Real-Time Communication System Powered by AI for Specially Abled

Submitted By

TEAM ID :PNT2022TMID29575

Shibu Radeef Fadal M (510419205026)

Singararaja M (510419205027)

Arun Rajan v (510419205004)

Manoraj R (510419205014)

1. INTRODUCTION

1.1 Overview

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.

1.2 Purpose

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.

2. LITERATURE SURVEY

2.1 Existing problem

Some of the existing solutions for solving this problem are:

Technology

One of the easiest ways to communicate is through technology such as a smart phone or laptop. A deaf person can type out what they want to say and a person who is blind or has low vision can use a screen reader to read the text out loud.

Interpreter

If a sign language interpreter is available, this facilitates easy communication if the person who is deaf is fluent in sign language. The deaf person and person who is blind can communicate with each other via the interpreter. The deaf person can use sign language and

the interpreter can speak what has been said to the person who is blind and then translate anything spoken by the blind person into sign language for the deaf person.

Just Speaking

Depending on the deaf person's level of hearing loss, they may be able to communicate with a blind person who is using speech. For example, a deaf person may have enough residual hearing to be able to decipher the speech of the person who is blind or has low vision.

2.2 References

1. **Environment Setup-** https://www.youtube.com/watch?v=5mDYijMfSzs

2. **Sign Languages Dataset-** https://drive.google.com/file/d/1ITbDvhLwyTTkuUYfNjOKhcIZh7hDgi64/view?usp=sharing

3.Keras- https://keras.io/api/preprocessing/image/

4.OpenCV- https://www.youtube.com/watch?v=mjKd1Tzl70I

5.Flask- https://www.youtube.com/watch?v=lj4I_CvBnt0

6.Flask Run Basis - https://www.youtube.com/watch?v=bzX_auqvePs

7.IBM cloud - https://youtu.be/4y_zD-0Q3F8

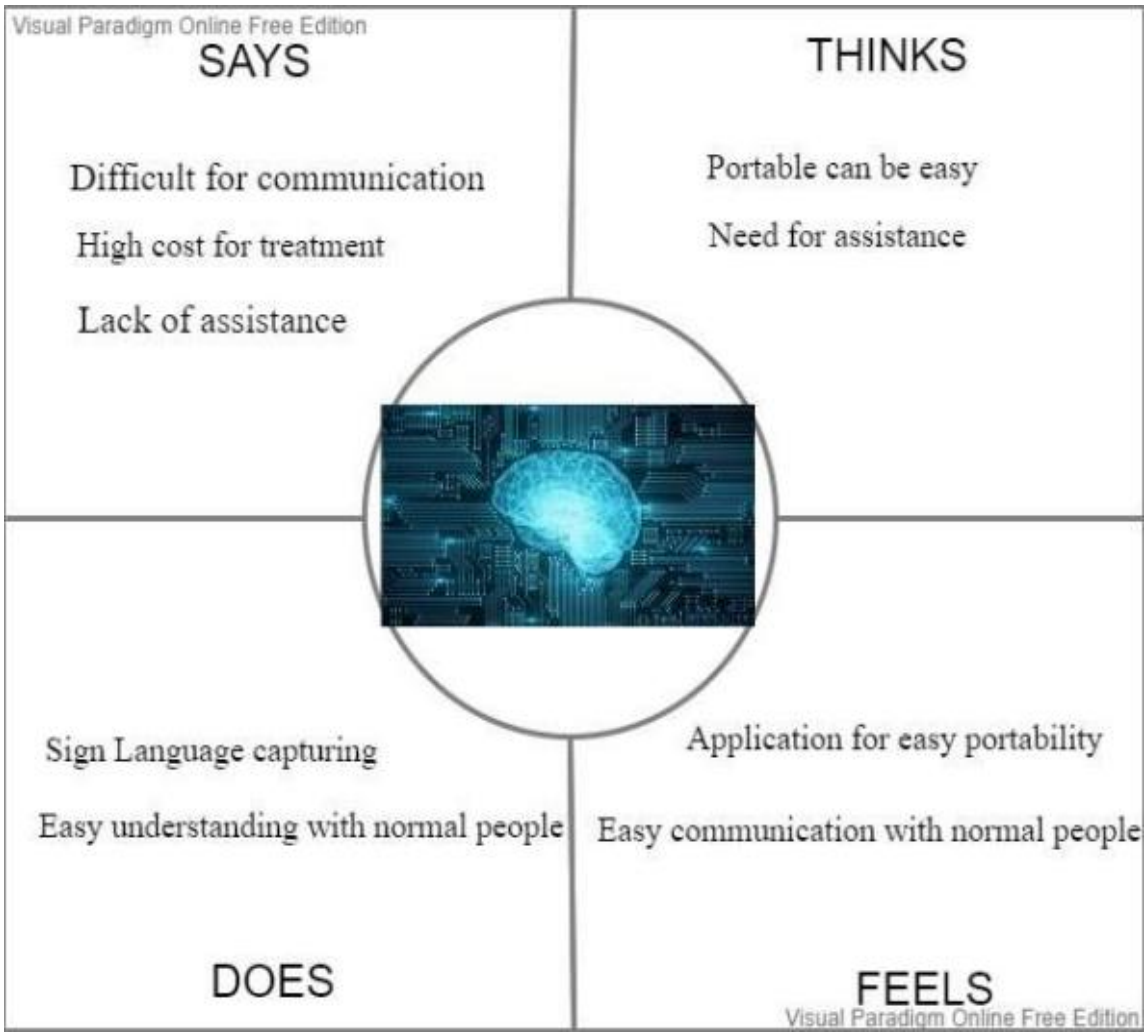
8.CNN reference - https://youtu.be/umGJ30-15_A

2.3 Problem Statement

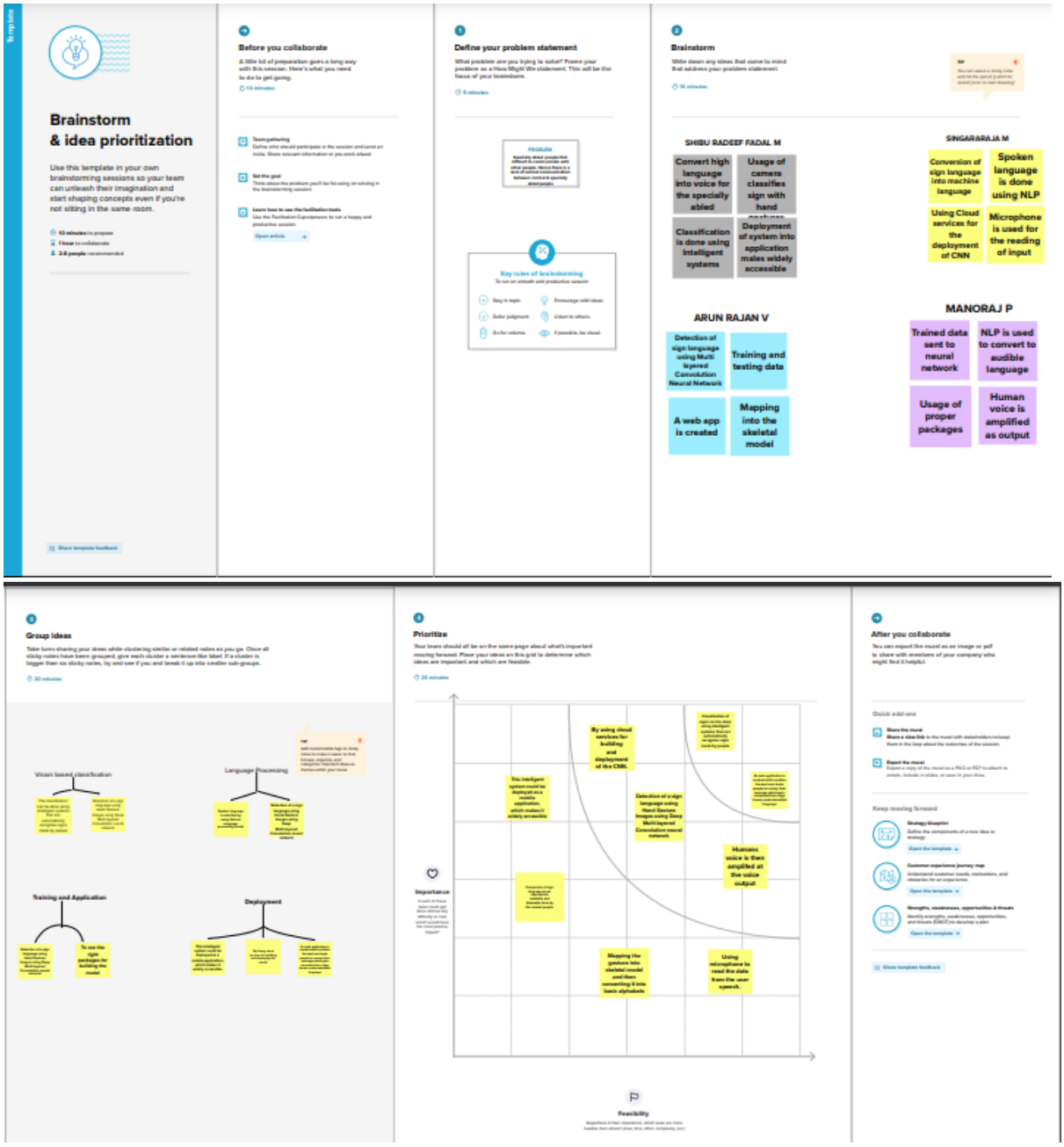
In our society, we have people with disabilities. The technology is developing day by day but no significant developments are undertaken for the betterment of these people. Communications between deaf-mute and a normal person has always been a challenging task. It is very difficult for mute people to 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.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming



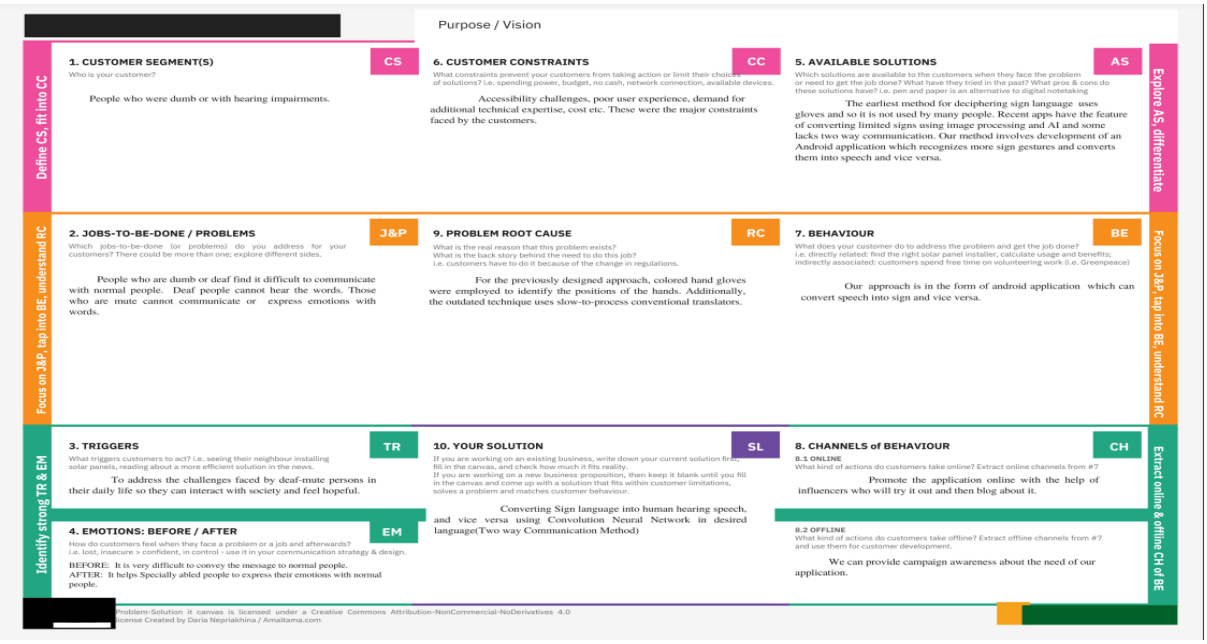
3.3 Proposed Solution

The Aim of our solution is to establish communication between the deaf-dumb and normal people to bring betterment for the society.

S.No.	Parameter	Description
1	Problem statement (problem to be solved)	To address the challenge faced by deaf-mute person in their daily life so they can interact

		with society
2	idea/solution description	Converting sign language into human being speech,vice versa using convolution neural network in desired language
3	Novelty/Uniqueness	Deploying and improving our solution to provide faster response in desired language
4	Social impact/Customer satisfaction	• The application provides good interfacing. • Improving the communication between normal people and Deaf-Dumb • It leads to the development of technologically advanced society
5	Business Model	• We will provide campaign awareness about the need of our application • The application will be made avaliable to more recipients,which will accelerate growth
6	Scalability of the solution	• The user will find it very simple to use and update • Encoding the errors and decoding with better accuracy

3.4 Problem Solution fit



4. REQUIREMENT ANALYSIS

4.1 Functional requirement

FR No	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Input Customization	Via Hand Gesture
FR-4	User Output	Text or Audio Output

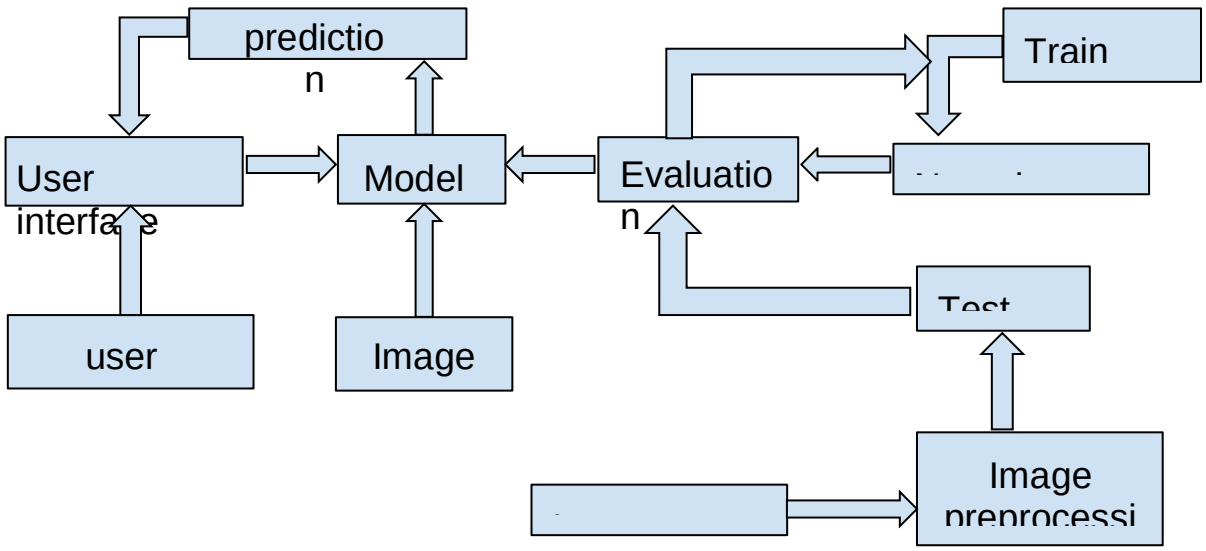
4.2 Non-Functional requirements

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Must be User-Friendly to the disabled people

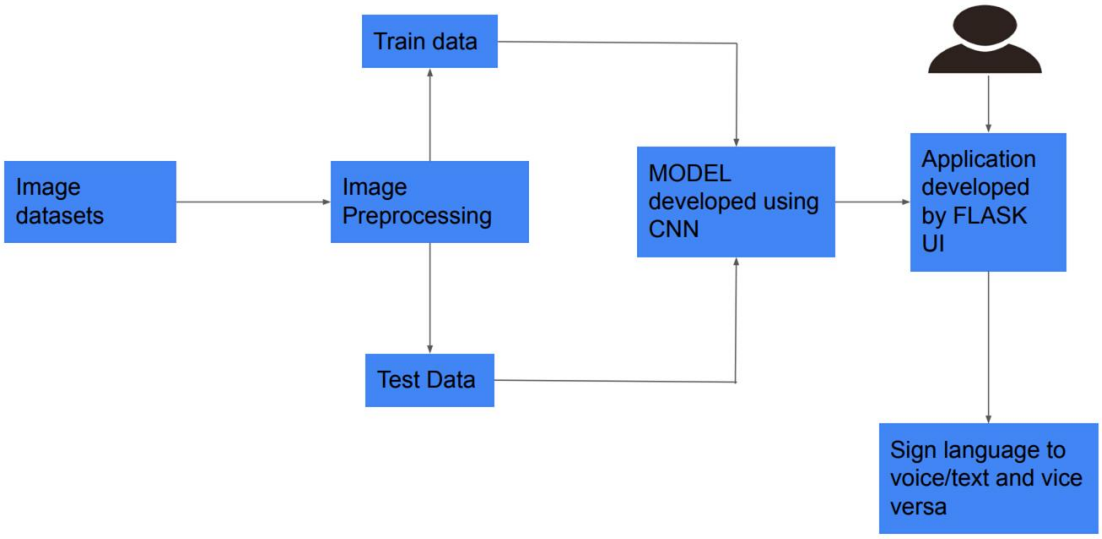
NFR-2	Security	Information stored in the application regarding the user must be kept safe
NFR-3	Reliability	Through collecting feedback from users we can provide reliability
NFR-4	Performance	Quick response, Various languages must be included
NFR-5	Availability	Advertisement Free, Must be available in all kind of App Stores
NFR-6	Scalability	Storage Capacity of Application must be low

5. PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture



5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Open application	USN-1	Open the application with the help of a web page or mobile application.	Can open in app/chrome	High	Sprint-1
	Home page	USN-2	Link directed into home page	N/A	High	Sprint-1
	Introduction page	USN-3	Click on the demo/ introduction	Introduction page will open. Follow the instructions given	Medium	Sprint-2
	Launch application	USN-4	Click launch to move the next page.	Launch the application, it will be redirected to the next page.	Medium	Sprint-1
	Selecting the	USN-5	User need to select the	Users should	High	Sprint-1

	conversion		conversion	select the conversion from text to sign or sign to text.		
	Output / conversion	USN-6	Output on regional language	The gesture or text will display	-	-
Customer (Web user)	same for both users					
Customer Care Executive	Same for both normal and disabled people					
Administrator	same for all the users					

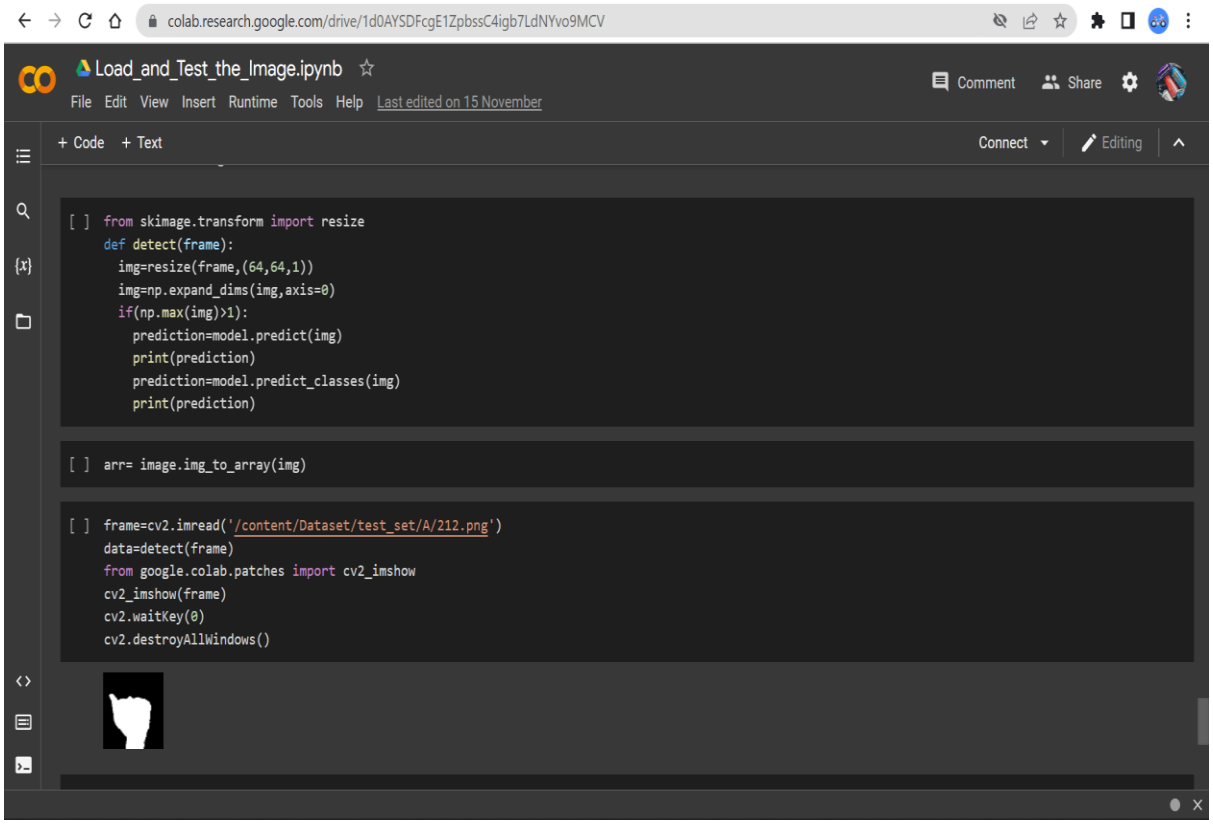
6. PROJECT PLANNING & SCHEDULING

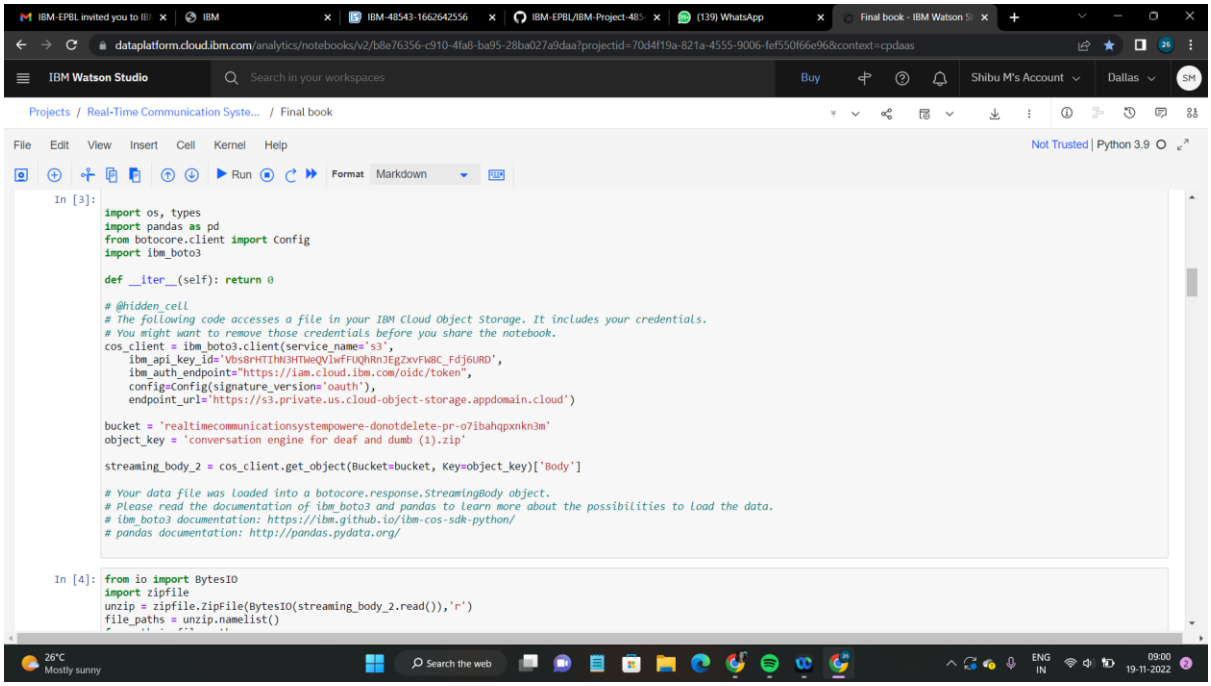
6.1 Sprint Planning & Estimation

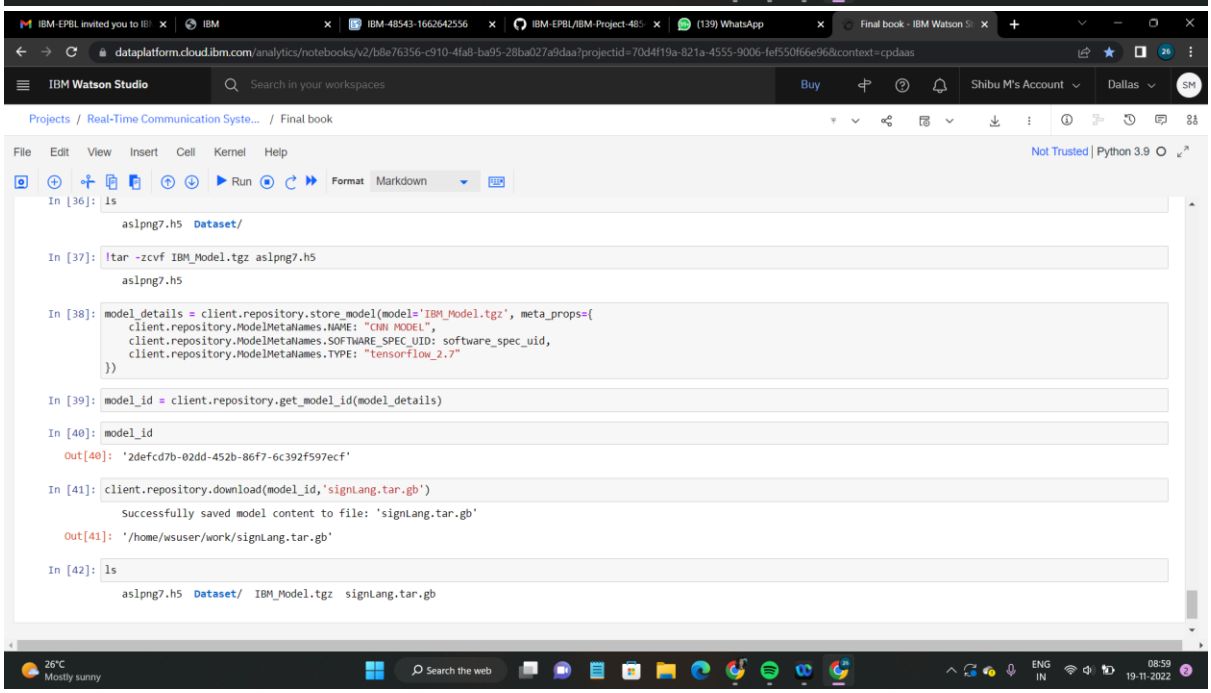
Sprint	Functional Requirement (Epic)	User Story Number	User Story/ Task	Story Points	Priority	Team Members
Sprint – 1	Registration	USN – 1	As a user, I can register for the application by entering my email, password, and confirming my password.	3	High	Shibu Radeef Fadal M Singararaja M
Sprint – 1	Authentication	USN – 2	As a user, I will receive OTP to confirm details.	2	High	Shibu Radeef Fadal M Singararaja M
Sprint – 1	Registration	USN – 3	As a user, I will	1	Low	Shibu Radeef

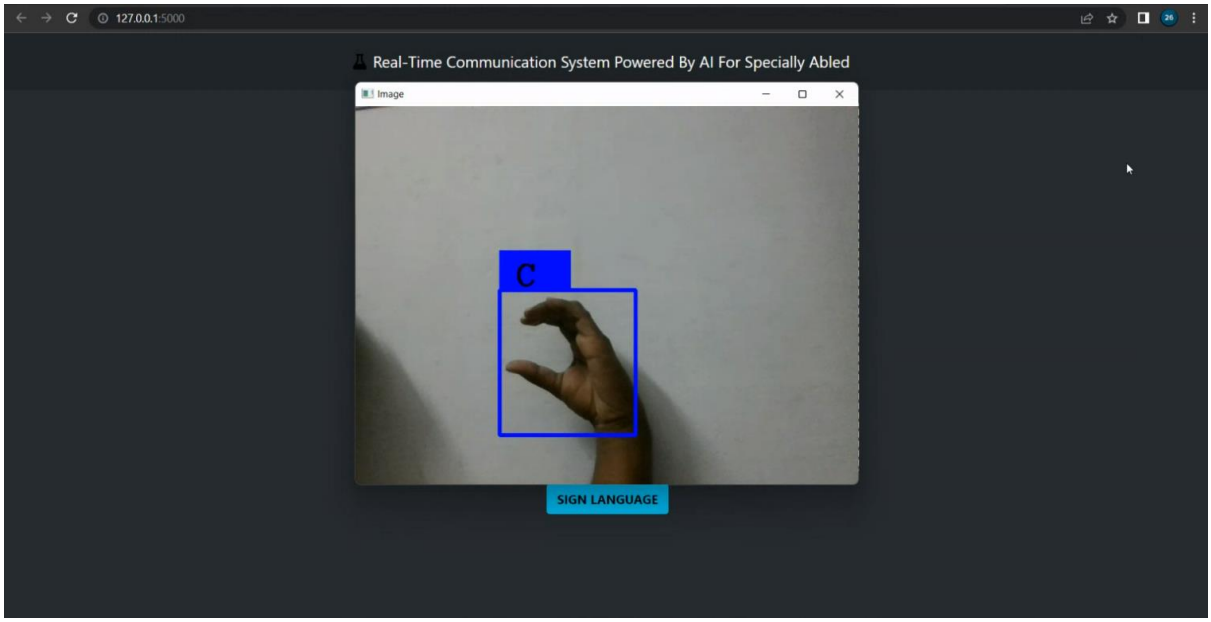
			receive a confirmation email once I have registered for the application.			Fadal M Arun Rajan V
Sprint – 1	Login	USN – 4	As a user, I can log into the application by entering email & password.	2	High	Shibu Radeef Fadal M Singararaja M
Sprint – 2	Dashboard	USN – 5	As a user, I must have one place to explore all available features.	3	High	Shibu Radeef Fadal M Singararaja M
Sprint – 2	Login	USN – 6	As a user, If I forget my password, I must get an auto-generated password to reset my password.	2	medium	Shibu Radeef Fadal M Manoraj P Arun Rajan V
Sprint – 3	Help	USN – 7	As a user, I must be able to reach out to the Support Team	1	Low	Singararaja M Manoraj P
Sprint – 3	Management	USN – 8	As a user, I can access the site using mobile/ desktop.	3	High	Shibu Radeef Fadal M Singararaja M
Sprint – 4	System	USN – 9	As a user, I must have access to previous usage history.	2	Medium	Shibu Radeef Fadal M Manoraj P Arun Rajan V
Sprint – 4	System	USN – 10	As a user, I can have audio output as well as text output.	3	High	Shibu Radeef Fadal M Singararaja M

7. CODING & SOLUTIONING




IBM-EPBL invited you to IBM
IBM
IBM-48543-1662642556
IBM-EPBL/IBM-Project-485
(139) WhatsApp
Final book - IBM Watson St
dataplatform.cloud.ibm.com/analytics/notebooks/v2/b8e76356-c910-4fa8-ba95-28ba027a9daa?projectid=70d4f19a-821a-4555-9006-fef550f66e96&context=cpdaas
IBM Watson Studio
Search in your workspaces
Buy
Shibu M's Account
Dallas
Projects / Real-Time Communication Syste... / Final book
File Edit View Insert Cell Kernel Help
Not Trusted | Python 3.9
Run
Format Markdown
In [3]:
import os, types
import pandas as pd
from botocore.client import Config
import ibm_boto3
def __iter__(self): return 0
# @hidden_cell
# The following code accesses a file in your IBM Cloud Object Storage. It includes your credentials.
# You might want to remove those credentials before you share the notebook.
cos_client = ibm_boto3.client(service_name='s3',
ibm_api_key_id='VbsBrHTIhN3HTWeQVlwfFUQhRnJEgZxvFW8C_Fdj6URD',
ibm_auth_endpoint="https://iam.cloud.ibm.com/oidc/token",
config=Config(signature_version='oauth'),
endpoint_url='https://s3.private.us.cloud-object-storage.appdomain.cloud')
bucket = 'realtimecommunicationsystempowere-donotdelete-pr-o7ibahqpxnkn3m'
object_key = 'conversation engine for deaf and dumb (1).zip'
streaming_body_2 = cos_client.get_object(Bucket=bucket, Key=object_key)['Body']
# Your data file was loaded into a botocore.response.StreamingBody object.
# Please read the documentation of ibm_boto3 and pandas to learn more about the possibilities to load the data.
# ibm_boto3 documentation: https://ibm.github.io/ibm-cos-sdk-python/
# pandas documentation: http://pandas.pydata.org/
In [4]:
from io import BytesIO
import zipfile
unzip = zipfile.ZipFile(BytesIO(streaming_body_2.read()),'r')
file_paths = unzip.namelist()
26°C
Mostly sunny
Search the web
ENG
IN
09:00
19-11-2022


IBM-EPBL invited you to IBM
IBM
IBM-48543-1662642556
IBM-EPBL/IBM-Project-485
(139) WhatsApp
Final book - IBM Watson St
dataplatform.cloud.ibm.com/analytics/notebooks/v2/b8e76356-c910-4fa8-ba95-28ba027a9daa?projectid=70d4f19a-821a-4555-9006-fef550f66e96&context=cpdaas
IBM Watson Studio
Search in your workspaces
Buy
Shibu M's Account
Dallas
Projects / Real-Time Communication Syste... / Final book
File Edit View Insert Cell Kernel Help
Not Trusted | Python 3.9
Run
Format Markdown
In [36]: ls
aslpng7.h5 Dataset/
In [37]: !tar -zcvf IBM_Model.tgz aslpng7.h5
aslpng7.h5
In [38]: model_details = client.repository.store_model(model='IBM_Model.tgz', meta_props={
client.repository.ModelMetaNames.NAME: "CNN MODEL",
client.repository.ModelMetaNames.SOFTWARE_SPEC_UID: software_spec_uid,
client.repository.ModelMetaNames.TYPE: "tensorflow_2.7"
})
In [39]: model_id = client.repository.get_model_id(model_details)
In [40]: model_id
Out[40]: '2defcd7b-02dd-452b-86f7-6c392f597ecf'
In [41]: client.repository.download(model_id,'signLang.tar.gb')
Successfully saved model content to file: 'signLang.tar.gb'
Out[41]: '/home/wsuser/work/signLang.tar.gb'
In [42]: ls
aslpng7.h5 Dataset/ IBM_Model.tgz signLang.tar.gb
26°C
Mostly sunny
Search the web
ENG
IN
08:59
19-11-2022



8. TESTING

8.2 User Acceptance Testing

8.2.1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the REAL TIME COMMUNICATION SYSTEM POWERED BY AI FOR SPECIALLY ABLED project at the time of the release to User Acceptance Testing (UAT)

.

8.2.2. Defect Analysis

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

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	1	0	2	2	5
Duplicate	1	0	0	0	1
External	2	3	0	1	6
Fixed	5	1	6	4	16
Not Reproduced	0	0	1	0	1
Skipped	1	1	1	1	4
Won't Fix	0	5	3	1	8

Totals	10	10	13	9	14

8.2.3. Test Case Analysis

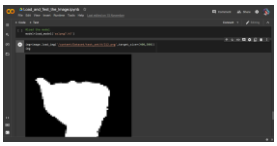
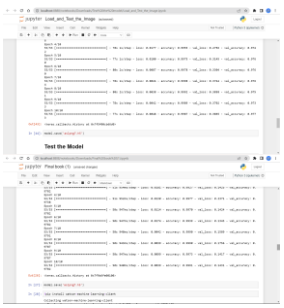
This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	3	0	0	3
Client Application	18	0	0	18
Security	4	0	0	4
Outsource Shipping	3	0	0	3
Exception Reporting	6	2	0	4
Final Report Output	4	0	0	4
Version Control	8	2	0	6

9. RESULTS

9.1 Performance Metrics

Model Performance Testing:

S.NO	Parameter	Values	Screenshot
1	Model Summary	-	
2	Accuracy	Training Accuracy – 97.77 Validation Accuracy – 98.86	

10. ADVANTAGES & DISADVANTAGES

Advantages :

1.It makes communication process easy
2.Defeats the barrier of communication between the disabled people and makes easy to understand, both vice-versa.
3.Easy to communicate with the people of disability as well as the normal people.
4.As different sign language standards exist, their dataset can be added, and the user can choose which sign language to read.

Disadvantages :

1.Consumes lot of data to train.
2.Required trained dataset in order to predict and shows the similar answer than the unknown predicted value.
3. The current model only works from alphabets A to I.
4. In absence of gesture recognition, alphabets from J cannot be identified as they require some kind of gesture input from the user.

11. CONCLUSION

Sign language is a useful tool for facilitating communication between deaf & hearing people. Because it allows for twoway communication, the system aims to bridge the communication gap between deaf people and the rest of society. The proposed methodology translates language into English alphabets that are understandable to humans.
This system sends hand gestures to the model, who recognises them and displays the equivale nt Alphabet on the screen.
Deaf-mute people can use their hands to perform sign language, which
will then be converted into alphabets, thanks to this project.

12. FUTURE SCOPE

Having a technology that can translate hand sign language to its corresponding alphabet is a game changer in the field of communication and Ai for the specially abled people such as dea f and dumb. With introduction of gesture recognition, the web app can easily be expanded to recognize letters beyond 'I', digits and other symbols plus gesture recognition can also allow controlling of software/hardware interfaces.

13. APPENDIX

Github :
https://github.com/IBM-EPBL/IBM-Project-48543-1660809062
Project Demo Link :
https://drive.google.com/file/d/1_u6TLPKqC1aMk-4y3x0ELflaW0rPqR4W/view?usp=share_link