) known as a blockchain is part of this method.

Let's consider the example of Bitcoin for a better understanding.

Bitcoin is a digital currency that was first introduced in January of 2009. It is based on ideas outlined in a whitepaper by the elusive and pseudonymous Satoshi Nakamoto.The identity of the individual or individuals who developed the invention is still unknown. Bitcoin promises lower transaction costs than conventional online payment methods, and it is run by a decentralized authority, unlike government-issued currencies.

Cryptocurrencies, such as Bitcoin, are a form of digital currency. There are no actual bitcoins; instead, balances are stored on a public ledger that anyone can see. A vast amount of computational power is used to verify all bitcoin transactions. Individual bitcoins are not valuable as commodities since they are not distributed or guaranteed by any banks or governments. Even though it is not a legal tender, Bitcoin is incredibly common and has spurred the development of hundreds of other cryptocurrencies known as altcoins. "BTC" is a common abbreviation for Bitcoin. The bitcoin system is made up of a group of computers (known as "nodes" or "miners") that all run bitcoin's code and store its blockchain. A blockchain can be thought of as a series of blocks metaphorically. Each block contains a set of transactions. No one can cheat the system because all machines running the blockchain have the same list of blocks and transactions and can see all new blocks being filled with new bitcoin transactions transparently. These transactions can be seen in real-time by everyone, whether or not they run a bitcoin "server." A bad person will need to control 51 percent of the computational power that makes up bitcoin to commit a criminal act. As of January 2021, Bitcoin has about 12,000 nodes, and this number is increasing.

Bitcoin Mining: The method of releasing bitcoins into circulation is known as bitcoin mining. In general, mining involves solving computationally challenging puzzles to locate a new block to add to the blockchain.

Bitcoin mining adds and verifies transaction records through the Bitcoin network. Miners get rewarded with some bitcoins for adding blocks to the blockchain; the reward is halved per 210,000 blocks.

C. Trading in cryptocurrency

The act of speculating on cryptocurrency price fluctuations via a CFD trading account, or buying and selling the underlying coins via an exchange, is known as cryptocurrency trading.

Cryptocurrency CFDs (contract-for-difference)- CFD trading is a type of derivative that allows you to bet on cryptocurrency price fluctuations without having to own the underlying coins. You can go long ('buy) if you believe the value of a cryptocurrency will increase, or short ('sell') if you believe the value will fall.

Both are leveraged goods, which means you only need a small deposit (known as margin) to gain maximum exposure to the underlying market. Since your benefit or loss is always measured based on the overall size of your position, leverage magnifies all gains and losses.

Buying and selling of cryptocurrencies.

When you buy cryptocurrencies on an exchange, you're buying the coins. To open a spot, you'll need to open an exchange account, deposit the full value of the asset, and keep the cryptocurrency tokens in your wallet until you're ready to sell.

D. Safety of cryptocurrency

Currency must be legal if it is to be sustainable. The United States maintains a neutral stance on cryptocurrencies. Instead of currency, they would regard it as a piece of land, subjecting it to all property taxes. Australia, too, did not accept it as a legal tender, instead of imposing tariffs on goods and services. Cryptocurrency is not common in Russia. Canada is the only nation that imposes a virtual currency levy.

The current situation in India is that the majority of people believe it is unsafe and illegal. In India, however, cryptocurrency is never considered illegal. In July 2018, the Reserve Bank of India prohibited banks from facilitating cryptocurrency transactions.

Cryptocurrency transactions are then stopped. People also filed writ petitions to overturn the ban. The supreme court ruled against the RBI's ban in March 2020.

The Reserve Bank of India (RBI) has declared that it would investigate its own central bank digital currency (CBDC) with the help of some legislation. It's good news because it may be the first move toward digital currency. However, there is a risk that they will place limits or taxes on other private cryptocurrencies, or even outright ban them.

E. Is it safe to invest in India?

It is right that cryptocurrency is not banned in India. However, unlike traditional investing avenues, there is no legal promise of the survival of the deposited funds.

Between July 2018 and March 2020, cryptocurrency exchanges were unable to open bank accounts due to a banking prohibition. The banking ban was overturned by India's Supreme Court in 2020.

The current Budget session of Parliament is scheduled to discuss a bill that bans all private cryptocurrencies in India and establishes a Reserve Bank of India-issued official digital currency.

The government plans to pass a Bill in Parliament shortly that would specifically prohibit private cryptocurrencies such as bitcoin, agreeing with the central bank that allowing private parties to play with currencies might jeopardize financial market stability.

The Blockchain and Regulation of Official Digital Currency Bill of 2021, on the other hand, would make it easier to introduce any official digital currency and improve the ecosystem that supports it. The Reserve Bank of India (RBI) is on the verge of launching a new currency.

V. USAGE

Using cryptocurrency for daily transactions, trading, or hoarding it for future use is easy and secure. It is just that it is taxable and we need to pay taxes on its transactions the same as we do for currency while paying online using payment gateways

Since digital currencies are not considered securities or legal tender in Malaysia, cryptocurrency trades are tax-free, and cryptocurrencies may not count for capital gains tax.

Cryptocurrencies are only taxable in Portugal if they are used as professional trading practice, which requires you to register as a broker and pay taxes on your profits; otherwise, they are considered non-taxable in Portugal because they do not fall into any of the categories.

Businesses that accept digital currency as payment for goods and services, on the other hand, may be subject to income tax.

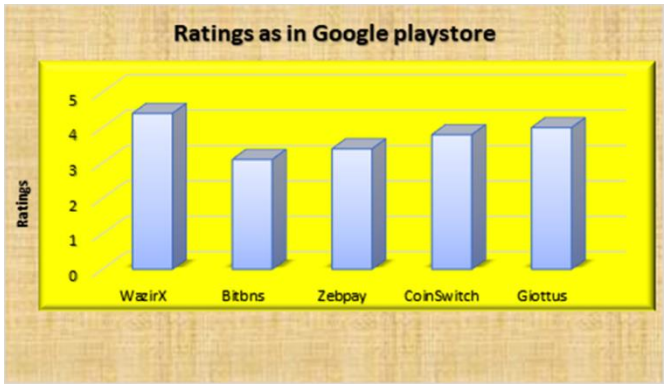
In Singapore, there are no capital gains levy, but neither persons nor companies that possess cryptocurrency are responsible.

Companies operating in Singapore, on the other hand, could be subject to income tax whether their primary

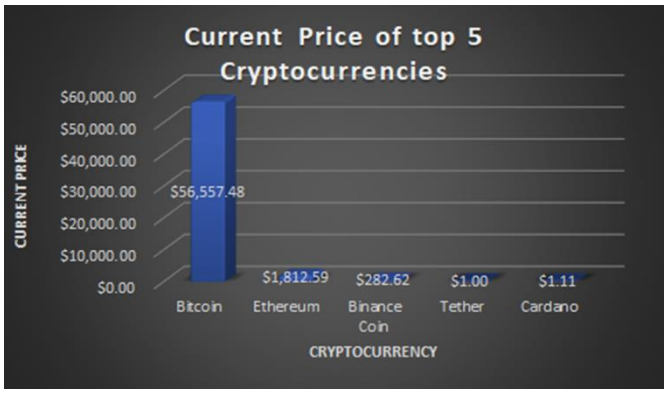
activity is cryptocurrency dealing or accepting cryptocurrency as payment.

Businesses who want to adopt digital currencies like Bitcoins as payment or sales are subject to ordinary income tax laws. They will be taxed on wages earned in Singapore or collected there. Where permitted by our tax laws, tax deductions will be eligible. If you purchase, sell, or keep cryptocurrencies for personal benefit in Switzerland, you will not be subject to capital gains taxes. Ethereum and Shapeshift are two well-known Swiss-based firms. There is no digital service levy in Switzerland.

F. Figures



The above graphs show ratings (as in the play store) of all the five cryptocurrency exchange platforms mentioned above. From the graph, we get a better visual that WazirX tops the play store rating with 4.4 stars while Bitbns has the lowest rating of 3.1 stars.



The above graph shows the current market price of top 5 cryptocurrencies.

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VII. CONCLUSION

People in India can keep And trade bitcoin but cannot exchange in cash which is possible in few developed countries and they can change the cryptocurrency in their country. It is a good investment for the developing and the developed countries across the globe as the value of this digital currency is rising day by day as it is safe to trade and secure for payment. Giottus Cold wallets are safe and it protects the trading by a 100% cyber-theft insurance policy. For Cryptocurrency, while trading, the coins cannot be hacked. Although the understanding and usage of it are a bit difficult to the layman in the starting but once into this market it is easy and rewarding. It has the potential to succeed and give healthy competition to the share market. Few countries have accepted cryptocurrency but are not considering it a medium for trade or use in banks in their countries. Cryptocurrency exchanges are prepared to work with the government to share information on how to frame authorities. However, the Indian government is preparing to introduce its digital currency. The Reserve Bank of India and the government are not prepared for private players. If

they are ready in the future, they will almost certainly enforce a tax or GST.

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Critical Review of Police FIR and Case Record Management and Proposed Blockchain-Based Systems

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ABSTRACT

India is the largest democracy with an increasing population where a growing crime rate is almost inevitable. There are several robust rules in the constitution to ensure smooth functioning of the system, however, sometimes, the entire process is slowed down with the need for verification at each step. To avoid the delay in specifically the First Information Report (FIR) and case-related proceedings, a digitized solution is proposed wherein all the steps were carried out online reducing the time and was more convenient to both the public and the police department. Yet the need for a more secure, unalterable, traceable, and chronological sequence of records was still lacking. Hence, to fill in the void, blockchain-based systems have been proposed but an end-to-end system covering the entire span of police judicial proceedings is new and is currently being developed.
In our paper, we take this opportunity to study and analyze the existing police case-related proceedings, the blockchain technology, and the proposed systems and also suggest an integrated police record management system using blockchain, Machine Learning (ML), and the Internet of Things (IoT).

Keywords - FIR, Blockchain, Machine Learning, IoT, Police case-recording system.

I. INTRODUCTION

Our Indian judicial system is one of the most important institutions for the smooth functioning of the world's largest democracy. For record-keeping in the police force, it is essential to maintain an unaltered chronological sequence of events and documents so that police can analyze criminal activity to avoid discrepancies or interference in the records and documents.

More than 50 lakh criminal cases were registered in India in the year 2019 [4] To solve such a high number of cases in an effective and timebound manner, the Indian police force is in dire need to upgrade its infrastructure and case management systems with modern technology [10]. This is required to improve efficiency, prevent malpractices and increase public confidence in the police force. Maintaining all the case-records in an unalterable manner is important for the fair, accurate, partial, and speedy resolution of any case. Traditional and current case-record keeping systems have been digitalized but they still lack security and are not tamper-proof [8]. Since police records are sensitive information, they need to be stored in a

chronological sequence, ensure traceability, and must be unalterable once recorded. A blockchain-based system can provide safe and secure record-keeping while maintaining an unalterable, traceable, chronological sequence of records and documents providing total transparency in record handling as required. The blockchain-based system can further be enhanced by integrating it with IoT and Machine Learning.

II. LITERATURE SURVEY

The literature survey intends to study the current FIR process, current research on delays in the FIR process, and other systemic problems which directly or indirectly hamper the case process and can be addressed via technology improvements.

A. Police FIR and case-record management systems

First Information Report (FIR) is an initial step of registering a cognizable offense based on the victim's statement upon verification by the police [1]. The further process states that the police officer starts investigating the crime scene, other facts and collects the required pieces of evidence regarding the case. Post investigation, the police officer sends the complete case report to the magistrate. Now if the offense is proved in the report, then the charge sheet is filed before the magistrate, however, if no offense is made out, then the case closure report is filed before the magistrate [1]. Following this, the court proceedings are started, if then the police fail to complete the further investigation process within sixty or ninety days depending upon the nature of the offense, the accused then will be released on bail.

Along this process, if any officer-in-charge wants to cancel the FIR before the completion of an investigation, there is no provision in the Criminal Procedure Code (CrPC) to do so [2]. Only after the completion of the investigation, the magistrate, according to 173(2) CRPC, if feels that the case is not strong enough, can drop the proceedings and the FIR is thus canceled.

FIG 1. Criminal Case Trial Process (India) [3].

The ever-growing crime rate in India has resulted in a total of 51,56,172 cognizable crimes consisting of 32,25,701 Indian Penal Code (IPC) crimes and 19,30,471 Special & Local Laws (SLL) crimes in 2019. This was an increase of 1.6% over 2018 (50,74,635 cases). The crime rate registered per lakh population has also marginally increased from 383.5 in 2018 to 385.5 in 2019 according to the 2019 NCRB report [4]. A worrying trend indicates that when the crime rates

are controlled in some states, new centers of crime emerge [12].

According to research conducted by Banerjee et al. [5] along with Rajasthan police, it was found that the police staff who often work long hours, display decreased efficiency and reduced job satisfaction which results in delay in the FIR process and other case-related proceedings. Another report [6] showcased that to keep the crime figures low, the officer refuses to file certain FIRs which results in misleading data, and also justice does not prevail. A national survey [7] conducted expresses confidence of citizens in their respective country's police departments did not feature India among the countries with high confidence levels.

Research conducted in 2016 by Marmat and More [8] noted that usually many crimes go unreported or are ignored by the citizens or witnesses due to fear of the police department or lack of time and ignorance, also many of the cases are dropped due to lack of evidence and proof collected and lack of collaboration of the citizens and police. Witnesses to the crime often apprehensive about approaching the police due to fear of crime and sometimes even non-cooperation by the police [9]. Due to the issue of corruption in registration and non-registration of FIRs, a new dual system [10] had been introduced, which allows preliminary verification before FIR registration which also avoids fake FIRs and delays in proceedings.

In "Police Structure: A comparative study of policing models", John Varghese [11], upon studying the Indian police structure and workflow, argued for a consent-based, transparent and accountable framework based on the British model which would help in increasing public confidence.

The Crime Criminal Information System (CCIS) and Common Integrated Police Application (CIPA) were developed and implemented by the Government of India at a national level to make use of information technology in the police department and workflow automation [13].

Research conducted in 2017 titled: "Research on the Impact of Technology on Policing Strategy in the 21st Century, Final Report" for the US Office of Justice Programs by Kevin Storm [14] found out the positive impacts of technology on law enforcement agencies which resulted in an increase in efficiency, communication, enhancing information sharing practices by digitizing the workflow. Digitalization and e-police will help reduce paperwork, duplication and build citizen confidence and transparency [15].

Bhosle et al. in 2019 proposed a Computerized Real-time crime record Management System (CRMS) [16] for the police station where all the case related information could be stored at a centralized location which would result in ease of accessibility, reduced time consumption, cost reduction, and increased operational efficiency and flexibility. A similar study conducted by Iyer et al. [17] proposed an android application for FIR registration and tracking where the complainant would be filing the FIR form, upload shreds of evidence and records, and would later be able to track the progress and get real-time updates on his cellphone. A recent approach towards passenger security is proposed by Pednekar et al. [18] which will help the passengers file an FIR in real-time during their train travel, using cellphone whenever any incident occurs, which would also help them to directly communicate with the Government Railway Police.

Various online systems proposed to date, where the user can lodge their FIRs and track them in real-time, have certain drawbacks. The citizen can file a complaint on the online application but for filing an FIR, [19] according to 154 CrPC, the user must

upload their signature every time after the one-step authentication which could result in delay and inconvenience. Another issue is that the e-FIR verification takes 48 hours to just confirm whether the FIR is valid or not and only then can the user download the copy of the FIR. Even if the FIR is rejected, the reason for the same is not communicated in 51% of the cases [20]. With several e-FIR applications have already been initiated by the government such as Sindhu Police App by the Maharashtra State Police department, there is still a lack of awareness among the citizens with less than 1000 downloads for the aforementioned app [21] even though the technological expenditure on State Police Forces has been increased, the results haven't yet been encouraging.

B. Blockchain-based systems

After studying the traditional and digital FIR and record-keeping methods used by the police department and their pros and cons, a more resilient and secure system can be developed by employing blockchain technology.

The cryptocurrency bitcoin and technology underlying it i.e. blockchain finds its origin in a 2008 paper written by a person or a group of people using the pseudonym Satoshi Nakamoto titled Bitcoin: A Peer-to-Peer Electronic Cash System [22]. The proposed system combined encryption and the distributed storage technology to create a secure, unalterable distributed ledger system. The advantage of the system came from its internal mechanisms to verify the transactions without any mediating third party. While the Bitcoin cryptocurrency is highly volatile and subject to various regulations across the world, its underlying blockchain technology has found growing acceptance as the basis for decentralized, tamper-proof, transparent, and distributed ledger via a peer-to-peer network. Blockchain is finding an increasing relevance as a means of introducing credibility and trust to the transactions [23].

In a permissioned Blockchain-based system, data can be reviewed or added by any of the peers within the system, however, modifying /adding the data is not possible without a majority of the peers agreeing to it. This makes it computationally infeasible to tamper with the data thus making the system immutable [24].

The benefits of such a system have led to it being researched for application in a wide range of fields such as supply chain management [25], copyright protection [26], healthcare [27]. Further advancements in the underlying blockchain introduced the need for the creation of decentralized applications. In the Ethereum whitepaper by V. Buterin in 2013 [28], smart contracts were introduced to Blockchain. A smart contract is an executable code for the execution of terms of an agreement between untrusted parties upon meeting pre-determined rules.

There are two types of blockchain - public blockchain and private blockchain [29]. In a public blockchain, any anonymous user can join the network, read the content of the blockchain, send a new transaction or verify the correctness of the blocks. Examples of public blockchains are Cryptocurrencies such as Bitcoin and Ethereum. In a private blockchain, only users with permissions can join the network, write or send transactions to the blockchain. Private blockchains will be typically used by organizations and agencies for their specific internal use cases.

Blockchains are chronological in nature. Every transaction, block, data storage in the blockchain network is timestamped and stored in a chronological manner. This provides the system with transparency

and traceability [32]. The key components of a Blockchain network are Cryptography, Transactions, Consensus Mechanism, and the Distributed Ledger.

Information exchange within the blockchain network happens on a peer-to-peer basis between the nodes. This happens through the transfer of files containing information from one node to another. After each transaction, the state of the Blockchain changes [30]. All the system transactions are stored with the distributed ledger. Distributed Ledger is like a replicated, synchronized database that is distributed to all the member nodes of the system [31].

Blockchain has been researched for application in smart cities, specifically for security applications [34]. The reliable nature of Blockchain makes it suitable for creating a security framework for various governmental and other organizations which need storing and processing sensitive information.

A smart Blockchain-based solution for the e-FIR filling was proposed by Nasir et al. in their paper 'Smart FIR: Securing e-FIR Data through Blockchain within Smart Cities' [33]. Ethereum blockchain was explored as a potential solution for adding integrity, transparency to the FIR records while preventing the filling of false FIR's. It was suggested that the use of Blockchain will prevent data tampering and reduce false registrations.

Hassija et al. [35] developed a system for 'Police FIR Registration and Tracking Using Consortium Blockchain'. This system envisaged a way for enabling the people to file their complaints directly if so, required in certain cases where the police officers might be reluctant to do so.

The systems seen so far have not considered the entire police - judicial case proceedings in their system proposals. An end-to-end system encompassing the entire case sequence named "PoliceChain: Blockchain-Based Smart Policing System for Smart Cities" [36] was proposed. Different stakeholders in the system were considered and appropriate access was provided.

III. CRITICAL ANALYSIS

A system proposed in a paper in 2020 titled "Smart FIR: Securing e-FIR Data through Blockchain within Smart Cities" [33] embraced blockchain in e-FIR to secure the current system and make it tamper-proof. In the proposed system, when a user files a complaint, the admin immediately initiates verification. The e-FIR is only registered in the blockchain network if found to be a valid and verified complaint. Since the initial complaint by the user is not entered into the blockchain network, it exposes a potential loophole to be abused by the admin. If any such malpractice is carried out by the admin it would not be traceable since it won't be recorded in the network itself. The designation or the enrollment criteria for the admin is not specified in the paper, combined with the admin being the sole authority in the network creates the possibility of a false FIR filed by the admin himself. Although there is a provision for the Superintendent of Police (SP) to verify the transactions made by the admin, this is inconvenient for the SP and may also introduce a delay in the system. Such an issue would have been better solved if the system architecture would have been taken into account. The system performance was evaluated on a local database, the description of which was not provided. Also, the response time and other parameters of the locally tested system aren't mentioned. Since the system is dependent on the smart city program, the cost analysis should have been provided for the same.

Some of the above-stated issues are addressed in "Police FIR Registration and Tracking Using Consortium Blockchain" [35]. The proposed system

was primarily focused on enabling people to file cases directly. This was to tackle the issue as expressed in some papers of people being hesitant to file reports due to police insensitivity, reluctance, and fear of backlash. The use of blockchain ensures that the system offers all the usual benefits associated with the technology. The system model has 4 roles, namely: commissioner, miner, miner candidate, and client. The commissioner has the highest authority and selects miners, usually officers with high reputations, based on records and can also award points and make deductions based on current performance. Miners are the nodes that work on forming blocks from floating transactions and the blocks are added to the network upon verifying that no malicious activity was detected. -. These are given special roles such as investigations of FIR transactions by the commissioner. The network also employs smart contracts to keep track of actions taken on the FIR and raises alarms if too much time is passed without any significant work. For certifying block authenticity, the proof of voting algorithm [35] is used for the consensus mechanism. The proposers of the system have done a comparative analysis between their system and the traditional systems using 400 cases for time comparison and 200 cases for incentive comparison. The system showed a significant advantage in both cases. Admittedly, the transparency and accountability introduced by blockchain have shown immense improvements.

The aforementioned systems have only considered the police department as a sole stakeholder in the case related proceedings, the most complete and recent research titled "PoliceChain: Blockchain-Based Smart Policing System for Smart Cities" [36] has also considered all the crucial stakeholders such as Citizens, Law Enforcement Agency, Forensics, Court, and Identity Provider and also has provided respective services to the citizens. It also helps in overcoming the limitations of a centralized system by involving multiple stakeholders and agencies that are included in the further judicial proceedings for maintaining the law and order of the nation. It has also addressed the response time issue for multiple requests at different time instances. The blockchain network was created using the Hyperledger Fabric which consists of six chaincodes, namely Citizen Profile chaincode, First Information Report chaincode, Evidence chaincode, Investigation chaincode, Charge-Sheet chaincode, Judgement chaincode, which implements all the functionalities of the system including information access control where Attribute-Based Access Control (ABAC) has been implemented which minimizes the complexity of the network. The entire system takes the idea a step closer to achieving transparency, trust, and accountability in the current system using a blockchain-backed solution.

IV. POSSIBLE ADVANCES TO CURRENTLY PROPOSED SYSTEMS

The need for a modern, technology-based, transparent, credible, traceable, tamper-proof police-judicial record-keeping system is acutely felt. Blockchain has shown promise to be the ideal solution for this problem and systems have been proposed with that intention in mind. Different authors have taken varying approaches to implement the solution, yet, the need and space exist to evolve the system to better, more involved, intelligent systems that function robustly and also help make intelligent decisions. The purpose of these systems should be to help police officers take better and faster decisions.

A majority of the systems, if not all, are static in nature, i.e., they simply perform the tasks as they were programmed to do so, they are unable to make decisions intelligently, depending on the nature of data and events. A smart blockchain-based system

can take the secure distributed ledger and combine it with other upcoming technologies like Machine Learning (ML), Internet of Things (IoT), and Artificial Intelligence (AI). This combinational approach can give the system an added edge.

ML is a field where computers learn through data to find hidden patterns of significance and other information that might not be apparent to humans due to the size of the data. The goal of ML is to get better at a task with respect to some measure as it gains more experience. ML can be used to help assist the human decision-makers, improve the workflow, optimize time efficiencies. An example application can be as follows: Whenever a user files a complaint against any offense on the application, the system can assist the police officer by suggesting the likelihood of it being a genuine case and whether it is a cognizable offense. Similarly, cases can be prioritized, distributed amongst the officials with the best track record in solving that particular type of case. Most of these decisions are currently taken manually and they can be expedited, optimized through the use of ML. This will also help take the pressure off the police officers and they can focus on solving the crime.

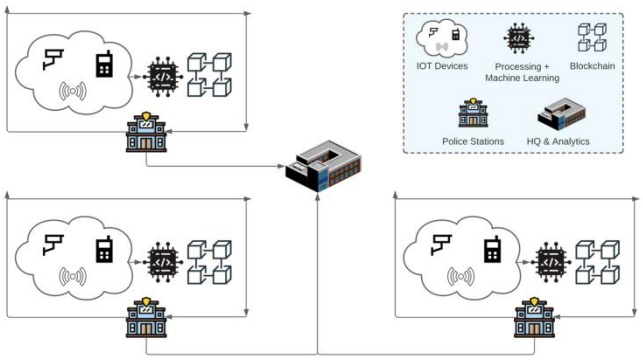

FIG 2. Proposed Integrated Police Case Record Management System

In addition to this, the scope of the blockchain framework may be extended by using additional chaincodes to enforce secure logistics management including but not limited to the transport of evidence, relocation of criminals, etc.

A blockchain-based ecosystem for the management of police stations and jails may be created to assist in additional tracking such as jail-visitors tracking, tracking behavioral progress of jailed criminals, etc. A smart contract that automatically logs any complaint initiated by any citizen (albeit in an ad-hoc state), will ensure that no FIR goes un-logged, which is a major problem as cited by [10].

ML can also be used to improve accessibility through features such as text-to-speech for FIR and update read-outs to the visually impaired and speech-to-text for record-keeping.

IoT employs sensors and devices for capturing information. Through the blockchain-based secure storage system, we are storing the evidence and information related to the case on the system. Smart devices can be of immense help to the police officer. Wearable devices, location tracking, auto evidence collection, crime detection are all applications that can aid the police officer in crime-solving and bring a speedy resolution to the case. The data from these devices can be verified, stored, and used through the blockchain system, Further, ML can be used to analyze this data and gain insights from it.

V. CONCLUSION

In this paper, we studied the Indian police case record management systems, the case flow including the various stakeholders involved in the case proceedings, we saw the traditional methods of FIR registration and case record management, its flaws, and the need for an online system to be introduced. We also studied the subsequent online systems that were introduced and different optimizations suggested by researchers. Having seen these existing systems in use, it was apparent that a modern,

unalterable, transparent, accountable, traceable, chronological system to be introduced to improve efficiency and reduce malpractices. We saw how blockchain technology with its inherent mechanism, architecture, and its different components was a perfect match to this particular application. Along these lines, we analyzed and reviewed various blockchain-based systems that have been recently proposed for solving these particular problems, we also understood the various advantages and drawbacks associated with these systems. While these systems are largely improving their efficiencies and workflows, however, our country being a developing nation, the required infrastructure for a blockchain-based online system such as storage, reach, online facilities, and skilled and trustworthy human resource is still being developed. The challenges associated with these problems are yet to be solved. The blended police record management system solutions that we propose provide a powerful alternative to an efficient, tamperproof case management system.

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Wearable Women Safety Device Using IoT And Machine Learning

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ABSTRACT

With advent of technology and applied sciences in every field, the growing problem of women harassment should be brought a solution. Recently, National Women's Parliament 2021 supported by MIT- School of Government was organized to talk about women empowerment and discuss issues that women have constantly faced in the society. One of the major widespread issues that women face is Sexual Harassment and abuse at different spaces they find themselves at. From workplace to homes, there is no real space where a woman is at her safest. Recent reports have brought to our attention that there is 54% increase in women assault cases and rapes every year and it was recorded that there are approximately 87 rape cases every day in India. Experts say that one woman is raped every 16 minutes in India. With enhancement of the #METOO movement and support of Women Parliaments and like-minded noble women, awareness has been spread across the nation about women safety. There are still increasing problems in the lane, and with an active role of technology in every minor aspect of human lives, this paper is hereby proposed to suggest a model where zero human intervention is required to trigger the system. Enhanced concepts of IOT are amalgamated with relevant machine learning algorithms to detect high pressure on the victim.

Keywords : IOT, Women Safety, Machine Learning

I. INTRODUCTION

Women safety is one of the major concerns across the world, specifically in India – where population is constantly increasing with each day. While there have consistent attempts by various women parliaments and committees, women police departments and likewise groups of men and women trying to overcome this catastrophe by procuring teams to teach self defence to women, enriching men and their mindset with proper sex education from an early age, women have still never felt safe totally. Hence, the core of our project is to provide a safe zone for women to be able to live life without repetitive concern of getting raped and being the victim of malicious crimes and higher level concern for their families, thereby hindering their development and growth. Our representation of the proposed solution is to validate the recurrent crimes against women and try and stop them with the advancement and approach of technology. Machine Learning Algorithms are used to predict the crime with accuracy and emergency contacts to the nearest police stations and crime branches are set to notify them with the victim's location details. This project as a whole shows full support to the safety of an individual and with the use of collection of sensors and datasets to improve the accuracy of Machine

Learning algorithms, this model can be tweaked and tuned to perfection.

II. LITERATURE REVIEW

The issue of women safety is global and has attracted researchers to find varied solutions with efficiency and accuracy. The researchers reviewed number of research papers to know of the risks and the drawbacks of the existing solutions. The papers describe and discuss the problems faced by women on a daily basis. The bias that women face at workplaces and in their families is visibly clear. Various statistics have been mentioned conveying how women not only face verbal abuse and harassment but also deal with domestic abuse and sexual harassment.

These devices are triggered through heartbeat and blood pressure. Most of the systems proposed talk about huge hardware integrated with the system as a part of their prototype model. Hand gloves are made to trigger the system which might not be very comfortable and feasible to be worn by individuals on a daily basis. Cables and wires are connected inside the glove material which make the hand look larger which would not be preferred by most women. Moreover, these systems use Wi-Fi modules which might not be available necessarily at the time of the accident. It uses internet connectivity which makes the system complex and yet inefficient. Some of the solutions also center around electric shock wave technology which can also be dangerous for the victim itself. The processors and modules used in the systems are high priced. These systems use switches which are triggered using a gesture or are triggered through gestures of the skin such as sweat which does not necessarily only occur at the time of an accident. Some even require human intervention as a part of their trigger module.

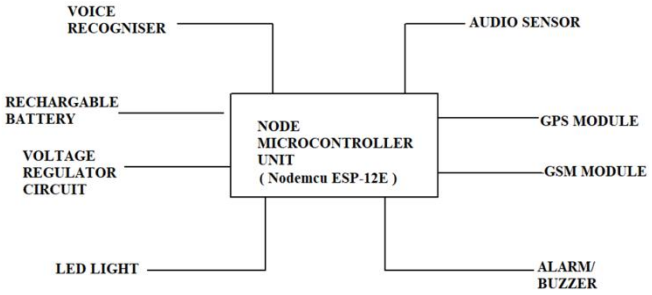
The proposed paper investigates and innovates a solution that is triggered through various catch phrases and through the implementation of Word detection to alert nearest crime branches and also alerts the registered contact details that are provided by the user at the time of registration. The device created works independent of the wifi module and hence can be used even at the time of no available network. The device can easily be worn by the user without seeking any inessential attention. It is cost effective and is smaller in size which makes it easier to use. Implementation of a wearable device which can be embarked into an accessory or can be worn directly as a necklace or any such accessories that are worn either on the back or torso which will alert the nearest crime branches and registered contacts when the user says the trigger phrase. The device will be connected with an app by implementing various concepts of Internet of Things where the user can also add three emergency contacts to get in touch with at the time of urgency.

III. PROPOSED MODEL

The proposed solution is an IoT based GPS enabled device - a security system specially designed for women in distress. It is a simple and easy to carry device with magnanimous functionality. The basic approach is to intimidate instant location and a distress message to the cops and registered number, so that unfortunate incidents would be averted and to provide real time evidence for swift action against the perpetrators of crime against women. Currently the work is under process to miniaturize it so that it could be embedded in jewelries, mobile phones etc in order to make it a versatile instrument for masses. It can play a major role in the upcoming projects such as CCTNS (crime and criminal tracking network and system) in which all the police records all over India are digitized and all the police station throughout the country will be integrated. It allows women to be

safe at every corner across the country. The device works coherently in context with the location. Any mode of action or a danger word can be set to the device for it to activate. As soon as th device is triggered, a signal is sent of the accurate location of the crime to the nearest crime resolution station – police stations/crime branches and the like.

The stations are allowed to track the location of the victim and hence the chances of reduced number of cases increase.



NODE MICRO CONTROLLER UNIT

NodeMCU firmware comes with ESP8266 Development board/kit. Since NodeMCU is open source platform, their hardware design is open for edit/modify/build.

Features

- Open-source
- Interactive
- Programmable
- Low cost
- Simple
- Smart

Specification:

- Voltage: 3.3V.
- Current consumption: 10uA~170mA.
- Flash memory attachable: 16MB max (512K normal).
- Integrated TCP/IP protocol stack.
- Processor: Tensilica L106 32-bit.
- Processor speed: 80~160MHz.
- RAM: 32K + 80K.
- GPIOs: 17 (multiplexed with other functions).
- Analog to Digital: 1 input with 1024 step resolution.
- +19.5dBm output power in 802.11b mode
- 802.11 support: b/g/n.
- Maximum concurrent TCP connections: 5.

GPS MODULE

GPS(G702-001UB)

It consists of six wires out of which three wires are used for connection. The blue wire is the transmitter wire which is connected to the 15th pin of the microcontroller. Voltage supply is about 3.3V to 5V. When trigger button is pressed, GPS starts receiving signals from 8 satellites out of the 24 satellites in the orbit . Once if the connection is established the latitude and longitude values of the current location are obtained. The GPS acts as a transmitter. The 5V supply is given to the GPS from the microcontroller.

Features of G702-001UB

- Received bandwidth is about 1575.42MHz.
- 50 tracking channels are available.
- Accuracy in terms of time is about 1 us.
- The maximum altitude is about 18000 m.
- Maximum speed is about 500 m/s.
- Sensitivity of tracking is about 162dBm.
- Operating temperature is about 30 degree to 80degree.

GSM MODULE

- GSM(SIM 900A)
- RS 232/interface DB port.
- Low cost.
- Voice communication port.

AUDIO SENSOR

The typical audio sensor used in most devices is a standard microphone. Microphones convert sound to electrical signals and are prevalent in many applications ranging from the typical public

addressing systems to movies to laptops to mobile, wearable, and IoT devices.

Most of the microphones used in these devices are MEMS (microelectromechanical systems) sensors and are likely to be analog or digital. The output of the microphone is typically pulse-density modulated (PDM) or pulse code modulated (PCM) and data is captured from 4-bit to 64-bit and can be tuned for signal-to-noise ratio and quality of the capture.

VOICE RECOGNIZER

Voice Recognition Module is a compact easy-control speaking recognition board. It is a speaker-dependent module and supports up to 80 voice commands. Any sound could be trained as command. Users need to train the module first before recognizing any voice command. Voice commands are stored in one large group like a library. Any 7 voice commands in the library could be imported into recognizer. It means 7 commands are effective at the same time.

This board has 2 controlling ways: Serial Port (full function), General Input Pins (part of function). General Output Pins on the board could generate several kinds of waves while corresponding voice command was recognized.

Specifications:

- Voltage: 4.5-5.5V
- Current: <40mA
- Digital Interface: 5V TTL level UART interface
- Analog Interface: 3.5mm mono-channel microphone connector + microphone pin interface
- Recognition accuracy: 99% (under ideal environment)
- Support maximum 80 voice commands, with each voice 1500ms
- Maximum 7 voice commands effective at same time
- Easy Control: UART/GPIO

IV. BRIEF INTRODUCTION OF THE TECHNOLOGIES USED IN THE MAKING OF THE SYSTEM

INTERNET OF THINGS

IoT describes a system where items in the physical world, and sensors within or attached to these items, are connected to the Internet via wireless and wired Internet connections. These sensors can use various types of local area connections such as RFID, NFC, Wi-Fi, Bluetooth, and ZigBee. Sensors can also have wide area connectivity such as GSM, GPRS, 3G, and LTE.

KEYWORD RECOGNITION

Keyword recognition is probably the simplest form of speech recognition where the focus is to ensure whether a particular word was uttered. Keyword recognition can be speaker-dependent (trained for a particular speaker) or speaker-independent (generally applicable for all).

AUDIO CLASSIFICATION

Machine Learning is used to build a system that can recognize when a particular sound is happening—a task known as audio classification. The system will be able to recognize the voice even in the presence of other background noise. Once the data is collected, signal processing is used to extract the most important information, and train a deep neural network that can tell you whether the voice can be heard in a given clip of audio.

GSM MODULE

Global System for Mobile Communication (GSM) SIM card is a device to send the location obtained through GPS. The GSM SIM card number is registered with the system. In this proposed device the GSM acts as a receiver while the GPS acts as a transmitter. The received values from the transmitter are sent as an SMS to the few predefined emergency

numbers. The receiver pin of GSM is interfaced with 16th pin of the microcontroller. The supply voltage is about 3.4V which is supplied from the voltage regulator circuit.

GPS MODULE

It is a tool used for navigation and accurate positioning. It records the location in the form of longitude and latitude. The GPS receiver gets a signal from each GPS satellite. The satellites transmit the exact time the signals are sent. By subtracting the time the signal was transmitted from the time it was received, the GPS can tell how far it is from each satellite.

V. WORKING OF THE MODEL

Women are not safe anywhere across the world and are especially at stake when they are alone or in deserted area. Observing the ongoings across the globe, not only women safety but safety at individual level is becoming important with each passing hour. The existing devices which have scope to solve rational problems require human intervention to trigger and enable the device. The given disadvantages of these existing systems are brought to an end point to come for a better and an optimum solution to solve the provided problem statement.

A wearable device will be created and integrated with an application to protect not only women but individuals at a larger scale. The device will be trained consistently with machine learning algorithms to protect and act on the spot, at the spur of the moment. The constant increase in the usage of the device and implementation of related modules will allow us to improve the accuracy of the produced results. It
comprises of hardware components such as Node Microcontroller Unit, GPS Module, GSM Module, Voltage Regulator Circuit and a buzzer and Audio Sensor to activate the services. It is activated by the victim by clicking the button or by using a trigger word set at the time of setting up by the user. Upon clicking or as soon as the device is triggered, the current location of the victim is fetched and the information is sent to the nearest crime branches and police stations. Moreover, this information is also sent to the emergency contacts that have been set up by the user itself. This enables the user to select proper contacts to get in touch with at the time of an unprecedented event.

Mobile application is designed with features using various modules utilized in order to implement the given module such as – GSM/GPS module, communication modules to transfer data from the wearable device to the application – it can be Wi-Fi or Bluetooth. Once activated, the GPS location is sent to the predefined contacts and police control rooms. Another utility of the proposed solution is that the mobile app will be used for women safety where safe locations from victim's current location – the location of the assault will be shown on the map so that women can herself reach the safe place from her current location. Machine Learning Algorithms are used to make the system dynamic and reliable for users as it gets trained constantly with the ongoing of events.

ADVANTAGES OF THE PROPOSED DEVICE

- Can be used for the safety of women.
- Can be used for the safety of children.
- Can be used for the safety of elderly aged people.
- Can be used for the safety of physically challenged people.
- Can be used as a legal evidence of crime with exact location information for prosecution.

APPLICATIONS OF THE PROPOSED DEVICE

- Compact in size.
- Wireless connectivity.
- Easy and fast to install.
- Easy Maintenance
- Low cost with high performance.
- Works round the clock

VI. FUTURE SCOPE AND ENHANCEMENT

As a mark of first-hand security and reaction of trigger, shockwave technology can be inbuilt directly in the device to protect the security of women at individual level. A more optimized version of the device can be built in order to protect every individual, not just confined to women. A module which detects handheld cameras can also be added to protect individuals from violation without their knowledge. A spy camera can be used to record the culprit which can also further be used for prosecution.

VII. CONCLUSION

Women safety has always been an issue even in these modern times with so much advancement in technology. Women are not safe anywhere and are most vulnerable when traveling alone into lonely roads and deserted places. Even in crowded places, women often find themselves at risk. Especially in a country like India where the crime rate increases at a greater ratio than the population growth rate, it is becoming extremely important each day to keep personal check for our own safety. Existing hand held safety devices for women require human intervention for activating the device such as pressing the button or shake the device etc after sensing the danger. The current paper proposes a solution which will try to overcome the disadvantages of the existing systems and also aim at providing fool proof safety to women. The proposed work aims at designing an IoT based safety device that relies on providing security to women by fingerprint-based method of connectivity to the device and alerting nearby people and police when a woman is not safe.

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Accident Detection with GPS Tracking and Messaging System

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ABSTRACT

Road traffic accidents are the leading cause of death by injury and the tenth leading cause of all deaths globally. This paper presents an accident detection system that detects an accident and alerts the family members and emergency services. The number of accidents happening is increasing every day. The existing systems for a person who has met with an accident do not work efficiently due to the large increment in population over the years. Also, the existing systems are mainly focused on the prevention of accidents rather than taking immediate actions after an accident has taken place. Often the family members and emergency services are just not informed in time which in turn results in delaying the help reached to the affected victims. Our project is designed to avoid such situations, detect such as road accidents, and locate the victims using a real-time vehicle tracking system using GPS.

Keywords - Internet of Things, Raspberry Pi, Cloud Database, Sensors, Gyroscope, GPS

I. INTRODUCTION

Roads are of crucial importance for both short and medium distances facilitating the transportation of passengers and goods. However, the roads in India are the biggest sources of accidents leading to deaths. In India, every four minutes a person is killed in road accidents. On average, 3287 deaths happen per day as a result of car accidents. Among young adults aged 15-29, the leading cause of deaths in a road accident which in turn cost countries 13% of the Gross Domestic Product (GDP).

An accident detection mechanism may be employed to tackle this problem. This system caters to situations of car accidents when individuals are subjected to serious or fatal injury, with no one around to help. This system collects vehicular information, for instance, the location and identity of the concerned individual that met with the accident and delivers the said information to emergency services and family members, thus acting as an accident identification mechanism. Further, the emergency services are conveyed all relevant information with regards to hospitals and police stations in the vicinity of the coordinates of the accident, in order to dispatch helping services immediately.

II. LITERATURE SURVEY

India, being one of the busiest nations in the world with regards to road traffic, has a road network spanning over 5M km, carrying almost 90% of the country's passenger traffic and 65% of goods. Road safety is a factor of utmost significance for the citizens considering the rapid increase in the number of vehicles and the heavily congested Indian roads. India reported over 151,000 fatalities by road accidents in 2019 itself. These lives may be saved if immediate medical services are provided. This paper resonates with a system suggesting a solution to this issue.

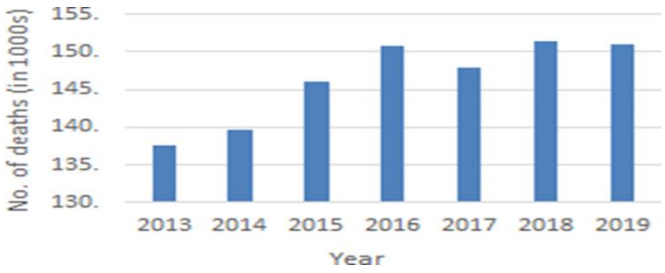

Fig. 1 Number of deaths due to road accidents across India (in 1,000s) (Source: Ministry of Road Transport and Highways India)

III. PROPOSED ACCIDENT DETECTION SYSTEM

Accidents are a very serious and widespread problem if the response from the emergency facilities is not fast it can even cause the victim's life. Many people die because they can not get a quick medical facility. We consider that time is a very important factor to protect the victim's life in case of an accident.

Therefore, the problem in this work concerns mitigating the considerable number of deaths resulted from car accidents and caused mainly due to the lack of latency of succouring responses to the injured person. Our System aims to detect accidents automatically using IOT sensors and automatically inform medical emergencies like the police station, hospital, fire station about Accident details.

IV. SYSTEM ARCHITECTURE MODEL

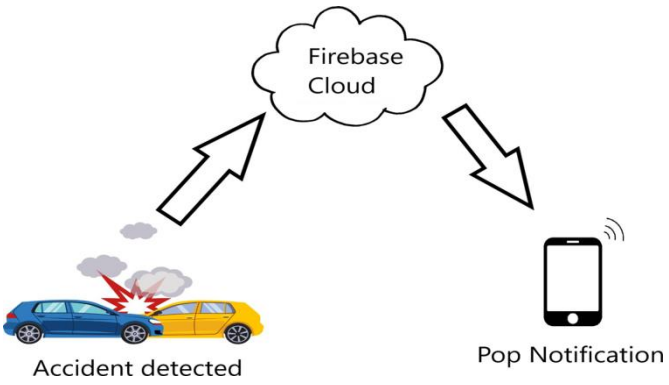

Fig. 2 System Overview

The figure(Fig. 2) shows us how the system will look like and how the components in the system will communicate. We will have all the IoT Sensors mounted on the Vehicle with Raspberry Pi. As soon as any of the Sensors detect the Accident, Raspberry Pi will communicate the data to the real-time cloud database(firebase). Firebase at the same time will ask the driver's Mobile Application for the live location of Rider. And will communicate this information to the informed emergency services like the police station, hospital, fire station on their dedicated Dashboard. Also, the Family Members of the victims will be shared details of the accident.

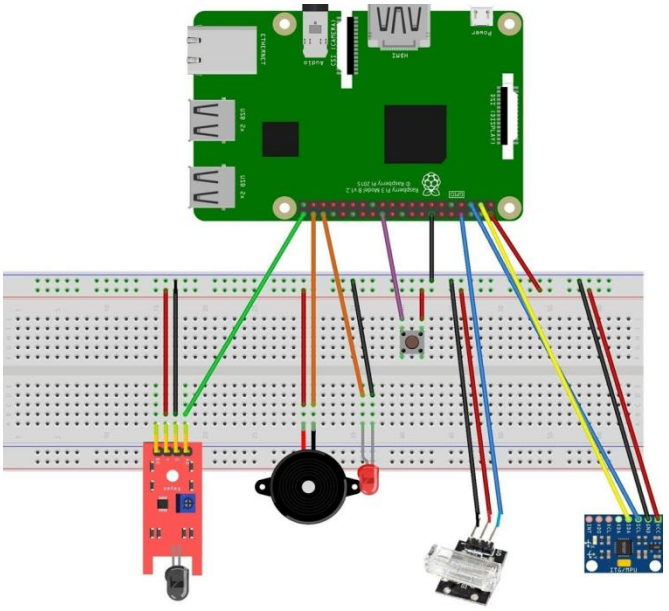

Fig. 3 Raspberry pi with Sensors

The above figure (Fig. 3) shows the architectural interfacing of Raspberry pi with all the sensors used. Sensors like Gyroscope, Fire Sensor, Knock Sensor are used to detect Accidents, based on their functionality. Red jumper wires specify the 5 volts VCC supply and black as ground. The given circuit can be mounted on the vehicle. The Gyroscope should be mounted on the plane surface to provide a 0-degree angle of reference with respect to the earth's gravity. Fire sensors should be placed inside the cabin where passengers reside. Knock Sensors can be placed on the outer side of vehicles so that they can detect the impact in terms of vibration. Buzzer, LED and push-button should be placed near the driver for easy access.

No external GPS module is required to be installed. Using the rider's phone as a GPS device reduces the cost and complexity of the whole system. Thus rider app gets the location from the rider's phone and sends location coordinates to the cloud database in case of an accident. The Mobile Application has been interfaced with Google maps to show the rider's current location. The app also has the facility to display all the hospitals and police stations nearby the rider. This will result in a quick response for taking further actions.

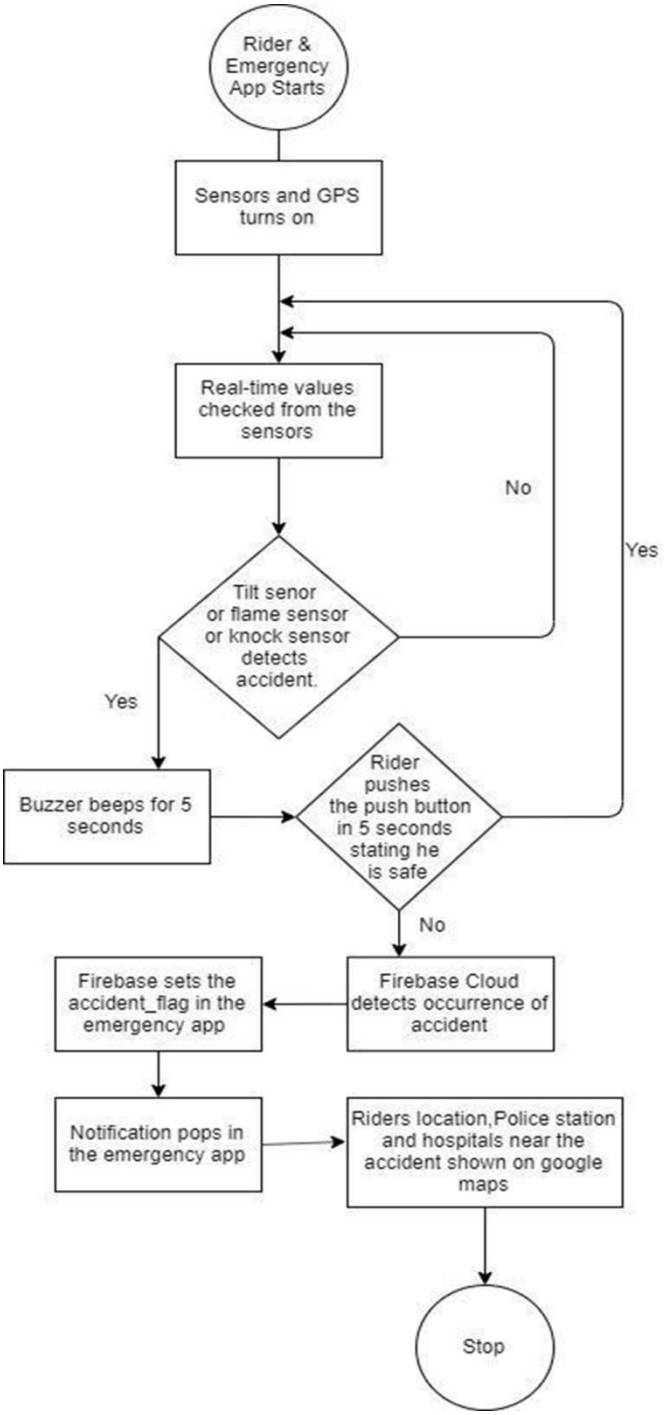

Fig. 4 Flow Chart

The figure (Fig. 4) shows the flow chart of the accident detection system. After detecting any sort of accident by the sensor the buzzer will beep. If the rider stops it by pressing a push-button in 5 seconds, the system will detect that the rider is safe and no notification will be sent. If not then the system will detect an accident and the emergency contact will be

prompted with the pop notification. Further rider's location, police stations, and hospitals near its location will be displayed. This feature is provided in cases where the accident is not severe enough or in the case any sensor detects any accident by mistake. Thus enhancing the efficiency of the overall system.

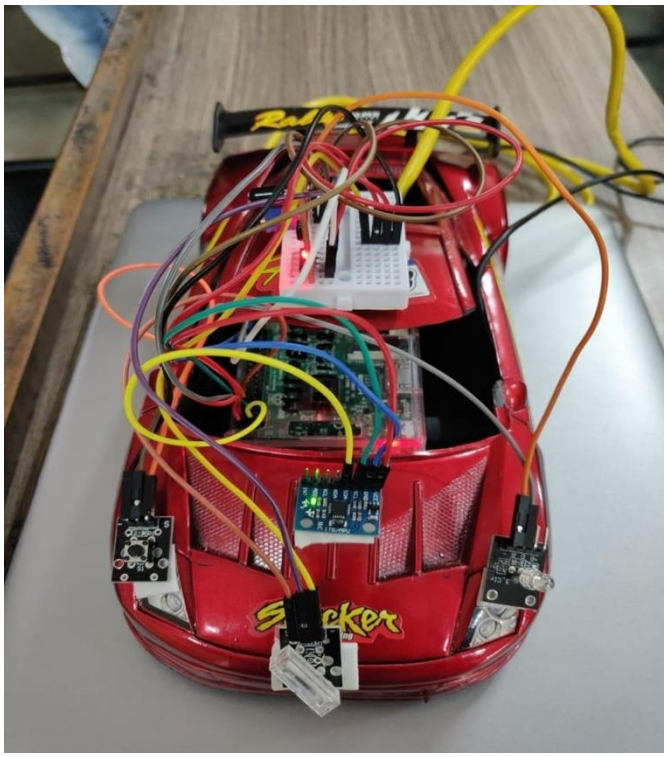

Fig. 5 Model with mounted sensors

V. HARDWARE AND SOFTWARE REQUIREMENTS

Hardware requirements:

- Raspberry Pi 3b
- Knock Sensor
- MPU5060 Gyroscope
- Flame Sensor
- RGB LED
- Bread Board
- Push-button
- Jumper wires
- Buzzer
- Smartphone

Software Requirements:

- Raspbian OS
- Firebase Cloud
- Android

Studio Sensors Used:

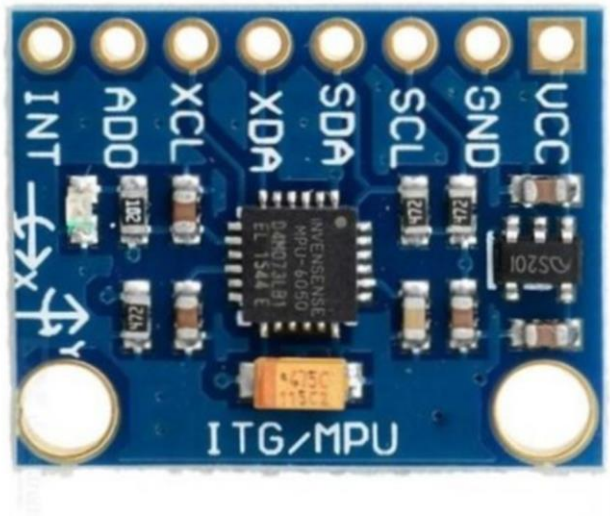

Fig. 6 MPU5060 Gyroscope

Fig. 7 IR Fire Sensor

Fig. 8 Knock Sensor

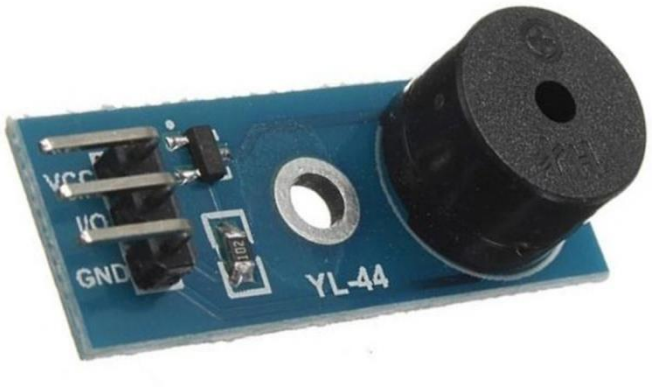

Fig. 9 Buzzer

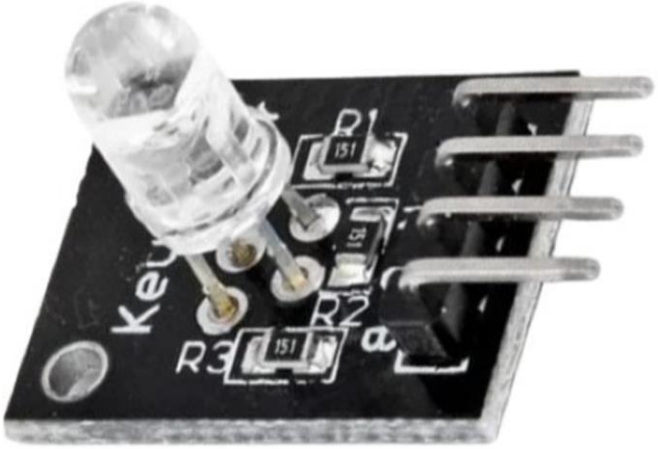

Fig. 10 RGB LED

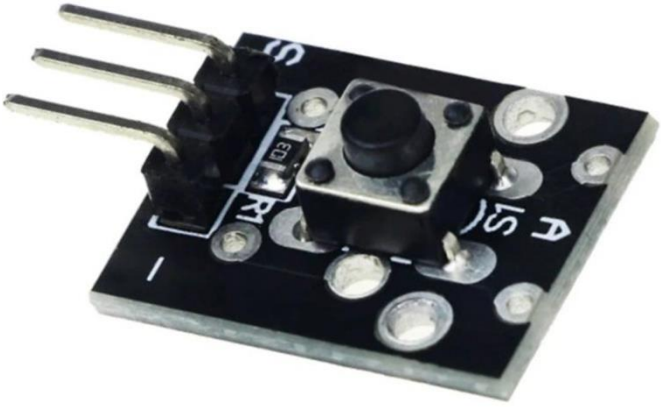

Fig. 11 Push Button

VI. RESULTS OBTAINED

The emergency application uses the location traced by the rider's application via his/her phone's inbuilt GPS. Thus no external module is required in our system. The screenshots of the two applications are shown in the given figure Fig 12 shows the Rider app interface and Fig 13 shows the Emergency app interface.

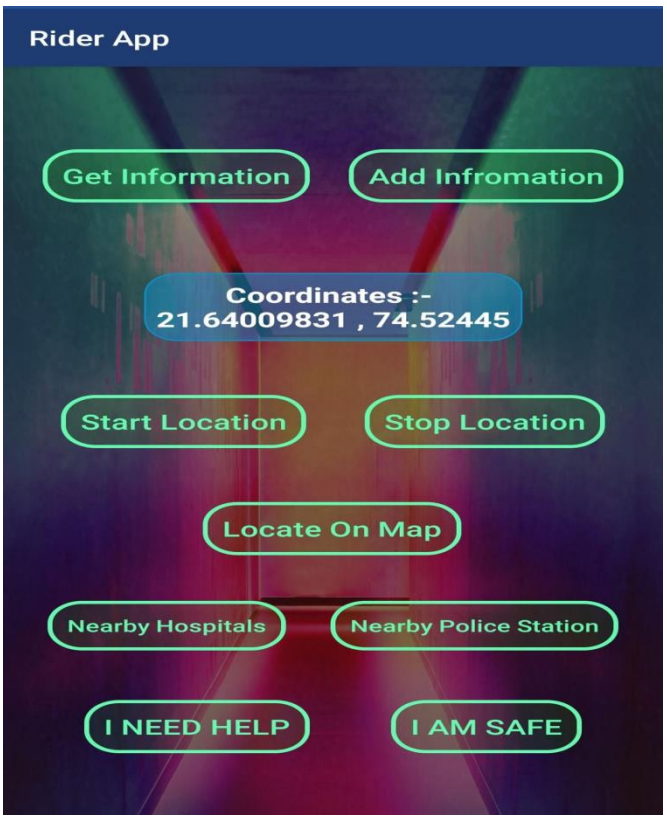

Fig. 12 Riders app

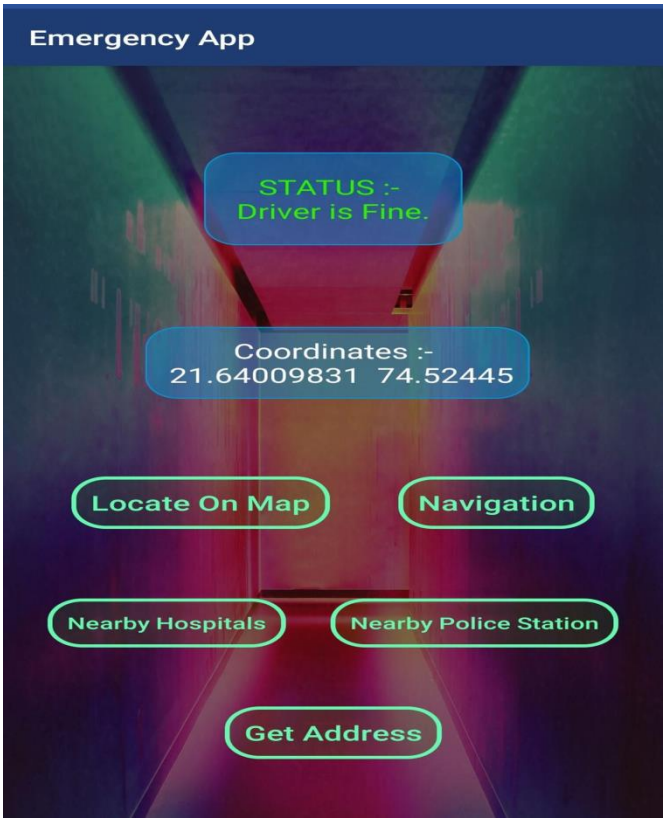

Fig. 13 Emergency app

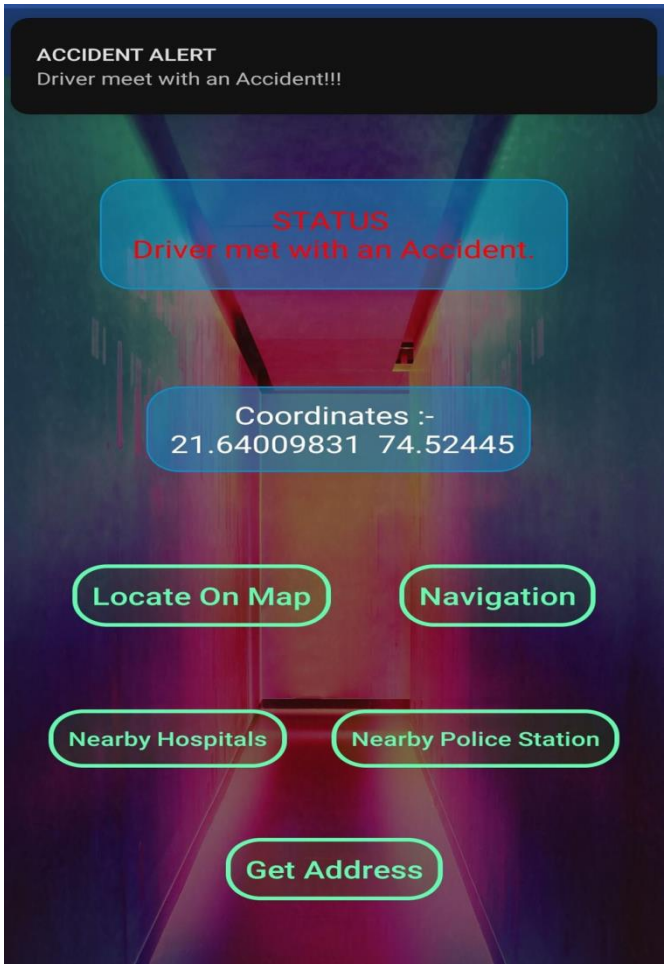

Fig. 14 Pop alert notification

Whenever an accident is detected, the emergency app pops a notification stating that the driver has met with an accident. The emergency app also shows the location, hospitals nearby, police stations near the rider's location. Figure 14 shows the pop notification.

VII. CONCLUSION

In this project, we have created an accident alert system by using raspberry pi, necessary sensors, and an application that will notify people who are either family members or relatives of that person i.e user-defined mobile numbers. This project is implemented by using a GPS tracking system so that whenever a person meets an accident then the app can track the users' location and send a notification to all nearby hospitals and police stations.

We have carried out a number of trials on this project and found that this system shows higher sensitivity and accuracy indeed. This project is user-friendly and very much reliable to be used in vehicles. The sensors used in this project will be integrated with the vehicle's computer unit in a protected place inside the vehicle in order to avoid damage when an accident happens. This proposed system can also be used for traffic estimation and accidents survey in the country by the road safety control department of India with some modifications.

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An Answer to all the Wh questions of Cyber Security

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ABSTRACT

In today's digital world where man can't even think of doing anything without the help of internet, the most important thing that comes to everyone's mind is that 'Is their data safe or not'. And from these suspicious questions arises the topic 'Cyber Security'. Every year lots and lots of money is invested into this field just to be sure that everyone's data is safe and secure. But still the crimes are increasing day by day. Every other day thousands of people suffer due to Cyber Attacks and Hacking. But is this only governments responsibility to investigate this concern? isn't this an educated citizens responsibility too? This paper mainly focuses on such Wh questions that arises to many people and besides will provide the answers to their questions.

Key points:

- When was Cyber security introduced?
- What are the biggest cybersecurity threats?
- Where do we use Cyber Security?
- Who all are responsible for Cyber-security?
- Why do we need to worry about information security?
- How to prevent and overcome Cyber-attacks?

Keywords: cyber-security, cyber-attack, hacking, cyber-crime, threats, information security, network security, recover.

I. INTRODUCTION

Before digging into the research paper, the biggest question arises to all of us is 'What is cyber security'? The answer lies into the question itself. Protection as well as recovering of network-based devices and programs from any kind of malware attacks is basically cyber security.

The data and its integrity of computing assets that belong to a certain organization are protected by cyber security. The sole purpose of it is to defend against all the threats throughout the entire cyber-attack.

With every passing second the danger of cyberattacks to common people, companies and organizations

increases. Nobody knows how a malware attack is designed to access one's data. It can destroy/steal their personal information; it can also disrupt businesses and one's financial assets. To avoid being cyberattacked we need to build strong cyber security systems along with making smart cyber defence choices.

II. WHEN WAS CYBER SECURITY INTRODUCED?

The history of Cyber security can be traced back to an era when file malwares and ransomware attacks where not much to worry about. The history can be traced back to 1970s when the topic rose to great hights just because of a research project. Bob Thomas sensed that he could send a program across certain network simultaneously leaving trails
behind it. He named this program "CREEPER". He found it entertaining and went on printing a message "I'M THE CREEPER: CATCH ME IF YOU CAN."

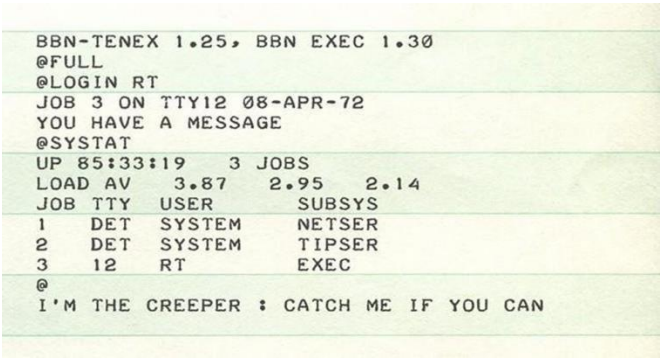

Fig 1: This is an example of the creepers taunting message.

Not soon a man named Ray Tomlinson followed this idea and by doing some changes he made his own self-replicating program also known as the very first "COMPUTER WORM". At the same time, he wrote another program that helped to detect the Creeper. He named it "REAPER" which was also the first ever Anti-virus software.

III. WHERE DO WE USE CYBER SECURITY?

Questioning about uses of IT security might sound like a fool's question, but there is lot to discuss about.

- As we talked earlier the main use of cyber security is to protect businesses and sensitive data breaches.
- Secondly comes the protection of endpoint user from unauthorized user.
- It protects the computer from certain viruses and malwares. A virus might not harm a business initially, but it can slow down the productivity carried by the employees.
- Along with the protection of public data it also needs to ensure quick recovery after a malware attack.
- To sum up a security shield also holds the reputation and trust of the people to their company.

IV. WHO ALL ARE RESPONSIBLE FOR CYBER-SECURITY?

Cybercrime is either everyone's problem or no one's. It can't be blamed on anyone. In a business or organization, people generally say that the CEO is responsible for handling such issues. But the matter should be looked after by every single employee, by every junior/senior partner, the manager and finally the CEO. Talking about the common people we are completely depended on ourselves. Timely checking of personal data, changing of password and using verified anti-virus software.

Fig 2: Who's responsibility is cyber- security.

V. WHAT ARE THE BIGGEST CYBERSECURITY THREATS?

Without any doubt whenever we talk about the threats of cyberattack the first term that comes to our mind is 'HACKING'. To elaborate we can divide those threats as follows:

- **Ransomware attacks**
  These kinds of attacks are planned intentionally. It follows a basic path of locking an organization's network and encrypt their sensitive data. The main target of such attacks are commonly big business firms.

- **Phishing scams**
  This is one of the most common online scams, targeting the consumers it effects a lot of livelihood. The cycle starts from sending an e-mail or message that seems to be sent by a well-known company, bank, insurance agency or network provider. They trick the consumer into giving their personal details and later use the information to gain access to one's mail, bank and many other accounts.

- **Malicious threats**
  Malicious attacks are done by the MCAs (Malicious cyber attackers). They generally provide viruses, exploits or other threats that carry the potential to destroy one's device, network and systems. It completely crashes the whole system with no chances of recovery.

- **Unauthorized access**
  As we all know unauthorized access means bursting into someone's else data without their knowing or consent. The main reason for such data breaches is weak passwords and firewall. Sometimes due to broken authentication mechanism invites the unauthorized parties.

Leaving all the above threats there are also many other threats such as Insider attacks, APT attacks, brute force attack etc.

Graph 1: Biggest cyber-security threats.

VI. WHY DO WE NEED TO WORRY ABOUT INFORMATION SECURITY?

The biggest asset one hold is his own information and protecting it is very vital. When it comes to protection of personal information the very first thing to strike one's mind is using a strong password for various sites and using effective anti- viruses. Apart from protecting one's personal data information security plays many other important roles in organizations and companies. Some of them are:

- Protecting the organization's sensitive and liable information along with the clients confidential information.
- Helps to protect the company system from crashing.
- Prevents the Data-breaches that may lead to financial downfall of the company in terms of revenue and stocks.
- A good firewall between the organization and hackers saves a lot of money.

- Sustains the ability of the company to keep on functioning and maintains the reputation of the company.

VII. HOW TO PREVENT AND OVERCOME CYBER-ATTACKS?

Preventing a cyber-attack might look like a headache but there are various simple and economical steps:

i. The very first step is to change your password on daily basis.
ii. Keep an eye on the latest updates of your browser and ensure your site is secure before visiting it.
iii. When someone obtains your personal data without your knowledge, identify it as soon as possible to prevent fraud in future.
iv. In an organization it is the duty of the CEO and the manager to provide the knowledge regarding cyber security.
v. Keep your anti-virus updated and always trust on the verified software' only.
vi. Backup your data after every certain period.
vii. Whenever you are suspicious about a malware or fraud you should always report it.
viii. In an organization to prevent physical fraud, limit the access of employee to the data and information.
ix. Using a secured network is also important to make sure it is hidden and private.
x. To prevent future loss of money you should purchase a Cyber insurance policy, in case you suffer a cyber-attack.

Even after following the principles to prevent cyber-attack there are chances that we still might fail. To overcome a cyber-attack, we should always be ready.

Some of the ways are:

i. Having a backup of data is always helpful. In case of a malware attack if you lose your data, you can easily regain it.
ii. Close all the unauthorized and unproductive accounts that charges your account.
iii. Leaving all the regrets apart one should think about what other information might be at risk and take necessary steps to prevent it.
iv. In case if there is a financial fraud you should file a report instantly.
v. Finally, if an organization gets hit by a data-breach they should instantly make changes to their encryption level and make sure that every employee follows the same.

Fig 3: How to overcome cyber-attack.

VIII. CONCLUSION

From the paper we would finally like to conclude our topic. After covering major topics, we can say the field of IT is spreading very fast. Whether we like it or not, but IT is the reason for the rise of cybercrime and it's our duty to fight it and overcome it. People might try to take advantage of this, but we should be prepared from our side. Campaigns on cyber security should be raised to increase the awareness. With

proper knowledge we will have more skilled workers in the field of cyber security organizations. However, looking at the evolving nature of cyber security we need to declare it as a global threat and need to find a solution to it internationally.

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5G : The New Era of Internet

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ABSTRACT

A 40-year-old male Asian elephant was presented to the Veterinary Polyclinic, North Paravur with right pelvic In today's world everyone is likely to have speed and moreover speedy internet. So, there is an intense competition, for every major telecom that is working and trying to make it even faster. Commercial sectors, professional institutions, real-time simulators, devices with AI, robots, smartphones, cars, watches, mobiles and even houses are increasingly requiring speedy and stable internet connections. In future, some of the major requirements or demands that needs to be fulfilled are improved data rate, lower latency, increased capacity and better service quality and better bandwidth. In order to survive in this competitive world where people urge for more and more advancement in technologies here comes the latest iteration of cellular technologies: Fifth Generation Wireless Technology known as 5G. It has three main features: Improved speed, lower latency and ability to connect many devices simultaneously. This paper is contented with the details related to the 5th generation, its architecture and some of the important concepts like CNN and DNN, MIMO (Multiple Input Multiple Output). This paper also highlights cloud technology and artificial intelligence combined with 5G which would make this world a better place to live in.

Keywords - 5G, AI, Cloud Computing, CNN, DNN, MIMO

I. INTRODUCTION

The increase in network traffic has driven the capacity demands of the users of 3G and 4G. In today's world the research for 5G is getting done the most intensively way. It was supposed that the working of 5G would be seen in this world by the end of 2020, and it did work out but not quite efficiently. In some countries the testing of 5G has begun, in fact the nodes that transmits the 5G Signals have also been setup in some cities. There is still no correct definition for 5G yet but that's why we are here to discuss. This paper focuses on the question what is 5G and how it is useful for today's generation? The rest of the paper focuses on the architecture/working of this technology, the evolution from 1G till 5G, Drawbacks of 5G, How we will comeback these drawbacks, 5G with AI Technology, 5G With Cloud Computing and its Boons and banes. The Goal Of 5G is to establish greater speeds at higher capacity per sector and at lower latency than 4G.

II. ARCHITECTURE/WORKING OF 5G

A. Architecture of 5G

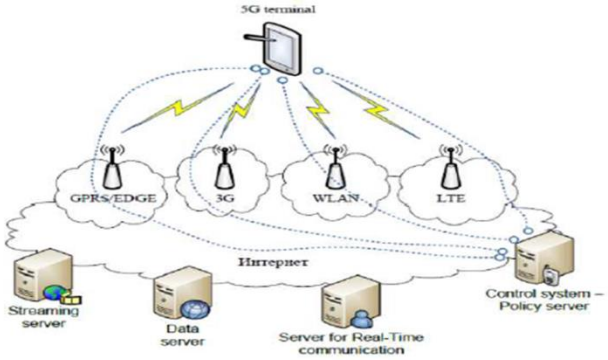
As we all know that 5G is the next generation in the wireless technology, something about how 5G works based on its architecture.5G networks work by transmitting millimeter waves. The 5G is now being dedicated to multiple frequency ranges. The Specific frequency portion of 5G lies between 30-300 GHz. Multi access edge computing or known as (MEC) is the most important part in the working architecture of5G.The Architecture of 5G provides less network trafficking and a higher bandwidth than the previous wireless generations. Frequencies between 24-100 GHz are being tested for 5G.The (Multi Access Edge Computing) MEC is an evolution on cloud computing that brings the applications from centralized data centers to the network and therefore closer to the end users and their devices.The (Network Function Virtualization) NFV decouples the software from hardware by replacing various network functions such as firewalls, load balancers and routers with virtualized instances running as software. Due to which we don't need to invest in expensive hardware element. It includes (NST) network slicing technology that enables multiple virtual networks to run simultaneously.

B. Beamforming

Another technology can be helped to develop 5G which is Beam forming. Beam forming means that we can put up conventional base stations that will receive the signal from the 5G node and will again transmit it to the mobile network. We can also say that it can be worked as a repeater. Now let us talk about the core architecture of 5G.The core network of 5G enables the increased throughput demand and utilizes the cloud and the service-based architecture also known as SBA which spans across all 5G functions which includes authentication, security and aggregation.

How is 5G Better and Different Than 4G?

When 4G was announced, cloud services were usable on mobile phones. What 5G does is that it will take it to a next level. A 5G network has a lot of network processing power built in, that it becomes more than a network and can distribute data that performs processing tasks, either using the full power of centralized resources or the responsiveness of edge computing done close to the user.4G was a great leap forward in networking technology which allowed people to stream music gaming and much more things, 5G is designed to make connection of many more devices (other than smartphones) to these features and provide more features to do the same. Like if we see a smart watch runs on a very small battery, but 5G can provide a connection that will consume little energy for its operations. An Industrial robot can be provided with 5G with extremely fast and secure connectivity.



III. EVOLUTION OF WIRELESS TECHNOLOGY

The Technology in today's world keeps evolving as the technology of the wireless networking has been evolved to its latest generation the 5th generation known as 5G.

A. 1G-The Beginning

Nippon Telegraph and Telephone (NTT) launched1G mobile networks in Tokyo in 1979. By 1984, NTT tried to cover the spread of 1G all over Japan.

The 1st generation came in early1980's. It has a data rate up to 2.4kbps. Advanced Mobile Phone System

(AMPS), Nordic Mobile Telephone (NMT), and Total Access Communication System (TACS) were some of the major subscribers. Few disadvantages of 1G were like reckless handoff, with no security since voice calls were stored and played in radio towers due to which vulnerability of these calls from unwanted eavesdropping by third party increases, below par capacity, and inferior voice associations.

B. 2G-Rise in Revolution

GSM standard in Finland in 1991 launched the 2G or second generation of mobile networks.GSM which stands for Global Systems for Mobile Communications, was actually the first 2G system, which was utilizedwithvoice communication. Having a data rate up to 64kbps, the second-generation mobile handset battery lasts for a longer time. With the help of 2Gpeople could start sending multimedia messages (MMS), send text messages (SMS) on their phones. Initially, transfer speed of 2G was around 9.6 kbit/s so operatorsinvestedin new infrastructure like mobile cell towers. By the end of the era, 40 kbit/s was achievable and EDGE connections offered speeds of up to 500 kbit/s.

C. 3G-Growth In Network/Network Strengthening

In late 2000 the third generation or 3G came into existence. 2Mbps is its transmission rate. 3G's increased data transfer capability emerged to new innovations like video streaming, video conferencing, download game, movies, and voice over IP (like SKYPE). 3G connectivity played a role in making features of Blackberry in 2002. 3G plans are more expensive than 2G since it has more rate of connectivity. Since 3rdGeneration of networking technology involves the introduction and utilization of UMTS and CDMA,WCDMA has over 2000 technologies, the emerging technologies like Evolution-Data Optimized (EVDO) and High Speed Uplink/Downlink Packet Access (HSUPA/HSDPA) has made a massive wireless generation between 3G and 4G called 3.5G with upgraded data rate of 5-30 Mbps.

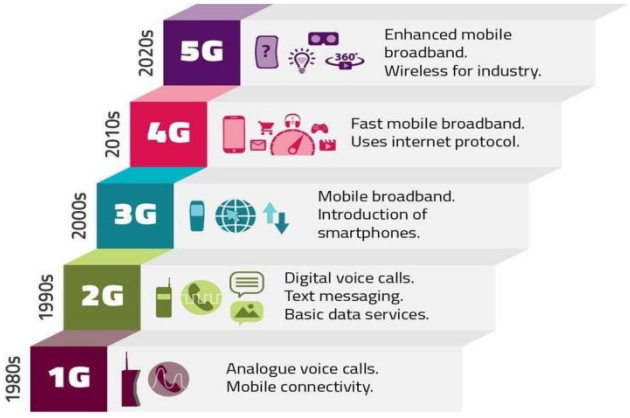
D. 4G-The Era of Streaming

In Stockholm, Sweden, and Oslo, in 2009 4G was first deployed as the Long-Term Evolution (LTE).4G LTE is much faster than 3G, with speed of 150Mbps i.e., potential speed of 80Mbps in real world. With 4G LTE you can easily download a 2GB HD film in 3 minutes 20 seconds, while it would take over 25 minutes on a standard 3G network. Compared to 3G, 4G is much faster with strong connectivity which provides HD video games downloading, crystal clear voice conferencing calls, browse web pages on a one click.Applications made to use a 4G network are Digital Video Broadcasting (DVB), video chat, High-Definition TV content, Multimedia Messaging Service (MMS) and mobile TV.

E. 5G-The Future Of Internet

5th generation mobile network is known as 5G. It is a new global wireless technology after 1G, 2G, 3G, and 4G networks. 5G is a new advanced network which can easily connect virtually everyone and everything at instance. Earlier, one could download a game in minutes but now with the help of 5G to download that same game is possible in seconds.

By 2035, 5G will be able to support 22 million jobs worldwide and also will bring growth to the economic income.



IV. HOW WELL CAN 5G COLLAB WITH ARTIFICIAL INTELLIGENCE?

As a general smart critical thinking procedure, AI can be extensively applied in the plan, design furthermore, streamlining for the 5G organisations. Artificial intelligence is applicable to three primary specialized issues in 5G:

A. Combitional Optimization

One normal illustration of the combinatorial optimisation issue in 5G (new radio) NR is the network source reallocation. Given an asset restricted organisation, an enhanced plan ought to be sorted out to allot assets to various clients who share the organisation to such an extent that the usage of the asset accomplishes greatest effectiveness. As the utilization of the Heterogeneous network (HETNET) engineering in 5G (new radio) NR with highlights like organisation virtualization, network cutting and self-putting together organisations (Child), the related network asset allotment issues are getting more muddled, which requires more compelling arrangements.

B. Detection

The plan of the correspondence recipient is an illustration of the identification issue. An advanced beneficiary can recuperate the sent messages dependent on the got signals, accomplishing limited identification blunder rate. Location will be trying in 5G inside the massive Multiple-In Multiple-Out (MIMO) structure.

C. Estimation

The normal model is the channel assessment issue. 5G requires precise assessment of the channel state information to accomplish interchanges in spatially associated channels of massive Multiple-In Multiple-Out (MIMO). The famous methodology is the supposed preparing arrangement (or pilot succession), where a realized sign is communicated, and the channel state information is assessed utilizing the joined information on the sent furthermore, got signal.

D. Problems difficult to solve

Network resource allocation is a major question in 5G (new radio) NR , which remembers explicit issues for orthogonal pilot resource allocation ,inter-cell resource block allocation, massive Multiple-In Multiple-Out (MIMO),beamforming resource allocation, client bunching and asset pool arrangement in virtualized networks. The organisation asset assignment targets amplifying the throughput of the organisation while adjusting the assistance rate. It's generally a NP-hard combinatorial advancement issue, and the computational intricacy to tackle this sort of issue increments dramatically as the size of the frameworks. Conventional arrangements utilize static segment of the organisation to reduce the computational expense for a problematic arrangement. These days, with the assistance of modern computing technologies, AI will be a new compelling answer for these issues.

E. Uniform Implementation

Traditional techniques are planned in a separation and-vanquish way for some capacity blocks in 5G (new radio) NR. For instance, the actual layer in 5G (new radio) NR comprises of a progression of sign preparing squares, for example, multiuser MIMO space-time handling, non-orthogonal multiple access (NOMO) signal location and encoding furthermore, translating for low density parity check code (LDPC) as well as polar codes. Analysts have endeavored to advance the calculations and usage of each preparing module and made progress by and by. Be that as it may, the proficient and Nonetheless, the productive and adaptable execution of the whole correspondence framework is missing, with ensured execution. It is noted that, artificial intelligence strategies should be

skilled for dealing with every one of the modules. This moves us to additionally build up a uniform AI based execution which turns out together for all the key modules in the 5G (new radio) NR actual layer. By bringing together the modules with AI techniques in both calculation what is more, equipment, the plan, setup and execution of the actual layer correspondences will be less complex, quicker, more practical and more effective.

F. AI for Baseband signal handling: Uniform 5G accelarator

The baseband signal handling in 5G comprises of a progression of sign preparing blocks including massive Multiple-In Multiple-Out (MIMO) identification, non-orthogonal multiple access (NOMO) discovery and translating for polar codes. The expanded number of baseband blocks prompted more equipment region and changed execution structures. Notwithstanding, we notice that the conviction proliferation calculation dependent on factor charts can be applied to all the squares. For every square, the systems are kept unaltered, and we just need to adjust the image set and limitations of the factors to the specific capacity. Henceforth, a uniform accelerator for the baseband can be planned dependent on the conviction engendering calculations with configurable factors.

In any case, the exhibition of conviction spread is restricted in some baseband blocks in specific situations. Here, AI can be a potential answer for these issues. By improving the conviction proliferation strategies with the AI strategies, an artificial intelligence based uniform accelerator can be built. The AI helped conviction engendering calculations can be planned with the accompanying two strategies:

DNN-aided belief propagation:

(1) Unfurl the factor chart of conviction spread by copying the cycles to frame a deep neural network (DNN).

(2) Train the deep neural network (DNN)by directed preparing. Utilizations of this technique in the baseband incorporate the deep neural network (DNN) -based polar codes decoder and the deep neural network (DNN) -supported MMO locator.

Belief propagation-based convolutional neural network (CNN):

(1) Map every hub in the factor diagram of conviction spread to one pixel in an image, in which associated hubs ought to be planned into adjoining pixels; (2) Train the convolutional neural network (CNN) utilizing the acquired pictures. This strategy is used in the BP-CNN channel decoder.

The neural organisations are profoundly self-versatile and solid. By applying deep neural network (DNN)and convolutional neural network (CNN) in the baseband, we can accomplish execution upgrades up to a uniform equipment usage structure. All things considered, the centre activity for convolutional neural network (CNN) is the convolution, while the centre of deep neural network (DNN)is theaugmentation of the two-dimensional lattices. We notice that the systolic design can understand both tasks.

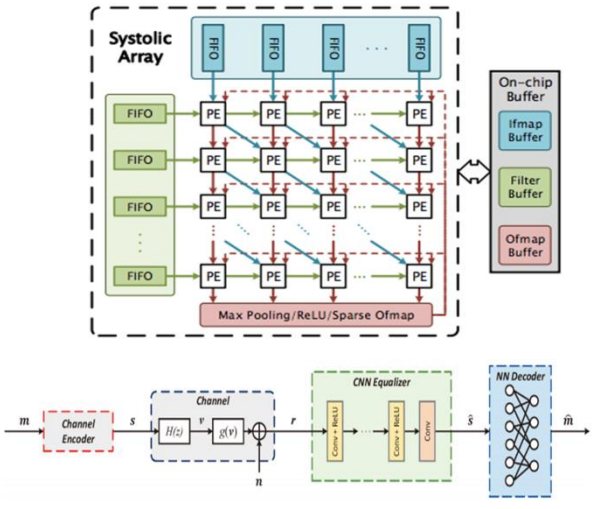


Figure represents a reconfigurable systolic engineering intended for accelerated convolutional neural network.

It very well may be seen that the systolic design is standard and adaptable, which upholds extraordinary

convolutional neural network (CNN)s and deep neural network (DNN) s. This persuades us to investigate the prospects of reusing a similar equipment engineering to acknowledge both 5G and DL calculations.

The related AI accelerator can be together acknowledged by two systems:

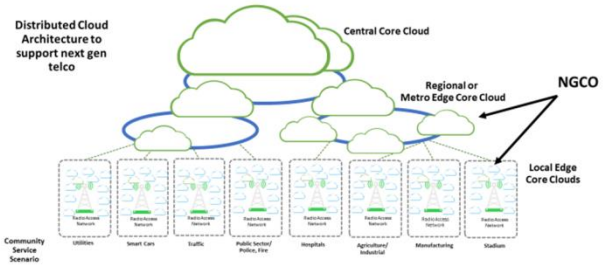
(1) The uniform engineering: The common collector can be collapsed into one uniform processor to spare the gear zone. This processor at first fills in as a CNN-based equalizer with the data signals from the channel. The surrender of the convolutional neural network (CNN) will be spared presently. The processor will at that point work as a DNN-based decoder, for which the spared surrender from the convolutional neural network (CNN) will fill in as the information. The disentangling comes about will be the final abdicate.

(2) The cascade engineering: Two processors will be fell clearly to develop the recipient, one being the CNN-based equalizer whereas the other being the DNN-based decoder. This engineering has more gear utilization, be that as it may, fulfills higher throughput rate.

Generally, the AI based uniform accelerator is more adaptable for the equipment usage, consequently, can accomplish different framework prerequisites.

V. HOW WELL CAN 5G COLLAB WITH CLOUD COMPUTING?

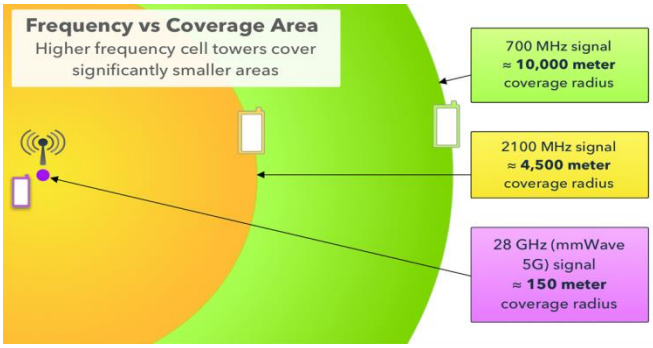
In Today's Organization Cloud processing/Cloud computing is one of the most essential for the processing of data. The future of mobile cloud applications will become more efficient after the widespread of 5G technology. 5thGeneration networking technology will be able to enable the cloud service providers to reach the mobile customers with ease and reliability. Cloud computing technologies will be able to offer more features and options to mobile users, allowing remote workers to access the cloud even where internet connectivity is not reachable. The Cloud Computing features can be enhanced with 5G technology. For example, if a news reporter needs to upload a video within a minute to their cloud then and only then his news will be seen on TV. In this 5G plays big role by providing the efficient upload speed for the user.



VI. DRAWBACKS

First let's talk about drawbacks and how can we comeback on those:

1. As 5G technology transmits millimeter wave which is in 30-300 GHz, it cannot transmit through any obstacles. Even it gets interruptions in the rain. If we see the coverage of 5G, it does not cover a massive area. It only works in a small coverage area. The comeback for both above drawbacks is either beamforming or setting up base signal receivers. These base signal receivers will act as a repeater and transmit the signal further to many receiver mobile phones which will cover up a large area.



2. The 5G millimeter waves have some of the worst adverse effect of human health. TheseEffects includes increase in the risk of cancer, cellular stress, genetic damages, structural and functional changes of the reproductive system, learning and memory defects, neurological disorders, and negative impacts on general well-being. Countries like UK, Ireland, Australia have banned 5G network due to the adverse health effects on the human health saying that people of the nation are not guinea pigs whose health could be sold at a profit. The only comeback to this problem is if we change the frequency from 300 GHz to 600-700 GHz to reduce the millimeter wave radiation.

VII. BOONS

5G provides fast and furious speed:

The speed provided by 5th generation wireless network is 20 gigabits per second. Increased bandwidth = faster speed. With this improved speed all files would be accessed without any lag. Movies can be downloaded within a couple of seconds. The benefits of a fast 5G network go beyond downloading videos and games. Because of the activation of the cloud system devices neednot to depend on the internal memory. As all this can be done on cloud itself, there is no need to save data.

Low Latency:

Latency in simple words is called as lag. It is the time taken by the system to access an event and respond to it. A large file that takes couple of hours to download with 3rd generation technology would take even less than 4 seconds to download with 5th generation technology. Considering the lag, 5G tries to make it negligible. Low latency will work as a boon to help people and save lives across the world in the medical field. Other fields like industry and transport will also be benefited with the use of this new 5G technology.

Greater Capacity of Networks:

The capacity of the 5th generation of Network technology is so high that it will allow more and more people to get connected to the internet, even then the internet connection would stay stable and fast, unaffected by the usage of thousands of users. This shows that one will not be affected and be responsible for anyone else's connectivity and every individual will be able to experience a good and stable internet connection in crowded places as well.

Better Gaming Experience:

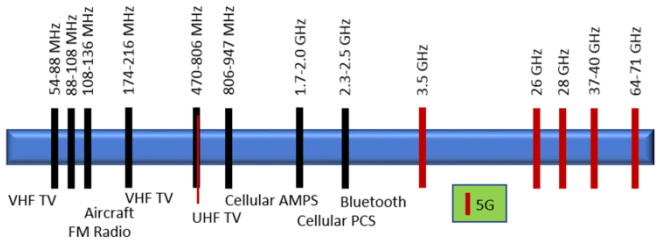
With the 5th generation of Network Technology, the world of gaming will be able to witness innumerable advancements. The 5th generation technology will work to rise the gaming industry on the horizon. Low latency aka "lag" works as a huge benefit to overcome the dreaded lag whichgamers have been awaiting since long time. With the help of 5G added with the cloud gaming server, gamers can enjoy their game on with mobile technology. Response time is reduced to a few of milliseconds because of the advancements done in the 5th generation. As a result, users can experience real time virtual reality.

5G and the Internet of Things:

The 5th generation will help the advancements in IoT to get faster and even better. The 5th generation does way more than just improving the quality of the product. With the help of improved speed and low latency, 5G influenced doorbell cameras are able to record clear videos and load them in milliseconds. Alarm systems got revolutionized with 5G which will help to start the processes quickly without any delay. This will change the face of the security industry.

VIII. SIGNAL FREQUENCY

The diagram below illustrates the signal frequency that 5G currently is being developed right now.



IX. CONCLUSION

5G wireless technology is one of the most efficient technologies which will connect the entire world without limits. It is a multipurpose network for many electric and electronic appliances. It is designed to provide much higher data capabilities, unhindered networks, and vast data broadcasts. In this paper, a detailed review has been done on the 5th generation wireless cellular technology and advancements in capacity, latency, speed, and quality of service provided by the same. In this paper, the evolution of networks from 1G to 5G have been detailed along with the 5G wireless network working and architecture highlighting the improvements in the technological world. Advancements due to 5G in some of the key promising technologies like belief base propagation-CNN and DNN, cloud technology and artificial intelligence have also been discussed in this paper. Moreover, the advantages and drawbacks of 5G networking system have been debated fairly. The 5G wireless technology is still in the developing stage and seems to have a very bright future once completely developed.

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Smart Card : A Single Card Solution for Multiple Activities

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ABSTRACT

The Smart Card technology is being applied in many industries. This technology can be used for multiple functions like analyzing the data of an individual person. The day to day transactions can be done using the smart cards. If the smart card is allocated to each and every existing citizen as well as newborn babies then what changes take place in the system/society is written further. This paper aims about the smart card implementation in a city, region or country which could bring a great change in the transactions and many more things which is further elaborated.

Keywords - National ID, Smart Card, Tax, Insurance, Hospital, Police Records.

I. INTRODUCTION

As the technology is developing on a daily basis there are many factors which are affecting the transactions done as well as many frauds and thefts are taking place. Smart cards are one of the technologies which can keep a track of all the things and can help in analyzing the data of an individual. The smart card is made up of a plastic card in which a microprocessor is embedded. This microprocessor can also be used to read, write, update and make changes in the data of the smart card. It can act as an access control device for accessing particular servers and transferring the data, for example: payments, hospital records, police records, etc. Smart cards ensure availability, security, convenience and data probability. Smart cards are of two types: contact smart cards and contact less smart cards. The main focus on the implementation of the smart card is further written in this paper.

II. CHALLENGES

1. Multiple government permissions, data and assets security.
2. Issuing smart cards to each and every individual citizen.
3. Security of the smart card's data.

III. METHODOLOGY

The smart card will need a device which will have a fingerprint scanner for authentication of a particular person. This device will be placed in an individual organisation for eg: hospital, which will only be able

to fetch and access all the data related to the hospital. This data will be accessed only if the individual person is authenticated using the smart card and fingerprint scanning. The data then would be able to validate, insert, update, delete the records of that particular person. Using that particular organization's device nobody would be able to fetch the data of other organizations, for eg: using a hospital's device, tax department's data will not be fetched.

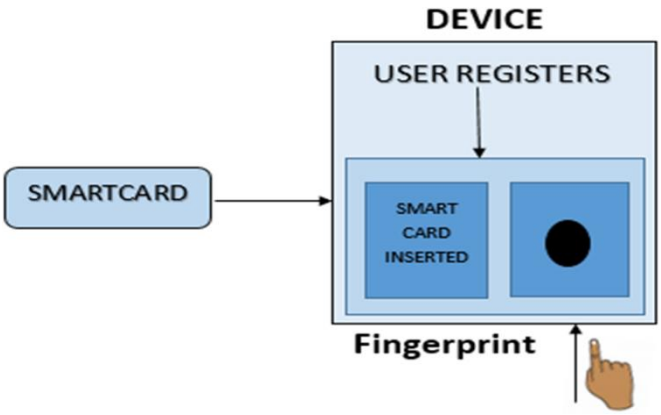

Fig.1. The smart card authentication device

IV. ALGORITHM

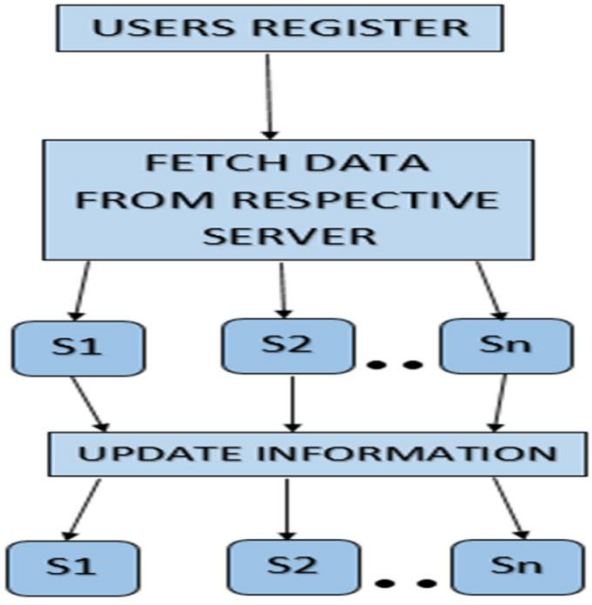

Fig.2. Algorithm for accessing the data of smart card users

V. IMPLEMENTATION IN HOSPITALS

If smart cards are used in hospitals for uploading each and every medical record then that would ease the process of the hospitals during new medical issues when any patient comes to the hospital. The medical history and the payment history for previous medical tests and treatment can all be tracked once the smart card of a particular person swiped in the hospital's system just like our atm cards.

VI. IMPLEMENTATION IN POLICE RECORDS

If any person goes to the police station for filing a complaint or if any person has any criminal records all the things can be tracked with a single smart card ID of that particular person. This would also speed up the police work rather than searching the documents of complaints then seeing the progress of it or any other paperwork task would be eliminated. This would be beneficial for all the police personnels as their time would be saved.

VII. IMPLEMENTATION IN RTO

Suppose that, if a particular person could be reminded of his/her fines from time to time for breaking the law while driving a vehicle or any other fines related to RTO by linking the smart card then it would save the late fees and also track the problem of unknown fines or any payment done but not received at the RTO sector which many times causes a problem afterwards to that person. Smart cards will also include the license information of particular vehicle types.

VIII. IMPLEMENTATION IN BANKING SECTOR

If the transactions which are done by UPI IDs are linked to the smart card of that particular person then the banking sector will not have any problems

tracking people who have taken loans from the bank and then got absconded.

IX. IMPLEMENTATION IN INCOME TAX DEPARTMENT

The tax department is nowadays working on how the black money would be minimized. If the daily transactions of every person is tracked as the smart card will be linked to the banks for payment purposes then it would be easier for the tax consultants to track every single penny.

X. IMPLEMENTATION IN INSURANCE COMPANIES

After the implementation in insurance companies the phase of work process of any insurance contract generation or insurance claim would speed up, as all things would be traceable by the smart card.

XI. BENEFITS

1. All data of a particular person would be linked.
2. High level of security would be provided.
3. Citizen's lots of paperwork will get eliminated which will save time.
4. Without smart cards/illegal duplicates would be traced.
5. Terrorists will be easily traced.
6. Jana Ganana (10 years) manpower will be needed.

XII.CONCLUSION

Smart card will be the solution for all the problems related to citizen identity and verification. Manpower, resources, money, time required for citizen identity in different Government/Private offices/organizations will be exponentially reduced. Illegal immigration/terrorist activities will be reduced because of the smart card project implementation.

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eSIM: Security Aspects for Privacy and Protection of Users

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ABSTRACT

The developing world needs optimization of hardware components and higher performance of the devices. An innovative idea got implemented in 2012 which also provided additional range and storage benefits. But with advanced technology benefits, there are also cons of using it. The main con of eSIM was hijacking it and tampering it for gaining full access. eSIM has a specific encrypted link to a specific MNO which may give access to hackers to push a new profile in it but this has been already reported by GSMA. The security level of eSIM is as equal as a normal SIM[11][18][22]. The following security aspects have been elaborated in this paper.

Keywords - eSIM, GSMA(Global System Mobile Association), MNO, eUICC, SM-DP, SM-SR.

I. INTRODUCTION

The eSIM technology is an embedded-SIM or embedded universal integrated circuit card (eUICC) which is a form of programmable SIM card, it is embedded directly into a device[8]. eSIMs are re-programmable and can support multiple profiles[2]. eSIM technology provides the same level of security as that of regular SIM, with additional secure over-the-air (OTA) update capability. There is no physical SIM card involved and no physical swapping is required by the individual [21]. eSIM is a global specification by the GSMA which authorizes remote SIM available to any mobile device. GSMA defines eSIM as the SIM for the next generation of connected consumer devices[5]. This specification is used in various applications such as electronics, home IoT applications, industrial (IIoT) applications like smart metering or in logistics[9][19]. eSIM are simply SIM chips embedded in your device instead of having a simple physical SIM card[16]. eSIM can be used for both the consumer solution and Machine-to-Machine (M2M) solution as more capable devices are entering the market[1]. It is the next big thing in the telecommunication world which allows distant deployment of network details and connectivity on the phone containing eSIM [6].

II. EASE OF USING AN ESIM

A. Cell Network Personalization

eSIM enables users to change operators remotely, directly from their phone, without having to purchase a new SIM card, waiting for it to arrive and start functioning, and then inserting it into your phone. You also don't need to hunt for a SIM 'ejector tool' to remove the SIM and to insert the new one [22].

B. Freedom of Switching Network

eSIM allows users to store multiple profiles on a single device, upto five numbers, and switch between them at ease[22].

III. PROS OF ESIM

- eSIM gives instant connectivity. One doesn't need to wait for the new SIM to arrive or install it on the phone. You will be able to do it with just a few taps.
- Giving a range of 5 network options to choose from, eSIM helps users customise, personalise and a sense of freedom.
- In a world wherein thin phones are all the rage, eSIM enables a significant reduction in phone size. The absence of a SIM tray leads to visible physical reduction in size.
- eSIMs are more secure as it is programmed to request verification whenever someone tries to change the user profile [22].

IV. CONS OF ESIM

- E-waste is a global crisis. The concept of eSIM renders older phones waste as it does not work in older models. Thus the new technology creates much more debris and unnecessary waste.
- Data such as contacts are difficult to transfer as you will have to download and reupload that data.
- eSIM can only be used on a single phone. You cannot just take the SIM out and use it on a different phone[24].

V. SECURE ELEMENTS OF ESIM

A. Secured according to design

eSE(embedded Secure element) is a hardware component which is a tamper-proof chip and is available in all designs and sizes for every different device[14]. Security by device is checked by performing penetration testing at both the hardware and software levels. Hackers cannot push any new profile into the current existing profile of the eSIM[13]. Hence tampering of the information of current users cannot be done[13].

B. Trusted execution environment (TEE)

This environment amplifies the security of eSIM which runs on the handset/device memory or has a separate, secure element[3]. The communication is having end-to-end encryption with secure services and it also uses secured interfaces and drivers that link hardware security features to a particular trusted education environment [1].

C. Trusted environment (TRE)

This environment provides RoT(Root of Trust) and hardware security anchor. It contains all the necessary resources that establishes a reliable environment and protects the system behavior for the execution of software, and storage of sensitive data [1].

VI. ESIM SECURITY ARCHITECTURE

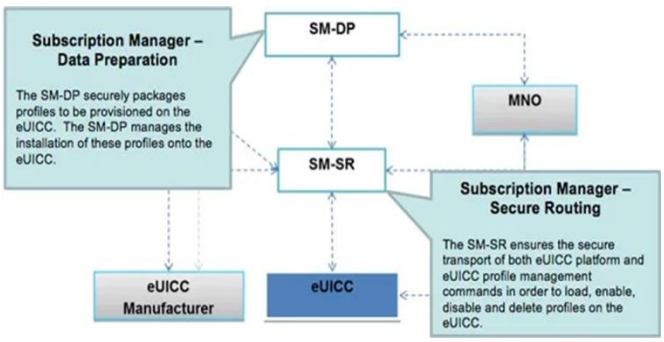

Fig.1. eSim Security Architecture

SM-DP (Subscription Manager-Data Preparation) : It stores,
prepares and protects the operator's profile (including the operator credentials)[10]. It also downloads as well as installs the profile of eUICC(Embedded Universal Integrated Circuit Card)[6][7].

eUICC (Embedded Universal Integrated Circuit Card) : It is a secure element which contains more than one subscription Profiles[6][7].

SM-SR (Subscription Manager-Secure
Routing) : It manages the statuses of the Profiles of eUICC. It secures communication links between eUICC and SM-DP which is used for delivery of the user Profiles[6][7].

VII. SECURITY ASPECTS

The eSIM security aspects are majorly focused by the companies as many frauds are taking place as well as the tampering of the eSIM is done.

eUICC (Embedded Universal Integrated Circuit Card) has an independent security realm. MNO(Mobile Network Operator)[17], SM-DP (Subscription Manager-Data
Preparation) and SM-SR (Subscription Manager-Secure
Routing) also consider the approach of the security realm which is based on the commercial as well as regulatory impact[7][12]. Secure Channel Protocol(SCP) is used for maintaining the security between the eUICC (Embedded Universal Integrated Circuit Card) and the eSIM infrastructure and also provides confidentiality of the messages which have been exchanged[7][8].
Four cryptographic algorithms are used for the security of the eSIM namely:

- Advanced Encryption Standard (AES) - 128 bits.
- SHA-256.
- Elliptic curve (ECC) - 256 bits.
- Rivest Shamir Adleman (RSA) - 3070bits.

WIB(Wireless Internet Browser) which is a SIM toolkit application which allows users to customise dynamic menus for the value added services of that particular subscriber. This process can be done using OTA(Over the Air) messages which are controlled by the central server. This WIB vulnerability is similar to the simjacker[4].

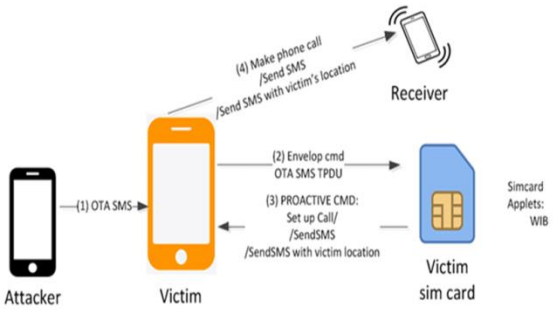

Fig.2. Using WIB(Wireless Internet Browser) for attacking victim

Simjacker exploit which has been fixed 2013 but there are still many eSIM which are non-certified and do not follow the GSMA standards and can be affected. The binary message which is used in eSIM management can be handled without any acknowledgement of the receiver's device/user[15]. Due to this SIM toolkit command gets executed and is sent back to the attacker by using another binary message.

VIII. IS TAMPERING OF ESIM DURING DEVICE REPAIRS POSSIBLE?

The tampering of the hardware can be done when the device is given for repairs as the hardware of the eSIM will carry the information of the user. If that embedded eSIM is replaced by some other hardware then that information could be transferred or swapped just like normal sim card swapping but in this case there would be a hardware swap. The eSIM has eUICC embedded software which has been deployed on the embedded SIM hardware like MFF2 (Machine-to-Machine Form Factor). Once the hardware is ready it can be deployed in any device. So hardware swapping from one device to another can be easily done.

IX. IS IT POSSIBLE TO CAMOUFLAGE ESIM TO HACK USER INFORMATION?

When an attacker takes control of the mobile phone that person can take control of the eSIM signal strengths and could manipulate the users calls. The users might see signals of their mobile operators on their mobile phones but in the background it would have no signal and spoofing of wrong signals could be a possibility. This would create problems for the users while talking on the phones. Also the whole conversations as well as texts would be tracked by the hackers. The attackers/hacker may not be able to swap the eSIM information but could manipulate the eSIM by re-rooting the phone softwares.

X. CAN ESIM HARDWARE BE TAMPERED BY UPGRADING IT?

As the eSIM is embedded in the SIM hardware like MFF2 (Machine-to-Machine Form Factor) it could be changed by anybody. The information will not get deleted even if the eSIM hardware is changed by any repairer. Afterwards this information could be accessed by installing this hardware into some other device which will have the same device compatibility.

XI. SOLUTIONS

The eSIM hardware should be given a security code, once a user information gets registered in it. This will help in securing the information of the user even though the hardware is changed or swapped. Secondly the hardware should only accept the manufacturer's software updates and not any third-party updates. If any third party updates are taking place in the eSIM software then it should get locked.

XII.CONCLUSION

After observing the possibilities, causes and solutions we can conclude that the security of the eSIM is a major factor. eSIM tampering can be done in many ways and the solutions which are suggested can be implemented with a possibility of being successfully. There may be many more ways for saving the eSIM from leaking user's information and the hardware as well as the software part of the eSIM could be more sophisticated to break through its security in order to prevent frauds and thefts of the bank information which is connected to that particular eSIM phone number.

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Cloud Service Providers: A Review of the Major Players in the Field

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ABSTRACT

Cloud computing is the delivery and management of computer services like data, storage, software, analytics with the help of Internet that is the cloud. Cloud computing enables faster innovation, flexible and vast resources and economies of scale. Cloud computing offers pay as you go system. This means that user only pays for the resources they use.
Cloud computing is a technology which offers a workspace or services to users which can work over internet. Here in this paper a basic comparison between all the top cloud service provider companies are given. This comparison is done so that it helps the customer to choose the cloud service provider easily and effectively according to its needs and specifications. The comparison is also paired with the explanation of all the cloud service provider services in detail following the leading cloud storage providers.
Keywords - Cloud Computing, Servers, Data, AWS, Microsoft Azure, Google Cloud

I. INTRODUCTION

Cloud computing is the delivery of computer services like data, storage, software, analytics over the Internet that is the cloud for faster innovation, flexible resources and economies of scale. Cloud computing offers pay as you go system. This means that user only pays for the resources they use. Cloud computing is a technology which offers a workspace or services to users which can work over internet. Cloud computer has proven to be a very beneficial when it comes to managing data and services. Instead of saving the data and managing it on a hard drive or storage hardware, it makes them possible to store and access it on a remote database. There are many cloud service providers in the market. The paper talks about each leading cloud service provider and the services its offers. This comparison makes easy for the customer to prefer from the cloud services provider according to its desired requirements.

II. CLOUD SERVICE PROVIDERS

A. Amazon Web Services

Amazon Web Services is the oldest service in the public cloud service market. It has the best computing power and provide database of the highest storage. It provides the best infrastructure. It holds highest market share for cloud IaaS. It is a feature rich-ready to provide cloud service provider. The Virtual Machine enables user to run small or big workloads. It has high configurations of Graphic

Processing Unit enabled VM types. These services make AWS an ideal system for Machine Learning and Artificial Intelligence [4].

B. Microsoft Azure

Microsoft Azure is a cloud computing service created by Microsoft. It is used for tasks like building, testing, deploying, and managing applications and services through data centers managed by Microsoft. It supports different programming language, tools and frameworks. It focused on the software and platform instead of infrastructure. The target customers where the developers specially app developers. It later expanded in IaaS. It computes and process at a high capacity. It efficiently run on high end HCP and SAP workloads. These properties of Azure make it ideal for Artificial Intelligence and Machine Learning. Following are the services provided:[1].

- Computer Services
- Mobile Services
- Storage Services
- Media Services
- Identity
- Data Management
- CDN
- Developer
- Azure AI
- Azure Blockchain Workbench
- Internet of Things (IoT)

C. Google Cloud Platform

Google App Engine is a platform as a Service and cloud computing platform for developing and hosting web applications data centers managed by Google. This app engine offers automatic scaling for web applications. The resources are allocated on demand basis. Google App Engine Python, Java, PHP Node JS etc. Fees are changed for additional storage, bandwidth, or instance hours required by the application. Google Cloud Platform is robust and ideal for Big data analytics and Machine Learning. It has significant load balancing and scaling. It came late into the market and has the lowest market share. Similar to Azure, It started with Platform as a Service. It has a relatively low pricing as compared to AWS and Azure. This is due to lack of features. The billing is done as per the memory used instead of the VMs used. This avoids wastage of memory. Another reason is because of the discounts offered for long term usage. It is ideal for mobile app development[3].

III. FREE CLOUD STORAGES

The following are the cloud storages which provides free data storages on cloud. They can be used individually or in a group. They provide services like data storage, data sharing and data synchronization.

A. Google Drive

Google drive is a service developed by Google in the year 2012.It is used for file storage and synchronization . It allows users to store the data on cloud. It also provides services like storing data, managing data, share and active synchronization of data. The data is stored on Google servers and they offer upto 15MB of free data storage.

B. Dropbox

Dropbox is a service developed by Dropbox Inc. It is an American Company having its headquarters in San Francisco, California. It was released in year 2008. It is used widely for file hosting. Dropbox offers only 2MB free storage. This storage can be increased by using the referral program upto 500MB.

C. Sugar Synch

Sugar Synch is a cloud service which is used for synchronization of files across computers and other devices for backup, access, synching and sharing from a variety of operating systems. It is developed by J2

Global and released in year 2009. It offers 5MB of free storage.

D. Spider Oak

Spider Oak collaboration tool which is an online file hosting tool that allows user to access, share , update and synchronize data using a cloud server. It was released in year 2007.It doesn't offer any free storage but gives free 21 days trail.

IV. BENEFITS OF CLOUD COMPUTING

Companies have big data centers. These on-site data centers require a large amount of hardware, cooling elements to maintain the temperature. Moreover, data recovery is very critical. If the data centers crashes then it is very time consuming to bring the data center on track. This require a lot of expenses which small companies can't afford. Hence, companies are switching on cloud because it offers virtual data centers. The main benefit of using cloud computing is that it the cloud service providers take care of data and the virtual data center. The service provider is responsible for the data loss if any.

Customer can use cloud services from anywhere in the world. The only thing required is a computer with active internet connection. This promotes remote work environment in a company. Thus making it cost effective.

Mostly, the cloud computing services are provided on demand of the customer. The services asked by the customer are therefore provided in minutes. This gives businesses and companies flexibility and requires no capacity planning.

Cloud computing makes data backup and disaster recovery easier and cost effective. Many cloud services provide a set of security policies which helps in strengthening the data and protect the system [2].

V. COMPARISON OF CLOUD SERVICE PROVIDERS

Following is the tabular representation of comparisons of all the leading cloud service providers with their services [5].

Features	AWS	Azure	Google Cloud Platform
Maximum Processors in VM	128	128	96
Maximum memory in VM	3904	3800	1433
SLA Availablity	99.95% Annual Uptime	99.90% Annual Uptime	99.95% Annual Uptime
Operating System Supported	Windows, SLES, Cent OS, Core OS, OpenSUSE, RHEL, Ubuntu, Oracle, Linux	Windows, SLES, Cent OS, Core OS, OpenSUSE, RHEL, Ubuntu, Oracle, Linux	Windows, SLES, CoreOS, CentOS, RHEL, Debian, Free BSD, Ubuntu
Marketplace	AWS Marketplace	Azure Marketplace	G Suite Marketplace
Cloud Services and its Protection	Sheild	DDoS Protection Service	

Backup	Object Storage, Cold Storage, Archive, SnowMobile	Backup	
Database Migration	Database Migration Service	Database Migration Service	
Dedicated Network Connection	Direct connect	Express Route	
Protection with Data Encryption	Key Management Service	Storage Service Encryption	
Developer Tools	Developer Tools	Developer Tools	
Firewall	Per hour	Per minute	Per minute
Usage	Best for launching Linux VM	Good for Mobile App development,Web Development and DevOps	DevOps compatible

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Integrated Approach of IoT, Big Data and AI (Case Study : Smart Village)

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ABSTRACT

In India, the growth of villages has a huge effect on the nation's success now the smart villages will use technologies to improve living standards, minimise costs and resource consumption (like transportation, electricity, health care, education, social services, water, and waste management), and communicate with their people more efficiently and effectively. The main aim of IoT, Big Data, and AI technologies is to streamline these operations in multiple fields, increase device performance (technologies or particular processes), and eventually improve life quality which ensures self-sufficiency and self-reliance by optimising natural resources with the assessment of local people's interests and a greater knowledge of village dynamics.
This paper discusses the principle of smart villages. It focuses solely on villages in order to research them and then offer alternatives for their needs. It also assists in the development of their standard of living.

Keywords : Smart Village, Big Data, IOT, Sensor, AI, SDG.

I. INTRODUCTION

In most of the rural areas depend on agriculture. Rural villages have emerged as a critical priority for achieving the SDGs (Sustainable Development Goals). Inadequate infrastructure, a lack of Internet access, low-income levels, transportation challenges, the education system, etc. endanger rural life and the economy. Big data, AI and IOT's can helps us in numerous ways to solve these problems like Monitoring water level of a from various water source, such as water tank, borewell etc., plays a key role in agriculture. Real-time data together with AI will assist in the identification of different problems as they occur, more use of IoTs, AI and good infrastructure would be able to manage network problems more quickly, like VR, AR, and other technologies. Learners can achieve successful learning opportunities and outcomes, as well as realistic knowledge and problem-solving skills, these things can help with transportation and traffic control, as well as change the generation / delivery of energy, etc.

II. METHODOLOGY

Some firms, including Cisco, IBM, and others, are already collaborating with universities and local governments to create data-driven systems for transportation, waste management, law enforcement,

and energy use to make them more efficient and improve the lives of peoples. The research on "Smart Villages" requires multidisciplinary studies: the integration of cutting-edge technologies for enabled services for social services.

III. DISCUSSION

Technologies can solve some problems like -

- Lower Income
- Illiteracy
- Unemployment
- Various Problems and etc.

Challenges lie ahead are tough and will require a lot of work in the technology and research sector before implementing smart technologies in villages and after that telling people how to use that technology and how they will be benefited from that. Especially farmers there are still many farmers who are using old techniques to improve their work which eventually takes time and energy and they still do not get many benefits from them. By implementing Big Data, IOT and AI which will help determine farmers the quality of crop they are growing and can make smart future decisions based on the data provided by the intelligent technologies.

Importance of Climate Change, Energy, Environmental Science and sustainable development should be taught in schools and colleges. There should be competition on providing the best solutions to the people living in villages to improve their lives. The best idea can be selected and funded by various angle investor / Governments, Industrial Sectors in order to improve lives in villages.

There are numerous problems faced by villagers, but we can solve those problems in many ways.

A. Improvement of Irrigation:

Precision agriculture relies heavily on smart irrigation. It assists farmers in reducing water waste and improving crop growth quality in their fields by

- Irrigating at the correct times.
- Minimizing runoffs and other wastages.
- Accurately determining soil moisture levels and, as a result, determining irrigation requirements in any location.

Replacing manual irrigation valves and systems with automated valves and systems eliminates human error (for example, failing to turn off a valve after watering the field) and is beneficial in saving energy, time, and valuable resources. Smart irrigation system installation and configuration are also relatively simple in general.

[8] To solve these problems Agricultural Robot Applications can also be used and farmers will focus more on improving total production yields by using agricultural robots to automate long, routine activities.

The following are some of the most popular agricultural robot applications.

- Harvesting and picking.
- Weed control.
- Autonomous mowing, pruning, seeding, spraying and thinning.
- Phenotyping.
- Sorting and packing.
- Utility platforms.

❖ Use Sensors for Irrigation:

[9] Various methods can be used to determine the soil moisture content (in volumetric and gravimetric forms), which can be classified into traditional and modern techniques for both laboratory and in situ measurements. Precision agriculture makes use of a variety of sensing technologies to provide data that

helps farmers track and maximise crops as well as respond to evolving environmental factors.

B. F2C (Farmer to consumer):

Farm Direct Marketing aims to capture a larger portion of the customer rupee. The delicate balancing of production and distribution must be mastered by all effective farming operations. As opposed to selling wholesale, many farmers choose to direct market their crops because it makes for higher profit margins. Cut out the middleman and having direct input from customers will make these marketing avenues worth the time and effort taken to implement.

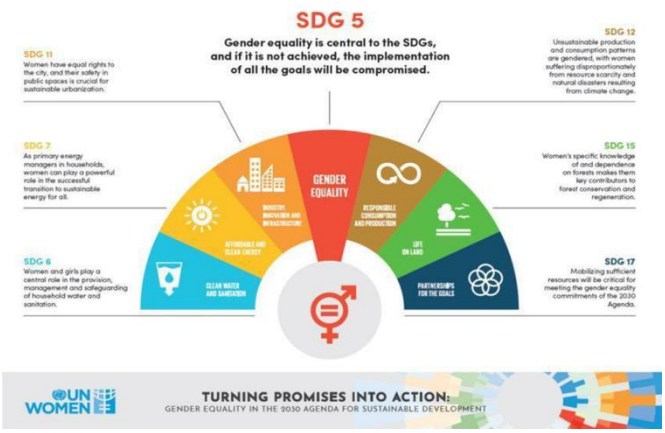
C. Water Scarcity:

Water shortage affects billions of people, and access to safe drinking water is a fundamental human right. There is more salt water on the planet than fresh water, making drinking water scarce. Some have created technologies for this reason. The top four technologies are mentioned below.

- The Water Seer
- The Desolenator
- Janicki Omni Processor
- Desalination

D. SDGs Approach:

SDG5, achieving gender equality and empowering both women and children, is one of the most important SDGs because it would have positive cascading impacts on the other SDGs, including higher schooling, poverty reduction, green energy, reduced injustice, good health and healthcare, zero hunger, lean water and sanitation, decent employment and economic growth, and, most importantly, climate change.



E. Involvement of women's

Investing in girls and women has a multiplier impact, benefiting not only individual women but also their families, communities, and nations. One study found that countries with higher female parliamentary representation are more prone to ratify international environmental treaties. Evidence also shows that when women have stable rights and access to property, they are more likely to use resources sustainably. Women's participation in climate change mitigation would serve to ensure that future generations have access to clean air, healthy drinking water, adequate food, and safe housing.

The battle against climate change becomes more intense every year as the 2030 deadline for meeting the Sustainable Development Goals approaches, with policymakers pouring money into achieving them.

F. Labour:

"The robots are coming." "No jobs are safe." "The way we work is coming to an end."

As technologies have the potential to change the employment landscape, these concerns about automation and technology's effect on jobs continue to intensify. While new technologies may result in the loss of millions of jobs, they will also result in the creation of millions of new jobs (although it is still uncertain if there will be enough new jobs).

Concerns about robotics, automation, and artificial intelligence (AI) overlook the fact that technological

advancements are more likely to alter rather than remove employment. In the manufacturing industry, businesses are experimenting with using mechanical exoskeletons on floor and line staff to minimise pressure and fatigue when lifting large items. In sales, members would need to improve their online marketing and engagement skills in order to respond to changing consumer tastes.

Technology is changing the way we work, but questions about which jobs are lost and which are added, as well as how these changes impact, are critical in determining whether people will be able to transition from yesterday's jobs to tomorrow's jobs.
The evidence shows that technological advancements have reduced the need for repetitive mechanised work while increasing demand and pay for high-skilled technical and analytical work.

The effect of automation and artificial intelligence is accelerating a process that has been developing for decades. Many grocery store clerks have been replaced by self-checkout machines, and switchboard operators have recently been replaced by phone and interactive voice response menus. According to studies, advances in AI can cause truck drivers, paralegals, and even surgeons to have their careers disrupted.

In this world, tech workers can appear to be the only ones with steady job growth. But they're not the only ones. While developers and data scientists are in high demand, jobs in personal care and the medical field are also rising.

IV. ADDITIONAL APPROACHES to PROBLEM SOLVING:

1) Financial assistance from angle investors/NGO's or Individuals needs to be strengthen. Strategic planning plays an important role for given domain. Government frameworks for supporting in these domains. Transparency should be maintaining and donor should get the details of amount spend With the help of prior data, we can in like manner anticipate future headway that in what ways our next progress should be gone before this can be cultivated with the help of creating data which can be explored for later use with the assistance of Data Science and Big Data.
2) We should encourage and motivate eco-tourism, agro-tourism to create job opportunities.
3) We should furnish extra data with legitimate direction such as meeting, video's and article to assist farmers with various cultivating techniques. We should organize farming campaigns and motivate our "Youth" to take part effectively.
4) We can utilize innovation to capacity and refine water in the event of precipitation.
5) We should direct survey for every region to know the diverse climatic condition, water level, soil moisture and various offices to amplify the benefit and increase the production.
6) A non-agricultural land is an infertile land, unsuitable for development and in the event that we own an agrarian land and need to raise a structure for private or modern or business purposes by transformation, it is conceivable by Law.

V. IOT'S

Renewable energy IoT applications that are enabling the development of a sustainable future:

1) Automation to Improve Overall Production
2) Smart Grids for Elevated Renewable Implementation:
3) Balancing Supply and Demand

IoT has enhanced the use of renewables drastically. Renewable energy sources are now being used by energy providers to ensure a steady supply of power

to their customers. The Internet of Things has already boosted solar and wind energy adoption.
It has potential uses in geothermal, biogas, and hydroelectric power plants.
As per a survey, the global geothermal resource base is even larger than that of coal, gas, uranium, and oil combined. Clearly, renewables are the future of existence. Their acceptance will gradually but definitely fulfil our growing electricity requirements.

VI. BIG DATA

Farming processes will become increasingly computer-driven and data-enabled as smart machines and sensors appear on farms and farm data grows in quantity and scale. The phenomenon of Smart Farming is being driven by rapid advances on the Internet of Things, AI, Big Data and Cloud Computing.

[1] Machines are equipped with a variety of sensors that measure data in their environment that is used to guide the machines' behaviour. Big Data innovations play an important, mutual role in this development: machines are equipped with a variety of sensors that measure data in their environment that is used to guide the machines' behaviour. This can range from basic feedback systems (such as a thermostat that regulates temperature) to complex deep learning algorithms (e.g., to implement the right crop protection strategy). This is enhanced by integrating it with external Big Data sources like weather or business data, as well as benchmarks from other farms. Since Big Data and Smart Farming are both emerging technologies, it is likely that awareness of their uses and implications for research and development is limited.

Table 1: Examples of Big Data applications/aspects in different Smart Farming processes. [1]

Cycle of Smart Farming	**Arable**	**Livestock**	**Horticulture**	**Fishery**
Smart sensing and monitoring	Robotics and sensors	Biometric sensing, GPS Tracking	Robotics and sensors, greenhouse computers	Automated Identification Systems (AIS)
Smart analysis and planning	Seeding, Planting, Soil typing, Crop Health, yield modelling	Breeding, monitoring	Lighting, energy management	Surveillance, monitoring
Smart control	Precision farming	Milk robots	Climate control, Precision control	Surveillance, monitoring
Big Data in the cloud	Weather/ climate data, Yield data, Soil types, Market information, agricultural census data	Livestock movements	Weather/ climate, market information, social media	Market data

[1] Big Data is projected to have a major effect on Smart Farming, with implications around the whole supply chain.

- Smart sensors and devices generate massive volumes of data, allowing for exponential decision-making.
- Conventional and non-traditional actors are likely to see significant changes in positions and power ties as a result of Big Data.
- Business and governance (including data ownership, anonymity, and security)

VII. THE DIGITAL TWINS:

[2] Here, digital twins will help farmers make better use of their equipment. A digital twin is a mirror of a real machine that is always learning. Gartner has listed the digital twin as one of the Top Five innovation trends for 2017. These software models can provide deep perspectives from each physical asset through continuous learning, allowing them to track agricultural machine output and minimise costs. Smart solar/wind farms will transform rural areas into sources of local and urban electricity. [3] States like Karnataka, where wind energy is a big initiative, will use AI and IoT to optimise wind farm layouts and the directional alignment of individual windmills and turbine blades under varying wind speeds and wakes. Bengaluru, the state capital, now has 51 percent of the population.

[3] Despite the difficulties, a variety of companies in India are working to implement IoT in agriculture. Gramophone, for example, uses technologies to counter information asymmetry and Sat Sure uses IoT and big data to provide financial protection to growers. Avanijal's software irrigates fields while saving water and allowing farmers to sleep! Green Robot uses 3D vision technology to create smart farm machinery.

VIII. CSR (CORPORATE SOCIAL RESPONSIBILITY) AND GOVERNMENT

[4] With the current reverse migration, this number is expected to rise in the coming months. The SMART Village programme was born in 2016 after the Union Ministry of Rural Development brainstormed with Prime Minister Modi. The main goal of the Shyama Prasad Mukherji R-urban Mission (SPMRM) is to transform villages into smart growth centres.

The below are the highlights of the CSR programme:

- Community-based solar microgrids are being built to provide electricity to homes, government schools, and Aanganwadi centres.
- Establishment of the 'Renew Edu Hub', a career-building education centre for children and youth that uses technology to impart education and promotes digital literacy.

IX. IMPACT OF SVARG (Smart Village Adopted by ReNew Group)

[4] In 2016, 11-kilowatt cooperative solar mini-grids were constructed in the village, bringing electricity to 50 households. Renew Power completed three neighbourhood solar grids in the village in 2017, electrifying 115 households from the village's economically disadvantaged portion. Renew Power assisted in the construction of community solar grids with a combined capacity of 25 kW by the end of August 2017.

[7] It is possible to overcome difficulties with the help of these points:

- Mind the investment Gap.
- Level the playing field.
- Overcome Non-Market Barriers.
- Stay Up to Date.
- Plan for a Just Transition.

- Do the Hard stuff too.
- At the same time, work on technology, policy, and markets.

Many villagers were adopted, and their effect on the community's growth was positive. e.g.-

[6] Smart Village the Social Outcomes at Dhanora

- The village has been designated as a "Crime Free Village" by the District Police since no FIR has been filed with the police station.
- The village is transforming into an Alcohol-free village.
- Open Defecation free village.
- The Rajasthan government has introduced the smart village model for the state.
- Village awarded by Government of Rajasthan for its development.

Nearby 100 villages have been influenced by Dhanora's smart village and have joined the "Soch Badlo Goan Badlo" campaign for rural reform in India.

X. FUTURE THINKER:

There are such countless ways that urban areas make life unreasonable furthermore, hopeless the clamour the cost stuffing social turmoil contamination and the division from nature individuals are separated also, stuck in these small boxes that make it inconceivable to feel associated and be sound or even see the stars these urban areas are based on an extractive and destructive financial model that annihilates biological systems and is held together.

We could construct our Villages towns and urban communities on the standards of biomimicry to be tough decentralized assorted and adjusted to the nearby climate.

We have many solutions to make our village more strong and smart :

1. Conceptualize the system for "Smart Village".
2. Build a model to draw an execution system.
3. Plan innovation arrangements, strategy for better and enabled provincial administration.
4. Plan for speculation and asset distribution system for actualizing smart town activity and many more.

And these things are only possible when we actively use the new technology with the help of big data,AI and IoT.

XI. LIMITATION:

The results show that due to lack of education, infrastructure, technology our village has not grown much more.

But this is the time where we have a good education system, infrastructure, technology and good government policies and support of NGO's to make our village smart. And here we can have great support from Iot's, Big Data and AI which can change things in more smartly ways.

XII.CONCLUSION

- The foundation and pre-requisites for scaling up digital platforms are cost effectiveness and convergence. The plurality of digital technologies that an individual requires cannot be scaled up by a single government agency or service provider. It is therefore crucial to embrace new mindsets and approaches for integrated digital investments, especially in rural areas where investment effectiveness can be increased by reusability.
- We have to make sure that to make villages smart we have to put technology first agenda everywhere. Connect every single citizen of this nation digitally.

- We ought to gather different guidance meeting for villagers to comprehend that how this new technology work.
- It will come with great price tag, but it will do the work for the next generations to come and there should not be language barriers for villagers to recognise the IOT.
- Everyone deserves to live with technology and move with technology. No people should be untouched by technology and this can be done with help of:
    - Analyse and plan.
    - Design and Develop.
    - Deploy and Implement.
    - Monitor and Evaluate.
- The smart village concept is a citizen-driven project and a learning journey for digital change and rural growth.
- With the help of Big Data, IOT and AI we can reach out a great success to make our village smart.

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Finger Gestures Detection Using Convolution Neural Network for Playing Virtual Cricket

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ABSTRACT

This is an era of intelligent machines. With the advancement in artificial intelligence, machine learning, and deep learning, machines have started to impersonate humans. Gesture recognition is a hot topic in computer vision and pattern recognition. We wanted to develop a game with less complexity and in an interactive way so that users of any age group can appreciate it.

In this paper, the proposed model uses convolutional neural networks (CNN) to recognize the hand gesture with accurate results. This process flow consists of placing your palm over the particular segment over the screen and finger recognition using CNN classifier. The fingers are recognized using the Convolution, Normalization, Activation, Max-pooling, and Dropout layers. In this paper, we have compared different models using various combinations of these layers. Based on the performance and complexity of these models, we have selected a model with higher performance and reasonable complexity which helped us to classify the image correctly.

A chatbot is also integrated with the game that will help users to understand the rules of the game. Users need to ask a query to the bot. The Bot will understand the query and return the appropriate answer. A web page will be provided to the user where he/she can play the game and ask queries to the chatbot.

Keywords : Intelligent machines, Artificial Intelligence, Machine Learning and Deep Learning, Convolution, Normalization, Activation, Max-pooling, and Dropout layers

I. INTRODUCTION

This project "Hand Gestures Detection Using Convolution Neural Network for Playing Virtual Cricket" uses deep learning techniques to recognize the hand gesture and to count fingers in the frame to build an interactive and fun game. The built model can analyze hand signs and categorize them. It allows users to give input just by gestures without using a mouse, keyboard, or any other peripheral devices. Such a human-machine interaction game creates an environment that provides a simulation of reality. Based on the user's hand gesture, this model recognizes the gestures and provides the test result. As per the test result, this model gives the users an interactive and easy approach to play the game with the system, providing more enjoyment for people in an effective way.

The second part of the game focuses on a chatbot. A chatbot is a software used for user support in various

industries. There are different ways to develop a chatbot. Based on the requirement and resources available, we can select any method of implementation. A chatbot that can understand the context of the conversation seems to be more user-friendly and effective. Here, we have used the cosine similarity technique to understand input from the user and uses natural language processing (NLP) techniques to maintain the context of the conversation. This type of chatbots can be used in small industries or businesses for automating customer care as user queries will be handled by chatbots thus reducing the need for human labor and expenditure. This chatbot helps the user to understand the rules of the game.

II. LITERATURE REVIEW

The performance of deep learning neural networks often improves with the amount of data available for preprocessing [1]. As the amount of data increases, the deep learning model tends to provide better results hence data plays a very important role while building any deep learning or machine learning model.

Image data augmentation is perhaps the most well-known type of data augmentation and involves creating transformed versions of images in the training dataset that belong to the same class as the original image [2]. Transforms include a range of operations from the field of image manipulation, such as shifts, flips, zooms, and much more.

There are different chatbots available. Some of them use technologies like deep learning or machine learning whereas some of them are rule-based. Rupesh Singh and the co-author used a deep learning approach to develop the chatbot. This method uses TensorFlow for developing the neural network model of the chatbot and uses the NLP techniques to maintain the context of the conversation [3]. It can be used for small-scale businesses. The drawback of this technique is, it requires a large amount of data to learn itself as it is using a neural network.

Human-machine interaction is a study looking at the transmission and communication of information and emotion between humans and machines. For a human to sense the realistic and comfortable relation when interacting with machines, an interface for natural and intuitive interactions will be important for the bridging of the relation between humans and machines. Gestures are the unsaid words of humans which he expresses in the form of actions. It allows individuals to communicate feelings and thoughts with different emotions with words or without a word [4].

Other than language. The hand gesture is a way to express human intention and emotion. Using bode gestures is one of the common and natural ways of communication and interaction [5].

The human hand gestures are detected and recognized using the convolutional neural networks (CNN) classification approach. This process flow consists of hand region of interest segmentation using mask image, fingers segmentation, normalization of segmented finger image, and finger recognition using CNN classifier [6]. P. S. Neethu, R. Suguna and Divya Sathish in their paper “An efficient method for human hand gesture detection and recognition using deep learning convolutional neural networks” stated convolutional neural network provides better performance when used with enhancement techniques.

III. PROPOSED SYSTEM

There are 3 different modules of this project. 1. Model to detect hand gestures 2. Chatbot to understand user queries 3. A web page where users can play and ask queries. Based on the study was done and available resources we proposed the following solution approach for our problem statement.

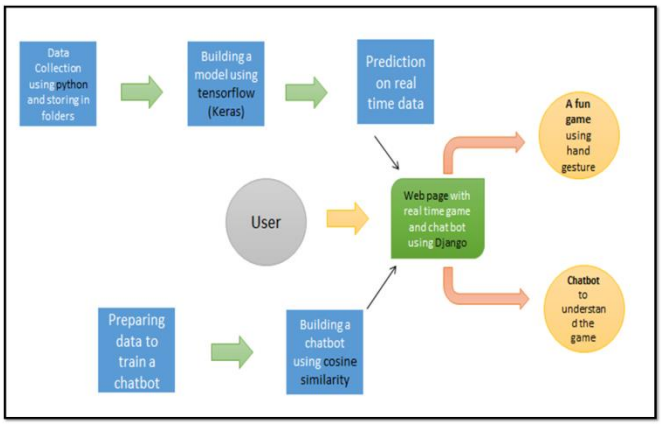

Image 1 Solution Approach

There are different approaches for data collection:

i) Download the images from Google and train the model on those images. We can use web scraping to download images, but we need to delete unrelated images manually. It was a time-consuming task. So, we decided to go with the second approach.

ii) Generating our own dataset to build the model:
We have used python programming language for this. For data collection, we have used OpenCV library by python to capture the images and OS library to store folder-wise images of each sign on our local machines. There are many efficient pre-trained models used for object detection like Yolo (You only look once) and Mobilenet SSD (Single-shot detection). YOLO is an object detection system for real-time data processing. It divides images into frames & then forms a bounding box around the object & predicts class. Mobilenet SSD is designed for mobile embedded apps. It extracts a feature map & applies convolution. It is fast and it has simple architecture.
To learn and explore more about neural networks, we built our own model for hand sign recognition. To build this model we have used Keras which is an open-source neural network library written in Python. After building an acceptable model, using OpenCV and the model, we were able to recognize hand signs on real-time data.

To build the chat, we used the cosine similarity method. It requires less data, space, time, and processing power. In this method, we check the similarity between two strings and return a numeric value. This technique helps to understand the intent of the user. We have provided data to the chatbot, which has different intent along with potential patterns/ questions asked by users and expected answers from the bot. using this data, we were able to understand the user input and give a proper response.
The last module of this project is web integration. We have used Django framework for this. Django is a high-level Python Web framework that helps in rapid development. There are other frameworks too like flask. We opt for Django over flask as it allows database connections. Flask is single page application preferable for personal blogs, forums, etc. So, we choose Django as its complete package for web development.

3.1 TECHNOLOGY STACK

Python - It is a high-level, interpreted programming language. It has a simple syntax and it also allows developers to write programs with fewer lines.
OpenCV – It is an open-source computer vision and machine learning software library mainly aimed at real-time computer vision.
OS - It is a module in python that provides functions for interacting with the operating system & using its dependent functionality. It comes under Python's standard utility modules.
Keras - It is an open-source neural-network library & is capable of running on top of TensorFlow. It is designed to enable fast experimentation with deep neural networks; it focuses on being user-friendly, modular, and extensible.
Django – It is a high-level Python Web framework that encourages rapid development. It Helps developers take applications from concept to completion as quickly as possible and avoid many

common security mistakes with the ability to scale quickly and flexibly.

3.2 Design Model

We will provide a web page to user where he/she can play game or understand rules of the game by asking questions to chatbot. On the home page, user can start playing game or ask question in the text box given. When he/ she ask any question, it will try to understand the question and return appropriate response using the model built. Once user starts the game, he/she has to make hand signs defined in the region of interest. Model will recognize the signs and simultaneously generate a number. Based on the rules of the game, system number and signs of the user, game will stop or continue till 6 rounds. In the end, result will be displayed on the screen itself. Users need to refresh the web page in order to start the game again.

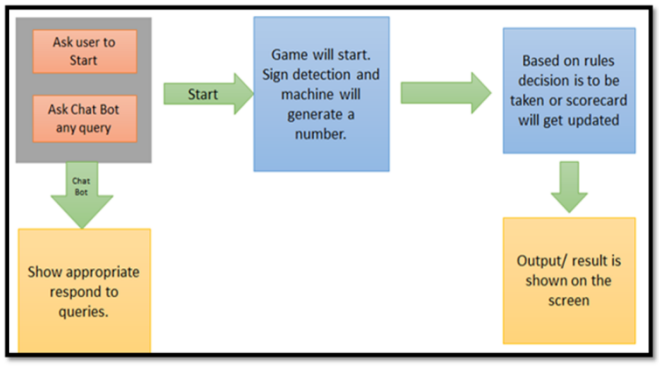

Image 2 Process Flow

IV. DATASET DETAILS

The data was collected by compiling a data collection function (Code) where separate folders for every sign (finger count) were generated. On running the code, a frame was generated along with ROI (Region of Interest). So, the respective sign was to be shown in the given ROI. Strictly while collecting the data background was kept as a plain surface without any distraction to obtain maximum accuracy.

There were approximately 1000 such images collected for each sign and further the data folders were split as train, test, validation. A total of 6240 images were collected. The size of data collected is 187Mb.

Some basic things to be considered while collecting images are as follows:

Plain Background for ROI.

Finger sign to be shown in ROI (Region of Interest) i.e., the blue frame shown in the upper image.

The only hand gesture is to be fitted within the boundaries of ROI, no other body-part or object should be included in ROI while capturing.

Gestures

The only respective key should be pressed while collecting images for that sign. Example: 1 for One, 2 for Two, and so on till 6.

Only set of gestures to be used as shown in image above.

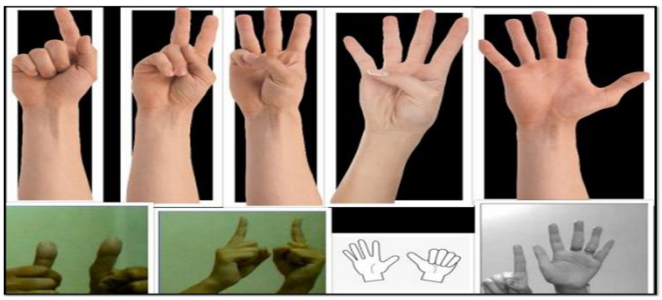

Image 3 Dataset Overview

To improve the model accuracy, we considered invariance while collecting the data.

Invariance means, you can recognize an object as an object, even when its appearance varies. This is generally a good thing, because it upholds the object's identity, category, (etc.) across changes in the aspects of the visual input, for example the relative positions of the viewer/camera and the object.

Note: Here the hand/Fingers sign is the object/target.

1) Positional / Transnational Invariance:

Ability to detect positional shifts, or translations of the target in the image.

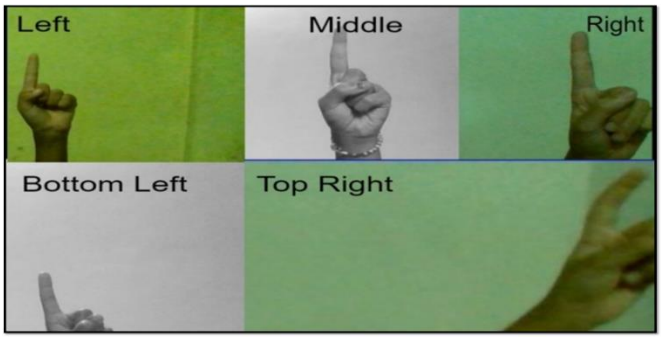

Image 4 Positional / Transnational Invariance

2) Rotation / View-Point Invariance:

Ability to detect circular movement of an object around a center (or point) of rotation. It's a change in the viewpoint of seeing the object.

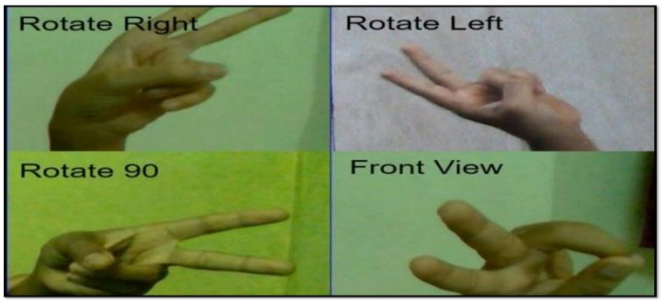

Image 5 Rotation / View-Point Invariance

3) Size Invariance:

Ability to detect a change in the size of the target in the image.

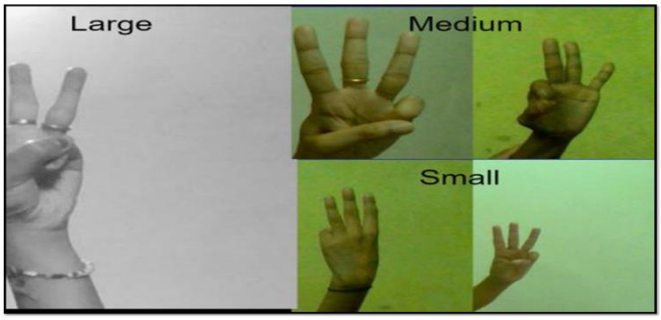

Image 6 Size Invariance

4) Illumination Invariance:

Ability to detect the target in the image even if visibility is low due to light intensity or shadows etc.

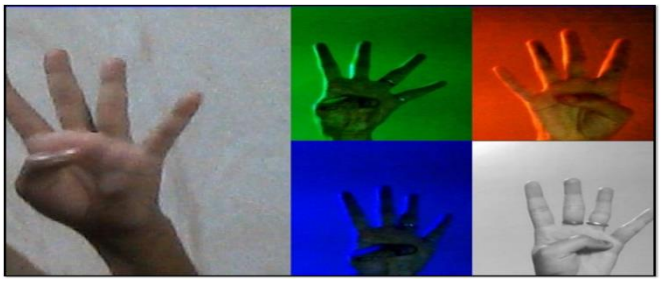

Image 7 Illumination Invariance

5) Space between the Fingers:

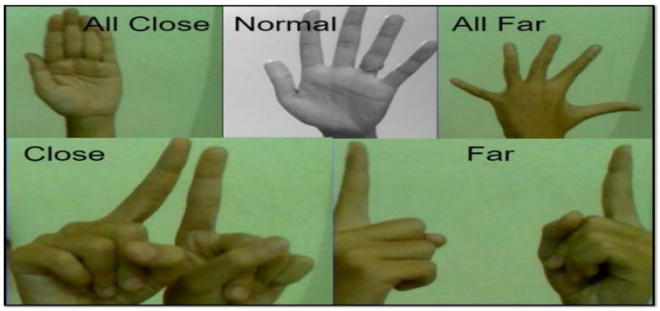

Image 8 Different Spacing between the Fingers

Ability to detect the sign even if fingers are close or wide apart.

V. IMPLEMENTATION

We have used Keras to build a model for hand sign recognition. There were many different models with different combinations of layers and the number of neurons built. Different hyperparameters need to be considered while building any neural network. This is the structure of our model used for hand sign recognition.

Our model architecture consists of a Batch Normalization layer followed by Convolution layers. We have used 6 convolution 2D layers (number of filters being 32,32,128,128,256,256 and kernel size as 3,4,3,3,3,3) each accompanied by activation function 'relu' and MaxPooling layer.

We then used a flattening layer to give input to the feed-forward network. Total 5 dense layers were used having 256, 128, 64, 32, 7 neurons that take 'relu' as an activation function. Dropout layers with a rate of

0.2 go along with each of these dense layers for regularization.

Sequential: A Sequential model is appropriate for a plain stack of layers where each layer has exactly one input tensor and one output tensor.

In the project, input tensors of size (n batches, 310, 310, 1) and output vector of size (7, 1) are used.

Batch Normalization: It is used to normalize the output of the previous layers. The activations/filters scale the input layer. Using batch normalization learning becomes efficient also it can be used as regularization to avoid over-fitting of the model.

1 batch normalization layer is used just before the CNN layers.

Convolution Layers: It is an important layer that is used to do image recognition, image classification, etc. Convolution is the first layer to extract features from an input image. Convolution preserves the relationship between pixels by learning image features using pixels of input data. It is a mathematical operation that takes 2 inputs such as an image matrix and a filter or a kernel.

In the project, 6 convolution layers are used. The motive is to keep adding layers until over-fit, after which the regularization techniques could be used for generalization.

The convolution layers were accompanied by activation function 'relu', the reason is that the images are naturally non-linear, so the rectifier function was preferred.

Kernels: The kernel is a filter that is used to extract the features from the images. In the project, 32, 128, 256 numbers of kernels are used in different Convolution layers. These convolution kernels act as a filter to create a feature map. Kernels of size 4, 3 were used because the benefit that smaller kernel size provides that it reduces computational costs and weight sharing and extract the more granular features as we move along the layers. The padding function used is 'same', doing this improves performance as it retains the information at the borders.

Pooling-layer Parameters: The pooling layer aims to down-grade the input (image, hidden-layer output matrix, etc.), reducing its dimensionality by keeping the max value (activated features) in the sub-regions binned to reduce the cost of operations. For the project, 6 max-pooling layers (size: 2) were used after every CNN layer.

Dense Layers: Dense layers are keras's alias for Fully connected layers. These layers give the ability to classify the features learned by the CNN. For the project, 5 dense layers are used (neurons as 256, 128, 64, 32, 7). Activation function 'Relu' is used for hidden layers while 'Softmax' is used for the output layer to classify the 7 outcomes (0-6).

Regularization: To over-fit the model, we tend to add more layers to the model. Once we obtain higher accuracy in our training set, we use regularization like l1 / l2 regularization, dropout, batch norm, data augmentation, etc. to reduce over-fitting. For the project, Dropout layers are used by switching off 20% of neurons in Dense layers.

Adam - The superiority of the Adam optimizer lies in its adaptive learning rate and is favored due to its relatively fewer parameters tuning.

Loss function: Categorical cross-entropy is used in the project as we have multiple classes where each example belongs to a single class.

Performance Graph of Model

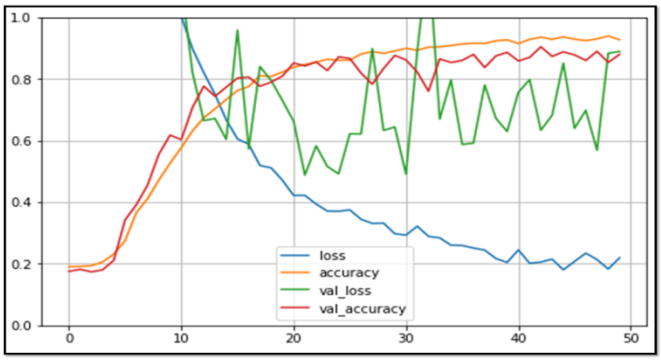

Image 9 Performance of the model

Below is the table-description for the models created for the project:
Model 10 was chosen as the final one as it stands out for the best performance in terms of accuracy and complexity.

Model	Input Image	Architecture	Training Accuracy	Validation Accuracy
1	64*64	2 Conv2D Filters (num=32,32; size=3,3) Padding = valid + 2 Max Pooling + 4 Dense Layers	92	77
2	64*64	2 Conv2D Filters (num=32,64; size=3,3) Padding = valid + 2 Max Pooling + 2 Dense Layers	86	70
3	128*128*1	2 Conv2D Filters (num=32,32; size=3,3) Padding = valid + 2 Max Pooling + 2 Dense Layers	25.6	23.43
4	128*128*1	4 Conv2D Filters (num=32,6,128,128; size=3,4,3,2) Padding = same + 4 Dense Layers	52.12	50.5
5	128*128*1	Batch Normalization + 4 Conv2D Filters (num=32,32,128,128; size=3,4,3,2) Padding = valid + 4 Max Pooling + 4 Dense Layers + Dropouts	52.71	56.76
6	180*180*3	3 Conc2D Filters (num=32,64,128; size=3,3,3) Padding=valid + 1 Max Pooling + 2 Dense Layers + Dropout	73	60
7	256*256	3 Conc2D Filters (num=32,128,256; size=3,3,3) Padding=valid + 3 Max Pooling + 3 Dense Layers	96	74
8	310*310*1	Batch Normalization + 6 Conv2D Filters (num=32,32,128,128,256,256; size=3,4,3,3,3,2) Padding = valid + 6 Max Pooling + 5 Dense Layers + Dropouts	91	88
9	310*310*1	Batch Normalization + 6 Conv2D Filters (num=32,32,128,128,256,256; size=3,4,3,3,3,2) Padding = valid + 6 Max Pooling + 5 Dense Layers + Dropouts	94	89
10	310*310*1	Batch Normalization + 6 Conv2D Filters (num=32,32,128,128,256,256; size=3,4,3,3,3,3) Padding = valid + 6 Max Pooling + 5 Dense Layers + Dropouts	92	88

Most of the models were disregarded because of their input size; the higher the image resolution, the better the accuracy.

Some were set aside because of the over-fitting that caused the higher error for the unknown inputs. (Model 7, 1, 2, 6)

Some of them were overlooked because they completely under-fit the training data. (Model 3, 4, 5).

Model 10 was chosen for the final evaluation because of the fine stability between bias and variance. (Model 9 is equally preferable though)

VI. FUTURE WORK

The system can be further extended to Game Intelligence where the machine can predict the number generated by the human in ROI. It will be challenging for a user to defeat the bot.

A voice module can also be added to increase the game's ability and agility. In this module, rather than making hand signs, a user needs to utter any random number.

The change of background with increasing its ability to detect off a variation can be made available. This will help to overcome the limitation of a plain background.

The web app can contain more information like user score per delivery, strike rate and high score till now, etc. A scoreboard can be further integrated to increase the creative aspect of the system.

VII. RESULT

This model uses human hand gesture recognition to determine the output. These experiments cover various models aimed to discover the best combination of layers needed that classify the fingers into separate classes. CNN is a multi-layered neural network that is one of the deep learning techniques used efficiently in the field of gesture recognition. On-going through the results, we concluded that CNN is the most appropriate method to be used in the hand gesture system because of its highly accurate result. We have used a machine learning approach to create a bot in this project. Chatbots based on machine learning do not understand the meaning of sentences. It learns how to respond based on previous experience. Though we have used some NLP functions, the actual process through which response is generated is using machine learning. As said earlier, we created the model and trained it with the intent file thus more diverse the intent file more accurate will be the result.

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Tape Hardware Compression and Source Based Data Deduplication

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ABSTRACT

Cloud Computing has become an important advance for business actions in industry at the present time. These decades are experiencing the fast development of cloud computing that results in a vast data produced every moment. The data compression is becoming more important as it helps potentially in transportation over the network and efficient data storage to the great extent. This leads to the requirement of huge data processing and computation which is not easily accessible at the user's end. This has already led to the evolution of cloud platform for data storage. But solution to one problem may give birth to the other problem. Similarly, the speed of uploading and downloading the data from the cloud reduces the data processing time. Current paper focuses on providing solution to this problem by compressing the data using efficient tape hardware. It mainly considers the multimedia data for compression and also uses a hybrid technology for source-based cloud data deduplication for data stored on google drive and other networks.

Keywords – Data Compression, Data Deduplication, Hardware Compression, Tape Drive, Hybrid Algorithm, Virtual Tape Library (VTL)

I. INTRODUCTION

The cloud computing is a predictable field of data communication and resource sharing in the modern era. The real meaning of its functioning, its limits and the development of new applications, becoming increasingly agile and collaborative, inspiring subjects for research. The data decompression is nothing but to restore the compressed data back to its original form. It is also termed as expansion. The data compression is used for saving the resources like disk space, time needed to transmit or communicate the data over the internet. The data which is to be handled and the information to be communicated are growing. In this situation the data compression technology is considered as the important factor to handle the information. Hence it is essential to have an efficient algorithm to compress and decompress the humongous data present in the real world and to reduce the work load of the system. The primary objective of the proposed research is to find the Hybrid algorithm to optimize the resource consumption mentioned above.

In following section tape hardware compression technique is explained.

II. BACKGROUD WORK

Tape hardware compression is a technique in which data are been compressed and stored in the tape libraries. In tape hardware compression the data are been stored in a tape drive. Tape drives are an offline archival data storage which uses magnetic tape to store the data in a compressed manner. Tape drives are similar to a hard disk drive that provide direct access to the storage [2]. To read a particular piece of data, the Tape drives physically wind tape between reels. Tape drives have a very large access time. But the data can be streamed fast if a required position has been reached. Tape hardware compression if faster than the other compression technique because it doesn't slow things down. Choosing a tape hardware compression technique provide fast access of data compression. It has a better compression ratio of more than 2:1.[2] It uses Virtual Tape Libraries (VTLs) to compress the data and stores it on the Tape drive. It supports the transfer rate of up to 150MB/s. The IBM TS1160 has a capacity of 20TB. [2]

In the paper, "Hybrid Data Deduplication Technique in Cloud Computing for Cloud Storage", the authors have designed the hybrid data deduplication for cloud computing. It fulfills the demands of users as well as applications. They have used the file level and chunk level deduplication. Using hybrid design the researchers could achieve the effective data deduplication for various types of data. The FFCD design showed results closer to FVCD for chunk size of 500 bytes [8].

In the white paper by Oracle, the performance of the Tape Drive is evaluated for different size of the data. According to the paper, the speed of the storage applications or the throughput speed are the limiting factors in evaluating the performance of the tape drive. The existing storage application with the throughput of 50-60 MB/s is not sufficient to achieve the maximum speed of 4GB SCSI FCP interface. The current tape drive technologies are not capable to read/write the data for the 4GB SCSI FCP interface. Oracle mainly focused on doubling the throughput and considering the native drive performance on StorageTek T10000 tape drive. It proved very efficient in solving customer problems [9].

Tape drives have built in compression algorithms. Hardware compression might be less useful for the data which is secured by data protection operations. If sometime the network becomes jammed then the tape drives can become ravenous for data.

The hardware compression is reputable on the data path level. This kind of compression is only available for data paths which directly connects with the data to tape libraries. Though the compression structure the data sends uncompressed data from the client computer through the data path. The tape drive hardware compresses the data before writing it to the media.

Data compression automatically switches back on, when data becomes compressible again. Both the compressed and uncompressed data can be recorded on a tape which will be marked accordingly for proper treatment during playback. Such intellect prevents the expansion of early compressed or incompressible data.

Though the incompressible data is being used while the compression feature of a tape drive which does not have an intellect compression feature. This can cause a 5 - 10 percent lessening in capacity.

A mathematical algorithm is used that reduces terminated strings of data and assists in data compression. This in turn confirms the increased storage capacities of data. The compression algorithm is implemented using hardware for tape drives. It removes the terminated level from the data by encoding the pattern of input characters in efficient way. If the data patterns are repeated then the data compression will be more. The data deduplication can be achieved for such repeated patterns. However, the hardware compression technique is not much useful if the data secured by data protection

operations is competing with the other data used for the network bandwidth. In such case, the tape drive will compress the data but the data will not be abandoned quickly. The drives must start and stop the media as early as the data is available. Due to this the performance of the compression is affected.

The paper says that, the hardware compression is faster than the software compression as it is performed by dedicated electronic equipment. Mainly this compression is applicable for data paths. The data paths route the data to the tape libraries. Before data is written to the media, it is compressed by the tape drive. The hardware compression is used for direct-connect

configurations in which the sub-client and mediaagent are attached with the same physical computer. The data transfer to the media drives is smooth in these cases. Once the data is received from the sub-client it is quickly compressed by the drive. The tape can store the more data per unit time due to the high-speed operation of the tape.

The only drawback of the hardware compression is that it cannot be applied for the disk libraries. Therefore, the software compression is used for sub-client for the data paths associated with the libraries [11].

The compression feature of any software package must be turned off when the compression is available in the tape drive hardware or firmware. It helps to reduce the processing overhead on the computer system. The compression ratio 2:1 means that the compressed file is half of the size of the original file [10].

III. HARDWARE COMPRESSION

It accepts the uncompressed data (say image) from the client computer and is sent to the media through the data path. Before writing to the media, the tape drive hardware compresses the data (e. g. image).

Fig. 1: IBM TS1160 Tape Drive [3]

IV. SOURCE BASED PRIMARY DATA DEDUPLICATION

Primary data deduplication is a relatively recent trend in the field of file-based system storage solution as compared to backup-based data deduplication. There is only one copy named primary copy of the data for which no backup copy is available.

The main challenges for primary data deduplication are that the proposed system should be able to balance the system resource consumption (CPU/memory/disk I/O) with the deduplication space savings and the deduplication throughput i.e., the speed with which the data is being send to the cloud server after compression [2].

Following are the main requirements for the system that are identified.

A) Optimize for the Uniqueness of the Data

The optimization for the uniqueness of the data can be achieved using hardware compression. The bulk of the data can be unique on the contrary to the backup-based data deduplication where 90% of the data is duplicated.

B) Broadly Used Platform

Specifically, it must run hassle free and efficiently on a broadly used platform like the windows server 2012.

C) Minimum Requirements

Particularly, it must run-on low-end servers and should be able to accommodate huge variations in workloads and different hardware platforms.

D) Friendly Primary Workload

The proposed system cannot assume that it will be having access to dedicated resources and hence must yield to primary workload.

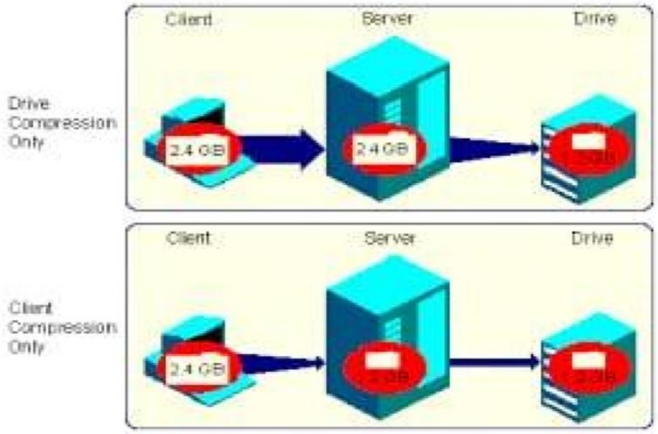

Fig. 2: Tape volume capacity and data compression.

V. MATHEMATICAL EQUATIONS

Usually, the hardware compression is much faster than a software compression because as disparate to the software compression it does not use a computer processor which draws from resources. The following is the illustration for the same.

If we have 200 MB of data under existing system.

(i) Using Tape Hardware Compression Alone:

If the compression ratio is 2:1 then 200 MB data is compressed to 100 MB.

(ii) Using Source Based Data Deduplication Alone:

If the compression ratio is 3:2 then 200 MB data is compressed to 133.3 MB.

Under proposed system first we use DATA DEDUPLICATION at software level so 200 MB gets converted to say 134 MB. Then, we use TAPE HARDWARE COMPRESSION at the hardware level so 134 MB gets converted to 67 MB.

Therefore, Compression Ratio Achieved using the proposed Hybrid Algorithm is, available in the tape drive hardware. The compression features the software package which should be turned off. This reduces the processing load on your computer and also the hardware-based compression which is naturally much more effective.

VI. VIRTUAL TAPE LIBRARY (VTL)

A **virtual tape library** (**VTL**) is a data storage technology used in general for backup as well as recovery purposes. It presents a logical view of the physical storage resources to the host computer. [1]

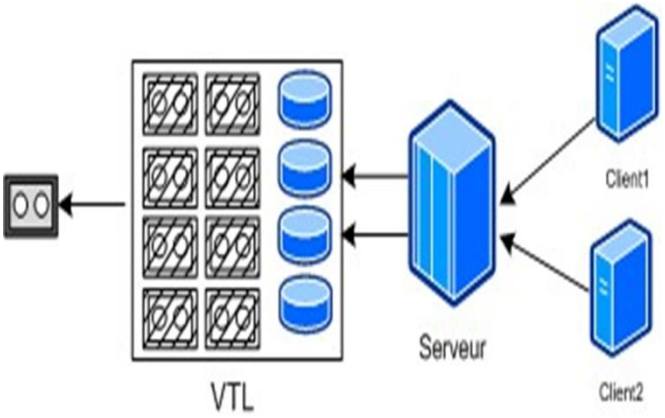

Fig.3: Virtual Tape Libraries (VTLs) [4]

VII. CONCLUSION

In this proposed work, we are making a Hybrid technology using tape hardware compression and source-based data deduplication. Source based data deduplication compresses the data (i.e., 2:1 ratio) and then it interacts with the tape hardware system to store that compressed data into more compressible manner (i.e., 4:1 ratio). We are combining the hardware compression and the software compression to obtain a lossless form of data upload and unload. We are using tape hardware so that the amount of time taken in uploading and retrieving the data becomes faster. We are working on the algorithm how to connect the two data compression technique and form a hybrid of it. So that this technology may be useful in future.

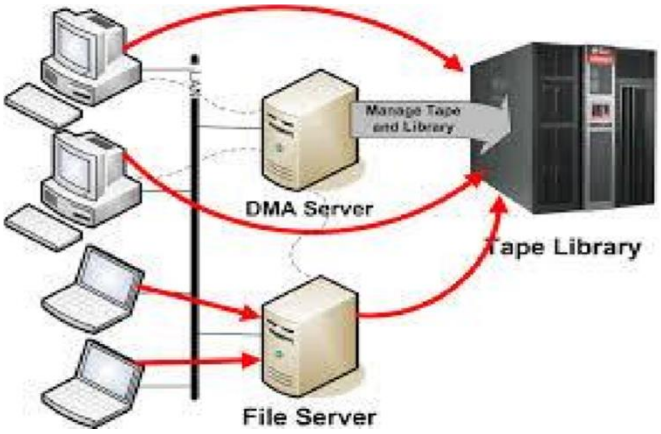

Fig. 5: Checking Tape Driver Performance

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Impact of Risk Factor in E-Commerce

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ABSTRACT

This research work is an effort to develop a scale for exploring the impact on various risk factors about E-commerce. With the assistance of Exploratory correlational analysis, three factors like Financial and Convenience Risk (FCR), Perceived Trust (PT), and merchandise and Delivery Risk (PDR) were extracted, accounting for 54.8% of the total variance explained. The study considered the impact of six major risk dimensions and trust on behavioural intentions of youth online shoppers. The study is expected to act because the foundation for future investigations in the impact of assorted risk dimensions on online shopping behaviour in the Indian context. Testing the statistical significance of the revised conceptual framework on a bigger sample size would be the long-run agenda of research.

Keywords : Financial and Convenience Risk (FCR), Perceived Trust (PT), merchandise and Delivery Risk (PDR)

I. INTRODUCTION

E-Commerce has been one of the rapidly growing business segments in developing countries like India. As per a consultation paper by IBEF, India's e-commerce sector is anticipated to achieve 14838 billion by 2026 from 20856 billion in 2017. Growing riddling on the internet, a steady rise's income, a young consumer base, and aggressive business strategies by e-commerce players would act as a catalyst for such a stupendous growth. Online consumer behaviour has been one of every of the widely discussed research domains in western parts of the globe. With the appearance of e-commerce evolution in India, the requirement to explore India's specific cultural and behavioural aspects in Ecommerce has aggravated.

Across the world, TAM (Technology Acceptance Model) by Davis is widely wont to study the human-technology interaction. Researchers studied E-commerce behaviour in the Indian context by testing the TAM construct. Based on this conceptual model, this research work aims at developing a scale that may be utilized further for an outsized size sample study to explore E-commerce behaviour amongst the Indian youth (15-35 age group). Considering the improvement in internet connectivity, lowered the cost of smartphone acquisition, and availability of E-commerce services in Tier II, III cities in recent times, a close investigation in perceived risk

dimensions. By developing India's specific scale of risk dimensions and their interplay with behavioural intentions this research work would have a significant contribution to the present knowledge domain.

II. LITERATURE SURVEY

E-commerce and related behavioural aspects have attracted serious interest amongst the research fraternity globally. To know the theoretical base, the researchers reviewed about 20-30 peer-reviewed research papers which target various risk dimensions or on trust and their interplay in the context of Ecommerce behaviour. The small print of our observations and corresponding research as quoted as below,

Perceived Risk in E-commerce: in step with Li and Huang, the concept of perceived risk in E-commerce may be divided into two parts, the probability of a loss and also the subjective feeling of unfavourable consequences. It had been observed that perceived risk and trust act as antecedents of a user's deciding just in case of both the models. Similarly, proposed and validated the moderating role of perceived risk on the relationship between four benefits (perceived convenience, product variety. The author also underlines the requirement to possess a detailed investigation of the interplay between risk and intensions, especially in developing countries because the system infrastructure in these economies is yet to develop satisfactorily. Various Risk Dimensions: The literature found evidence of varied risk dimensions considered by the previous researchers. The discussion on these dimensions is as follows:

A. Delivery Risk:

Dan et al. This aspect is said with a possible loss to the patron because of wrong delivery of products, goods sent to the incorrect address, or quantity of the products ordered not matching to the products delivered.

B. Performance Risk:

Performance risk is defined because the loss incurred when the merchandise is chosen won't perform as desired. A number of the researchers clubbed the merchandise performance and merchandise risk together during a single construct. However, this research treated performance risk separately to unearth the precise risk dimensions

Net loss of the cash. This refers to the perceived loss or possibility of monetary damage occurring from non-delivery or delivery of the faulty product. It analysed the impact of economic risk together with five other risk dimensions on a user's intention to continue with E-commerce. The research found a significant negative impact of monetary risk on intentions to buy online. Similarly, found a negative impact of economic risk on behavioural intentions in numerous contextual settings.

C. Privacy Risk:

Privacy risk because the user's concerns related to a potential breach of privacy or improper usage of data for fraudulent activities. The research observed that the perceived risk related to misuse of personal information acts as a serious obstacle in consumer's e-commerce intentions.

D. Time/Convenience Risk:

This definition also considers time lost in terms of delivery of the merchandise (late delivery, delivery on wrong address, no delivery). Forsythe et al. found time or convenience risk as a powerful predictor of behavioural intentions while it was failed to find a significant impact of your time or convenience risk on intension.

E. Product Risk:

A critical appraisal of the present literature base reveals that the merchandise risk is studied in two different contexts. The primary approach deals with the inconvenience caused to the user thanks to a faulty product or the particular product not meeting the specifications shown on the website. Another aspect is said with the post-purchase performance of the merchandise. For this study, we've considered product performance as a separate factor altogether. E-commerce behavioural studies altogether these studies, trust was found to own curtailing effect on perceived risk. In nutshell, because the trust of a user in the system grows, the perceived risk in E-commerce diminishes considerably.

III. RESEARCH MODEL

The conceptual model of the research is based on Banerjee and Vidyasagar (2019). This research wor presented a conceptual model comprising of six dimensions of risk (financial, privacy, product, performance, delivery, and time) and trust as determinants of online shopping behaviour. This research work would like to survey to check the suitability of this model and the instrument designed for a large-scale survey in the future.

A. Instrument development process:

In any inquiry, it is vital to have an instrument that can be tested on information collected from the respondents. The researcher has two options to exercise, either to use a previously validated scale or to develop own instrument by employing a standardized procedure. Since this research aims to explore the impact of varied risk dimensions and trust on online shopping behaviour amongst the Indian youth, it had been decided to develop a personalized scale for conducting the research further.

B. The pooling of the statements:

Banerjee and Vidyasagar (2019) presented a literature synthesis on existing research work available on risk dimensions and trust and its corresponding impact on online shopping behaviour (in Indian or in a global context). Taking a clue from this research, a conceptualized model for the research was developed. For developing a greenhorn scale, all papers considered various risk dimensions and Trust because the determinant of online shopping was studied and items from previously validated scales were collated together.

C. Expert Opinion Method:

So on test the face validity of the instrument, the draft questionnaire was sent to a panel of experts for his or her valuable suggestions. The involvement of the experts during this task was voluntary and no remuneration was offered to them for this assignment. All the experts were asked to rate the items on the thought of their perceived importance (1 = most important and last being the littlest amount significant). On the premise of the mean ranking of each statement, a threshold was set and thus the things were selected for the questionnaire. Supported the inputs by the experts, necessary changes in the wording of the instrument were incorporated, and also the draft questionnaire was prepared.

A total of 38 statements related to eight variables were taken together for the formulation of the draft questionnaire.

D. Reliability of the instrument:

Reliability Analysis is that the opening conducted in any quantitative survey-based research. Reliability of the instrument refers to the degree to which the study is predicted to deliver stable and consistent results. Seminal work by Cronbach (1951) is taken into account because the base for reliability calculations by an oversized set of researchers and is named Cronbach's Alpha. The statistical analysis on the info collected indicates that the general

instrument reliability stands at 0.957, which is much above the edge limits.

IV. RESEARCH METHODOLOGY

In the first stage, we will use the sampling method to get the nod of the population. In the second stage, we will explain the methodology of the Research Paper.

A. Population, Measurement and Sampling Technique:

To verify questions Causes by this research we conducted a Survey Form with the help of a sampling Method using google Forms. The Survey Form was Plot to investigate all the data variables are there in the Research model indicate that the Survey Form was reliable and therefore the Cronbach Alpha value was (0.68). The Survey Form was designed asper the Likert scaling technique.

B. Data Collection

Researcher have collected the info using google forms. Authors got the responses from 172 people across India Out of which 71.5% are Male and 28.5% are Female. Data is collected through the Likert scale. during this response, we ought to understand how frequently users are using E-commerce for shopping and of which age of individuals are using it frequently supported this we've got done the test.

C. Explanation and Analysis

Demographic Test: The demographic profile of the respondent is showing during this table (knowledge of all the respondents). Table 2 shows No of respondents which is 172 respondents in which 123 are male and 49 are females. In age, under 20 are 16

- (9.3%), age 20-30 are 82(47.6%), age 31- 40 are 55
- (31.9%), age 41-50 are 16 (9.3%) and above 51 are 3 (1.7%).
- Purchasing items from e-commerce over 1.5-2.5 times per year:
- 19.18% 1.5-2.5 times per year: 9.18% over 1.5-2.5 times per month: 42.81% 1.5-2.5 times per month: 23% Never: 10.09%.

Table 1. No of respondents

Respondent Demographic	Frequency	Percentage
Gender(N=172)		
Male	123	71.5
Female	49	28.5
Age(N=172)		
Under 20	16	9.3
20-30	82	47.6
31-40	55	31.9
41-50	16	9.3
above 51	3	1.7
Times Purchased		
In year	=< 1.5-2.5	26.36
In month	=< 1.5-2.5	64.51
Never		10.09

Source Data: snapsurveys.com

D. Reliability test

Reliability Analysis is that the commencement conducted in any quantitative survey-based research. Reliability of the instrument refers to the degree at which the study is predicted to deliver stable and consistent results. To get the measurement of proposed model and reliability assessment we are using Cronbach alpha method. The projected values of Cronbach's alpha are used as shown in table 2. During this table, the Cronbach's alpha values are between from 0.71- 0.89 which shows that every data has high upstanding. Alpha of monetary Risk is 0.89, alpha of Product risk is 0.71, alpha of Privacy risk is 0.82, NDR alpha is 0.77, and alpha of Performance risk is 0.92.

Table 2 Projected values of Cronbach's alpha

Construct	Valid N	Number of items	Cronbach's Alpha
Financial risk	172	3	0.89
Product risk	172	5	0.74
Non delivery risk	172	4	0.77
Performance risk	172	5	0.71
Privacy risk	172	5	0.82

Source Data: researchgate.net

The KMO evaluates the capability sampling that checks whether the responses of samples are accepted or not. It must be around 0.6 for a good correlational analysis to start. If the cost of KMO is a smaller amount than 0.6 than it's not acceptable. The worth of KMO for Financial Risk is 0.77, value of KMO for Product risk is 0.82, value of KMO for performance risk is 0.83, and value of KMO for Non delivery risk for 0.86, value of KMO for Privacy is 0.81. Bartlett's test is preferred for strength of correlation among variables.

Table 3. Types of Risk

Constructs	Number of items	KMO-measure of sample adequacy	Bartlett's Testsphericity chi-square test	Bartlett's testsphericity significance
Financial risk	3	0.77	356	0.00
Product risk	5	0.82	328	0.00
Non delivery risk	4	0.86	1023	0.00
Performance risk	5	0.83	289	0.00
Privacy risk	5	0.83	293	0.00

Source Data: inovies.com

E. Total Variance and Eigen-values

Elements of the construct are stated Principal components that have Eigen-value over one. It's possibly best to run a primary analysis with the Eigen-value quite 1. Table 4 shows all the eigenvalues and every one variance described for construct. The financial risk which has 3 items described the variance of 61.253%. The merchandise risk which has 5 items described the variance of 63.382%. The performance risk which has 5 items described the variance of 71.891%. The non-delivery risk which has 4 items described the variance of 55.467%. The privacy risk which has 5 items described the variance of 70.889%.

Table 4. Eigenvalues & variance

Component	Total	%of variance
1	1.865	61.253
2	4.690	63.382
3	2.259	71.891
4	4.622	55.467
5	1.398	70.889

Source Data: researchgate.net

V. CONCLUSION

Supported previously conceptualized research model, this research paper aimed toward developing and validating a scale. Based which analyses the impact of varied risk dimensions an trust on online shopping behaviour. Six risk dimensions like financial, product, privacy, time & convenience, performance and delivery were considered within the construct. It absolutely was proposed that these six dimensions

together with trust would act as determinants of online shopping behaviour amongst the Indian people. The conceptual model was proposed and the draft questionnaire was tested on a sample of 172 internet buyers falling in a cohort of 15 to 65. Cronbach's Alpha reliability score for the draft questionnaire stood at 0.78, indicating the suitability of the instrument for larger sample collection and analysis. To explore the latent structure underlying the massive data, EFA was conducted and therefore the process extracted three factors like Financial and Convenience Risk (FCR), Perceived Trust (PT) and products and Delivery Risk (PDR). These five factors accounted for a complete variance of 63.57%. Supported the results of the correlational analysis, a revised conceptual model was proposed. Based on p-value we reject the null hypothesis saying there's no risk in e-commerce and accept the alternate hypothesis.

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COVID-19 Effects on Electronic Shopping : A Review

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ABSTRACT

was before 25 years in 1994 when the first documented online purchase was made. Since then, Online shopping has grown exceedingly to make millions and trillions today. The COVID-19 is a infectious disease that spreads mainly by droplets generated when an infected person sneezes or speaks and by touching infected surface as well. Hence, it is suggested to maintain a safe distance and avoid touching unknown surfaces. Following these guidelines people avoided offline work including shopping. In this way online business got a lot of promotion immediately. Few industries have luckily experienced tremendous growth during and after COVID-19 but few have even faced losses as never before. This is based on the kind of product we take in consideration. In this paper we have attempted to analyse and predict the online shopping market before and after the pandemic applying various Supervised Machine Learning algorithms on the data available for Maximum accuracy. This Research will help online businesses to make more profit analyzing the public demand and the conditions.

Keywords - Online Shopping, Accuracy, Market Analysis and Prediction, COVID-19

I. INTRODUCTION

UNCTAD says that the acceleration in online shopping habits due to the COVID-19 Pandemic is expected to have a long lasting effect.[3]For example : almost doubled sales of groceries in march 2020 compared to before months suggest that e-commerce is being taken by Americans much faster. This is due to physical store closing due to corona virus. The statistics from adobe analytics(2020) tell that there has been an overall increased with 25% in e-commerce.[1] The Pandemic offered the forced opportunity of digitization to the population and the countries, it has benefited the online market the most, in all aspects.
This Paper deals with the insights about the online market before and after the pandemic. This Paper will help the businesses to understand the key drivers boosting the online market in US.

II. RELATED WORK

Helin Oven and Melissa Hicintuka in "Covid-19: How Does it affect international e-commerce firms? A qualitative case study about how the Covid-19 situations affects e-commerce firms and how they respond to it", by Qualitative research method tried to explain in what ways external impacts can affect e-commerce business. According to their thesis the commerce firms have been affected in different ways based on the type of there firm.[1]

United States Census Bureau, in "Quaterly Financial Report: Large U.S. Retail Trade Corporations, Third Quarter 2020" under Third Quarter 2020 confirmed that seasonally adjusted profits after tax of U.S. retail corporations with benefits of $50million and over totaled $43.4billion, upto $4.7(±0.2)billion from the $38.8billion recorded in the second quarter of 2020. [2]

III. DATA DESCRIPTION

For our work, we are using data of U.S. online sales present on Statista. The data set contains information about the e-commerce in recent years. To present a clear Report we have consider the data for only one country that is U.S.

IV. RESEARCH METHODS

We used our observation, exploratory analysis and the proposed experiment method for the Review using Machine Learning regression algorithm.

A. Random Forest

A group of regression trees, made from the random selection of samples of the training data is known as Random Forests [6]. A random forest is a predictor made of a collection of random regression trees[7]. Random forests are more accurate and efficient as the observations are finalized with number of classifiers and the model with the best accuracy is chosen.

B. Decision Tree

The values of attributes for the provided data decides the grouping of data in the Decision Tree[6]. In a decision tree each node represents a feature (attribute), each link (branch) represents a decision (rule) and each leaf represents an outcome (categorical or continues value) [9]. The main motive behind plotting a decision tree is to plot the whole data and process a final outcome.

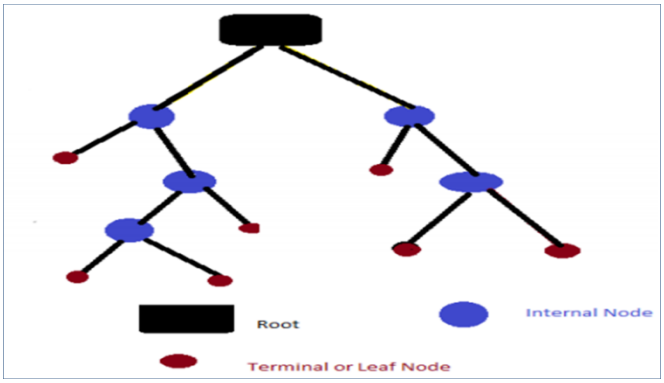

Fig 1. Tree Structure [6].
This Figure describes the structure of a tree [6].

V. EXPLORATORY ANALYSIS

AVERAGE VALUE OF ONLINE SHOPPING ORDERS IN UNITED STATES AS OF 2ND QUARTER 2020, BY DEVICE	
DEVICE NAME	**PERCENTAGE USAGE**
Desktop	131.16
Tablet	96.75
Mobile Phone	90.82
Others	63.72

Fig 2: table showing percentage usage for various devices for online shopping
Data Source : Statistic 2021

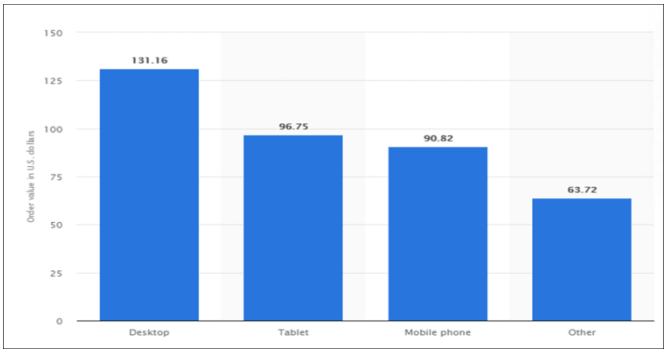

Fig 3: graphical representation for the data shown in figure 1.

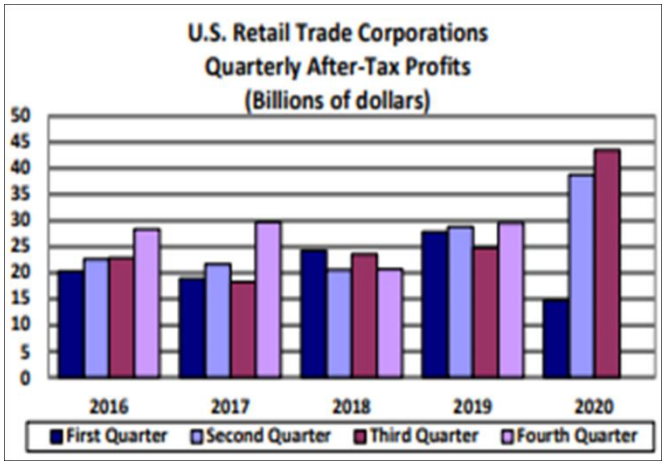

Fig 4: Adjusted Data only for Seasonality but not changes in price

Source: U.S. Census Bureau, Quarterly Financial Report, December 8, 2020

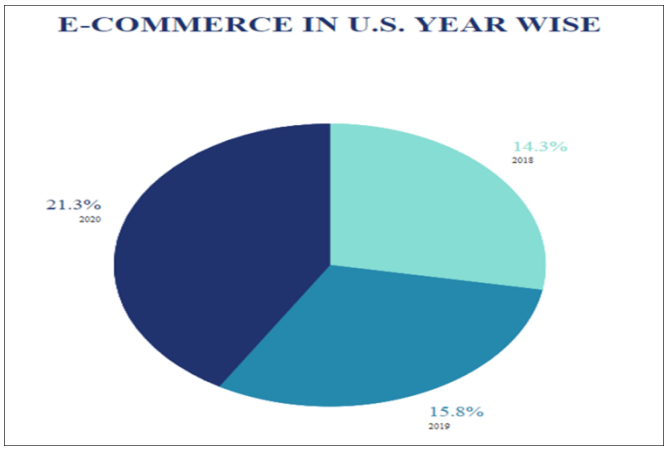

Fig 5: Pie-Chart for E-Commerce Penetration in year 2018, 2019, 2020.

Data Source : Digitalcommerce360

Fig 6: Comparision between Growth of E-Commerce and total retial sales.

Source : Digital Commerce 360, U.S

This figure clearly shows the drastic increase in the e-commerce sales from the year 2019 to 2020 (during the COVID-19 pandemic)

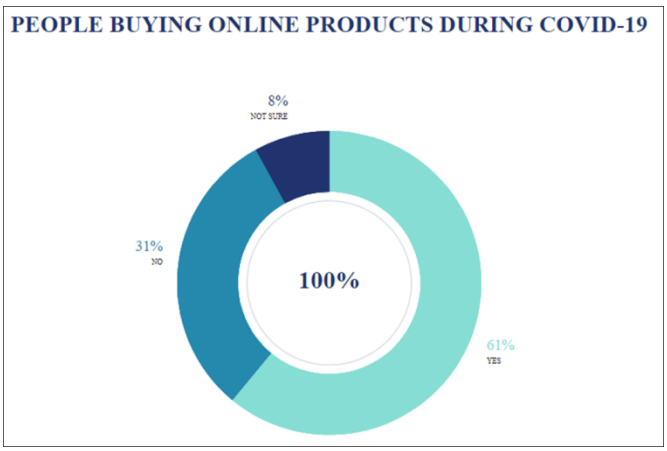

Fig 7: People buying online products during COVID-19. [5]

These figures clearly indicate that COVID-19 has boosted the online shopping market surprisingly.

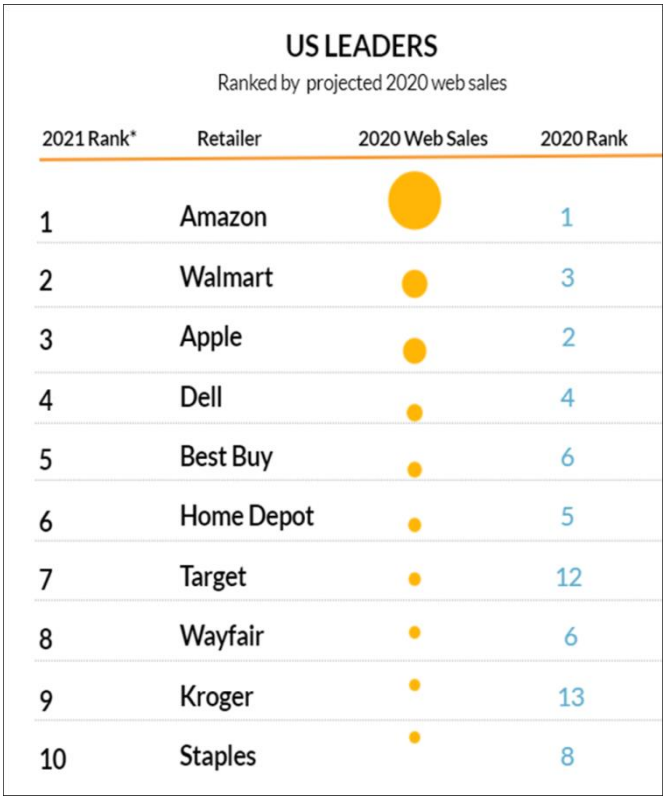

Fig 8: Top 10 Retailers in U.S. for online shopping with their 2020 Rankings.

Source : Digital Commerce 360.

VI. RESULT AND DISCUSSION

With the implementation of lockdown people were in a way forced to switch to digital work and digital market as compared to offline interactions. Though the situation due to the pandemic was entirely new and unexperienced for most of the public but now, with time people have adapted to the circumstances and have learnt the new technologies realising the current demand of time.

Now since, people have learnt the technologies, learnt how to operate it, have gone through the experience and hence, realised the benefits as well as harms about it.

Now, even if COVID has slowed down as compared to before but people have already adapted

VII. CONCLUSION

After analysis all the available data we come to conclude that online business market got a huge boost of income after COVID-19.

Hence, we can say that the people are getting more attracted towards internet shopping during Corona Phase.And keeping in mind the current trend we can expect to see similar trend for coming years.

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Online Medical Diagnostic System

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ABSTRACT

Health is a very important aspect of life: "Health is Wealth". So, to stay fit and fine is very important and the importance of health has been increasing day-by-day, as the life is becoming stressful which ultimately leads into many health disorders. Diagnosis of a disease can be done by a Doctor and in many other ways. People often think that some simple looking thinks like allergies, etc. can be cured by themselves which in order, leads to some big health disorder due to improper diagnosis of the same. This paper discusses about the Online or Web Based Medical Diagnosis System. This is basically a process of three vital parts: Patient's Registration, Diagnosis and Treatment and Health Monitoring.

Keywords – Online, Diagnosis, Health, Reports, Patients, Doctors, Medical, Corona

I. INTRODUCTION

Health is very essential. But now-a-days, almost every person is suffering from one or another disease which ultimately leads in increase of number of patients demanding number of Doctors. According to the latest statistics by WHO, in India the ratio of doctor and patient is 1:1456. The importance of Diagnostic centre came in from the late 19th century and came into force in 20th century with many innovations and discoveries.

As the patients are increasing, the numbers of diseases are also increasing. As a result, many different ways of healing a single disease or disorder are increasing. This is making it difficult for the doctors to plan an accurate methodology for the treatment of a disease. Doctors really are giving their best to the society as their duty.

World is becoming digital and has made many remarkable innovations and discoveries in the field of Medical Diagnostics too. We are able to experience Online methods for booking the tests prescribed by the concerned Doctors. Hospitals or Diagnostic Centres have their own Websites or Apps for the same which makes it easy for the patient as well as for the doctors and technicians to generate the Reports and make it available as soon as possible to the patients. The key role and the benefit of this system is that, many people at the same time and from anywhere can make use of this facility, which is less time consuming. But with this, many mistakes or errors, fraud etc. go hand-in-hand.

II. RELATED WORK

Raenu Kolandaisamy and Rafidah Md Noor had presented a paper regarding the same in the year 2016 named as: Web Based Online Medical Diagnosis System (WOMEDS). In this paper, the new system has been developed which is known as Web Based Online Medical Diagnosis System (WOMEDS). This system has the features for users to do diagnostics for the health problem and also the system will provide some health monitoring and tips for the user to follow.

Digital Pathology Research Paper: Attitudes and practices in the Canadian pathology community by Magdaleni Bellis, Shereen Metias and Christopher Naugler includes some basic facts related to the Digital Pathology as it is an emerging field.

Errors in pathology and laboratory medicine: Consequences and prevention by Sandra C. Hollensead, William B. Lockwood and Ronald J. Elin discuss about the errors or mistakes done by the Diagnostic Centres and in the field of Pathology.

There are more such papers or reviews which are related to many different topics that come under the field of Pathology or Diagnostic Centres.

III. ANALYSIS

According to our research, the necessity for Online Diagnostic Tests services was as it is increasing day-by-day and it got an immediate boost in this pandemic situation of COVID-19. The main reason for the boost in this system was due to many facilities including some medical services like Private Doctors, clinics were not available for the people during Lockdown. And in order to decrease the spread of Corona Virus, Lockdown was an essential tool. This gave a boost to not only Online Medical Services but, to many other industries too.

Along with increasing digitalization, it has been observed that threat of fraud, security and privacy is also increasing day-by-day. Due to this, the result in the reports may be wrong. And this ultimately leads in patients in taking wrong direction and wrong mode of treatment. Not all the fraud cases come out and due to this, many people suffer problems which affect their life in the long run. Below mentioned are two simple Case Studies.

A. Case study 1:

This Case Study discusses about not only one but, many such cases that happen every day. The discussion is about the "Fraud" that takes place on the name of some disease. We are experiencing this from a long time that sometimes the Diagnostic Centres make a fake report of some disease and put it in front of the patients so that they can wrench money from the people. Considering the pandemic, this has happened with many of the people when they had undergone a diagnosis to know whether they are suffering from Corona or not. Many Offices and Institutes have also faced this problem as these Centres made a fake report and mentioned that each one of them is "Corona Positive".

B. Case Study 2:

Due to this Online System for Diagnosis of a disease, a facility for sample collection and report delivery at the door step has also been made available. In this, a lab technician has to visit the patients house for the collection and after generation of Reports, a delivery person has to visit the patients place. And this increases the risk and threat of Robbery, Murder for the sake of Money or any other criminal or illegal activities and behaviour which puts in trouble to patients and their family members. Fraud people, thiefs, murderers may get ready as a Lab Technician and visit peoples house and by wrong means, they can harm the people. As far as the pandemic is considered, many such cases happened where, a group of people use to get themselves ready as a lab technician and make fake ID and loot the people by

saying that the Government has sent them for the surveys or for testing people whether they are Corona Positive or not.

IV. ADVANTAGES

Due to Online Tests Booking facility, it has made easy for the people in time management instead of visiting and waiting for the number to come in sequence. With online Report generation, it has also provided us with the facility that the concerned lab technician can visit the patients house for the sample collection and if the reports are needed in paper form, they can also courier the Reports. This again saves a lot of time of the people. Not all the Diagnostic Centres are fraud but, some are really good at the services, looking at the accuracy of the results. They even offer good discounts and offers for the regular patients and so on. These centres are really helpful for the people. Some of them also have the facility of consulting doctors either online or by booking an appointment with the concerned doctor online. This is helpful for the aged ones or for those who stay alone or for those who stay away from their family, etc.

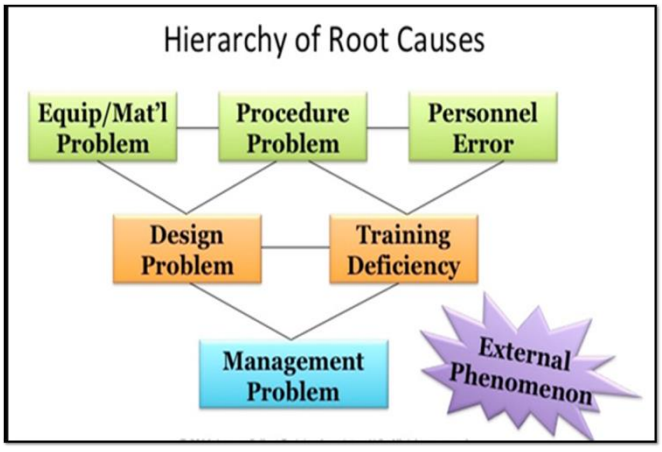
V. DISADVANTAGES

Diagnostic Centres have a facility of Online Booking for the Tests and the Reports are generated digitally and are sent to the patients through E-mail. Many-a-times, it happens that someone else's reports have been sent to someone else or the reports are not been sent on time in spite of requesting for the same on urgent basis. It has been also observed that the reports are not accurate and up to the mark. What takes people here is because of the offers or discount these centres offer and apply. Off course, Money is essential in order to live life peacefully. This is how people are running a business and playing with the health of patients and on top of that, the Diagnostic Centres refuse to accept their mistakes. This puts common people in trouble because they have to bear a severe loss of Money as well as health sometimes. Also, the fraud cases has been discussed above in the Case Study section.

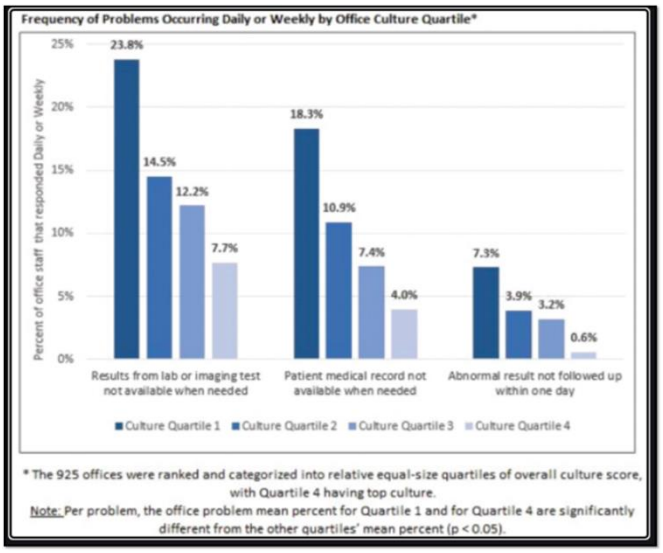
VI. RESULT AND DISCUSSION

Due to the implementation of Lockdown, people were forced to switch on the Digital platform as compared to offline interactions. As the pandemic situation was new, unexperienced and unexpected where everything became Online, it took some time for the people to get adjusted. But now as almost everything is as before, people have accepted the situation and the challenges that they are going face due to COVID-19. Also, people have accepted the emerging technology and digitalization and have learnt them considering it as a demand of current time. As a result, people are now aware of the benefits as well as the harms of digitalization.

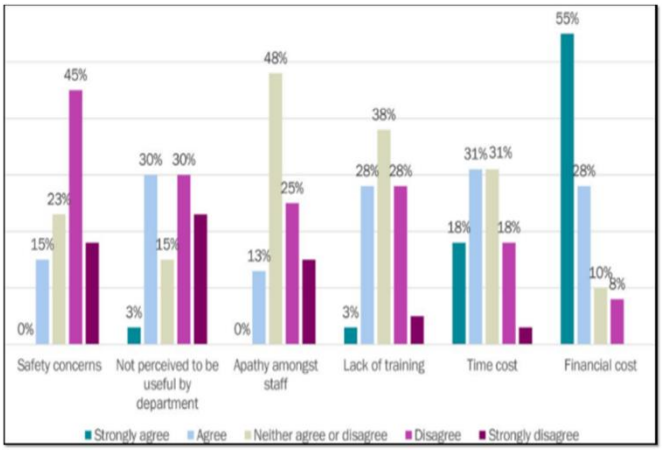
The image mentioned below shows what are the root causes for the errors and mistakes that we are experiencing in the field of Pathology or Medical Diagnosis.



The graph below is about the Office Culture Quartile. It discusses about the four quartiles which show the percentage of mistakes or errors done in the field of Pathology or Medical Diagnosis.



The below mentioned graph discusses some of the barriers with respect to the field of Pathology or Medical Diagnosis after doing a survey.



VII. SUGGESTIONS

Due to boost in the Digitalization, the threat of security has also increased. As mentioned in the above sections, many fraud and illegal practices took place, are taking place and are going to happen in future too. It is very difficult to keep each and every piece of data safe in this highly populated world where tons of data is generated every millisecond. But, some suggestions can definitely make our systems stronger and safer.

Suggestion for the Online Medical Diagnosis System is that, we can have an application or website through which people will be able to track the status of their Diagnosis when given for it. For example, there are many tests which need a time of few days for the results to be generated. In such cases, sometimes it happens that some or the other step of processing is left out and finally, the result of the test generated is not correct and accurate. This increases the threat of life of the patients. And many-a-times, the staff at Diagnostic Centres don't accept their mistake where in turn, the people have to face problems.

The suggestion about the tracking system given above can be useful for those tests whose processing cannot be done at a place and it has to be sent to some different place for processing. So the sample can be collected and can be sent to a different place for processing but, the patient need not visit that place unnecessarily when their work is not done. The patient can track the status of the processing and accordingly visit the place for report collection or for further treatment. This will help people with time and money management both.

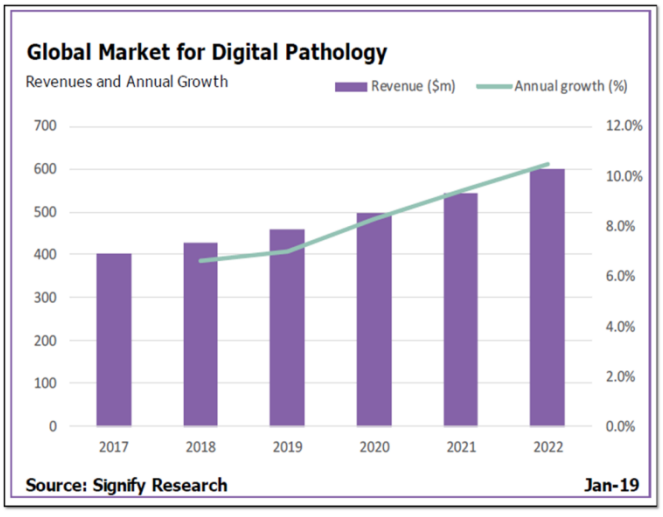
In this way if we try to implement the tracking system for status of diagnosis, it we help us in making less mistakes. Also, people will have a proof with them via this app that they can use if any mistake is done from the Diagnosis Centre's side.

Another suggestion is that, we can send the details of the Lab Technician who will be visiting the patients place for sample collection. This feature can be added to the app. This idea will increase awareness among the people as well as, it will decrease the risk and threat of any criminal or illegal activity. People will be alert beforehand and if still some activity takes place, then the people will be able to produce proof for the same. Very few Diagnostic Centres or

Hospitals provide this information with the patients but not all. Considering safety as an essential tool, our system needs to modify some things.

Along with this, many-a-times there is a confusion between the patients of similar names. This also can be avoided if we implement the following method i.e. after collecting the sample of the patient, the patients will immediately receive a message regarding the details of their sample which will include the things like- Name of patient, name of the test, time of sample collection, in what type of condition is it kept, in which section it is kept, name of the Doctor, estimated date and time when the reports will be received by the patient, etc. This feature can also be added to the app in order to avoid confusion.

As Digital Pathology is the emerging industry which is a sub-field under pathology, which mainly focuses on the data management based on the information generated from digitized specimen slides through the use of computer-based technology. It also uses Virtual Microscopy. This goes hand in hand with the Online Medical Diagnosis System and hopefully will help us reduce errors.



The above mentioned graph represents the predictions of Global Market for Digital Pathology.

VIII. CONCLUSION

After analysing the available data we can come to a conclusion that due to pandemic, digitalization has got a huge boost. We can say that people have turned to Online means for making every necessary thing available and are now well adapted to the situation. People are expecting similar trends of digitalization in the coming years too. Like Digital Pathology, more such fields are likely to emerge in the upcoming years.

IX. ACKNOWLEDGEMENT

This review was supported by MIT-WPU Institute, Mrs. Varsha Sontakke, Assistant Professor. We thank our colleagues from MIT-WPU Institute who provided insight that greatly assisted the review, although they may not agree with all of the interpretations/conclusions of this paper.

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An Overview of Various Analytical Methods for Solving One Dimensional Wave Equation

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ABSTRACT

Partial Differential Equations has many physical applications in various fields such as Hydraulics, Mechanics and Theory of elasticity and so on. They have much wider range of application than Ordinary Differential equations which can model only the simplest physical system. Laplace equation, Navier-Stokes, Wave& Heat equations play a vital role in Fluid Dynamics & Electromagnetism. Schrodinger's equation constitutes a fundamental part of Quantum Physics. In Partial Differential Equations, one dimensional wave equation is one of the major mathematical problems whose governing equation signifies transverse vibrations of an elastic string. To get the solution of wave equation, various analytical as well as numerical methods are available..In the present article, we take an overview of some of the analytical methods. Separation of Variables is most commonly used method for wave equations. In which, given function is expressed as a product of two single variable functions which reduces the partial differential equation to two ordinary differential equations. Determining the solution of these ordinary differential equations with boundary conditions defines the general solution of wave equation. D'Alembert's method is transforming the partial differential equation by introducing two new independent variables corresponding to an explicit solution of wave equation along with boundary conditions. In Laplace transform method, the transform is used with respect to one of the variables. This converts to an ordinary differential equation, which gives the solution by boundary conditions. Another approach to find the solution using finite Fourier sine transform is also cited here.

Keywords : Wave equation, Laplace Transform, Partial Differential equation, Computational Mathematics.

I. INTRODUCTION

In the present paper, we take an overview of various analytical methods of solving one dimensional wave equation. One dimensional wave equation along with initial and boundary condition constitutes initial boundary value problem (IBVP), which occurs frequently in many physical phenomena. We obtain an analytical solution of IBVP by separation of variable method, D' Alembert's method , Laplace transform method and Finite Fourier sine transform[5]. The vibration of string problem was first solved by John Bernoulli, a Swiss Mathematician. He has assumed the string as a flexible thread which has a finite number of equally distanced beads or weights placed along it. This was time independent equation.

But Jean Le Rond D'Alembert, a French Mathematician, introduced time variable and derived one dimensional wave equation in 1746. In 1750, Swiss Mathematician, Leonard Euler gave a solution of the Wave equation using Fourier series. Pierre-Simon de Laplace has given the solution to potential equation in the study of Gravitational pull. Joseph Fourier has derived heat equation and Solution by separation of variables in 1807 [1]. The rest of this article is systematized as follows. Section 2 talks about mathematical formulation of the IBVP. Section 3 describes solution of Wave equation using method of separation of variables, D' Alembert's method , Laplace transform method and Finite Fourier sine transform method. Section 4 summarizes the article.

II. MATHEMATICAL FORMULATION OF THE PROBLEM:

Consider a uniformly stretched elastic string with length a, which is fixed at two points O & A. Constant tension τ is applied on it. The tension τ is to be considered large than the weight of the string so that the gravitational pull becomes negligible.

Let the string be released from rest and allowed to vibrate [1, 2].

The problem is to study the motion of the string with no external forces acting on it. Assume that each point of the string makes a small vibration at right angle to the equilibrium position of the string in one place.

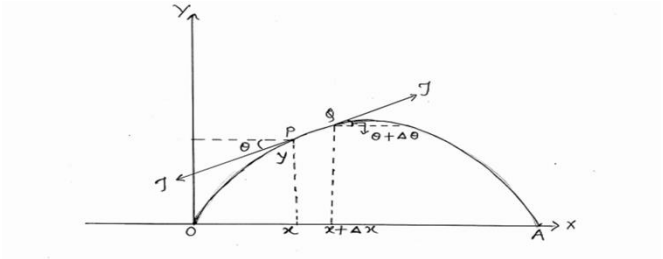

Figure No-1 vibrating string

Let the motion of the string takes place in XY plane. String is fixed at O & A on the X-axis. Let the string be in a position OPA at time t. Consider motion element P(x, y) & Q $(x + \Delta x, y + \Delta y)$ where tangents make angle θ & $\theta + \Delta\theta$ with X axis respectively. The element is moving upward with acceleration $\frac{\partial^2 y}{\partial t^2}$. The vertical component of force is acting on it is given as

$$F = \tau \sin(\theta + \Delta\theta) - \tau \sin(\theta)$$
$$= \tau(\sin(\theta + \Delta\theta) - \sin\theta)$$
$$= \tau(\tan(\theta + \Delta\theta) - \tan\theta)$$

$$= \tau \left[\left[\frac{\partial y}{\partial x}\right]_{x+\Delta x} - \left[\frac{\partial y}{\partial x}\right]_x \right],$$

where last equation is due to the fact that θ is very small

If μ is the mass of the string per unit length then by using Newton's 2nd law of motion

$$\mu \delta x \frac{\partial^2 y}{\partial t^2} = \tau \left(\left[\frac{\partial y}{\partial x}\right]_{x+\Delta x} - \left[\frac{\partial y}{\partial x}\right]_x \right),$$

$$\Rightarrow \frac{\partial^2 y}{\partial t^2} = \frac{\tau}{\mu} \left[\frac{\left[\frac{\partial y}{\partial x}\right]_{x+\Delta x} - \left[\frac{\partial y}{\partial x}\right]_x}{\Delta x} \right] \quad (1)$$

Taking limits Q→ P in equation (1) we get $\Delta x \to 0$,

$$\frac{\partial^2 y}{\partial t^2} = \frac{\tau}{\mu} \frac{\partial}{\partial x} \left[\frac{\partial y}{\partial x} \right],$$

$$\frac{\partial^2 y}{\partial t^2} = \frac{\tau}{\mu} \frac{\partial^2 y}{\partial x^2}.$$

Let $\frac{\tau}{\mu} = c^2 \Rightarrow \frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$ is the classical one dimensional wave equation.

III. ANALYTICAL METHODS FOR WAVE EQUATIONS

3.1 Method of Separation of Variables[1,2]

Consider one dimensional wave equation

$\frac{\partial^2\eta}{\partial t^2} = c^2 \frac{\partial^2\eta}{\partial x^2}$ ---------- (I)

along with boundary conditions $\eta(0,t) = 0, \eta(a,t) = 0$

Let $\eta(x,t) = F(x)G(t)$, where F is a function of x & G is a function of t only. Then

$\frac{\partial\eta}{\partial t} = F\ \frac{dG}{dt}$ & $\frac{\partial\eta}{\partial x} = G\ \frac{dF}{dx}$,

$\frac{\partial^2\eta}{\partial t^2} = F\ \frac{d^2G}{dt^2}$ & $\frac{\partial^2\eta}{\partial x^2} = G\ \frac{d^2F}{dx^2}$.

And equation (I) becomes

$F\ \frac{d^2G}{dt^2} = c^2\ G\ \frac{d^2F}{dx^2}$.

Separating variables,

$\frac{\frac{d^2G}{dt^2}}{c^2G} = \frac{\frac{d^2F}{dx^2}}{F} = k$ or $\frac{G''}{c^2G} = \frac{F''}{F} = k$

$\frac{d^2G}{dt^2} - kc^2G = 0$ and

$\frac{d^2F}{dx^2} - kF = 0$, with boundary conditions $\eta(0,t) = 0,\ \eta(a,t) = 0\ \ \forall t$

However $\eta(x,t) = F(x)\ G(t)$, thus $\eta(0,t) = 0 \Rightarrow F(0)\ G(t) = 0$ &

$\eta(a,t) = 0 \Rightarrow F(a)\ G(t) = 0$

If $G(t) = 0 \Rightarrow k = 0 \Rightarrow Trivial\ solution$, hence $G(t) \neq 0$

$\therefore F(0) = 0$ & $F(a) = 0$

i. If $k = 0 \Rightarrow$

$$F'' = 0 \Rightarrow F(x) = C_1x + C_2$$

$$F(0) = 0 \Rightarrow C_2 = 0\ \&\ F(a) = 0 \Rightarrow C_1 = 0$$

$$\therefore F(x) = 0$$

We get trivial solution in this case.

ii. If $k > 0\ say\ k = m^2$

$\frac{F''}{F} = m^2 \Rightarrow D^2 - m^2 = 0$ is

corresponding auxiliary equation

$F(x) = C_1e^{mx} + C_2e^{-mx}$

$F(0) = 0 \Rightarrow C_1 + C_2 = 0$ &

$F(a) = 0 \Rightarrow C_1e^{ma} + C_2e^{-ma} = 0$

$\Rightarrow\ C_1 = 0$ & $C_2 = 0\ \therefore F(x) = 0$

We get trivial solution in this case.

iii. If $k < 0\ say\ k = -m^2\ , m > 0$

$\frac{F''}{F} = -m^2 \Rightarrow D^2 + m^2 = 0$ is

corresponding auxiliary equation

$F(x) = C_1 \cos mx + C_2 \sin mx,$

$F(0) = 0 \Rightarrow C_1 = 0$ & $F(a) = 0 \Rightarrow$

$C_2 \sin ma = 0 \Rightarrow \sin ma = 0$

where $ma = n\pi\ \Rightarrow m = {}^{n\pi}/_{a}\ ,\ n = 1,2,3, \ldots.$

Also, $\frac{G''}{c^2G} = -m^2 \Rightarrow$

$D^2 + c^2m^2 = 0\ \Rightarrow$

$G(t) = C_3 \cos cmt + C_4 \sin cmt$

$G_n(t) = C_3 \cos\left(\frac{n\pi ct}{a}\right) + C_4 \sin\left(\frac{n\pi ct}{a}\right)$

The solution

$\eta(x,t) = \left(C_2 \sin\left(\frac{n\pi x}{a}\right)\right)\left(C_3 \cos\left(\frac{n\pi ct}{a}\right) + C_4 \sin\left(\frac{n\pi ct}{a}\right)\right)$

Or $\eta(x,t) = \left(A_n \cos\left(\frac{n\pi ct}{a}\right) + B_n \sin\left(\frac{n\pi ct}{a}\right)\right)\left(\sin\left(\frac{n\pi x}{a}\right)\right)$

$\eta(x,t) = \sum_{n=1}^{\infty}\left(A_n \cos\left(\frac{n\pi ct}{a}\right) + B_n \sin\left(\frac{n\pi ct}{a}\right)\right)\left(\sin\left(\frac{n\pi x}{a}\right)\right)$

This is the general solution of one dimensional wave equation (1) along with boundary conditions.

3.2 D' Alembert's Method[1,2]

Consider $\frac{\partial^2\eta}{\partial t^2} = c^2 \frac{\partial^2\eta}{\partial x^2}$ (1)

$where\ \ c^2 = {}^{\tau}/_{\mu}$

Let $\alpha = x + ct$ & $\beta = x - ct$ then $\eta = f(\alpha,\beta)$

$\therefore\ \eta_x = \eta_\alpha\alpha_x + \eta_\beta\beta_x \Rightarrow \eta_x = \eta_\alpha + \eta_\beta$ (2)

Similarly, $\eta_{xx} = \left(\eta_\alpha + \eta_\beta\right)_x$

$= (\eta_\alpha + \eta)_\alpha\alpha_x + \left(\eta_\alpha + \eta_\beta\right)_\beta\beta_x$

$\eta_{xx} = \eta_{\alpha\alpha} + 2\eta_{\alpha\beta} + \eta_{\beta\beta}$ (3)

Assuming all the partial derivatives are continuous, we get $\eta_{\alpha\beta} = \eta_{\beta\alpha}$

Now differentiating with respect to t, $\eta = \eta_\alpha\alpha_t + \eta_\beta\beta_t \Rightarrow \eta_t = c\eta_\alpha + (-c)\eta_\beta$

$\Rightarrow \eta_t = c(\eta_\alpha - \eta_\beta)$ (4)

&$\eta_{tt} = c\left(\eta_\alpha - \eta_\beta\right)_t$

$= c\left(\eta_\alpha - \eta_\beta\right)_\alpha\alpha_t + c\left(\eta_\alpha - \eta_\beta\right)_\beta\beta_t$

$\eta_{tt} = c^2(\eta_{\alpha\alpha} - 2\eta_{\alpha\beta} + \eta_{\beta\beta})$ (5)

Substituting in equation (1)

$$c^2(\eta_{\alpha\alpha} - 2\eta_{\alpha\beta} + \eta_{\beta\beta}) = c^2(\eta_{\alpha\alpha} + 2\eta_{\alpha\beta} + \eta_{\beta\beta})$$

$$\Rightarrow \eta_{\alpha\beta} = 0 \qquad (6)$$

Integrating (6) with respect to β & then w. r. t $\alpha \Rightarrow$ $\frac{\partial \eta}{\partial \alpha} = f(\alpha)$

$$\& \ \eta = \int f(\alpha)d\alpha + g(\beta)$$

here $f(\alpha)$& $g(\beta)$ are arbitrary functions of α & β.

$\therefore \eta = \emptyset(\alpha) + g(\beta) \Rightarrow \eta(x,t) = \emptyset(x+ct) + g(x-ct)$ (7)

is the solution of wave equation by D' Alembert's method.

Now we determine $\emptyset$ & g with initial condition $\eta(x,0) = f(x)$

& $\frac{\partial \eta}{\partial t} = 0 \ at \ t = 0$.

Differentiating (7) with respect to t,

$\frac{\partial \eta}{\partial t} = c\,\emptyset'(x+ct) - c\,g'(x-ct)$,

Put $\frac{\partial \eta}{\partial t} = 0 \ at \ t = 0 \Rightarrow \emptyset'(x) = g'(x) \Rightarrow \emptyset(x) = g(x) + K$

Now put $\eta = f(x)$ at $t = 0$ in (7)

$$\Rightarrow \eta(x,0) = f(x) = \emptyset(x) + g(x)$$

$\Rightarrow f(x) = 2g(x) + K$,

$\Rightarrow g(x) = \frac{1}{2}(f(x) - K)$& $\emptyset(x) = \frac{1}{2}(f(x) + K)$.

From equation (7)

$$\eta(x,t) = \frac{1}{2}[f(x+ct) + f(x-ct)]$$

3.3 Laplace Transform Method[2]

Consider one dimensional wave equation

$\frac{\partial^2 \eta}{\partial t^2} = c^2 \frac{\partial^2 \eta}{\partial x^2}$, $x > 0, t > 0$ (1)

With boundary conditions

$$\eta(0,t) = f(t),$$

$\eta(x,0) = 0, \lim_{x\to\infty} \eta(x,t) = 0$ & $\left(\frac{\partial \eta}{\partial t}\right)_{t=0} = 0.$

For semi-infinite string

For $t > 0$, string is in sine wave form [1,2]

Take Laplace transform of (1),

$\Rightarrow L[\eta_{tt}] = c^2 L[\eta_{xx}]$,

$\Rightarrow s^2 L[\eta] - s\eta(x,0) - \eta_t(x,0) = c^2 L[\eta_{xx}]$,

$\Rightarrow s^2 U(x,s) = c^2 L[\eta_{xx}]$ (2)

Since $\eta(x,0) = 0$ & $\eta_t(x,0) = 0$,

Now $L[\eta_{xx}] = \int_0^\infty e^{-st} \frac{\partial^2 \eta}{\partial x^2}\ dt$,

$= \frac{\partial^2}{\partial x^2} \int_0^\infty e^{-st}\, \eta(x,t)\, dt$,

$= \frac{\partial^2}{\partial x^2} L[\eta(x,t)]$

$L[\eta_{xx}] = \frac{\partial^2}{\partial x^2} U(x,s)$ (3)

Put (3) in (2)

$$s^2 U(x,s) = c^2 \frac{\partial^2}{\partial x^2} U(x,s)$$

$\frac{\partial^2 U}{\partial x^2} - \frac{s^2}{c^2} U = 0$ (4)

Equation (4) is an ordinary differential equation for $U(x,s)$ and hence its solution is given as

$U(x,s) = P\, e^{sx/c} + Q\, e^{-sx/c}$ (5)

Where P & Q are arbitrary constants of s.

From boundary conditions,

$\eta(0,t) = f(t)$,

Let $L[f(t)] = F(s)$,

$\therefore U(0,s) = L[\eta(0,t)] = L[f(t)] = F(s)$.

Now

$\lim_{x\to\infty} U(x,s) = \lim_{x\to\infty} \int_0^\infty e^{-st}\eta(x,t)dt$,

$\lim_{x\to\infty} U(x,s) = \int_0^\infty e^{-st} \lim_{x\to\infty} \eta(x,t)dt$,

$= 0$ given boundary condition.

And interchanging integration with limit

$P(s) = 0$ in (5) since $c > 0 \Longrightarrow$ for every positive s ,$e^{sx/c}$ increases as x increases

Assume $s > 0$

$\therefore U(0,s) = Q(s) = F(s)$

$\therefore$ (5) $\Longrightarrow U(x,s) = F(s)e^{-sx/c}$

Taking inverse Laplace transform, we obtain

$\eta(x,t) = f\left(t - \frac{x}{c}\right)\eta\left(t - \frac{x}{c}\right)$.

By using second shifting property $\{L^{-1}[e^{-as}F(s)] = f(t-a)\eta(t-a)\}$ we get the required solution

$$\Longrightarrow \eta(x,t) = \begin{cases} sin\left(t - \frac{x}{c}\right) & , \quad if \frac{x}{c} < t < \frac{x}{c} + 2\pi \\ 0 & , \text{otherwise} \end{cases}$$

3.4 Using Finite Fourier Sine Transform[6]

Consider one dimensional wave equation

$\frac{\partial^2 \eta}{\partial t^2} = c^2 \frac{\partial^2 \eta}{\partial x^2}$,

along with boundary condition

$\eta(0,t) = 0, \eta(a,t) = 0$

$F_s\left[\frac{\partial^2\eta}{\partial t^2}\right] = \int_0^a \frac{\partial^2\eta}{\partial x^2} \sin\left(\frac{n\pi x}{a}\right) dx \ , n \in Z$

$\Rightarrow F_s\left[\frac{\partial^2\eta}{\partial t^2}\right] = F_s\left[c^2 \frac{\partial^2\eta}{\partial x^2}\right]$

$\Rightarrow \int_0^a \frac{\partial^2\eta}{\partial t^2} \sin\left(\frac{n\pi x}{a}\right) dx = c^2 \int_0^a \frac{\partial^2\eta}{\partial x^2} \sin\left(\frac{n\pi x}{a}\right) dx$

$\Rightarrow \frac{\partial^2}{\partial t^2}\int_0^a \eta(x,t) sin\left(\frac{n\pi x}{a}\right) dx = c^2 \left\{\left(\frac{\partial\eta}{\partial x} sin\left(\frac{n\pi x}{a}\right)\right)_0^a - \int_0^a \frac{\partial\eta}{\partial x} cos\left(\frac{n\pi x}{a}\right)\frac{n\pi}{a} dx \right\}$

$\Rightarrow \frac{\partial^2}{\partial t^2}[F_s\, \eta(x,t)] = -\frac{c^2 n\pi}{a}\left[\left(\eta(x,t) cos\left(\frac{n\pi x}{a}\right)\right)_0^a - \int_0^a \eta(x,t)\, sin\left(\frac{n\pi x}{a}\right)\frac{n\pi}{a} dx \right]$

$\Rightarrow \frac{\partial^2}{\partial t^2}[F_s\, \eta(x,t)] = -\frac{c^2 n\pi}{a}\left[(\eta(a,t)\cos n\pi - \eta(0,t)) - \int_0^a \eta(x,t)\, sin\left(\frac{n\pi x}{a}\right)\frac{n\pi}{a} dx \right]$

$\Rightarrow \frac{\partial^2}{\partial t^2}[F_s\, \eta(x,t)] + \frac{c^2 n^2\pi^2}{a^2} F_s\, \eta(x,t) = 0$

This is second order ordinary differential equation.

Let $F_s\,[\eta(x,t)] = e^{mt}$ be trivial solution of the equation then $m = \pm\frac{in\pi c}{a}$

So the general solution is

$F_s[\eta(x,t)] = A\cos\left(\frac{n\pi ct}{a}\right) + B\sin\left(\frac{n\pi ct}{a}\right)$

Taking inverse Finite Fourier sine transform,

$\eta(x,t) = \frac{2}{a}\sum_{n=1}^{\infty}\left(A\cos\left(\frac{n\pi ct}{a}\right) + B\sin\left(\frac{n\pi ct}{a}\right)\right)\sin\left(\frac{n\pi x}{a}\right)$

IV. SUMMARY

Partial Differential equations have great importance in our daily life. They are used in Meteorology, Oceanography, Solar System, Economics, Physics, Chemistry & various Engineering branches to represent the model of Physical problem. We have taken an overview of some of the analytical methods used for solving one dimensional wave equation with boundary conditions. The general solution is obtained in each case. Our article takes a bird's eye view of various analytical methods of solving one dimensional wave equation where this equation is used in elastic mediums for modeling air column of an organ pipe and vibrations of a metal rod . These solutions will be helpful to all researchers working in the domain of Engineering and Science.

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