REAL TIME COMMUNICATION FOR SPECIALLY ABLED POWERED BY AI

A PROJECT REPORT

Submitted by

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CHAPTER-1

INTRODUCTION

1. INTRODUCTION

In our society, we have people with disabilities. The technology is developing day by day but no significant developments are undertaken for the betterment of these people. Communications between deaf-mute and a normal person has always been a challenging task. It is very difficult for mute people to convey their message to normal people. Since normal people are not trained on hand sign language. In emergency times conveying their message is very difficult. The human hand has remained a popular choice to convey information in situations where other forms like speech cannot be used. Voice Conversion System with Hand Gesture Recognition and translation will be very useful to have a proper conversation between a normal person

and an impaired person in any language.

1.1PROJECT OVERVIEW

The project aims to develop a system that converts the sign language into a human hearing voice in the desired language to convey a message to normal people, as well as convert speech into understandable sign language for the deaf and dumb. We are making use of a convolution neural network to create a model that is trained on different hand gestures. An app is built which uses this model. This app enables deaf and dumb people to convey their information using signs which get converted to human-understandable language and speech is given as output.

1.2PURPOSE

An app is developed for helping disabled with sign language conversion .The app enables deaf and dumb people to convey their information using signs which gets converted to human understandable language and speech is given as output. As people with hearing and speaking disabilities are very diverse groups. We wanted to reflect that diversity with our project .As we explore how intelligent agent can enable people with these disabilities; we wanted to consider how differences in context, culture and resource availability would affect the

ideas generated.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM

People suffering from hearing impairment or deafness face many challenges every day. They have problems in expressing themselves properly and responding to the people around them. This constant struggle may cause social and mental issues.

Communication is the only medium by which we can share our thoughts or convey the message but for a person with disabilities such as hearing and speaking impairments faces difficulties in communication with normal person. They have difficulties in understanding even if they do lip read.

2.2REFERENCES

Author: Nishika Gupta

Artificial Intelligence is the science and engineering of making intelligent machines, especially intelligent computer programs. Artificial Intelligence (AI) is intelligence exhibited by machines. In computer science the field of AI defines itself as the study of intelligent agents. Generally, the term AI is used when a machine simulate functions that human associate with other human minds such as learning and problem solving. In the last few years, there has been an arrival of large amount of software that utilizes elements of artificial intelligence. Subfield s of AI such as Machine Learning, Natural Language processing, Image Processing and Data mining have become an important topic for today tech giants.

Artificial Neural Networks

Author: Enzo Grossi and Massimo Buscemab

The coupling of computer science and theoretical bases such as nonlinear dynamics and chaos theory allows the creation of ‘intelligent’ agents, such as artificial neural networks (ANNs), able to adapt themselves dynamically to problems of high complexity. ANNs are able to reproduce the dynamic interaction of multiple factors simultaneously, allowing the study of complexity; they can also draw conclusions on individual basis and not as average trends.

These tools can offer specific advantages with respect to classical statistical techniques.

This article is designed to acquaint gastroenteritis with concepts and paradigms related to ANNs. The family of ANNs, when appropriately selected and used, permits the maximization of what can be derived from available data and from complex, dynamic, and multidimensional phenomena, which are often poorly predictable in the traditional ‘cause and effect’ philosophy.

Trends in Intelligent Communications Systems

Author: Konstantinous Koufos

The remainder of this paper is organist as follows. In Section 2, we give a short review of intelligent functions at the RAN, and discuss purely data-driven and model- aided ML techniques as suggested by Renzo et al. we review the standardization activities at the 5G core recommended by 3GPP and ETSI, and at the RAN by the O-RAN Alliance. We also discuss research and standardization gaps identified by ITU FG-ML5G. Furthermore, we review the trends in ML algorithms running on low- power micro-controller units, often referred to as TinyML, which was mostly omitted by the previous survey papers. Section 4 provides a summary of recent and currently funded projects in Europe, the U.K., and the U.S. on intelligent communications and networking. Section 5 summarizes the main research gaps identified during the combined review of research papers, projects, and standards, and concludes this survey.

Natural Language Processing (NLP)

Author: Diksha Khurana

Natural language processing has recently gained much attention for representing and analyzing human language computationally. It has spread its applications in various fields such as machine translation, email spam detection, information extraction, summarization, medical, and question answering etc.

The paper distinguishes four phases by discussing different levels of NLP and components of Natural Language Generation (NLG) followed by presenting the history and evolution of NLP, state of the art presenting the various applications of NLP and current trends and challenges.

2.3PROBLEM DEFINITION STATEMENT

Problem faced by customer:

As a deaf person they try to communicate better but there are not enough resource to make that happen . So he /she feels inferior.

As a dumb person they try to talk effectively but sign language is difficult to understand by normal people so they are not able to convey the message it makes them frustrated.

Problem faced by Engineer :

As a engineer we try to create a module that helps in communication between specially abled and normal person but existence of complication in understanding the inputs from user because training the module based on the real time inputs is tough which make us feel motivated work for the specially abled .

3. IDEATION & PROPOSED SOLUTION

3.1EMPATHY MAP CANVAS

An empathy map is a simple , easy to digest visual that captures knowledge about a user behavior and attitudes . It is useful tool to help teams better understand their uses.

Creating an effective solution requires understanding the true problem and the person who is experiencing it. This map helps participants consider things from the user’s perspective along with his/her goals and challenges.

Advantages:

An empathy map helps to map what a design team knows about the potential audience .This tool helps to understand the reason behind some actions a user takes deeply. This tool helps to build Empathy towards users and helps design teams shift focus from the product to users who are going to use the product.

Role of empathy map:

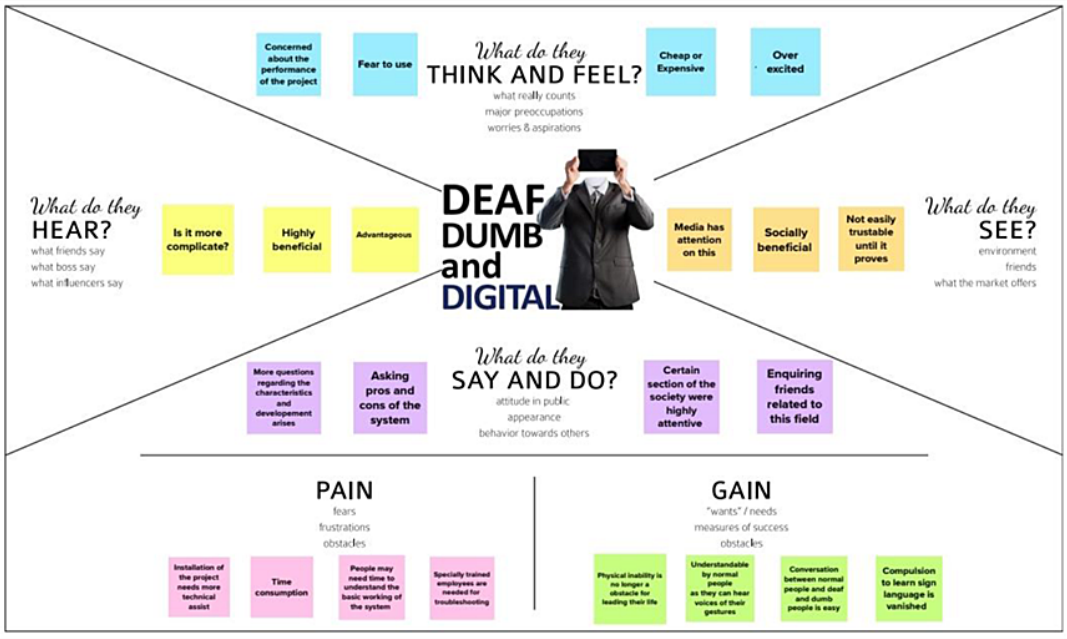
An empathy map helps to map what a design team knows about the potential audience. This tool helps to understand the reason behind some actions a user takes deeply.

This tool helps build Empathy towards users and helps design teams shift focus from the product to the users and help design teams shift focus from the product to the users who are going to use the product.

Empathy map – Real Time Communication Powered By AI for specially abled

Real-Time Communication System Powered By AI For Specially Abled

Creation of model for converting sign language into speech and vice versa



3.2 IDEATION AND BRAIN STORMING

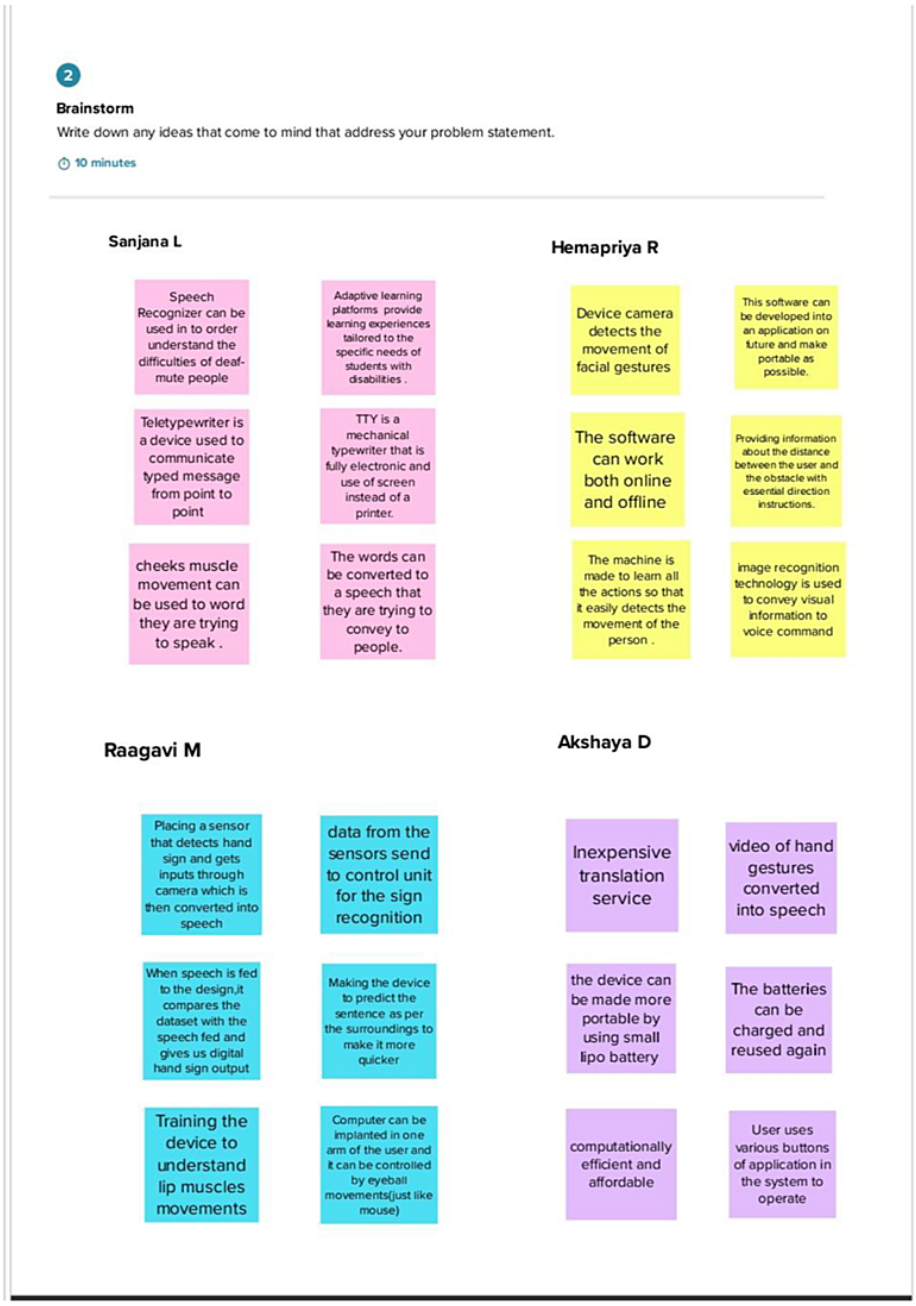
Brain storming provides free and open environment that encourages everyone within a team to participate in the creative thinking process that leads problem solving .

Prioritizing volume over value out of the box ideas are welcome and built upon , and all the participants are encouraged to collaborate , helping each other develop a rich amount of creative solutions .

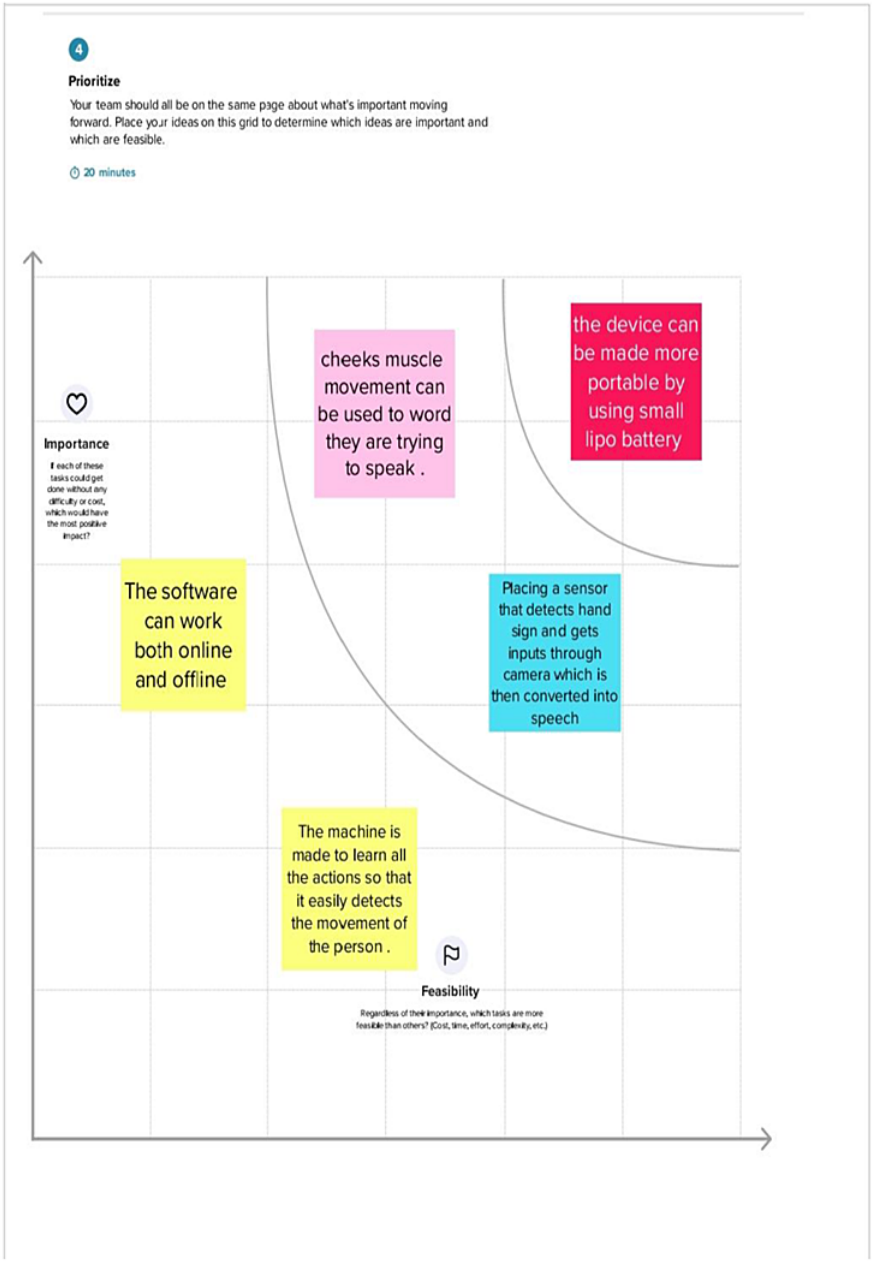
Idea prioritization :

Idea prioritization is just a part of idea management process. Having a structured idea management process and systematic way of gathering, evaluating and prioritizing new ideas takes time. To make it work, the entire idea management process should be integrated to the every ways of working.

Step-2: Brainstorm



Step-4: Idea Prioritization



3.3 Proposed Solution

The main goal of presenting a proposed solution is to provide solution to a problem faced by a potential user. This section should be as comprehensive as possible, and able to address all the needs that you have pointed in the first section.

S.no	Parameter	Description
1.	Problem Statement (Problem to be solved).	Existence of complications in understanding inputs from user.
2.	Idea / Solution description	Real-time captioning or translations for people with a hearing impairment or even people who don't speak the language.
3.	Novelty / Uniqueness	We are making use of a convolution neural network to create a model that is trained on different hand gestures.
4.	Social Impact / Customer Satisfaction	Voice Conversion System with Hand Gesture Recognition and translation will be very useful to have a proper conversation between a normal person and an impaired person in any language.
5.	Business Model (Revenue Model)	This business model truly revolutionizes accessibility and people with disabilities can drastically improve their everyday lives. The person who is incapable of speaking can easily chat with normal people and the people with hearing impairments can also understand the speech of normal person using this device.
6.	Scalability of the Solution	Accessibility for people with disabilities is high and hearing impaired users can use text descriptions. Device is portable and power consumption is low .Battery can be charged and reused again. It is user friendly. Hence scalability is high. It is user friendly. Hence scalability is high.

3.4 Problem solution fit

Problem-solution fit is a term used to describe the point validating that the base problem resulting in a business idea really exists and the proposed solution actually solves that problem. Validate that the problem exists: When you validate your problem hypothesis using real-world data and feedback.

4. REQUIREMENT ANALYSIS

4.1 Functional requirements

A functional requirement document helps you to define the functionality of a system or one of its subsystems. Functional requirements along with requirement analysis help identify missing requirements. They help clearly define the expected system service and behavior.

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Gmail
FR-2	User verification	Verification email is sent to user whenever registered for the first time
FR-3	User Confirmation	Confirmation via Email Confirmation via OTP
FR-4	Authentication	Device shutdown in case of cyber attack
FR-5	Legal Requirements	Medical certificate is required

4.2 Non-functional requirements

Nonfunctional Requirements (NFRs) define system attributes such as security, reliability, performance, maintainability, scalability, and usability. They serve as constraints or restrictions on the design of the system across the different backlogs.

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

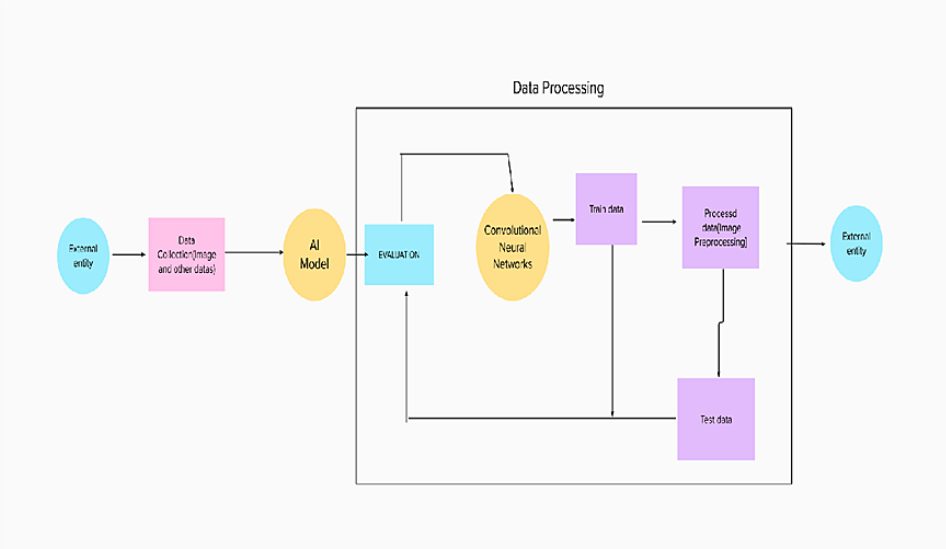
FR No.	Non-Functional Requirement	Description
NFR-1	**Portability**	The transferability of device from one place to another is easy
NFR-2	**Security**	Protect the sensitive information through password
NFR-3	**Reliability**	This device has technology whose function is highly reliable
NFR-4	**Performance**	Response time should be quick
NFR-5	**Availability**	User access the device all hour a day
NFR-6	**Scalability**	In standard network condition the device should convert information within second

5. PROJECT DESIGN

5.1 Data Flow Diagram

A data flow diagram shows the way information flows through a process or system. It includes data inputs and outputs, data stores, and the various sub processes the data moves through. DFDs are built using standardized symbols and notation to describe various entities and their relationships.

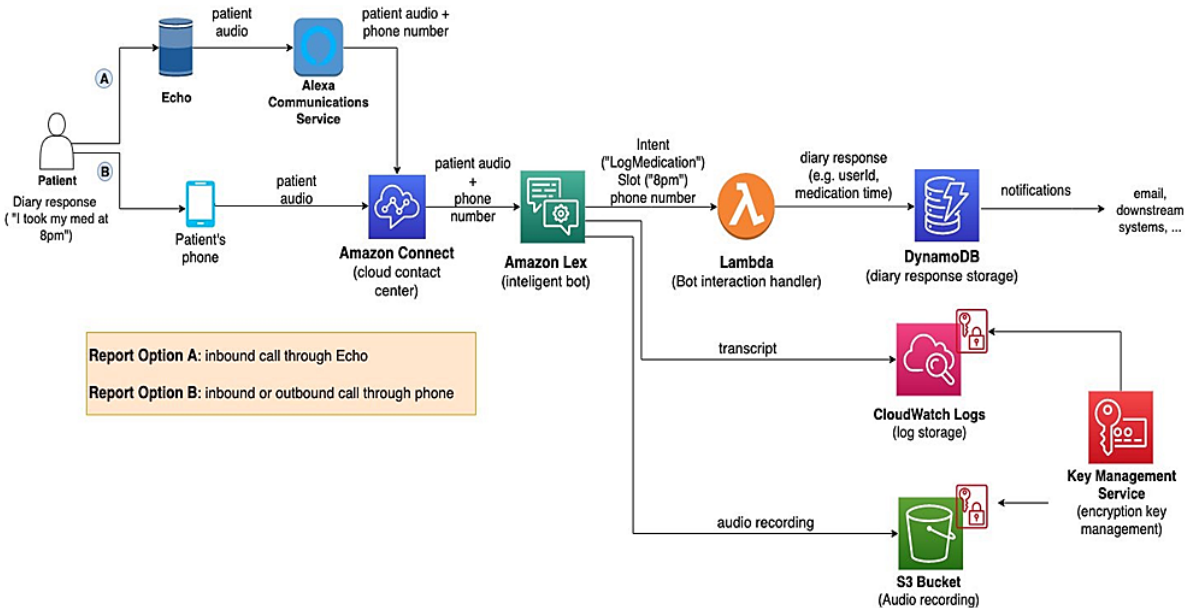
DFD is a traditional visual representation of information flows within a system. A neat and clear DFD can depict the right amount of system requirement graphically. It shows how data enters and leaves the system. what changes the information and where data is stored.



5.2 Solution Architecture

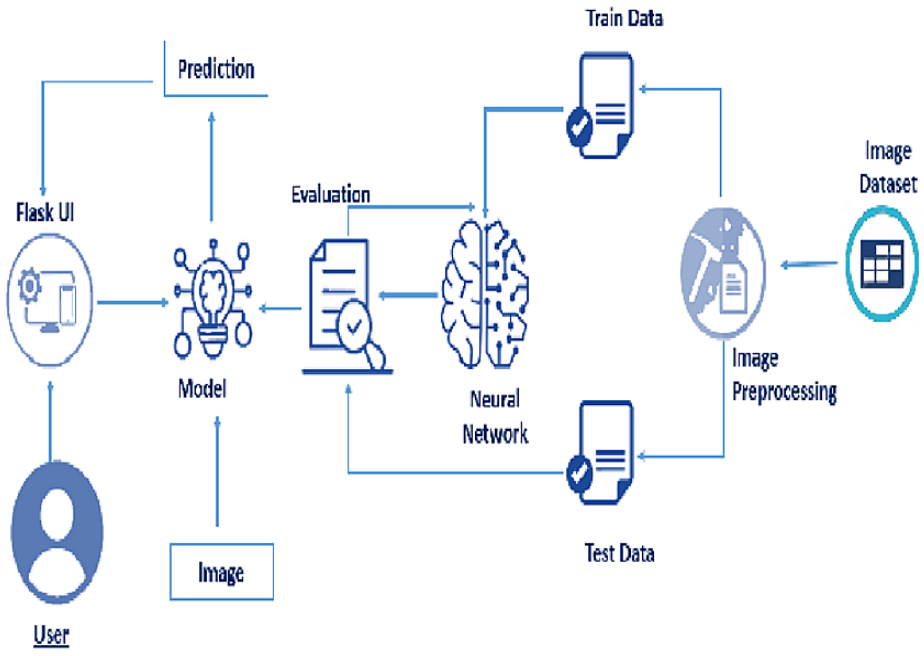
Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.



Technical Architecture:

Technical Architecture (TA) is a form of IT architecture that is used to design computer systems. It involves the development of a technical blueprint with regard to the arrangement, interaction, and interdependence of all elements so that system-relevant requirements are met.



5.3 User Stories

A user story is an informal, general explanation of a software feature written from the perspective of the end user or customer. The purpose of a user story is to articulate how a piece of work will deliver a particular value back to the customer.

User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer	Sign language converter	USN-1	As a user, I have to communicate with lot of people who may not understand sign language	I can communicate people in speech without any complication	High	Sprint-1
Customer	Text to sign language converter	USN-2	As a user, I have to communicate with deaf and dumb people around me	It converts speech into text with full efficiency and accuracy	High	Sprint-1
Customer	Learning and Teaching Device	USN-3	As a user, I can use this device to learn sign language	I can understand sign language better	Low	Sprint-2

6.PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	User story	USN-1	Translation of sign language is difficult .As a human it is difficult to understand the sign language of deaf and dump.	5	Medium	Sanjana.L
Sprint-1	Data sets	USN-2	Collect the image of different sign language and create the dataset	5	Medium	Hemapriya.R
Sprint-1	Data Preprocessing	USN-3	Process the Image from the dataset	6	High	Akshaya.D
Sprint-2	Image processing	USN-4	Once images are processed can be constructed for train and test	6	Medium	Hemapriya.R
Sprint-2	Train and Test	USN-5	Apply Image data generator functionality to trainset and test set	6	High	Sanjana.L
Sprint-2	Import Model	USN-6	Import the model building libraries with CNN algorithm	6	Medium	Raagavi.M
Sprint-3	Configure Model	USN-7	Adding dense layer to configure the learning process to train and test the model	7	High	Hemapriya.R
Sprint-3	Webpage Creation	USN-8	Create the HTML web page with python code	7	High	Raagavi.M
Sprint-3	Dashboard Creation	USN-9	It contains the details of predicting criteria and user information.	6	High	Akshaya.D

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-4	Application Creation	USN-10	Create the flask application and loading our model by using load model method	7	High	Sanjana.L
Sprint-4	Application Building	USN-11	Routing the HTML Page and Run the Application	6	High	Raagavi.M
Sprint-4	Train the Model	USN-12	Train the Model on IBM Cloud	6	High	Akshaya.D

6.2 SPRINT DELIVERY SCHEDULE

Project Tracker, Velocity & Burndown Chart: (4 Marks)

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	16	6 Days	24 Oct 2022	29 Oct 2022		30 Oct 2022
Sprint-2	18	6 Days	31 Oct 2022	05 Nov 2022		06 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022		13 Nov 2022
Sprint-4	19	6 Days	14 Nov 2022	19 Nov 2022		19 Nov 2022

Velocity:

Sprint 1 Average Velocity = 16/6 = 2.66

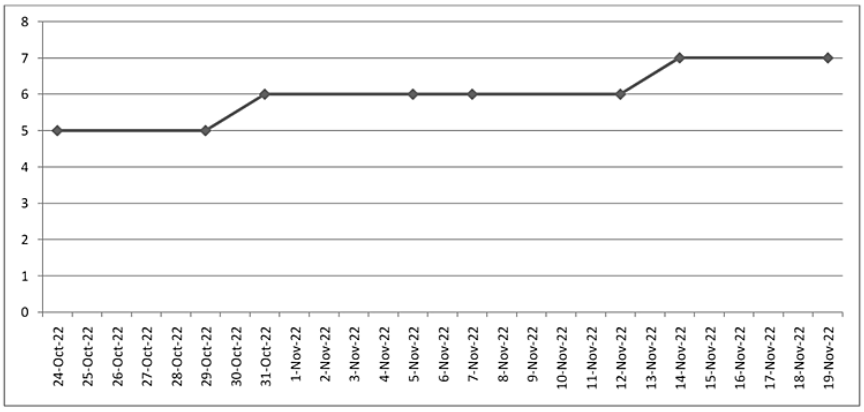
Sprint 2 Average Velocity = 18/6 = 3

Sprint 3 Average Velocity = 20/6 = 3.33

Sprint 4 Average Velocity = 19/6 = 3.16

6.3 REPORTS FROM JIRA

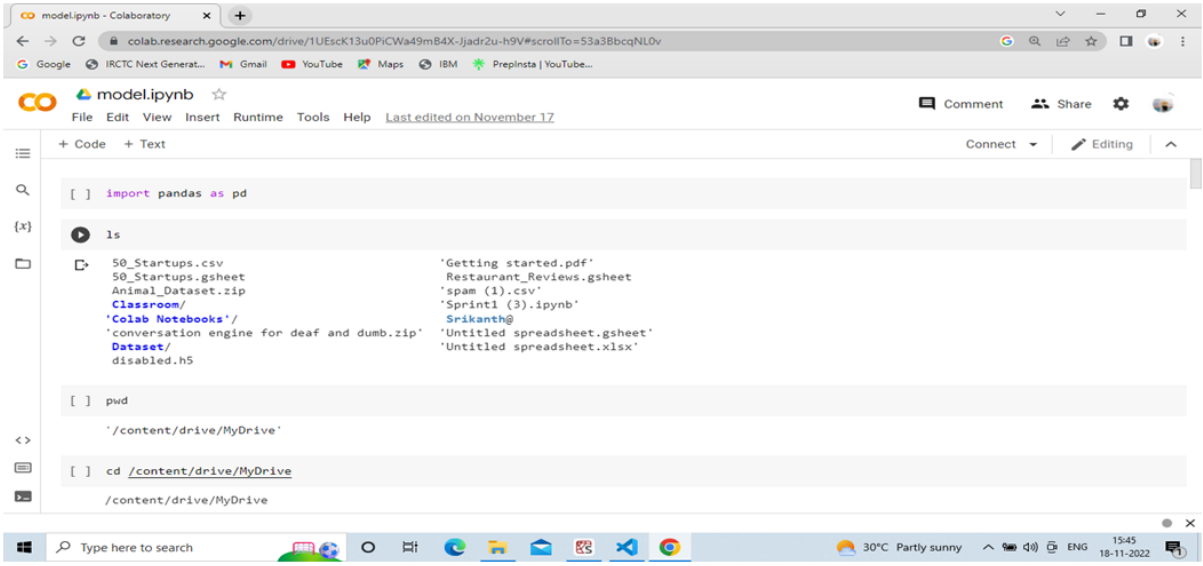
Burndown Chart:



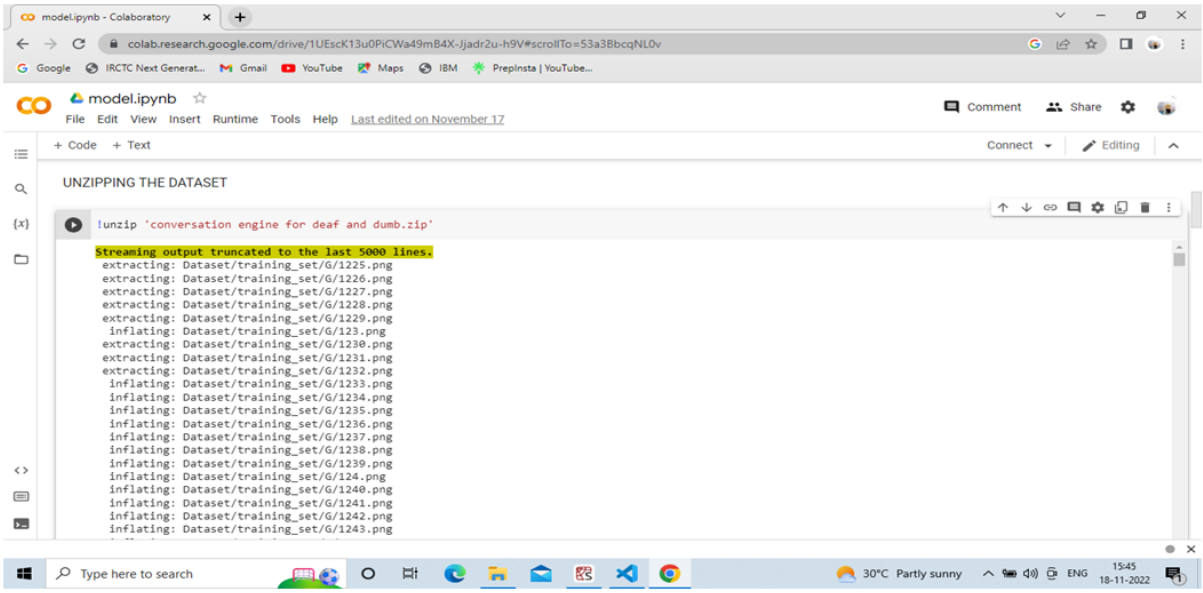
7. CODING & SOLUTIONING

7.1 Feature: 1

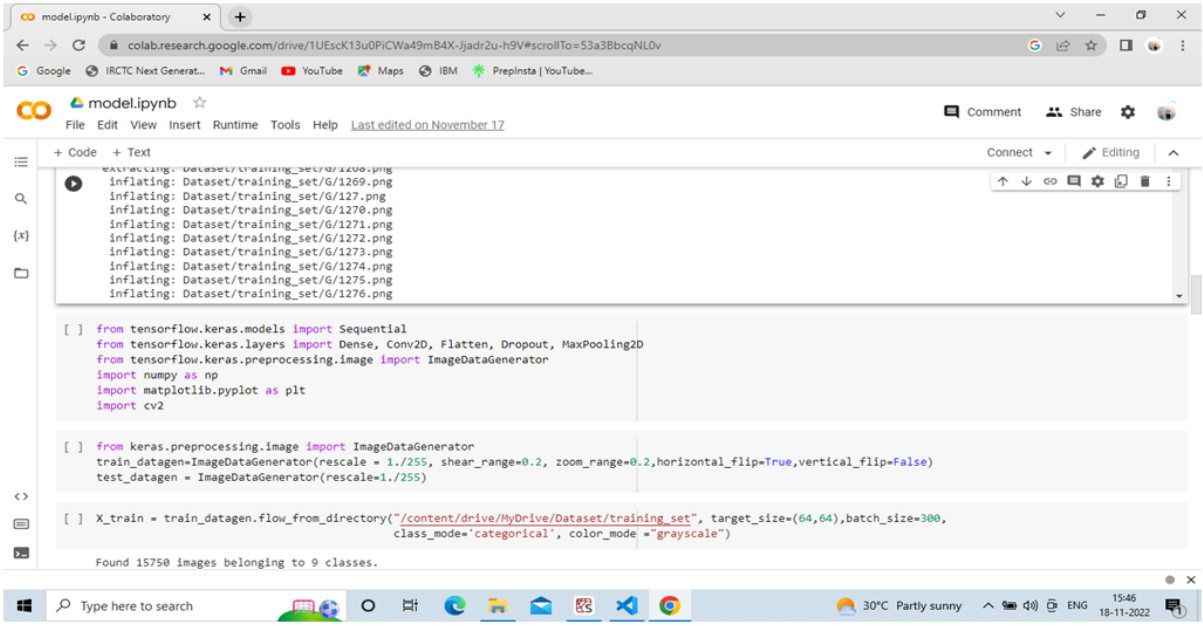
#Load the dataset



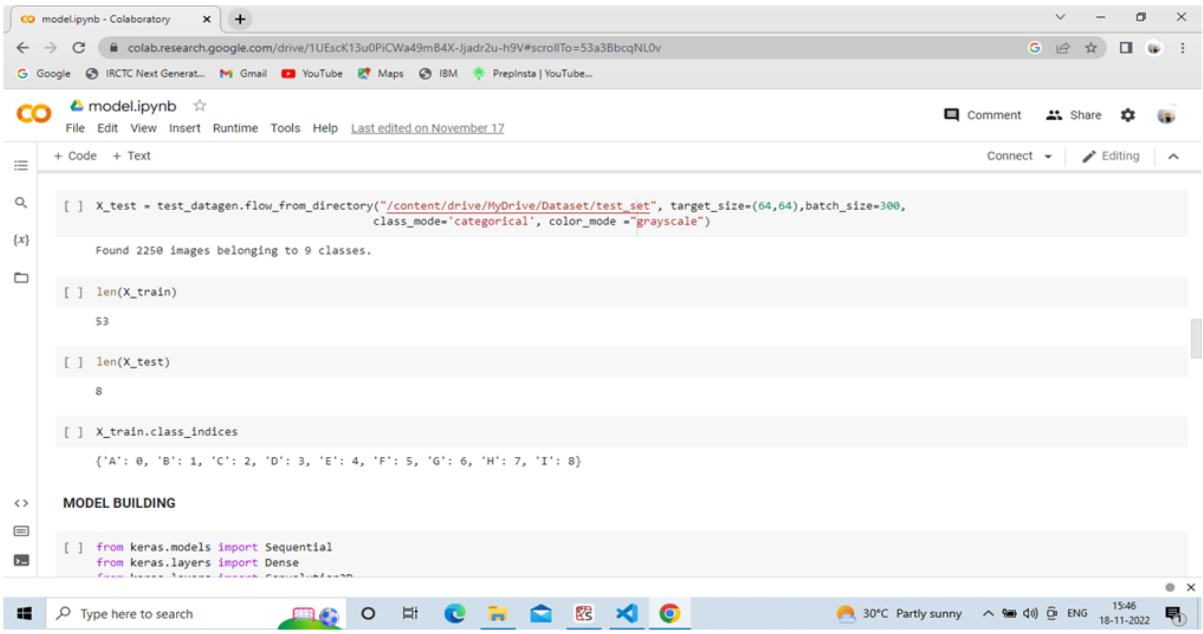
#unzip the dataset



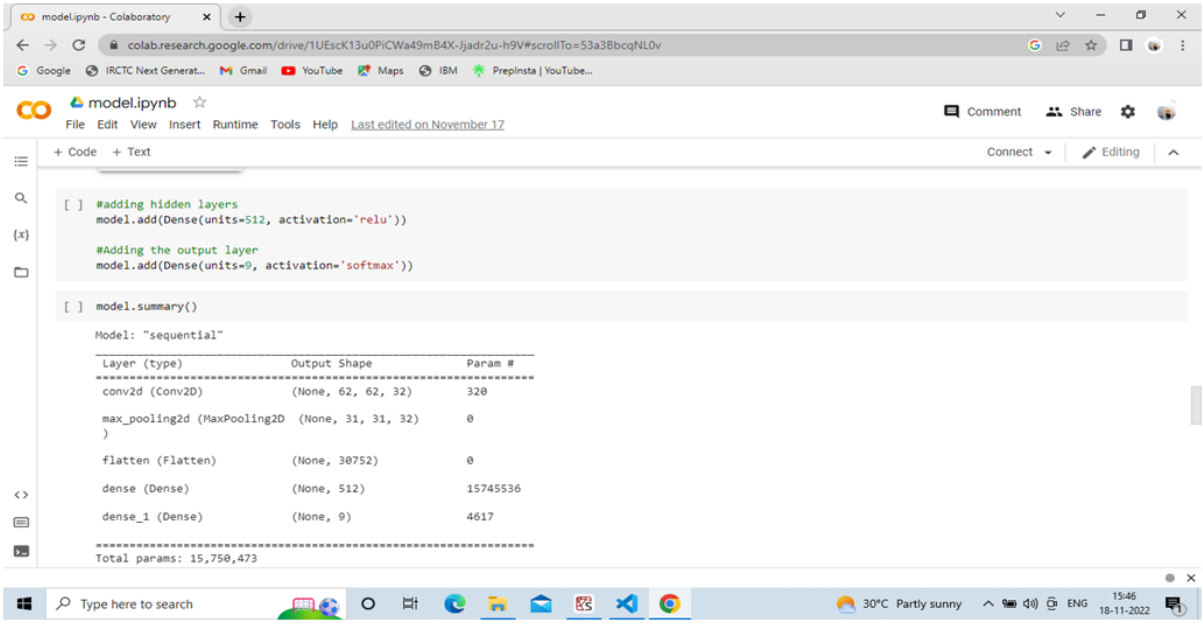
#import required libraries



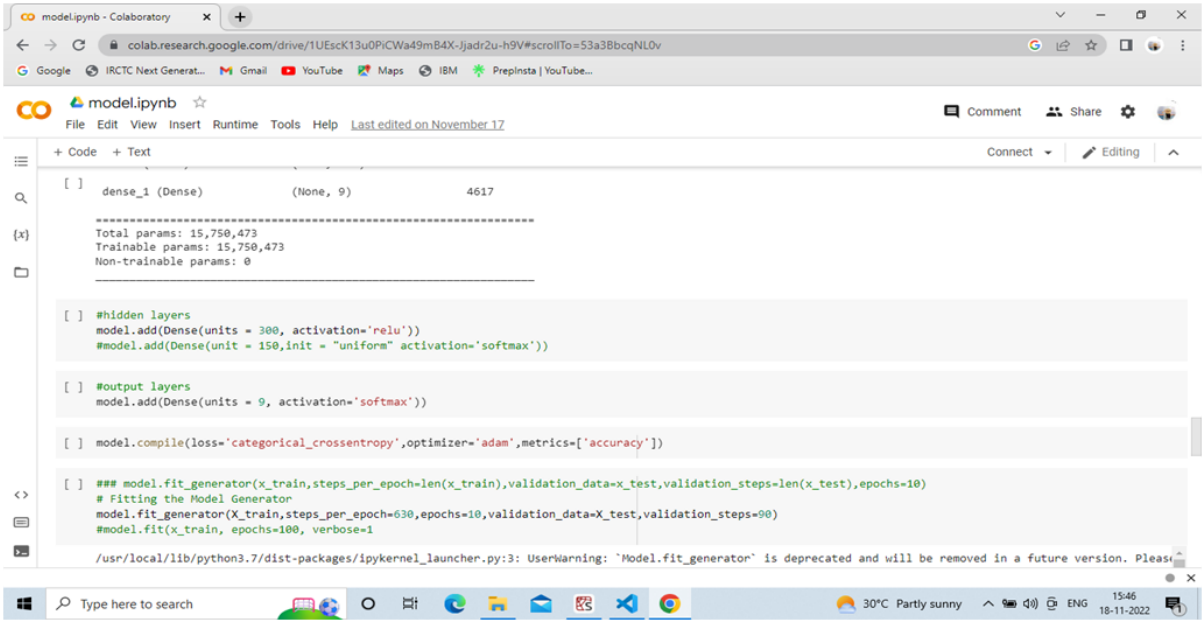
#test and train



#adding layers

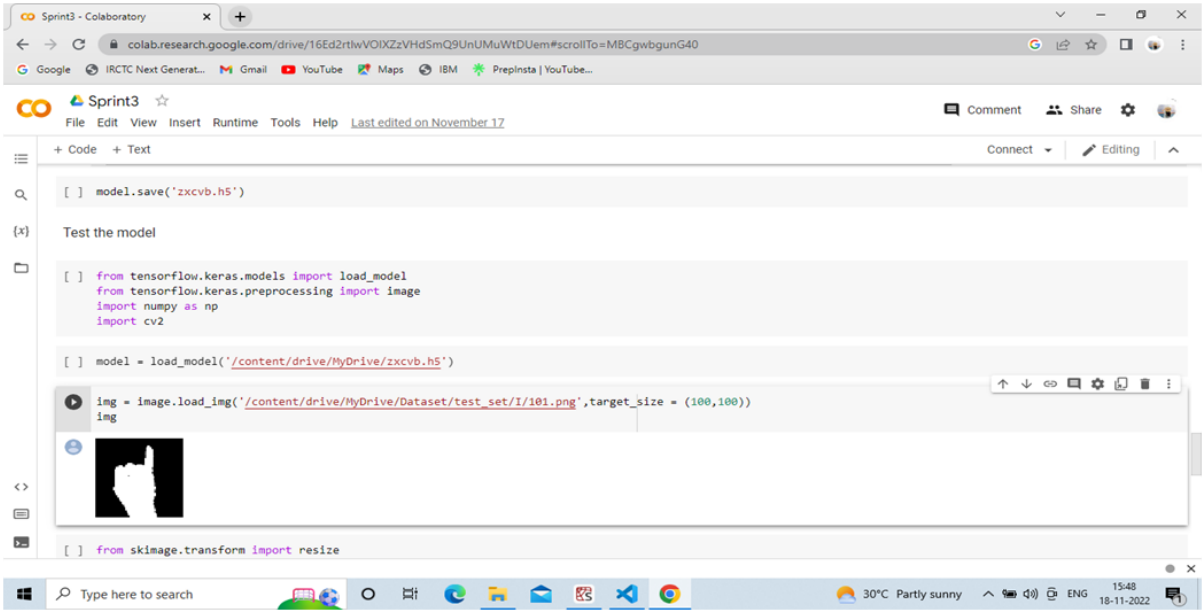


#compile model

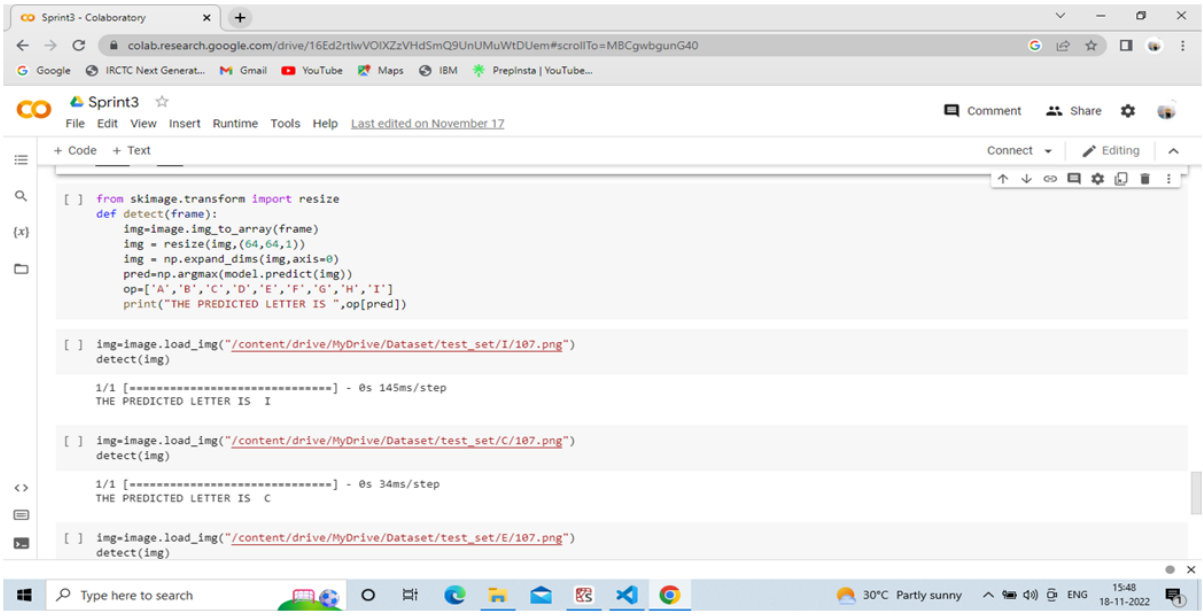


7.2 FEATURE-2

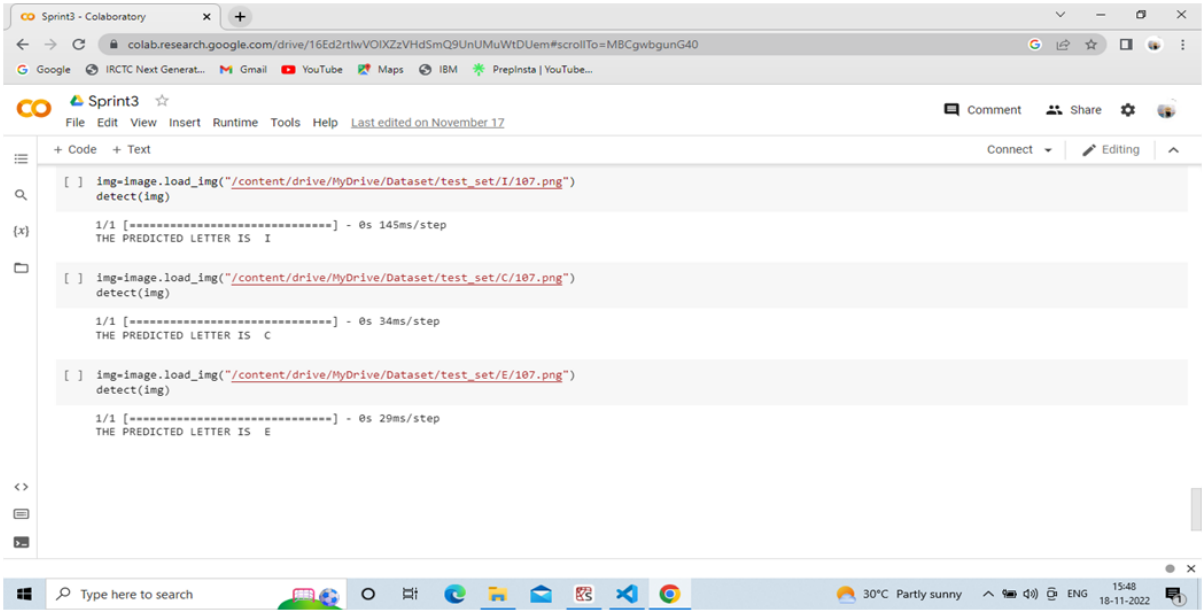
#test the model



#load the image



#output is predicted



We are making use of a convolution neural network to create the model that is trained on different hand gestures. An app is built which uses this model. This app enables deaf and dumb people to convey their information using signs which get converted into human understandable language and speech is given as output.

Features used:

Python Central Neural Network IBM Cloud

IBM Watson Studio IBM Cloudant DB

Deep Learning Python-Flask

8.TESTING

8.1 TEST CASES

This report shows the number of test cases that have passed,failed and untested.

Section	TotalCases	Not Tested	Fail	Pass
PrintEngine	1	0	0	1
ClientApplication	1	0	0	1
Security	1	0	0	1
OutsourceShipping	1	0	0	1
ExceptionReporting	1	0	0	1
FinalReportOutput	1	0	0	1
VersionControl	1	0	0	1

8.2 User Acceptance Testing

The purpose of this document is to briefly explain the test coverage and open issues of the real time communication for specially abled powered by Ai at the time of the release to User Acceptance Testing(UAT).

This report show the number of resolved or closed bugs at each severity level, and how they were resolved.

9. RESULTS

9.1 Performance Metrics

Performance metrics are defined as figures and data representative of an organization's actions, abilities, and overall quality. Performance metrics are used to measure the behavior, activities, and performance of a business.

This should be in the form of data that measures required data within a range, allowing a basis to be formed supporting the achievement of overall business goals.

Measuring performance through metrics is key to seeing how things are working, and whether targets are being met.

S.No.	Parameter	Values	Screenshot
1.	Model Summary	-	Model: "sequential_5" Layer (type) Output Shape Param # conv2d_10 (Conv2D) (None, 62, 62, 32) 320 max_pooling2d_4 (MaxPooling2D) (None, 31, 31, 32) 0 flatten_4 (Flatten) (None, 30752) 0 Total params: 320 Trainable params: 320 Non-trainable params: 0
2.	Accuracy	Training Accuracy – 0.85363 Validation Accuracy – 0.89009	orts until 98 - accuracy: 0.4139 - val_loss: 1.2455 - val_accuracy: 0.6098 09 - accuracy: 0.6395 - val_loss: 0.7839 - val_accuracy: 0.8364 32 - accuracy: 0.8344 - val_loss: 0.6295 - val_accuracy: 0.8342 76 - accuracy: 0.8549 - val_loss: 0.5360 - val_accuracy: 0.8333 58 - accuracy: 0.8976 - val_loss: 0.3582 - val_accuracy: 0.9498 32 - accuracy: 0.9635 - val_loss: 0.3361 - val_accuracy: 0.9724 40 - accuracy: 0.9747 - val_loss: 0.3673 - val_accuracy: 0.9649 81 - accuracy: 0.9828 - val_loss: 0.3307 - val_accuracy: 0.9627 42 - accuracy: 0.9855 - val_loss: 0.3669 - val_accuracy: 0.9747 26 - accuracy: 0.9895 - val_loss: 0.3932 - val_accuracy: 0.9627

10. ADVANTAGES

Create a communication link between deaf-dumb and normal people .

During emergency the specially abled people can easily contact and express feelings to others. Their feelings can be easily shared.

This application helps in expressing their emotions and motives to others.

An ability of the customers to communicate efficiently at serious and necessary situations.

Helps people to learn the sign language and also helps to teach normal person .

DISADVANTAGES

Understanding the inputs from the user may take time.

Difficulty in understanding the user manual.

Inputs need to be double check for proper output.

Language needed to be known for the user.

Technical persons are needed for the installation and if any error occur technical persons are need to be there for debug the error.

11.CONCLUSION

The main purpose of this application is to enhance the communication of the specially abled community. The team members of this team propose an enhanced interpersonal-human interaction for people with special needs, especially those with speaking and hearing disabilities. The proposed model comprises of automated real time behaviour monitoring, designed and implemented with the ubiquitous and affordable concept in mind to suit the underprivileged. In this application, our team present the prototype which encapsulates an automated facial expression recognition system for monitoring the disabled, equipped with a feature to send Short Messaging System (SMS) for notification purposes. Our team members uses the Central Neural Network at the face detection stage and implemented template matching technique for the expression classification and recognition stage. We tested our application with a few users and achieved satisfactory results. The enhanced real time behaviour monitoring system is an assistive tool to improve the quality of life for the disabled by assisting them anytime and anywhere when needed. They can do their own tasks more independently without constantly being monitored physically or accompanied by their care takers, teachers, or even parents. The communication between specially abled persons and normal people is now easy with the help of this application .

12. FUTURE SCOPE

This application is not designed to replace humans but rather to enhance our lives by helping us do things we are unable to do on our own. Many companies are working on this type of research, including Google Deepmind, Apple Siri, Microsoft Cortana, etc., which means there will likely be many new developments soon. These innovations could positively impact everyone's life – even those without disabilities – because they make everyday tasks easier and less time-consuming.

This sign prediction technology is quickly becoming a part of everyday life. It's used to improve public security, the accuracy of letters and words and even make grocery shopping easier. But those who can't speak or hear? sign recognition has the potential to offer independence and inclusion for these individuals. This means that people with disabilities can get a job or go out without needing a caregiver or companion to help them find their way around and do things independently. From entertainment to security, many aspects of daily life have been improved through this advancement in technology. In future, this application became more available to the public market. Today, facial recognition software is being used for blind children to read books aloud. Soon, this applications can be accessible for deaf and dumb people to communicate with others.

1. APPENDIX

This entire document consists of sign conversion application in details. How models are tested,compiled?How sign recognition and prediction are done?.

In our society, we have people with disabilities. The technology is developing day by day but no significant developments are undertaken for the betterment of these people. Communications between deaf-mute and a normal person has always been a challenging task. It is very difficult for mute people to convey their message to normal people. Since normal people are not trained on hand sign language. In emergency times conveying their message is very difficult. The human hand has remained a popular choice to convey information in situations where other forms like speech cannot be used. Voice Conversion System with Hand Gesture Recognition and translation will be very useful to have a proper conversation between a normal person and an impaired person in any language.

The project aims to develop a system that converts the sign language into a human hearing voice in the desired language to convey a message to normal people, as well as convert speech into understandable sign language for the deaf and dumb. We are making use of a convolution neural network to create a model that is trained on different hand gestures. An app is built which uses this model. This app

enables deaf and dumb people to convey their information using signs which get converted to human-understandable language and speech is given as output.

Percentage of deaf and dumb all over the world