TEAM ID :PNT2022TMID14100

Team Leader:P.BHUVANESHWARAN

Team members:K.PRAVEEN KUMAR ,M.VASANTH,T.NIRANJAN KUMAR

Real-Time Communication System Powered by AI for Specially Abled

Project Report Format

1. INTRODUCTION

1.1 Project Overview

to convey their information using signs which get converted to human-understandable language and speech isIn 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 given as output.

1.2 Purpose

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

Depending on the type of disability and profile, communicating with others can be a challenge. The same holds true for staying connected to others in a world that's more and more digitized with the growing importance of social media and our dependence to the Internet. But technology and AI leave no one behind and can be at the service of people with disabilities. A lot of apps use artificial intelligence to favor accessibility.The methodology used is similar to [1] except that, instead of bare hands, the system requires the user to wear gloves to extract hand gesture.The image is converted into grayscale and the edges of the fingers are detected using Canny edge detection. Then using the detected finger tips the gesture is recognized.The RGB image is converted into a binary image. Certain coordinates are mapped to the binary image. Using a pattern matching algorithm the coordinates are then compared to the coordinates in a database. Based on the comparison, the gesture is identified.

2.2 Reference

[1] Good Chancel, and Anju Mishra, "AAWAAZ: A communication system for deaf and dumb," 2016 5th International Conference on Reliability, Inform Technologies and Optimization (Trends and Future Directions) (ICRITO). IEEE, 2016.

[2] Adhara R. Ghorpade, Surendra K. Waghamare, "Full Duplex Communication System for Deaf & Dumb People," International Journal of Emerging Technology and

[3] Er. Addition Kalsh, Dr N.S. Garewal, "Sign Language Recognition System," International Journal of Computational Engineering Research (IJCER), Volume 03, Issue june 2013.

[4] Sawant Pramada, Deshpande Saylee, NalePranita, NerkarSamiksha, Mrs.Archana S. Vaidya "Intelligent Sign Language Recognition Using Image Processing," IOSR Journal of Engineering (IOSRJEN), Volume 3, Issue 2, Feb. 2013, PP 45-51

2.3 Problem Statement Definition

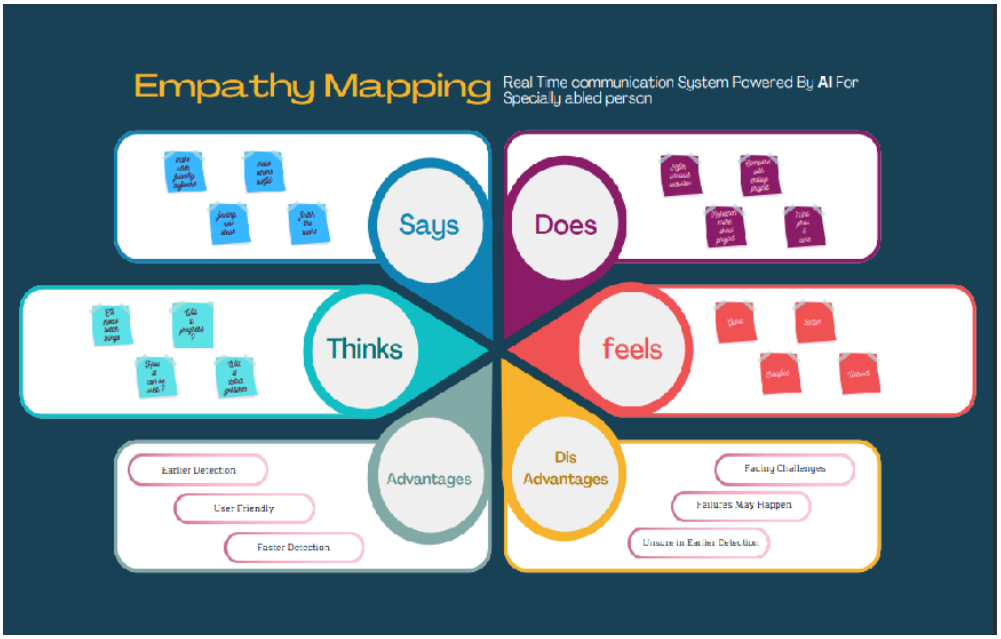
A large quantity of floating trash is finding its way .Improving Education Delivery and learning outcome for specially abled children. AI research can be a force for good for disabled people as long as they are not marginalized. A roadmap which includes AI ethical.

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PROBLEM STATEMENT - I	Normal user	Interact with deaf-muted person via speech to sign converter	Couldn't find matching signs for this regional phrases	Lack of input resources	frustrated

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PROBLEM STATEMENT - II	Deaf-Muted user	Convey my thoughts to hearing abled person via sign language translator	thoughts not conveyed effectively	Facial expression & gestures not tracked	disappointed

IDEATION & PROPOSED SOLUTION

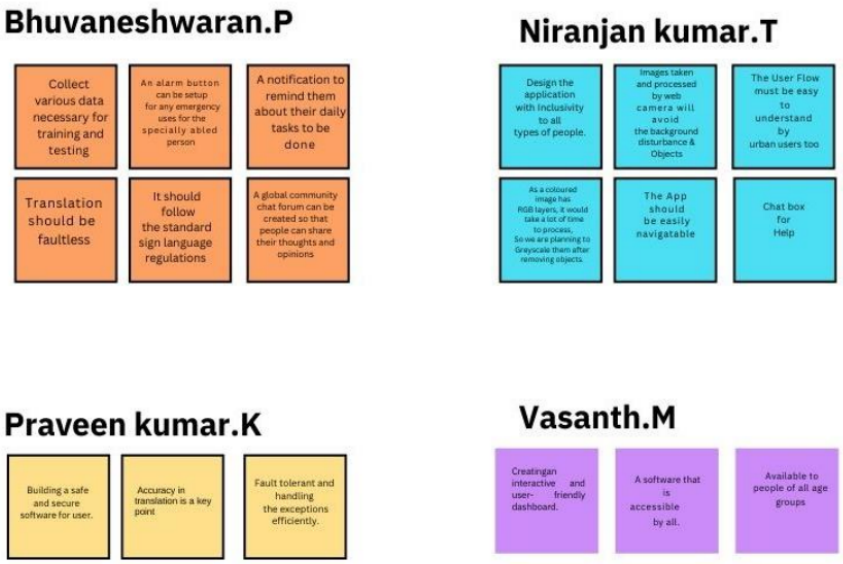
3.1 Empathy Map Canvas



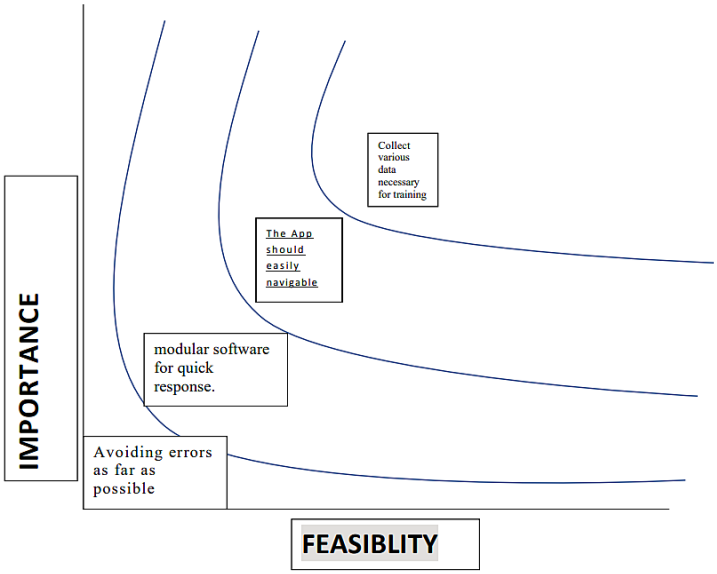
3.2 Ideation & Brainstorming

Problem Statement: Now a days there are many peoples living with the disabilities of hearing and vocal. Communicate with normal people using AI.

Brainstorm & Idea



IDEA PRIORTIIZATION:



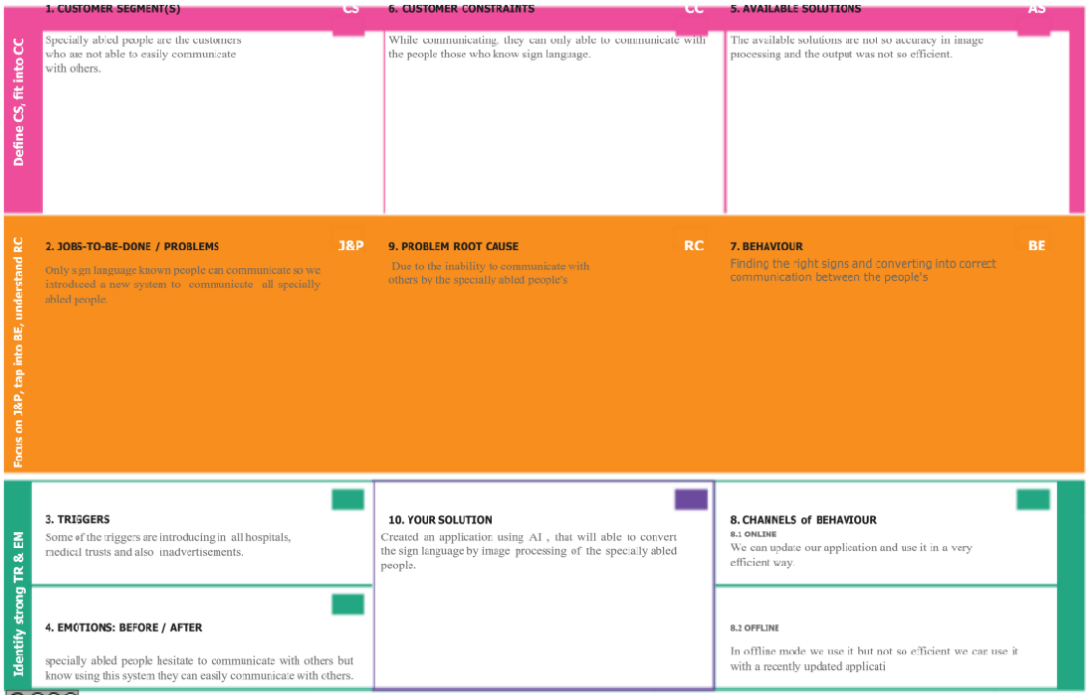
3.3 Proposed Solution

Proposed Solution Template:

Project team shall fill the following information in proposed solution template.

S.No.	PARAMETER	DESCRIPTION
1	Problem Statement (Problem to be solved)	Differently able like dump and mute people can communicate only through the sign language,normal people those who do not know the sign language feels difficult to communicate with them.
2	Idea / Solution description	To overcome this problem we have an idea that an application is created to communicate with the normal people.
3	Novelty / Uniqueness	This process the image of the person who is using sign language and convert it into the voice by analyzing the sign used.
4	Social Impact / Customer Satisfaction	Differently able people feel free to communicate and it bring a huge difference comparing to past.
5	Business Model (Revenue Model)	There are many people in the world who is differently able,this application will become more popular among them and it will bc installcd by all and it will bc used,and so it will produce more money.
6	Scalability of the Solution	Thus this would bring a new evolution in Real Time Communication System Powered by AI for Specially Able with less time and safe enough resources.

3.4 Problem Solution fit



4.REQUIREMENT ANALYSIS

4.1 Functional requirement

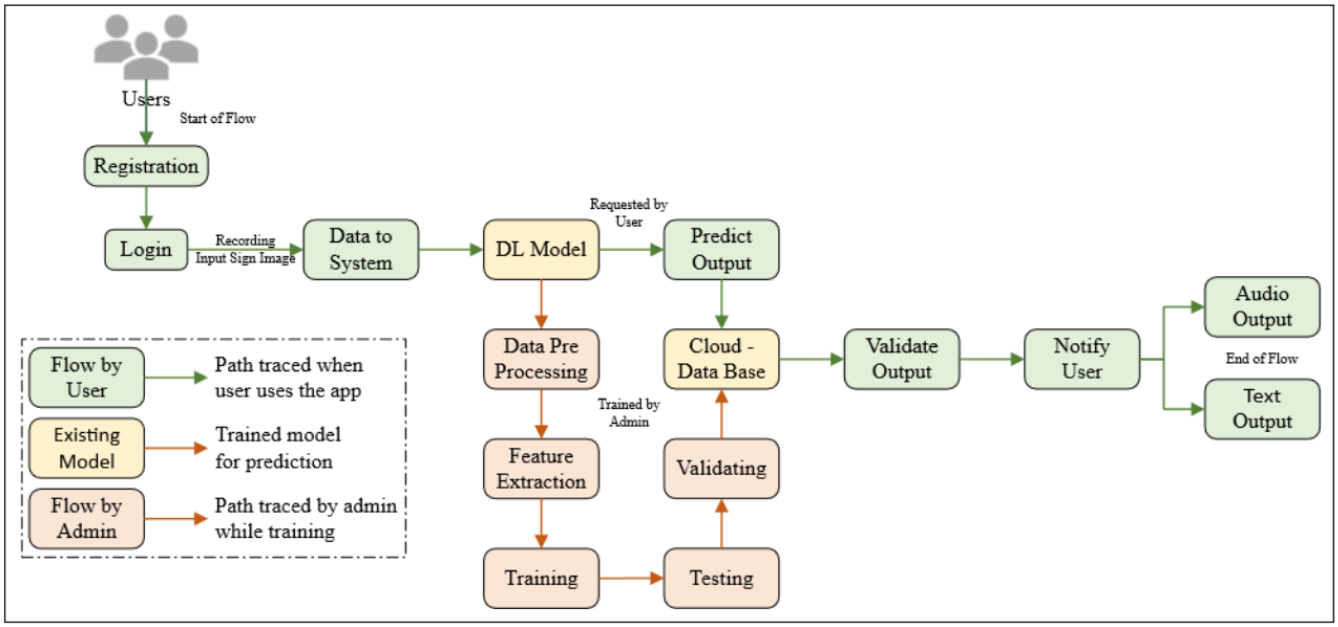
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	• Registration through Web UI/ E-Mail ID. • Authentication via OTP.
FR-2	User Confirmation	• Confirmation via mail.
FR-3	System	• Desktop/ Mobile with good resolution camera. • Provides system access to capture images/ video and other relevant data.
FR-4	Text conversion	Converts the Sign language into a text using Convolutional Neural Network (CNN) Model.
FR-5	Sentence Translation	To create sentence(s) by recognizing the signs and pauses in the input video stream.

4.2 Non-Functional requirements

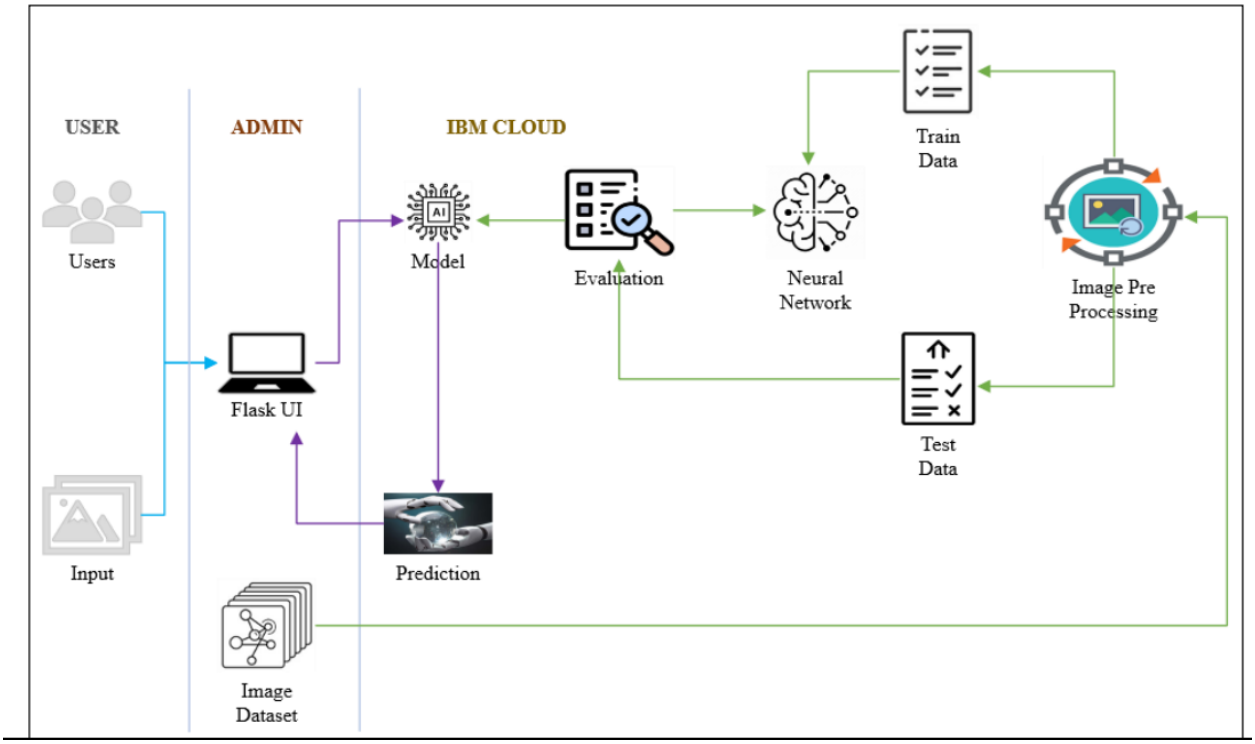
NFR No.	Non-Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
NFR-1	Usability	Deaf-mute people should be able to use the system with ease. The same applies for normal people who get the system's output. The system should have good UI.
NFR-2	Security	Even though the use-case of the system doesn't need any security feature, it must be ensured that the privacy of user data be maintained and handled appropriately.
NFR-3	Reliability	The translation of sign languages should be reliable. The accuracy of the system should be tested extensively to make sure that it is up to the mark.
NFR-4	Performance	The processing should be done in considerable time so that the conversation can go on without waiting for the system's output.
NFR-5	Availability	The system should be universally accessible. Since sign language is almost same everywhere, the system can be used across the globe.
NFR-6	Scalability	The system should be scalable to accommodate new features and functionalities and to cater wider range of people in future.

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)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint - 1
	Authentication	USN-2	As a user, I will receive confirmation email once I have registered for the application.	I can receive confirmation email & click confirm	Low	Sprint - 1
	Login	USN-3	As a user, I can log into the application by entering email & password.	I am able to get into the Dashboard	High	Sprint - 2
	Dashboard	USN-4	One place to explore all available features.	I can access my dashboard	High	Sprint - 2
Customer (Web user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint - 1
	Authentication	USN-2	As a user, I will receive confirmation email once I have registered for the application.	I can receive confirmation email & click confirm.	Low	Sprint - 1
	Login	USN-3	As a user, I can log into the application by entering email & password	I am able to get into the Dashboard	Low	Sprint - 2
	Dashboard	USN-4	One place to explore all available features	I can access my dashboard	Low	Sprint - 2
	Upload image	USN-5	As a user, I can upload the sign language image for translating into text format	I can be able to see the appropriate text for the sign language	High	Sprint - 3
Administrator	Manage	USN-6	Do-it-yourself service for delivering Everything.	Set of predefined requirements that must be met to mark a user story complete	High	Sprint - 4

PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Product Backlog, Sprint Schedule, and 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	BHUVANESHWARAN P VASANTH M NIRANJAN KUMAR T PRAVEEN KUMAR K
Sprint – 1	Authentication	USN – 2	As a user, I will receive OTP to confirm details.	2	High	BHUVANESHWARAN P VASANTH M NIRANJAN KUMAR T PRAVEEN KUMAR K
Sprint – 1	Registration	USN – 3	As a user, I will receive confirmation email once I have registered for the application.	1	Low	_
Sprint – 1	Login	USN – 4	As a user, I can log into the application by entering email & password.	2	High	_
Sprint – 2	Dashboard	USN – 5	As a user, I must have one place to explore all available features.	3	High	BHUVANESHWARAN PRAVEEN KUMAR K VASANTH M NIRANJAN KUMAR 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	BHUVANESHWARAN P VASANTH M PRAVEEN KUMAR K NIRANJAN KUMAR T
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	BHUVANESHWARAN P VASANTH M NIRANJAN KUMAR T PRAVEEN KUMAR K
Sprint – 3	Management	USN – 8	As a user, I can access the site using mobile/ desktop.	3	High	BHUVANESHWARAN P PRAVEEN KUMAR K VASANTH M NIRANJAN KUMAR T
Sprint – 4	System	USN – 9	As a user, I must have access to previous usage history.	2	Medium	BHUVANESHWARAN P PRAVEEN KUMAR K VASANTH M NIRANJAN KUMAR T
Sprint – 4	System	USN – 10	As a user, I can have audio output as well as text output.	3	High	BHUVANESHWARAN P PRAVEEN KUMAR K VASANTH M NIRANJAN KUMAR T

6.2 Sprint Delivery Schedule

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	8	6 Days	24 October 2022	29 October 2022	0	29 October, 2022
Sprint – 2	5	6 Days	08 November 2022	13 November, 2022		13 November 2022
Sprint – 3	4	3 Days	13 November, 2022	15 November, 2022		15 November 2022
Sprint – 4	5	4 Days	17 November, 2022	20 November, 2022		20 November 2022

7. CODING & SOLUTIONING (Explain the features added in the project along with code)

7.1 CODE 1

```
from keras.models import load_model
import numpy as np
import cv2
```

```
[ ] model=load_model('Balaji.h5')
```

```
[ ] from skimage.transform import resize
    def detect(frame):
        img = resize(frame,(64,64,1))
        img = np.expand_dims(img,axis=0)
        if(np.max(img)>1):
            img = img/255.0
        prediction = model.predict(img)
        print(prediction)
        predictions = np.argmax(model.predict(img), axis=1)
        print(predictions[0])


    frame=cv2.imread(r"E:\Development\Dataset\test_set\B\1.png")
    data= detect(frame)
```

```
[[1.6074194e-08 9.9914765e-01 2.6342215e-04 1.2412619e-05 9.8290046e-05
```

7.2 CODE 2

```
[ ]  Collecting keras==2.7.0
       Downloading keras-2.7.0-py2.py3-none-any.whl (1.3 MB)
          |████████████████████████████████| 1.3 MB 14.1 MB/s eta 0:00:01
     Installing collected packages: keras
       Attempting uninstall: keras
         Found existing installation: Keras 2.2.4
         Uninstalling Keras-2.2.4:
           Successfully uninstalled Keras-2.2.4
     Successfully installed keras-2.7.0
```

```
from keras.preprocessing.image import ImageDataGenerator
train_datagen = ImageDataGenerator(rescale = 1./225, shear_range=0.2,zoom_range=0.2,horizontal_flip=True)
test_datagen = ImageDataGenerator(rescale = 1./225)
```

```
[ ] 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
    # You might want to remove those credentials before you share the notebook.
    cos_client = ibm_boto3.client(service_name='s3',
        ibm_api_key_id='kxTodcnZnZV9ertCzD2UKE39UZrk_EI4_wFgzHbArMyl',
        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 = 'imageclassification-donotdelete-pr-zgrmaebuc27a5x'
```

"@hidden_cell" is not an allowed annotation - allowed values include [@param, @title, @markdown].

8. TESTING

8.1 User Acceptance Testing

Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issuesof the project at the time of the release to User Acceptance Testing.

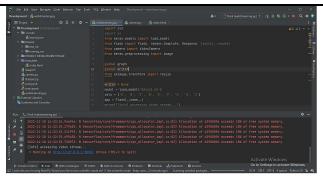
Test Case Analysis

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

Section	Total Cases	Not Tested	Fail	Pass
Camera detection	1	0	0	1
Train the model and saving	7	0	0	7
Frame capturing and output	2	0	1	1

9. RESULTS

9.1 Performance Metrics

S.No.	Parameter	Values	Screenshot
1.	Project Structure	Dataset Python file HTML file flask	
2.	Output	capture images -record videos	

10. ADVANTAGES & DISADVANTAGES

Advantages

- It is more useful for understanding their languages easily
- Easy to talk with the specially abled person.

Disadvantages

- Lack of more storage needed to implement.
- Lack of knowledge on education

11. CONCLUSION

From the above literature survey, we can conclude that all those papers follow a more or less similar methodology. We also like to follow that methodology with some improvements to overcome some of the limitations mentioned above. The input image is processed to isolate the hand. Then it is passed to a trained convolution neural network to identify the gesture with greater accuracy.

12. FUTURE SCOPE

created an application using AI , that will able to convert the sign language by image processing of the specially abled people.

13. APPENDIX

Source Code
GitHub Id
(Copy and paste url)
https://github.com/IBM-EPBL/IBM-Project-54311-1661850189
Project Demo Link
(Copy and paste url link)
https://youtu.be/7myQugHpvm4