

PROJECT REPORT

A GESTURE-BASED TOOL FOR STERILE BROWSING OF RADIOLOGY IMAGES

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1. INTRODUCTION

1.1 PROJECT OVERVIEW:

- Intuitive show frameworks utilize progressed Human PC Cooperation (HCI) procedures to give a more helpful and easy to use interface for controlling show shows, for example, page up/down controls of x-beams and transferred pictures in the clinical field machine console control, new experience is altogether improved with these methods.
- Hand signal has colossal applications. In this review, we apply it to an intuitive show framework to make a straightforward cooperation interface.
- The utilization of specialist PC cooperation gadgets in the activity room (OR) requires new modalities that help clinical imaging control while permitting specialists' hands to stay clean. We are introducing "Gestix," a dream based hand signal catch and acknowledgment framework that deciphers progressively the client's motions for route and control of pictures in an electronic clinical record (EMR) data set.
- "Gestix" was tried during a cerebrum biopsy methodology. In the in vivo explore, this connection point forestalled the specialist's center shift and change of area while accomplishing a fast natural response and simple collaboration.

2. LITERATURE SURVEY :

2.1 Existing Problem:

- A significant test included is to give Specialists effective, instinctive, exact and safe method for collaboration without influencing the nature of their work.
- Anyway the utilization of PC consoles and mouse by specialists in serious consideration unit(ICU) is a typical mean for spreading contaminations.
- We recommend the utilization of hand motions in clinical field as an option in contrast to the current connection point methods by offering greatest degree of sterility.

2.2 References

- Robust Part-Based Hand Gesture Recognition Using Kinect Sensor Zhou Ren, Junsong Yuan, Member, IEEE, Jingjing Meng, Member, IEEE, and Zhengyou Zhang, Fellow, IEEE, 15, AUGUST 2013.
- A Fast Gesture Recognition Scheme for Real-Time Human Machine Interaction Systems . Ching-Hao Lai* Smart Network System Institute for Information Industry Taipei City, Taiwan , 2010.

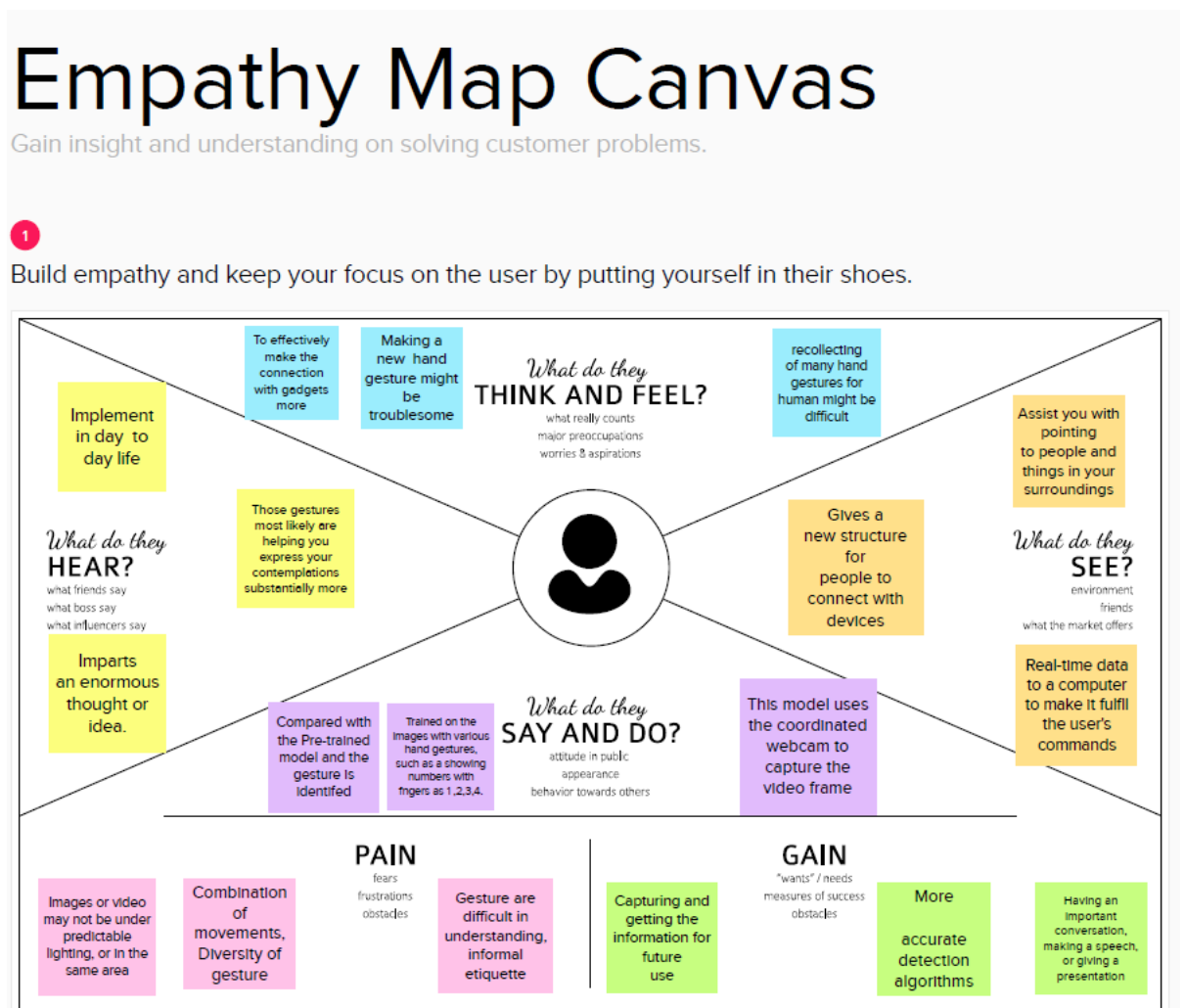
- Intension, Context and Gesture Recognition for Sterile MRI Navigation in the Operating Room by Agency for Healthcare Research and Quality (AHRQ)
- Hand Gestures Recognition Using Radar Sensors for Human-Computer Interaction Supported by the Bio ad Medical Technology Development Program of the National 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, Jiaqing LIU, Tomoko Tateyama

2.3 Problem Statement Definition

A significant test included is to furnish Specialists with proficient, instinctive, precise and safe method for cooperation without influencing the nature of their work. Anyway the utilization of PC consoles and mouse by specialists in concentrated care unit(ICU) is a typical mean for spreading infections.We propose the utilization of hand signals in clinical field as an option in contrast to the current connection point strategies by offering most extreme degree of sterility.

3.IDEATION & PROPOSED SOLUTION :

3.1 Empathy Map Canvas



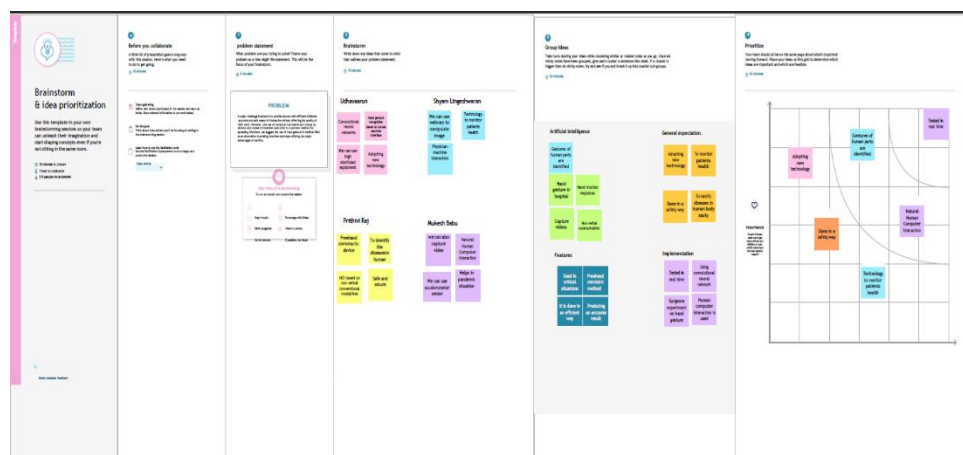
3.2 Ideation & Brainstorming

Conceptualizing gives a free and open climate that empowers everybody inside a group to partake in the imaginative reasoning cycle that prompts critical thinking. Focusing on volume over esteem, out-of-the-container thoughts are gladly received and based upon, and all members are urged to team up, helping each other foster a rich measure of clever fixes.

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 collaboration with interventional imaging frameworks inside a sterile climate is a difficult errand for doctors. Direct doctor machine connection during a mediation is somewhat restricted as a result of sterility and work area limitations.

- We propose a strategy for motion controlled projection show that empowers an immediate and regular doctor machine collaboration during registered tomography (CT)- based intercessions.
- Consequently, a graphical UI is projected on a radiation safeguard situated before the doctor. Hand signals before this show are caught and characterized utilizing a jump movement regulator.
- We propose a motion set to control essential elements of mediation programming like signals for 2D picture investigation, 3D item control and choice. Our strategies were assessed in a clinically situated client study with 12 members

The consequences of the performed client study affirm that the presentation and the hidden communication idea are acknowledged by clinical clients. The acknowledgment of the motions is vigorous, in spite of the fact that there is potential for upgrades.

- The signal preparation times are under 10 min, however shift intensely between the members of the review. The created signals are associated intelligently to the intercession programming and instinctive to utilize.
- The proposed signal controlled projection show counters current reasoning, to be specific it gives the radiologist unlimited authority of the mediation programming. It opens additional opportunities for direct doctor machine collaboration mediations in particular during medical procedures.

3.4 Problem Solution Fit

Project Title: A Gesture-based Tool for Sterile Browsing of Radiology Images

Project Design Phase-I - Solution Fit

<p>DEFINE CS, fit into CC</p>	<p>1. CUSTOMER SEGMENT(S)</p> <ul style="list-style-type: none"> This device is by and large utilized by the majority of the specialists. From the start, the clients could confront some sort of troubles to utilize the product. 	<p>6. CUSTOMER CONSTRAINTS</p> <ul style="list-style-type: none"> The clients should diminish the use of force utilization. They ought to keep a steady association with run the product. 	<p>5. AVAILABLE SOLUTIONS</p> <ul style="list-style-type: none"> At beginning phase, the specialists utilize a straightforward sheet to print the patient's portrayal. However, presently a days with the assistance this motion based device the specialists can obscure, pivot and resize the pictures in like manner. 	<p>Explore AS, differentiate</p>
<p>Focus on J&P, tap into BE, understand RC</p>	<p>2. JOBS-TO-BE-DONE / PROBLEM</p> <ul style="list-style-type: none"> The client should grasp the calculations. Then, they should know how to utilize the product appropriately with no unsettling influence. 	<p>9. PROBLEM ROOT CAUSE</p> <ul style="list-style-type: none"> The clients need to utilize their hands to manage the product. They feel that these advances are costly at this moment. In this way, that is the reason some sort of deferral happens at the activity theater. 	<p>7. BEHAVIOUR</p> <ul style="list-style-type: none"> In case if customer faces some issues in the designed software, then they will contact our technical team. The technical team will resolve the issues which are faced by our customers. 	<p>Focus on J&P, tap into BE, understand RC</p>
<p>Identify Strong TR & EM</p>	<p>3. TRIGGERS When it's installed at place, then the customers show some eagerness to install at their place to use the software.</p> <p>4. EMOTIONS: BEFORE / AFTER</p> <ul style="list-style-type: none"> Sometimes doctors felt sad because they need to carry the patient's description at their place. But now a days doctors uses the gesture tool to save their work. 	<p>10. YOUR SOLUTION</p> <ul style="list-style-type: none"> At the point when this sort of innovation send off at around the world, then, at that point, it will be useful to the specialists to perform their medical procedures in speedy and more straightforward manner. The Signal put together apparatus is totally based with respect to the hand second and it act as needs be to its prepared datasets. 	<p>8. CHANNELS of BEHAVIOR</p> <p>Online:</p> <ul style="list-style-type: none"> Extricates channels from conduct block. <p>Offline:</p> <ul style="list-style-type: none"> Extracs channels from conduct block and is utilized for client's sending. 	<p>Identify Strong TR & EM</p>

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	User Registration	Registration is done at the Registration and login page at Web application
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Authentication	Through Password authentication protocol
FR-4	External Interfaces	Microphone, Camera Ethernet, Wi-Fi and USB dongle to provide internet facilities
FR-5	Reporting	If any issues are faced by the customer or user, it will be directly notified to the developer.
FR-6	Compliance to Rules or Laws	Privacy policy, Terms and Conditions, End user agreement.

4.2 Non - Functional Requirements

NON-FUNCTIONAL REQUIREMENTS:

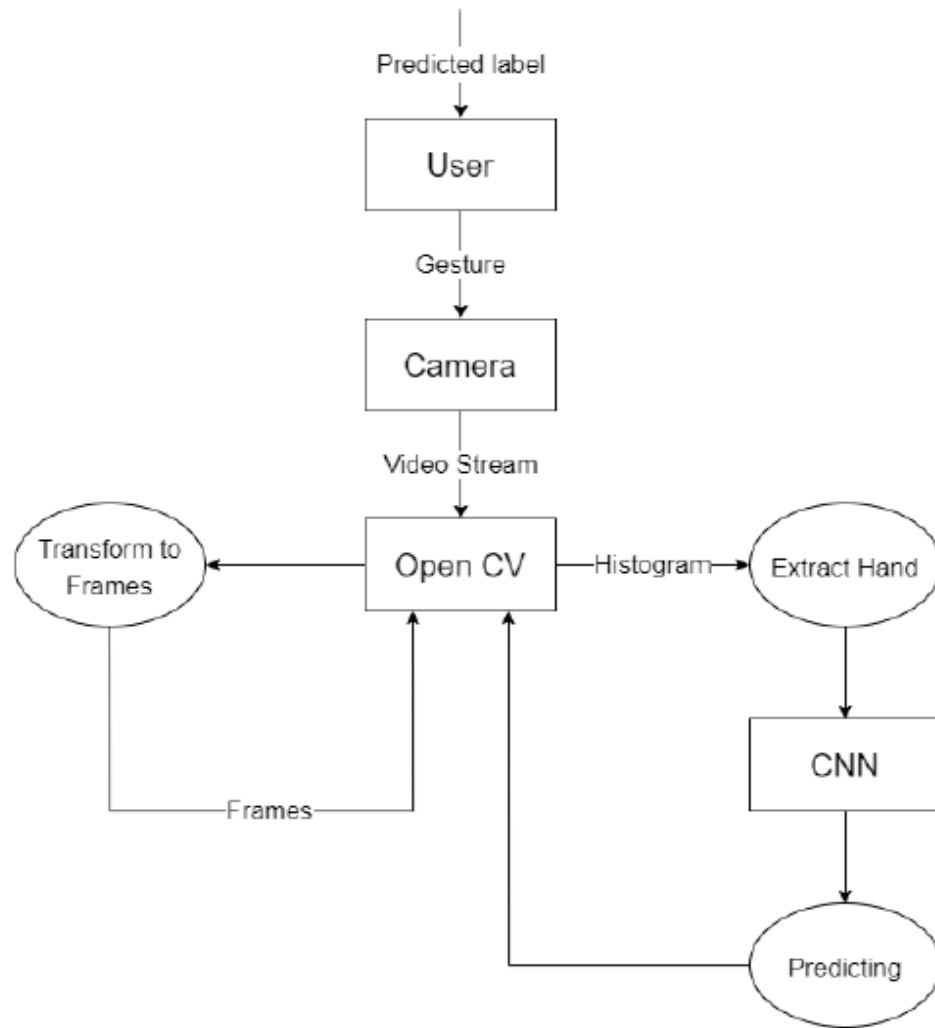
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Can be utilized for some reasons some of them significant are: <ul style="list-style-type: none">● Speak with PC by means of Hand Sign● Ready to control IOT by means of Hand Sign
NFR-2	Security	It is a Web Application platform which is secured by "Encrypting the user data"
NFR-3	Reliability	With this software the users can do many things example: <ul style="list-style-type: none">● Surf on the internet● Communicate with Computer● Controlling IOTs
NFR-4	Performance	The Performance of the software is high because <ul style="list-style-type: none">● The speed and accuracy are high● It Upgrades the lifestyle of human beings by controlling things via hand signs.
NFR-5	Availability	The Demand for this technology is high cause with this: <ul style="list-style-type: none">● We can control over object● Able to use wave screen technology● Able to control the cars etc..
NFR-6	Scalability	In future we can develop the cars that would being controlled by hand gestures

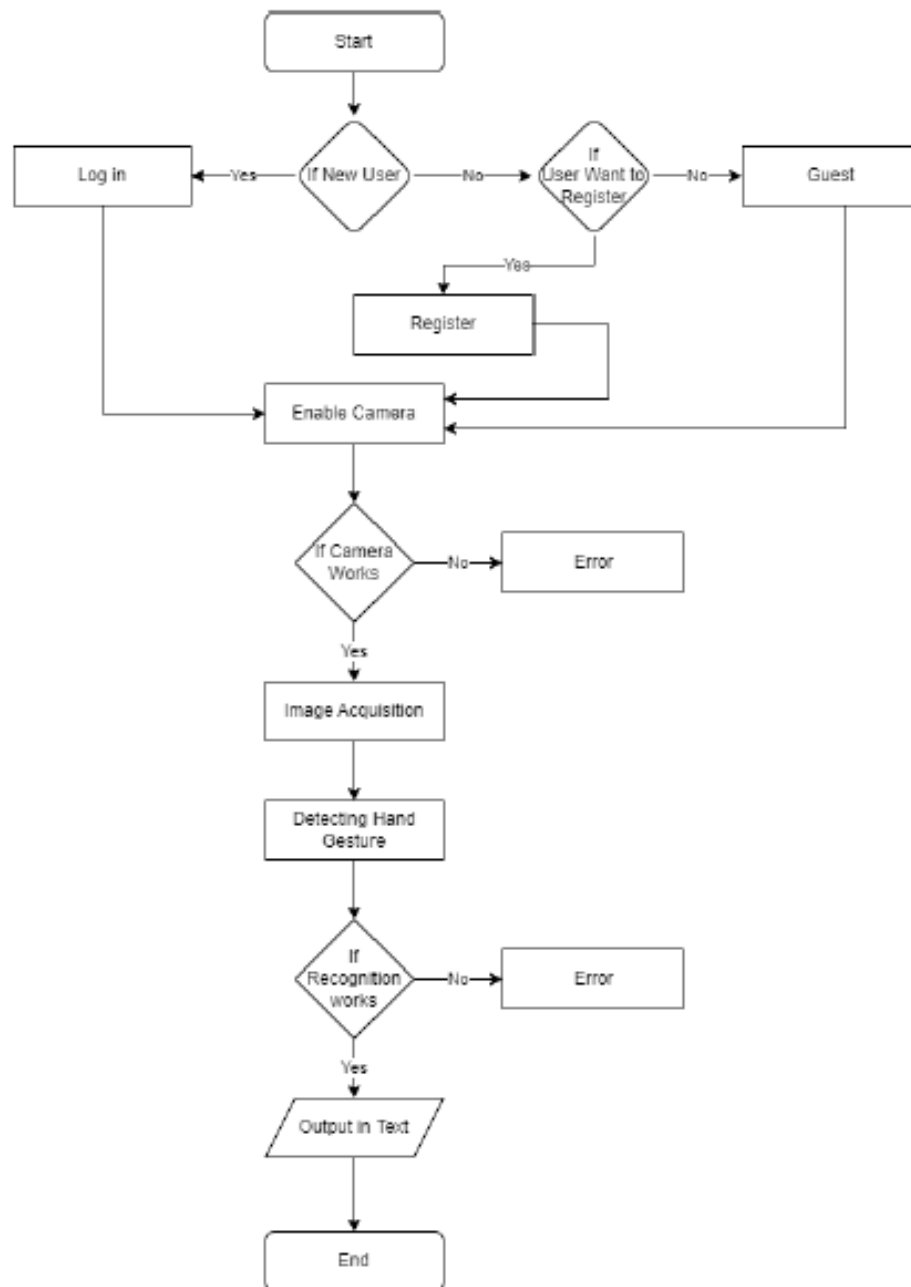
5. PROJECT DESIGN :

5.1 Data Flow Diagrams

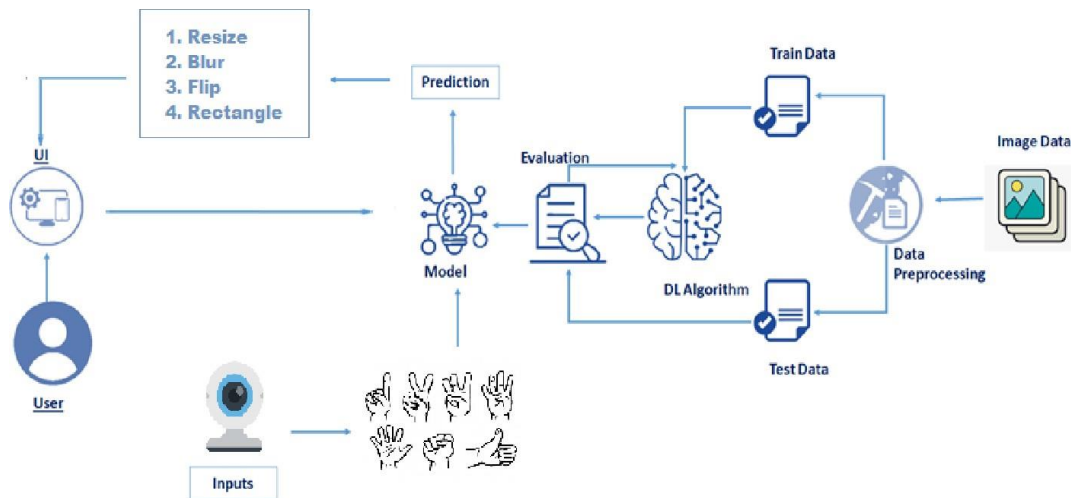
SIMPLIFIED DFD:



INDUSTRY STANDARD DFD:



5.2 Solution & Technical Architecture



5.3 User Stories

USER STORIES:

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

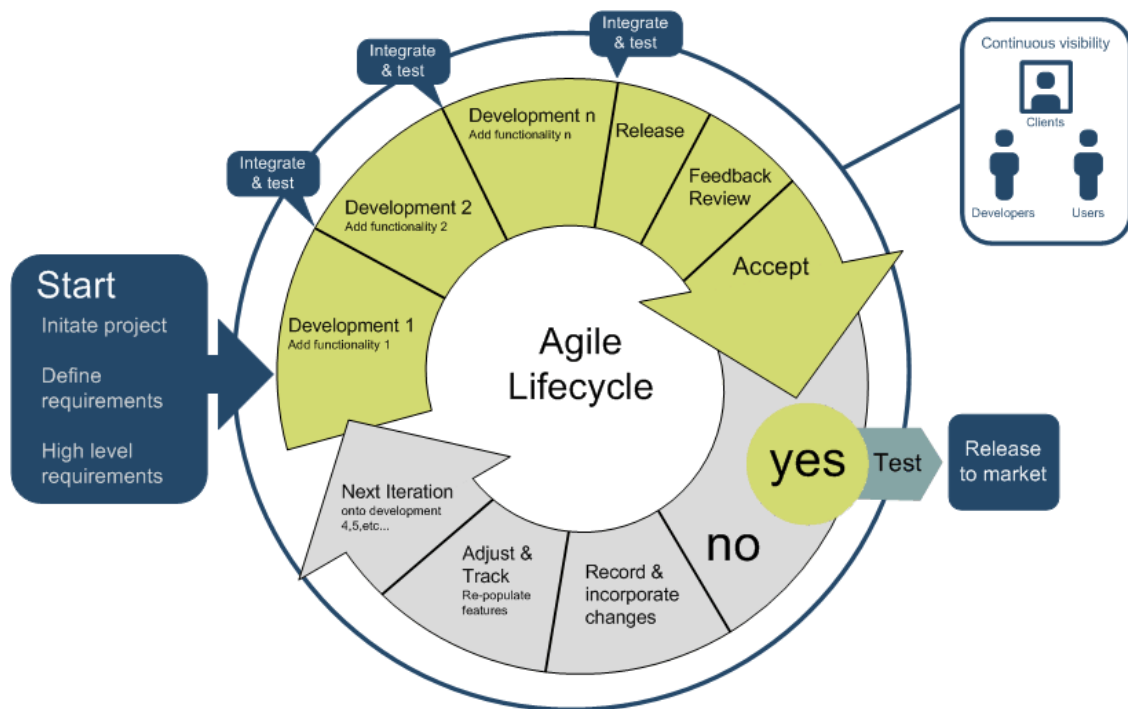
User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Client (Versatile client)	Registration	USN-1	As a client, I can enlist for The Internet Application by entering my email, secret phrase, and affirming my secret word.	I can get to my record / dashboard	High	Sprint-1
		USN-2	As a client, I will get affirmation email whenever I have enlisted for The Internet Application	I can get affirmation email and snap affirm	High	Sprint-1
Normal Individuals and Uniquely Abled	Login	USN-3	As a client, I can sign into The Internet Application by entering email and secret word	If the enrolled data matches the given data acknowledge login.	High	Sprint-1
	Dashboard		<ul style="list-style-type: none"> The Scramble board is basic, Easy to use Connection point and Normal to Each Client After the astounding presentation page, the client can sign in with email and secret word or the client can involve the entrance the component as a visitor 	I can get to my record/dashboard I can get to the elements as a visitor	High	Sprint 2

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
6. Application building using Html and CSS
7. Form for uploading the image
8. Python flask for connecting Model and Webpages



6.3 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

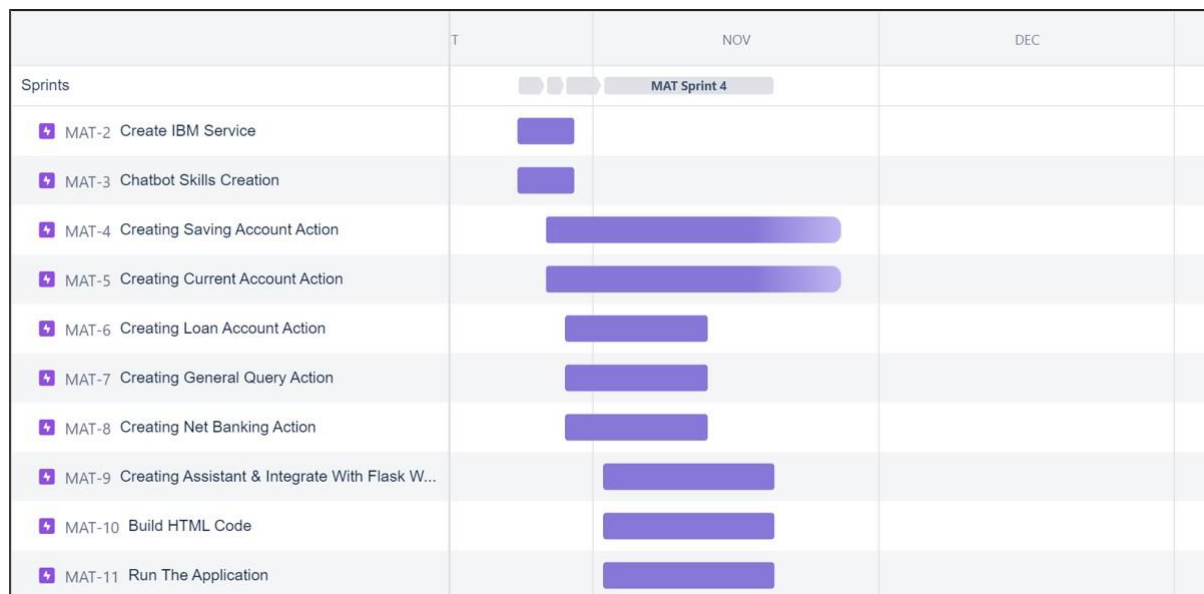
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Launching Software	USN-1	As a user, I can launch the developed software	1	Low	Prithivi raj Udhayaarun Shyam lingeshwaran Mukesh babu
Sprint-1	Access UI	USN-2	As a user, I will use the software and operate on the UI	1	Medium	Prithivi raj Udhayaarun Shyam lingeshwaran Mukesh babu
Sprint-2	Launching Camera	USN-3	As a user, I can open the camera from the software to perform gesture	1	Low	Prithivi raj Udhayaarun Shyam lingeshwaran Mukesh babu
Sprint-2	Upload images from local system	USN-4	As a user, I can upload images to the software from the local system	2	Low	Prithivi raj Udhayaarun Shyam lingeshwaran Mukesh babu
Sprint-3	perform guestures	USN-5	As a user, I can perform various gesture with respect to system specification for processing	2	Medium	Prithivi raj Udhayaarun Shyam lingeshwaran Mukesh babu

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-4	output	USN-6	As a user, I can see the sterile browsers image with respect to the gesture performed, display on the screen	2	High	Prithivi raj Udhayaarun Shyam lingeshwaran Mukesh babu

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

6.4 Reports from JIRA



7.CODING & SOLUTIONING :

7.1 Feature 1

1:IMAGE PREPROCESSING:

Import the ImageDataGenerator Library:

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

Configure ImageDataGenerator Functionality To Trainset And Test set:

Image Data Agumentation

```
#setting parameter for Image Data agumentation to the traing data
train_datagen = ImageDataGenerator(rescale=1./255,shear_range=0.2,zoom_range=0.2,horizontal_flip=True)
#Image Data agumentation to the testing data
test_datagen=ImageDataGenerator(rescale=1./255)
```

Apply Image Data Generator Functionality To Trainset And Testset

Loading our data and performing data agumentation

```
#performing data agumentation to train data
x_train = train_datagen.flow_from_directory('data/train',target_size=(64, 64),batch_size=5,
                                            color_mode='grayscale',class_mode='categorical')
#performing data agumentation to test data
x_test = test_datagen.flow_from_directory('data/test',target_size=(64, 64),batch_size=5,
                                         color_mode='grayscale',class_mode='categorical')

Found 600 images belonging to 6 classes.
Found 30 images belonging to 6 classes.
```

7.2:MODEL BULIDING:

Importing The Model Building Libraries

Importing Neccessary Libraries

```
import numpy as np#used for numerical analysis
import tensorflow #open source used for both ML and DL for computation
from tensorflow.keras.models import Sequential #it is a plain stack of layers
from tensorflow.keras import layers #A layer consists of a tensor-in tensor-out computation function
#Dense Layer is the regular deeply connected neural network layer
from tensorflow.keras.layers import Dense,Flatten
#Faltten-used fot flattening the input or change the dimension
from tensorflow.keras.layers import Conv2D,MaxPooling2D #Convolutional layer
#MaxPooling2D-for downsampling the image
from keras.preprocessing.image import ImageDataGenerator
```

Initializing The Model

```
model=Sequential()
```

Adding CNN Layers

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

# Flattening the layers
classifier.add(Flatten())
```

Adding Dense Layers

```
# Adding a fully connected layer
classifier.add(Dense(units=128, activation='relu'))
classifier.add(Dense(units=6, activation='softmax')) # softmax for more than 2
```

```
classifier.summary()#summary of our model
```

```
Model: "sequential_4"
```

Layer (type)	Output Shape	Param #
=====		
conv2d_6 (Conv2D)	(None, 62, 62, 32)	320

max_pooling2d_6 (MaxPooling2D)	(None, 31, 31, 32)	0

conv2d_7 (Conv2D)	(None, 29, 29, 32)	9248

max_pooling2d_7 (MaxPooling2D)	(None, 14, 14, 32)	0

flatten_3 (Flatten)	(None, 6272)	0

dense_6 (Dense)	(None, 128)	802944

dense_7 (Dense)	(None, 6)	774

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

```
classifier.summary()#summary of our model
```

Model: "sequential_4"

Layer (type)	Output Shape	Param #
=====		
conv2d_6 (Conv2D)	(None, 62, 62, 32)	320

max_pooling2d_6 (MaxPooling2D)	(None, 31, 31, 32)	0

conv2d_7 (Conv2D)	(None, 29, 29, 32)	9248

max_pooling2d_7 (MaxPooling2D)	(None, 14, 14, 32)	0

flatten_3 (Flatten)	(None, 6272)	0

dense_6 (Dense)	(None, 128)	802944

dense_7 (Dense)	(None, 6)	774
=====		
Total params: 813,286		
Trainable params: 813,286		
Non-trainable params: 0		

Configure The Learning Process

Compiling the model

```
# Compiling the CNN  
# categorical_crossentropy for more than 2  
classifier.compile(optimizer='adam', loss='categorical_crossentropy', metrics=['accuracy'])
```

Training Model

Fitting the model

```
classifier.fit_generator(  
    generator=x_train, steps_per_epoch = len(x_train),  
    epochs=20, validation_data=x_test, validation_steps = len(x_test)) # No of images in test set
```

Save the Model

Saving our model

```
# Save the model  
classifier.save('gesture.h5')  
  
model_json = classifier.to_json()  
with open("model-bw.json", "w") as json_file:  
    json_file.write(model_json)
```

Test the Model

Predicting our results

```
from tensorflow.keras.models import load_model
from keras.preprocessing import image
model = load_model("gesture.h5") #Loading the model for testing

img = image.load_img(r"E:\PROJECTS\number-sign-recognition\data\test\1\1.jpg", grayscale=True,
                    target_size= (64,64)) #Loading of the image
x = image.img_to_array(img) #image to array
x = np.expand_dims(x, axis = 0) #changing the shape
pred = model.predict_classes(x) #predicting the classes
pred

array([1], dtype=int64)

index=['0','1','2','3','4','5']
result=str(index[pred[0]])
result

'1'
```

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
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

@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 image1():
    return render_template("index6.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:

- 7.2.1.1 Getting our input and storing it
- 7.2.1.2 Grab the frames from the web cam.
- 7.2.1.3 Creating ROI
- 7.2.1.4 Predicting our results
- 7.2.1.5 Showcase the results with the help of opencv
- 7.2.1.6 Finally run the application
- 7.2.1.7 Getting our input and storing it

Once the predict route is called, we will check whether the method is POST or not. If it is POST then we will request the image files and with the help of os 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)
```

7.3 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)
```

7.4 Creating ROI

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 as 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.

```
# Got this from collect-data.py
# 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)
```


7.4.1 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 into a variable for the further operations.

```
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)
```

7.4.2 Showcase the results with the help of opencv

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

```
#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.destroyAllWindows("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.destroyAllWindows("Rectangle")

elif prediction[0][0]=='TWO':
    (h, w, d) = image1.shape
    center = (w // 2, h // 2)
    M = cv2.getRotationMatrix2D(center, -45, 1.0)
    rotated = cv2.warpAffine(image1, M, (w, h))
    cv2.imshow("OpenCV Rotation", rotated)
    key=cv2.waitKey(3000)
    if (key & 0xFF) == ord("2"):
        cv2.destroyAllWindows("OpenCV Rotation")

elif prediction[0][0]=='THREE':
    blurred = cv2.GaussianBlur(image1, (11, 11), 0)
    cv2.imshow("Blurred", blurred)
    key=cv2.waitKey(3000)
    if (key & 0xFF) == ord("3"):
        cv2.destroyAllWindows("Blurred")
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

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

```
(base) E:\>cd E:\PROJECTS\number-sign-recognition\Flask
(base) E:\PROJECTS\number-sign-recognition\Flask>python app.py
```

Then it will run on localhost:5000

```
* Serving Flask app "app" (lazy loading)
* Environment: production
  WARNING: This is a development server. Do not use it in a production deployment.
  Use a production WSGI server instead.
* Debug mode: off
* Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
```

Navigate to the localhost (<http://127.0.0.1:5000/>) where you can view your web page.

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 Matrics

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

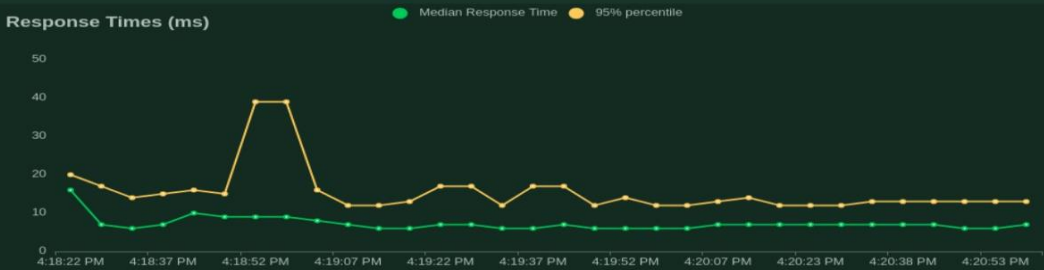
Method	Name	50%ile (ms)	60%ile (ms)	70%ile (ms)	80%ile (ms)	90%ile (ms)	95%ile (ms)	99%ile (ms)	100%ile (ms)
GET	/	12	12	13	14	16	17	40	60
GET	/image1	6	6	7	7	8	9	11	27
GET	/intro	6	6	7	7	9	13	22	39
GET	/predict	6	7	7	8	9	10	11	13
Aggregated		7	7	9	11	12	15	22	60

Charts

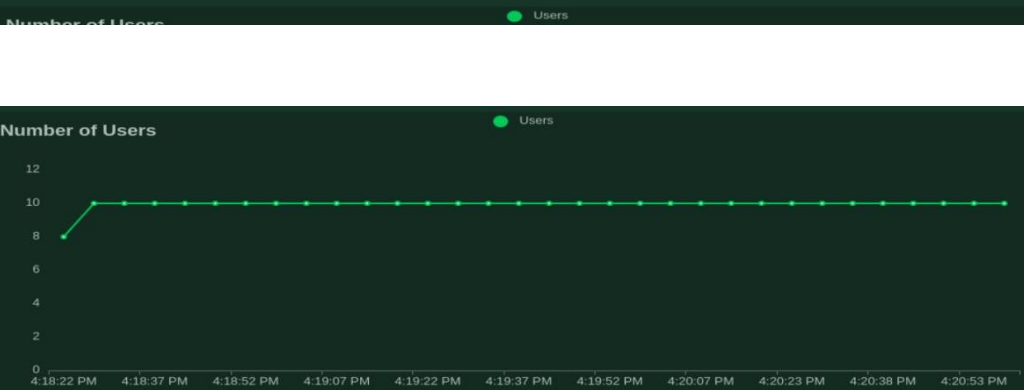
Total Requests per Second



Response Times (ms)



Number of Users



Final ratio

Ratio per User class

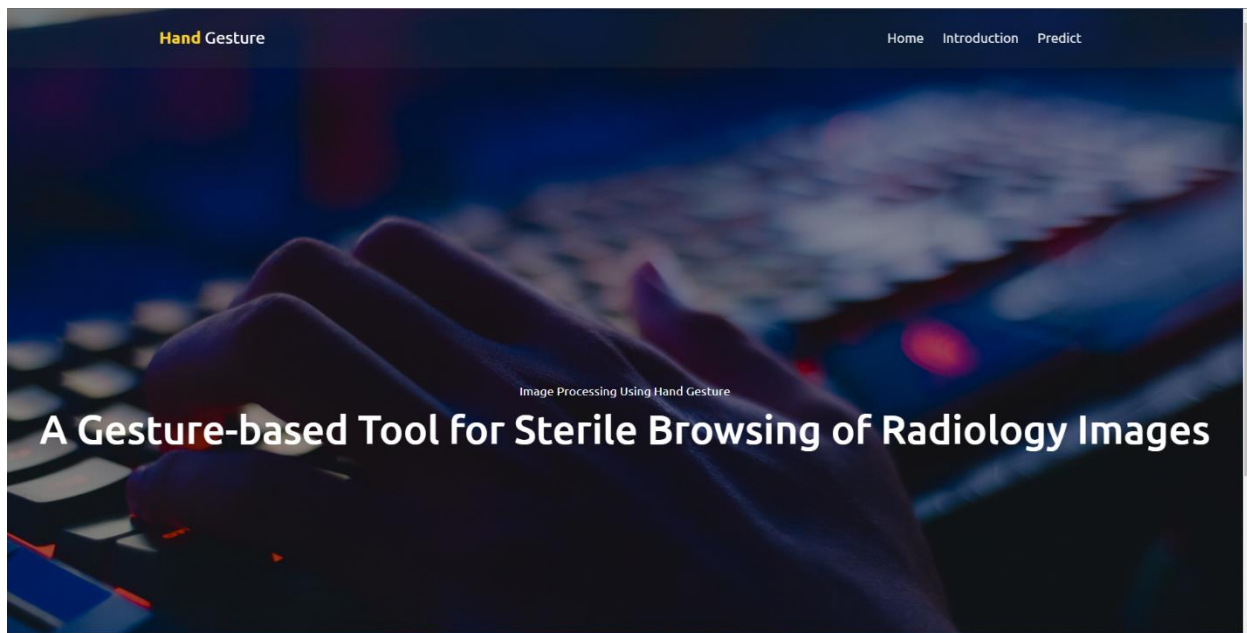
- 100.0% AppUser
 - 25.0% image1
 - 25.0% predict
 - 25.0% home
 - 25.0% intro

Total ratio

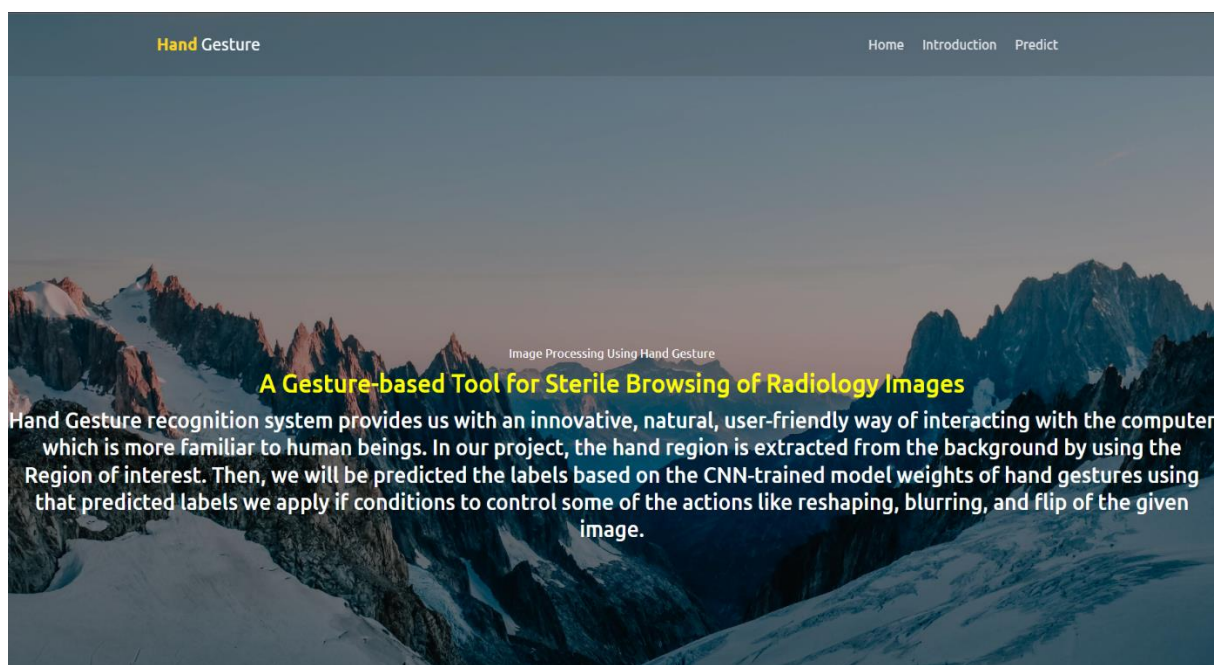
- 100.0% AppUser
 - 25.0% image1
 - 25.0% predict
 - 25.0% home
 - 25.0% intro

9.2 .Output

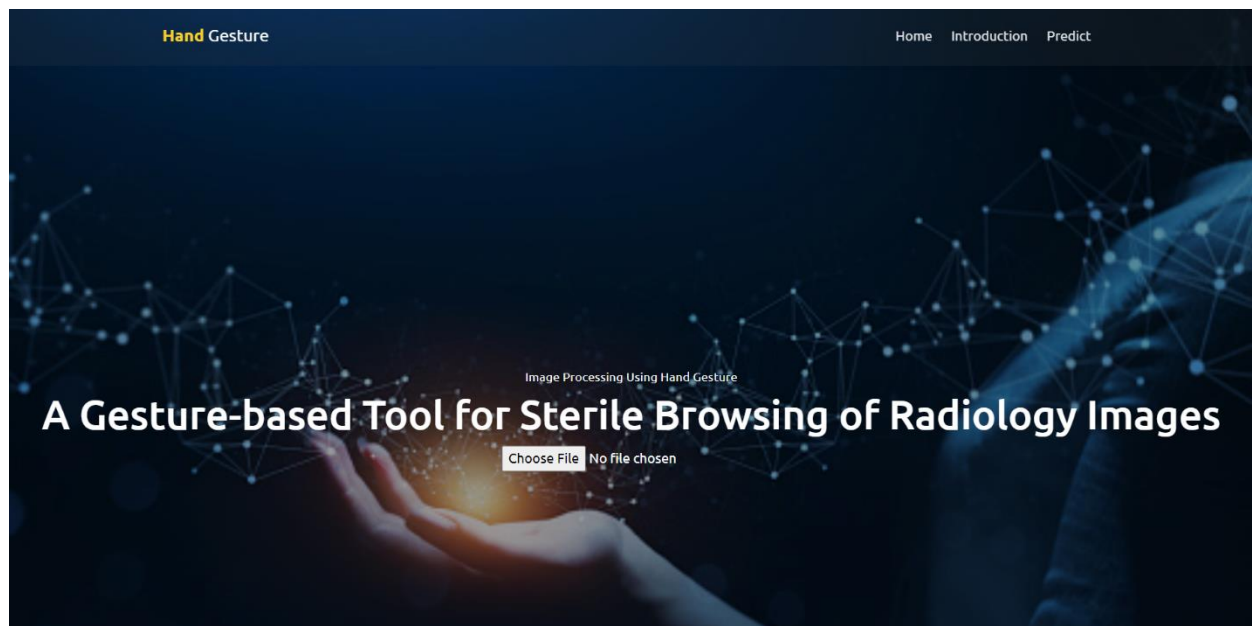
1:Home Page:



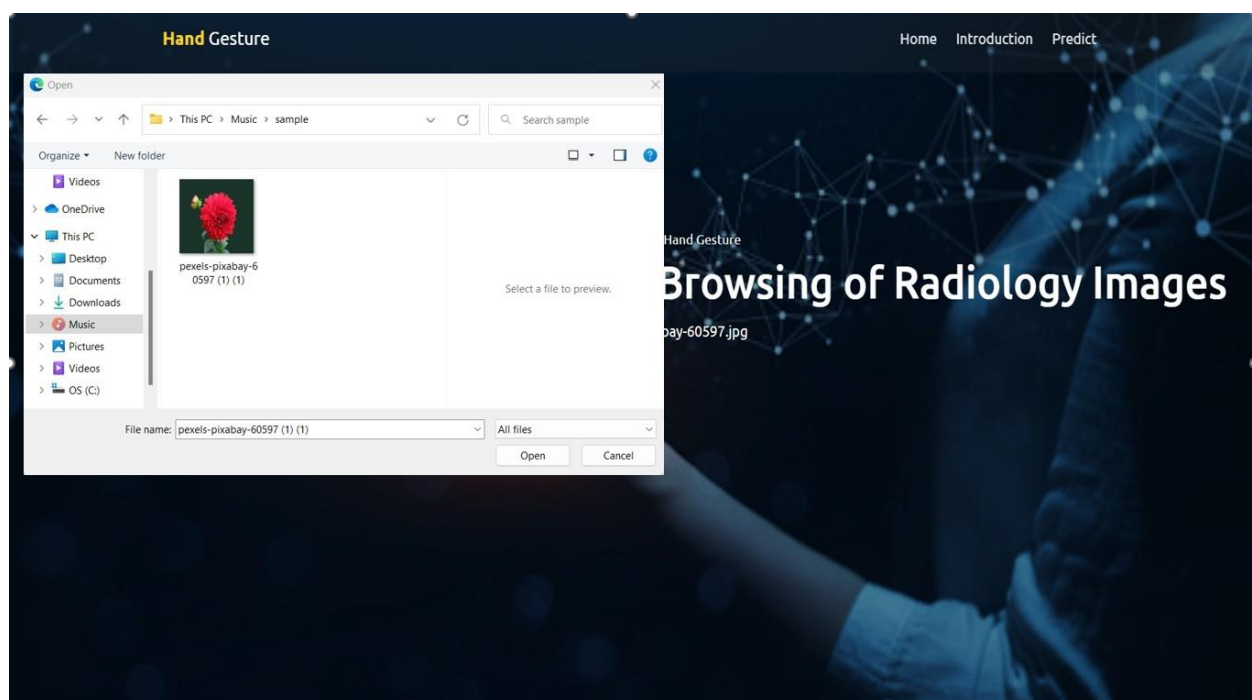
2:Introduction Page:



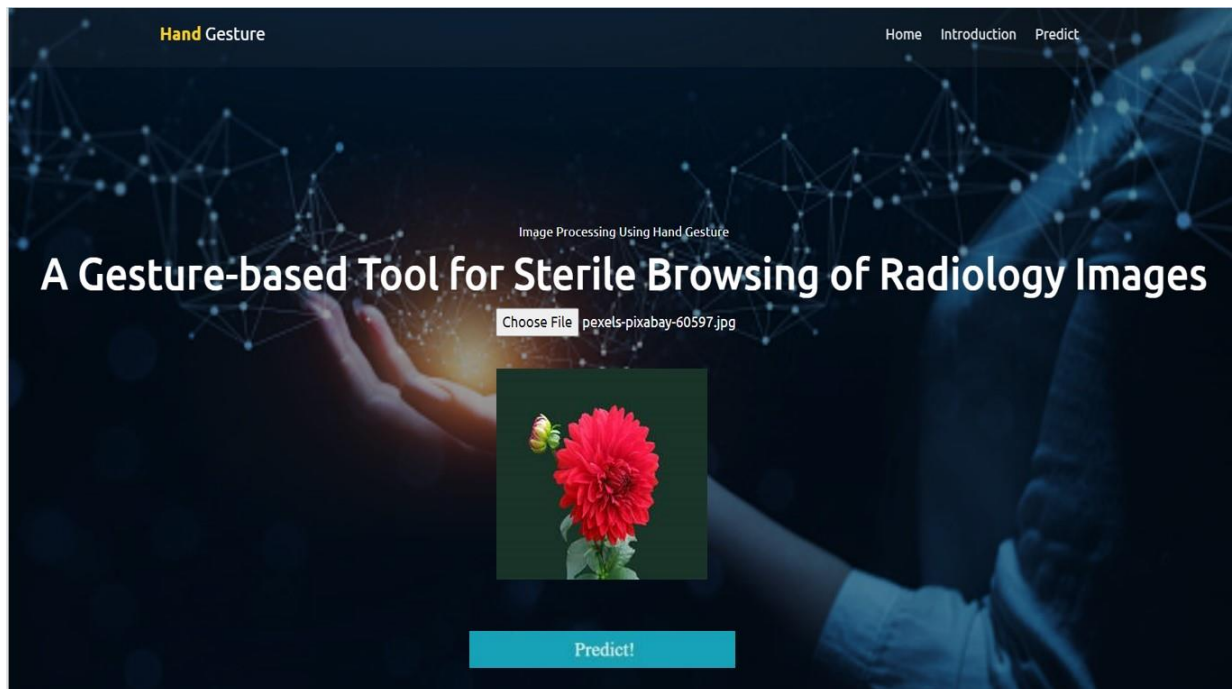
3:Predict Page:



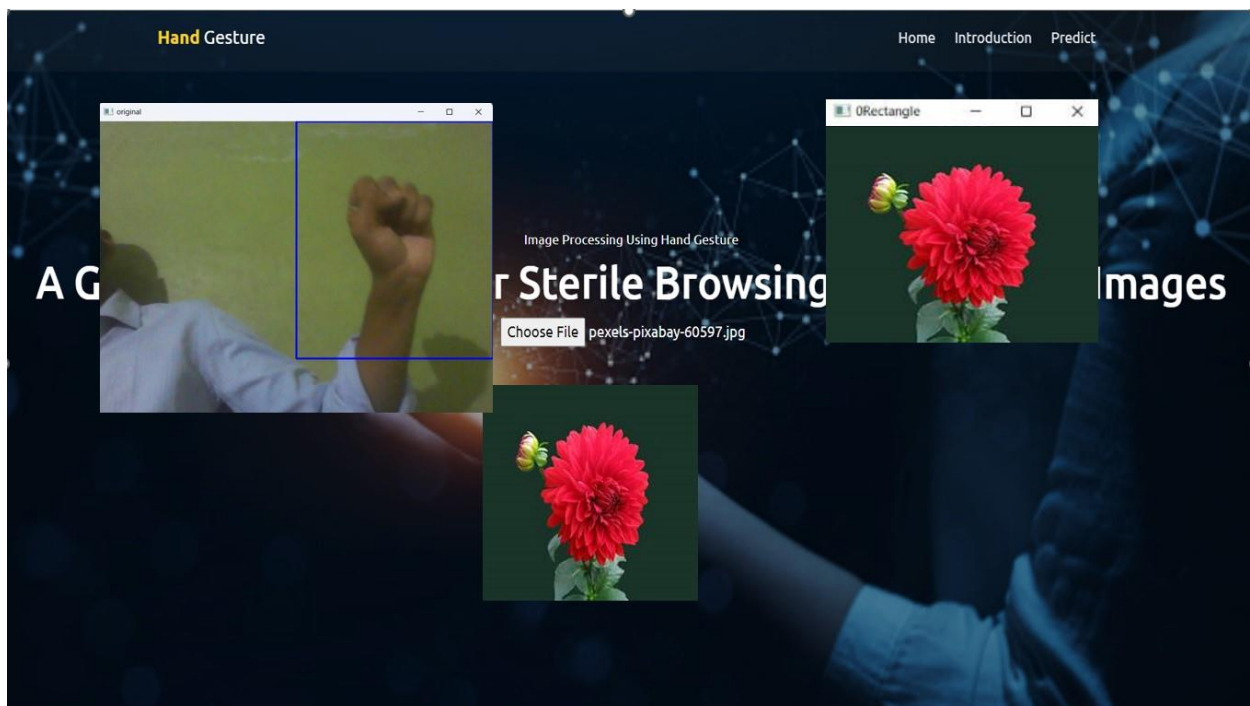
3.1:Upload Image:

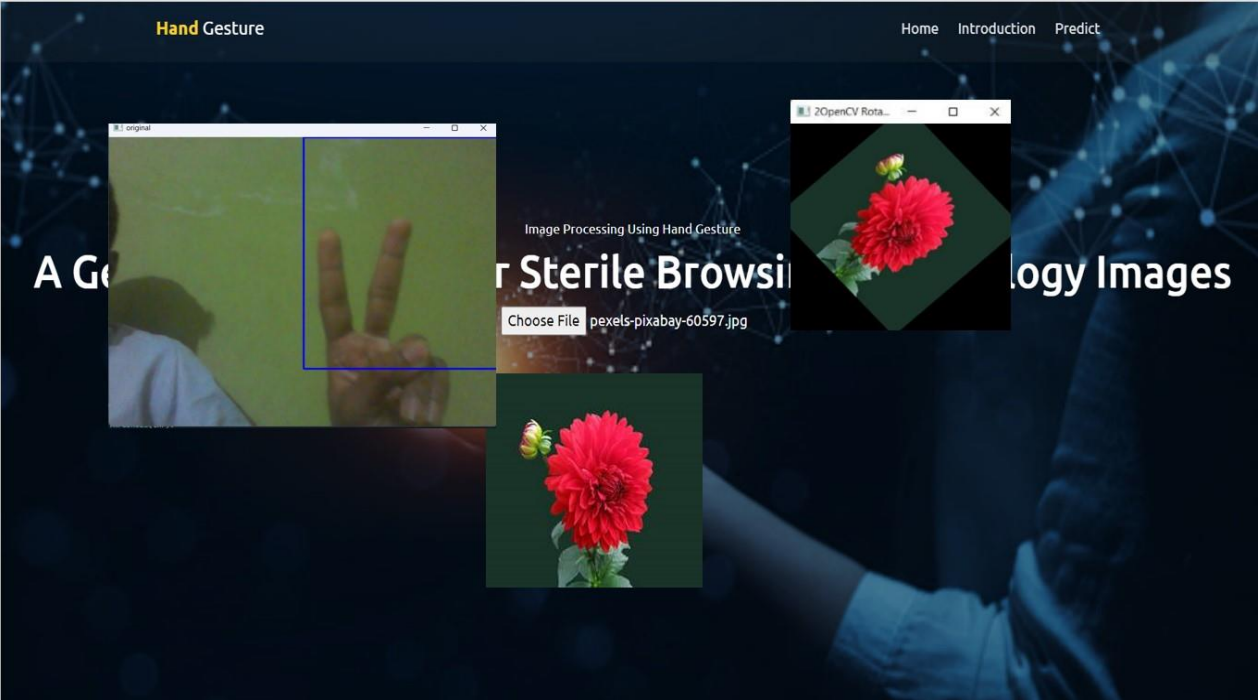
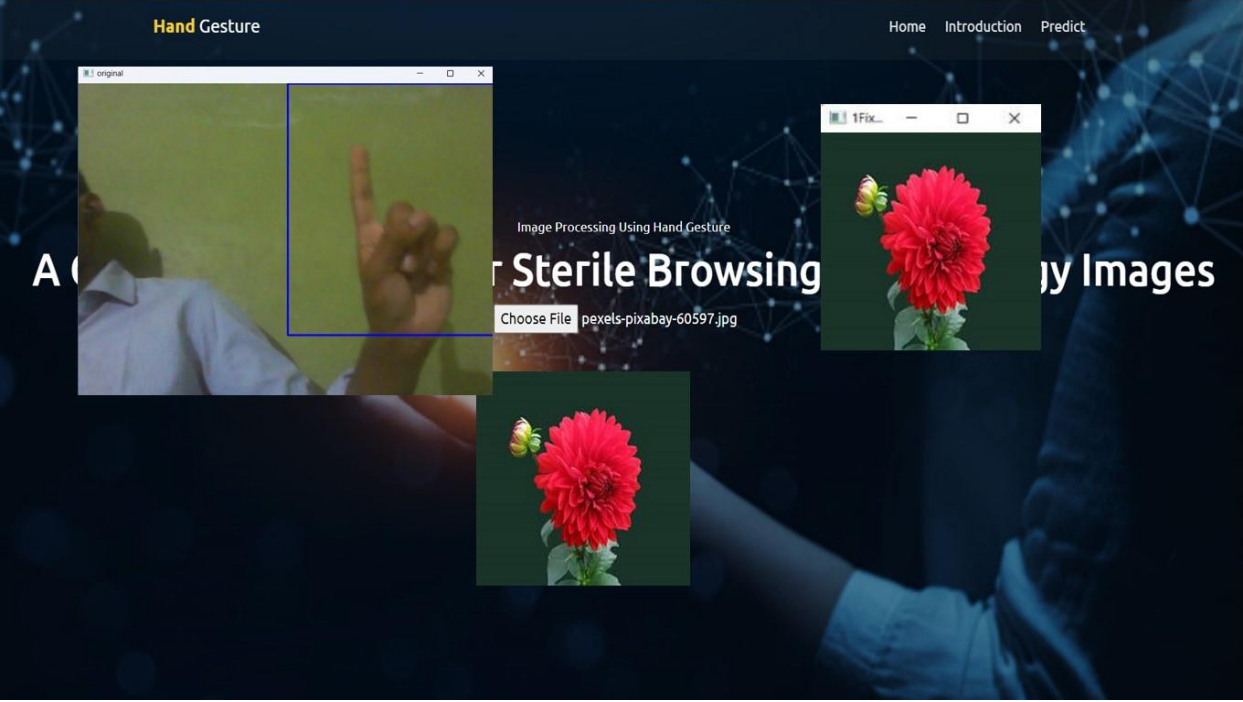


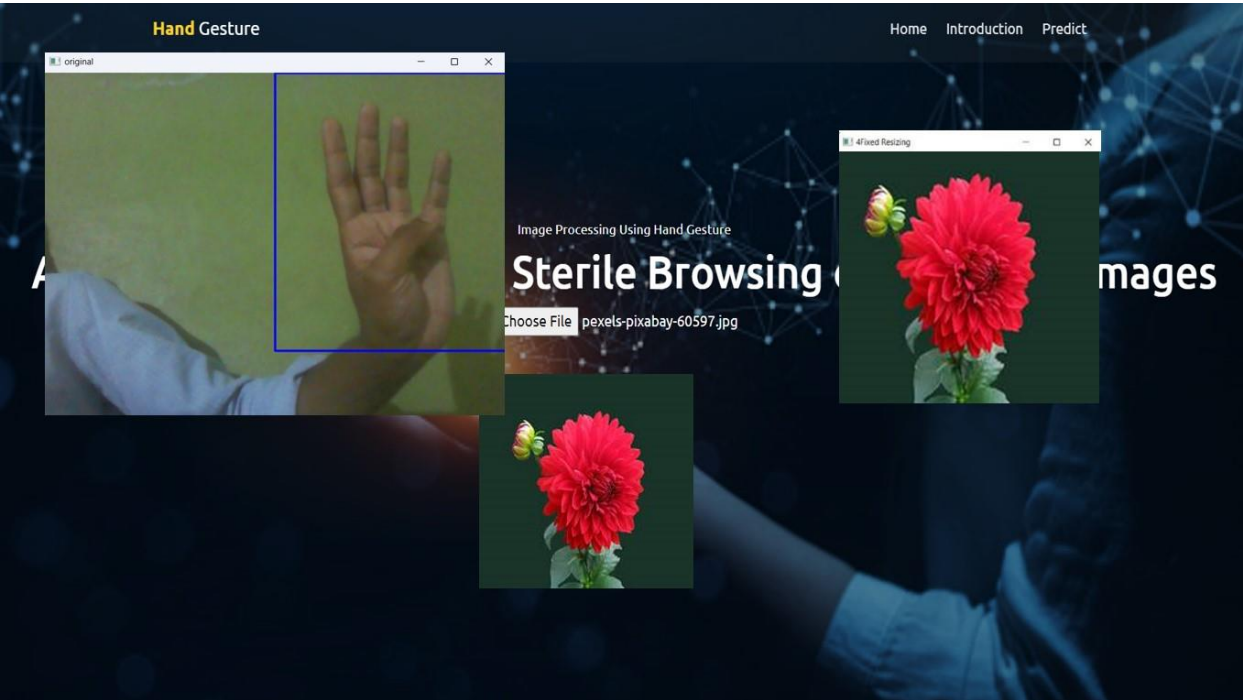
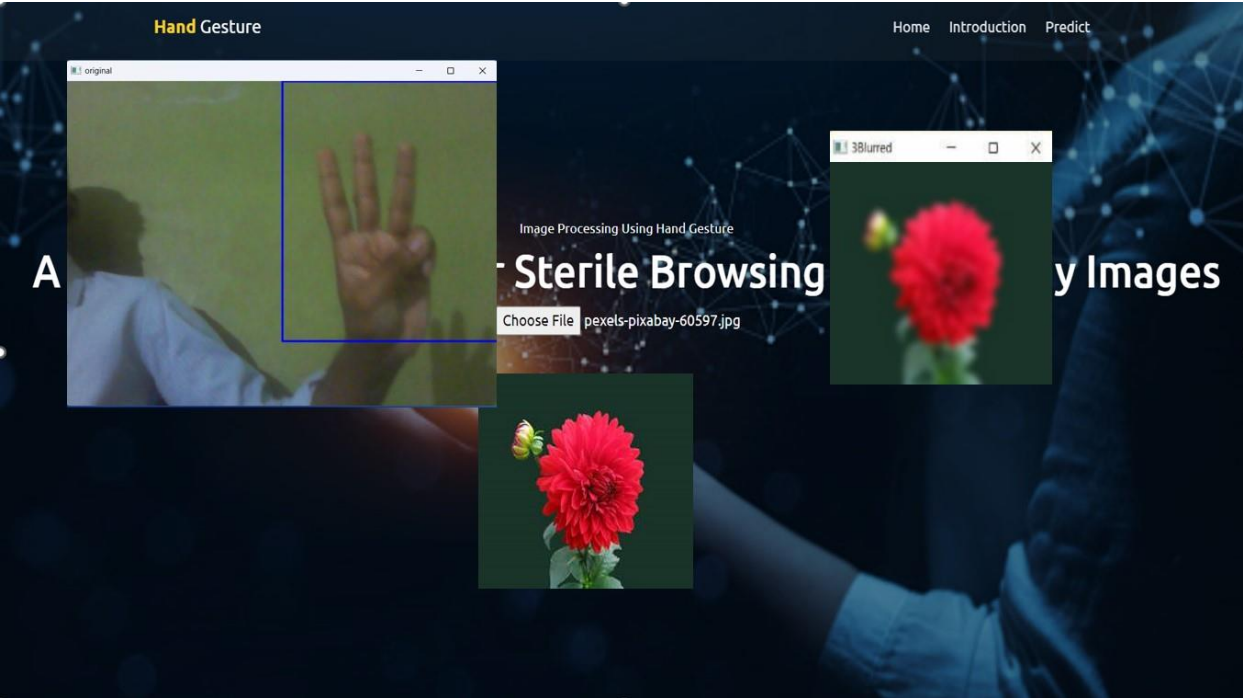
3.2:Image Uploaded:

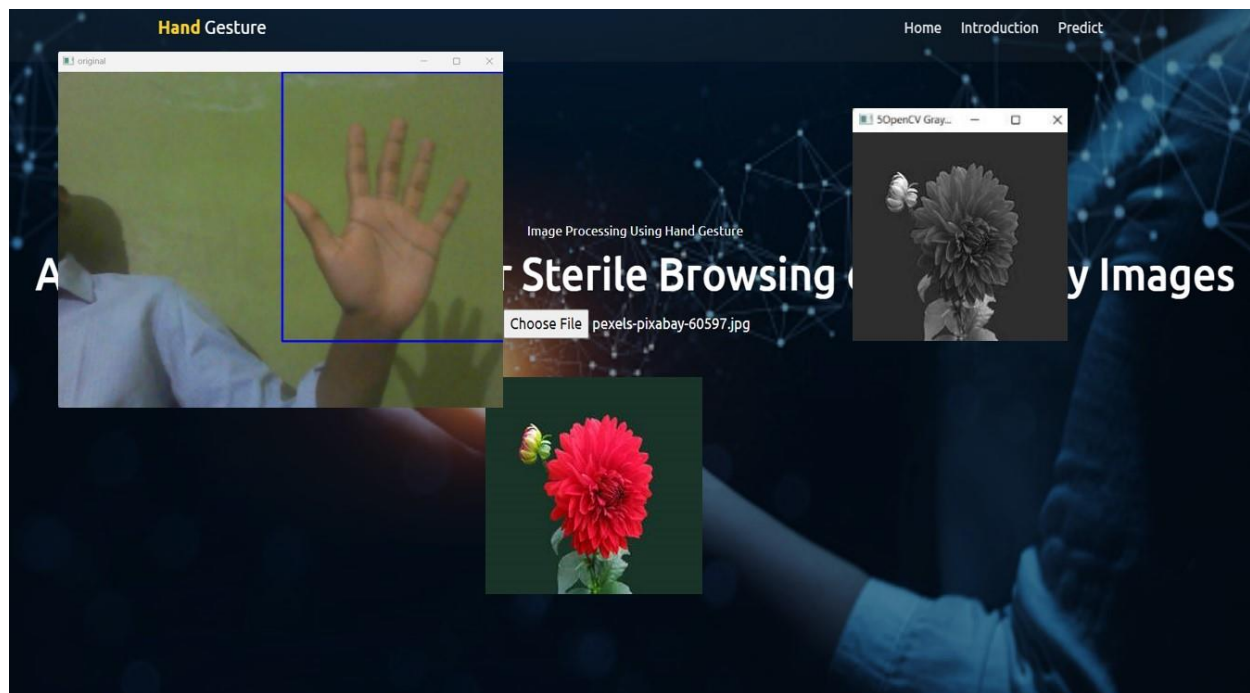


3.3 PREDICT:





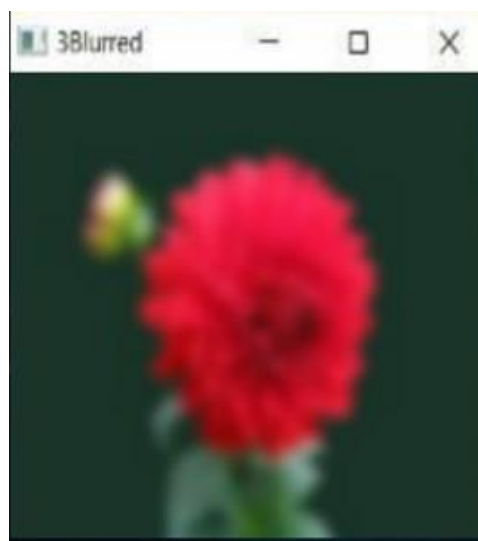
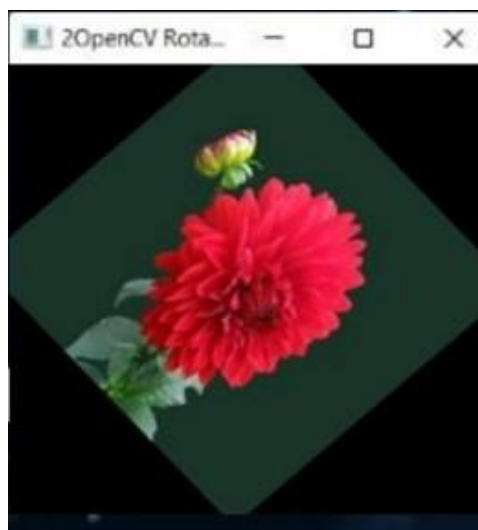




4.Actions:

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







10.ADVANTAGES & DISADVANTAGES:

10.1 Advantages:

- Convenience — the framework permits the specialist to utilize his/her hands, their regular work instrument
- Quick response — nonverbal guidelines by hand motion orders are natural and quick (practically speaking, the "Gestix" framework can deal with pictures and track hands at an edge pace of 150 Hz, in this way, answering the specialist's signal orders continuously)
- An unhampered connection point — the proposed framework doesn't need the specialist to join a mouthpiece, use head-mounted (body-contact) detecting gadgets or to utilize foot pedals
- Distance control — the hand motions can be performed up to 5 meters from the camera regardless be perceived precisely.
- Exactness is high.
- Memory Saving. [because of cloud]
- An Uncumbered Connection point.
- Distance Control. Translation independent.

10.2 Disadvantages:

- This sort of information additionally raises gives that are not pertinent with conventional information. On the client's side, these issues are to learn, to recollect and to execute motions precisely.
- The designer needs to give a framework that accurately perceives these motions. Freeman et al. commented that the perception of signals doesn't do the trick to learn them, as the eyewitness can't separate applicable and unessential developments.
- The instructing of multi-contact and mid-air motions is more troublesome than that of single-contact signals. On account of the last option, the hand act is immaterial - clients just have to follow a way accurately to play out an order.
- Picture Outlining isn't precise.
- Modest number of dataset.
- Wrong expectation in low light.
- Precision is less.
- Dataset isn't appropriate for continuous

11.CONCLUSION :

In this venture , we proposed a thought for possible correspondence between hearing debilitated and normal individual with the assistance of profound learning and AI approach. This is ever the encompassing test to foster a gesture based communication framework in information the assortment stays invariant of the unconstraint climate. This task can be extended to the ongoing information. Our strategy shows to have potential in handling this issue utilizing a straight forward camera as a premade dataset has been used.as been utilized, on the off chance that adequate significant preparation data is given, which can be constantly finished and included through the recently referenced process.

12.FUTURE SCOPE :

The utilization of specialist PC communication gadgets in the activity room (OR) requires new

modalities that help clinical imaging control while permitting specialists' hands to stay clean, supporting their focal point of consideration, and giving quick reaction times.

.

13.APPENDIX :

a. SourceCode

[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;
  background-repeat: no-repeat;
  text-align: center;
  color: white;
  position: relative;
  height: 100%;
  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="#"><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="home.html">Home</a>
      </li>
      <li class="nav-item">
        <a class="nav-link" href="intro.html">Introduction</a>
      </li>
      <li class="nav-item">
        <a class="nav-link" href="index6.html">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>
    <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 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/1.jpg);
  background-size: cover;
  background-position: center;
  background-repeat: no-repeat;
  text-align: center;
  color: white;
  position: relative;
  height: 100%;
  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="#"><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="home.html">Home</a>
          </li>
          <li class="nav-item">
            <a class="nav-link" href="intro.html">Introduction</a>
          </li>
          <li class="nav-item">
            <a class="nav-link" href="index6.html">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>
        <h1>A Gesture-based Tool for Sterile Browsing of Radiology
Images</h1>
        <input type="file" id="myFile" name="filename">
    </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 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">

    <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.min.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 0
    rgba(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%;

    border-radius:4px;

    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;  
}
```

```
@-webkit-keyframes fade {
```

```
    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="#"><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">


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

b.GitHub & Project Demo Link

GITHUB:

<https://github.com/IBM-EPBL/IBM-Project-4170-1658722707>

PROJECT DEMO LINK:

https://drive.google.com/drive/folders/1TYW_c5V5kkIXC_4R4L7iO92l8-OKPrd9?usp=sharing