

## SPRINT 3: Classification of Arrhythmia by Using Deep Learning With 2-D ECG Spectral Image Representation

### Description of USN and Screenshots:

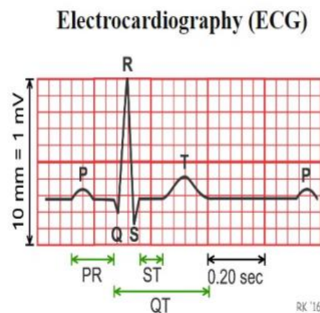
#### USN-5:

As a user, I can enter the webpage and view the homepage about the information about Electrocardiography (ECG) giving a clear perspective of the signals. I must also be able to comprehend all medical jargon related to Arrhythmia such as ECG, Coronary Heart Disease, Cardiomyopathy and its types.

#### Screenshot:



#### ECG Image Based Heartbeat Classification



An electrocardiogram (ECG) is a simple test that can be used to check your heart's rhythm and electrical activity. Sensors attached to the skin are used to detect the electrical signals produced by your heart each time it beats. These signals are recorded by a machine and are looked at by a doctor to see if they're unusual. An ECG may be requested by a heart specialist (cardiologist) or any doctor who thinks you might have a problem with your heart, including your GP. The test can be carried out by a specially trained healthcare professional at a hospital, a clinic or at your GP surgery. Despite having a similar name, an ECG isn't the same as an echocardiogram, which is a scan of the heart.

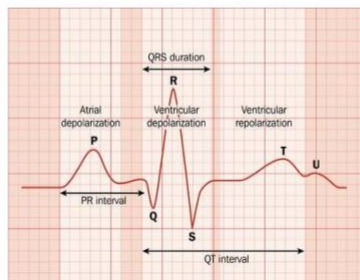
## When is an ECG is used?

An ECG is often used alongside other tests to help diagnose and monitor conditions affecting the heart. It can be used to investigate symptoms of a possible heart problem, such as chest pain, palpitations (suddenly noticeable heartbeats), dizziness and shortness of breath. An ECG can help detect:

- Arrhythmias - Where the heart beats too slowly, too quickly, or irregularly.
- Coronary Heart Disease - Where the heart's blood supply is blocked or interrupted by a build-up of fatty substances.
- Heart Attacks - Where the supply of blood to the heart is suddenly blocked.
- Cardiomyopathy - Where the heart walls become thickened or enlarged.

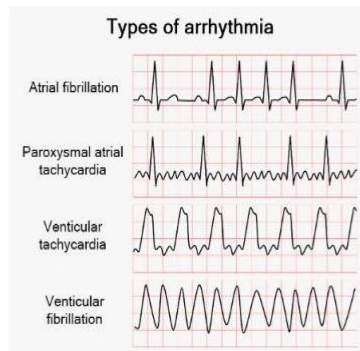
A series of ECGs can also be taken over time to monitor a person already diagnosed with a heart condition or taking medication known to potentially affect the heart.

## Normal ECG



A normal ECG is illustrated above. Note that the heart is beating in a regular sinus rhythm between 60 - 100 beats per minute (specifically 82 bpm). All the important intervals on this recording are within normal ranges.

## Abnormal ECG



Electrocardiographic abnormalities include first-degree heart block, right and left bundle branch block, premature atrial and ventricular contractions.

The HTML file used to build the app\_flask.py page includes:

The screenshot displays an IDE window for a project named "mini project". The Project Explorer on the left shows the project structure, including folders like "data", "flask", "static", "templates", and "uploads", and files like "app\_flask.py", "app\_ibm\_flask.py", "ECG.h5", "ECG\_ibm.h5", "flask\_reference", "IBM\_training", "Report\_Video\_Reference", "training", "README.md", and "REFERENCE.txt".

The Code Editor shows the content of "app\_flask.py". The code is as follows:

```

1 import os
2 import numpy as np #used for numerical analysis
3 from flask import Flask,request,render_template
4 # Flask-It is our framework which we are going to use to run/serve our application.
5 #request-for accessing file which was uploaded by the user on our application.
6 #render_template- used for rendering the html pages
7 from keras.models import load_model#to load our trained model
8 from keras.utils import load_img
9 from keras.utils import img_to_array
10
11 app=Flask(__name__)#our flask app
12 model=load_model('ECG.h5')#loading the model
13
14 @app.route("/") #default route
15 def about():
16     return render_template("home.html")#rendering html page
17
18 @app.route("/about") #default route
19 def home():
20     return render_template("home.html")#rendering html page
21
22 @app.route("/info") #default route
23 def information():
24     return render_template("information.html")#rendering html page
25
26 @app.route("/upload") #default route
27 def upload():
28     if request.method=='POST'

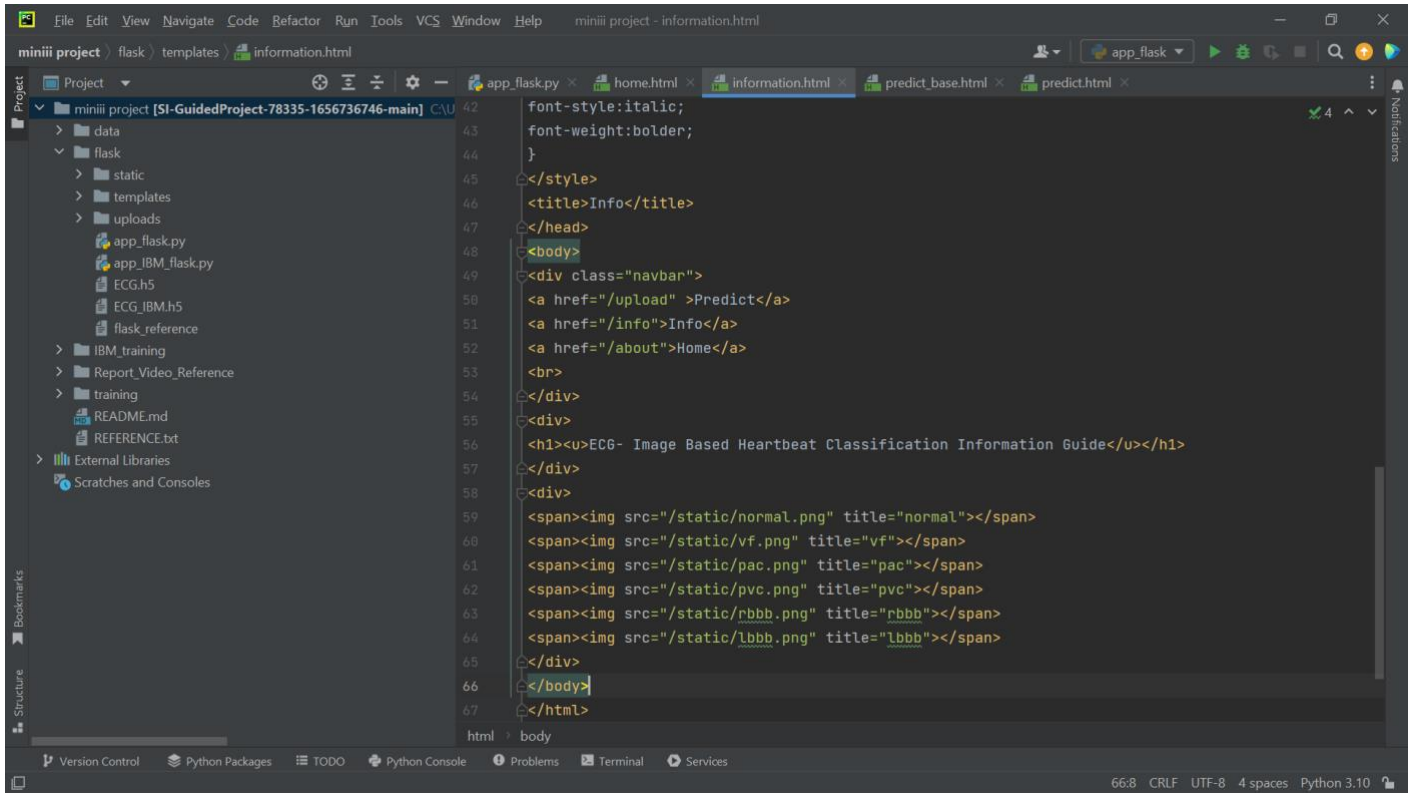
```

The Run and Debug Console at the bottom shows the command "python app\_flask.py" and the output "Running on http://127.0.0.1:5000".

The HTML file used to build the Home.html

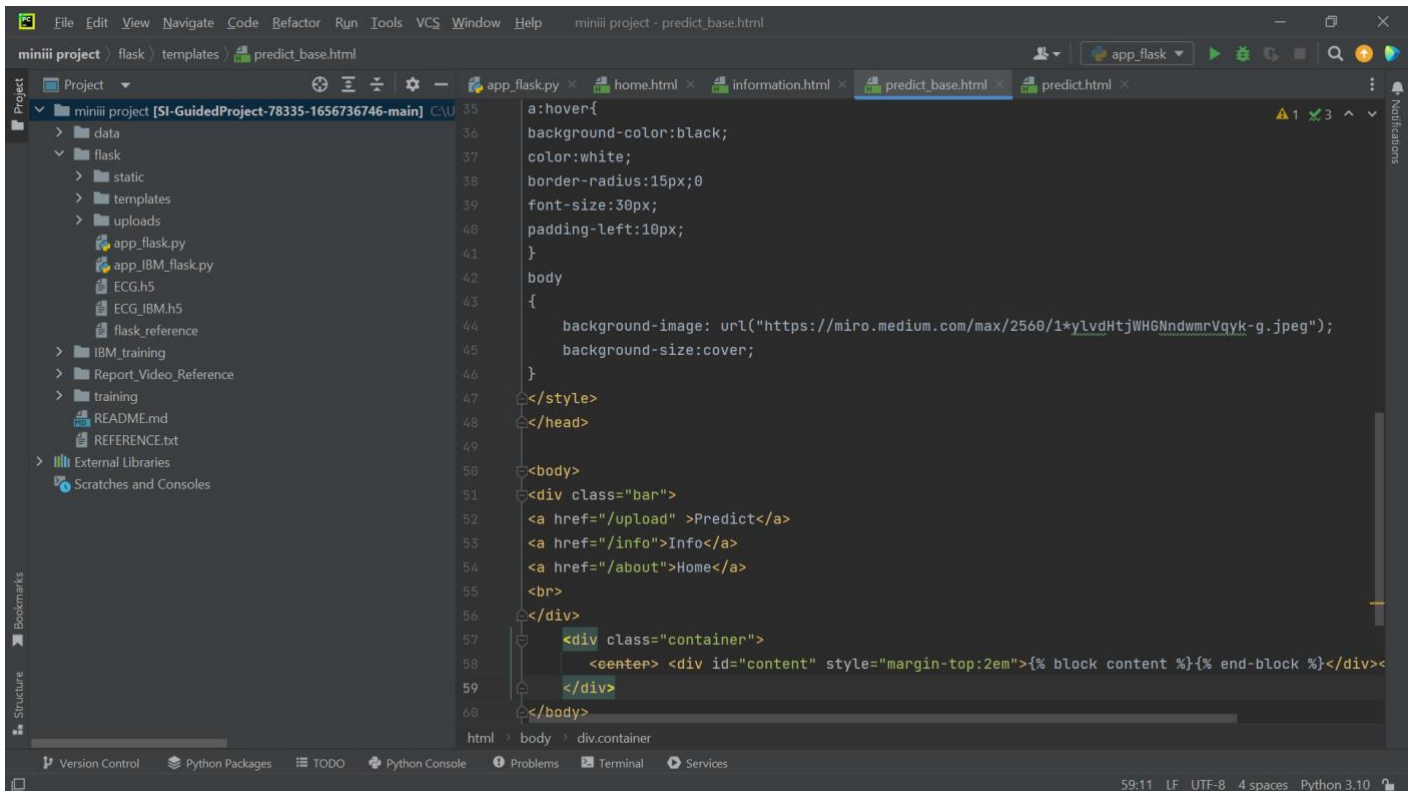
The screenshot shows a VS Code editor with a project named 'mini project'. The left sidebar shows the project structure, including folders like 'data', 'flask', 'static', 'templates', and 'uploads', and files like 'app\_flask.py', 'app\_ibm\_flask.py', 'ECG.h5', 'ECG\_IBM.h5', 'flask\_reference', 'IBM\_training', 'Report\_Video\_Reference', 'training', 'README.md', and 'REFERENCE.txt'. The main editor displays the 'home.html' file, which contains HTML code for a web page. The code includes a navigation bar with links to 'upload', 'info', and 'about'. Below the navigation bar, there is a section for 'ECG - IMAGE BASED ARRHYTHMIA CLASSIFICATION' featuring a heart rate image and a description of the ECG arrhythmia classification. The bottom status bar indicates the current file path as 'html > body > div'.

The HTML file used to build the information.html



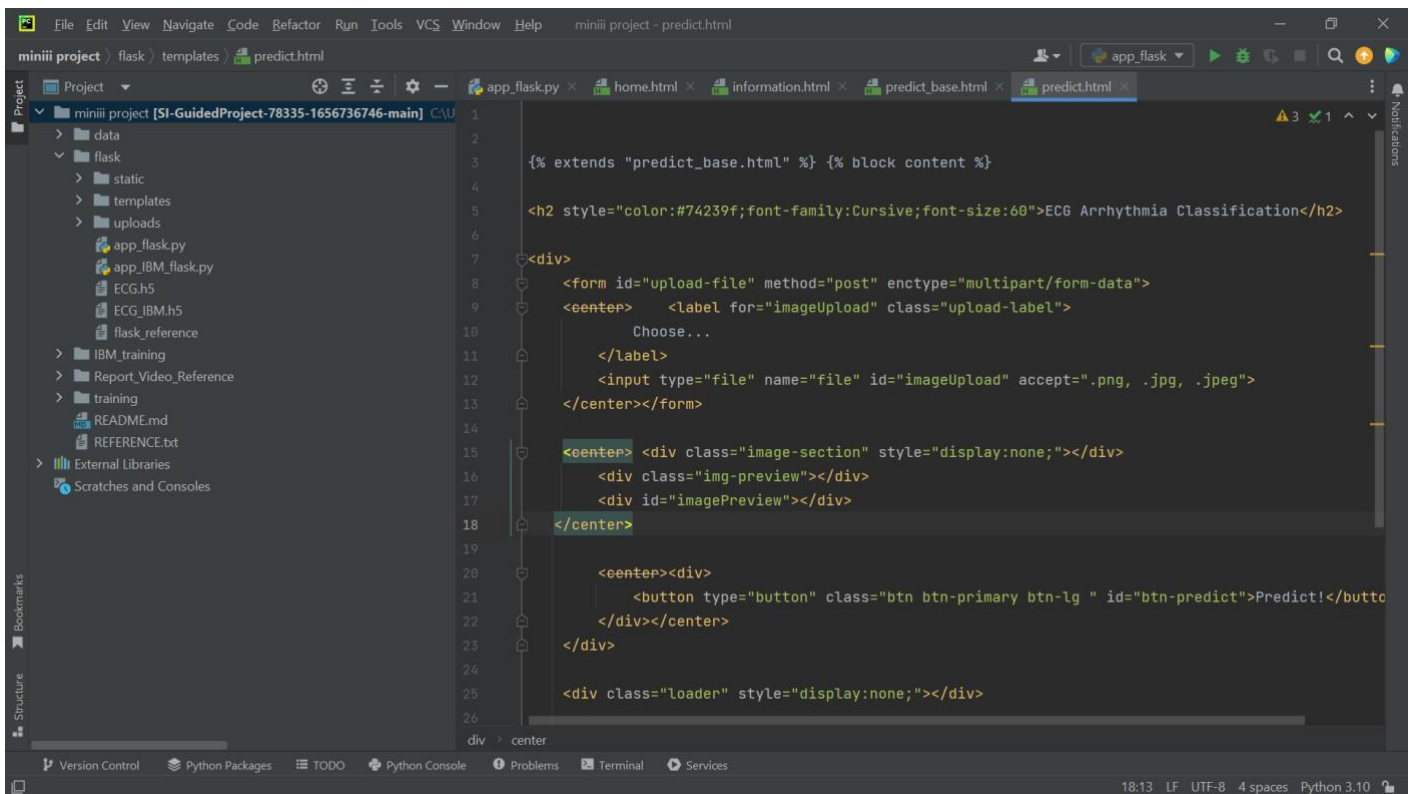
```
42 font-style:italic;
43 font-weight:bolder;
44 }
45 </style>
46 <title>Info</title>
47 </head>
48 <body>
49 <div class="navbar">
50 <a href="/upload" >Predict</a>
51 <a href="/info">Info</a>
52 <a href="/about">Home</a>
53 <br>
54 </div>
55 <div>
56 <h1><u>ECG- Image Based Heartbeat Classification Information Guide</u></h1>
57 </div>
58 <div>
59 <span></span>
60 <span></span>
61 <span></span>
62 <span></span>
63 <span></span>
64 <span></span>
65 </div>
66 </body>
67 </html>
```

The HTML file used to build the predict\_base.html



```
35 a:hover{
36 background-color:black;
37 color:white;
38 border-radius:15px;0
39 font-size:30px;
40 padding-left:10px;
41 }
42 body
43 {
44 background-image: url("https://miro.medium.com/max/2560/1*YlvdHtjWHGndwMrVgYk-g.jpeg");
45 background-size:cover;
46 }
47 </style>
48 </head>
49
50 <body>
51 <div class="bar">
52 <a href="/upload" >Predict</a>
53 <a href="/info">Info</a>
54 <a href="/about">Home</a>
55 <br>
56 </div>
57 <div class="container">
58 <center> <div id="content" style="margin-top:2em">{% block content %}{% end-block %}</div>
59 </div>
60 </body>
```

The HTML file used to build the predicate.html



The screenshot shows a code editor with the following content:

```
1 2
3  {% extends "predict_base.html" %} {% block content %}
4
5  <h2 style="color:#74239f;font-family:Cursive;font-size:60">ECG Arrhythmia Classification</h2>
6
7  <div>
8      <form id="upload-file" method="post" enctype="multipart/form-data">
9          <center>
10             <label for="imageUpload" class="upload-label">
11                 Choose...
12             </label>
13             <input type="file" name="file" id="imageUpload" accept=".png, .jpg, .jpeg">
14             </center></form>
15
16             <center> <div class="image-section" style="display:none;"></div>
17                 <div class="img-preview"></div>
18                 <div id="imagePreview"></div>
19             </center>
20
21             <center><div>
22                 <button type="button" class="btn btn-primary btn-lg " id="btn-predict">Predict!</button>
23             </div></center>
24
25             <div class="loader" style="display:none;"></div>
26
```

The editor interface includes a sidebar with a project tree, a top menu bar, and a bottom status bar showing the file encoding (UTF-8) and Python version (3.10).