CLASSIFICATION OFARRHYTHMIA BY USING DEEP LEARNING WITH 2-D ECG SPECTRAL IMAGE REPRSESNTATION

PROJECT REPORT

Submitted by

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In partial full filments for the award of the degree

Of

BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE AND ENGINEERING

GOJAN SCHOOL OF BUSINESS AND TECHNOLOGY

REDHILLS

ANNA UNIVERSITY : CHENNAI- 600 025

JUNE 2022

1. INTRODUCTION

1.1 Project Overview:

According to the World Health Organization (WHO), cardiovascular diseases (CVDs) are the number one cause of death today. Over 17.7 million people died from CVDs in the year 2017 all over the world which is about 31% of all deaths, and over 75% of these deaths occur in low and middle-income countries. Arrhythmia is a representative type of CVD that refers to any irregular change from the normal heart rhythms. There are several types of arrhythmia including atrial fibrillation, premature contraction, ventricular fibrillation, and tachycardia. Although a single arrhythmia heartbeat may not have a serious impact on life, continuous arrhythmia beats can result in fatal circumstances. In this project, we build an effective electrocardiogram (ECG) arrhythmia classification method using a convolution al 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.

1.2 Purpose:

In the past few decades, Deep Learning has proved to be a compelling tool because of its ability to handle large amounts of data. The interest to use hidden layers has surpassed traditional techniques, especially in pattern recognition. One of the most popular deep neural networks is Convolution al Neural Networks. In deep learning, a convolution al neural network (CNN/ConvNet) is a class of deep neural networks, most commonly applied to analyze visual imagery. Now when we think of a neural network we think about matrix multiplications but that is not the case with ConvNet. It uses a special technique called Convolution. Now in mathematics convolution is a mathematical operation on two functions that produces a third function that expresses how the shape of one is modified by the other.

2. LITERATURE SURVEY

2.1 Existing problem:

A 75-year-old man, with no significant symptoms, was referred after the incidental finding of a left hilar pulmonary mass of 30 30 50 mm on a chest CT. F-18 fluorodeoxyglucose (FDG) PET/CT demonstrated a heterogeneous, moderate radiotracer uptake in the mass (SUV 3.5 g/mL). Bronchoscopy revealed a discrete extrinsic compression of the superior bronchus without endobronchial lesion. Endobronchial fine-needle biopsies could not deliver a final diagnosis. The patient underwent upper lobectomy by thoracotomy. Histopathology revealed a benign intrapulmonary schwannoma. Although rare, intermediate FDG uptake in the settings of a pulmonary mass should include schwannoma in the differential diagnosis.

2.2 References:

1. Schallreuter K U. A review of recent advances on the regulation of pigmentation in the human epidermis. Cell Mol Biol (Noisy-le-grand) 1999: 45: 943–949.

2. Wood J M, Chavan B, Hafeez I, Schallreuter K U. Regulation of tyrosinase by tetrahydropteridines – what is real? A critical re-analysis of H. Wojtasek's view. Biochem Biophys Res Commun 2005: 331: 891–893.

3. Schallreuter K U. Functioning methionine-S-sulfoxide reductases A and B are present in human skin. J Invest Dermatol 2006: 126: 947–949.

4. Hasse S, Gibbons N C, Rokos H, Marles L K, Schallreuter K U. Perturbid 6-tetrahydrobiopterin recycling via decreased dihydropteridine reductase in vitiligo: more evidence for H2O2 stress. J Invest Dermatol 2004: 122: 307–313.

5. Schallreuter K U, Moore J, Wood J M et al. Epidermal H2O2 accumulation alters tetrahydrobiopterin (6BH4) recycling in vitiligo: identification of a general mechanism in regulation of all 6BH4-dependent processes? J Invest Dermatol 2001: 116: 167–174.

2.3 Problem Statement Definition:

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	Patient	I will build an effective electrocardiogram (ECG) Arrhythmia classification method using a convolutional neural network (CNN).	A single arrhythmia heartbeats may not have a serious impact on life.	It can be used to investigate symptoms of a possible heart problem, such as a chest pain, palpitation, dizziness and shortness of breath.	An ECG is a quick, safe and painless test.no electricity is put into your body while it's carried out.
PS-2	Patient	I am trying to cure the cardiovascular diseases (CVDs).	Arrhythmia is a representative type of CVD that refers to any irregular change from the normal heart rhythms.	Over 17.7 million people died from CVDs in the year 2017.The world wise the count of deaths percentage is 31%.	Arrhythmia using deep two-dimensional CNN with grayscale ECG images.

3. IDEATION & PROPOSED SOLUTION:

3.1 Empathy Map Canvas:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviors and attitudes. It is a useful tool to helps teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.
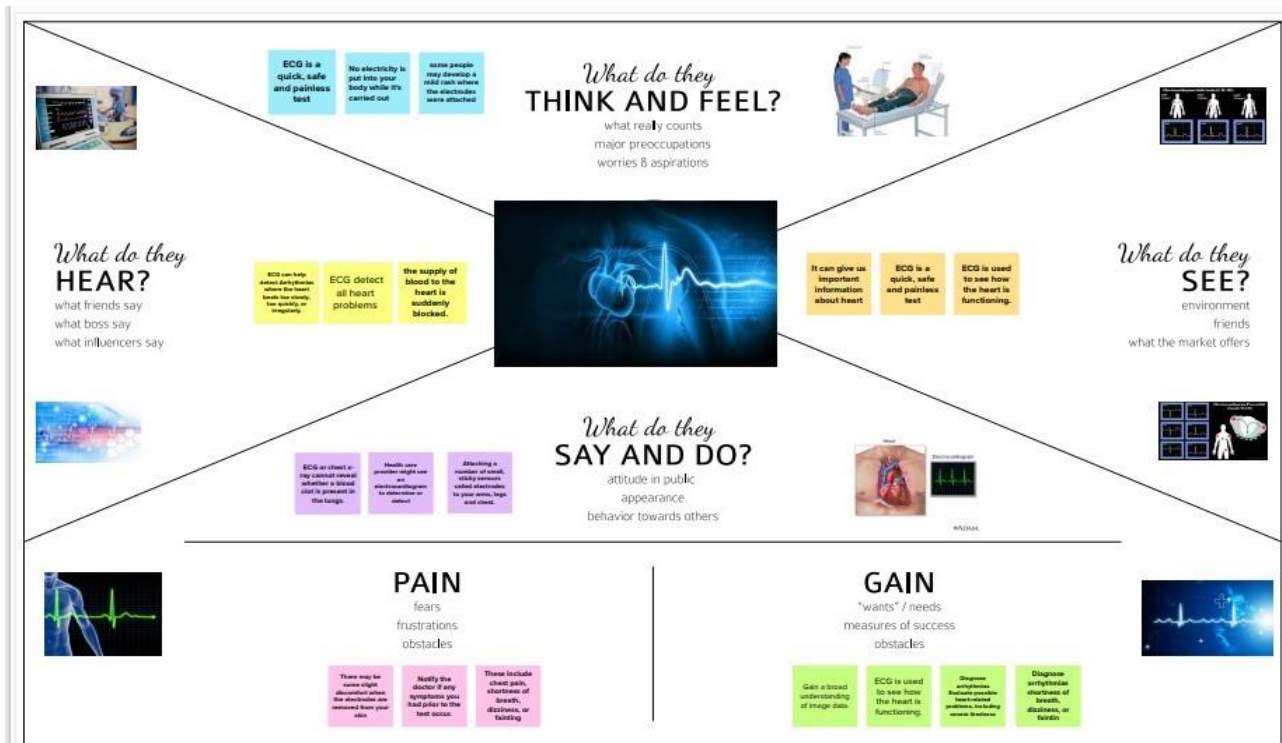
3.2 Ideation & Brainstorming:

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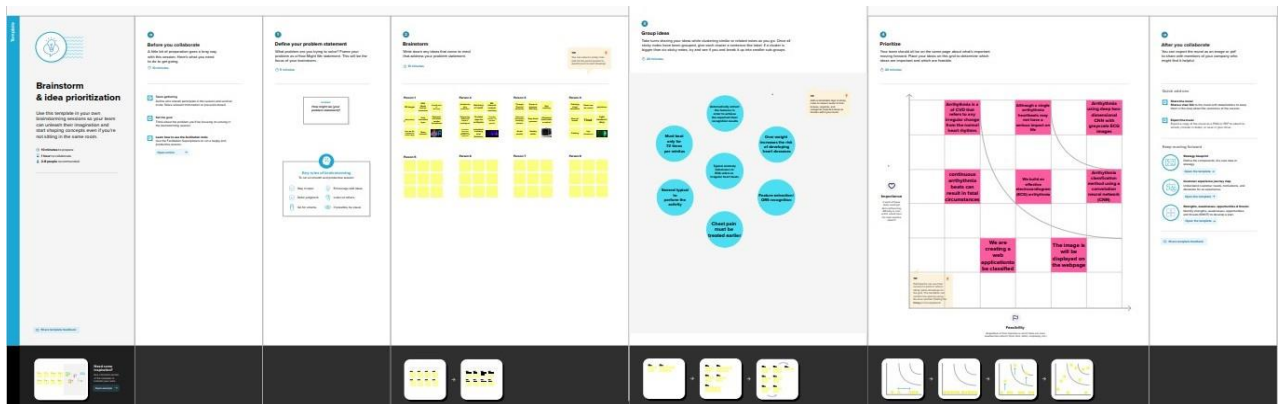
3.3 Proposed Solution:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	• A Heart arrhythmia is an irregular heartbeat. Heart rhythm problems occur when electrical signals that coordinate the hearts beats don't work properly. • The faulty signalling causes the heart to beat too fast, too slow or irregularly.
2.	Idea / Solution description	• The image is fed into the model that is trained and the cited class will be displayed on the webpage. We can also able to see the results.
3.	Novelty / Uniqueness	• The other six being different types of arrhythmia using deep two-dimensional CNN with grayscale ECG images.
4.	Social Impact / Customer Satisfaction	• 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.
5.	Business Model (Revenue Model)	• 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.
6.	Scalability of the Solution	• Apply the biosensor to the prepared skin to start monitoring. ECG data is analysed by using CNN platform using AI. • In upcoming years any one can develop and introduce new concept with use this same content.

3.4 Problem Solution fit:

Project Title: Classification of Arrhythmia by using deep learning with 2-D ECG spectral Image Representation	Project Design Phase-I Solution Fit	Team ID: PNT2022TMID36166

1. CUSTOMER SEGMENT(S) — CS

The patient who is suffering with irregular heartbeat.

6. CUSTOMER CONSTRAINTS — CC

* You can certainly live a happy, healthy life with an irregular heartbeat. However, it's always a good idea to check with your doctor when you're experiencing new symptoms or discomfort.

5. AVAILABLE SOLUTION — AS

- Treatment for heart arrhythmia's may include medications, therapies such as Val maneuvers, cardio version catheter procedures or heart surgery.

2. JOBS-TO-BE-DONE / PROBLEMS — J&P

- Eat heart-healthy foods.
- Exercise regularly.
- Quit smoking.
- Maintain a healthy weight.
- Keep blood pressure and cholesterol levels under control.
- Drink alcohol in moderation

9. PROBLEM ROOT CAUSE — RC

* The most common type of arrhythmia is atrial fibrillation, which causes an irregular and fast heartbeat.

* Many factor scan affect your heart's rhythm, such as having had a heart attack, smoking, congenital heart defects, and stress. Some substances or medicines may also cause arrhythmia's.

7. BEHAVIOR — BE

- Symptoms may include fatigue, weakness, and many other symptoms.

- The symptoms may affect one's lifestyle, and may also lead to concern about the potential impede normal life activities.

3. TRIGGERS — TR

Drinking too much alcohol can affect the electrical impulses in your heart and can increase the chance of developing atrial fibrillation

4. EMOTIONS: BEFORE / AFTER — EM

* Stress can contribute to heart rhythm disorders (arrhythmia's) such as atrial fibrillation.

- Some studies suggest that stress and mental health issues may cause your atrial fibrillation symptoms to worsen.

10. YOUR SOLUTION — SL

Consult the doctor on time to avoid the risk.

- Take the ECG in the authorized center under the consultation of the doctor.

- Take a heart healthier foods.

- Due breathing exercise

8. CHANNELS OF BEHAVIOR — CH

8.1 ONLINE
- In a video chat the doctor used to consult first for the gastric problem they advise to take pills for it.
- It is not cured an advice to consult a doctor in offline

8.2 OFFLINE
- After seeing all the pass history they advise to take ECG and follow up with health checkup

Side labels: Define CS, fit into CC · Focus on J&P, tap into BE, understand RC · Identify strong TR & EU · Explore AS, differentiate · Focus on J&P, tap into BE, understand RC · Extract online & offline CH of BE

4. REQUIREMENT ANALYSIS:

4.1 Functional requirement:

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 G mail Registration through Linked IN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Functional requirements	The requirements for our projects are Deep learning,CNN(convolution neural network),ECG spectral image representation
FR-4	Proposed solution.	The method consists of 5steps, signal pre-processing generation of 2-D image (spectrograms), augmentation of data, extraction of features from the data (using the CNN model) and its classification based on the extracted features.
FR-5	Dataset	Twenty-five recordings were chosen from a similar set, with a focus on complex ventricular, junction, and Supra-ventricular arrhythmia's. These recordings were digitized at 360 samples/sec for each channel with a resolution of 11-bits over a range of 10 mV.
FR-6	Experimental Setup	The experimental setup consisted of an eighth-generation ASUS server with 32GB internal RAM, 500 GB external SSD hard drive with the Addition of internal hard drive, and NVIDIA 1080 GPU with 11 GB memory. The 2-D spectral images Were divided such that 70% of the data was used for training, 30% for test.

4.2 Non-Functional requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Classification Of Arrhythmia By Using Deep Learning With 2-D ECG Spectral Image Representation our usability is 6.88
NFR-2	**Security**	Concerning the security and privacy of the ECG monitoring system, we adopted a PRG -based stream cipher to protect the ECG signal, and we conceal the identity of the user from the DSS using a pseudonym system. To verify that our system is secure, we verify that our scheme satisfies the security objectives.
NFR-3	**Reliability**	Automated arrhythmia detection systems are sensitive in acute stroke.
NFR-4	**Performance**	Performance Analysis for Arrhythmia Classification using PSO, GWO and SVM. Abstract: Proper heart rate or heart rhythm leads to healthy lifestyle.
NFR-5	**Availability**	When the electrical signals that coordinate the heart's beats don't work properly.
NFR-6	**Scalability**	The ECG waveform scaling properties thus suggest that reduced complexity dominates the underlying mechanisms of arrhythmia.

5. PROJECT DESIGN:

5.1 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 centers and leaves the system, what changes the information, and where data is stored.
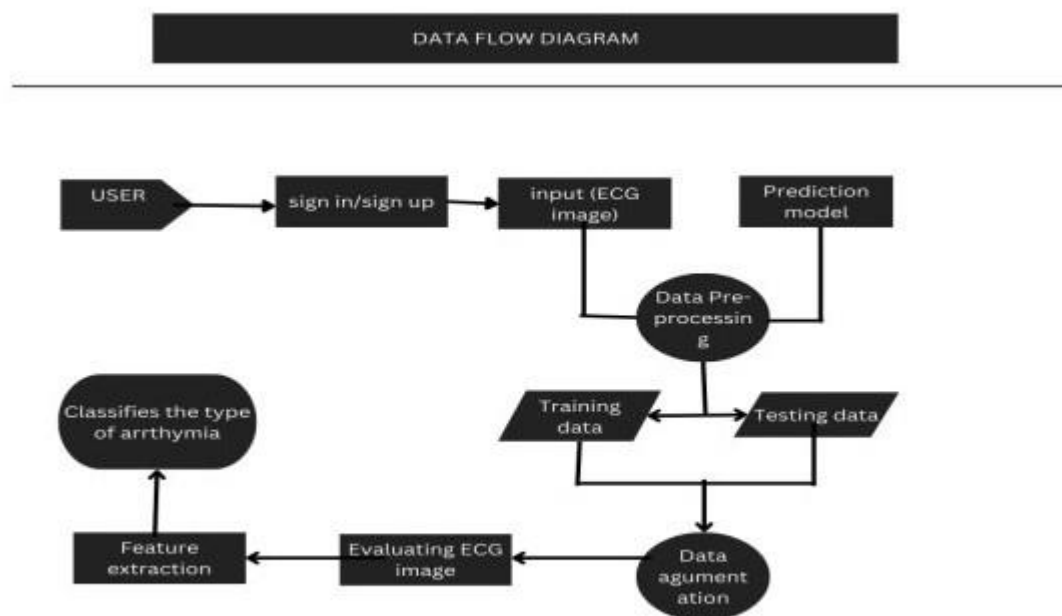
5.2 Solution & Technical Architecture:

•Deep learning techniques are used to identity diseases,through image processing.

•The customers gives in the image, the user interface accepts the image and goes inside the DL algorithm.

•First its train the data and test the image data and then gives the output.
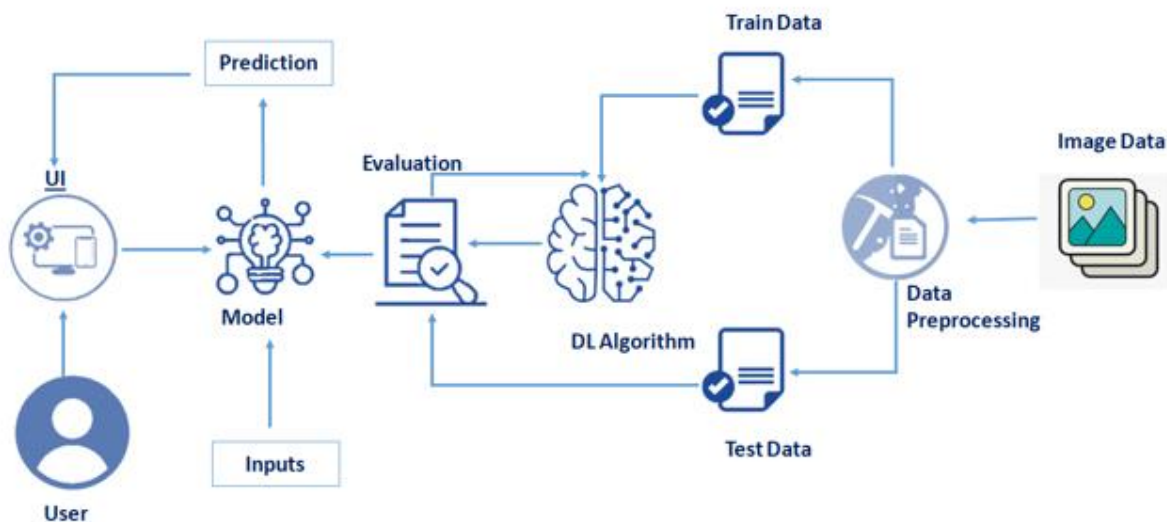
5.3 User Stories:

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

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I can register for the application using Gmail	I can access my account/dashboard	High	Sprint-1
	Confirmation	USN-3	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
Data Input	Getting user input	USN-4	As a user, I can share my input like the medical reports to the application	I can proceed with further steps with no error	High	Sprint-2
	Save report	USN-5	The data that is provided by the user will be saved in the application backend for future purpose	If all the data is in correct format it will be stored	High	Sprint-2
Customer Interaction	Chat with doctor	USN-6	If the customer is interested he can consult with the doctor regarding doubts	If the doctor is free the appointment will be accepted	Low	Sprint-1
Report Generation	Get complete report	USN-7	After the complete analysis the report will be generated	The results will be shown on the screen to patients	High	Sprint-2

6. PROJECT PLANNING & SCHEDULING:

6.1 Sprint Planning & Estimation:

Sprint	Functional Requirement(Epic)	UserStory Number	UserStory/Task	StoryPoints	Priority	Team Members
Sprint-1	Download TheDataset	USN-1	User Interacts with user interface to upload Image	1	High	D.Joshualravel
Sprint-1	Import TheImageDataGeneratorLibrary	USN-2	Upload image is analyzed by the model which is integrated	1	Low	S.Mahalakshmi
Sprint-2	ConfigureImageDataGeneratorclass	USN-3	Once model analysis the uploaded image the prediction is show cased on the U1	1	Medium	A.Rubavathi
Sprint-2	Apply theImageDataGeneratorfunctionalitytoTrainSetandDataset	USN-4	The image data generator accepts the original data, randomly Transforms it and returns only the new transform the data	1	Low	R.ManojKumar
Sprint-3	ImportLibraries	USN-5	A U1 is provided for user where he has uploaded an image	1	High	D.Joshualsravel

Sprint	Functional Requirement(Epic)	UserStory Number	UserStory/Task	StoryPoints	Priority	Team Members
Sprint-3	InitializetheModel	USN-6	The uploaded images is given to the saved model and prediction is showcased on the U1	1	High	S.Mahalakshmi
Sprint-4	AddingCNNlayer	USN-7	Upload the image and click on the predict button to view the result on the "base.html" page on the local host	1	Low	D.Joshualravel
Sprint-4	AddingDenseLayer	USN-8	Upload an image and see the predicted result	1	Medium	S.Mahalakshmi

6.2 Sprint Delivery Schedule:

Sprint	TotalStory Points	Duration	SprintStartDate	SprintEndDate(Planned)	Story PointsCompleted (ason PlannedEndDate)	SprintReleaseDate(Actual)
Sprint-1	20	6Days	24Oct2022	29Oct2022	20	29Oct2022
Sprint-2	20	6Days	31Oct2022	05Nov2022	20	05Nov2022
Sprint-3	20	6Days	07Nov2022	12Nov2022	20	12Nov2022
Sprint-4	20	6Days	14Nov2022	19Nov2022	20	19Nov2022

6.3 Reports from JIRA:
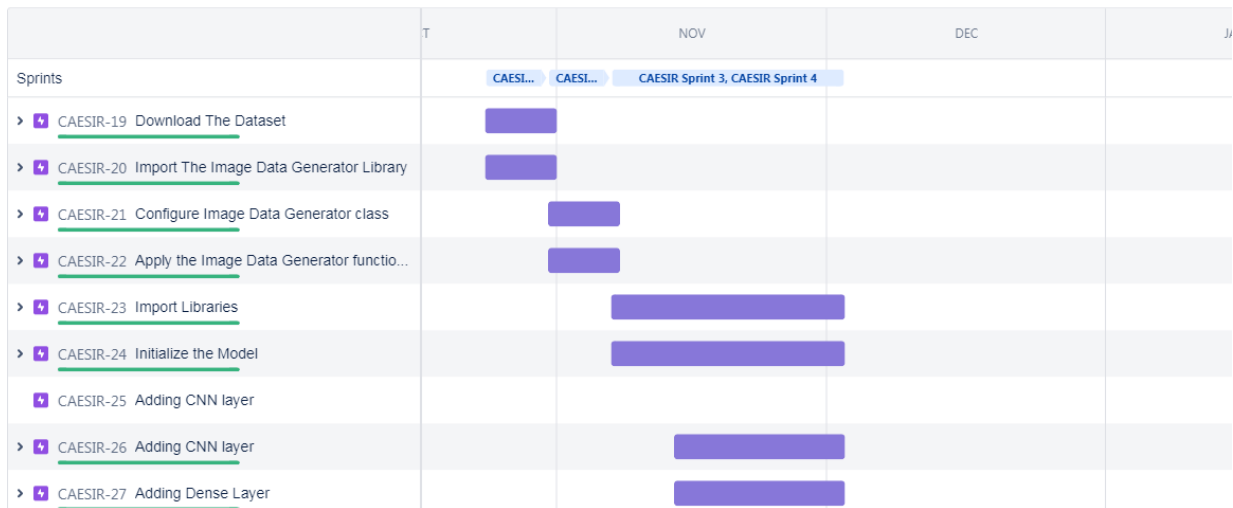
7. CODING & SOLUTIONING (Explain the features added in the project along with code):

7.1 Feature 1:

7.2 Feature 2:
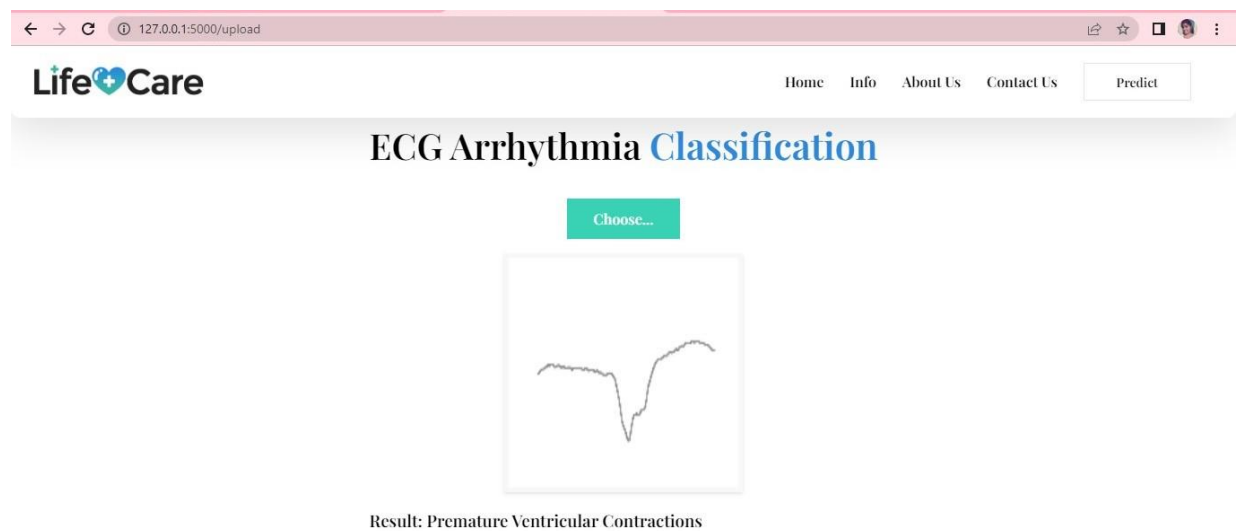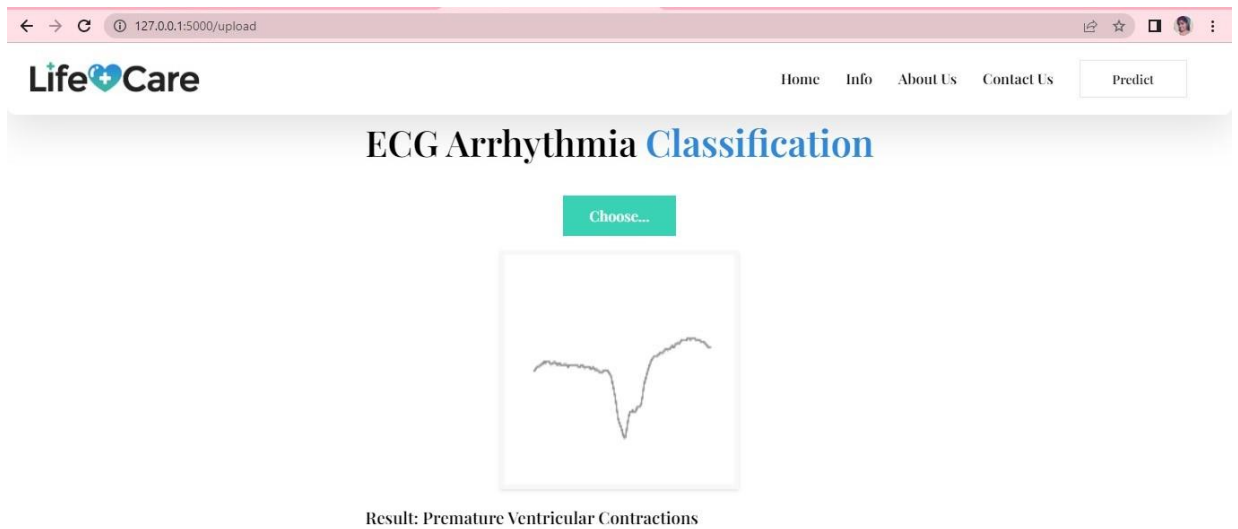
8 TESTING:

8.1 Test Cases:

Section	TotalCases	Not Tested	Fail	Pass
PrintEngine	7	0	0	7
ClientApplication	51	0	0	51
Security	2	0	0	2
OutsourceShipping	3	0	0	3
ExceptionReporting	9	0	0	9
FinalReportOutput	4	0	0	4
VersionControl	2	0	0	2

8.2 User Acceptance Testing:

Resolution	Severity1	Severity2	Severity3	Severity4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won'tFix	0	5	2	1	8
Totals	24	14	13	26	77

9   RESULTS

9.1 Performance Metrics:

```
In [15]: model.fit_generator(generator=x_train,steps_per_epoch = len(x_train), epochs=10, validation_data=x_test,validation_steps = len(x_test))

C:\Users\Saipriya\AppData\Local\Temp\ipykernel_16540\53529216.py:1: UserWarning: `Model.fit_generator` is deprecated and will be removed in a future v
ersion. Please use `Model.fit`, which supports generators.
  model.fit_generator(generator=x_train,steps_per_epoch = len(x_train), epochs=10, validation_data=x_test,validation_steps = len(x_test))
Epoch 1/10
480/480 [==============================] - 90s 184ms/step - loss: 0.7718 - accuracy: 0.7376 - val_loss: 0.4899 - val_accuracy: 0.8243
Epoch 2/10
480/480 [==============================] - 103s 225ms/step - loss: 0.2681 - accuracy: 0.9218 - val_loss: 0.4358 - val_accuracy: 0.8598
Epoch 3/10
480/480 [==============================] - 93s 194ms/step - loss: 0.2177 - accuracy: 0.9355 - val_loss: 0.3288 - val_accuracy: 0.9116
Epoch 4/10
480/480 [==============================] - 84s 175ms/step - loss: 0.1848 - accuracy: 0.9459 - val_loss: 0.3467 - val_accuracy: 0.8919
Epoch 5/10
480/480 [==============================] - 101s 210ms/step - loss: 0.1577 - accuracy: 0.9529 - val_loss: 0.3456 - val_accuracy: 0.9034
Epoch 6/10
480/480 [==============================] - 96s 200ms/step - loss: 0.1411 - accuracy: 0.9576 - val_loss: 0.4097 - val_accuracy: 0.8983
Epoch 7/10
480/480 [==============================] - 83s 173ms/step - loss: 0.1204 - accuracy: 0.9621 - val_loss: 0.4474 - val_accuracy: 0.8908
Epoch 8/10
480/480 [==============================] - 79s 165ms/step - loss: 0.1196 - accuracy: 0.9643 - val_loss: 0.3226 - val_accuracy: 0.9197
Epoch 9/10
480/480 [==============================] - 66s 126ms/step - loss: 0.1058 - accuracy: 0.9635 - val_loss: 0.4323 - val_accuracy: 0.8963
Epoch 10/10
480/480 [==============================] - 68s 141ms/step - loss: 0.1028 - accuracy: 0.9631 - val_loss: 0.3876 - val_accuracy: 0.9127
```

10 ADVANTAGES & DISADVANTAGES:

Advantages:

- The proposed model predicts Arrhythmia in images with a high accuracy rate of nearly96%
- The early detection of Arrhythmia gives better understanding of disease causes,initiates therapeutic interventions and enables developing appropriate treatments.

Disadvantages:

- Not useful for identifying the different stages of Arrhythmia disease.
- Not useful in monitoring motor symptoms.

11 CONCLUSION:

- Cardiovascular disease is a major health problem in today's world.
- The earlydiagnosis of cardiac arrhythmia highly relies on the ECG.
- Unfortunately, the expert level of medical resources is rare, visually identify the ECGsignal is challenging and time-consuming.
- The advantages of the proposed CNN network have been put to evidence.
- It is endowed with an ability to effectively process the non-filtered dataset with itspotential anti-noise features. Besides that, ten-fold cross-validation is implemented inthis work to further demonstrate the robustness of the network.

12 FUTURE SCOPE:

For future work, it would be interesting to explore the use of optimization techniques to find a feasible design and solution. The limitation of our study is that we have yet to apply any optimization techniques to optimize the model parameters and we believe that with the implementation of the optimization, it will be able to further elevate the performance of the proposed solution to the next level.

13 APPENDIX:

13.1 Source Code:

STATIC:

CSS:

About.css:

- **contact.css**

- **main.css**

- **style.css**

Static CSS:

```css
{
  text-decoration: none !important;
  margin: 0;
  padding: 0;
  box-sizing: border-box;
}

@font-face {
  font-family: Exo;
  src: url(./fonts/Exo2.0-Medium.otf);
}

.main {
  height: 400px;
  margin: 60px;
  background-color: #2f8be0;
  display: flex;
  flex-direction: row;
  padding: 50px;
  justify-content: space-evenly;
  align-items: center;
  border-radius: 120px 20px;
}

.profile-card {
  position: relative;
  font-family: sans-serif;
  width: 220px;
  height: 220px;
  background: #fff;
  padding: 30px;
  border-radius: 50%;
  box-shadow: 0 0 22px #3336;
```

```css
  transition: 0.6s;
  margin: 0 25px;
}

.profile-card:hover {
  border-radius: 10px;
  height: 260px;
}

.profile-card .img {
  position: relative;
  width: 100%;
  height: 100%;
  transition: 0.6s;
  z-index: 99;
}

.profile-card:hover .img {
  transform: translateY(-60px);
}

.img img {
  width: 100%;
  border-radius: 50%;
  box-shadow: 0 0 22px #3336;
  transition: 0.6s;
}

.profile-card:hover img {
  border-radius: 10px;
}

.caption {
  text-align: center;
  transform: translateY(-80px);
  opacity: 0;
  transition: 0.6s;
}

.profile-card:hover .caption {
  opacity: 1;
}

.caption h3 {
  font-size: 21px;
  font-family: sans-serif;
}

.caption p {
  font-size: 15px;
  color: #0c52a1;
  font-family: sans-serif;
  margin: 2px 0 9px 0;
}

.caption .social-links a {
  color: #333;
  margin-right: 15px;
  font-size: 21px;
```

```
    transition: 0.6s;
}


.social-links a:hover {
  color: #0c52a1;
}
```

Static-CSS (contact.css):
```css
body,
html {
  background-color: #fff;
  font-family: "Playfair Display", serif;
  overflow-x: hidden !important;
  margin: 0px !important;
  padding: 0px !important;
}
* {
  margin: 0;
  padding: 0;
  box-sizing: border-box;
}
.wrapper {
  width: 100%;
  min-height: 100vh;
  display: flex;
  justify-content: center;
  align-items: center;
  position: relative;
}
.container {
  margin-top: 80px;
  width: 80%;
  height: 80vh;
  display: flex;
  align-items: center;
  justify-content: center;
  overflow: hidden;
  box-shadow: 0px 2px 15px -4px #9e9e9e;
  border-radius: 5px;
  animation: container 1.5s ease;
}
.container .image {
  width: 50%;
  height: 100vh;
  display: flex;
  align-items: center;
  position: relative;
}
.container .image::before {
  content: "";
  position: absolute;
  height: 100%;
  width: 100%;
  background-color: #f0f6ff;
  clip-path: polygon(0% 0%, 75% 0%, 100% 50%, 75% 100%, 0% 100%);
}
.container .image img {
  margin-left: 50px;
```

```css
    height: 400px;
    z-index: 1;
}
.container .form-area {
    display: flex;
    width: 50%;
    flex-direction: column;
    justify-content: center;
    align-items: center;
    animation: form 1.8s ease;
}

.container .form-area h2 {
    font-size: 30px;
    font-family: "Playfair Display", serif;
}
.container .form-area form {
    width: 60%;
    display: flex;
    flex-direction: column;
    margin-top: 30px;
}
.container .form-area form input {
    font-family: "Playfair Display", serif;
    padding: 15px 5px;
    margin-bottom: 10px;
    border: none;
    border-bottom: 1px solid #ddd;
    outline: none;
}
.container .form-area form input::placeholder {
    color: #999;
    letter-spacing: 1px;
}
.container .form-area form input:hover::placeholder,
.container .form-area form textarea:hover::placeholder {
    padding-left: 10px;
    transition: 0.3s all ease-in-out;
}
.container .form-area form input:focus,
.container .form-area form textarea:focus {
    border-bottom: 1px solid #62c3fc;
    animation: border 0.5s ease;
}
.container .form-area form textarea {
    font-family: "Playfair Display", serif;
    border: none;
    border-bottom: 1px solid #ddd;
    outline: none;
    resize: none;
    padding: 0px 5px;
}
.container .form-area form textarea::placeholder {
    font-size: 14px;
    color: #999;
}
.container .form-area form button {
    font-family: "Playfair Display", serif;
    margin-top: 10px;
```

```css
  border: none;
  padding: 10px 0px;
  border-radius: 30px;
  background-color: #62c3fc;
  color: #fff;
  font-size: 17px;
  cursor: pointer;
  transition: 0.3s all ease-in-out;
}
.container .form-area form button:hover {
  background-color: #2fa5e9;
}
.container .form-area .social-icons {
  margin-top: 50px;
  display: flex;
}
.container .form-area .social-icons i {
  margin-right: 10px;
  padding: 10px;
  border-radius: 50%;
  cursor: pointer;
}
.container .form-area .social-icons .facebook {
  background-color: #3b5998;
  color: #fff;
}
.container .form-area .social-icons .instagram {
  background: linear-gradient(167deg, #0085fc 0%, #f700da 30%, #f7ed00 90%);
  color: #fff;
}
.container .form-area .social-icons .linkedin {
  background-color: #0e76a8;
  color: #fff;
}
```

Static-CSS (Main.css):

```css
.img-preview {
  width: 256px;
  height: 256px;
  position: relative;
  border: 5px solid #f8f8f8;
  box-shadow: 0px 2px 4px 0px rgba(0, 0, 0, 0.1);
  margin-top: 1em;
  margin-bottom: 1em;
}

.img-preview > div {
  width: 100%;
  height: 100%;
  background-size: 256px 256px;
  background-repeat: no-repeat;
  background-position: center;
}

input[type="file"] {
  display: none;
```

```css
}

.upload-label {
  display: inline-block;
  padding: 12px 30px;
  background: #39d2b4;
  color: #fff;
  font-size: 1em;
  transition: all 0.4s;
  cursor: pointer;
}

.upload-label:hover {
  background: #34495e;
  color: #39d2b4;
}

.loader {
  border: 8px solid #f3f3f3; /* Light grey */
  border-top: 8px solid #3498db; /* Blue */
  border-radius: 50%;
  width: 50px;
  height: 50px;
  animation: spin 1s linear infinite;
}

@keyframes spin {
  0% {
    transform: rotate(0deg);
  }
  100% {
    transform: rotate(360deg);
  }
}
```

Static-CSS (Style.css):

```css
.img-preview {
  width: 256px;
  height: 256px;
  position: relative;
  border: 5px solid #f8f8f8;
  box-shadow: 0px 2px 4px 0px rgba(0, 0, 0, 0.1);
  margin-top: 1em;
  margin-bottom: 1em;
}

.img-preview > div {
  width: 100%;
  height: 100%;
  background-size: 256px 256px;
  background-repeat: no-repeat;
  background-position: center;
}

input[type="file"] {
  display: none;
}
```

```css
.upload-label {
  display: inline-block;
  padding: 12px 30px;
  background: #39d2b4;
  color: #fff;
  font-size: 1em;
  transition: all 0.4s;
  cursor: pointer;
}

.upload-label:hover {
  background: #34495e;
  color: #39d2b4;
}

.loader {
  border: 8px solid #f3f3f3; /* Light grey */
  border-top: 8px solid #3498db; /* Blue */
  border-radius: 50%;
  width: 50px;
  height: 50px;
  animation: spin 1s linear infinite;
}

@keyframes spin {
  0% {
    transform: rotate(0deg);
  }
  100% {
    transform: rotate(360deg);
  }
}
```

Static-JS:

```css
body::-webkit-scrollbar {
  display: none;
}
body,
html {
  background-color: #fff;
  font-family: "Playfair Display", serif;
  overflow-x: hidden !important;
  margin: 0px !important;
  padding: 0px !important;
}
* {
  text-decoration: none !important;
}
/* Navigation Bar */
.nav {
  position: fixed;
  z-index: 1000;
  top: 0;
  right: 0;
  left: 0;
  height: 80px;
```

```css
  display: flex;
  flex-direction: row;
  justify-content: space-between;
  align-items: center;
  padding: 0 25px 0 25px;
  background-color: #fff;
  box-shadow: 0 19px 38px rgba(0, 0, 0, 0.1);
  border-bottom-left-radius: 10px;
  border-bottom-right-radius: 10px;
}
.nav .links a {
  margin-right: 25px;
  font-size: 16px;
  font-weight: 600;
  color: #000;
}
.nav .links .mainLink {
  color: #e8501b;
}

.nav .links a:hover {
  color: #007bff;
}
.nav .links .btn1 {
  padding: 8px 34px;
  margin-left: 10px 0px 10px 0px;
  display: inline-block;
  padding: 10.5px 36px;
  font-size: 14px;
  color: #000;
  -o-transition: all 0.4s ease-in-out;
  -webkit-transition: all 0.4s ease-in-out;
  transition: all 0.4s ease-in-out;
  text-transform: capitalize;
  border: 1px solid #e4e6ea;
  font-family: "Playfair Display", serif;
}

.nav .links .btn1:hover {
  color: #fff;
  border-radius: 45px;
  background-color: #007bff;
}

.nav .user-pic {
  width: 40px;
  border-radius: 50%;
  cursor: pointer;
  margin-left: 30px;
}
/* Landing CSS */
.landing {
  display: flex;
  flex-direction: row;
  justify-content: space-between;
  align-items: center;
  padding: 0 10vw 0 10vw;
  height: 90vh;
}
```

```css
.landingText h1 {
  font-size: 4vw;
  margin: 0 !important;
}
.landingText h3 {
  margin: 6px !important;
  font-size: 15px;
  line-height: 1.8;
  color: #777777;
  font-family: "Playfair Display", serif;
  padding-right: 20px;
}
.landingText .btn2 {
  width: 120px;
  margin-top: 30px;
  padding: 14px 20px 12px 20px;
  background-color: #007bff;
  border-radius: 45px;
  text-align: center;
}
.landingText .btn2 a {
  font-size: 1.2vw;
  color: #fff;
}
.landingImage img {
  width: 42vw;
}

/*Services Css*/
.about {
  height: 600px;
  padding: 30px 50px 30px 50px;
  display: flex;
  flex-direction: row;
  justify-content: space-evenly;
  align-items: center;
}
.aboutText {
  position: relative;
  padding: 0 50px;
  height: inherit;
}
.aboutText h1 {
  position: relative;
  left: 110px;
}
.aboutText img {
  width: 42vw;
  position: absolute;
  top: 50px;
}
.aboutList {
  width: 50%;
}
ol {
  list-style-type: none;
  color: #e0501b;
}
ol li {
```

```css
  font-size: 34px;
  position: relative;
  margin-bottom: 20px;
  border-bottom: 1px solid #ebebeb;
}
li p {
  font-size: 16px;
  color: #000;
  padding-left: 60px;
  line-height: 30px;
  opacity: 0.6;
}
li span {
  position: absolute;
  line-height: 25px;
  font-weight: 600;
}

/*Info Section*/
.infoSection {
  height: 600px;
}
.infoHeader {
  text-align: center;
  margin-bottom: 40px;
}
.infoCards {
  display: flex;
  flex-direction: row;
  justify-content: space-around;
  align-items: center;
  padding: 40px 0 40px 0;
}
.infoCards .card {
  position: relative;
  height: 360px;
  width: 360px;
  background: #fff;
  box-shadow: 0 10px 22px rgba(0, 0, 0, 0.9);
}
.infoCards .one .cardoneImg {
  width: 150px;
  position: absolute;
  top: -50px;
  right: -50px;
}
.infoCards .two .cardtwoImg {
  width: 150px;
  position: absolute;
  top: -50px;
  right: -50px;
}
.infoCards .three .cardthreeImg {
  width: 150px;
  position: absolute;
  top: -50px;
  right: -30px;
}
.cardbgone {
```

```css
    height: 150px;
    border-color: #fff;
}
.cardbgtwo {
    height: 150px;
    background-color: #fff;
}
.cardbgthree {
    height: 150px;
    background-color: #fff;
}
.cardContent {
    padding: 0 20px;
}
.cardContent p {
    line-height: 30px;
    opacity: 0.6;
}
.cardContent .cardBtn {
    position: absolute;
    right: 20px;
    padding: 10px;
    background-color: #ededed;
    width: 25px;
    height: 20px;
    border-radius: 6px;
    display: flex;
    justify-content: center;
    align-items: center;
    transition: all ease-in-out 0.2s;
}
.cardContent .cardBtn:hover {
    border-color: #2f8be0;
}
.cardContent .cardBtn .cardIcon {
    position: relative;
    top: 0px;
    left: 0px;
    width: 16px;
}

/*Banner Css*/
.banner {
    height: 400px;
    background-color: #2f8be0;
    display: flex;
    flex-direction: row;
    padding: 50px;
    justify-content: space-evenly;
    align-items: center;
}
.bannerText h1 {
    font-size: 3vw;
    color: #000;
    font-weight: 600;
}
.bannerText img {
    width: 10vw;
    margin-right: 20px;
```

```css
}
.bannerImg img {
  width: 20vw;
}
/*Footer Css*/
.footer {
  height: 100px;
  display: flex;
  flex-direction: column;
  align-items: center;
  padding-bottom: 20px;
}
.footerlinks a {
  margin: 20px;
  font-size: 16px;
  font-weight: 600;
  color: #000;
}
.footer .mainLink {
  color: #e0501b;
}
.footer a:hover {
  color: #007bff;
}
body::-webkit-scrollbar {
  display: none;
}
body,
html {
  background-color: #fff;
  font-family: "Playfair Display", serif;
  overflow-x: hidden !important;
  margin: 0px !important;
  padding: 0px !important;
}
* {
  text-decoration: none !important;
}
/* Navigation Bar */
.nav {
  position: fixed;
  z-index: 1000;
  top: 0;
  right: 0;
  left: 0;
  height: 80px;
  display: flex;
  flex-direction: row;
  justify-content: space-between;
  align-items: center;
  padding: 0 25px 0 25px;
  background-color: #fff;
  box-shadow: 0 19px 38px rgba(0, 0, 0, 0.1);
  border-bottom-left-radius: 10px;
  border-bottom-right-radius: 10px;
}
.nav .links a {
  margin-right: 25px;
  font-size: 16px;
```

```css
    font-weight: 600;
    color: #000;
}
.nav .links .mainLink {
    color: #e8501b;
}

.nav .links a:hover {
    color: #007bff;
}
.nav .links .btn1 {
    padding: 8px 34px;
    margin-left: 10px 0px 10px 0px;
    display: inline-block;
    padding: 10.5px 36px;
    font-size: 14px;
    color: #000;
    -o-transition: all 0.4s ease-in-out;
    -webkit-transition: all 0.4s ease-in-out;
    transition: all 0.4s ease-in-out;
    text-transform: capitalize;
    border: 1px solid #e4e6ea;
    font-family: "Playfair Display", serif;
}

.nav .links .btn1:hover {
    color: #fff;
    border-radius: 45px;
    background-color: #007bff;
}

.nav .user-pic {
    width: 40px;
    border-radius: 50%;
    cursor: pointer;
    margin-left: 30px;
}
/* Landing CSS */
.landing {
    display: flex;
    flex-direction: row;
    justify-content: space-between;
    align-items: center;
    padding: 0 10vw 0 10vw;
    height: 90vh;
}
.landingText h1 {
    font-size: 4vw;
    margin: 0 !important;
}
.landingText h3 {
    margin: 6px !important;
    font-size: 15px;
    line-height: 1.8;
    color: #777777;
    font-family: "Playfair Display", serif;
    padding-right: 20px;
}
.landingText .btn2 {
```

```css
    width: 120px;
    margin-top: 30px;
    padding: 14px 20px 12px 20px;
    background-color: #007bff;
    border-radius: 45px;
    text-align: center;
}
.landingText .btn2 a {
    font-size: 1.2vw;
    color: #fff;
}
.landingImage img {
    width: 42vw;
}

/*Services Css*/
.about {
    height: 600px;
    padding: 30px 50px 30px 50px;
    display: flex;
    flex-direction: row;
    justify-content: space-evenly;
    align-items: center;
}
.aboutText {
    position: relative;
    padding: 0 50px;
    height: inherit;
}
.aboutText h1 {
    position: relative;
    left: 110px;
}
.aboutText img {
    width: 42vw;
    position: absolute;
    top: 50px;
}
.aboutList {
    width: 50%;
}
ol {
    list-style-type: none;
    color: #e0501b;
}
ol li {
    font-size: 34px;
    position: relative;
    margin-bottom: 20px;
    border-bottom: 1px solid #ebebeb;
}
li p {
    font-size: 16px;
    color: #000;
    padding-left: 60px;
    line-height: 30px;
    opacity: 0.6;
}
li span {
```

```css
  position: absolute;
  line-height: 25px;
  font-weight: 600;
}

/*Info Section*/
.infoSection {
  height: 600px;
}
.infoHeader {
  text-align: center;
  margin-bottom: 40px;
}
.infoCards {
  display: flex;
  flex-direction: row;
  justify-content: space-around;
  align-items: center;
  padding: 40px 0 40px 0;
}
.infoCards .card {
  position: relative;
  height: 360px;
  width: 360px;
  background: #fff;
  box-shadow: 0 10px 22px rgba(0, 0, 0, 0.9);
}
.infoCards .one .cardoneImg {
  width: 150px;
  position: absolute;
  top: -50px;
  right: -50px;
}
.infoCards .two .cardtwoImg {
  width: 150px;
  position: absolute;
  top: -50px;
  right: -50px;
}
.infoCards .three .cardthreeImg {
  width: 150px;
  position: absolute;
  top: -50px;
  right: -30px;
}
.cardbgone {
  height: 150px;
  border-color: #fff;
}
.cardbgtwo {
  height: 150px;
  background-color: #fff;
}
.cardbgthree {
  height: 150px;
  background-color: #fff;
}
.cardContent {
  padding: 0 20px;
```

```css
}
.cardContent p {
  line-height: 30px;
  opacity: 0.6;
}
.cardContent .cardBtn {
  position: absolute;
  right: 20px;
  padding: 10px;
  background-color: #ededed;
  width: 25px;
  height: 20px;
  border-radius: 6px;
  display: flex;
  justify-content: center;
  align-items: center;
  transition: all ease-in-out 0.2s;
}
.cardContent .cardBtn:hover {
  border-color: #2f8be0;
}
.cardContent .cardBtn .cardIcon {
  position: relative;
  top: 0px;
  left: 0px;
  width: 16px;
}

/*Banner Css*/
.banner {
  height: 400px;
  background-color: #2f8be0;
  display: flex;
  flex-direction: row;
  padding: 50px;
  justify-content: space-evenly;
  align-items: center;
}
.bannerText h1 {
  font-size: 3vw;
  color: #000;
  font-weight: 600;
}
.bannerText img {
  width: 10vw;
  margin-right: 20px;
}
.bannerImg img {
  width: 20vw;
}
/*Footer Css*/
.footer {
  height: 100px;
  display: flex;
  flex-direction: column;
  align-items: center;
  padding-bottom: 20px;
}
.footerlinks a {
```

```css
  margin: 20px;
  font-size: 16px;
  font-weight: 600;
  color: #000;
}
.footer .mainLink {
  color: #e0501b;
}
.footer a:hover {
  color: #007bff;
}
```

Static-js(Main.js):

```javascript
$(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();
        $('#btn-predict').show();
        $('#result').text('');
        $('#result').hide();
        readURL(this);
    });

    // Predict
    $('#btn-predict').click(function () {
        var form_data = new FormData($('#upload-file')[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
```

```
                $('.loader').hide();
                $('#result').fadeIn(600);
                $('#result').text(' Result:  ' + data);
                console.log('Success!');
            },
        });
    });

});
```

TEMPLATES:

Templates-about.html:

```html
<!DOCTYPE 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=1.0">
    <link rel="shortcut icon" href="{{url_for('static', filename='images/fevicon.png' )}}"
type="image/x-icon">
    <title>Life Care - About Us</title>
    <link rel="stylesheet" href="{{url_for('static', filename='css/about.css')}}">
    <link rel="stylesheet" href="{{url_for('static', filename='css/style.css')}}">
    <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/aos/2.3.1/aos.css"
/>
    <link
href="https://fonts.googleapis.com/css2?family=Playfair+Display:wght@600&display=swap"
rel="stylesheet" />
    <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.png" alt="Website Title"
style="width:190px" /></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>
```

```html
        </div>
        <div class="landing">
            <div class="landingText" data-aos="fade-up" data-aous-duration="1000">
                <h1>
                    We are a team of
                    <span style="color: #e0501b; font-size: 4vw">Arrthymia Prediction</span>
                </h1>
                <h3>
                    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: 450px;
height:450px" />
            </div>
        </div>
        <div class="main">
            <div class="profile-card">
                <div class="img">
                    <img src="static/images/profile_avatar.png">
                </div>
                <div class="caption">
                    <h3>Muthamizhan Rio</h3>
                    <p>Professional Deep Learning Engineer, Back End Developer</p>
                    <div class="social-links">
                        <a href="#"><i class="fab fa-facebook"></i></a>
                        <a href="#"><i class="fab fa-instagram"></i></a>
                        <a href="#"><i class="fab fa-twitter"></i></a>
                    </div>
                </div>
            </div>
            <div class="profile-card">
                <div class="img">
                    <img src="static/images/profile_avatar.png">
                </div>
                <div class="caption">
                    <h3>Vignesh </h3>
                    <p>Full Stack Developer, Web Designer, Deep Learning Engineer</p>
                    <div class="social-links">
                        <a href="#"><i class="fab fa-facebook"></i></a>
                        <a href="https://www.instagram.com/the_._champ/"><i class="fab fa-
instagram"></i></a>
                        <a href="#"><i class="fab fa-twitter"></i></a>
                    </div>
                </div>
            </div>
            <div class="profile-card">
```

```html
                <div class="img">
                    <img src="static/images/profile_avatar.png">
                </div>
                <div class="caption">
                    <h3>Vetriselvan</h3>
                    <p>Back End Developer</p>
                    <div class="social-links">
                        <a href="#"><i class="fab fa-facebook"></i></a>
                        <a href="#"><i class="fab fa-instagram"></i></a>
                        <a href="#"><i class="fab fa-twitter"></i></a>
                    </div>
                </div>
            </div>
            <div class="profile-card">
                <div class="img">
                    <img src="static/images/profile_avatar.png">
                </div>
                <div class="caption">
                    <h3>Bharathidasan</h3>
                    <p>Front End Developer</p>
                    <div class="social-links">
                        <a href="#"><i class="fab fa-facebook"></i></a>
                        <a href="#"><i class="fab fa-instagram"></i></a>
                        <a href="#"><i class="fab fa-twitter"></i></a>
                    </div>
                </div>
            </div>
        </div>
        <div class="footer">
            <h1>LifeCare</h1>
            <div class="footerlinks">
                <a href="/home">Home</a>
                <a href="/info">Info</a>
                <a href="/about">About Us</a>
                <a href="/contact">Contact Us</a>
            </div>
        </div>
    </div>

    </div>
    <script src="https://cdnjs.cloudflare.com/ajax/libs/aos/2.3.1/aos.js"></script>
    <script>
        AOS.init();
    </script>
</body>

</html>
```

Templates-Contact.Html:

```html
!DOCTYPE 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=1.0">
    <link rel="shortcut icon" href="{{url_for('static', filename='images/fevicon.png' )}}"
```

```html
type="image/x-icon">
    <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/aos/2.3.1/aos.css"
/>
    <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-
awesome/5.15.3/css/all.min.css" />
    <link
href="https://fonts.googleapis.com/css2?family=Playfair+Display:wght@600&display=swap"
rel="stylesheet" />
    <link rel="stylesheet" href="{{url_for('static', filename='css/contact.css' )}}" />
    <link rel="stylesheet" href="{{url_for('static', filename='css/style.css' )}}" />
    <title>Life Care - Contact US</title>
</head>

<body>
    <div class="wrapper">
        <div class="nav">
            <div class="logo">
                <a href="/">
                    <img src="static\images\logo.png" style="width:190px" />
                </a>
            </div>
            <div class="links">
                <a href="/home" class="mainLink">Home</a>
                <a href="/info">Info</a>
                <a href="/about">About Us</a>
                <a href="/contact">Contact Us</a>
                <a href="/upload" class="btn1">Predict</a>
            </div>
        </div>
        <div class="container" data-aos="fade-down" data-aous-duration="1000">
            <div class="image" data-aos="fade-right" data-aous-duration="6000">
                <img src="static/images/contact.png" alt="">
            </div>
            <div class="form-area">
                <h2>Contact US</h2>
                <form action="">
                    <input type="text" placeholder="Full Name">
                    <input type="email" placeholder="Email">
                    <input type="text" placeholder="Subject">
                    <textarea cols="30" rows="3" placeholder="Your Message"></textarea>
                    <button type="submit">Send Message</button>
                </form>
            </div>
        </div>
    </div>
    <script src="https://cdnjs.cloudflare.com/ajax/libs/aos/2.3.1/aos.js"></script>
    <script>
        AOS.init();
    </script>
</body>

</html>
```

Templates-index.Html:

```html
<!DOCTYPE html>
<html lang="en">

<head>
```

```html
    <meta charset="UTF-8" />
    <meta http-equiv="X-UA-Compatible" content="IE=edge" />
    <meta name="viewport" content="width=device-width, initial-scale=1.0" />
    <title>Life Care - Heart Prediction Online</title>
    <link rel="shortcut icon" href="{{url_for('static', filename='images/fevicon.png' )}}"
type="image/x-icon">
    <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/aos/2.3.1/aos.css" />
    <link
href="https://fonts.googleapis.com/css2?family=Playfair+Display:wght@600&display=swap"
rel="stylesheet" />
    <link rel="stylesheet" href="{{url_for('static', filename='css/style.css' )}}" />
    <script src="https://kit.fontawesome.com/64d58efce2.js" crossorigin="anonymous">
    </script>
</head>

<body>
    <div class="wrapper">
        <!--Navigation Bar-->
        <div class="nav">
            <div class="logo">
                <a href="/">
                    <img src="static\images\logo.png" style="width:190px" />
                </a>
            </div>
            <div class="links">
                <a href="/home" class="mainLink">Home</a>
                <a href="/info">Info</a>
                <a href="/about">About Us</a>
                <a href="/contact">Contact Us</a>
                <a href="/upload" class="btn1">Predict</a>
            </div>
        </div>
        <!--Landing Page-->
        <div class="landing">
            <div class="landingText" data-aos="fade-up" data-aous-duration="1000">
                <h1>
                    Classification of Arrhythmia
                    <span style="color: #e0501b; font-size: 4vw">Prediction</span>
                </h1>
                <h3>
                    According to the World Health Organization (WHO), cardiovascular diseases (CVDs)
are the number one cause of
                    death today. Over 17.7 million people died from CVDs in the
                    year 2017 all over the world which...
                </h3>

                <div class="btn2"><a href="/info">Read more</a>
                </div>
            </div>
            <div class="landingImage" data-aos="fade-down" data-aous-duration="2000">
                <img src="static/images/banner_img.jpg" alt="bannerImg" style="width: 500px;
height:360px" />
            </div>
        </div>

        <!--Service Section-->
        <div class="about">
            <div class="aboutText" data-aos="fade-up" data-aous-duration="1000">
                <h1 style="margin: 20px;">
```

```html
                Our Patients Are at Centre
            <span style="color: #2f8be0; font-size: 3vw">of Every We Do</span>
          </h1>
          <div class="image-container">
            <img src="/static/images/connsultPationt.png" alt="consultPationt"
              style="width:400px; margin:100px 0px 0px 90px;"></img>
          </div>
        </div>
        <div class="aboutList" data-aos="fade-left" data-aous-duration="1000">
          <ol>
            <li>
              <span>01</span>
              <p>99.8% accurate result.</p>
            </li>
            <li>
              <span>02</span>
              <p>No need to go hospital.</p>
            </li>
            <li>
              <span>03</span>
              <p>No need to login</p>
            </li>
            <li>
              <span>04</span>
              <p>24/7 Support.</p>
            </li>
          </ol>
        </div>
      </div>

      <!--Info Section-->
      <div class="infoSection">
        <div class="infoHeader" data-aos="fade-up" data-aous-duration="1000">
          <h1>
            We Analyse Youe Health states <br /><span style="color: #e0501b">In Order to Top
Service.</span>
          </h1>
        </div>
        <div class="infoCards">
          <div class="card one" data-aos="fade-up" data-aous-duration="1000">
            <img src="static/images/banner_1.svg" class="cardoneImg" alt="" data-aos="fade-up"
              data-aous-duration="1100" />
            <div class="cardbgone"></div>
            <div class="cardContent">
              <h2>Health State</h2>
              <p>
                Easy to know Health state
              </p>
              <a href="/">
                <div class="cardBtn">
                  <img src="static/images/next.png" alt="" class="cardIcon" />
                </div>
              </a>
            </div>
          </div>
          <div class="card two" data-aos="fade-up" data-aous-duration="1300">
            <img src="static/images/banner_1.svg" class="cardtwoImg" alt="" data-aos="fade-up"
              data-aous-duration="1200" />
            <div class="cardbgtwo"></div>
```

```html
        <div class="cardContent">
          <h2>User Friendly</h2>
          <p>
            Easy for people to use, prediction
          </p>
          <a href="/">
            <div class="cardBtn">
              <img src="static/images/next.png" alt="" class="cardIcon" />
            </div>
          </a>
        </div>
      </div>
      <div class="card three" data-aos="fade-up" data-aous-duration="1600">
        <img src="static/images/banner_1.svg" class="cardthreeImg" alt="" data-aos="fade-up"
          data-aous-duration="1000" />
        <div class="cardbgthree"></div>
        <div class="cardContent">
          <h2>Classification of Arrhythmia</h2>
          <p>
            Prediction Classification of Arrhythmia
          </p>
          <a href="/upload">
            <div class="cardBtn">
              <img src="static/images/next.png" alt="" class="cardIcon" />
            </div>
          </a>
        </div>
      </div>
    </div>
  </div>

  <!--Banner And Footer-->
  <div class="banner">
    <div class="bannerText" data-aos="fade-right" data-aous-duration="1000">
      <h1>
        Download the LifeCare App Today <br /><span style="font-size: 1.6vw; font-weight: normal"
          class="bannerInnerText">Stay Updated and get all your medical needs taken care
of!</span>
      </h1>
      <a href="/"><img src="static/images/AndroidPNG.png" alt="" /></a>
      <a href="/"><img src="static/images/iosPNG.png" alt="" /></a>
    </div>
    <div class="bannerImg" data-aos="fade-up" data-aous-duration="1000">
      <img src="static/images/app.png" alt="" />
    </div>
  </div>

  <div class="footer">
    <h1>LifeCare</h1>
    <div class="footerlinks">
      <a href="/home" class="mainLink">Home</a>
      <a href="/info">Info</a>
      <a href="/about">About Us</a>
      <a href="/contact">Contact Us</a>
    </div>
  </div>
</div>
```

```
  <script src="https://cdnjs.cloudflare.com/ajax/libs/aos/2.3.1/aos.js"></script>
  <script>
    AOS.init();
  </script>
</body>

</html>
```

Template-info.Html:

```
!DOCTYPE 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=1.0" />
    <title>Life Care - About Classification of Arrhythmia</title>
    <link rel="shortcut icon" href="{{url_for('static', filename='images/fevicon.png' )}}" type="image/x-icon"
    <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/aos/2.3.1/aos.css" />
    <link href="https://fonts.googleapis.com/css2?family=Playfair+Display:wght@600&display=swap" rel="styleshe
    <link rel="stylesheet" href="{{url_for('static', filename='css/style.css' )}}" />
    <script src="https://kit.fontawesome.com/64d58efce2.js" crossorigin="anonymous">
    </script>
    <style>
        .banner {
            margin: 60px;
            width: auto;
            height: 300px;
            /* Setup */
            background-color: #fff;
            box-shadow: rgba(0, 0, 0, 0.15) 2.4px 2.4px 3.2px;
            display: flex;
            flex-direction: row;
            padding: 50px;
        }

        .bannerText h1 {
            font-size: 3vw;
            color: #007bff;
            font-weight: 600;
        }

        .bannerText p {
            text-indent: 50px;
            color: #777777;
            font-size: 1.2vw;
            font-weight: normal
        }

        .bannerText img {
            width: 10vw;
            margin-right: 20px;
        }

        .bannerImg img {
            margin-left: 90px;
            width: 350px;
```

```html
            }
        </style>
    </head>

<body>
    <div class="wrapper">
        <!--Navigation Bar-->
        <div class="nav">
            <div class="logo">
                <a href="/"><img src="static/images/logo.png" alt="Website Title" style="width:190px" /></a>
            </div>
            <div class="links">
                <a href="/home">Home</a>
                <a href="/info" class="mainLink">info</a>
                <a href="/about">About Us</a>
                <a href="/contact">Contact Us</a>
                <a href="/upload" class="btn1">Predict</a>
            </div>
        </div>
        <!--Landing Page-->
        <div class="landing">
            <div class="landingText" data-aos="fade-up" data-aous-duration="1000">
                <h1>
                    Classification of Arrhythmia
                    <span style="color: #e0501b; font-size: 4vw">Prediction</span>
                </h1>
                <h3>
                    According to the World Health Organization (WHO), cardiovascular diseases (CVDs) are the n
                    cause of death
                    today. Over 17.7 million people died from CVDs in the year 2017 all over the world which i
                    31% of all deaths, and
                    over 75% of these deaths occur in low and middle-income countries. Arrhythmia is a represe
                    type of CVD that
                    refers to any irregular change from the normal heart rhythms. There are several types of a
                    including atrial
                    fibrillation, premature contraction, ventricular fibrillation, and tachycardia. Although a
                    arrhythmia heartbeat
                    may not have a serious impact on life, continuous arrhythmia beats can result in fatal
                    circumstances.
                </h3>
            </div>
            <div class="landingImage" data-aos="fade-down" data-aous-duration="2000">
                <img src="static/images/banner_img.jpg" alt="bannerImg" style="width: 500px; height:360px" />
            </div>
        </div>
        <div class="banner">
            <div class="bannerText" data-aos="fade-right" data-aous-duration="1000">
                <h1>
                    Left Bundle Branch
                </h1>
                <p>A delay blockage of electrical impulses
                    to the left of the heart. Left bundle brach block sometimes
                    makes it harder for the heart to pump
                    blood efficiently through the circulatory
                    system.</p>
                <p>Most people don't have symptoms. If
                    symtoms occur, they inlcude fainting or
                    a slow heart rate.</p>
                <p>If there's an underlying condition, such
```

```html
                    as heart disease, that condition needs
                    treatment. In patients with heart failure,
                    a pacemaker can also relieve symptoms as
                    well as prevent death.</p>
            </div>
            <div class="bannerImg" data-aos="fade-up" data-aous-duration="1000">
                <img src="static/images/LBB.svg" alt="" />
            </div>
        </div>
        <div class="banner">
            <div class="bannerText" data-aos="fade-right" data-aous-duration="1000">
                <h1>
                    Normal
                </h1>
                <p>Note that the heart is beating
                    in a regular sinus rhythm
                    between 60-100 beats per
                    minute (specifically 82 bpm).</p>
                <p>All the important intervals
                    on this recording are within
                    normal ranges.</p>
                <p>The normal ECG
                    patterns seen in children
                    differ considerably from those
                    in adults.</p>
            </div>
            <div class="bannerImg" data-aos="fade-up" data-aous-duration="1000">
                <img src="static/images/normal.svg" alt="" />
            </div>
        </div>
        <div class="banner">
            <div class="bannerText" data-aos="fade-right" data-aous-duration="1000">
                <h1>
                    Premature Atrial Contraction
                </h1>
                <p>usually, premature artial contraction have
                    no clear cause and no health risks. In most
                    cases, premature artrial contractions aren't a
                    sign of heart disease and just happen
                    naturally.</p>
                <p>But some people who have PACs turn out to
                    have related heart conditions, such as
                    Cardiomyopathy (a weakend heart muscle)
                    Caronary heart disease (fatty deposits in you blood vessels)</p>
            </div>
            <div class="bannerImg" data-aos="fade-up" data-aous-duration="1000">
                <img src="static/images/PAC.jpg" alt="" />
            </div>
        </div>
        <div class="banner">
            <div class="bannerText" data-aos="fade-right" data-aous-duration="1000">
                <h1>
                    Premature Ventricular Contractions
                </h1>
                <p>Extra, abnorma heartbeats that begininone of the
                    Heart's two lower chambers.</p>
                <p>Premature ventricular contractions (PVCs) occur
                    in most people at some point. Causes may include certain
                    medication, alcohol, some illegal drugs, caffeine,
```

```html
                        tobacco, excercise or anxiety.</p>
                    <p>
                        PVCs often cause no symtoms. When symptoms do
                        occur, they feel like a flip-flop or skipped-beat
                        sensation in the chest.
                    </p>
                    <p>Most people with isolated PVCs and an otherwise
                        normal heart don't need treatment. PVCs occurring
                        continuously serious cardiac than 30 seconds is a
                        potentially serious cardiac condition known as
                        ventriclular tachycardia.</p>
                </div>
                <div class="bannerImg" data-aos="fade-up" data-aous-duration="1000">
                    <img src="static/images/PVC.jpg" alt="" />
                </div>
            </div>
            <div class="banner">
                <div class="bannerText" data-aos="fade-right" data-aous-duration="1000">
                    <h1>
                        Right Bundle Branch
                    </h1>
                    <p>Right bundle branch block is associated with
                        structural changes from strech or ischemia to
                        the myocardium. It can also occur
                        iatorgenically from certain common cardiac
                        precedures, such as right heart catheterization.</p>
                    <p>Although there is no significant association
                        with cardiovascular risk factors, the presence
                        with cardiovascular risk factors, the presence
                        of a right bundle branch block is a predictor of
                        mortality in myocardial infarction, heart
                        failure, and certain heart blocks.</p>
                    <p>In asymptomatic patients, isolated right bundle
                        brach block typically does not need further
                        evaluation.</p>
                </div>
                <div class="bannerImg" data-aos="fade-up" data-aous-duration="1000">
                    <img src="static/images/RBB.svg" alt="" />
                </div>
            </div>
            <div class="banner">
                <div class="bannerText" data-aos="fade-right" data-aous-duration="1000">
                    <h1>
                        Ventricular Fibrillation
                    </h1>
                    <p>A life-threatening heart rhythm that results in a
                        rapid, inadeuate heartbeat.</p>
                    <p>Ventricular fibrillation (VF) is a rapid,
                        Life-threatening heart rhythm starting in the bottom
                        chambers of the heart. It can be triggered by a heart attack.</p>
                    <p>Because the heart doesn't pump adequately during
                        ventricular fibrillation, sustained VF can cause
                        low blood pressure, losso f consciousness of death.</p>
                    <p>Emergency treatment includes immediate
                        defibrillation with a n automated external
                        defibrillator (AED) and cardiopulmonary
                        resuscitation(CPR). Long-term therapy includes
                        implantable defibrillators and medcations to
                        prevent recurrence.</p>
```

```html
            </div>
            <div class="bannerImg" data-aos="fade-up" data-aous-duration="1000">
                <img src="static/images/VF.png" alt="" />
            </div>
        </div>
        <div class="footer">
            <h1>LifeCare</h1>
            <div class="footerlinks">
                <a href="/home">Home</a>
                <a href="/info" class="mainLink">Info</a>
                <a href="/about">About Us</a>
                <a href="/conduct">Contact Us</a>
            </div>
        </div>
    </div>
    <script src="https://cdnjs.cloudflare.com/ajax/libs/aos/2.3.1/aos.js"></script>
    <script>
        AOS.init();
    </script>
</body>

</html>
```

Template-predictbase.html:

```html
!DOCTYPE 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=1.0" />
    <title>Life Care - Heart Prediction Online</title>
    <link rel="shortcut icon" href="{{url_for('static', filename='images/fevicon.png' )}}" type="image/x-icon"
    <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/aos/2.3.1/aos.css" />
    <link href="https://fonts.googleapis.com/css2?family=Playfair+Display:wght@600&display=swap" rel="styleshe
    <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">
    <link rel="stylesheet" href="{{url_for('static', filename='css/style.css' )}}" />
    <script src="https://kit.fontawesome.com/64d58efce2.js" crossorigin="anonymous">
    </script>
</head>

<body>
    <div class="wrapper">
        <!--Navigation Bar-->
        <div class="nav">
            <div class="logo">
                <a href="/">
                    <img src="static\images\logo.png" style="width:190px" />
                </a>
            </div>
            <div class="links">
                <a href="/">Home</a>
                <a href="/info">Info</a>
                <a href="/about">About Us</a>
```

```html
                <a href="/contact">Contact Us</a>
                <a href="/upload" class="btn1">Predict</a>
            </div>
        </div>
        <!--Landing Page-->
        <div class="landing">
            <div class="landingText" data-aos="fade-up" data-aous-duration="10000">
                <h1>
                    Classification of Arrhythmia
                    <span style="color: #e0501b; font-size: 4vw">Prediction</span>
                </h1>
                <h3>
                    According to the World Health Organization (WHO), cardiovascular diseases (CVDs) are the n
                    cause of
                    death today. Over 17.7 million people died from CVDs in the
                    year 2017 all over the world which...
                </h3>

                <div class="btn2"><a href="/info">Read more</a>
                </div>
            </div>
            <div class="landingImage" data-aos="fade-down" data-aous-duration="2000">
                <img src="static/images/banner_img.jpg" alt="bannerImg" style="width: 500px; height:360px" />
            </div>
        </div>

        <div class="about">
            <div class="aboutText" data-aos="fade-up" data-aous-duration="1000">
                {% block content %}{% endblock %}
            </div>
        </div>

        <div class="footer">
            <h1>LifeCare</h1>
            <div class="footerlinks">
                <a href="/home">Home</a>
                <a href="/info">Info</a>
                <a href="/about">About Us</a>
                <a href="/contact">Contact Us</a>
            </div>
        </div>
    </div>

    <script src="https://cdnjs.cloudflare.com/ajax/libs/aos/2.3.1/aos.js"></script>
    <script>
        AOS.init();
    </script>
</body>
<footer>
    <script src="{{ url_for('static', filename='js/main.js') }}" type="text/javascript"></script>
</footer>

</html>
```

Template-predict.html:

```html
{% extends "predict_base.html" %} {% block content %}
```

```html
<center>
    <h2 style="font-size: 40px;">
        ECG Arrhythmia
        <span style="color: #2f8be0; font-size: 3vw">Classification</span>
    </h2>
</center>

<div>
    <form id="upload-file" method="post" enctype="multipart/form-data">
        <center> <label for="imageUpload" class="upload-label">
            Choose...
        </label>
        <input type="file" name="file" id="imageUpload" accept=".png, .jpg, .jpeg">
        </center>
    </form>

    <center>
        <div class="image-section" style="display:none;">
            <div class="img-preview">
                <div id="imagePreview">
                </div>
            </div>
        </div>
    </center>
</div>
<center>
    <div class="btn3" id="btn-predict"
        style="padding: 8px 34px; width: 120px; margin-top: 30px; padding: 14px 20px 12px
20px; background-color: #007bff; border-radius: 45px; text-align: center; color: #fff;
cursor: pointer;">
        Predict</div>
    <div class="loader" style="display:none;"></div>
</center>

<h3 style="color:Black" id="result">
    <span> </span>
</h3>

</div>

</div>


{% endblock %}
```

Flask App.py:

```python
import os
import numpy as np  # used for numerical analysis
from flask import Flask, request, render_template
# 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.
# render_template- used for rendering the html pages
from keras.models import load_model  # to load our trained model
from keras.utils import load_img, img_to_array
```

```python
app = Flask(__name__)  # our flask app
model = load_model('ECG .h5')  # loading the model

@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

@app.route("/upload") #default route
def test():
    return render_template("predict.html")  #rendering contact.html

@app.route("/predict",methods=["GET","POST"]) #route for our prediction
def upload():
    if request.method == 'POST':
        f = request.files['file']  # requesting the file
        basepath = os.path.dirname('__file__')  # storing the file directory
        filepath = os.path.join(basepath, "uploads", f.filename)  # storing the file in
uploads folder
        f.save(filepath)  # saving the file

        img = load_img(filepath, target_size=(64, 64))  # load and reshaping the image
        x = img_to_array(img)  # converting image to array
        x = np.expand_dims(x, axis=0)  # changing the dimensions of the image

        preds = model.predict(x)  # predicting classes
        pred = np.argmax(preds, axis=1)  # predicting classes
        print("prediction", pred)  # printing the prediction

        index = ['Left Bundle Branch Block', 'Normal', 'Premature Atrial Contraction',
                 'Premature Ventricular Contractions', 'Right Bundle Branch Block',
'Ventricular Fibrillation']
        result = str(index[pred[0]])
        return result  # resturing the result
    return None


# port = int(os.getenv("PORT"))
if __name__ == "__main__":
    app.run(debug=False)  # running our app
    # app.run(host='0.0.0.0', port=8000)
```

13.2 GitHub & Project Demo Link:

13.2.1 GitHub link:

https://github.com/IBM-EPBL/IBM-Project-39776-1660534729

13.2.2 Project Demo link:

https://github.com/IBM-EPBL/IBM-Project-39776-1660534729/blob/main/Final deliverable phase/Project Demo.mp4