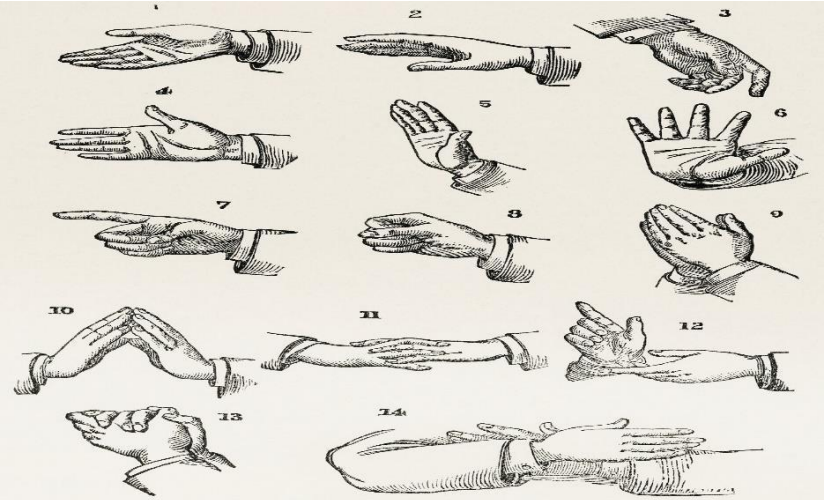
PROJECT REPORT

A GESTURE-BASED TOOL FOR STERILE BROWSING OF RADIOLOGY IMAGES



POSITIONS OF THE HANDS.

1. Simple affirmation. 2. Emphatic declaration. 3. Apathy or prostration. 4. Energetic appeal. 5. Negation or denial. 6. Violent repulsion. 7. Indexing or cautioning. 8. Determination or anger. 9. Supplication. 10. Gentle entreaty. 11. Carelessness. 12. Argumentation. 13. Earnest entreaty. 14. Resignation.

Team ID : **PNT2022TMID18569**

Team Leader - **Sujitha AK** - 1919102163

Team Member - **Swetha T** - 1919102170

Team Member - **Vakinidevi N** - 1919102174

Team Member - **Swetha S** - 1919102169

CONTENT

1. INTRODUCTION :

1.1 Project Overview

- The main aim of the project is to build a model that displays the images based on hand gestures. Gestures originate from any bodily motion or state but commonly originate from the face or hand. Gesture Recognition can be considered as a way for a computer to understand human body language. This has minimized the need for text interfaces and GUIs (Graphical User Interface). A gesture is an action that has to be seen by someone else and has to convey some piece of information. The gesture is usually considered as a movement of part of the body, esp. a hand or the head, to express an idea or meaning. Gesture recognition technologies are much younger in the world of today.
- Gestures are useful for computer interaction since they are the most primary and expressive forms of human communication. Gesture interfaces for gaming based on hand/body gesture technology must be designed to achieve social and commercial success. No single method for automatic hand gesture recognition is suitable for every application; each gesture-recognition algorithm depends on user cultural background, application domain, and environment.

2. LITERATURE SURVEY :

2.1 Existing Problem

- A major challenge involved is to provide Doctors with efficient, intuitive, accurate and safe means of interaction without affecting the quality of their work.
- However the use of computer keyboards and mouse by doctors in intensive care unit(ICU) is a common mean for spreading infections.
- We suggest the use of hand gestures in medical field as an alternative tothe existing interface techniques by offering maximum level of sterility.

2.2 References

- Robust Part-Based Hand Gesture Recognition Using Kinect Sensor ZhouRen , Jun song Yuan, Member, IEEE, Jingjing Meng, Member, IEEE, and
  Zheng you Zhang, Fellow, IEEE, 15, AUGUST 2013.

- A Fast Gesture Recognition Scheme for Real-Time Human MachineInteraction Systems . Ching-Hao Lai* Smart Network System
  Institute for Information Industry Taipei City, Taiwan , 2010.

- Intension, Context and Gesture Recognition for Sterile MRI Navigation in the Operating Room by Agency for Healthcare Research and Quality (AHRQ)

- Hand Gestures Recognition Using Radar Sensors for Human-Computer Interaction Supported by the Bio ad Medical Technology Development Program of the National Research Foundation(NRF)

- A Preliminary Study of Kinect-Based Real-Time Hand Gesture Interaction Systems for Touchless Visualizations of Hepatic Structures
  in Surgery by Medical Imaging and Information Sciences, Ji aqing LIU, Tomoko Tateyama.

- Vision Based Hand Gesture Recognition by World Academy of Science, Engineering and Technology, Pragati Garg, Naveen Aggarwal, Sanjeev So fat

2.3 Problem Statement Definition

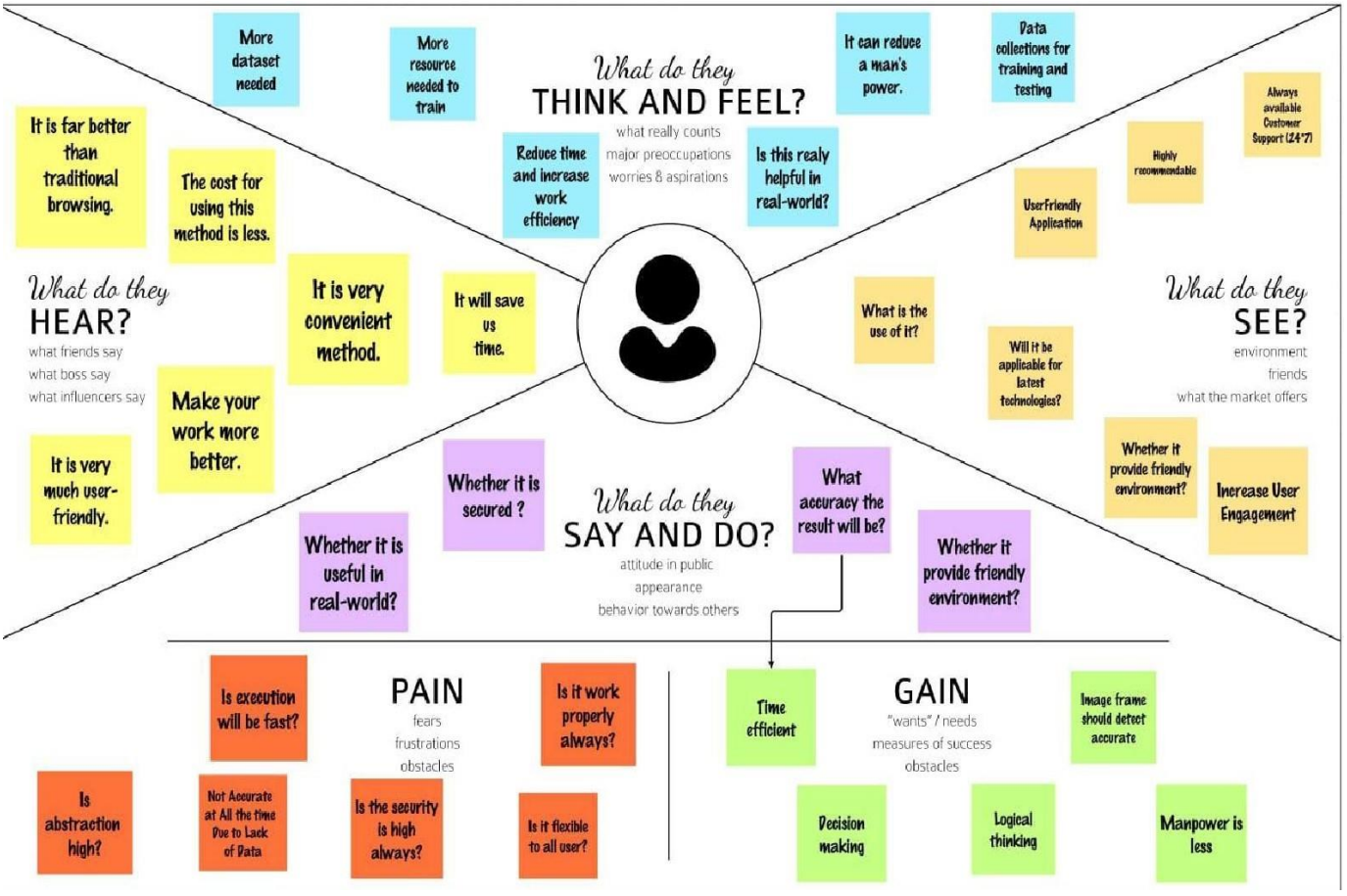
The solution is to develop AI-powered gesture based tool.

By giving the image of the hand gesture as the input to the application, it will display the required images.

By training the model with various inputs, image processing can be improved as well as the accuracy of the result.

3. IDEATION & PROPOSED SOLUTION :

3.1 Empathy Map Canvas



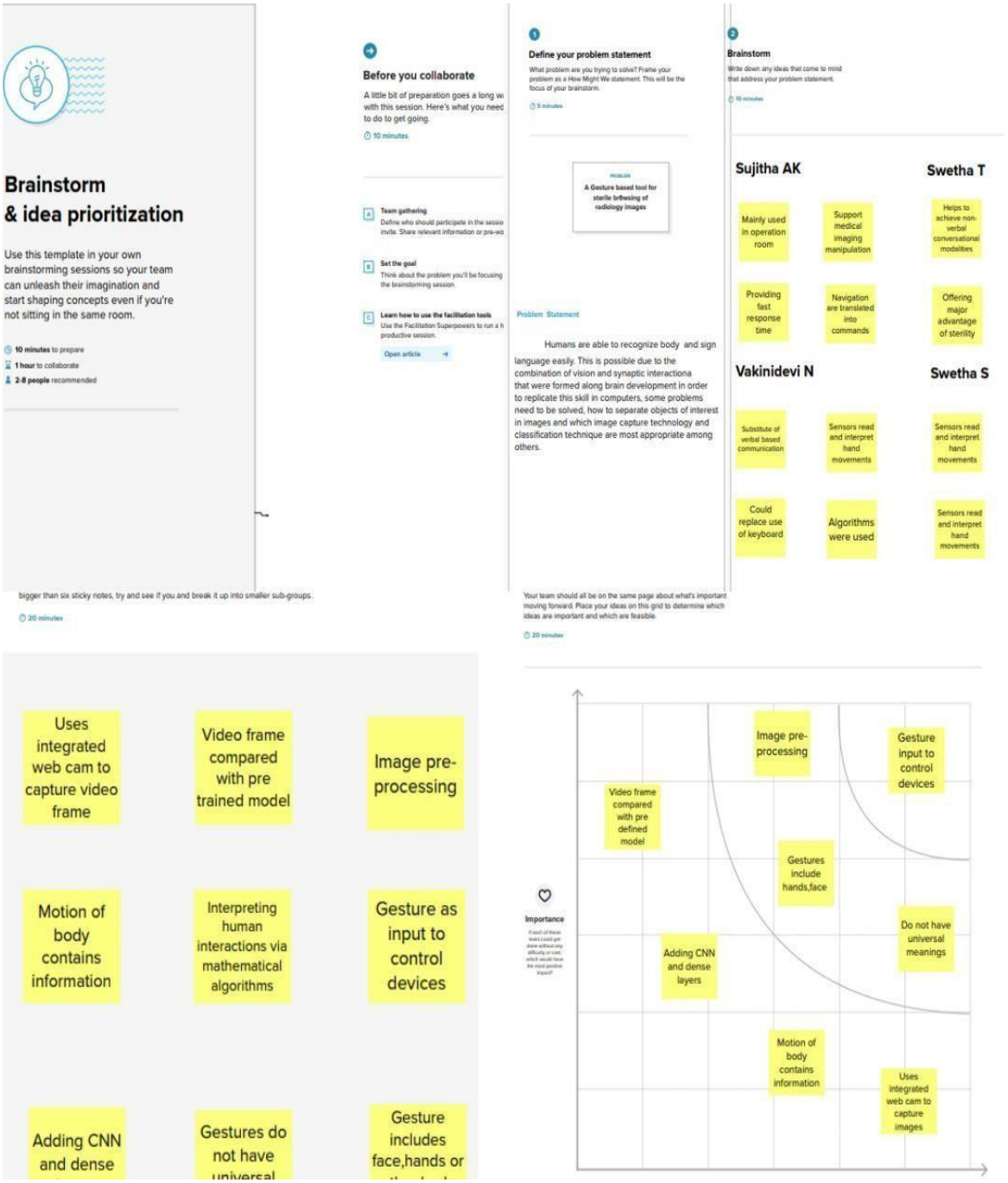
3.2 Ideation & Brainstorming

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.

Step-1: Team Gathering, Collaboration and Select the Problem Statement .**Step-**

2: Brainstorm, Idea Listing and Grouping.

Step-3: Idea Prioritization.



3.3 Proposed Solution

- The interaction with interventional imaging systems within a sterile environment is a challenging task for physicians. Direct physician–machine interaction during an intervention is rather limited because ofsterility and workspace restrictions.
- We propose a method of gesture-controlled projection display that enables a direct and natural physician–machine interaction during computed tomography (CT)-based interventions.
- Therefore, a graphical user interface is projected on a radiation shield located infront of the physician. Hand gestures in front of this display are captured and classified using a leap motion controller.
- We propose a gesture set to control basic functions of intervention software such as gestures for 2D image exploration, 3D object manipulation and selection. Our methods were evaluated in a clinically oriented user study with12 participants.
- The results of the performed user study confirm that the display and the underlying interaction concept are accepted by clinical users. The recognition ofthe gestures is robust, although there is potential for improvements.
- The gesture training times are less than 10 min, but vary heavily between the participants of the study. The developed gestures are connected logicallyto the intervention software and intuitive to use.
- The proposed gesture-controlled projection display counters current thinking ,namely it gives the radiologist complete control of the intervention software. It opens new possibilities for direct physician–machine interaction interventions most importantly during surgeries.

3.4 Problem Solution Fit

4. REQUIREMENT ANALYSIS :

4.1 Functional Requirements

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Launching the model	Launch the trained CNN model from the cloud
FR-2	Capturing the images	After capturing the images in camera we have to upload the images in the system
FR-3	Performing gestures	After classifying, identify the correct image by the gesture and it should perform the operation
FR-4	Model rendering	After capturing the image the algorithm will start its processing task
FR-5	Sterile browsing	The sterile browsing can be performed after identifying the gestures
FR-6	Visibility of images	After completing all the processes,a user can be able to see the images

4.2 Non - Functional Requirements

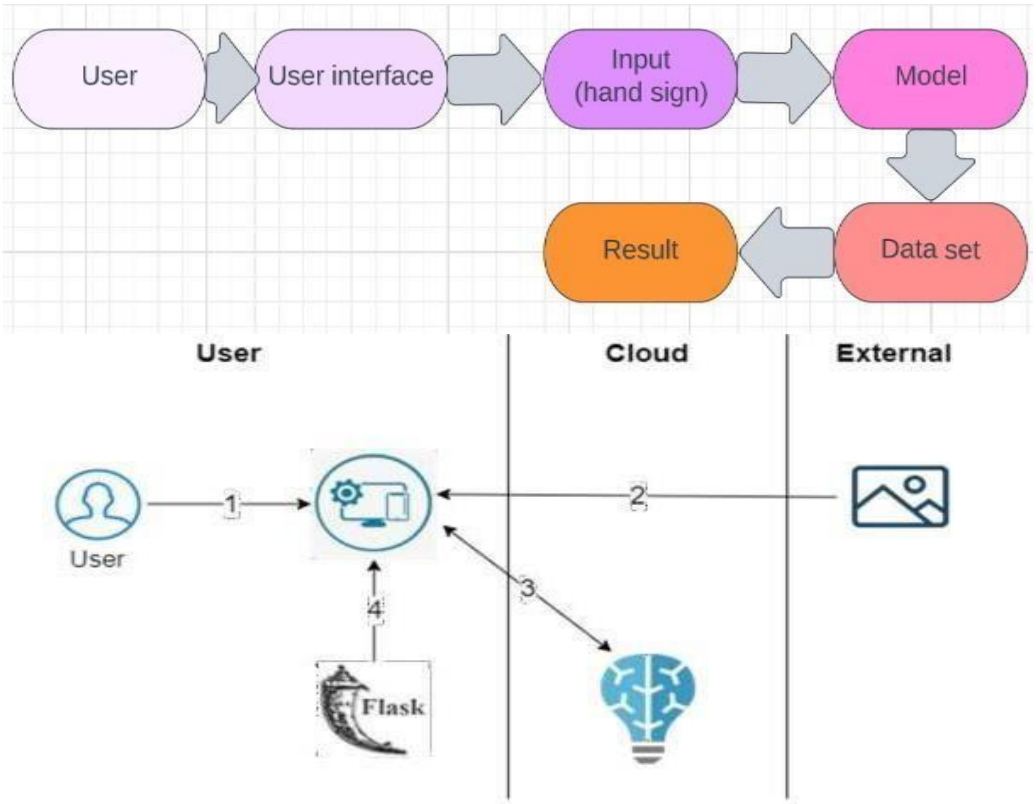
Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Used in doctor-computer interaction devices in the operation room.
NFR-2	**Security**	IBM Cloud security .
NFR-3	**Reliability**	This application is a reliable product that produces fast and verified and output of all its processes.
NFR-4	**Performance**	This application enhances data security, eliminates human errors and increases decision making.
NFR-5	**Availability**	This application will be available to use and help them to carry out their operations conveniently.
NFR-6	**Scalability**	One of the approaches to make the gesture recognition system scalable is to make use of cloud-native methods.

5 PROJECT DESIGN

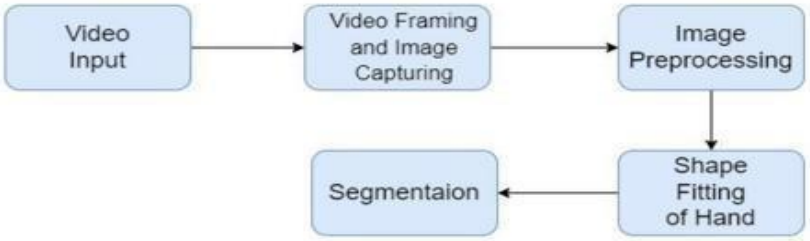
5.1 Data Flow Diagrams



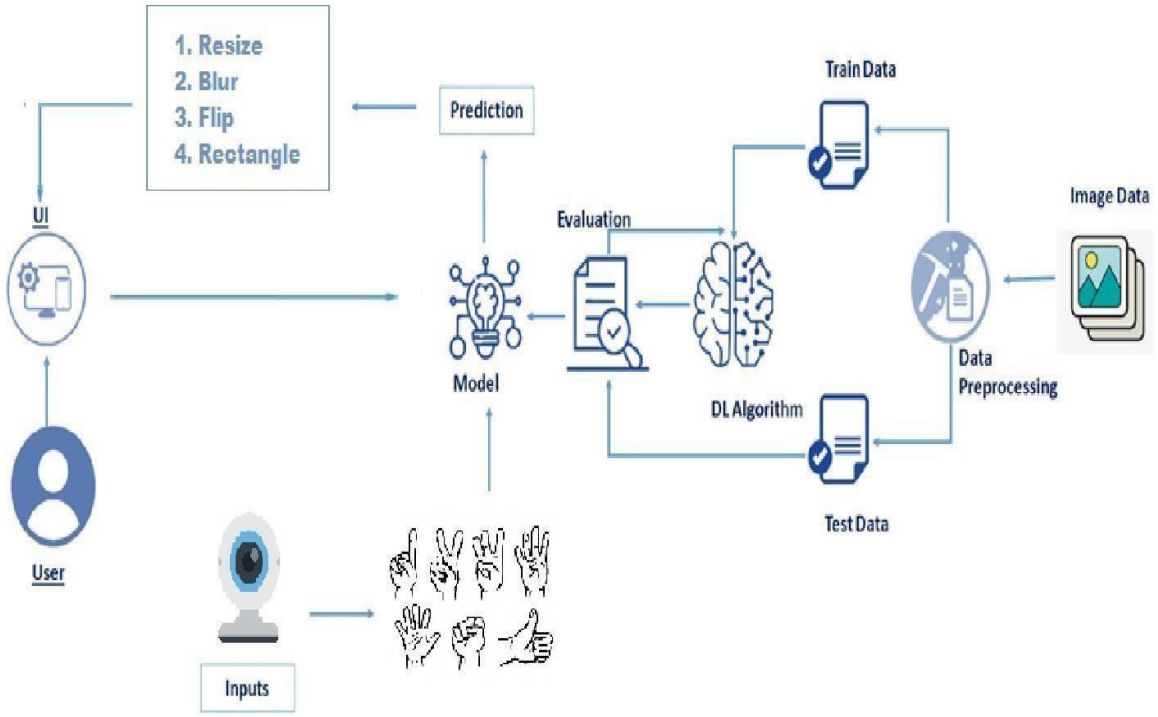
Data Flow Diagram - Level 0

Data Flow Diagram - Level 1

Data Flow Diagram - Level 2



5.2 Solution & Technical Architecture



5.3 User Stories

User Stories

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

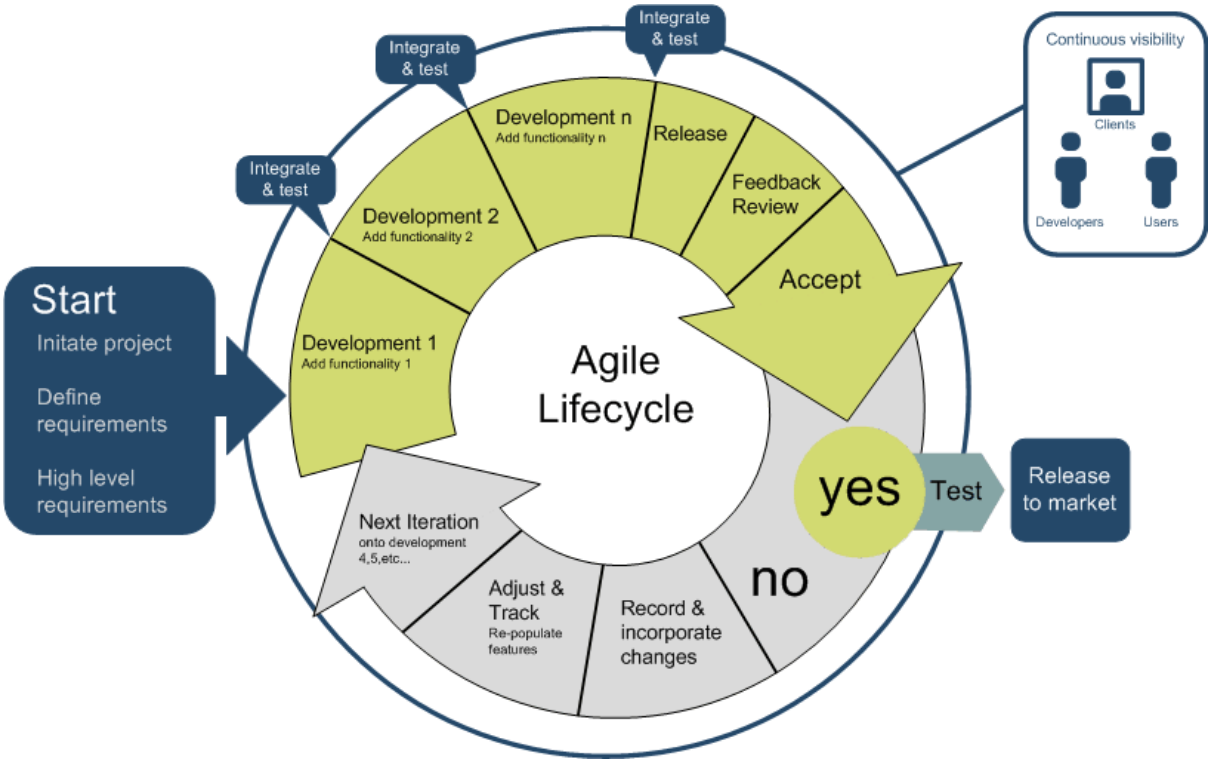
User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can upload an image for performing the action.	I can upload image	High	Sprint-3
		USN-2	As a user, I can show my hand sign in front of the camera.	I can show hand sign	High	Sprint-1 Sprint-2
		USN-3	As a user, I will send the result of the uploaded image based on my hand sign.	I can get the result.	High	Sprint-2
Customer (Web user)			same as a mobile user.			

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

To accomplish the above task, you must complete the below activities and tasks:

1. Collect the Image Data.
2. Preprocess the collected images.
3. Train the model.
4. Test the model.
5. Model is generated (gesture.h5).
6. Application building using HTML & CSS.
7. Form for uploading the image for prediction.
8. Python flask for connecting Model and webpages.



6.2 Sprint Delivery Schedule

Product Backlog, Sprint Schedule, and Estimation

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

Use the below template to create product backlog and sprint schedule

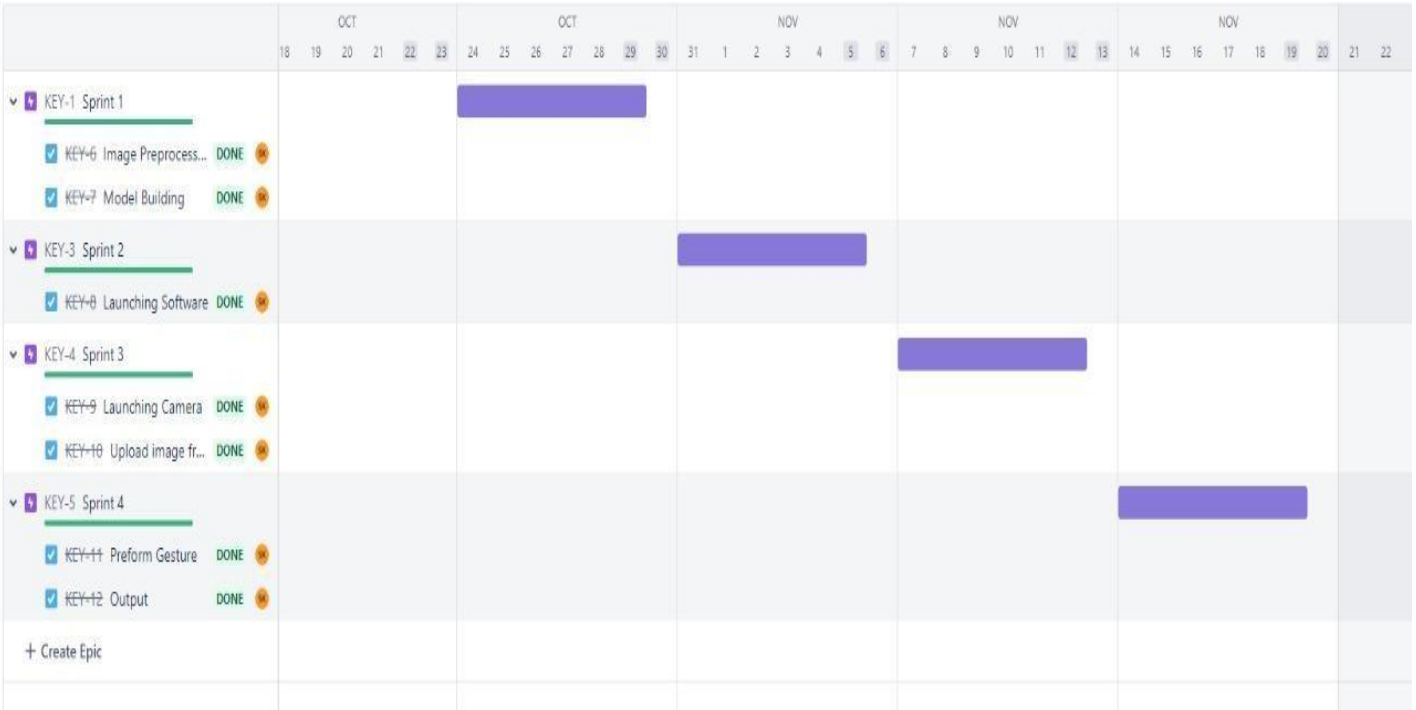
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Image preprocessing	USN-1	As a user, I can predict the image	2	High	Sujitha AK Swetha T Vakinidevi N Swetha S
Sprint-1	Model building	USN-2	As a user, I can predict the model building application	1	High	Sujitha AK Swetha T Vakinidevi N Swetha S
Sprint-2	Launching Software	USN-3	As a user, I can launch the development software	2	Low	Sujitha AK Swetha T Vakinidevi N Swetha S
Sprint-3	Launching Camera	USN-4	As a user, I can open the camera from the software to perform gesture	2	Medium	Sujitha AK Swetha T Vakinidevi N Swetha S

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-3	Upload image from local system	USN-5	As a user, I can upload a image to the software from the local system	1	Low	Sujitha AK Swetha T Vakinidevi N Swetha S
Sprint-4	Perform gesture	USN-6	As a user, I can perform various gestures with respect to system specifications for processing	2	Medium	Sujitha AK Swetha T Vakinidevi N Swetha S
Sprint-4	Output	USN-7	As a user, I can see the sterile browsers images with respect to the gesture performed, display on the screen	2	High	Sujitha AK Swetha T Vakinidevi N Swetha S

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	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

6.3 Reports from JIRA



7. CODING & SOLUTIONING :

7.1 Feature 1

1:IMAGE PREPROCESSING:

Import the Images Data Generator Library:

```
from keras.preprocessing.image import ImageDataGenerator
```

Configure Image Data Generator Functionality To Trainset And Test set:

```
#Image Data Agumentation

train_datagen = ImageDataGenerator (rescale=1./255,
                                    shear_range=0.2,zoom_range=0.2,
                                    horizontal_flip=True)
test_datagen=ImageDataGenerator(rescale=1./255)
```

Apply Image Data Generator Functionality To Trainset And Test set

```
#Loading our data and performing data agumentation

x_train = train_datagen.flow_from_directory(r'C:\Users\Boopathi\Documents\IBM Project\Dataset\training_set',target_size=(64, 64),
                                            batch_size=32,
                                            color_mode='grayscale',
                                            class_mode='categorical')
x_test = test_datagen.flow_from_directory(r'C:\Users\Boopathi\Documents\IBM Project\Dataset\test_set',
                                          target_size=(64, 64), batch_size=32,
                                          color_mode='grayscale',
                                          class_mode='categorical')
```

```
Found 594 images belonging to 6 classes.
Found 30 images belonging to 6 classes.
```

2:MODEL BULIDING:

Importing The Model Building Libraries

```
import numpy as np
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras import layers
from tensorflow.keras.layers import Dense, Flatten
from tensorflow.keras.layers import Conv2D, MaxPooling2D
from keras.preprocessing.image import ImageDataGenerator
```

Initializing The Mode

```
model=Sequential()
```

Adding CNN Layers

```
# First convolution Layer and pooling
model.add(Conv2D(32, (3, 3), input_shape=(64, 64, 1), activation='relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))
# Second convolution Layer and pooling
model.add(Conv2D(32, (3, 3), activation='relu'))
# input_shape is going to be the pooled feature maps from the previous convolution layer
model.add(MaxPooling2D(pool_size=(2, 2)))
# Flattening the Layers
model.add(Flatten())
```

Adding Dense Layers

```
model.add(Dense (units=128, activation='relu'))
model.add(Dense (units=6, activation='softmax'))
```

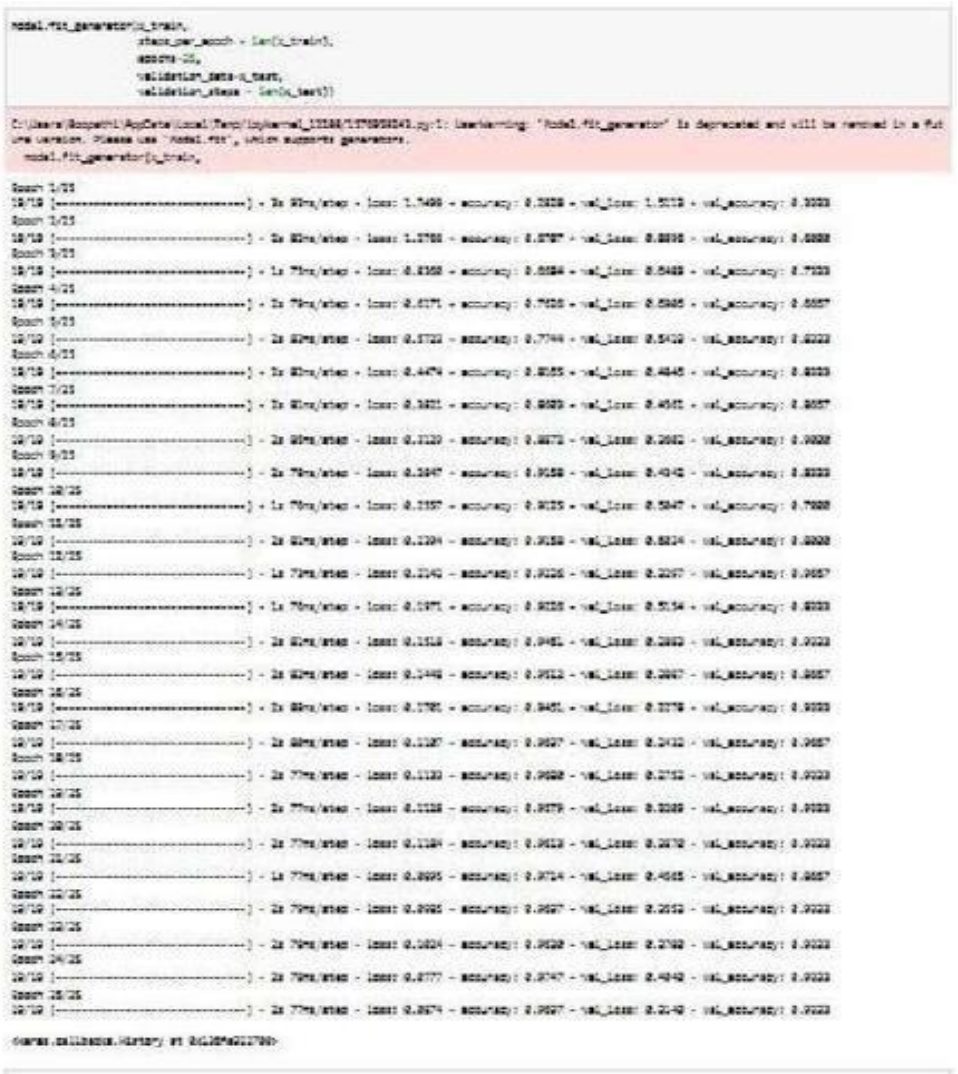
```
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 62, 62, 32)        320

 max_pooling2d (MaxPooling2D  (None, 31, 31, 32)       0
 )

 conv2d_1 (Conv2D)           (None, 29, 29, 32)        9248

 max_pooling2d_1 (MaxPooling  (None, 14, 14, 32)       0
 2D)

 flatten (Flatten)           (None, 6272)              0

 dense (Dense)               (None, 128)               802944

 dense_1 (Dense)             (None, 6)                 774

=================================================================
Total params: 813,286
Trainable params: 813,286
Non-trainable params: 0
_________________________________________________________________
```

Configure The Learning Process

```
# Compiling the model

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

Training Model



Save the Model

```
model.save('gesture.h5')
```

```
model_json = model.to_json()
with open("model-bw.json", "w") as json_file:
    json_file.write(model_json)
```

Test the Model

```
import tensorflow as tf
import numpy as np
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
model = load_model("Gesture.h5")
path= r"C:\Users\Boopathi\Documents\IBM Project\Dataset\test_set\2\1.jpg"
```

```
img = image.load_img(path,
                     color_mode='grayscale',
                     target_size= (64,64))
x = image.img_to_array(img)#image to array
x.shape
```

```
(64, 64, 1)
```

```
type(x)
```

```
numpy.ndarray
```

```
x = np.expand_dims(x,axis=0)
```

```
x.shape
```

```
(1, 64, 64, 1)
```

```
pred=(model.predict(x) > 0.5).astype("int64")
pred
```

```
1/1 [==============================] - 0s 141ms/step

array([[0, 0, 1, 0, 0, 0]], dtype=int64)
```

```
index=['0', '1', '2', '3', '4', '5']
```

```
index[np.argmax(pred[0])]
```

```
'2'
```

7.2 Feature 2

- Let us build flask file ‘app.py’ which is a web framework written in python for server-side scripting. Let’s see step by step procedure for building the backend application.
- App starts running when “_____name____” constructor is called in main.
- Render _template is used to return html file.
- “GET” method is used to take input from the user.
- “POST” method is used to display the output to the user.

1:Importing Libraries

```
from flask import Flask, render_template, request
# Flask-It is our framework which we are going to use to run/serve our application.
# request-for accessing file which was uploaded by the user on our application.
import operator
import cv2  # opencv library
import os
from tensorflow.keras.models import load_model  # to load our trained model import os
from werkzeug.utils import secure_filename
```

2:Creating our flask application and loading our model

```
app = Flask(__name__, template_folder="templates")  # initializing a flask app
# Loading the model
model = load_model('gesture.h5')
print("Loaded model from disk")
```

3:Routing to the html page

```
@app.route('/')  # route to display the home page
def home():
    return render_template('home.html')  # rendering the home page


@app.route('/intro')  # routes to the intro page
def intro():
    return render_template('intro.html')  # rendering the intro page


@app.route('/image1', methods=['GET', 'POST'])  # routes to the index html
def indexó():
    return render_template("indexó.html")
```

```
@app.route('/predict', methods=['GET', 'POST'])  # route to show the predictions in a web UI
def launch():
```

And the predict route is used for prediction and it contains all the codes which are used for predicting our results.

- Firstly, inside launch function we are having the following things:
  - Getting our input and storing it
  - Grab the frames from the web cam.
  - Creating ROI
  - Predicting our results
  - Showcase the results with the help of open cv
  - Finally run the application

- Getting our input and storing it.

Once the predict route is called, we will check whether the method is POST or not if is POST then we will request the image files and with the help of the function we will be storing the image in the uploads folder in our local system.

```
if request.method == 'POST':
    print("inside image")
    f = request.files['image']

    basePath = os.path.dirname(__file__)
    file_path = os.path.join(basePath, 'uploads', secure_filename(f.filename))
    f.save(file_path)
    print(file_path)
```

- Grab the frames from the web cam

  Now when we run the code a web cam will be opening to take the gesture input so we will be capturing the frames of the gesture for predicting our results.

```
cap = cv2.VideoCapture(0)
while True:
    _, frame = cap.read()  # capturing the video frame values
    # Simulating mirror image
    frame = cv2.flip(frame, 1)
```

- Creating ROI

  A region of interest (ROI)is a portion of an image that you want to filter or operate on in some way. The toolbox supports a set of ROI objects that you can use to create ROIs of many shapes, such circles, ellipses, polygons, rectangles, and hand-drawn shapes A common use of an ROI is to create a binary mask image.

  So, we will be creating a ROI to mask our gesture.

```
# Coordinates of the ROI
x1 = int(0.5 * frame.shape[1])
y1 = 10
x2 = frame.shape[1] - 10
y2 = int(0.5 * frame.shape[1])
# Drawing the ROI
# The increment/decrement by 1 is to compensate for the bounding box
cv2.rectangle(frame, (x1 - 1, y1 - 1), (x2 + 1, y2 + 1), (255, 0, 0), 1)
# Extracting the ROI
roi = frame[y1:y2, x1:x2]

# Resizing the ROI so it can be fed to the model for prediction
roi = cv2.resize(roi, (64, 64))
roi = cv2.cvtColor(roi, cv2.COLOR_BGR2GRAY)
_, test_image = cv2.threshold(roi, 120, 255, cv2.THRESH_BINARY)
cv2.imshow("test", test_image)
```

- Predicting our results

  After placing the ROI and getting the frames from the web cam now its time to predict the gesture result using the model which we trained and stored it intoa variable for the further operations.

- Showcase the results with the help of open cv

  Finally according to the result predicted with our model we will be performing certain operations like resize, blur , rotate etc.

```
result = model.predict(test_image.reshape(1, 64, 64, 1))
prediction = {'ZERO': result[0][0],
              'ONE': result[0][1],
              'TWO': result[0][2],
              'THREE': result[0][3],
              'FOUR': result[0][4],
              'FIVE': result[0][5]}
# Sorting based on top prediction
prediction = sorted(prediction.items(), key=operator.itemgetter(1), reverse=True)


# Displaying the predictions
cv2.putText(frame, prediction[0][0], (10, 120), cv2.FONT_HERSHEY_PLAIN, 1, (0, 255, 255), 1)
cv2.imshow("Frame", frame)
```

```
# loading an image
image1 = cv2.imread(file_path)
if prediction[0][0] == 'ONE':

    resized = cv2.resize(image1, (200, 200))
    cv2.imshow("Fixed Resizing", resized)
    key = cv2.waitKey(3000)

    if (key & 0xFF) == ord("1"):
        cv2.destroyWindow("Fixed Resizing")

elif prediction[0][0] == 'ZERO':

    cv2.rectangle(image1, (480, 170), (650, 420), (0, 0, 255), 2)
    cv2.imshow("Rectangle", image1)
    cv2.waitKey(0)
    key = cv2.waitKey(3000)
    if (key & 0xFF) == ord("0"):
        cv2.destroyWindow("Rectangle")

elif prediction[0][0] == 'TWO':
    (h, w, d) = image1.shape
    center = (w // 2, h // 2)
```

```
        rotated = cv2.warpAffine(image1, M, (w, h))
        cv2.imshow("OpenCV Rotation", rotated)
        key = cv2.waitKey(3000)
        if (key & 0xFF) == ord("2"):
            cv2.destroyWindow("OpenCV Rotation")

    elif prediction[0][0] == 'THREE':
        blurred = cv2.GaussianBlur(image1, (21, 21), 0)
        cv2.imshow("Blurred", blurred)
        key = cv2.waitKey(3000)
        if (key & 0xFF) == ord("3"):
            cv2.destroyWindow("Blurred")

    elif prediction[0][0] == 'FOUR':

        resized = cv2.resize(image1, (400, 400))
        cv2.imshow("Fixed Resizing", resized)
        key = cv2.waitKey(3000)
        if (key & 0xFF) == ord("4"):
```

```
        elif prediction[0][0] == 'FIVE':
            '''(h, w, d) = image1.shape
            center = (w // 2, h // 2)
            M = cv2.getRotationMatrix2D(center, 45, 1.0)
            rotated = cv2.warpAffine(image1, M, (w, h))'''
            gray = cv2.cvtColor(image1, cv2.COLOR_RGB2GRAY)
            cv2.imshow("OpenCV Gray Scale", gray)
            key = cv2.waitKey(3000)
            if (key & 0xFF) == ord("5"):
                cv2.destroyWindow("OpenCV Gray Scale")

        else:
            continue

        interrupt = cv2.waitKey(10)
        if interrupt & 0xFF == 27:  # esc key
            break

    cap.release()
    cv2.destroyAllWindows()
return render_template("home.html")
```

RUN THE APPLICATION:

At last, we will run our flask application

```
if __name__ == "__main__":
    # running the app
    app.run(debug=False)
```

Run The app in local browser

- Open anaconda prompt from the start menu
- Navigate to the folder where your python script is.
- Now type "python app.py" command
- Navigate to the localhost where you can view your web page

Then it will run on localhost:5000

Navigate to the localhost (http://127.0.0.1:5000/)where you can view your webpage.

8. TESTING :

8.1 Test Cases

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	1	0	0	1
Client Application	1	0	0	1

8.2 User Acceptance Testing

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the AI-based A Gesture-based Tool for Sterile Browsing of Radiology Image 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	1	0	0	0	1
Duplicate	4	1	3	0	8
External	1	3	0	0	4
Fixed	2	4	4	2	12
Not Reproduced	0	0	0	1	1
Skipped	0	0	0	0	0
Won't Fix	0	0	0	0	0
Totals	8	8	4	2	22

9. RESULTS :

9.1 Performance Metrics:

Locust Test Report

During: 11/17/2022, 4:18:19 PM - 11/17/2022, 4:21:00 PM

Target Host: http://127.0.0.1:5000/

Script: locustfile.py

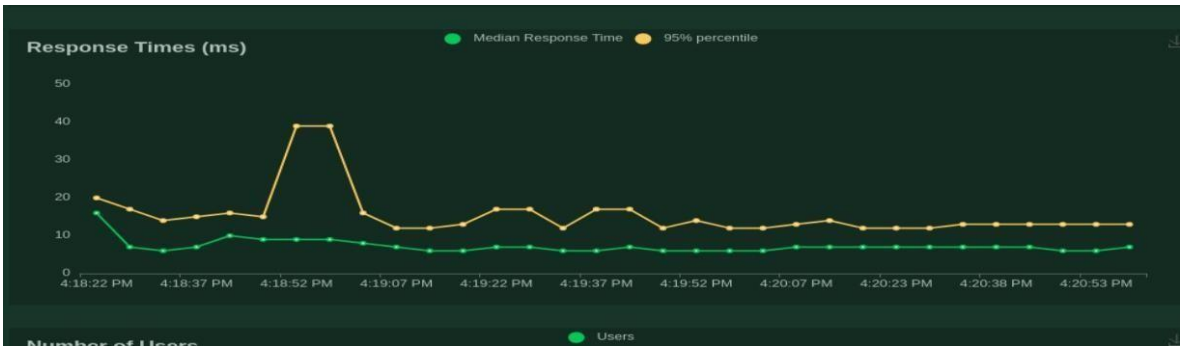
Request Statistics

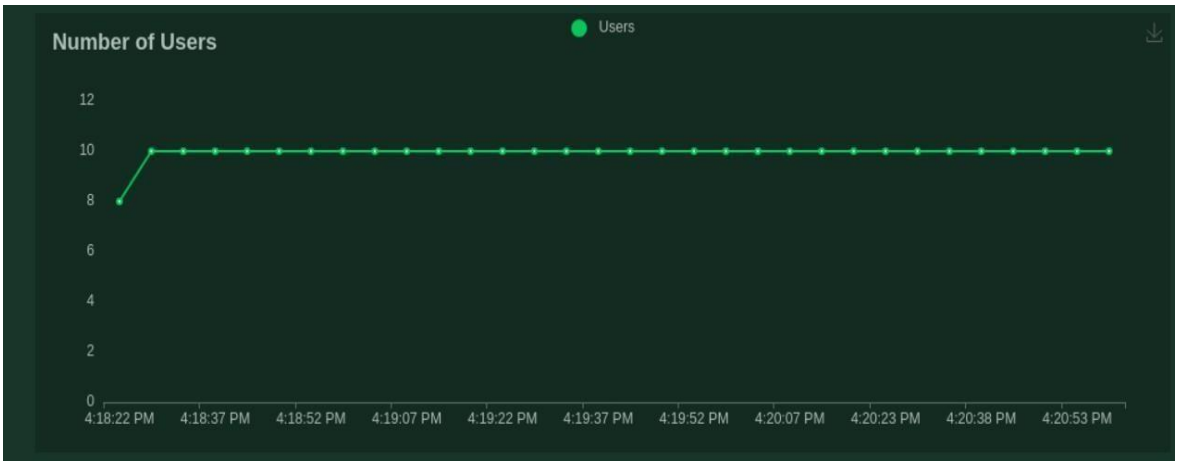
Method	Name	# Requests	# Fails	Average (ms)	Min (ms)	Max (ms)	Average size (bytes)	RPS	Failures/s
GET	//	126	0	13	9	59	6900	0.8	0.0
GET	/image1	129	0	6	5	27	7394	0.8	0.0
GET	/intro	139	0	7	4	38	8349	0.9	0.0
GET	/predict	136	0	6	5	12	6900	0.8	0.0
	Aggregated	**530**	**0**	**8**	**4**	**59**	**7400**	**3.3**	**0.0**

Response Time Statistics

Method	Name	50%ile (ms)	60%ile (ms)	70%ile (ms)	80%ile (ms)	90%ile (ms)	95%ile (ms)	99%ile (ms)	100%ile (ms)
GET	//	12	12	13	14	16	17	40	60
GET	/image1	6	6	7	7	8	9	11	27
GET	/intro	6	6	7	7	9	13	22	39
GET	/predict	6	7	7	8	9	10	11	13
	Aggregated	**7**	**7**	**9**	**11**	**12**	**15**	**22**	**60**

Charts





Final ratio

Ratio per User class

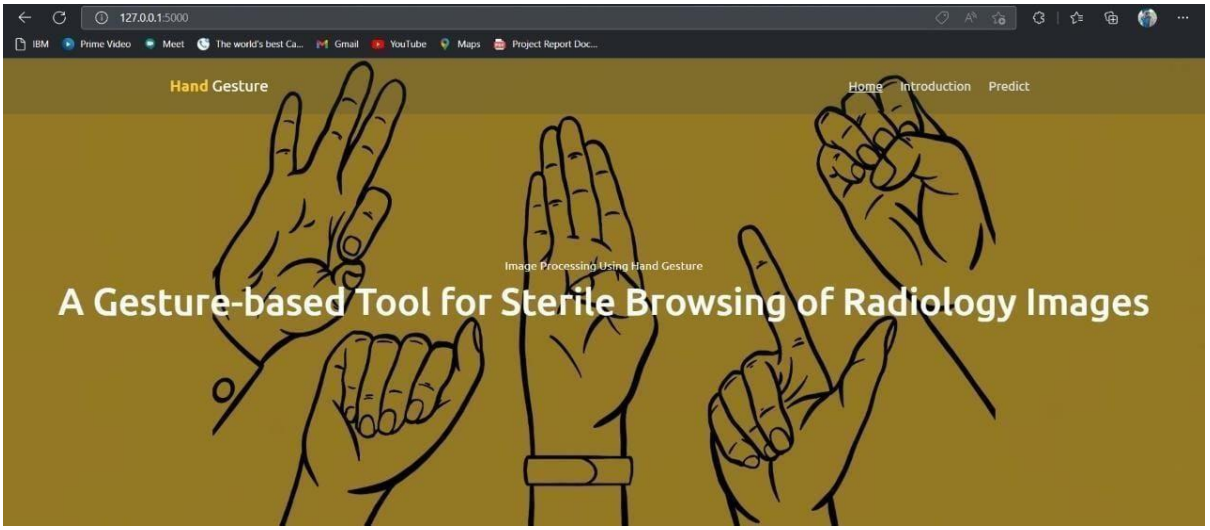
- 100.0% AppUser
  - 25.0% image1
  - 25.0% predict
  - 25.0% home
  - 25.0% intro

Total ratio

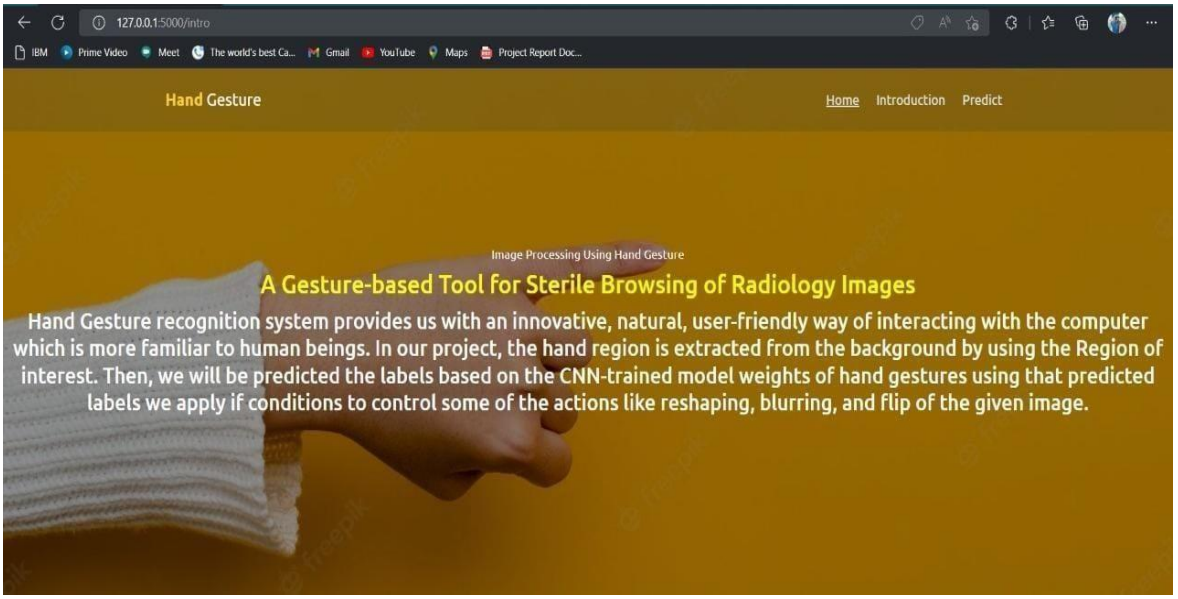
- 100.0% AppUser
  - 25.0% image1
  - 25.0% predict
  - 25.0% home
  - 25.0% intro

9.2 Output

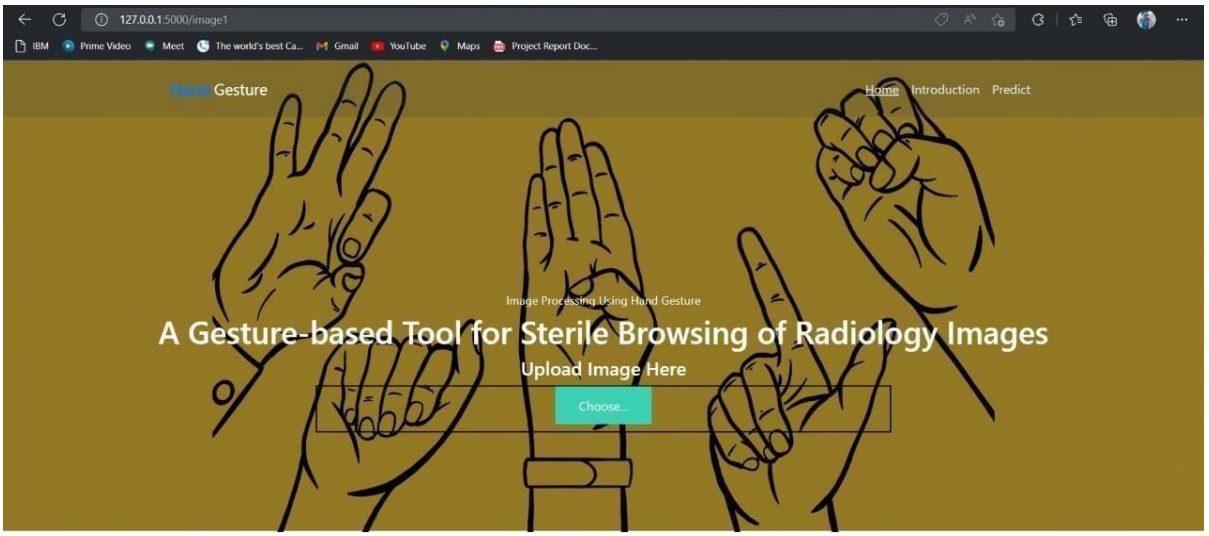
1:Home Page:



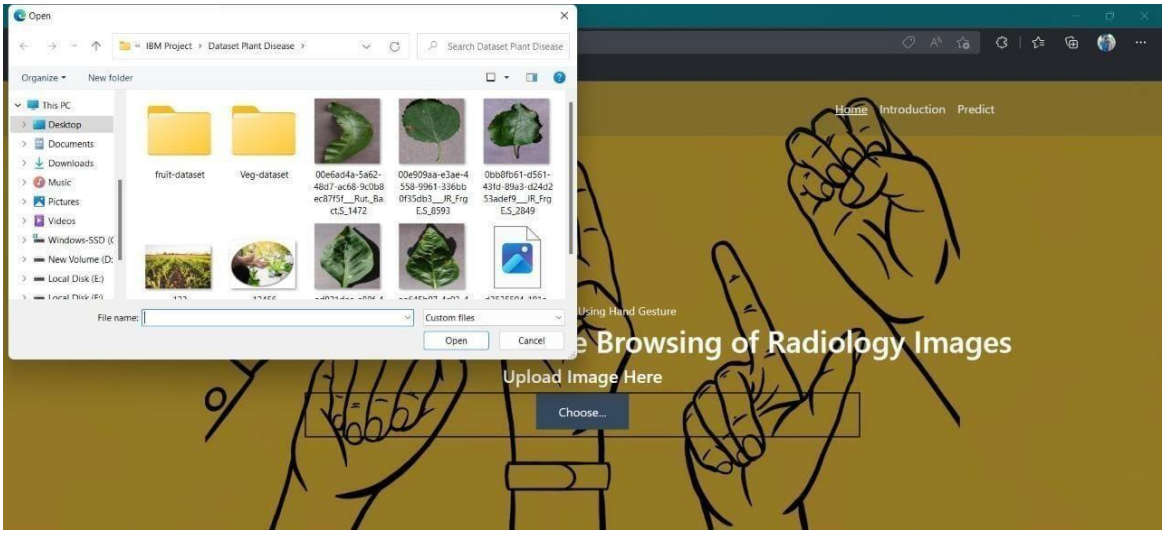
2:Introduction Page:



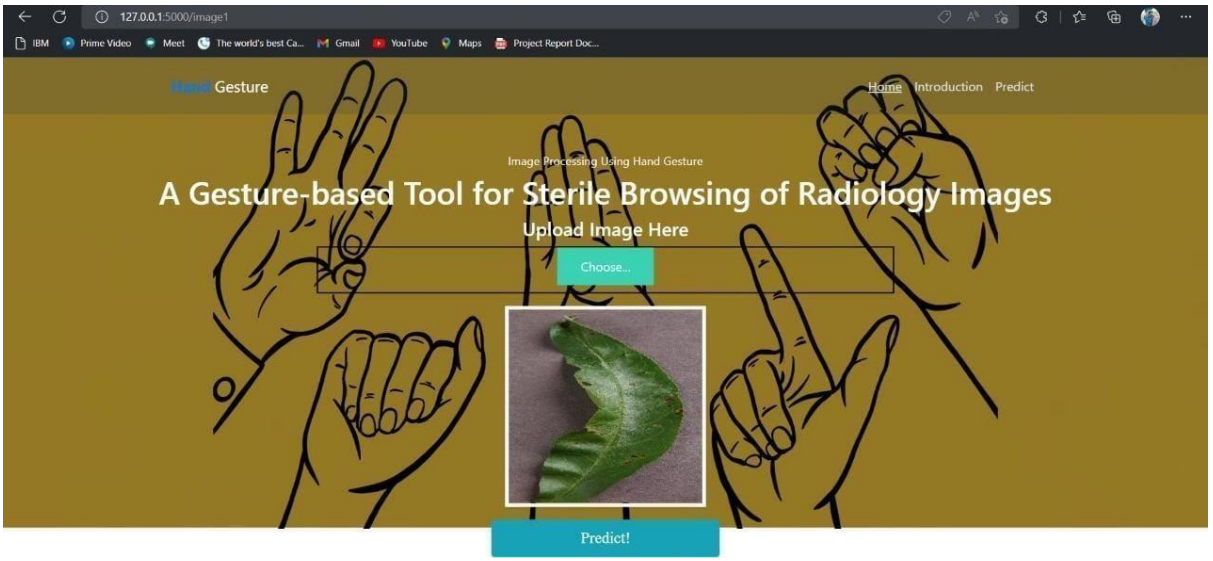
3:Predict Page:



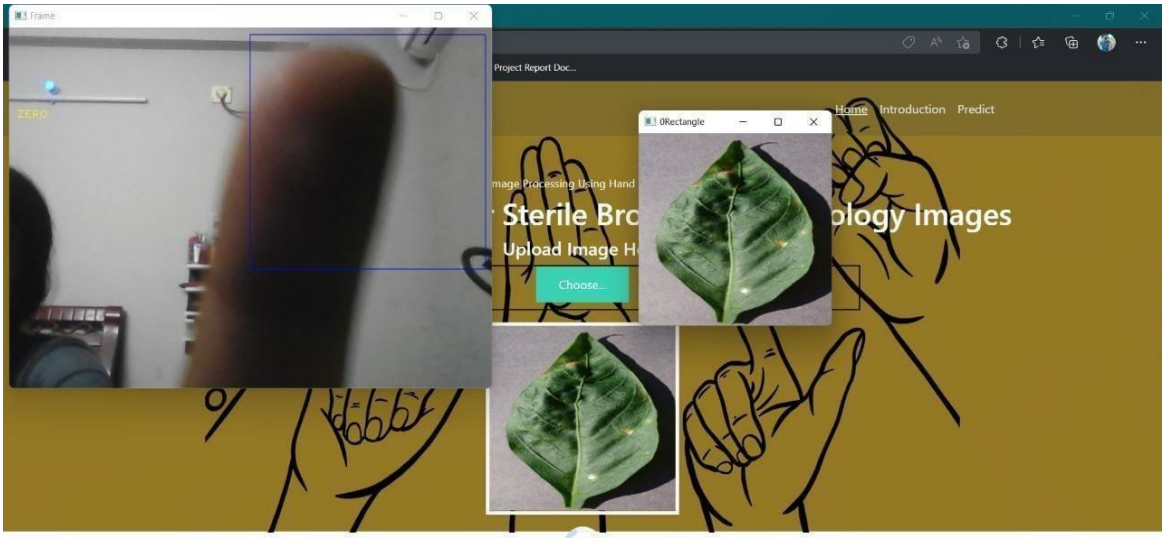
3.1 :Upload Image:

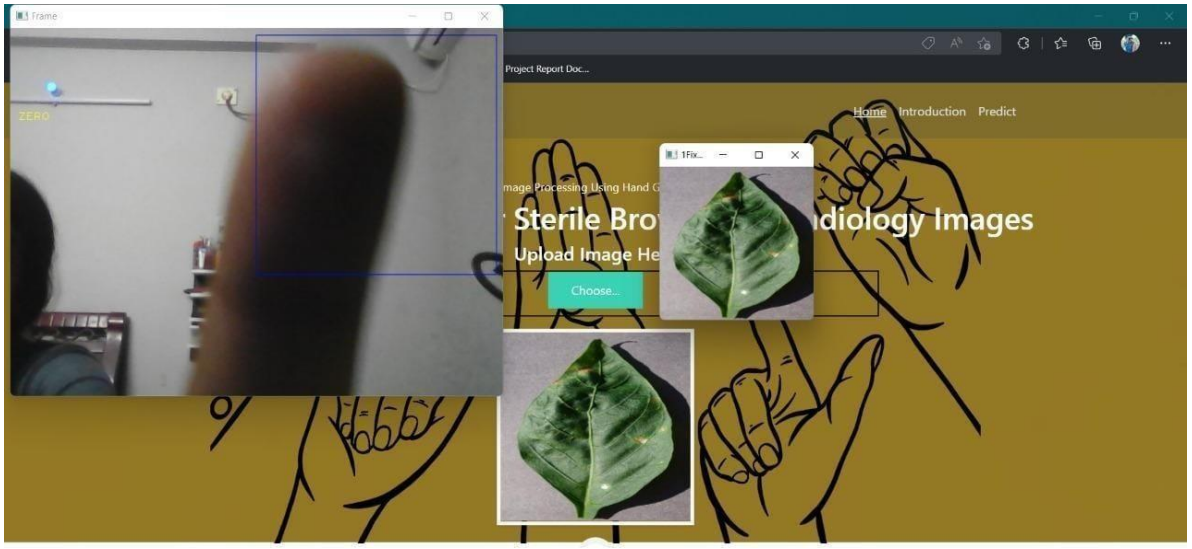


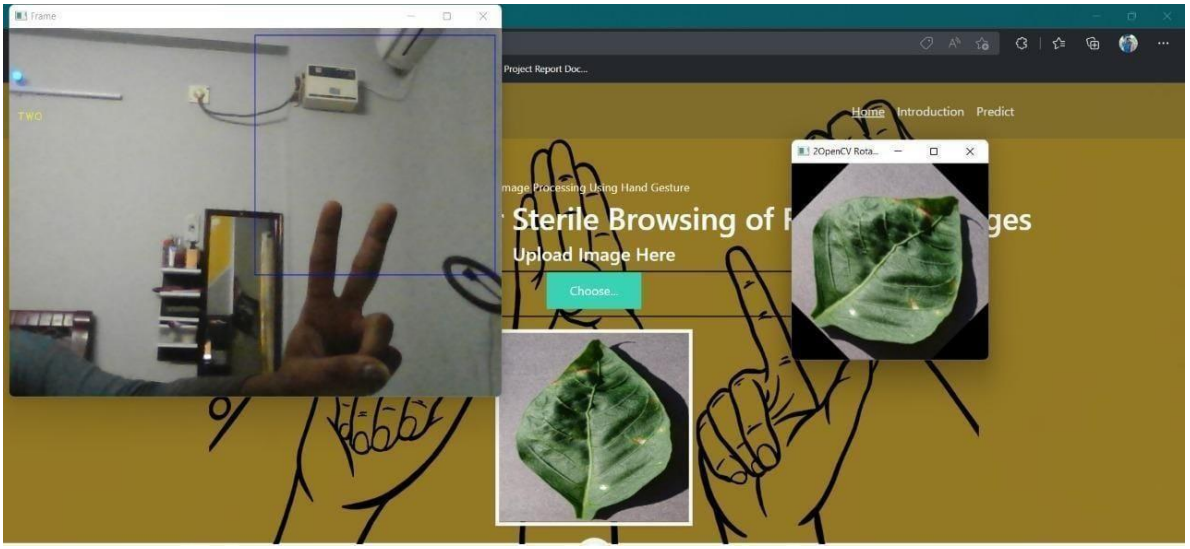
3.2 :Image Uploaded:

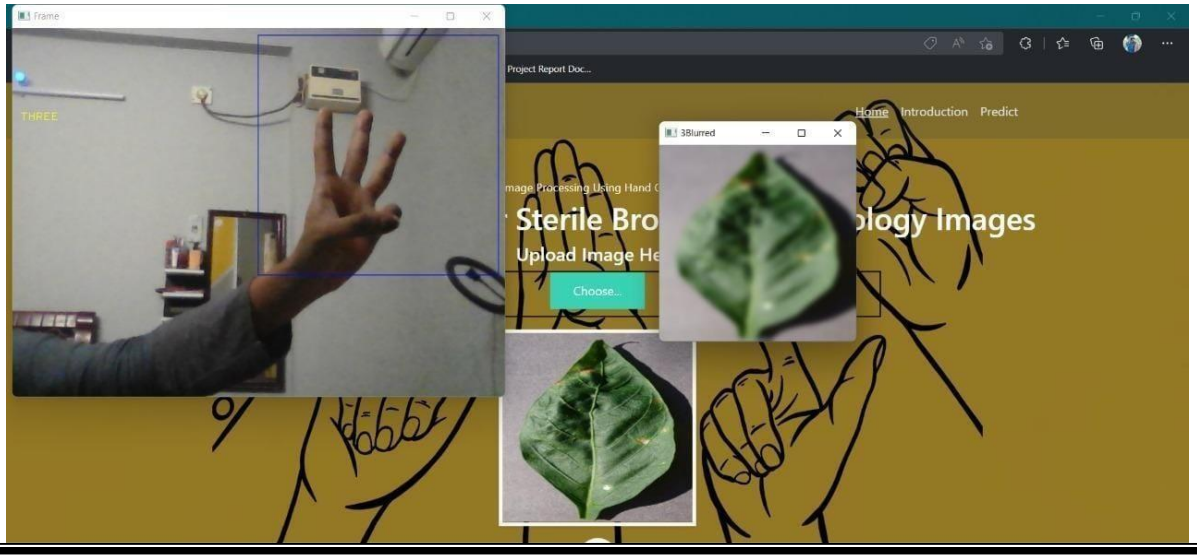


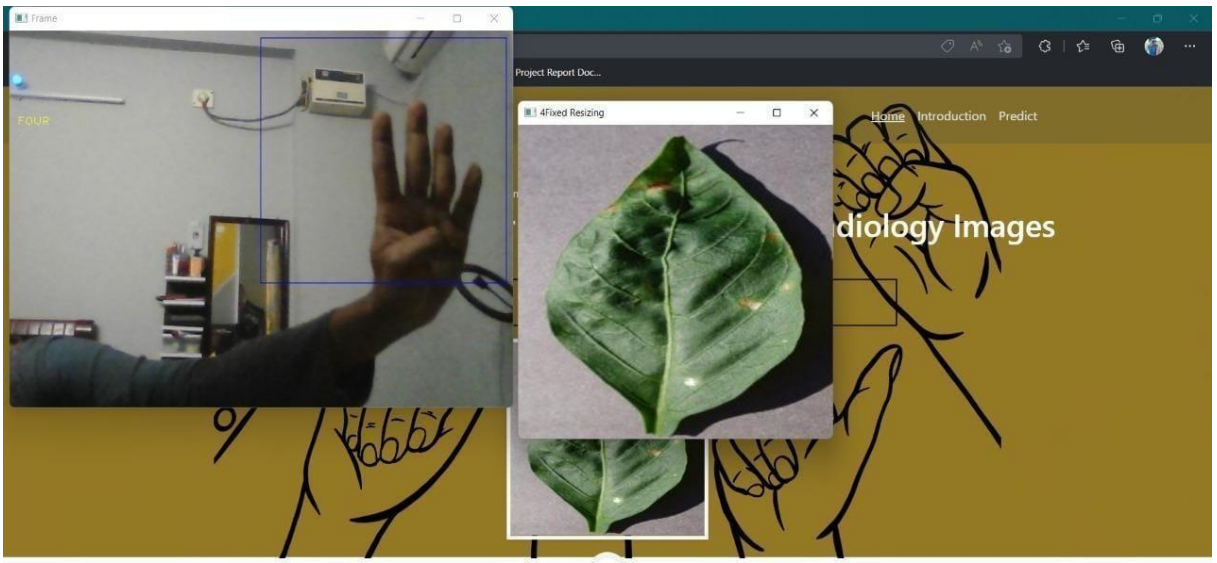
3.3 :Predict:

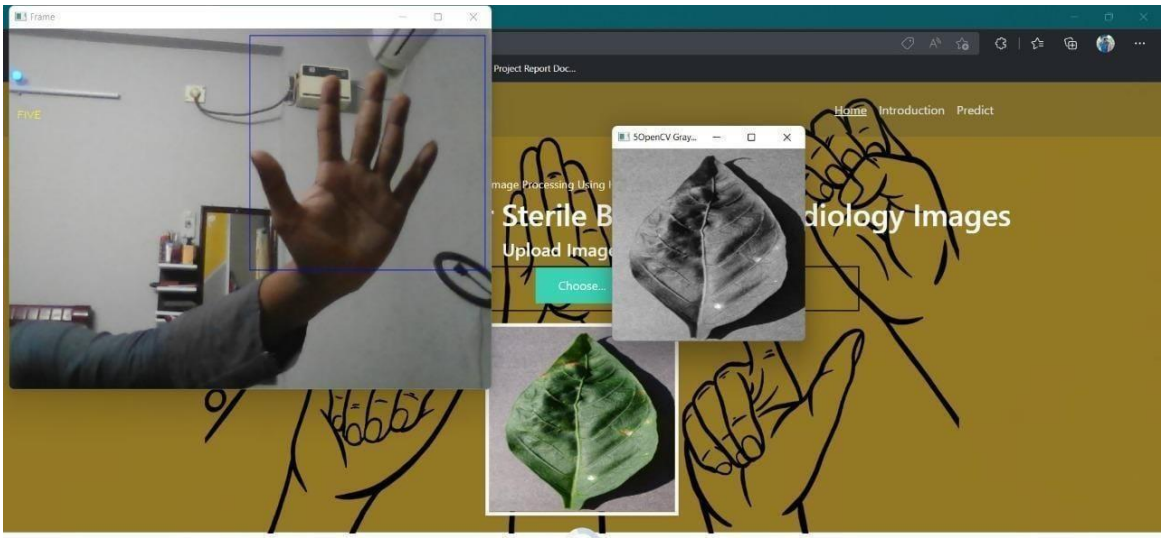



Frame
ZERO
Project Report Doc...
Home Introduction Predict
1Fix...
Choose...


Frame
TWO
Project Report Doc...
Home Introduction Predict
2OpenCV Rota...
Upload Image Here
Choose...

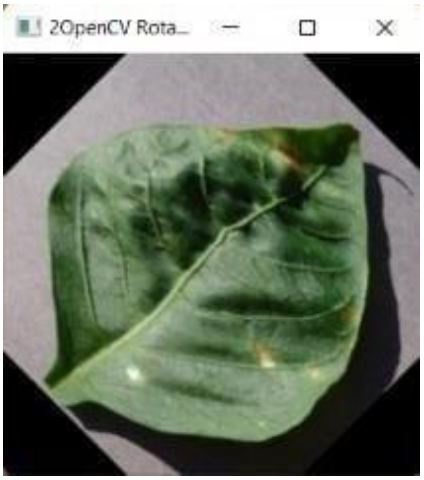

Frame
THREE
Project Report Doc...
Home Introduction Predict
3Blurred
Choose...


Frame
FOUR
Project Report Doc...
4Fixed Resizing
Home
Introduction
Predict
diology Images


Frame
FIVE
Project Report Doc...
Home
Introduction
Predict
5OpenCV Gray...
Sterile B
diology Images
Upload Imag
Choose...

4. Actions:

- ➤ 0-Rectangle
- ➤ 1-Fixed Resizing(200,200)
- ➤ 2-OpenCV Rotation
- ➤ 3-Blurred
- ➤ 4-Fixed Resizing(400,400)
- ➤ 5-OpenCV Grey Scale




4Fixed Resizing


5OpenCV Gray...

10. ADVANTAGES & DISADVANTAGES:

10.1 Advantages:

- **Ease of use**—the system allows the surgeon to use his/her hands, their natural work tool
- **Rapid reaction**—nonverbal instructions by hand gesture commands areintuitive and fast (In practice, the "Gestix" system can process images and track hands at a frame-rate of 150 Hz, thus, responding to the surgeon's gesture commands in real-time)
- **An unencumbered interface**—the proposed system does not require the surgeon to attach a microphone, use head-mounted (body-contact) sensing devices or to use foot pedals
- **Distance control**—the hand gestures can be performed up to 5 meters from the camera and still be recognized accurately.
- Accuracy is high.
- Memory Saving. [due to cloud]
- An Unecumbered Interface.
- Distance Control.

Translation independent.

10.2 Disadvantages:

- This kind of input also raises issues that are not relevant with traditional input .On the user's side, these problems are to learn, to remember and to accurately execute gestures.
- The developer has to provide a system that correctly recognizes these gestures. Freeman et al. remarked that the observation of gestures does not suffice in order to learn them, as the observer is unable to differentiate relevant and irrelevant movements.
- The teaching of multi-touch and mid-air gestures is more difficult than that of single-touch gestures. In the case of the latter, the hand posture is irrelevant - users only need to follow a path correctly to perform a command.
- Image Framing is not accurate.
- Small number of dataset.
- Wrong prediction in low light.
- Accuracy is less due to low light focus.
- Dataset is not suitable for real time.

11. CONCLUSION :

- In this project , we proposed an idea for feasible communication between hearing impaired and normal person with the help of deep learning and machine learning approach. This is ever the surrounding challenge to develope a sign language system in data the collection remains invariant of theunconstraint environment. This project can be extended to the real time data. Our method shows to have potential in tackling this problem employing a straight forward camera as a premade dataset has been used.as been used, incase sufficient substantial training information is given, which can be continuously done and included through the previously mentioned process.

12. FUTURE SCOPE :

- The use of doctor-computer interaction devices in the operation room (OR)requires new

modalities that support medical imaging manipulation while allowing doctors' hands to remain sterile, supporting their focus of attention, and providing fast response times. In future everything become automated .

13. APPENDIX :

13.1 Source Code

1:home.html

```
<!DOCTYPE html>
<html lang="en">
<head>
        <meta charset="utf-8">
    <meta name="viewport" content="width=device-width, initial-
scale=1,shrink-to-fit=no">
    <meta name="description" content="Start your development with Creative Design landing
page.">
    <meta name="author" content="Devcrud">
    <title>Hand Gesture Recognition</title>
    <link rel="stylesheet" href="../static/vendors/themify-icons/css/themify-
    icons.css">
        <link rel="stylesheet" href="../static/css/creative-design.css">
<style>
.header { background:
  #efefef
  url(../static/imgs/3.jpg);background-size: cover;
  background-position: center
  center;background-repeat: no-
  repeat;
  text-align:
  center;color:
  white; position:
  relative;height:
  598px; position:
  relative;
}
</style>
</head>
<body data-spy="scroll" data-target=".navbar" data-offset="40" id="home">
    <!-- Page Navbar -->
    <nav id="scrollspy" class="navbar page-navbar navbar-light navbar-
expand-mdfixed-top" data-spy="affix" data-offset-top="20">
        <div class="container">
            <a class="navbar-brand" href="#"><strong
                    class="text-primary">Hand</strong> <span class="text-
                        dark">Gesture</span></a>
                    <button class="navbar-toggler" type="button" data-
                        toggle="collapse"
```

data-target="#navbarSupportedContent" aria-
controls="navbarSupportedContent"aria-expanded="false" aria-
label="Toggle navigation">

```
            <span class="navbar-toggler-icon"></span>
        </button>

        <div class="collapse navbar-collapse" id="navbarSupportedContent">
            <ul class="navbar-nav ml-auto">
                <li class="nav-item">
                    <a class="nav-link" href="{{ url_for('home')}}"><u>Home</u></a>
                </li>
                <li class="nav-item">
                    <a class="nav-link" href="{{ url_for('intro')}}">Introduction</a>
                </li>
                <li class="nav-item">
                    <a class="nav-link" href="{{ url_for('index6')}}">Predict</a>
                </li>
            </ul>
        </div>
    </div>
</nav><!-- End of Page Navbar -->

<!-- Page Header -->
<header id="home" class="header">
<img src="../static/imgs/11.png" style="width:1000px;height:600px;">

    <div class="overlay"></div>
    <div class="header-content">
        <p>Image Processing Using Hand Gesture</p>
        <h1>A Gesture-based Tool for Sterile Browsing of Radiology Images</h1>
    </div>
</header><!-- End of Page Header -->
```

2:intro.html

```
<!DOCTYPE html>
<html lang="en">
<head>
        <meta charset="utf-8">
    <meta name="viewport" content="width=device-width, initial-scale=1,shrink-to-fit=no">
    <meta name="description" content="Start your development withCreative Design landing page.">
```

```
    <meta  name="author"  content="Devcrud">
    <title>Hand Gesture Recognition</title>
    <link rel="stylesheet"
href="../static/vendors/themify-icons/css/themify-icons.css">
        <link  rel="stylesheet" href="../static/css/creative-design.css">
<style>
.header { background:
  #efefef
  url(../static/imgs/1.jpg);background-size:
  cover;
  background-position: center
  center;background-repeat: no-
  repeat;
  text-align:
  center;color:
  white; position:
  relative;height:
  598px; position:
  relative;
}
</style>
</head>
<body data-spy="scroll" data-target=".navbar" data-offset="40"
id="home">
    <!-- Page Navbar -->
    <nav id="scrollspy" class="navbar page-navbar navbar-light
navbar-expand-md fixed-top" data-spy="affix" data-offset-
top="20">
        <div class="container">
            <a class="navbar-brand"
href="#"><strongclass="text-
primary">Hand</strong> <span class="text-
dark">Gesture</span></a>

            <div class="collapse navbar-collapse"
id="navbarSupportedContent">
                <ul class="navbar-nav ml-auto">
                    <li class="nav-item">
                        <a class="nav-link" href="{{
```

```
                <li class="nav-item">
                    <a class="nav-link" href="{{
url_for('intro')}}">Introduction</a>
                </li>
                <li class="nav-item">
                    <a class="nav-link" href="{{
url_for('index6')}}">Predict</a>
                </li>
            </ul>
        </div>
    </div>
</nav><!-- End of Page Navbar -->

<!-- Page Header -->
<header id="home" class="header">

    <div class="overlay"></div>
    <div class="header-content">
        <p>Image Processing Using Hand Gesture</p>
        <h3 style="color:yellow;">A Gesture-based Tool for Sterile
Browsing of Radiology Images</h3>
                        <h4>    Hand Gesture recognition system
provides us with an innovative, natural, user-friendly way of
interactingwith the computer which
is more familiar to human beings. In our project, the hand regionisextracted
from the background by using the Region of interest. Then, we will bepredicted
the labels based on the CNN-trained model weights of hand gestures
using that predicted labels we apply if conditions to control some of
theactions like reshaping, blurring, and flip of thegiven image. <h4>
    </div>
</header><!-- End of Page Header -->
```

3:index6.html

```
<html lang="en">
  <head>
     <meta charset="utf-8">
     <meta  http-equiv="X-UA-Compatible"  content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-
scale=1,shrink-to-fit=no">
    <meta name="description" content="Start your development
withCreative Design landing page.">
    <meta  name="author"  content="Devcrud">
    <title>Hand Gesture Recognition</title>
    <link rel="stylesheet"
href="../static/vendors/themify-icons/css/themify-icons.css">
        <link  rel="stylesheet" href="../static/css/creative-design.css">
    <link href="../static/css/creative-design.css/main.css"
rel="stylesheet">
    <link href="{{ url_for('static', filename='css/main.css') }}"
rel="stylesheet">
     <meta name="viewport" content="width=device-
width,initial-scale=0.6">
     <script src="https://ajax.googleapis.com/ajax/libs/jquery/3.3.1/jquery.min.js"
></script>
     <link href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.mi
n.css"rel="stylesheet">

     <script src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js"></
script>
     <script
src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></script
>
     <script src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js"><
/script>
     <link href="{{ url_for('static', filename='css/main.css') }}"
rel="stylesheet">
```

```
  <style>
.header { background:
  #efefef
  url(../static/imgs/3.jpg);background-size:
  cover;
  background-position: center
  center;background-repeat: no-
  repeat;
  text-align:
  center;color:
  white; position:
  relative;height:
  598px; position:
  relative;
}
.btncls{
  position:
  relative;top: -
  133px;
  left: 33px;
  border-radius:
  20px;height:30px;
  font-size:
  12px;border:
  none;
  background-color: rgb(45, 45, 43);
  color:rgb(252, 248, 248);
  font-weight: 600;
}
#display-
  image{width:
  400px;
  height:
  225px;
  border: 3px solid rgb(45, 45,
  43);border-radius:25px;
  background-position:
  center;background-size: cover;
  position: relative;
```

```
  top: -
  143px;left:
  33px;
}
#image-input{
```

```
  position:
  relative;top: -
  153px;
  left: 33px;
  border-radius: 20px;
  background-color: rgb(45, 45, 43);
}
.topnav {
    overflow: hidden;
    background-color:
    #056959;
  }

  .topnav-right a
    {float: left;
    color: black;
    text-align: center;
    padding: 14px
    16px; text-
    decoration: none;
    font-size: 18px;
  }

  .topnav-right a.active {
    background-color:
    #07201e;color: rgb(238,
    226, 234);
  }

  .topnav-right a:hover {
    background-color: rgb(181, 228, 236);
    color: rgb(6, 27, 36);
  }



  .topnav-right
    {float: right;
    padding-right:100px;
  }
```

```
.button {
background-color: #091425;
border: none;
color: black;
padding: 15px
32px;text-align:
center;
text-decoration:
none;display: inline-
block; font-size:
12px; border-radius:
16px;
}
.button:hover {
  box-shadow: 0 12px 16px 0 rgba(0,0,0,0.24), 0 17px 50px 0rgba(0,0,0,0.19);
}
form {border: 2px solid black; margin-left:400px;margin-
right:400px;}

input[type=text], input[type=password] {
  width: 100%;
  padding: 12px 20px;
  display: inline-block;
  margin-bottom:18px;
  border: 1px solid
  #ccc;box-sizing:
  border-box;
}

button {
  background-color:
  #091425;color: black;
  padding: 14px
  20px;margin-
  bottom:10px;  border:
  none;
  cursor: pointer;
  width: 19%;
```

```
  font-family:Montserrat;
}

button:hover
  {opacity:
  0.8;
}

.cancelbtn  {width:
  auto;
  padding: 10px 18px;
  background-color:
  #f44336;
}

.imgcontainer {
  text-align:
  center;
  margin: 24px 0 12px 0;
}

img.avatar {
  width:
  30%;
  border-radius: 50%;
}

.container {
  padding:
  16px;
}

span.psw {
  float:
  right;
  padding-top: 16px;
}

/* Change styles for span and cancel button on extra small screens */
```

```
@media screen and (max-width: 300px) {
  span.psw {
     display:
     block;float:
     none;
```

```
  }
  .cancelbtn {
     width:
     100%;
  }
}

.home{
  margin:80px;

  width: 84%;
  height: 500px;
  padding-
  top:10px;
  padding-left:
  30px;

}
.login{
  margin:80px;
  box-sizing: content-
  box;width: 84%;
  height:
  420px;
  padding:
  30px;
  border: 10px solid rgb(12, 91, 94);
}
.left,.right{
 box-sizing:    content-
 box;height:      400px;
 margin:20px;
 border: 10px solid rgb(12, 91, 94);
}

.mySlides {display: none;}
img {vertical-align:
middle;}
```

```
/* Slideshow container */
.slideshow- container
  {max- width:
  1000px; position:
  relative;
```

```
  margin: auto;
}

/* Caption text */
.text {
  color: #f2f2f2;
  font-size:
  15px; padding:
  8px
  12px;position:
  absolute; bottom:
  8px;
  width: 100%; text-
  align: center;
}
/* The dots/bullets/indicators */
.dot {
  height: 15px;
  width: 15px;
  margin: 0
  2px;
  background-color:
  #bbb;border-radius:
  50%; display: inline-
  block;
  transition: background-color 0.6s ease;
}

.active {
  background-color: #267481;
}

/* Fading animation */
.fade {
  -webkit-animation-name: fade;
  -webkit-animation-duration:
  1.5s;animation-name: fade;
  animation-duration: 1.5s;
}
```

```
  from {opacity: .4}
  to {opacity: 1}
 }
 @keyframes fade
  {from {opacity:
  .4}
  to {opacity: 1}
 }

 /* On smaller screens, decrease text size */ @media
 only screen and (max-width: 300px)
 {
  .text {font-size: 11px}
 }


</style>
</head>
<body data-spy="scroll" data-target=".navbar" data-offset="40"
id="home">
   <!-- Page Navbar -->
   <nav id="scrollspy" class="navbar page-navbar navbar-light
navbar-expand-md fixed-top" data-spy="affix" data-offset-
top="20">
       <div class="container">
          <a class="navbar-brand"
href="#"><strongclass="text-
primary">Hand</strong> <span class="text-
dark">Gesture</span></a>
             <button class="navbar-toggler" type="button"
 data-toggle="collapse"                                    data-
target="#navbarSupportedContent"                          aria-
controls="navbarSupportedContent"  aria-expanded="false"  aria-
label="Toggle navigation">
              <span class="navbar-toggler-icon"></span>
          </button>

          <div class="collapse navbar-collapse"
id="navbarSupportedContent">
             <ul class="navbar-nav ml-auto">
```

```
                    <a class="nav-link" href="{{
url_for('home')}}"><u>Home</u></a>
                </li>
                <li class="nav-item">
                    <a class="nav-link" href="{{
url_for('intro')}}">Introduction</a>
                </li>
                <li class="nav-item">
                    <a class="nav-link" href="{{
url_for('index6')}}">Predict</a>
                </li>
              </ul>
            </div>
        </div>
    </nav><!-- End of Page Navbar -->

    <!-- Page Header -->
    <header id="home" class="header">
<img src="../static/imgs/11.png" style="width:1000px;height:600px;">

        <div class="overlay"></div>
        <div class="header-content"><br><br><br><br><br><br><br>
            <p>Image Processing Using Hand Gesture</p>
            <h1>A Gesture-based Tool for Sterile Browsing ofRadiologyImages</h1>
          <div>
            <h4>Upload Image Here</h4>
        <form action = "http://localhost:5000/" id="upload-file"
method="post" enctype="multipart/form-data">
          <label for="imageUpload" class="upload-label">
            Choose...
          </label>
          <input type="file" name="image" id="imageUpload"
          accept=".png,
.jpg, .jpeg,.pdf">
        </form>
              <center>
```

```
        <div class="image-section" style="display:none;">
          <div class="img-preview">
            <div id="imagePreview">
            </div>
          </div>
          <div>
            <button type="button" color="#f35ac5" class="btn btn-infobtn-
lg" id="btn-predict">Predict!</button>
          </div>
        </div>
        <div class="loader" style="display:none;"></div>
            </center>
      </div>
      </div1>

          <footer>
      <script src="{{ url_for('static', filename='js/main.js') }}"
type="text/javascript"></script>
  </footer>
  </html>
```

13.2 GitHub & Project Demo Link

PROJECT GITHUB:
https://github.com/IBM-EPBL/IBM-Project-26433-1660026553

PROJECT DEMO LINK:

https://drive.google.com/file/d/19Rhnb1FLsmfVVIDHEZ7IaHzt7bcdE0X6/view?usp=drivesdk