RMK ENGINEERING COLLEGE

(An Autonomous Institution)

R.S.M. Nagar, Kavaraipettai, Gummidipoondi Taluk, Thiruvallur District 601 206.

PROJECT

CLASSIFICATION OF ARRHYTHMIA BY DEEP LEARNING WITH 2-D ECG SPECTRAL IMAGE REPRESENTATION

DONE BY

TEAM ID: PNT2022TMID15718

K.HEMANTH SURESH (111719104072)

K.SRI RAM (111719104068)

M.DHANUSH (111719104092)

K.NITISH(111719104079)

CONTENTS

Hardware Requirements:

Processor : Intel Core i5HDD: 1TB

RAM: Minimum 2GB;

Recommended 4GB

Software Requirements:

Operating system : Windows 10 Dataset: IAM

Dataset(Words, Lines)Programming Language:

Python

Numpy : Core package providing powerful tools to manipulate data arrays, such as our character images.

OpenCV : OpenCV is a large open-source library for image processing, character recognition, and machine learning. Itcanscan handwritten images.

Autocorrect : It is used to correct the spelling. It supports manylanguages.

Tensorflow : Tensorflow is the core open source library to helpyou develop and train Machine Learning models.

Survey Papers:

Paper 1:

Author Name : Zhao Y, Cheng, J

Title : ECG classification using deep CNN improved bywavelet transform

Publication website : https://opus.lib.uts.edu.au/handle/10453/142924

Published Date : 2020-06-30

Objective: Atrial fibrillation is the most common persistentform of arrhythmia. A method based on wavelet transformcombined with deep convolutional neural network is applied for automatic classification of electrocardiograms. Since the ECG signal is easily inferred, the ECG signal is decomposed into 9 kinds of subsignals with different frequency scales by wavelet function, and then wavelet reconstruction is carried out after segmented filtering to eliminate the influence of noise.

Technology used: Tensor flow - Tensor flow is the core open source library to help you develop and train MachineLearning models.

Paper 2:

- ECG classification using deep CNN improved bywavelet transform
- **Publication Year**: 2022-06-30
- **Author**: . Zhao Y, Cheng, J . It is challenging to visually detect heart disease from the electrocardiographic (ECG) signals. Implementing an automated ECG signal detection system can help diagnosis arrhythmia in order to improve the accuracy of diagnosis. In this paper, we proposed, implemented,and compared an automated system using two different frameworks of the combination of convolutional neural network (CNN) and long-short term memory (LSTM) for classifying normal sinus signals, atrial fibrillation, and other noisy signals. The dataset we used is from the MIT- BIT Arrhythmia Physionet. Our approach demonstrated that the cascade of two deep learning network has higher performance than the concatenation of them, achieving a weighted f1 score of 0.82. The experimental results have successfully validated that the cascade of CNN and LSTM can achieve satisfactory performance on discriminating ECG signals Image. However, even after applying all the said techniques Might not possible to achieve the full accuracy in a Preprocessing system.

PROBLEM STATEMENT

To identify the erythema by the user in the device and to convert images into prediction.

What does this problem focus on?	The generative models can perform recognition driven segmentation. The method involves a relatively small number of parameter and hence training is relatively easy and fast.
When does this occur?	This matter occurs classified the irregular heartbeat from the given input data personal individual .
Why do we need this?	To recognize the irregular heartbeat that can be used to classify the images.
How to do this?	Unlike many other recognition schemes, it does not rely on some form of pre-normalization of input images, but can handle arbitrary scalings, translations and a limited degree of image rotation.
Where it is used?	It is used in personal tracker and monitor ECG.

Ideation Phase

Brainstorm & Idea Prioritization Template

Date	19 September 2022
Team ID	PNT2022TMID15718
Project Name	Classification of arrhythmia by using deep learning with 2-d ecg spectral image representation
Maximum Marks	4 Marks

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

Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- **10 minutes** to prepare
- **1 hour** to collaborate
- **2-8 people** recommended

Share template feedback

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

A. Team gathering
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B. Set the goal
Think about the problem you'll be focusing on solving in the brainstorming session.

C. Learn how to use the facilitation tools
Use the Facilitation Superpowers to run a happy and productive session.

Open article →

1. Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

PROBLEM

A Novel Method for Handwritten Digit Recognition

Handwriting recognition is a challenging task because every person in this world has their own style of writing. It is the capability of the computer to automatically identify and understand the handwritten digits. Due to the technological advancements, everything is being digitalized to reduce human effort. Hence, handwritten digit recognition is a need-of-the-hour task in many real-time applications. MNIST data set, which has 70000 handwritten digit samples, is widely used for this recognition process.

Key rules of brainstorming

To run an smooth and productive session

- Stay in topic.
- Encourage wild ideas.
- Defer judgment.
- Listen to others.
- Go for volume.
- If possible, be visual.

2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

TIP

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

Karuturi Hemanth Suresh

- The proposed CNN model works on 2-D images of ECG signals as input data
- ECG signals augmenting training data manually could degrade the performance
- It should not have any limited amount of user or data
- The early detection of Arrhythmia gives better understanding of disease causes
- The early diagnosis of cardiac arrhythmia highly relies on the ECG
- Consume less time to finish the test and give the result
- It can also categorize according to risk levals
- Implemented in Python with the open source library TensoFlow
- The present research uses only a single-lead ECG signal

Kalapala Sri Ram

- An irregular or abnormal heartbeat
- Pause in sinus rhythem
- Evaluating the ecg tracing
- Abnormalities of impulse generation or abnormalities of impulse conduction or both
- Abnormalities of cardiac electrical activity result
- Based on Heart rate
- noninvasive diagnostic technique
- ECG data to use features based on the engineer.
- the mapping techniques for arrhythmia classification techniques using a deep neural network

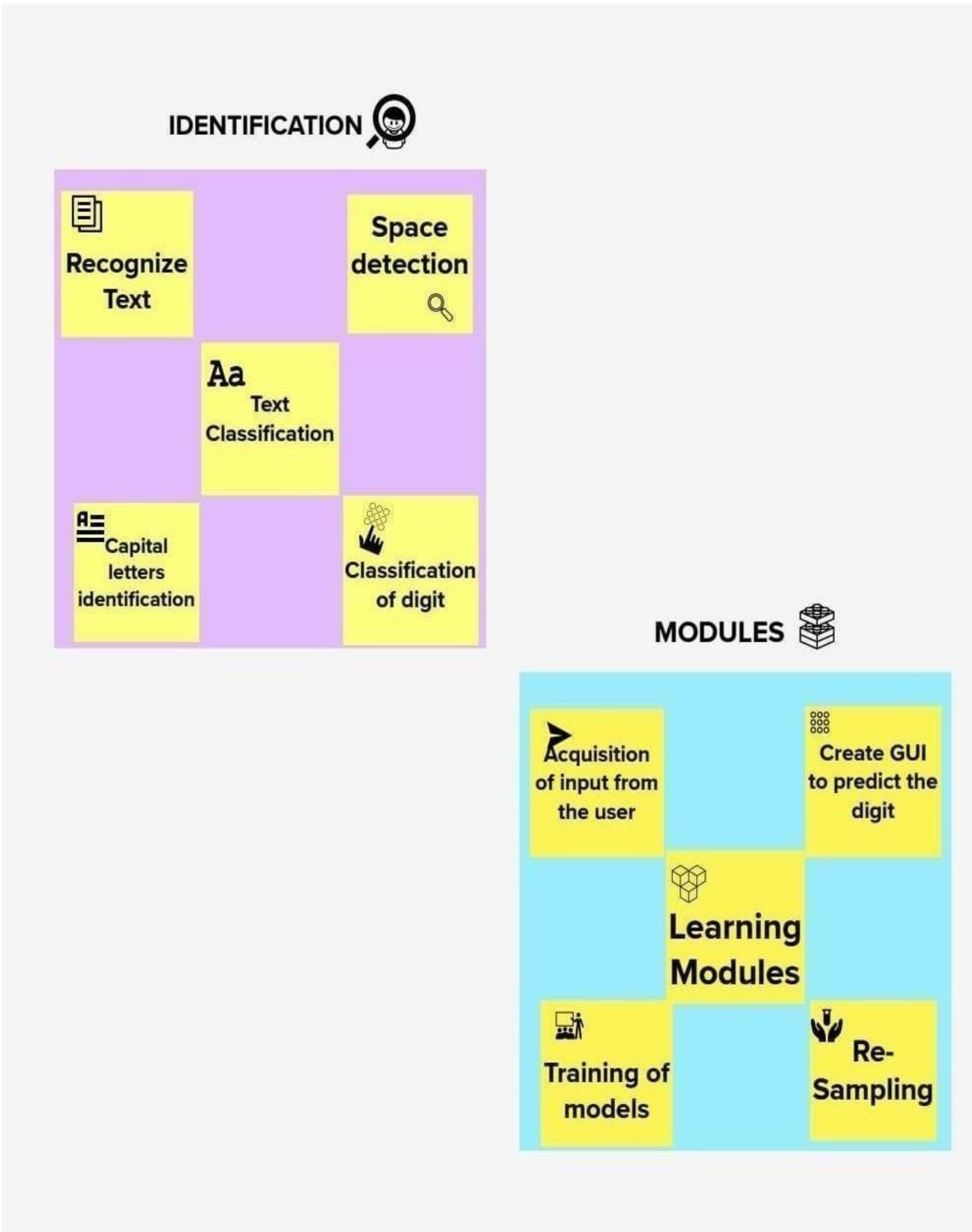
M Dhanush

- Incorporating different approaches of machine learning (ML) techniques
- Analysis of Digitalized ECG Signals Based on Artificial Intelligence
- Detection of Obstructive Sleep Apnoea Using Features Extracted
- Detection of Inferior Myocardial Infarction using Shallow CNN
- Multi Lead ECG Classification via an Information-Based Attention
- compared with AlexNet and VGGNet
- Each convolutional layer is followed by a pooling layer
- The model follows the CNN architecture with four 2-D convolutional layers
- A fully connected layer is used between the last pooling layer and the output layer

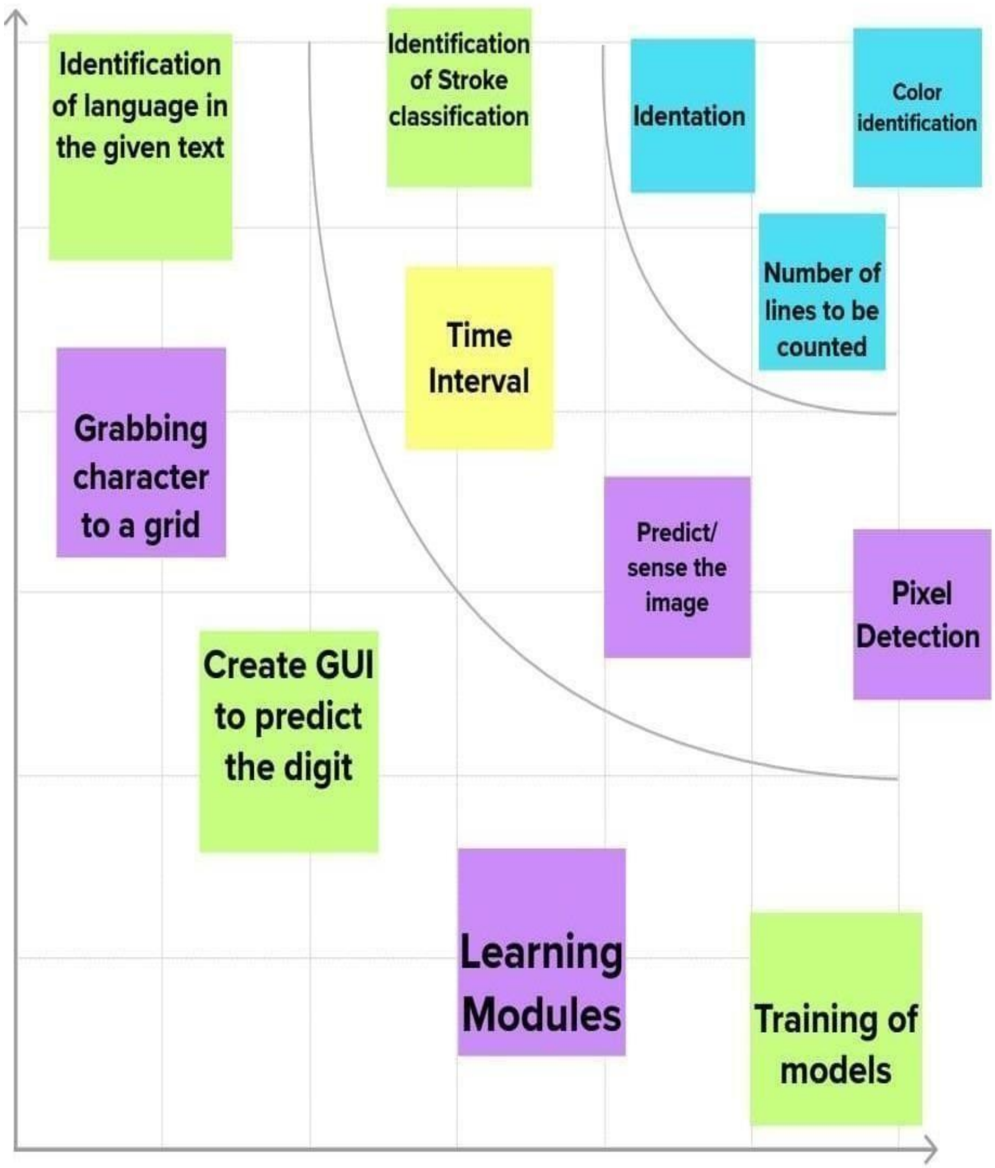
Konduru Nitish

- optimization parameters in the proposed 2-D CNN model
- Long term monitoring
- It is quick, safe and painless test
- Detects irregular heart beats
- can ECG detect heart blockage
- can be easily added to modified
- delivering more preventive care
- poor electrode to patient contact
- Remote access and availablity

Step-3: Idea Prioritization

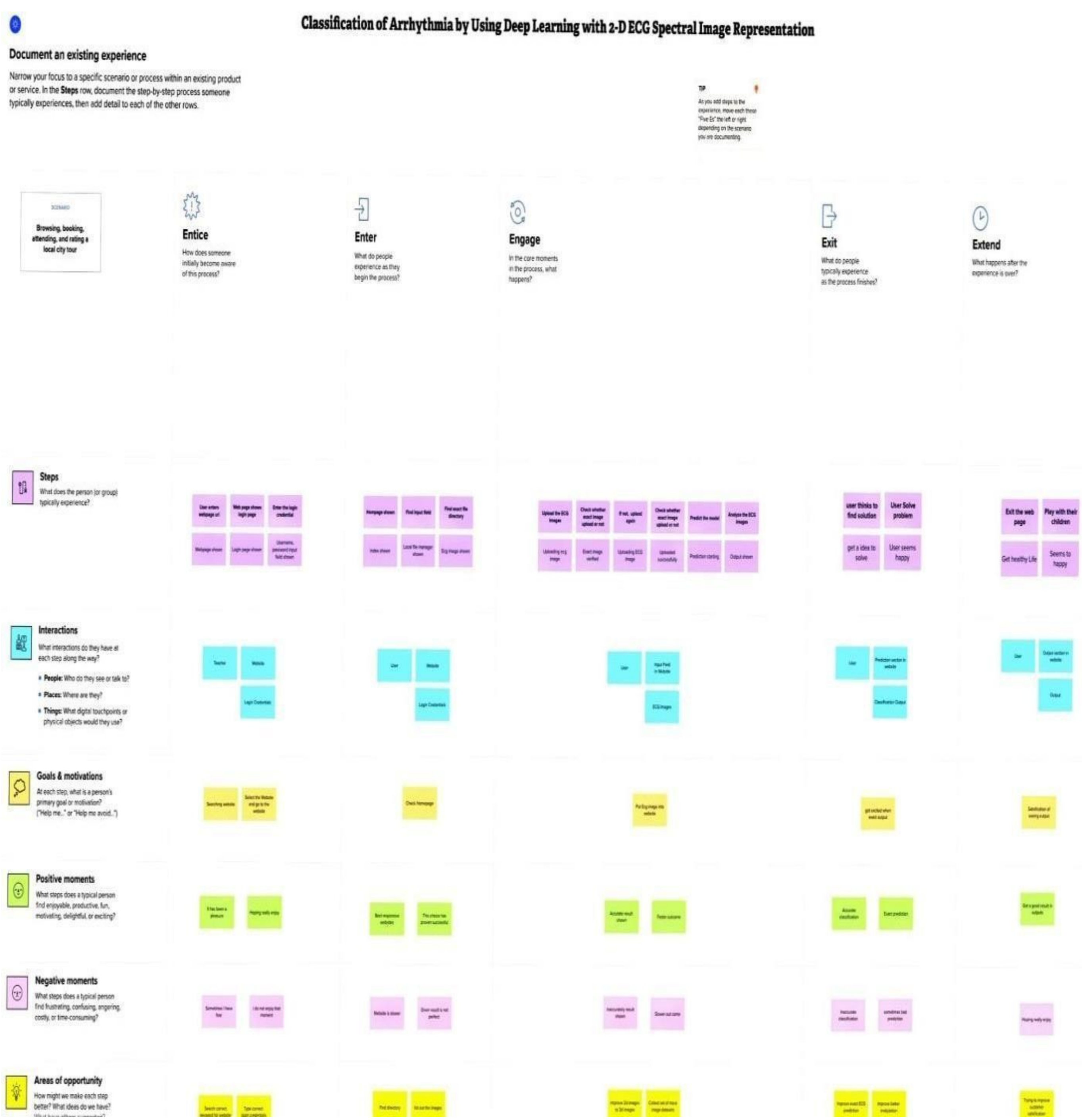


Step-4:



Identification of language in the given text
Identification of Stroke classification
Identation
Color identification
Number of lines to be counted
Time Interval
Grabbing character to a grid
Predict/ sense the image
Pixel Detection
Create GUI to predict the digit
Learning Modules
Training of models

Customer journey map



EMPATHY MAP

Classification of Arrhythmia by Using Deep Learning with 2-D ECG Spectral Image Representatio

Project Design Phase-I Problem – Solution Fit **Template**

Problem-Solution fit canvas 2.0

Purpose / Vision

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) — CS

Who is your customer?
i.e. working parents of 0-5 y.o. kids

Many people and nations suffer from irregular heartbeats.

6. CUSTOMER CONSTRAINTS — CC

What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.

In certain unique and unusual circumstances, there is a chance that findings won't be entirely accurate because to overfitting and underfitting. Additional investigation could be needed.

5. AVAILABLE SOLUTIONS — AS

Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking

The most popular and affordable diagnostic technique for examining cardiac electrical impulses in medical facilities is the electrocardiogram (ECG). Arrhythmia, as it is widely called, refers to the aberrant cardiac signals. Cardiac arrhythmia has the potential to be fatal or at least hazardous. Different forms of arrhythmia can occur, and an ECG test can identify them. The automatic categorization of arrhythmias based on ECG beats has been established for years. The automated technologies that may be used as a screening tool for arrhythmia categorization are crucial for patients as well as for clinicians. Although the deep learning-based automated arrhythmia classification algorithms have shown very accurate findings, they have not yet been widely used by healthcare practitioners.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS — J&P

Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.

The class of irregular heartbeat is discovered in the patient's heartbeat utilising the analysis and classification of the patients' CT scan image's provided input.

9. PROBLEM ROOT CAUSE — RC

What is the real reason that this problem exists?
What is the back story behind the need to do this job?
i.e. customers have to do it because of the change in regulations.

Electrolyte imbalances, such as when they are too high or too low, can disrupt the heart's signals and cause irregular heartbeats. certain medications and supplements. Arrhythmias can be brought on by several prescription medicines as well as some over-the-counter cough and cold remedies. too much booze

7. BEHAVIOUR — BE

What does your customer do to address the problem and get the job done?
i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)

Based on the heart rate, bradyarrhythmias and tachyarrhythmias are the two major categories for arrhythmia. They are further categorised based on the source, mode of transmission, and related disorders.

Focus on J&P, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS — TR

What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.

observing how other medical institutions quickly recognise their patients' problems and administer the necessary care

4. EMOTIONS: BEFORE / AFTER — EM

How do customers feel when they face a problem or a job and afterwards?
i.e. lost, insecure > confident, in control - use it in your communication strategy & design.

main emotions including happiness, sorrow, anger, fear, disgust, and surprise, as well as secondary emotions that conjure up an image in the mind that corresponds to a memory or primary emotion.

10. YOUR SOLUTION — SL

If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.
If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.

the patients' gathered photos Through the use of image processing and deep learning, CT scan pictures are analysed and categorised, making it simple to determine the kind of heartbeat.

8. CHANNELS of BEHAVIOUR — CH

8.1 ONLINE

What kind of actions do customers take online? Extract online channels from #7

The patient attempts to research the condition they have online.

8.2 OFFLINE

What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.

a patient makes an offline appointment to see a doctor

Extract online & offline CH of BE

AMALTAMA

Project Design Phase-II
Solution Requirements (Functional & Non-functional)

Date	14 October 2022
Team ID	PNT2022TMID15718
Project Name	Classification of arrhythmia by using deep learning with 2-d ECG spectral image representation

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR- 3	User interface	Check your profile Choose your file Sign Out your account account and change your password
FR- 4	Data processing	Evaluating the model using test data Training DL algorithm for a accuracy result Trained CNN model using Tensorflow,Kearas
FR-5	Predict ECG image	User ECG images in our web application Collection of datasets Database read ECG images

Non-functional Requirements:

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

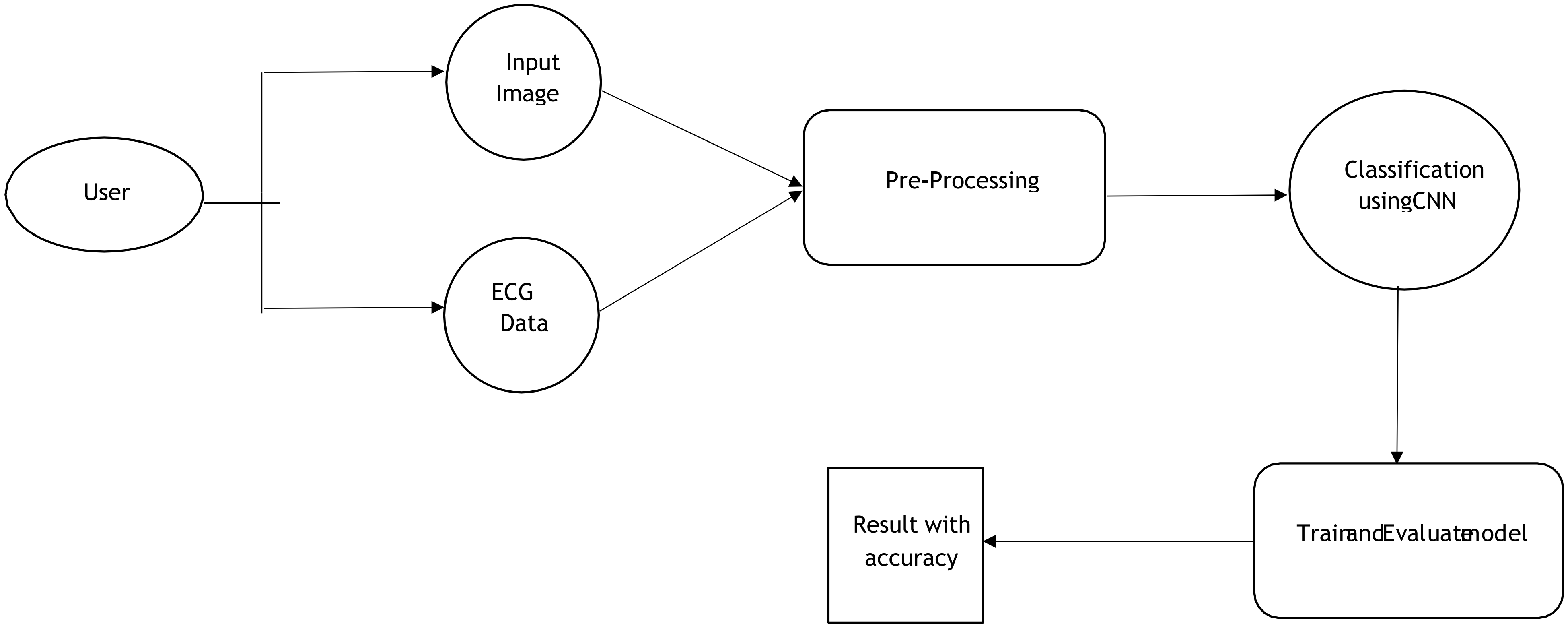
FR No.	Non-Functiona l Requirement	Description
NFR-1	Usability	Wireless ECG body sensor Savvy is a feasible solution for reliable and accurate long-term heart rhythm monitoring. However, there were no studies dealing with usability of this sensor in field testing.
NFR-2	Security	The work presented in this paper is applicable for encrypting and decrypting personalized Electrocardiograph ECG signals for secure transmission.
NFR-3	Reliability	The extent to the consistently performs the specified functions without failure
NFR-4	Performance	It essentially specifies how the system should behave and that it constrains the ECG wavelength of accurate disease information gathering.
NFR-5	Availability	Availability describes how likely the system is accessible to a user at a given point in time and the periodically for a solutions.
NFR-6	Scalability	The ability of the user problem in arrhythmia disease to handle an increase in workload without performance degradation, or its ability to quickly enlarge.

Project Design Phase-II
Data Flow Diagram &
User Stories

Date	17 October 2022
Team ID	PNT2022TMID15718
Project Name	Classification of arrhythmia by using deep learning with 2-d ecg spectral image representation.
Maximum Marks	4 Marks

Data Flow Diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



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	Application	USN-1	As a user, I can application by opening it easily.	I can download the application	High	Sprint-1
		USN-2	As a user, I can upload images	I can access the canvas	High	Sprint-1
		USN-3	As a user, I can change the colour of the pen ink.	I can use the canvas pen	Medium	Sprint-2

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer	Application	USN-1	As a user, I can application by opening it easily.	I can download the application	High	Sprint-1
		USN-2	As a user, I can upload images	I can access the canvas	High	Sprint-1
		USN-3	As a user, I can change the colour of the pen ink.	I can use the canvas pen	Medium	Sprint-2

Project Design Phase-II
Technology Stack (Architecture & Stack)

Date	14 October 2022
Team ID	PNT2022TMID15718
Project Name	Classification of Arrhythmia by Using Deep Learning with 2-D ECG Spectral Image Representation

Technical Architecture:
The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2

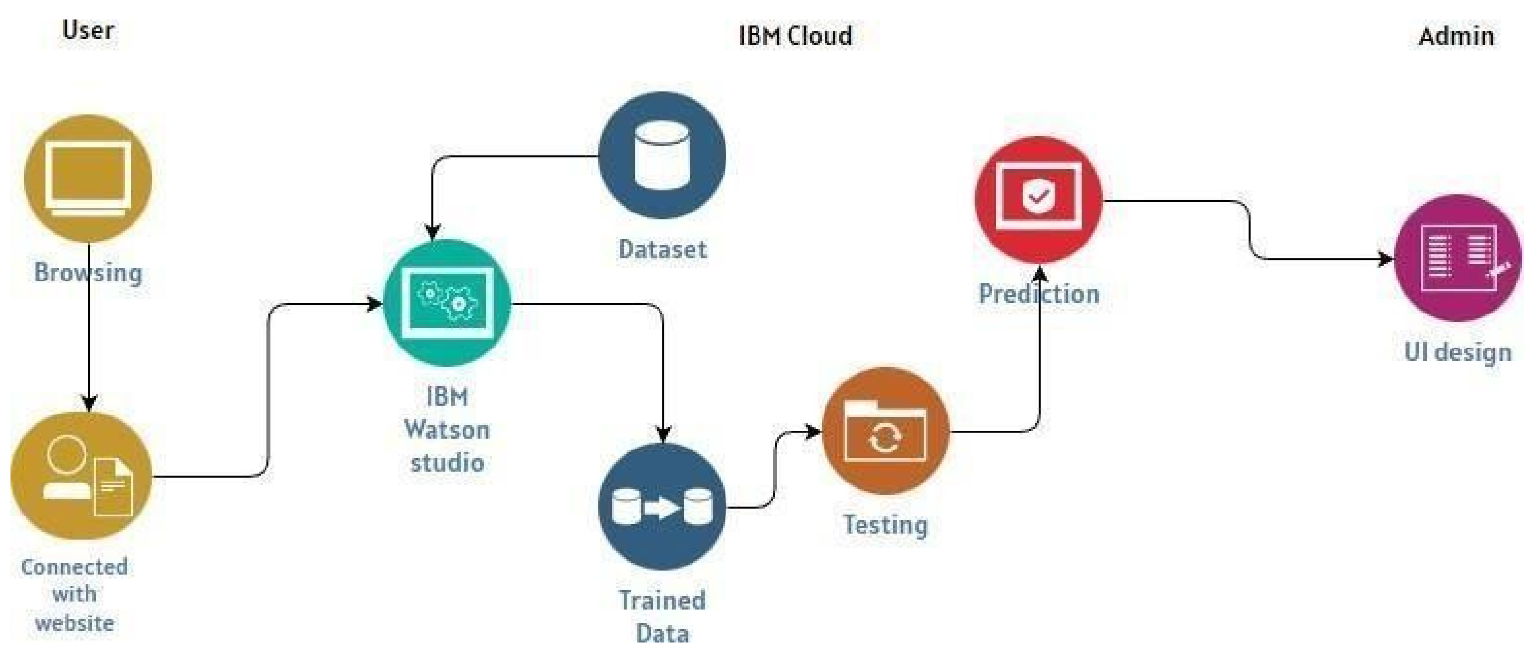


Table-1 : Components &Technologies:

S.No	Component	Description	Technology
1.	User Interface	Web UI, Mobile UI.	HTML, CSS, JavaScript / React Js.
2.	Application Logic-1	Python is used for backend	Python
3.	Application Logic-2	It's a symbolic math toolkit that performs a variety of tasks including deep neural network training and inference using dataflow and differentiable programming	Tensorflow
4.	Cloud Database	A global technology company that provides hardware, software, cloud-based services and cognitive computing.	IBM Cloud
5.	File Storage	Breaks up data into blocks and then stores those blocks as separate pieces, each with a unique identifier.	IBM Block
6.	External API-1	Purpose of External API used in the application	IBM Weather API, etc.
7.	External API-2	Purpose of External API used in the application	Aadhar API, etc.
8.	Machine Learning Model	Object recognition is a subfield of computer vision, artificial intelligence, and machine learning	Object Recognition Model
9.	Deep learning Model	The images from the created dataset are fed into a neural network algorithm.	Image Recognition Model

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Building user interfaces based on UI components.	React Js
2.	Security Implementations	OWASP is a nonprofit foundation that works to improve the security of software.	OWASP
3.	Scalable Architecture	a modular client-server architecture that consists of a presentation tier, an application tier and a data tier	3-tier architecture
4.	Availability	The data on each server can be simultaneously accessed and modified via a network.	Distributed Server
5.	Performance	Increasing data retrieval performance by reducing the need to access the underlying slower storage layer.	Cache

Performance Metrics

Date	20 october 2022
Team ID	PNT2022TMID15718
Project name	CLASSIFICATION OF ARRHYTHMIA BY DEEP LEARNING WITH 2-D ECG SPECTRAL IMAGE REPRESENTATION

The following evaluation metrics were used: global accuracy, IoU, Dice coefficient and BF score. In the description of these evaluation metrics, we will use the following definitions: False Positives: pixels that belong to the background that were misclassified as belonging to lesions; False Negatives (FN): pixels that belong to lesions that were misclassified as belonging to the background; True Positive: pixels that belong to lesions that were correctly classified as belonging to lesions; True Negative (TN): pixels that belong to the background that were correctly classified as belonging to the background.

The global accuracy is the ratio between the pixels correctly classified, regardless of class, and the total number of pixels and is given

global accuracy=TP+TNTP+TN+FP+FN

The accuracy gives the proportion of corrected classified pixels in each class and is given in

accuracy=(TP/TP+FN)+(TN/TN+FP)2

The IoU is a metric that penalizes the incorrect classification of pixels as lesions (FP) or as background (FN), and is given

$IoU=Lesion+Background2$IoU=Lesion+Background2
Where:

$Lesion=TPTP+FN+FP$Lesion=TPTP+FN+FP

$Background=TNTN+FN+FP$Background=TNTN+FN+FP

Acceptance Testing
UAT Execution & Report Submission

Date	03 November 2022
Team ID	PNT2022TMID15718
Project Name	Classification of Arrhythmia by using Deep Learning with 2-D

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of **A Classification of Arrhythmia by using Deep Learning with 2-D** 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	10	5	2	3	20
Duplicate	1	0	3	0	4
External	2	5	0	1	8
Fixed	10	3	2	18	33
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	23	18	11	24	76

3.Test Case Analysis

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

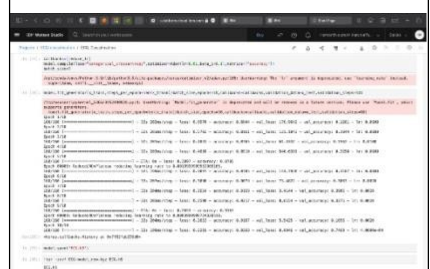
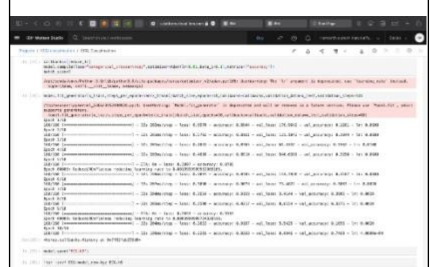
Section	Total Cases	Not Tested	Fail	Pass
Print Engine	6	0	0	6
Client Application	62	0	0	58
Security	4	0	0	3
Outsource Shipping	2	0	0	2
Exception Reporting	7	0	0	7
Final Report Output	3	0	0	3
Version Control	6	0	0	5

Project Development Phase
Model Performance Test

Date	10 November 2022
Team ID	PNT2022TMID15718
Project Name	Classification of Arrhythmia by using Deep Learning with2-D

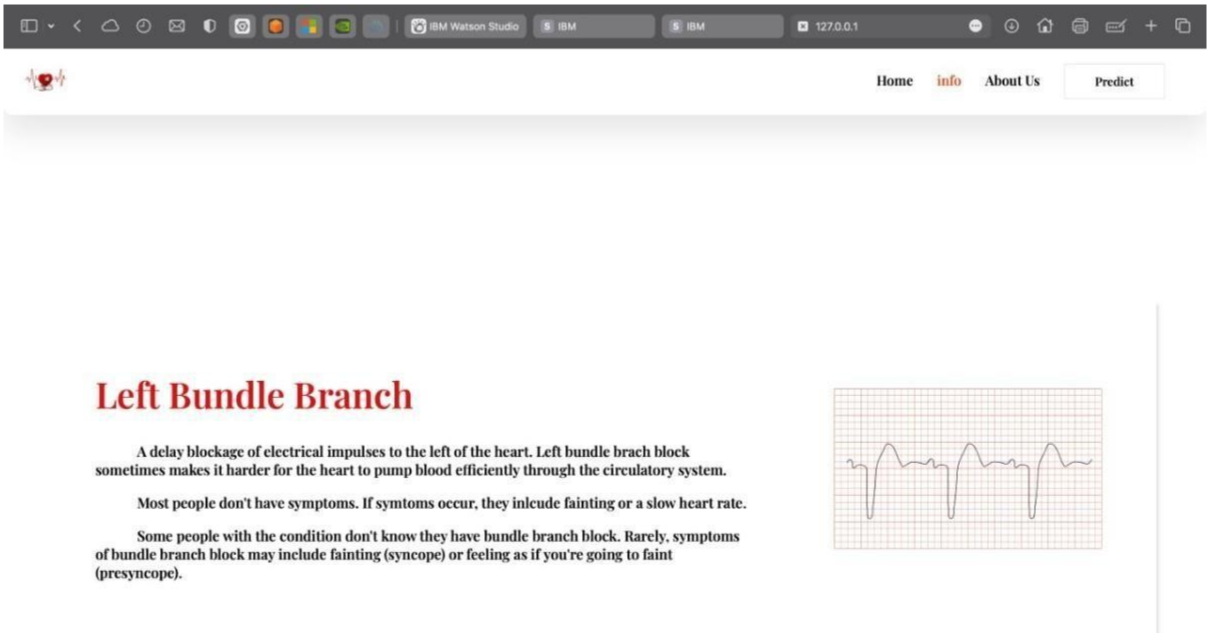
Model Performance Testing:

Project team shall fill the following information in model performance testing template.

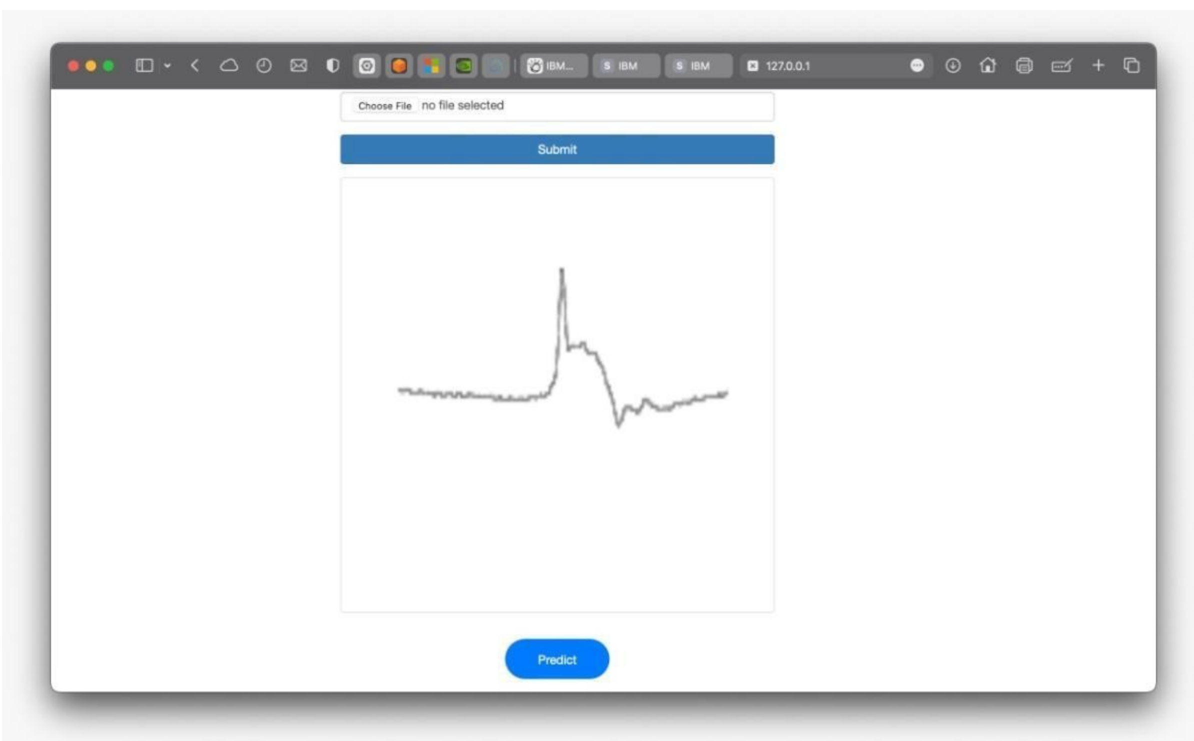
S.No.	Parameter	Values	Screenshot
1.	Model Summary	Fitting the Model- • loss: 0.22 • val_loss: 0.19	
2.	Accuracy	Training Accuracy – 0.93 Validation Accuracy -0.94	

Webpages

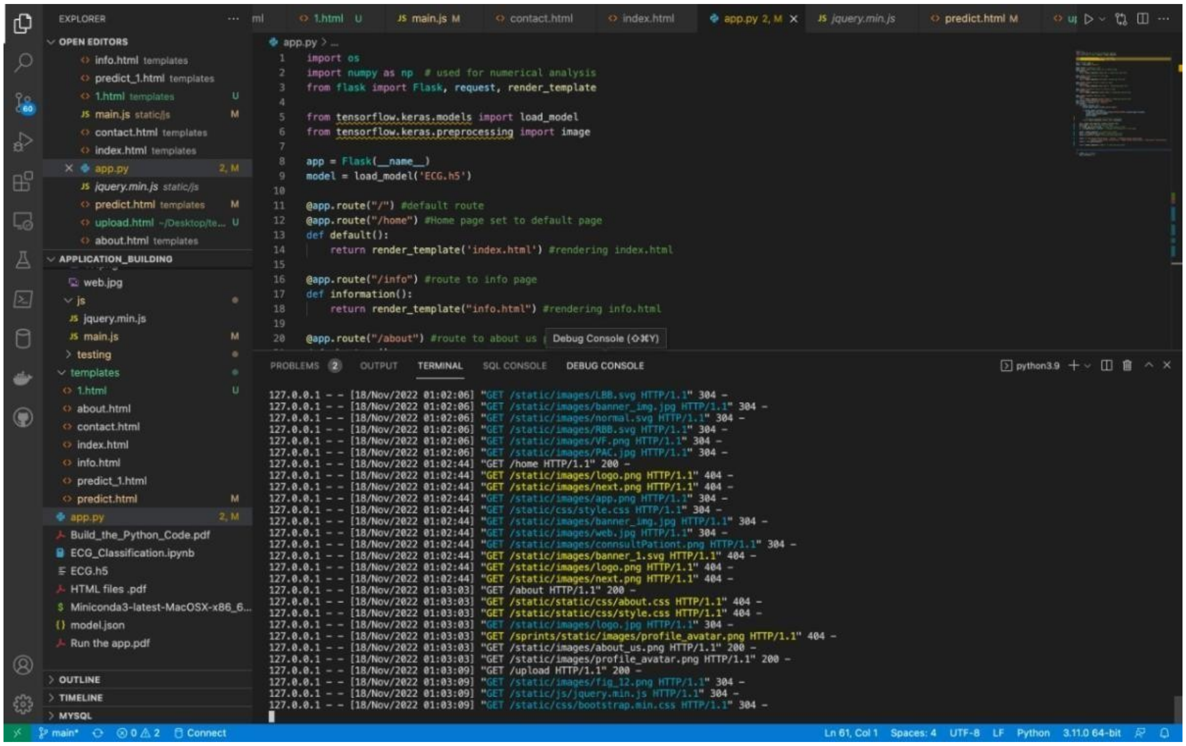
Info.html



Predict.html



Run the application



MODEL BUILDING

jupyter MODEL_building (autosaved)

File Edit View Insert Cell Kernel Widgets Help — Not Trusted — Python 3

ADDING CNN

```
In [17]: model=Sequential()

In [18]: model.add(Convolution2D(32,(3,3),padding="same",input_shape=(64,64,3),activation='relu'))
         model.add(MaxPool2D(pool_size=(2,2)))

In [19]: model.add(Convolution2D(32,(3,3),padding="same",input_shape=(64,64,3),activation='relu'))
         model.add(MaxPool2D(pool_size=(2,2)))

In [20]: model.add(Convolution2D(32,(3,3),padding="same",input_shape=(64,64,3),activation='relu'))
         model.add(MaxPool2D(pool_size=(2,2)))

In [21]: model.add(Flatten())#ANN INPUT

In [22]: model.add(Dense(units=128,kernel_initializer=tf.keras.initializers.RandomUniform(minval=-0.05, maxval=0.05, seed=Non
         model.add(BatchNormalization())
         model.add(Dropout(0.2))

In [23]: model.add(Dense(units=128,kernel_initializer=tf.keras.initializers.RandomUniform(minval=-0.05, maxval=0.05, seed=Non
         model.add(BatchNormalization())
         model.add(Dropout(0.2))

In [24]: model.add(Dense(units=64,kernel_initializer=tf.keras.initializers.RandomUniform(minval=-0.05, maxval=0.05, seed=None
         model.add(Dropout(0.2))

In [25]: model.add(Dense(units=64,kernel_initializer=tf.keras.initializers.RandomUniform(minval=-0.05, maxval=0.05, seed=None
         model.add(Dropout(0.2))
```

Adding output layer

```
In [26]: model.add(Dense(units=6,kernel_initializer="random_uniform",activation="softmax"))
```

jupyter Image_Preprocessing_1 Last Checkpoint: 43 minutes ago (autosaved)

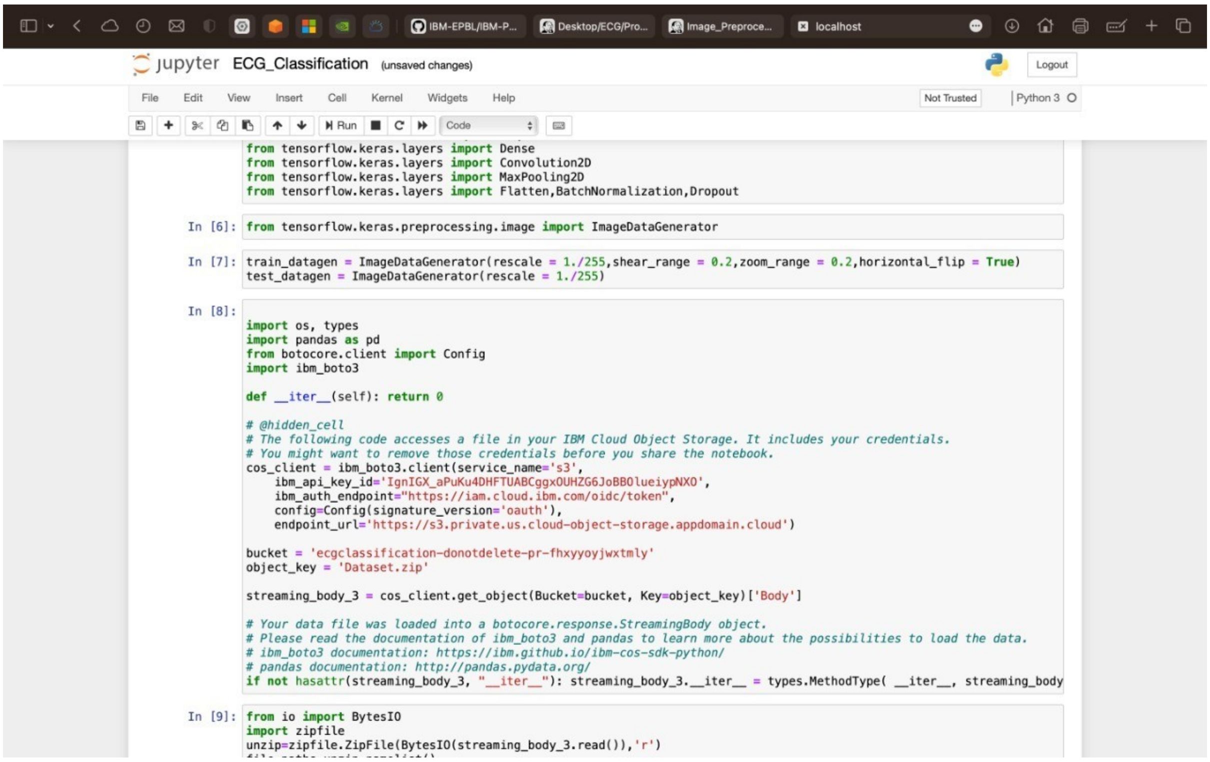
File Edit View Insert Cell Kernel Widgets Help — Trusted — Python 3

```
In [1]: import numpy as np
        import matplotlib.pyplot as plt
        import tensorflow as tf
        import os
        import cv2
        import numpy as np

In [2]: import keras
        from keras.layers import (Activation, BatchNormalization, Conv2D, Dense,
                                  Dropout, Flatten, MaxPooling2D)
        from tensorflow.keras.models import Sequential
        from tensorflow.keras.layers import Convolution2D,MaxPool2D,Flatten,Dense
        from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

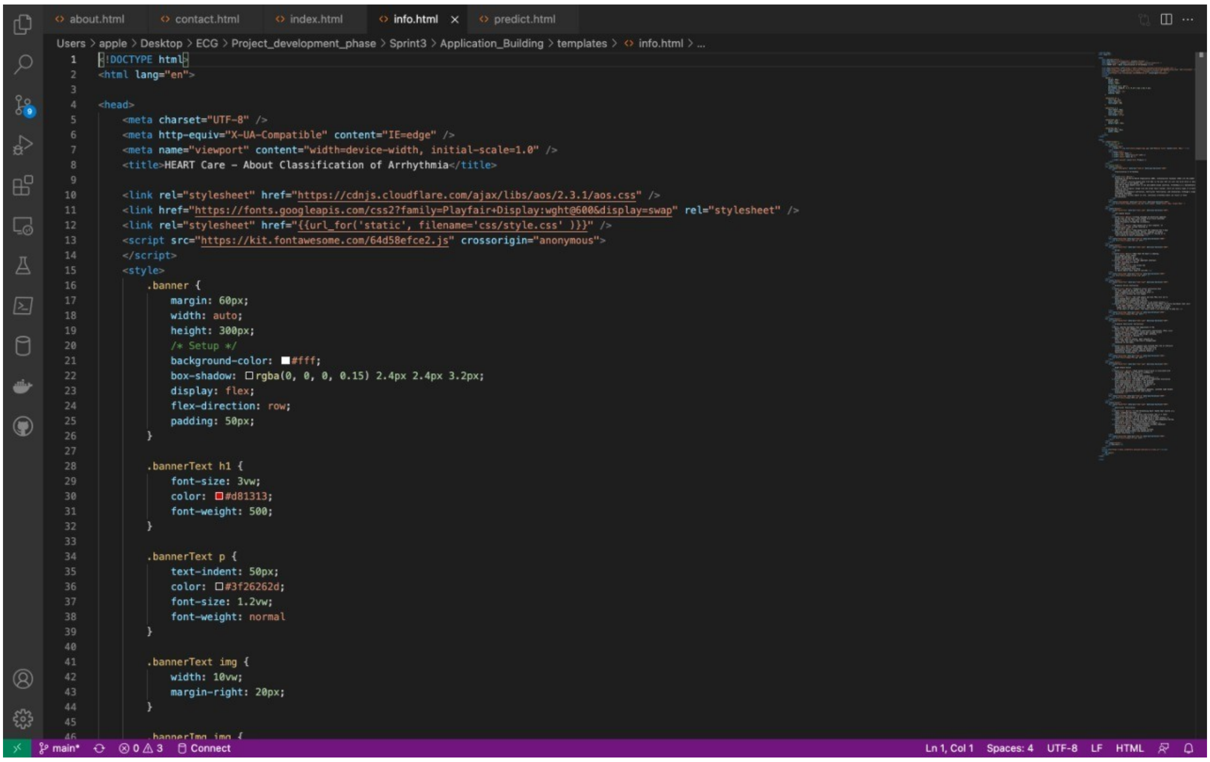
Preprocessing DATA

```
In [3]: train_datagen=ImageDataGenerator(rescale=1./255,shear_range=0.2,zoom_range=0.2,horizontal_flip=True,vertical_flip=Tr

In [4]: test_datagen=ImageDataGenerator(rescale=1./255)

In [5]: x_train=train_datagen.flow_from_directory('data/train',target_size=(64,64),batch_size=32,class_mode='categorical')
        Found 15341 images belonging to 6 classes.

In [6]: x_test=test_datagen.flow_from_directory('data/test',target_size=(64,64),batch_size=32,class_mode='categorical')
        Found 6825 images belonging to 6 classes.

In [7]: x_train.class_indices
Out[7]: {'Left Bundle Branch Block': 0,
         'Normal': 1,
         'Premature Atrial Contraction': 2,
         'Premature Ventricular Contractions': 3,
         'Right Bundle Branch Block': 4,
         'Ventricular Fibrillation': 5}
```

ECG Classification



HTML CODING

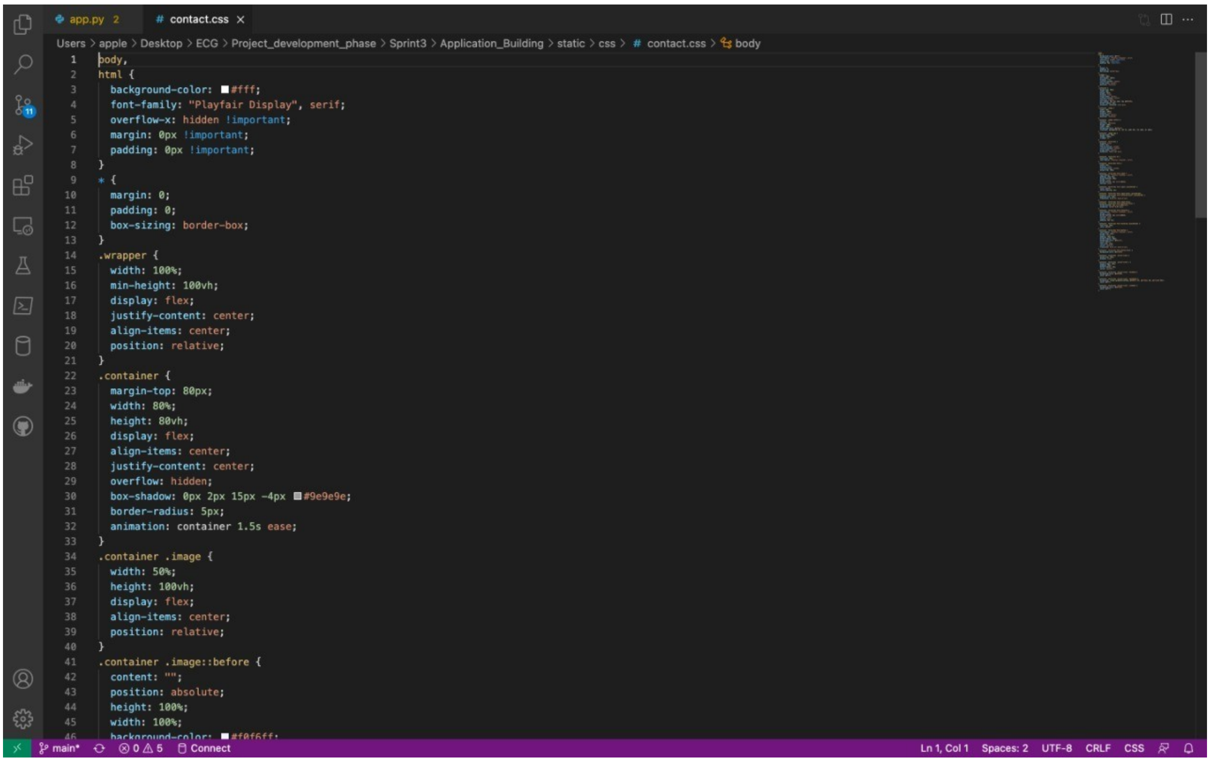


```html
    <link href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/5.10.0/css/all.min.css" rel="stylesheet">
</head>
<style>
    .footer {
        margin-bottom: 20px;
    }

    h1 {
        margin: 21.44px 0px;
    }
</style>
<body>
    <div class="wrapper">
        <!--Navigation Bar-->
        <div class="nav">
            <div class="logo">
                <a href="/"><img src="static/images/logo.jpg" alt="Website Title" style="width: 50px;" /></a>
            </div>
            <div class="links">
                <a href="/">Home</a>
                <a href="/info">Info</a>
                <a href="/about" class="mainLink">About Us</a>
                <a href="/contact">Contact Us</a>
                <a href="/upload" class="btn1">Predict</a>
            </div>
        </div>
        <div class="landing">
            <div>
                <h1>
                    <span >Arrthymia Prediction</span>
                </h1>
                <h3 style="color: black;">
                    In this project, we build an effective electrocardiogram (ECG) arrhythmia classification method
                    using a convolutional
                    neural network (CNN), in which we classify ECG into seven categories, one being normal and the other
                    six being different
                    types of arrhythmia using deep two-dimensional CNN with grayscale ECG images. We are creating a web
                    application where
                    the user selects the image which is to be classified. The image is fed into the model that is
                    trained and the cited
                    class will be displayed on the webpage.
                </h3>
            </div>
            <div class="landingImage" data-aos="fade-down" data-aous-duration="2000">
                <img src="static/images/about_us.png" alt="aboutImg" style="width: 50px; height: 50px;" />
```

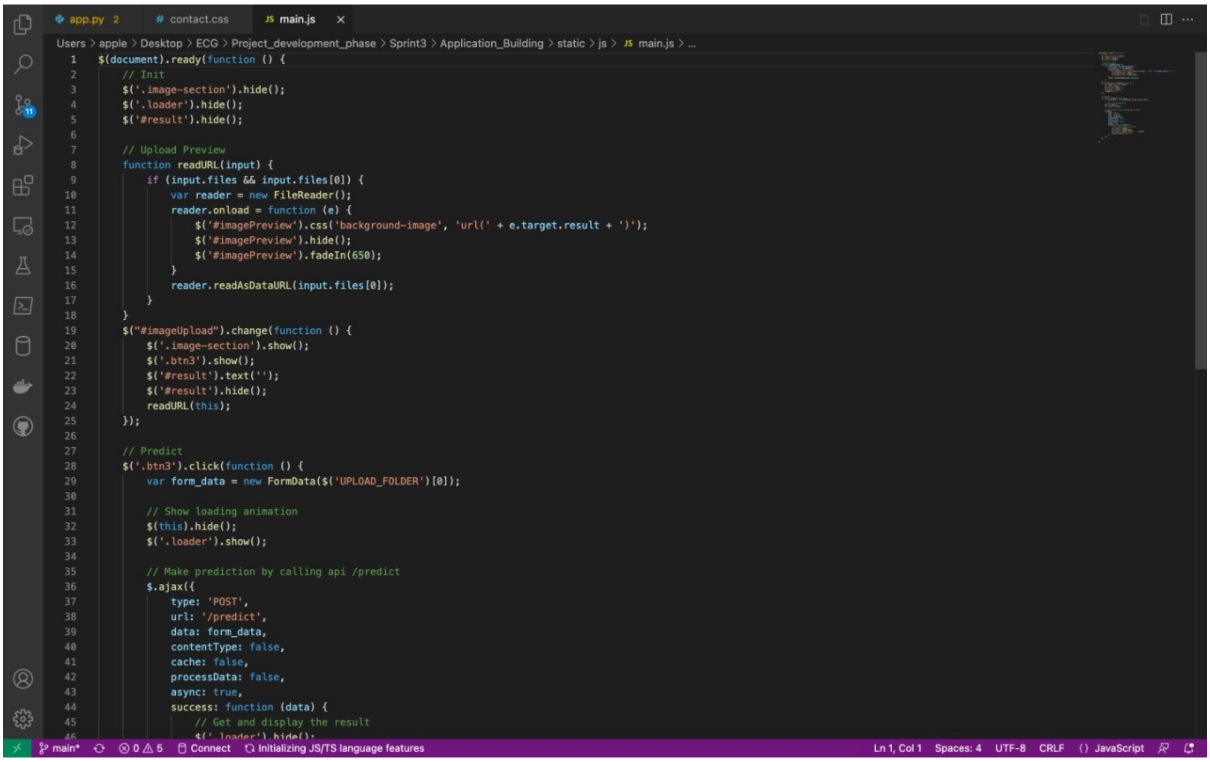
APP.PY

```python
import os
import numpy as np  # used for numerical analysis
from flask import Flask, request, render_template

from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image

app = Flask(__name__)
model = load_model('ECG.h5')
target_img = os.path.join(os.getcwd() , 'static/testing')


@app.route("/") #default route
@app.route("/home") #Home page set to default page
def default():
    return render_template('index.html') #rendering index.html

@app.route("/info") #route to info page
def information():
    return render_template("info.html") #rendering info.html

@app.route("/about") #route to about us page
def about_us():
    return render_template('about.html')  #rendering about.html

@app.route("/contact") #route to contact us page
def contact_us():
    return render_template('contact.html')  #rendering contact.html

#Allow files with extension png, jpg and jpeg
@app.route("/upload") #default route
def test():
    return render_template("predict.html")
app.config['UPLOAD_FOLDER']="static/testing"
@app.route("/",methods=['GET','POST'])
def upload():
    if request.method=='POST':
        upload_image=request.files['upload_image']

        if upload_image.filename!='':
            filepath=os.path.join(app.config["UPLOAD_FOLDER"],upload_image.filename)
            upload_image.save(filepath)
            path=filepath

            #flash("File Upload Successfully","success")
        return render_template('predict.html',data=path)
```

CSS



JAVA SCRIPT

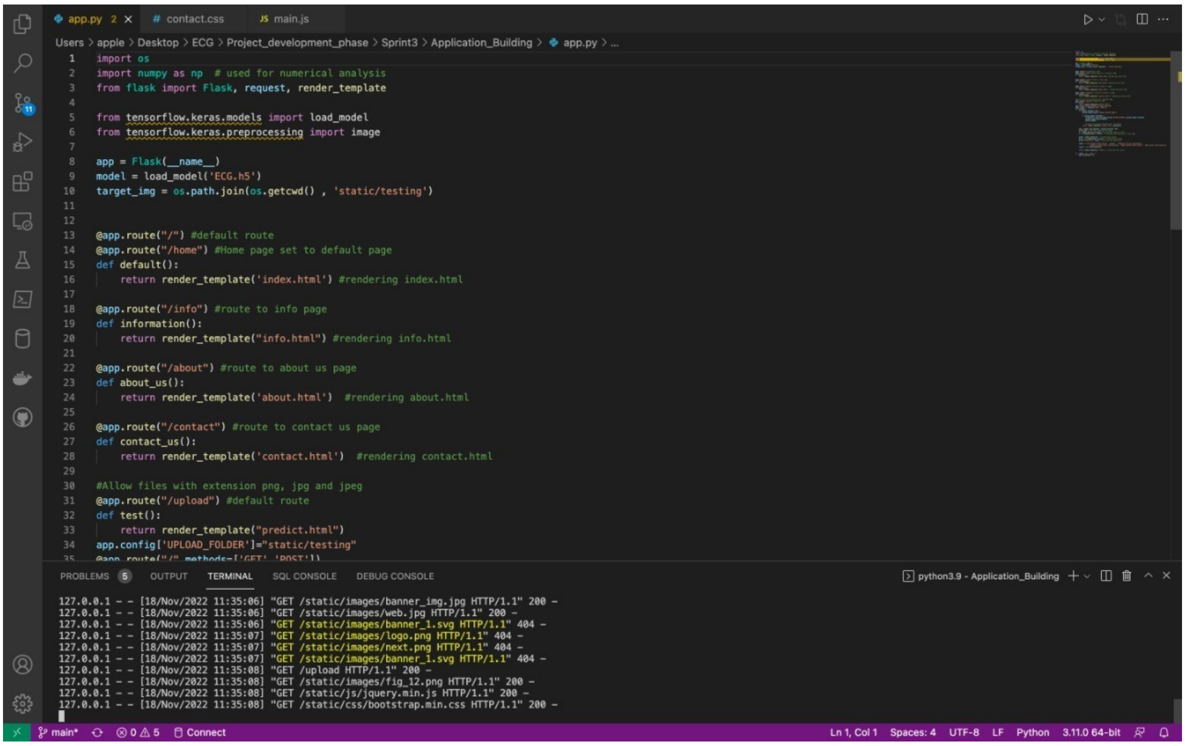

app.py 2
contact.css
main.js
Users > apple > Desktop > ECG > Project_development_phase > Sprint3 > Application_Building > static > js > main.js > ...
$(document).ready(function () {
    // Init
    $('.image-section').hide();
    $('.loader').hide();
    $('#result').hide();

    // Upload Preview
    function readURL(input) {
        if (input.files && input.files[0]) {
            var reader = new FileReader();
            reader.onload = function (e) {
                $('#imagePreview').css('background-image', 'url(' + e.target.result + ')');
                $('#imagePreview').hide();
                $('#imagePreview').fadeIn(650);
            }
            reader.readAsDataURL(input.files[0]);
        }
    }
    $("#imageUpload").change(function () {
        $('.image-section').show();
        $('.btn3').show();
        $('#result').text('');
        $('#result').hide();
        readURL(this);
    });

    // Predict
    $('.btn3').click(function () {
        var form_data = new FormData($('UPLOAD_FOLDER')[0]);

        // Show loading animation
        $(this).hide();
        $('.loader').show();

        // Make prediction by calling api /predict
        $.ajax({
            type: 'POST',
            url: '/predict',
            data: form_data,
            contentType: false,
            cache: false,
            processData: false,
            async: true,
            success: function (data) {
                // Get and display the result
main* 0 5 Connect Initializing JS/TS language features
Ln 1, Col 1 Spaces: 4 UTF-8 CRLF JavaScript


app.py 2
contact.css
main.js
Users > apple > Desktop > ECG > Project_development_phase > Sprint3 > Application_Building > app.py > ...
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@app.route("/contact") #route to contact us page
def contact_us():
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#Allow files with extension png, jpg and jpeg
@app.route("/upload") #default route
def test():
    return render_template("predict.html")
app.config['UPLOAD_FOLDER']="static/testing"
PROBLEMS 5 OUTPUT TERMINAL SQL CONSOLE DEBUG CONSOLE
python3.9 - Application_Building
127.0.0.1 - - [18/Nov/2022 11:35:06] "GET /static/images/banner_img.jpg HTTP/1.1" 200 -
127.0.0.1 - - [18/Nov/2022 11:35:06] "GET /static/images/web.jpg HTTP/1.1" 200 -
127.0.0.1 - - [18/Nov/2022 11:35:06] "GET /static/images/banner_1.svg HTTP/1.1" 404 -
127.0.0.1 - - [18/Nov/2022 11:35:07] "GET /static/images/logo.png HTTP/1.1" 404 -
127.0.0.1 - - [18/Nov/2022 11:35:07] "GET /static/images/next.png HTTP/1.1" 404 -
127.0.0.1 - - [18/Nov/2022 11:35:07] "GET /static/images/banner_1.svg HTTP/1.1" 404 -
127.0.0.1 - - [18/Nov/2022 11:35:08] "GET /upload HTTP/1.1" 200 -
127.0.0.1 - - [18/Nov/2022 11:35:08] "GET /static/images/fig_12.png HTTP/1.1" 200 -
127.0.0.1 - - [18/Nov/2022 11:35:08] "GET /static/js/jquery.min.js HTTP/1.1" 200 -
127.0.0.1 - - [18/Nov/2022 11:35:08] "GET /static/css/bootstrap.min.css HTTP/1.1" 200 -
main* 0 5 Connect
Ln 1, Col 1 Spaces: 4 UTF-8 LF Python 3.11.0 64-bit