



V.S.B. ENGINEERING COLLEGE
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Real-Time Communication System Powered by AI for Specially Abled Person

A person report submitted in partial fulfilment of 7th semester in degree of

**BACHELOR OF ENGINEERING
IN**

COMPUTER SCIENCE AND ENGINEERING

Submitted by

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1.INTRODUCTION

a. Project Overview:

- There are handicapped people in our society. Although technology is constantly evolving, little is being done to improve the lives of these people.
- Any method of telecommunication in which all users can instantly exchange information is known as real-time communications (RTC).
- The improvement of communication is crucial to a better world. It forges relationships and bonds amongst people.

b.Purpose:

Aim :

- The project intends to create a system that can translate speech into acceptable sign language for the deaf and dumb and convert sign language into a human hearing voice in the preferred language to communicate with normal people.
- The development of an app allows persons who are deaf or dumb to communicate using signs that are translated into speech and understood by others.

2.LITERATURE SURVEY

a.Existing problem

- It has always been difficult to communicate with someone who is deaf-mute.
- It is quite challenging for silent persons to communicate with non-mute people.
- Since normal people are not trained on hand sign language.
- Only those with special needs are taught sign language, and because the average person has no idea how it works, there is a communication gap.
- Under emergency situations, it is even more difficult for specially abled people to get help.
- Non-Emergency normal environments can also be hard for them to navigate needing special assistance.

b.References

- Koufos, K., EL Haloui, K., Dianati, M., Higgins, M., Elmirghani, J., Imran, M. A., & Tafazolli, R. (2021). Trends in Intelligent Communication Systems: Review of Standards,

Major Research Projects, and Identification of Research Gaps. Journal of Sensor and Actuator Networks, 10(4), 60.

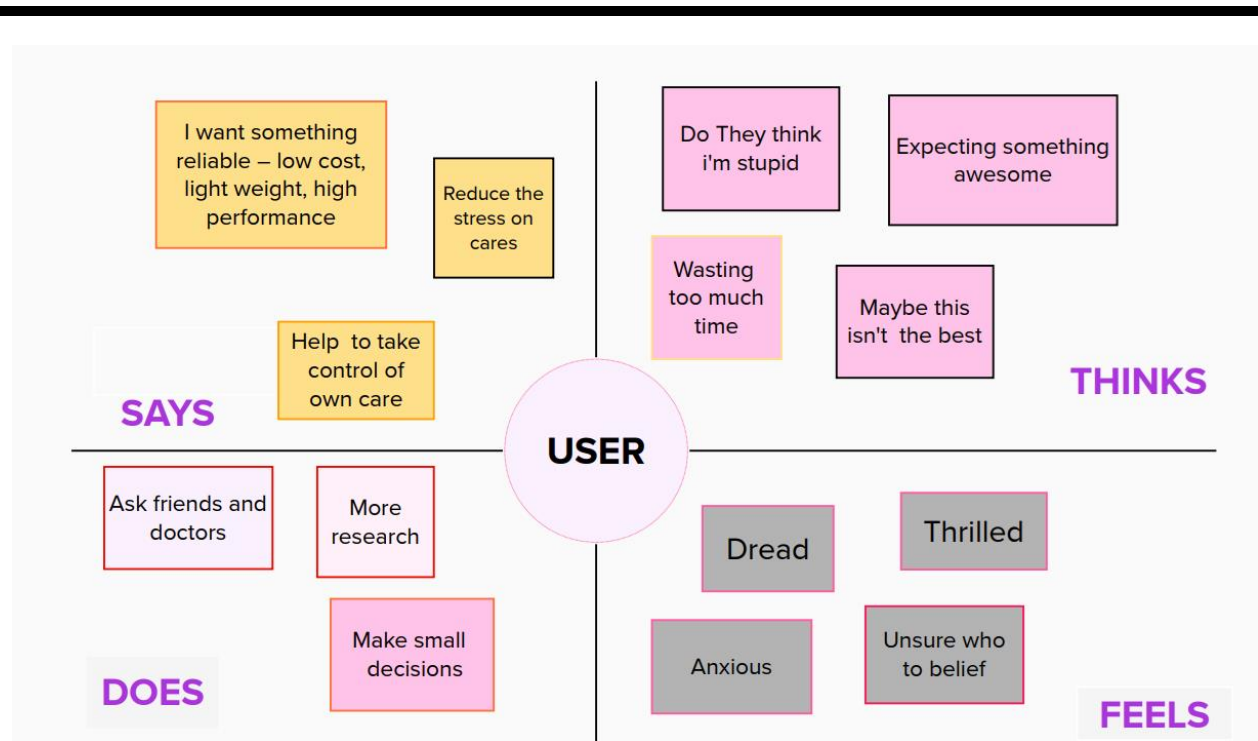
- Panda, G., Upadhyay, A. K., & Khandelwal, K. (2019). Artificial intelligence: A strategic disruption in public relations. Journal of Creative Communications, 14(3), 196-213.
- Xu, G., Mu, Y., & Liu, J. (2017). Inclusion of artificial intelligence in communication networks and services. ITU J. ICT Discov. Spec, 1, 1-6

c. Problem Statement Definition

- In the world, all the people are having the six senses are a multi-platform app for aiding the people in need that is people who are handicapped in the form of lack of speech (dumb), lack of hearing (deaf), lack of sight (blind), lack of judicial power to differentiate between objects (visual agnosia) and people suffering from autism (characterized by great difficulty in communicating and forming relationships with other people and in using language and abstract concepts).
- Our current implementation of the product is on two platforms, namely, mobile and a web app.
- Hence, it has been implemented on the mobile app utilizing the Firebase ML toolkit and different pre-trained models, which are both available offline as well as online

3. IDEATION & PROPOSED SOLUTION

a. Empathy Map Canvas



b.Ideation & Brainstorming

Brainstorm

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 in given an output.

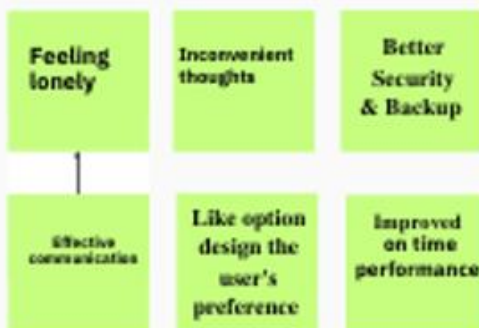
Pavithra



kavipriya



Madhumidha



Kiruthuka Parameshwari



Group id:raa

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.

Catagory 01

Different language options

Keep the UI simple and interactive

Catagory 02

Monitoring facial expression

Recognition of hand gestures

Choice based result

Providing automated services

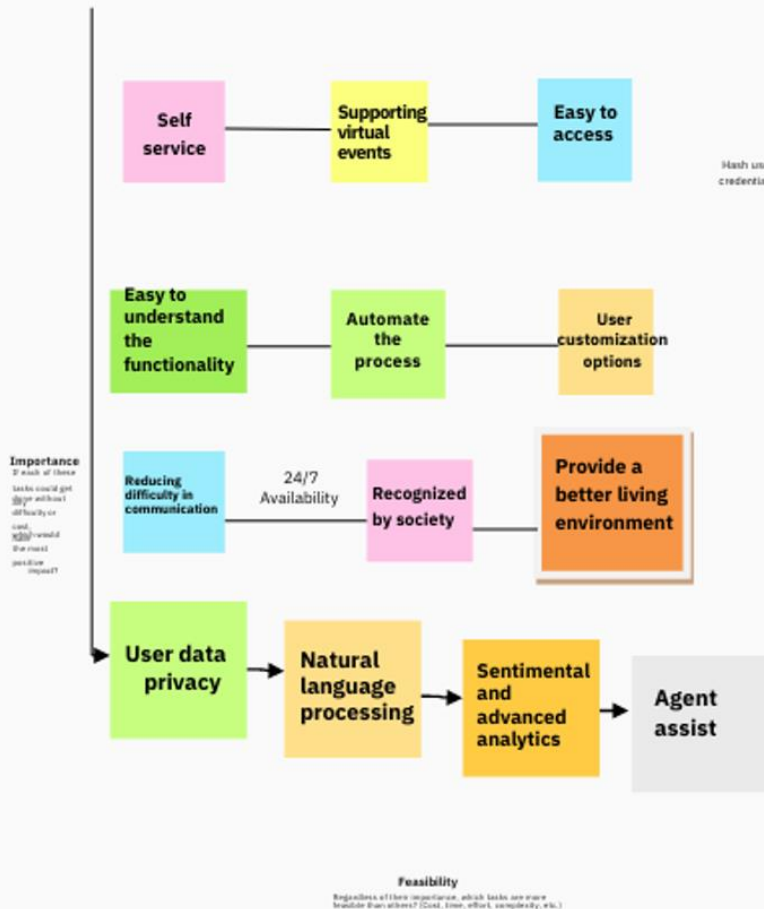
Catagory 03

Secure and trusted ecosystem

Write maintainable code

Prioritize

You can convey the wall laying out as an image or pdf to give to people from your association who could believe that it is helpful



After you collaborate

You can send out the products for specially abled persons that impart to individuals from your organization who could think that it is useful

Quick add-ons

1. **Share the mural**
Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.
2. **Export the mural**
Export a copy of the mural as a PNG or PDF to attach to email, include in slides, or save in your drive.

Keep moving forward

Strategy blueprint

Define the components of a new idea or strategy.

Customer e

Understand customer needs, motivations, and desires.

Strengths, weaknesses, opportunities & threats. Identify strengths, weaknesses, opportunities, and threats (SWOT).


c. Proposed Solution


S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	News organizations whose mobile apps only provide users with their articles or videos are missing a big opportunity. An application, by definition, should be applied to perform a task, to solve a problem. Most news doesn't do that. Rather than just feed readers recent stories you wrote <i>about</i> their problems, apps can provide tools and data that enable users to actually <i>solve</i> their problems. When you solve problems, you get more loyal users and a chance to make more money.
2.	Idea / Solution description	Start with an audience-first focus. Instead of thinking about what your organization produces (news articles) and how to fit that into an app, start from scratch and consider your audience. Who are they, and what problems do they face? Use your imagination, do some role playing with colleagues, and actually talk to some real people.
3.	Novelty / Uniqueness	Building mobile tools with data isn't as easy as importing an XML feed of your latest headlines. But if you're going to spend thousands of dollars developing a mobile app anyway, you might as well spend a little more to build a real application that helps solve problems and makes advertisers take notice.
4.	Social Impact / Customer Satisfaction	These apps are all about solving problems and enabling the user to take an action — go to this bar, shop at that boutique, rent this apartment. These are the apps that build loyal audiences because they help people get things done instead of just presenting another thing they feel obligated to do (keep up with news stories). That is valuable not only for users, but for advertisers as well.
5.	Business Model (Revenue Model)	Building mobile tools with data isn't as easy as importing an XML feed of your latest headlines. But if you're going to spend thousands of dollars developing a mobile app anyway, you might as

		well spend a little more to build a real application that helps solve problems and makes advertisers take notice.
6.	Scalability of the Solution	News tracker application can handle data across machines and data that will not fit into memory. It supports clusters and can handle machine failures, rebuilding machines easily.

d. Problem Solutionfit

Problem-Solution fit canvas 2.0		Purpose / Vision	
Define CS, fit into CC	1. CUSTOMER SEGMENT(S) Specially abled person CS	6. CUSTOMER CONSTRAINTS Low Budget, Proper Network connections, Available devices for customer requirements. CC	5. AVAILABLE SOLUTIONS In this product we provide feedback pop-up notifications frequently and an emergency purpose ping for people who have minimum knowledge about the application. AS
			Explore AS, differentiate
Focus on J&P, tap into BE, understand RC	2. JOBS-TO-BE-DONE / PROBLEMS Concentrate on making their effective communication is more about listening and live a usual life. J&P	9. PROBLEM ROOT CAUSE 1.It can be cause due to accidents, injuries, obesity, infection or other illness. Illness like cancer, heart attack or diabetes cause the impairments. RC	7. BEHAVIOUR The customer should be provided a customer care number and it gives many feedback pop-up notifications frequently which helps the customer to contact with us and get their jobs done. BE
			Focus on J&P, tap into BE, understand RC
Identify strong TR & EM	3. TRIGGERS To advertise the product in specially abled schools and other important places. And also making awareness and advertise about this product using various online platforms like face book, you tube etc., TR	10. YOUR SOLUTION Voice recognition and predictive texting tools allows people who have difficulty in speaking to communicate more easily using Artificial Intelligence. We can also Use AI Sensors to monitor their health conditions regularly and save the health reports for future purposes in a separate database. SL	8. CHANNELS of BEHAVIOUR 8.1 ONLINE Online voice assistants such as Siri, Alexa, Google assistants are allowing customers to make use of their devices. CH
	4. EMOTIONS: BEFORE / AFTER Before using this product the specially abled people were struggling and feel very bad to communicate with others. But after using this product they will feel very good ,easy and comfortable to communicate with others. EM		8.2 OFFLINE 1.Connecting with people might be difficult depending on the type of disability. 2.Technology and AI leave no one behind and can benefit persons with disability.
			Extract online & offline CH of BE

 Problem-Solution fit canvas is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 license Created by Daria Nepriakhina / Amaltama.com



4. REQUIREMENT ANALYSIS

a.Functional requirement

Functional Requirements:

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 Form Registration through Gmail Registration through LinkedIn
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Authentication	Confirmation through Facial acknowledgment Confirmation through secret key verification convention
FR-4	External interfaces	Robots and different apparatuses give locally situated care also, other help, permitting individuals with handicaps to freely live
FR-5	Transaction processing	Many application can use to interpret the communication through signing like D talk in the framework
FR-6	Reporting	There is a developing indication that we want to accomplish more, to assist make the existences of individuals with handicaps more straightforward

b.Non-Functional requirements

Non-functional Requirements:

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

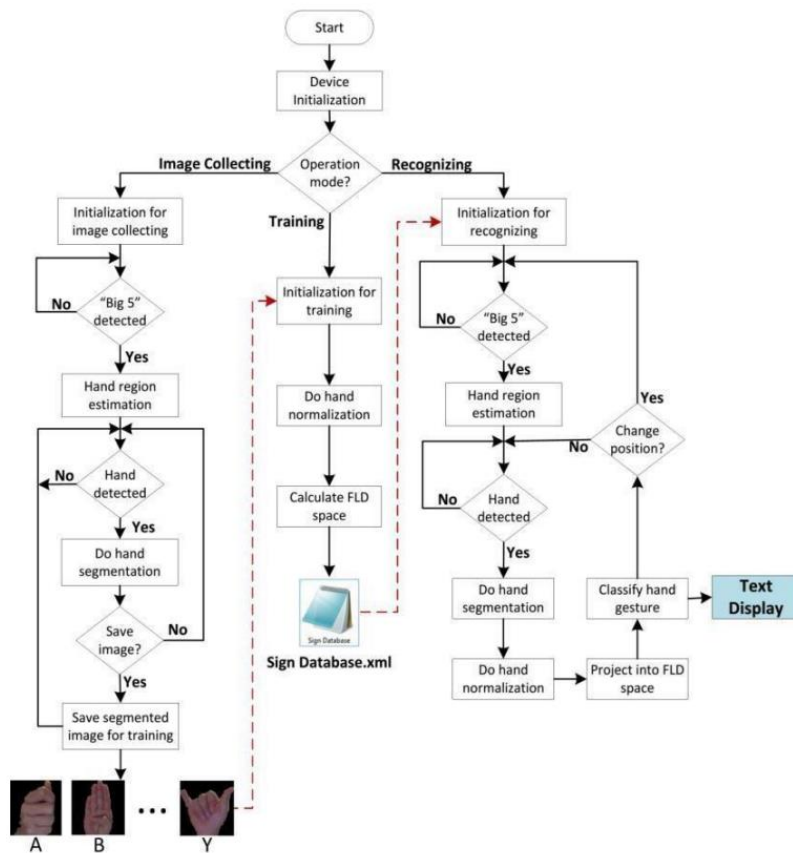
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The application and the product we are developing will be enabled with the facilities of voice engines which helps the user to analyse the surroundings and act accordingly. It also includes features such as speech to text and speech to signs and vice versa which allows deaf people to communicate with the outside world.
NFR-2	Security	This application provides a highly confidential platform when it comes to user security. It stores each and every detail of the users in a highly secured database which is impossible to access by the third parties.

NFR-3	Reliability	Our application provides quality customer service with high security so this will be trustworthy.
NFR-4	Performance	Speed, Accuracy, Efficiency, User-friendly.
NFR-5	Availability	Since our application does not contain any premium customers option it will be affordable for all the users. The users can always download it from google play store or apple store or from any other online application platforms.
NFR-6	Scalability	It is a single user entity. On the basis of performance this application will work efficiently even with less bandwidth of internet.

5.PROJECT DESIGN

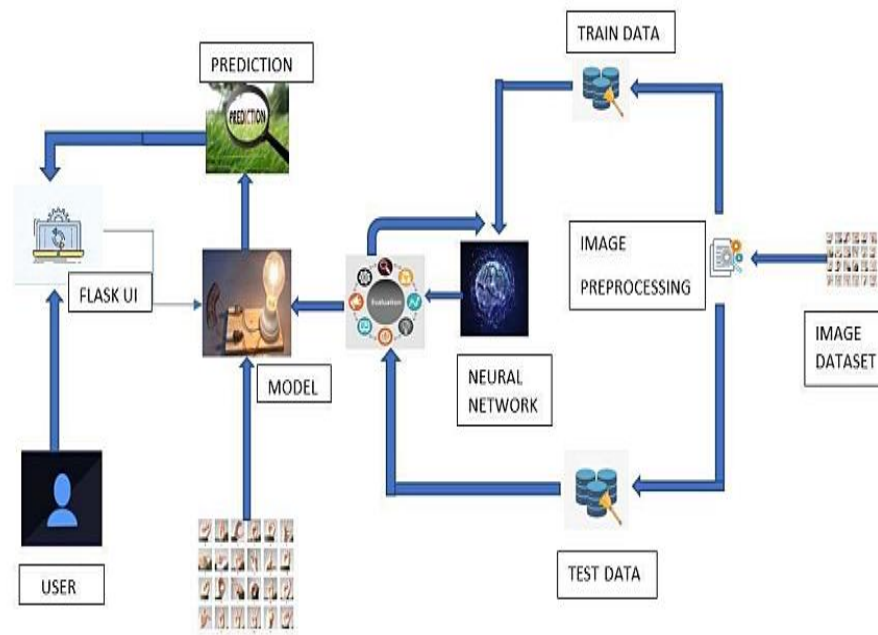
a. Data Flow Diagrams

Dataflow Diagram:



b. Solution & Technical Architecture

Technical Architecture:



c. User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Desktop user)	Registration	USN-1	Not Required	I can access my account dashboard	High	Sprint-1
	Login	USN-2	Not Required		High	Sprint-1
	Dashboard	USN-3	Not Required			
Customer (Desktop user)	Main page	USN-4	As a User, I can enter the web page once clicked, which provides be the Guidelines to use the app	I can enter the web page once clicked	Medium	Sprint-1
Customer (Desktop user)	Guidelines	USN-5	As a User, I can give a read through the guidelines to understand the functioning of the app.	I can give a read through the guidelines.	Medium	Sprint-1
Customer (Desktop user)	Convert Sign	USN-6	As a User, I can click the button <u>Convert sign</u> , which directs me towards the Main screen	I can click the button Convert sign and directed me to main screen.	Medium	Sprint-2
Customer (Desktop user)	Camera (Hand movement detection)	USN-7	As a User, I can show my hand sign towards the camera which converts them into text manner.	I can show my hand sign towards the camera accurately.	High	Sprint-2
Customer (Desktop user)	Voice mode	USN-8	Once the text is obtained, As a User I can click on the voice mode which provides the text in the form of speech.	I can click on the voice mode which provides the text in the form of speech.	High	Sprint-2

6.PROJECT PLANNING &SCHEDULING

a.Sprint Planning & Estimation

Milestone List:

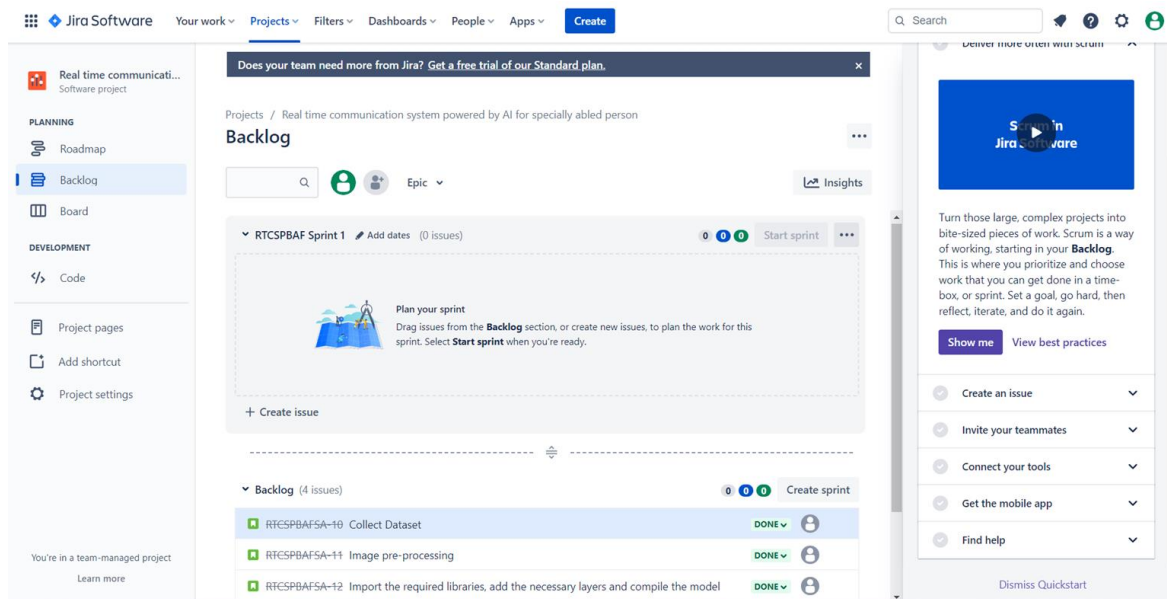
Milestone Number	Milestone Name	Duration	Submission Dates
MN – 01	Ideation Phase	3 Weeks	17 September, 2022
MN – 02	Project Design Phase – I	2 Weeks	01 October, 2022
MN – 03	Project Design Phase – II	2 Weeks	15 October, 2022
MN – 04	Project Planning Phase	1 Week	22 October, 2022
MN – 05	Project Development Phase	3 Weeks	18 November, 2022
MN – 06	Pre-requisites	1 Week	30 September, 2022
MN – 07	Project Structure	1 Week	02 October, 2022
MN – 08	Data Collection	2 Days	04 October, 2022
MN – 09	Image Pre-processing	4 Days	08 October, 2022
MN – 10	Model Building	1 Week	19 October, 2022
MN – 11	Test the model	2 Days	20 October, 2022
MN – 12	Application Building	1 Week	22 October, 2022
MN – 13	Train CNN Model on IBM	2 Days	30 October, 2022

b.Sprint Delivery Schedule

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	PAVITHRA V
Sprint – 1	Authentication	USN – 2	As a user, I will receive OTP to confirm details.	2	High	PAVITHRA V
Sprint – 1	Registration	USN – 3	As a user, I will receive confirmation email once I have registered for the application.	1	Low	KIRUTHIKA PARAMESHWARI M
Sprint – 1	Login	USN – 4	As a user, I can log into the application by entering email & password.	2	High	KIRUTHIKA PARAMESHWARI M
Sprint – 2	Dashboard	USN – 5	As a user, I must have one place to explore all available features.	3	High	KAVIPRIYA T
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	MADHUMIDHA M
Sprint – 3	Help	USN – 7	As a user, I must be able to reach out to the Support Team to get my issues resolved.	1	Low	PAVITHRA V

Sprint – 3	Management	USN – 8	As a user, I can access the site using mobile/ desktop.	3	High	KIRUTHIKA PARAMESHWARI M
Sprint – 4	System	USN – 9	As a user, I must have access to previous usage history.	2	Medium	KAVIPRIYA T
Sprint – 4	System	USN – 10	As a user, I can have audio output as well as text output.	3	High	MADHUMIDHA M

c.Reports from JIRA



7.CODING &SOLUTIONING (Explain the features addedinthe projectalong with code)

a.Model Building

Project: Real-Time Communication system powered by AI for specially abled

Model Building

Import The Required Model Building Libraries

```
In [ ]: #import imagedatagenerator
from keras.preprocessing.image import ImageDataGenerator
```

```
In [ ]: #training datagen
train_datagen=ImageDataGenerator(rescale=1./255,shear_range=0.2,zoom_range=0.2,horizontal_flip=True)
```

```
In [ ]: #testing datagen
test_datagen=ImageDataGenerator(rescale=1./255)
```

IMPORTING tensorflow

```
In [ ]: import tensorflow as tf
import os
```

Initialize The Model

```
In [ ]: #create model
from keras.models import Sequential
from keras.layers import Dense
from keras.layers import Convolution2D
from keras.layers import MaxPooling2D
from keras.layers import Dropout
from keras.layers import Flatten
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

```
In [ ]: import numpy as np
import matplotlib.pyplot as plt #to view graph in colab itself
import IPython.display as display
from PIL import Image
import pathlib
```

Unzipping the dataset

```
In [ ]: #create model
        from keras.models import Sequential
        from keras.layers import Dense
        from keras.layers import Convolution2D
        from keras.layers import MaxPooling2D
        from keras.layers import Dropout
        from keras.layers import Flatten
        from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

```
In [ ]: import numpy as np
        import matplotlib.pyplot as plt #to view graph in colab itself
        import IPython.display as display
        from PIL import Image
        import pathlib
```

Unzipping the dataset

```
In [ ]: !unzip '/content/drive/MyDrive/Colab Notebooks/conversation engine for deaf and dumb.zip'
```

Streaming output truncated to the last 5000 lines.

```
extracting: Dataset/training_set/G/1225.png
extracting: Dataset/training_set/G/1226.png
extracting: Dataset/training_set/G/1227.png
extracting: Dataset/training_set/G/1228.png
extracting: Dataset/training_set/G/1229.png
  inflating: Dataset/training_set/G/123.png
extracting: Dataset/training_set/G/1230.png
extracting: Dataset/training_set/G/1231.png
extracting: Dataset/training_set/G/1232.png
  inflating: Dataset/training_set/G/1233.png
  inflating: Dataset/training_set/G/1234.png
  inflating: Dataset/training_set/G/1235.png
  inflating: Dataset/training_set/G/1236.png
  inflating: Dataset/training_set/G/1237.png
  inflating: Dataset/training_set/G/1238.png
  inflating: Dataset/training_set/G/1239.png
  inflating: Dataset/training_set/G/124.png
  inflating: Dataset/training_set/G/1240.png
  inflating: Dataset/training_set/G/1241.png
  inflating: Dataset/training_set/G/1242.png
  inflating: Dataset/training_set/G/1243.png
  inflating: Dataset/training_set/G/1244.png
  inflating: Dataset/training_set/G/1245.png
extracting: Dataset/training_set/G/1246.png
  inflating: Dataset/training_set/G/1247.png
  inflating: Dataset/training_set/G/1248.png
  inflating: Dataset/training_set/G/1249.png
  inflating: Dataset/training_set/G/125.png
  inflating: Dataset/training_set/G/1250.png
  inflating: Dataset/training_set/G/1251.png
  inflating: Dataset/training_set/G/1252.png
  inflating: Dataset/training_set/G/1253.png
  inflating: Dataset/training_set/G/1254.png
  inflating: Dataset/training_set/G/1255.png
```

Applying ImageDataGenerator to training set

```
In [ ]: x_train=train_datagen.flow_from_directory('/content/Dataset/training_set',target_size=(64,64),batch_size=200,  
                                              class_mode='categorical',color_mode="grayscale")
```

Found 15750 images belonging to 9 classes.

Applying ImageDataGenerator to test set

```
In [ ]: x_test=test_datagen.flow_from_directory('/content/Dataset/test_set',target_size=(64,64),batch_size=200,  
                                              class_mode='categorical',color_mode="grayscale")
```

Found 2250 images belonging to 9 classes.

```
In [ ]: a=len(x_train)  
       b=len(x_test)
```

Length of training set

```
In [ ]: print(a)
```

79

Length of test set

```
In [ ]: print(b)
```

12

Add Layers

```
In [ ]: #create model  
       model=Sequential()
```

```
In [ ]: print(a)
```

79

Length of test set

```
In [ ]: print(b)
```

12

Add Layers

```
In [ ]: #create model
model=Sequential()
```

Add The Convolution Layer

```
In [ ]: model.add(Convolution2D(32,(3,3),input_shape=(64,64,1),activation='relu'))
```

Add Pooling Layer

```
In [ ]: model.add(MaxPooling2D(pool_size=(2,2)))
```

Add The Flatten Layer

```
In [ ]: model.add(Flatten())
```

Adding The Dense Layers

```
In [ ]: #1st hidden layer
model.add(Dense(units=512,activation='relu'))
#2nd hidden layer
model.add(Dense(units=261,activation='relu'))
```

```
In [ ]: #output layer
model.add(Dense(units=9,activation='softmax'))
```

Adding The Dense Layers

```
In [ ]: #1st hidden layer
model.add(Dense(units=512,activation='relu'))
#2nd hidden layer
model.add(Dense(units=256,activation='relu'))
```

```
In [ ]: #output layer
model.add(Dense(units=9,activation='softmax'))
```

Compile The Model

```
In [ ]: model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
```

Fit The Model

```
In [ ]: model.fit_generator(x_train,steps_per_epoch=len(x_train),epochs=10,validation_data=x_test,validation_steps=len(x_test))
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:1: UserWarning: `Model.fit_generator` is deprecated and will be removed in a future version. Please use `Model.fit`, which supports generators.
"""Entry point for launching an IPython kernel.
```

```
Epoch 1/10
79/79 [=====] - 89s 1s/step - loss: 0.4318 - accuracy: 0.8572 - val_loss: 0.2326 - val_accuracy: 0.9471
Epoch 2/10
79/79 [=====] - 87s 1s/step - loss: 0.0413 - accuracy: 0.9886 - val_loss: 0.1702 - val_accuracy: 0.9773
Epoch 3/10
79/79 [=====] - 88s 1s/step - loss: 0.0253 - accuracy: 0.9933 - val_loss: 0.1599 - val_accuracy: 0.9764
Epoch 4/10
79/79 [=====] - 86s 1s/step - loss: 0.0086 - accuracy: 0.9979 - val_loss: 0.1979 - val_accuracy: 0.9733
Epoch 5/10
79/79 [=====] - 87s 1s/step - loss: 0.0097 - accuracy: 0.9975 - val_loss: 0.1815 - val_accuracy: 0.9782
Epoch 6/10
79/79 [=====] - 86s 1s/step - loss: 0.0067 - accuracy: 0.9982 - val_loss: 0.2445 - val_accuracy: 0.9782
Epoch 7/10
79/79 [=====] - 84s 1s/step - loss: 0.0045 - accuracy: 0.9988 - val_loss: 0.2291 - val_accuracy: 0.9782
Epoch 8/10
79/79 [=====] - 84s 1s/step - loss: 0.0083 - accuracy: 0.9973 - val_loss: 0.1956 - val_accuracy: 0.9782
Epoch 9/10
79/79 [=====] - 83s 1s/step - loss: 0.0029 - accuracy: 0.9995 - val_loss: 0.2011 - val_accuracy: 0.9773
Epoch 10/10
79/79 [=====] - 84s 1s/step - loss: 0.0027 - accuracy: 0.9991 - val_loss: 0.2367 - val_accuracy: 0.9778
```

Out[]:

Save The Model

```
In [ ]: model.save('as1png2.h5')
```


8. TESTING

a. Test Cases

Adding The Dense Layers

```
In [ ]: #1st hidden Layer
model.add(Dense(units=512,activation='relu'))
#2nd hidden Layer
model.add(Dense(units=256,activation='relu'))
```

```
In [ ]: #output Layer
model.add(Dense(units=9,activation='softmax'))
```

Compile The Model

```
In [ ]: model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
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Fit The Model

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In [ ]: model.fit_generator(x_train,steps_per_epoch=len(x_train),epochs=10,validation_data=x_test,validation_steps=len(x_test))
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```
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79/79 [=====] - 87s 1s/step - loss: 0.0413 - accuracy: 0.9886 - val_loss: 0.1702 - val_accuracy: 0.9773
Epoch 3/10
79/79 [=====] - 88s 1s/step - loss: 0.0253 - accuracy: 0.9933 - val_loss: 0.1599 - val_accuracy: 0.9764
Epoch 4/10
79/79 [=====] - 86s 1s/step - loss: 0.0086 - accuracy: 0.9979 - val_loss: 0.1979 - val_accuracy: 0.9733
Epoch 5/10
79/79 [=====] - 87s 1s/step - loss: 0.0097 - accuracy: 0.9975 - val_loss: 0.1815 - val_accuracy: 0.9782
Epoch 6/10
79/79 [=====] - 86s 1s/step - loss: 0.0067 - accuracy: 0.9982 - val_loss: 0.2445 - val_accuracy: 0.9782
Epoch 7/10
79/79 [=====] - 84s 1s/step - loss: 0.0045 - accuracy: 0.9988 - val_loss: 0.2291 - val_accuracy: 0.9782
Epoch 8/10
79/79 [=====] - 84s 1s/step - loss: 0.0083 - accuracy: 0.9973 - val_loss: 0.1956 - val_accuracy: 0.9782
Epoch 9/10
79/79 [=====] - 83s 1s/step - loss: 0.0029 - accuracy: 0.9995 - val_loss: 0.2011 - val_accuracy: 0.9773
Epoch 10/10
79/79 [=====] - 84s 1s/step - loss: 0.0027 - accuracy: 0.9991 - val_loss: 0.2367 - val_accuracy: 0.9778
```

Out[]:

a. User Acceptance Testing

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

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	11	2	3	2	18
Duplicate	1	3	4	0	8
External	3	5	0	0	8
Fixed	12	2	5	22	41
Not Reproduced	0	1	0	0	1
Skipped	0	0	1	2	3
Won't Fix	0	4	1	1	7
Totals	27	17	14	27	86

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	8	0	0	8
Client Application	49	0	0	49
Security	4	0	0	4

Outsource Shipping	4	0	0	4
Exception Reporting	11	0	0	11
Final Report Output	2	0	0	2
Version Control	1	0	0	1

9.RESULTS

a. Performance Metrics

Technical Skills Evaluation Metrics									
ID	Metric	Weightage (%)	Description	Sub-Evaluation Metrics & Scoring Criteria	Score	Description	Weightage (%)	Scoring Mechanism	
1	Technical Training & Assignments	15%	This metric will be assessed based on the following: 1. Participation in the Train & the end of each training session 2. Evaluation of completed assignments	Number of Tests (Success/Failure/Total - 10 Marks) Assignment 1 Assignment 2 Assignment 3 Assignment 4 Assignment 5	5 5 5 5 5	Test: 100% (10/10) up to 10 questions Assignment 1: 100% (10/10) Assignment 2: 100% (10/10) Assignment 3: 100% (10/10) Assignment 4: 100% (10/10) Assignment 5: 100% (10/10)	5%	Start Date: January 1, 2024 Completion: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100	
2	Conceptual & Problem Solving	15%	This metric will be assessed and scored based on the following: 1. Technical Problem Solving 2. Logical Problem Solving 3. Mathematical Problem Solving	1. Descriptive & Diagram 2. Logical Problem Solving 3. Mathematical Problem Solving	5 5 5	1. Problem statement after analysis in the Train & the end of each session 2. Logical problem solving in the Train & the end of each session 3. Mathematical problem solving in the Train & the end of each session	5%	Start Date: January 1, 2024 Completion: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100	
3	Requirement Analysis using UML	15%	This metric will be assessed based on the following: 1. Requirement Analysis 2. UML Diagrams	Requirement Analysis (Functional, Non-Functional, Technical) (10 Marks) UML Diagrams (UML, UML, UML) (10 Marks)	5 5 5	1. Requirement Analysis (Functional, Non-Functional, Technical) (10 Marks) 2. UML Diagrams (UML, UML, UML) (10 Marks) 3. UML Diagrams (UML, UML, UML) (10 Marks)	5%	Start Date: January 1, 2024 Completion: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100	
4	Project Design using Design Thinking	15%	This metric will be assessed and scored based on the following: 1. Project Design 2. Design Thinking 3. Project Design	Project Design (10 Marks) Design Thinking (10 Marks) Project Design (10 Marks)	5 5 5	1. Project Design (10 Marks) 2. Design Thinking (10 Marks) 3. Project Design (10 Marks)	5%	Start Date: January 1, 2024 Completion: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100	
5	Technology Stack	15%	This metric will be assessed and scored based on the following: 1. Technology Stack 2. Technology Stack 3. Technology Stack	Technology Stack (10 Marks) Technology Stack (10 Marks) Technology Stack (10 Marks)	5 5 5	1. Technology Stack (10 Marks) 2. Technology Stack (10 Marks) 3. Technology Stack (10 Marks)	5%	Start Date: January 1, 2024 Completion: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100	
6	Project Planning using Agile Methodologies	15%	This metric will be assessed and scored based on the following: 1. Project Planning 2. Agile Methodologies 3. Project Planning	Project Planning (10 Marks) Agile Methodologies (10 Marks) Project Planning (10 Marks)	5 5 5	1. Project Planning (10 Marks) 2. Agile Methodologies (10 Marks) 3. Project Planning (10 Marks)	5%	Start Date: January 1, 2024 Completion: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100	
7	Testing & Deployment	15%	This metric will be assessed and scored based on the following: 1. Testing 2. Deployment 3. Testing	Testing (10 Marks) Deployment (10 Marks) Testing (10 Marks)	5 5 5	1. Testing (10 Marks) 2. Deployment (10 Marks) 3. Testing (10 Marks)	5%	Start Date: January 1, 2024 Completion: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100	
8	Performance Testing	15%	This metric will be assessed and scored based on the following: 1. Performance Testing 2. Performance Testing 3. Performance Testing	Performance Testing (10 Marks) Performance Testing (10 Marks) Performance Testing (10 Marks)	5 5 5	1. Performance Testing (10 Marks) 2. Performance Testing (10 Marks) 3. Performance Testing (10 Marks)	5%	Start Date: January 1, 2024 Completion: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100	

10. ADVANTAGES & DISADVANTAGES

a. Advantages:

- It enables workers from all over the world to connect with one another 24 hours a day and share ideas or swiftly solve problems.
- It is an affordable solution to bring multiple people from different locations to meetings and conferences.

b. Disadvantages:

- Also accuracy depends upon distance between camera and object.
- It takes a lot of time to listen, speak, read, or write to someone.

11. CONCLUSION

- When bridging the communication gap between two cultures, the proposed communication method between Deaf and Dumb persons and regular people is aiming for it. It enables effective two-way communication between the able-bodied and able-bodied individuals.
- A translator of sign language is needed to facilitate communication between a deaf person and a second person. A mediator must, however, be familiar with the deaf person's sign language. However, given that there are numerous sign languages for numerous languages, this is not always practical.
- This technique is therefore suggested in order for hearing individuals to understand all sign languages and hand gestures used by deaf persons.

12. FUTURE SCOPE

- The speech-to-text and text-to-speech technologies aided persons who had trouble expressing themselves or communicating with others in a usual way.
- As a result, there is less of a communication barrier between those with special needs and those without.
- It is simple to comprehend the context of items and clearly explains it to the individuals who use it for communication using picture pre-processing and artificial intelligence.

13.APPENDIX

a.Source Code

```

1  import cv2
2
3  video = cv2.VideoCapture(0)
4
5  while True:
6      ret, frame = video.read()
7      cv2.imshow("Frame", frame)
8      k = cv2.waitKey(1)
9      if k == ord('q'):
10         break
11
12  video.release()
13  cv2.destroyAllWindows()

```

```

1  import cv2
2  import numpy as np
3  from tensorflow.keras.models import load_model
4  from tensorflow.keras.preprocessing import image
5
6  class Video(object):
7      def __init__(self):
8          self.video = cv2.VideoCapture(0)
9          self.roi_start = (50, 150)
10         self.roi_end = (250, 350)
11         self.model = load_model('asl_model.h5') # Execute Local Trained Model
12         # self.model = load_model('IBM_Communication_Model.h5') # Execute IBM Trained Model
13         self.index=['A','B','C','D','E','F','G','H','I']
14         self.y = None
15
16     def __del__(self):
17         self.video.release()
18
19     def get_frame(self):
20         ret, frame = self.video.read()
21         frame = cv2.resize(frame, (640, 480))
22         copy = frame.copy()
23         copy = copy[150:150+200, 50:50+200]
24         # Prediction Start
25         cv2.imwrite('image.jpg', copy)
26         copy_img = image.load_img('image.jpg', target_size=(64, 64))
27         x = image.img_to_array(copy_img)
28         x = np.expand_dims(x, axis=0)
29         pred = np.argmax(self.model.predict(x), axis=1)
30         self.y = pred[0]
31         cv2.putText(frame, 'The Predicted Alphabet is: ' + str(self.index[self.y]), (100, 50), cv2.FONT_HERSHEY_SIMPLEX, 1, (0, 0, 0), 3)
32         ret, jpg = cv2.imencode('.jpg', frame)
33         return jpg.tobytes()

```

```

1  <!DOCTYPE html>
2  <html>
3  <head>
4  <meta name="viewport" content="width=device-width, initial-scale=1">
5  <style>
6  body {font-family: Arial, Helvetica, sans-serif;}
7
8  /* Full-width input fields */
9  input[type=text], input[type=password] {
10     width: 100%;
11     padding: 12px 20px;
12     margin: 8px 0;
13     display: inline-block;
14     border: 1px solid #ccc;
15     box-sizing: border-box;
16 }
17
18 /* Set a style for all buttons */
19 button {
20     background-color: #273298;
21     color: white;
22     padding: 14px 20px;
23     margin: 8px 0;
24     border: none;
25     cursor: pointer;
26     width: 100%;
27 }
28
29 button:hover {
30     opacity: 0.8;
31 }

```

```

33 /* Extra styles for the cancel button */
34 .cancelbtn {
35     width: auto;
36     padding: 10px 18px;
37     background-color: #f44336;
38 }
39
40 /* Center the image and position the close button */
41 .imgcontainer {
42     text-align: center;
43     margin: 24px 0 12px 0;
44     position: relative;
45 }
46
47 img.avatar {
48     width: 40%;
49     border-radius: 50%;
50 }
51
52 .container {
53     padding: 16px;
54 }
55
56 span.psw {
57     float: right;
58     padding-top: 16px;
59 }
60
61 /* The Modal (background) */
62 .modal {
63     display: none; /* Hidden by default */
64     position: fixed; /* Stay in place */
65     z-index: 1; /* Sit on top */
66     left: 0;
67     top: 0;
68     width: 100%; /* Full width */
69     height: 100%; /* Full height */

```

```

70     overflow: auto; /* Enable scroll if needed */
71     background-color: □rgb(0,0,0); /* Fallback color */
72     background-color: □rgba(0,0,0,0.4); /* Black w/ opacity */
73     padding-top: 60px;
74 }
75
76 /* Modal Content/Box */
77 .modal-content {
78     background-color: ■#fefefe;
79     margin: 5% auto 15% auto; /* 5% from the top, 15% from the bottom and centered */
80     border: 1px solid ■#888;
81     width: 80%; /* Could be more or less, depending on screen size */
82 }
83
84 /* The Close Button (x) */
85 .close {
86     position: absolute;
87     right: 25px;
88     top: 0;
89     color: □#000;
90     font-size: 35px;
91     font-weight: bold;
92 }
93
94 .close:hover,
95 .close:focus {
96     color: ■red;
97     cursor: pointer;
98 }
99
100 /* Add Zoom Animation */
101 .animate {
102     -webkit-animation: animatezoom 0.6s;
103     animation: animatezoom 0.6s
104 }

```

```

105 @-webkit-keyframes animatezoom {
106     from {-webkit-transform: scale(0)}
107     to {-webkit-transform: scale(1)}
108 }
109
110 @keyframes animatezoom {
111     from {transform: scale(0)}
112     to {transform: scale(1)}
113 }
114
115 /* Change styles for span and cancel button on extra small screens */
116 @media screen and (max-width: 300px) {
117     span.psw {
118         display: block;
119         float: none;
120     }
121     .cancelbtn {
122         width: 100%;
123     }
124 }
125
126 </style>
127 </head>
128 <body>
129
130 <div style="text-align: center; color: □rgb(1, 2, 2, 0.874);">REAL TIME COMMUNICATION SYSTEM POWERED BY AI FOR SPECIALLY ABLED</div>
131
132 <button onclick="document.getElementById('id01').style.display='block'">login</button>
133
134 <div id="id01" class="modal">
135
136     <form class="modal-content animate" action="/action_page.php" method="post">
137         <div class="lagcontainer">
138             <span onclick="document.getElementById('id01').style.display='none'" class="close" title="Close Modal">✖</span>
139             
140         </div>
141

```



```

142 <div class="container">
143   <label for="uname"><b>Username</b></label>
144   <input type="text" placeholder="Enter Username" name="uname" required>
145
146   <label for="psw"><b>Password</b></label>
147   <input type="password" placeholder="Enter Password" name="psw" required>
148
149   <button type="submit">Login</button>
150   <label>
151     <input type="checkbox" checked="checked" name="remember"> Remember me
152   </label>
153 </div>
154
155 <div class="container" style="background-color: #f1f1f1">
156   <button type="button" onclick="document.getElementById('id01').style.display='none'" class="cancelbtn">Cancel</button>
157   <span class="psw">Forgot <a href="#">password?</a></span>
158 </div>
159 </form>
160 </div>
161 <!doctype html>
162 <html lang="en">
163 <head>
164   <meta charset="UTF-8">
165   <meta name="viewport"
166     content="width=device-width, user-scalable=no, initial-scale=1.0, maximum-scale=1.0, minimum-scale=1.0">
167   <meta http-equiv="X-UA-Compatible" content="ie=edge">
168   <link rel="stylesheet" href="https://stackpath.bootstrapcdn.com/bootstrap/4.1.3/css/bootstrap.min.css">
169   <link rel="stylesheet" href="style.css">
170   <title>Document</title>
171 </head>
172 <body>
173 <div class="display-cover">
174   <video autoplay></video>
175   <canvas class="d-none"></canvas>
176
177   <div class="video-options">
178     <select name="" id="" class="custom-select">

```

```

179       <option value="">Select camera</option>
180     </select>
181   </div>
182
183   <img class="screenshot-image d-none" alt="">
184
185   <div class="controls">
186     <button class="btn btn-danger play" title="Play"><i data-feather="play-circle"></i></button>
187     <button class="btn btn-info pause d-none" title="Pause"><i data-feather="pause"></i></button>
188     <button class="btn btn-outline-success screenshot d-none" title="Screenshot"><i data-feather="image"></i></button>
189   </div>
190 </div>
191
192 <script src="https://unpkg.com/feather-icons"></script>
193 <script src="script.js"></script>
194 </body>
195 <html><head>
196 </head><body>
197   <video src="" ></video>
198   <br />
199 <button id='flipCamera'>Flip</button>
200 </body>
201 <script>
202   var front = false;
203   var video = document.querySelector('video');
204   document.getElementById('flipCamera').onclick = function() { front = !front; };
205   var constraints = { video: { facingMode: (front? "user" : "environment"), width: 640, height: 480 } };
206   navigator.mediaDevices.getUserMedia(constraints)
207     .then(function(mediaStream) {
208       video.srcObject = mediaStream;
209       video.onloadedmetadata = function(e) {
210         video.play();
211       };
212     })
213     .catch(function(err) { console.log(err.name + ": " + err.message); })
214 </script></html>
215 </html>

```

```

216 <style>
217 .screenshot-image {
218   width: 150px;
219   height: 90px;
220   border-radius: 4px;
221   border: 2px solid #whitesmoke;
222   box-shadow: 0 1px 2px 0 #rgba(0, 0, 0, 0.1);
223   position: absolute;
224   bottom: 5px;
225   left: 10px;
226   background: #white;
227 }
228
229 .display-cover {
230   display: flex;
231   justify-content: center;
232   align-items: center;
233   width: 70%;
234   margin: 5% auto;
235   position: relative;
236 }
237
238 video {
239   width: 100%;
240   background: #rgba(0, 0, 0, 0.2);
241 }
242
243 .video-options {
244   position: absolute;
245   left: 20px;
246   top: 30px;
247 }
248
249 .controls {
250   position: absolute;
251   right: 20px;
252   top: 20px;

```

```

253     display: flex;
254   }
255
256   .controls > button {
257     width: 45px;
258     height: 45px;
259     text-align: center;
260     border-radius: 100%;
261     margin: 0 6px;
262     background: transparent;
263   }
264
265   .controls > button:hover svg {
266     color: #white !important;
267   }
268
269   @media (min-width: 300px) and (max-width: 400px) {
270     .controls {
271       flex-direction: column;
272     }
273
274     .controls button {
275       margin: 5px 0 !important;
276     }
277   }
278
279   .controls > button > svg {
280     height: 20px;
281     width: 18px;
282     text-align: center;
283     margin: 0 auto;
284     padding: 0;
285   }
286
287   .controls button:nth-child(1) {
288     border: 2px solid #1a12b3;
289   }

```

```

291 .controls button:nth-child(1) svg {
292   color: #2b128e;
293 }
294
295 .controls button:nth-child(2) {
296   border: 2px solid #008496;
297 }
298
299 .controls button:nth-child(2) svg {
300   color: #008496;
301 }
302
303 .controls button:nth-child(3) {
304   border: 2px solid #0048b5;
305 }
306
307 .controls button:nth-child(3) svg {
308   color: #0f0a5b;
309 }
310
311 .controls > button {
312   width: 45px;
313   height: 45px;
314   text-align: center;
315   border-radius: 100%;
316   margin: 0 6px;
317   background: transparent;
318 }
319
320 .controls > button:hover svg {
321   color: rgb(75, 173, 230);
322 }
323 </style>
324
325 <script>
326 // Get the modal
327 var modal = document.getElementById('id01');

```

```

329 // When the user clicks anywhere outside of the modal, close it
330 window.onclick = function(event) {
331   if (event.target == modal) {
332     modal.style.display = "none";
333   }
334 }
335 feather.replace();
336
337 const controls = document.querySelector('.controls');
338 const cameraOptions = document.querySelector('.video-options>select');
339 const video = document.querySelector('video');
340 const canvas = document.querySelector('canvas');
341 const screenshotImage = document.querySelector('img');
342 const buttons = [...controls.querySelectorAll('button')];
343 let streamStarted = false;
344
345 const [play, pause, screenshot] = buttons;
346
347 const constraints = {
348   video: {
349     width: {
350       min: 1280,
351       ideal: 1920,
352       max: 2560,
353     },
354     height: {
355       min: 720,
356       ideal: 1080,
357       max: 1440
358     },
359   }
360 };
361 </script>
362 <script>
363 const getCameraSelection = async () => {
364   const devices = await navigator.mediaDevices.enumerateDevices();

```

```

365   const videoDevices = devices.filter(device => device.kind === 'videoinput');
366   const options = videoDevices.map(videoDevice => {
367     return `<option value="${videoDevice.deviceId}">${videoDevice.label}</option>`;
368   });
369   cameraOptions.innerHTML = options.join('');
370 });
371
372 </script>
373 <script>
374
375 play.onclick = () => {
376   if (streamStarted) {
377     video.play();
378     play.classList.add('d-none');
379     pause.classList.remove('d-none');
380     return;
381   }
382   if ('mediaDevices' in navigator && navigator.mediaDevices.getUserMedia) {
383     const updatedConstraints = {
384       ...constraints,
385       deviceId: {
386         exact: cameraOptions.value
387       }
388     };
389     startStream(updatedConstraints);
390   }
391 };
392
393 const startStream = async (constraints) => {
394   const stream = await navigator.mediaDevices.getUserMedia(constraints);
395   handleStream(stream);
396 };
397
398 const handleStream = (stream) => {
399   video.srcObject = stream;
400   play.classList.add('d-none');
401   pause.classList.remove('d-none');

```

```

402   screenshot.classList.remove('d-none');
403   streamStarted = true;
404 };
405
406 getCameraSelection();
407
408 ***
409 cameraOptions.onChange = () => {
410   const updatedConstraints = {
411     ...constraints,
412     deviceId: {
413       exact: cameraOptions.value
414     }
415   };
416   startStream(updatedConstraints);
417 };
418
419 const pauseStream = () => {
420   video.pause();
421   play.classList.remove('d-none');
422   pause.classList.add('d-none');
423 };
424
425 const doScreenshot = () => {
426   canvas.width = video.videoWidth;
427   canvas.height = video.videoHeight;
428   canvas.getContext('2d').drawImage(video, 0, 0);
429   screenshotImage.src = canvas.toDataURL('image/webp');
430   screenshotImage.classList.remove('d-none');
431 };
432
433 pause.onclick = pauseStream;
434 screenshot.onclick = doScreenshot;
435 </script>
436 </body>
437 </html>

```



```

1 <!DOCTYPE html>
2 <html lang="en">
3
4 <head>
5   <meta charset="utf-8">
6   <meta name="viewport" content="width=device-width, initial-scale=1.0, shrink-to-fit=no">
7   <title>SmartBridge WebApp Videotemplate</title>
8   <link rel="stylesheet" href="https://cdn.jsdelivr.net/npm/bootstrap@5.1.3/dist/css/bootstrap.min.css">
9   <link rel="stylesheet" href="https://use.fontawesome.com/releases/v5.12.0/css/all.css">
10  <link rel="stylesheet" href="assets/css/banner-heading-image.css">
11  <link rel="stylesheet" href="assets/css/navbar-centered-brand.css">
12  <link rel="stylesheet" href="assets/css/styles.css">
13 </head>
14
15 <body style="background: #394348;">
16   <div class="navbar navbar-light navbar-expand-md py-3" style="background: #212529">
17     <div class="container">
18       <div><div><a class="navbar-brand d-flex align-items-center" href="#"><span
19         class="bs-icon-sa bs-icon-rounded bs-icon-primary d-flex justify-content-center align-items-center me-2 bs-icon"><i
20           class="fas fa-flask"></i></span><span style="color: #212529;">Real-Time Communication
21         System Powered By AI</span></a></div></div>
22     </div>
23   </div>
24   </nav>
25   <section>
26     <div class="d-flex flex-column justify-content-center align-items-center">
27       <div class="d-flex flex-column justify-content-center align-items-center" id="div-video-feed"
28         style="width: 640px; height: 480px; margin: 10px; min-height: 480px; min-width: 640px; border-radius: 10px; border: 4px dashed #212529;">
29         
31       </div>
32     </div>
33     <div class="d-flex flex-column justify-content-center align-items-center" style="margin-bottom: 10px;"><button
34       class="btn btn-info" type="button" data-bs-target="#modal-1" data-bs-toggle="modal">Quick Reference
35     </button></div>
36   </section>
37 </section>

```

```

38   <div class="container">
39     <div class="accordion text-white" role="tablist" id="accordion-1">
40       <div class="accordion-item" style="background: #394348;">
41         <h2 class="accordion-header" role="tab"><button class="accordion-button" data-bs-toggle="collapse"
42           data-bs-target="#accordion-1 .item-1" aria-expanded="true"
43           aria-controls="accordion-1 .item-1"
44           style="background: #394348; color: #212529;">About The Project</button></h2>
45         <div class="accordion-collapse collapse show item-1" role="tabpanel" data-bs-parent="#accordion-1">
46           <div class="accordion-body">
47             <p class="mb-0">Artificial Intelligence has made it possible to handle our daily activities
48               in new and simpler ways. With the ability to automate tasks that normally require human
49               intelligence, such as speech and voice recognition, visual perception, predictive text
50               functionality, decision-making, and a variety of other tasks, AI can assist people with
51               disabilities by significantly improving their ability to get around and participate in
52               daily activities.<br><br>Currently, Sign Recognition is available <strong>only for
53               alphabets A-I</strong> and not for J-Z, since J-Z alphabets also require Gesture
54               Recognition for them to be able to be predicted correctly to a certain degree of
55               accuracy.</p>
56           </div>
57         </div>
58       </div>
59       <div class="accordion-item" style="background: #394348;">
60         <h2 class="accordion-header" role="tab"><button class="accordion-button collapsed"
61           data-bs-toggle="collapse" data-bs-target="#accordion-1 .item-2" aria-expanded="false"
62           aria-controls="accordion-1 .item-2"
63           style="background: #394348; color: #212529;">Developed By</button></h2>
64         <div class="accordion-collapse collapse item-2" role="tabpanel" data-bs-parent="#accordion-1">
65           <div class="accordion-body">
66             <p class="mb-0">Students at VIT-Bhopal University during SmartBridge AI Externship
67               Program.<br><br>1. <strong>Nirlov Deb</strong> 190CG10067<br>2.
68               <strong>Kushagra</strong> 190CG10025<br>3. <strong>Kartik Dhasmana</strong> 190CG10002
69             </p>
70           </div>
71         </div>
72       </div>
73     </div>
74   </div>

```

```

75 </section>
76 <div class="modal fade" role="dialog" tabindex="-1" id="modal-1">
77   <div class="modal-dialog" role="document">
78     <div class="modal-content">
79       <div class="modal-header">
80         <h4 class="modal-title">American Sign Language - Alphabets</h4><button type="button"
81           class="btn-close" data-bs-dismiss="modal" aria-label="Close"></button>
82       </div>
83       <div class="modal-body"></div>
84       <div class="modal-footer"><button class="btn btn-secondary" type="button"
85         data-bs-dismiss="modal">Close</button></div>
86     </div>
87   </div>
88 </div>
89 <script src="https://cdn.jsdelivr.net/npm/bootstrap@5.1.3/dist/js/bootstrap.bundle.min.js"></script>
90 </body>
91
92 </html>

```

```

1 .bs-icon {
2   --bs-icon-size: .75rem;
3   display: flex;
4   flex-shrink: 0;
5   justify-content: center;
6   align-items: center;
7   font-size: var(--bs-icon-size);
8   width: calc(var(--bs-icon-size) * 2);
9   height: calc(var(--bs-icon-size) * 2);
10  color: var(--bs-primary);
11 }
12
13 .bs-icon-xs {
14   --bs-icon-size: 1rem;
15   width: calc(var(--bs-icon-size) * 1.5);
16   height: calc(var(--bs-icon-size) * 1.5);
17 }
18
19 .bs-icon-sm {
20   --bs-icon-size: 1rem;
21 }
22
23 .bs-icon-md {
24   --bs-icon-size: 1.5rem;
25 }
26
27 .bs-icon-lg {
28   --bs-icon-size: 2rem;
29 }

```

```

38 }
39
40 .bs-icon.bs-icon-primary-light {
41   color: var(--bs-primary);
42   background: rgba(var(--bs-primary-rgb), .2);
43 }
44
45 .bs-icon.bs-icon-semi-white {
46   color: var(--bs-primary);
47   background: rgba(255, 255, 255, .5);
48 }
49
50 .bs-icon.bs-icon-rounded {
51   border-radius: .5rem;
52 }
53
54 .bs-icon.bs-icon-circle {
55   border-radius: 50%;
56 }

```

REAL TIME COMMUNICATION SYSTEM POWERED BY AI FOR SPECIALLY ABLED

Login



Username

Enter Username

Password

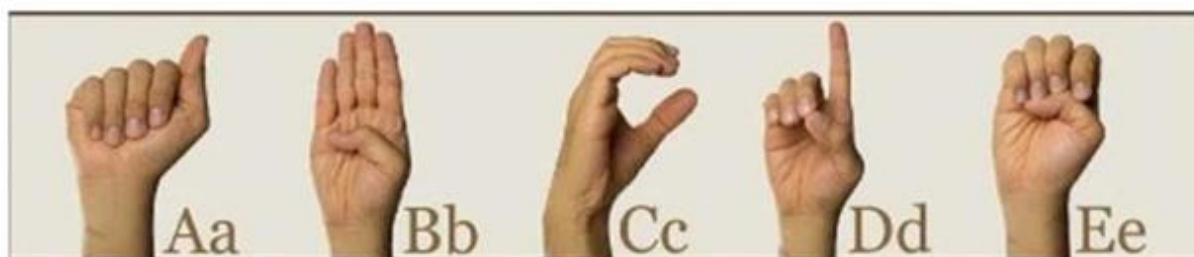
Enter Password

Login

☒ Remember me

Cancel

[forgot password?](#)



14.SOURCECODE AND GITHUB LINK

<https://github.com/IBM-EPBL/IBM-Project-41008-1660638331>