VISUALIZING AND PREDICTING HEART DISEASE WITH AN INTERACTIVE DASHBOARD

A PROJECT REPORT

Submitted by

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CHAPTER 1

INTRODUCTION

1.1 PROJECT OVERVIEW

According to the World Health Organization, every year 12 million deaths occur worldwide due to Heart Disease. The early diagnosis of heart disease plays a vital role in making decisions on lifestyle changes in high-risk patients and in turn reduces the complications. This project aims to predict and visualize future Heart Disease by analyzing data of patients which classifies whether they have heart disease or not using machine-learning algorithms.The terms "heart disease" and "cardiovascular disease" are frequently used interchangeably. Heart disease is a general term that covers a wide range of heart related medical conditions. The irregular health state that directly affects the heart and all of its components is characterized by these medical conditions. In order to forecast cardiac disease, this study discusses various data mining, big data, and machine learning techniques. Building an important model for the medical system to forecast heart disease or cardiovascular illness requires the use of data mining and machine learning. Our application helps the user in finding out if they have heart disease or not. They can find out by entering details such as their heart rate, cholesterol, blood pressure etc. A dashboard is also attached along with the results for better understanding where they can compare their blood pressure and similar metrics

with other users. This project focuses on Random Forest Classifiers. The accuracy of our project is 87% for which is better than most other systems in terms of achieving accuracy quickly.

1.2 PURPOSE

This project's goal is to determine, depending on the patient's medical characteristics such as gender, age, chest pain, fasting blood sugar level, etc. whether they are likely to be diagnosed with any cardiovascular heart illnesses. The leading cause of death in the developed world is heart disease. Heart disease cases are rising quickly every day, thus it's crucial and worrisome to predict any potential illnesses in advance. This diagnosis is a challenging task that requires accuracy and efficiency. Therefore, there needs to be work done to help prevent the risks of having a heart attack or stroke. It is the main factor in adult deaths. By using a person's medical history, our initiative can identify those who are most likely to be diagnosed with a cardiac condition. It can assist in identifying disease with less medical tests and effective therapies, so that patients can be treated appropriately. It can identify anyone who is experiencing any heart disease symptoms, such as chest pain or high blood pressure. Around the world, machine learning is applied in many different fields. There is no exception in the healthcare sector. Machine learning may be crucial in determining whether locomotor disorders, heart illnesses, and other conditions are present or absent. If foreseen well in advance, such information can offer valuable insights to doctors,

who can then customize their diagnosis and course of care for each patient.According to the World Health Organization, every year 12 million deaths occur worldwide due to Heart Disease. The load of cardiovascular disease is rapidly increasing all over the world from the past few years. Many researches have been conducted in an attempt to pinpoint the most influential factors of heart disease as well as accurately predict the overall risk. Heart Disease is even highlighted as a silent killer which leads to the death of the person without obvious symptoms This project aims to predict and visualize future Heart Disease by analyzing data of patients which classifies whether they have heart disease or not using machine-learning algorithms.

CHAPTER 2

LITERATURE SURVEY

2.1 EXISTING PROBLEMS

A quite significant amount of work related to the diagnosis of Heart disease using Machine Learning algorithms have been made. An efficient heart disease prediction has been made by using various algorithms some of them include Logistic Regression, KNN, Random Forest Classifier etc. It can be seen in results that each algorithm has its strength to register the defined objectives. The model incorporating IHDPS had the ability to calculate the decision boundary using the previous and new model of machine learning and deep learning. It facilitated the important and the most basic factors/knowledge such as family history connected with any heart disease. But the accuracy that was obtained in such an IHDPS model was far more less than the new upcoming model such as detecting coronary heart disease using artificial neural networks and other algorithms of machine and deep learning.

2.2 REFERENCES

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3. Purushottam, Kanak Saxena and Richa Sharma, "Efficient heart disease prediction system." Procedia Computer Science 85 (2016): 962-969.
4. Singh, Yeshvendra K., Nikhil Sinha, and Sanjay K. Singh, "Heart Disease Prediction System Using Random Forest", International Conference on Advances in Computing and Data Sciences. Springer, Singapore, 2016.
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8. Boshra Bahrami, Mirsaeid Hosseini Shirvani, "Prediction and Diagnosis of Heart Disease by Data Mining Techniques", Journal of Multidisciplinary Engineering Science and Technology (JMEST) ISSN: 3159-0040 Vol. 2 Issue 2, February–2015.

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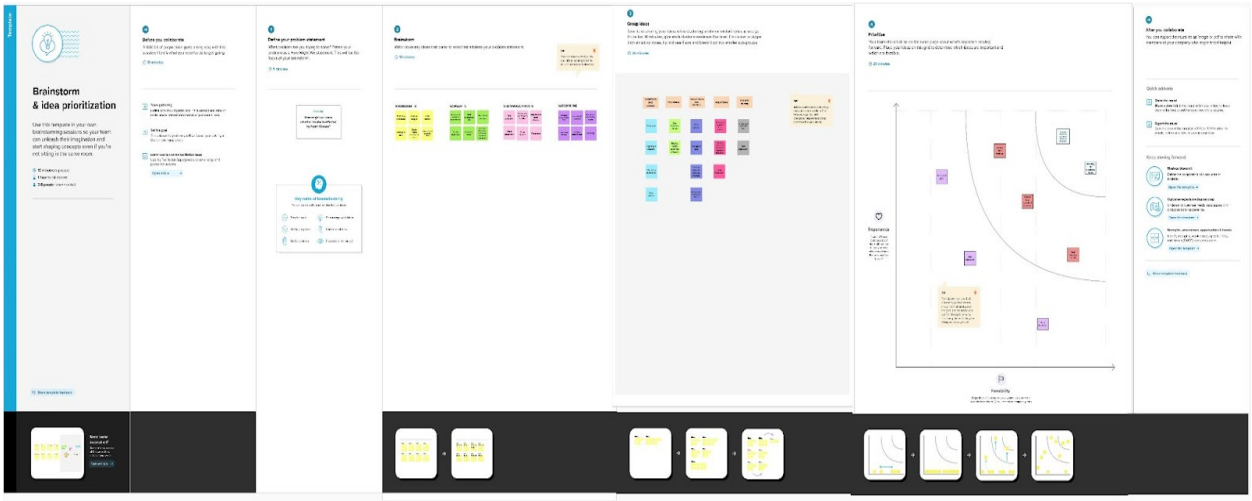
10. Lokanath Sarangi, Mihir Narayan Mohanty, Srikanta Pattnaik, "An Intelligent Decision Support System for Cardiac Disease Detection", IJCTA, International Press 2015.

CHAPTER 3

IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

3.2 IDEATION & BRAINSTORMING



3.3 PROPOSED SOLUTION

Our application helps the user in finding out if they have heart disease or not. They can find out by entering details such as their heart rate, cholesterol, blood pressure etc. A dashboard is also attached along with the results for better understanding where they can compare their blood pressure and similar metrics with other users. Our application has one of the smoothest user interfaces on the internet making it easy for the user to find their needs quickly and efficiently. And the tool utilizes the best machine learning algorithms for better prediction. There's separate sections for viewing treatment options, warning signs of cardiac arrest, risk factors and causes of various types of heart diseases.

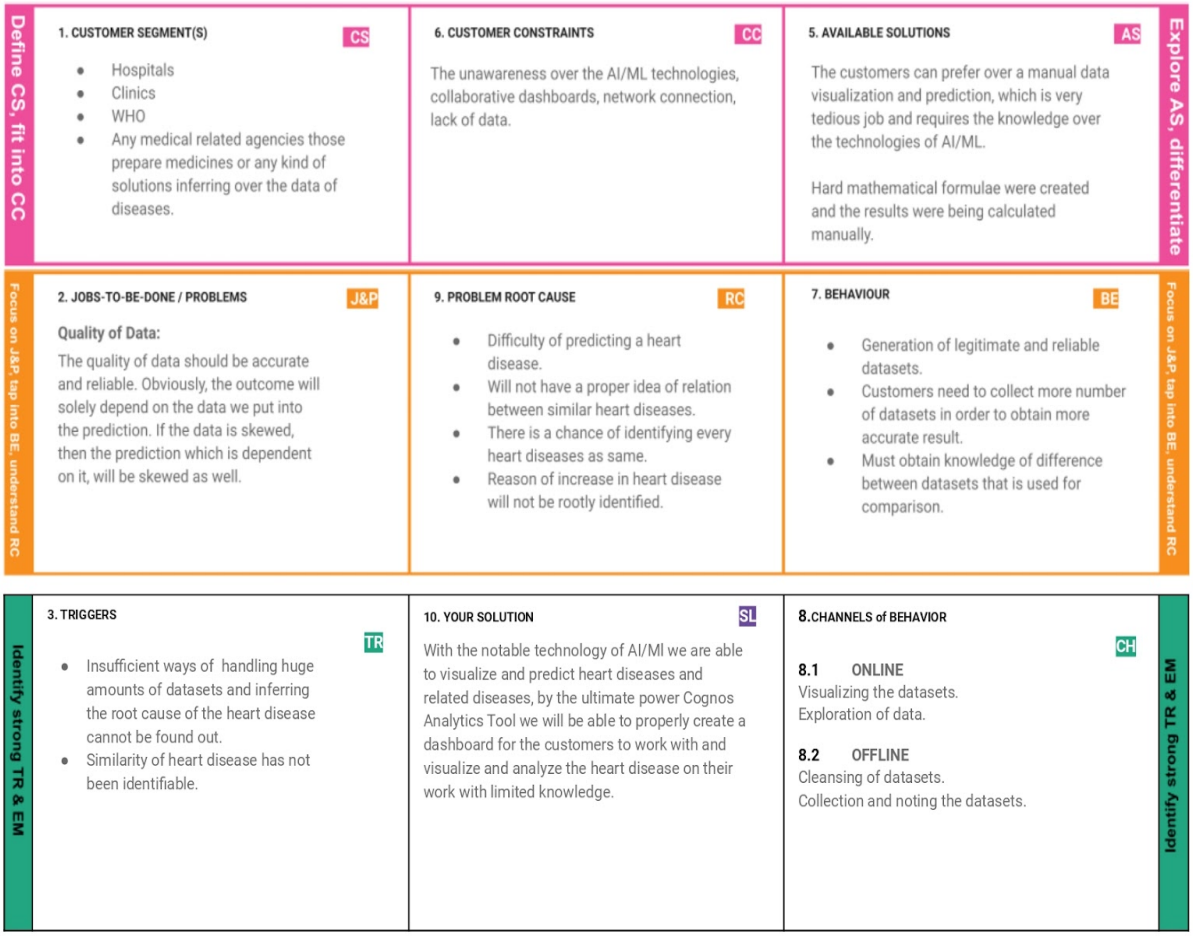
S.No	Parameter	Description
1.	Problem Statement (Problem to be solved)	To observe whether a person who is working under a high pressure environment is suffering from a heart disease and also to determine significant risk factors based on medical dataset which may lead to heart disease or not.
2.	Idea / Solution description	The goal is to create a data set about the Heart patients and store the data in the cloud,so the hospitals can use this information to easily predict the diseases easily and quickly.
3.	Novelty / Uniqueness	The patient should be treated based on the heart's condition and it can be easy for the doctors to diagnose.
4.	Social Impact / Customer Satisfaction	Prediction of heart disease helps the hospitals to know the health records of the patient.It will make the hospital work effectively and the patient can get immediate treatments.
5.	Business Model (Revenue Model)	Awareness can be created among the patients through ads.
6.	Scalability of the Solution	Heart disease can be predicted easily with the datas stored in the hospitals.It gives the best user experience and maintains the details.

3.4 PROBLEM SOLUTION FIT

The Problem-Solution Fit simply means that we have found a problem with our customer and that the solution we have realized for it actually solves the customer's problem. It helps entrepreneurs, marketers and corporate innovators identify behavioral patterns and recognize what would work and why. The purpose is to solve complex problems in a way that fits the state of your

customers and succeed faster and increase your solution adoption by tapping into existing mediums and channels of behavior.

Project Title: **Project Design Phase-I - Solution Fit Template** **Team ID:** PNT2022TMID32881



CHAPTER 4

REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

- Users have to login.
- Function to view the homepage by the user.
- Function to display information related to heart diseases on the website.
- Function to provide textboxes to enter medical results.
- Function to predict heart disease using ML model.
- Function to display visualizations of the final results.
- Function to provide a dashboard to users.

4.2 NON-FUNCTIONAL REQUIREMENTS

Non-functional Requirements:

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

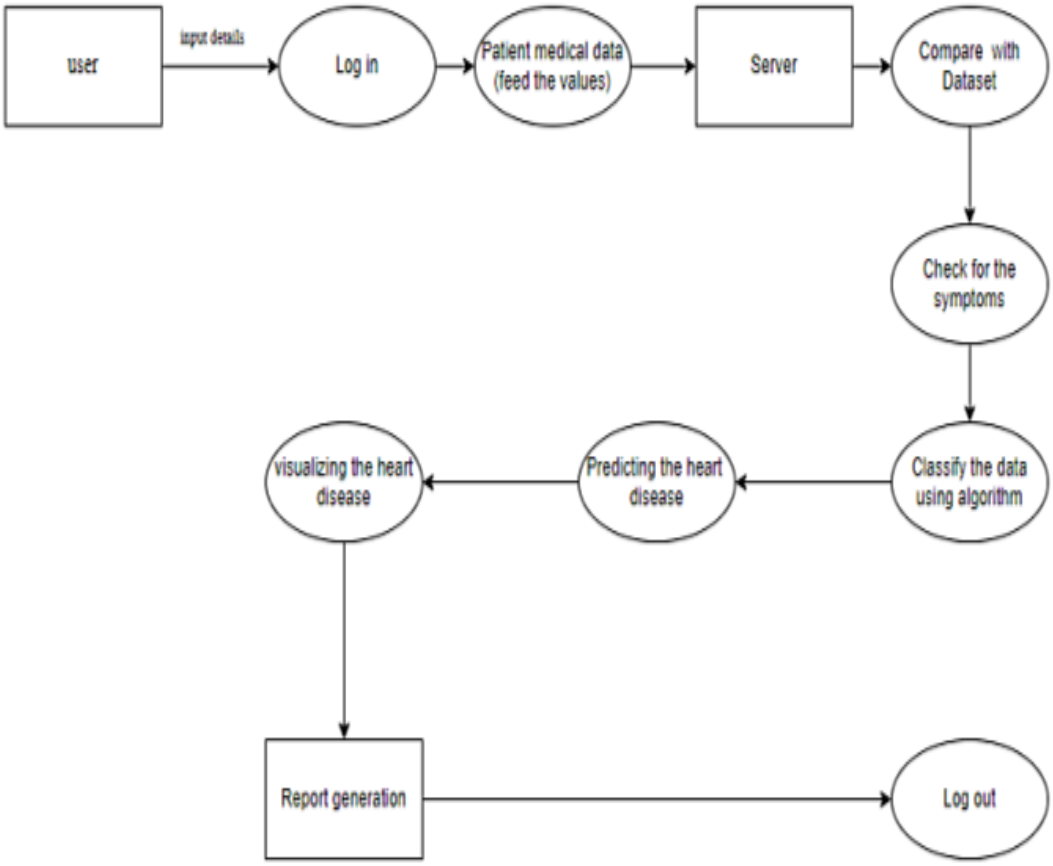
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Better workflow higher accuracy. Visualising and Predicting Heart diseases with an interactive dashboard.Thanks to the fact that doctors have access to a healthcare data network via an app,the risk of a mistake is minimized.this is incorporate make it simple for users to record their health data and access medical treatment.
NFR-2	Security	Some data privacy risk.resistance from doctors due to perceived loss of control over care process.Lack of good quality scientific research into health impacts.this is built to keep your data secure and product privacy.your data is encrypted and always in control your health information.
NFR-3	Reliability	The structure must be reliable and strong in giving the functionalities.The movements must be made unmistakable by the structure when a customer has

CHAPTER 5

PROJECT DESIGN

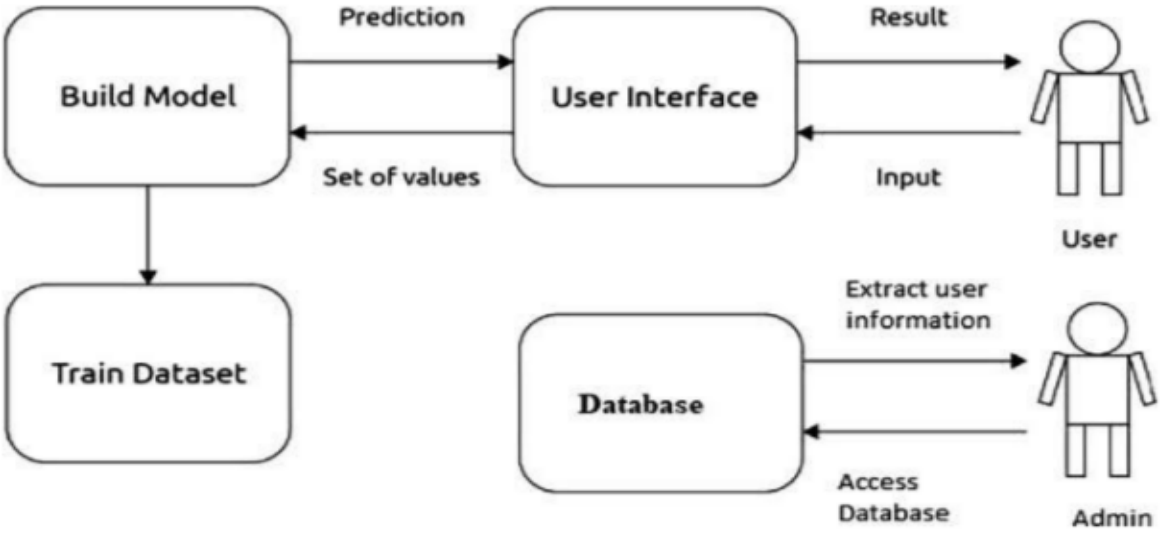
5.1 DATA FLOW DIAGRAMS

Data Flow Diagrams:



5.2 SOLUTION & TECHNICAL ARCHITECTURE

Solution Architecture:



5.3 USER STORIES:

User Stories

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

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user,I can register into the IBM cloud Account using personal details	I can access my account / dashboard	High	Sprint-1
	Login	USN-2	After registering, As a user I can login into the Account using login id and password	I can login using login id and password	High	Sprint-1
Customer (Web user)	Dashboard	USN-3	As a user I can fill the details asked here	I can register the asked detail	High	Sprint-2
Customer Care Executive		USN-4	As a user I can execute the give details	I can accept the terms	Medium	Sprint-2
Administrator		USN-5	As a administrator it predict the product	Show the result	High	Sprint-2

CHAPTER 6

PROJECT PLANNING & SCHEDULING

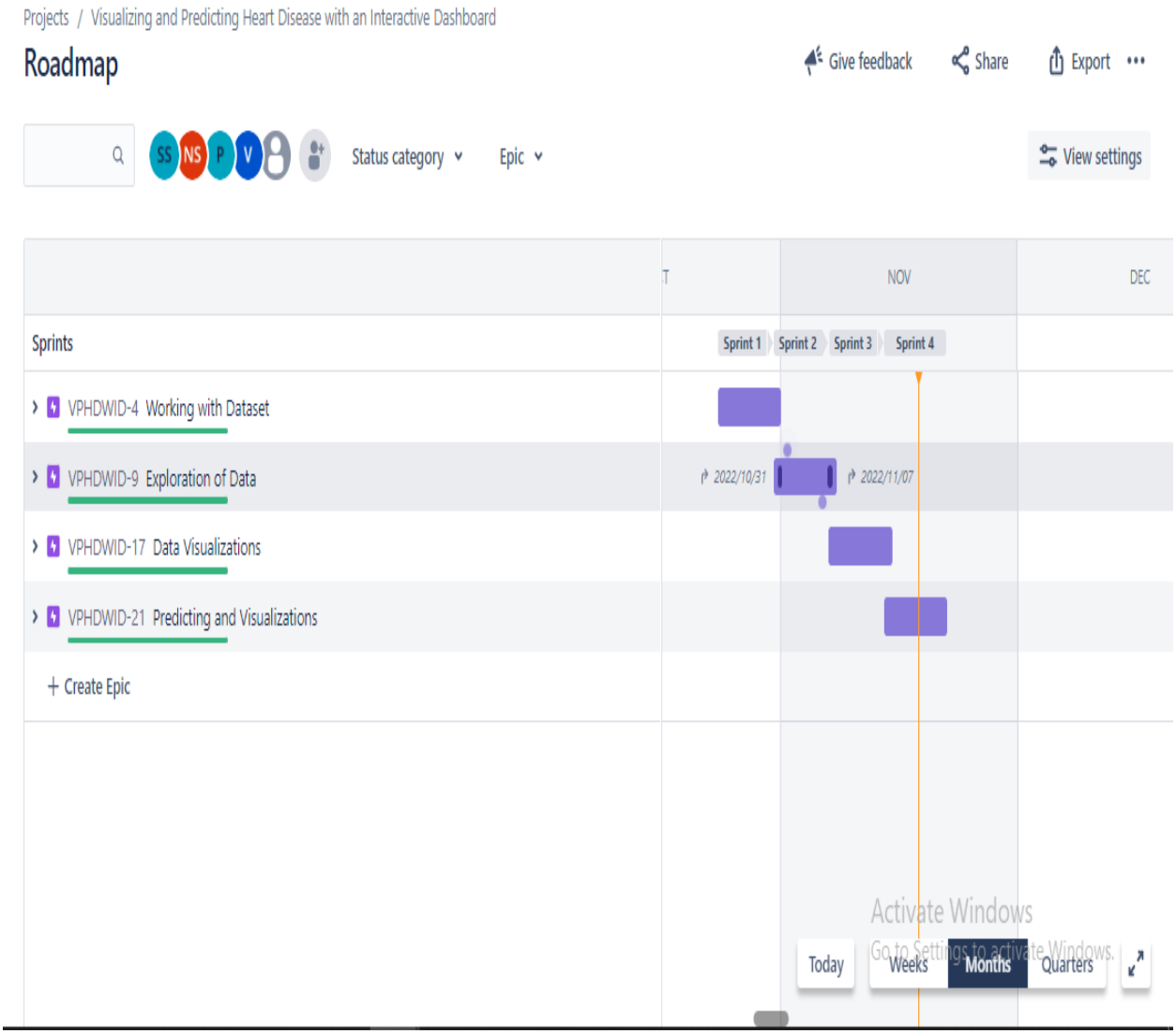
6.1 SPRINT PLANNING & ESTIMATION

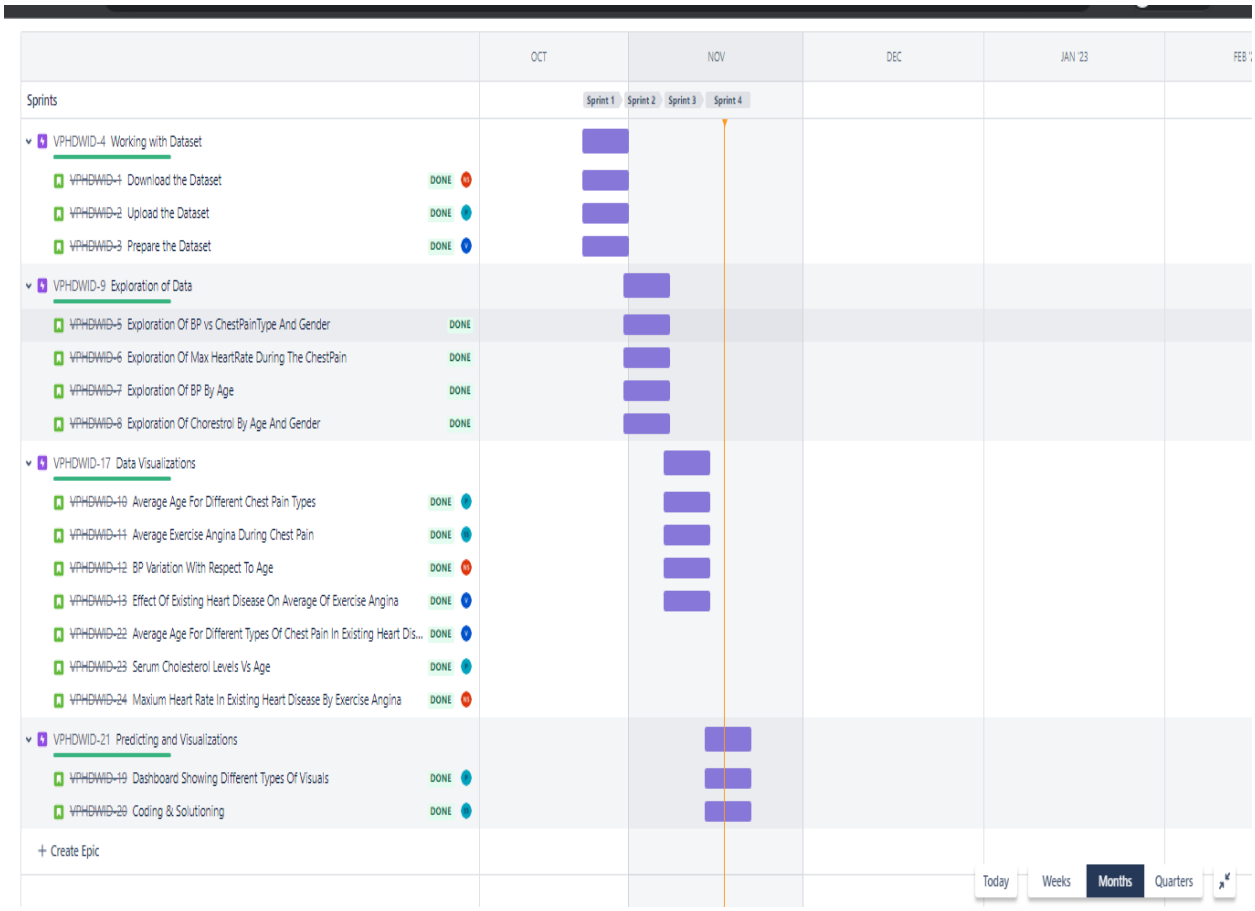
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Login	USN-1	As a user, if I have an IBM account I will login.if I don't have an IBM account ,I have to create.	10	High	Niranjana Sangavi
Sprint-1	Working With Dataset	USN-2	We upload, understand and create the dataset.After we are working With the dataset.	10	High	Shanmuga priya Varshini
Sprint-2	Exploration of Data	USN-3	We can explore the dataset.	20	Low	Niranjana Varshini
Sprint-3	Data Visualization	USN-4	We can visualize the dataset by using different charts.	20	Medium	Sangavi Shanmuga Priya
Sprint-4	Prediction and Visualization	USN-5	We can predict the heart disease of the patient by using their given data and can visualize it.	20	High	Niranjana Sangavi Shanmuga priya Varshini

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

6.3 REPORTS FROM JIRA




OCT
NOV
DEC
JAN '23
Sprints
Sprint 1
Sprint 2
Sprint 3
Sprint 4
VPHDWID-4 Working with Dataset
VPHDWID-1 Download the Dataset
DONE
VPHDWID-2 Upload the Dataset
DONE
VPHDWID-3 Prepare the Dataset
DONE
VPHDWID-9 Exploration of Data
VPHDWID-5 Exploration Of BP vs ChestPainType And Gender
DONE
VPHDWID-6 Exploration Of Max HeartRate During The ChestPain
DONE
VPHDWID-7 Exploration Of BP By Age
DONE
VPHDWID-8 Exploration Of Chorestrol By Age And Gender
DONE
VPHDWID-17 Data Visualizations
VPHDWID-10 Average Age For Different Chest Pain Types
DONE
VPHDWID-11 Average Exercise Angina During Chest Pain
DONE
VPHDWID-12 BP Variation With Respect To Age
DONE
VPHDWID-13 Effect Of Existing Heart Disease On Average Of Exercise Angina
DONE
VPHDWID-22 Average Age For Different Types Of Chest Pain In Existing Heart Dis...
DONE
VPHDWID-23 Serum Cholesterol Levels Vs Age
DONE
VPHDWID-24 Maxium Heart Rate In Existing Heart Disease By Exercise Angina
DONE
VPHDWID-21 Predicting and Visualizations
VPHDWID-19 Dashboard Showing Different Types Of Visuals
DONE
VPHDWID-20 Coding & Solutioning
DONE
Create Epic
Today
Weeks
Months
Quarters

CHAPTER 7

CODING AND SOLUTIONING

7.1 FEATURE 1

Heart Disease Predict.py

```
<!DOCTYPE html>
<html>
<head>
  <meta charset="UTF-8">
   <meta name="viewport" content="width=device-width, initial-scale=1.0">
   <meta http-equiv="X-UA-Compatible" content="ie=edge">
   <link rel="stylesheet" type="text/css"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"
integrity="sha384-
ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZ
w1T" crossorigin="anonymous">
   <link rel="stylesheet" type="text/css"
href="https://codepen.io/skjha5993/pen/bXqWpR.css">
   <title>Prediction</title>
   <style>
      label {
         font-weight: 600;
         color: #000000;
      }
```

```
        body {
            background: #19092d;
        }
    </style>
</head>
<body>
    <div class="container">
        <form action="  " method="POST">
            <h2 class="text-center text-white"><br></h2>
        <div class="row jumbotron bg-dark">
            <div class="col-sm-12 form-group">
                <h1 class="text-center text-white">Let's Predict!</h1>
            </div>
            <div class="col-sm-6 form-group">
                <label class="text-white" for="text"> Age: </label>
                                <input type="text" class="form-control" name="age"
required>
            </div>
            <div class="col-sm-6 form-group">
                <label class="text-white" for="sex"> Sex: </label>
                                <select name="sex" class="form-control custom-select
browser-default">
                                        <option value="1">Male</option>
                                        <option value="0">Female</option>
                                </select>
            </div>
            <div class="col-sm-6 form-group">
```

```
            <label class="text-white" for="cp"> Chest pain type: </label>
                        <select name="cp" class="form-control custom-select
browser-default">
                            <option value="1">Typical angina</option>
                            <option value="2">Atypical angina</option>
                            <option value="3">Non-anginal pain</option>
                            <option value="4">Asymptomatic</option>
                        </select>
        </div>
        <div class="col-sm-6 form-group">
            <label class="text-white" for="trestbps"> Resting Blood Sugar: </label>
                        <input type="text" class="form-control" name="trestbps"
required>
        </div>
        <div class="col-sm-6 form-group">
            <label class="text-white" for="chol">Cholestoral in mg/dl: </label>
                        <input type="text" class="form-control" name="chol"
required>
        </div>
        <div class="col-sm-6 form-group">
            <label class="text-white" for="fbs"> Fasting Blood Sugar higher than
120 mg/dl: </label>
                        <select name="fbs" class="form-control custom-select
browser-default">
                            <option value="1">True</option>
                            <option value="0">False</option>
                        </select>
```

```
        </div>
        <div class="col-sm-6 form-group">
            <label class="text-white" for="restecg"> Resting Electrocardiographic Results: </label>
                        <select name="restecg" class="form-control custom-select browser-default">
                            <option value="0">Normal</option>
                            <option value="1">ST-T Wave abnormality</option>
                            <option value="2">
                                Probable or definite left ventricular hypertrophy
                            </option>
                        </select>
        </div>
        <div class="col-sm-6 form-group">
            <label class="text-white" for=""> Maximum Heart Rate Achieved: </label>
                        <input type="text" class="form-control" name="mhr" required>
        </div>
        <div class="col-sm-6 form-group">
            <label class="text-white" for="exang"> Exercise Induced Angina: </label>
                        <select name="exang" class="form-control custom-select browser-default">
                            <option value="1">Yes</option>
```

```
                        <option value="0">No</option>
                    </select>
        </div>
        <div class="col-sm-6 form-group">
            <label class="text-white" for=""> ST depression: </label>
                    <input type="text" class="form-control" name="stdep"
required>
        </div>
        <div class="col-sm-6 form-group">
            <label class="text-white" for="slope"> Heart Rate Slope: </label>
                    <select name="slope" class="form-control custom-select
browser-default">
                        <option value="0">Upsloping</option>
                        <option value="1">Flatsloping</option>
                        <option value="2">Downsloping</option>
                    </select>
        </div>
        <div class="col-sm-6 form-group">
            <label class="text-white" for="vessels"> Number of Major Vessels
Colored by Flourosopy: </label>
                    <input type="text" class="form-control" name="vessels"
required>
        </div>
        <div class="col-sm-12 form-group">
            <label class="text-white" for="thal"> Thalium Stress Result: </label>
                    <select name="thal" class="form-control custom-select
browser-default">
```

```
                                    <option value="3">Normal</option>
                                    <option value="6">Fixed defect</option>
                                    <option value="7">Reversable defect</option>
                                </select>
            </div>
            <div class="col-sm-12 form-group mb-0">
                <button type="submit" id="sumbitBtn" class="btn btn-primary btn-lg
float-right" value="Predict">Predict</button>
            </div>
        </div>
        </form>
        <br>
        <br>
        <h3>{{ prediction_text }}</h3>
        <br>
        <br>
    </div>
</body>
</html>
```

7.2 FEATURE 2

Dashboard: Our application helps the user in finding out if they have heart disease or not. They can find out by entering details such as their heart rate, cholesterol, blood pressure etc. A dashboard is also attached along with the

results for better understanding where they can compare their blood pressure and similar metrics with other users.

Dashboard.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>Cognos dashboard</title>
      <link rel="stylesheet"
href="https://cdnjs.cloudflare.com/ajax/libs/normalize/5.0.0/normalize.min.c
s>
      <link rel="stylesheet" href="/static/style.css">
   </head>
   <body>
      <div class="main-container">
         <h1>
            This dashboard needs you to have a IBM account. So please create
one if
            you don't have any.
```

```
        </h1>
        <div class="dashboard">
          <iframe

src="https://us1.ca.analytics.ibm.com/bi/?perspective=dashboard&amp;amp;pathRef=.my_folders%2Fpriya&amp;amp;closeWindowOnLastView=true&amp;amp;ui_appbar=false&amp;amp;ui_navbar=false&amp;amp;shareMode=embedded&amp;amp;action=view&amp;amp;mode=dashboard&amp;amp;subView=model0000018460c67e47_00000002"
                width="1000"
                height="700"
                frameborder="0"
                gesture="media"
                allow="encrypted-media"
                allowfullscreen="">
            </iframe>
          </div>
      </div>
   </body>
</html>
```

7.3 FEATURE 3

Predict.Html

```
<!DOCTYPE html>
<html>
<head>
  <meta charset="UTF-8">
   <meta name="viewport" content="width=device-width, initial-scale=1.0">
   <meta http-equiv="X-UA-Compatible" content="ie=edge">
   <link rel="stylesheet" type="text/css"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"
integrity="sha384-
ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw
1T" crossorigin="anonymous">
   <link rel="stylesheet" type="text/css"
```

```
href="https://codepen.io/skjha5993/pen/bXqWpR.css">
    <title>Prediction</title>
    <style>
        label {
            font-weight: 600;
            color: #000000;
        }
        body {
            background: #19092d;
        }
    </style>
</head>
<body>
    <div class="container">
        <form action="  " method="POST">
            <h2 class="text-center text-white"><br></h2>
```

```
<div class="row jumbotron bg-dark">
    <div class="col-sm-12 form-group">
        <h1 class="text-center text-white">Let's Predict!</h1>
    </div>
    <div class="col-sm-6 form-group">
        <label class="text-white" for="text"> Age: </label>
                    <input type="text" class="form-control" name="age"
required>
    </div>
    <div class="col-sm-6 form-group">
        <label class="text-white" for="sex"> Sex: </label>
                    <select name="sex" class="form-control custom-select
browser-default">
                        <option value="1">Male</option>
                        <option value="0">Female</option>
                    </select>
```

```
        </div>
        <div class="col-sm-6 form-group">
            <label class="text-white" for="cp"> Chest pain type: </label>
                        <select name="cp" class="form-control custom-select
browser-default">
                                <option value="1">Typical angina</option>
                                <option value="2">Atypical angina</option>
                                <option value="3">Non-anginal pain</option>
                                <option value="4">Asymptomatic</option>
                        </select>
        </div>
        <div class="col-sm-6 form-group">
            <label class="text-white" for="trestbps"> Resting Blood Sugar: </label>
                        <input type="text" class="form-control" name="trestbps"
required>
        </div>
```

```
        <div class="col-sm-6 form-group">
            <label class="text-white" for="chol">Cholesterol in mg/dl: </label>
                        <input type="text" class="form-control" name="chol"
required>
        </div>
        <div class="col-sm-6 form-group">
            <label class="text-white" for="fbs"> Fasting Blood Sugar higher than 120
mg/dl: </label>
                        <select name="fbs" class="form-control custom-select
browser-default">
                            <option value="1">True</option>
                            <option value="0">False</option>
                        </select>
        </div>
        <div class="col-sm-6 form-group">
            <label class="text-white" for="restecg"> Resting Electrocardiographic
```

```
Results: </label>
                        <select name="restecg" class="form-control custom-select
browser-default">
                            <option value="0">Normal</option>
                            <option value="1">ST-T Wave abnormality</option>
                            <option value="2">
                                Probable or definite left ventricular
hypertrophy
                            </option>
                        </select>
        </div>
        <div class="col-sm-6 form-group">
            <label class="text-white" for=""> Maximum Heart Rate Achieved:
</label>
                        <input type="text" class="form-control" name="mhr"
required>
```

```
        </div>
        <div class="col-sm-6 form-group">
            <label class="text-white" for="exang"> Exercise Induced Angina: </label>
                        <select name="exang" class="form-control custom-select
browser-default">
                            <option value="1">Yes</option>
                            <option value="0">No</option>
                        </select>
        </div>
        <div class="col-sm-6 form-group">
            <label class="text-white" for=""> ST depression: </label>
                        <input type="text" class="form-control" name="stdep"
required>
        </div>
        <div class="col-sm-6 form-group">
            <label class="text-white" for="slope"> Heart Rate Slope: </label>
```

```
                        <select name="slope" class="form-control custom-select
browser-default">
                            <option value="0">Upsloping</option>
                            <option value="1">Flatsloping</option>
                            <option value="2">Downsloping</option>
                        </select>
        </div>
        <div class="col-sm-6 form-group">
            <label class="text-white" for="vessels"> Number of Major Vessels
Colored by Fluoroscopy: </label>
                        <input type="text" class="form-control" name="vessels"
required>
        </div>
        <div class="col-sm-12 form-group">
            <label class="text-white" for="thal"> Thalium Stress Result: </label>
                        <select name="thal" class="form-control custom-select
```

```
browser-default">
                                    <option value="3">Normal</option>
                                    <option value="6">Fixed defect</option>
                                    <option value="7">Reversable defect</option>
                                </select>
            </div>
            <div class="col-sm-12 form-group mb-0">
                <button type="submit" id="sumbitBtn" class="btn btn-primary btn-lg
float-right" value="Predict">Predict</button>
            </div>
        </div>
        </form>
        <br>
        <br>
        <h3>{{ prediction_text }}</h3>
        <br>
```

```
        <br>
        <h3>{{ prediction_text }}</h3>
        <br>
        <br>
    </div>
</body>
</html>
```

CHAPTER 8

TESTING

8.1 TEST CASES

	A	B	C	D	E	F	G	H
1					Date	18-Nov-22		
2					Team ID	PNT2022TMID47320		
3					Project Name	Project -VISUALIZING AND PREDIC		
4					Maximum Marks	4 marks		
5	**Test case ID**	**Feature Type**	**Component**	**Test Scenario**	**Pre-Requisite**	**Steps To Execute**	**Test Data**	**Expected Result**
6	LoginPage_TC_OO 1	UI Functional	Home Page	User is able to see the Prediction and Dashboard when user clicked on Predict and Dashboard button		1.click the URL Link to go the home page	http://127.0.0.1:5000/	user able to see the predict and dashboard button
7	LoginPage_TC_OO 2	UI Functional	Dashboard Page	Click the dashboard button to view the Dashboard		1..Click on the dashboard button 2.If User click it will return to dashboard page: 3.If ibm account have , login in and view the dashboard but haven't account create an new account	http://127.0.0.1:5000/predict	user able to see the dashboard
8	LoginPage_TC_OO 3	UI Functional	Predict page	Click the Predict button to view the Prediction		1.Enter the data in dataset to predict 2.Click the prediction button	http://127.0.0.1:5000/predict	user able to see the predict
9	LoginPage_TC_OO 4	UI Functional	Result page	User is able to see the result		1.click the predict button	http://127.0.0.1:5000/result	user able to see the result
10								
11								
12						d		
13								
14								

8.2 USER ACCEPTANCE TESTING

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	7	5	1	1	14
Duplicate	1	0	2	0	3
External	2	1	1	1	5
Fixed	7	5	1	1	12
Not Reproduced	0	0	0	0	0
Skipped	0	0	0	0	0
Won't Fix	0	0	0	0	0
Totals	17	11	4	3	34

Section	Total Cases	Not Tested	Fail	Pass
View Home Page	10	0	0	10
View Prediction Page	8	0	0	8
Enter the Scores	5	0	0	5
Click Submit Button	5	0	0	5
Prediction Output	5	0	0	5
View Dashboard Page	4	0	0	4
Version Control	10	0	0	10

CHAPTER 9

RESULTS

9.1 PERFORMANCE METRICS

1. Hours worked: 50 hours
2. Accuracy : 85% label accuracy
3. Precision : 90% labeled as absent of heart disease and 78% labeled as presence of heart diseases
4. Recall : 85% labeled as absent of heart disease and 86% labeled as presence of heart diseases
5. Efficiency of the product: 85%
6. Quality of the product: 85%

CHAPTER 10

ADVANTAGES & DISADVANTAGES

ADVANTAGES:

- Smooth User Interface
- Accuracy is achieved quickly
- Visualization is not complicate
- It's easy to understand and simple to implement.

DISADVANTAGES:

- KNN modeling does not include training period as the data itself is a model which will be the reference for future prediction and because of this it is very time efficient in terms of improvising for a random modeling on the available data.
- Prediction is not accurate

CHAPTER 11

CONCLUSION

This overview of the project conveys the idea that numerous methods have been investigated for diagnosing cardiovascular disease. Big data, machine learning, and data mining can be used to great success to analyze the prediction model with the highest degree of accuracy. The primary goal of this project is to diagnose cardiovascular disease or heart disease utilizing a variety of techniques and procedures to obtain a prognosis.The early prognosis of cardiovascular diseases can aid in making decisions on lifestyle changes in high risk patients and in turn reduce the complications, which can be a great milestone in the field of medicine. This project resolved the feature selection i.e. backward elimination and RFECV behind the models and successfully predicted the heart disease, with 85% accuracy. The model used was Logistic Regression. Further for its enhancement, we can train on models and predict the types of cardiovascular diseases providing recommendations to the users, and also use more enhanced models.

CHAPTER 12

FUTURE SCOPE

At some point in the future, the machine learning model will make use of a larger training dataset, possibly more than a million different data points maintained in the electronic health record system. Although it would be a huge leap in terms of computational power and software sophistication, a system that will work on artificial intelligence might allow the medical practitioner to decide the best suited treatment for the concerned patient as soon as possible. A software API can be developed to enable health websites and apps to provide access to the patients free of cost. The probability prediction would be performed with zero or virtually no delay in processing.A future update shall comprise a section for viewing renowned cardiologists and scan centers in their city. The obtained output can be further processed and sent to smart devices to provide necessary assistance. Constant monitoring can provide necessary data to recommend to consult a doctor in case of an emergency.At some point in future, the machine learning model will

make use of a larger training dataset, possibly more than a million different data points maintained in the electronic health record system. Although it would be a huge leap in terms of computational power and software sophistication, a system that will work on artificial intelligence might allow the medical practitioner to decide the best suited treatment for the concerned patient as soon as possible. A software API can be developed to enable health websites and apps to provide access to the patients free of cost. The probability prediction would be performed with zero or virtually no delay in processing.

CHAPTER 13

APPENDIX

PROJECT DEMONSTRATION LINK:

https://drive.google.com/file/d/1bVEhj61SpHdW8NEOF2ZXrJq0MqPhp2uA/view?usp=drivesdk

GITHUB LINK: https://github.com/IBM-EPBL/IBM-Project-37790-1660324851

APPENDIX A1: SCREENSHOTS

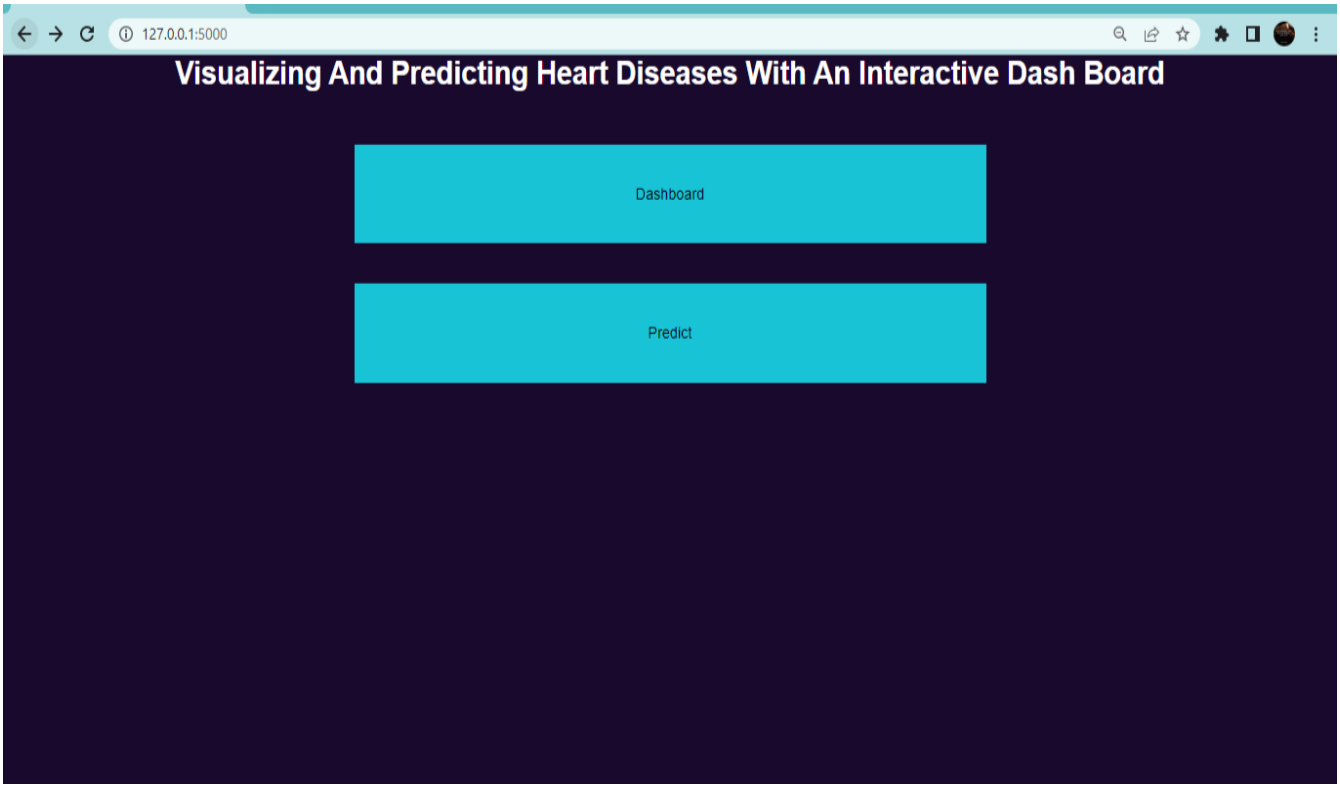


FIG 13.1 HOME PAGE

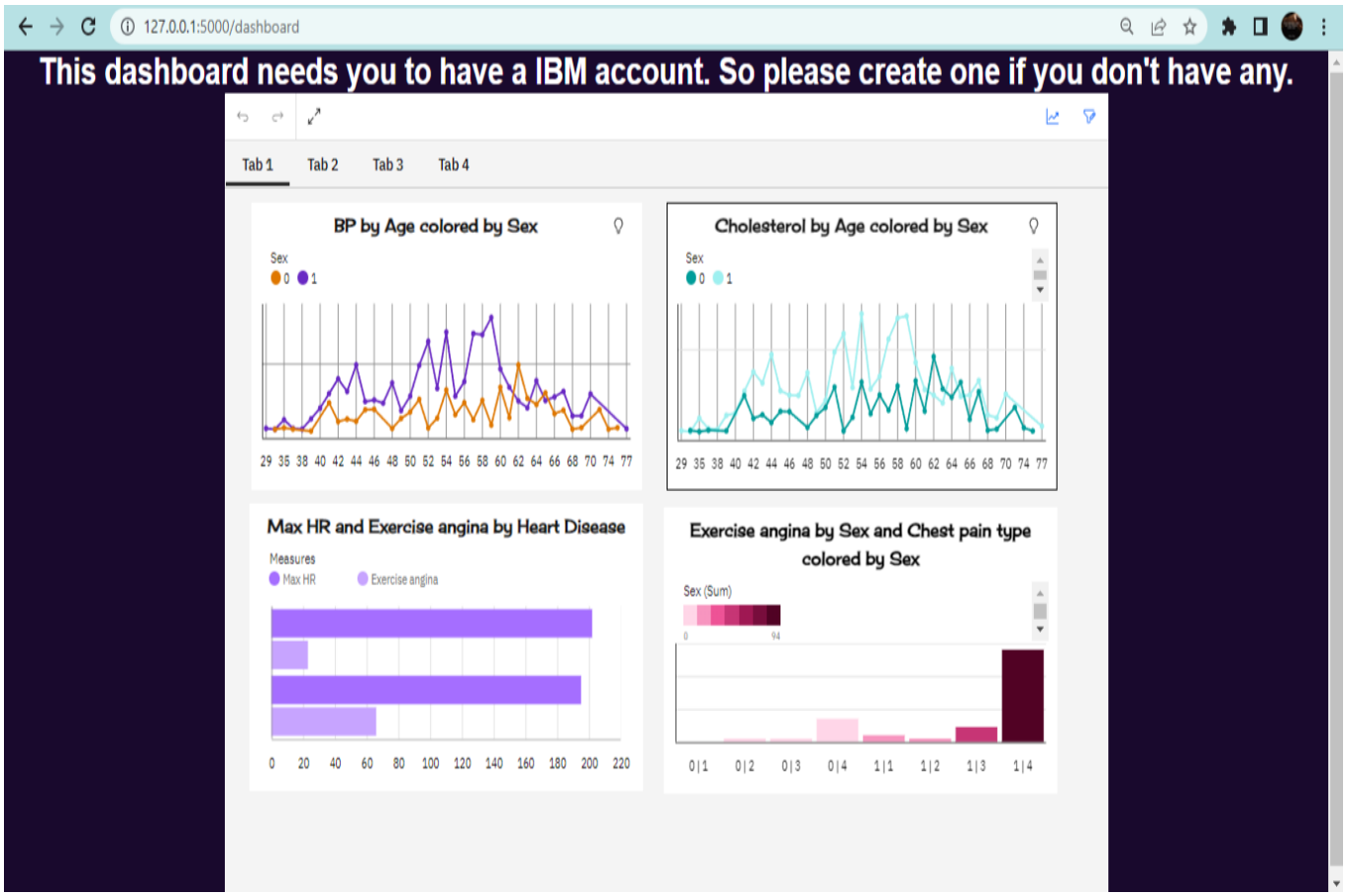


FIG 13.2 DASHBOARD SHOWING DIFFERENT TYPES OF VISUALS

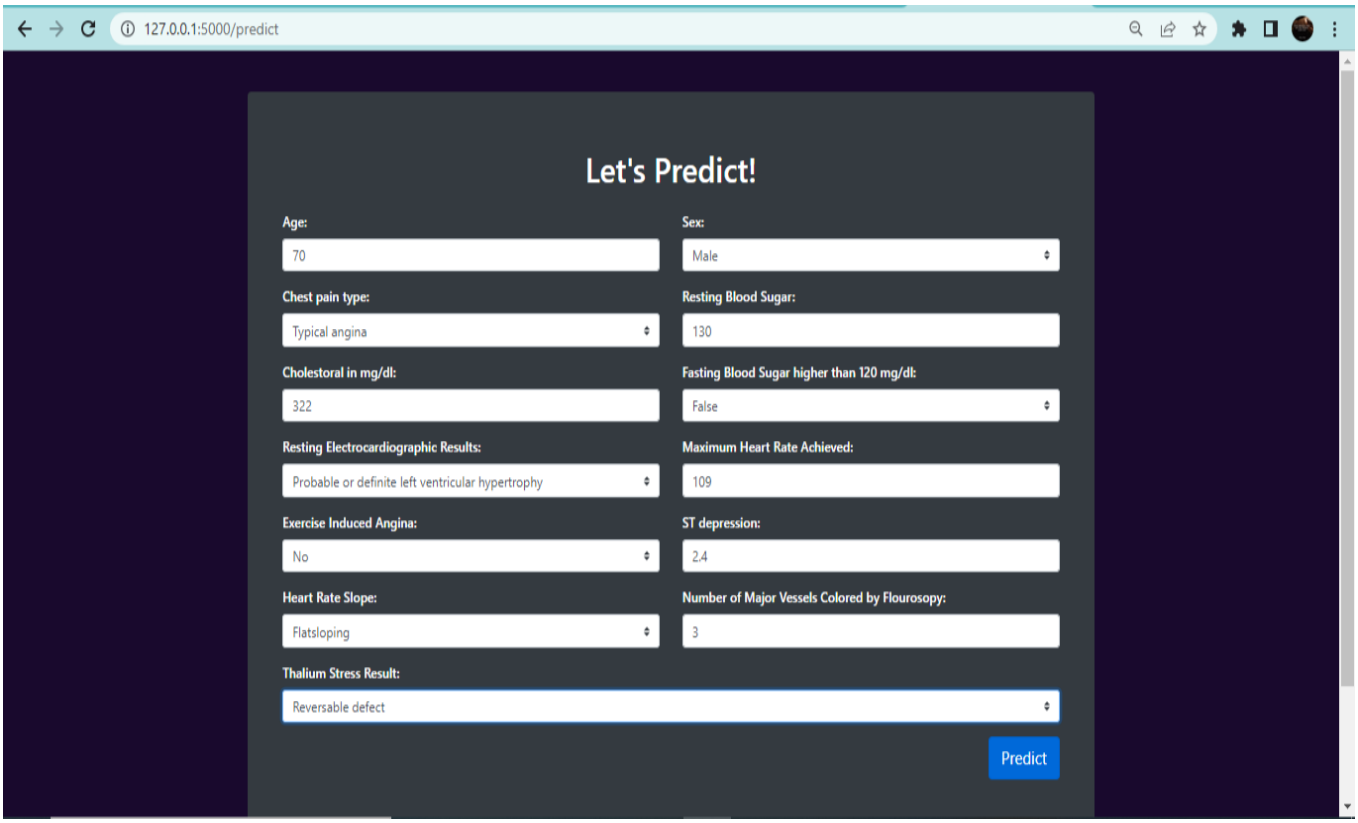


FIG 13.3 PREDICTION PAGE

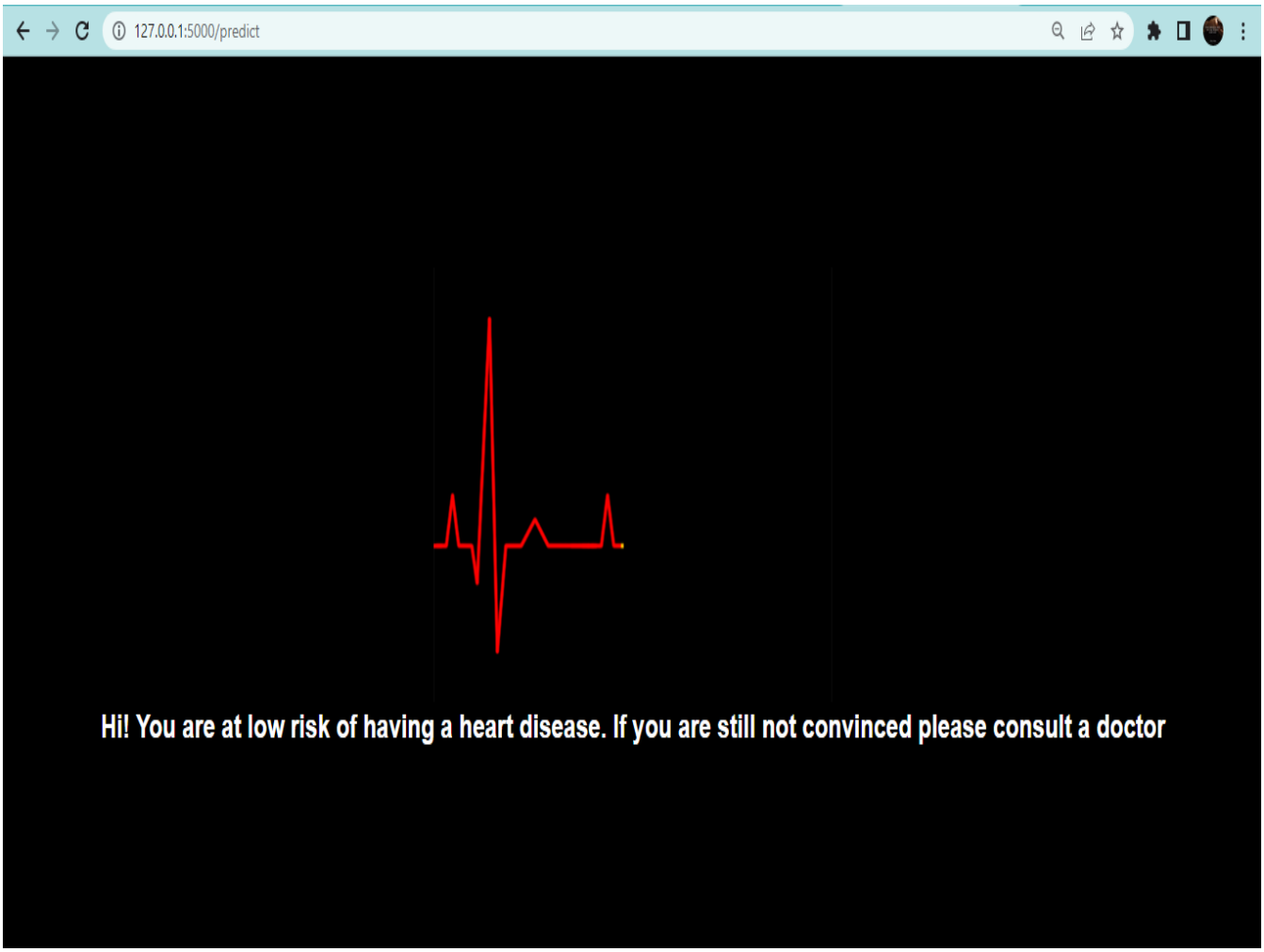


FIG 13.4 FINAL OUTPUT