

VISUALISING AND PREDICTING HEART DISEASES WITH AN INTERACTIVE DASHBOARD

- Submitted by

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Project Report

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CHAPTER 1

INTRODUCTION

1.1 : PROJECT OVERVIEW

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 Classifier. 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 customise their diagnosis and course of care for each patient.

CHAPTER 2

LITERATURE SURVEY

2.1 EXISTING PROBLEM

A quiet significant amount of works 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 IHDPS model was far more less than the new upcoming model such as detecting coronary heart disease using artificial neural network and other algorithms of machine and deep learning.

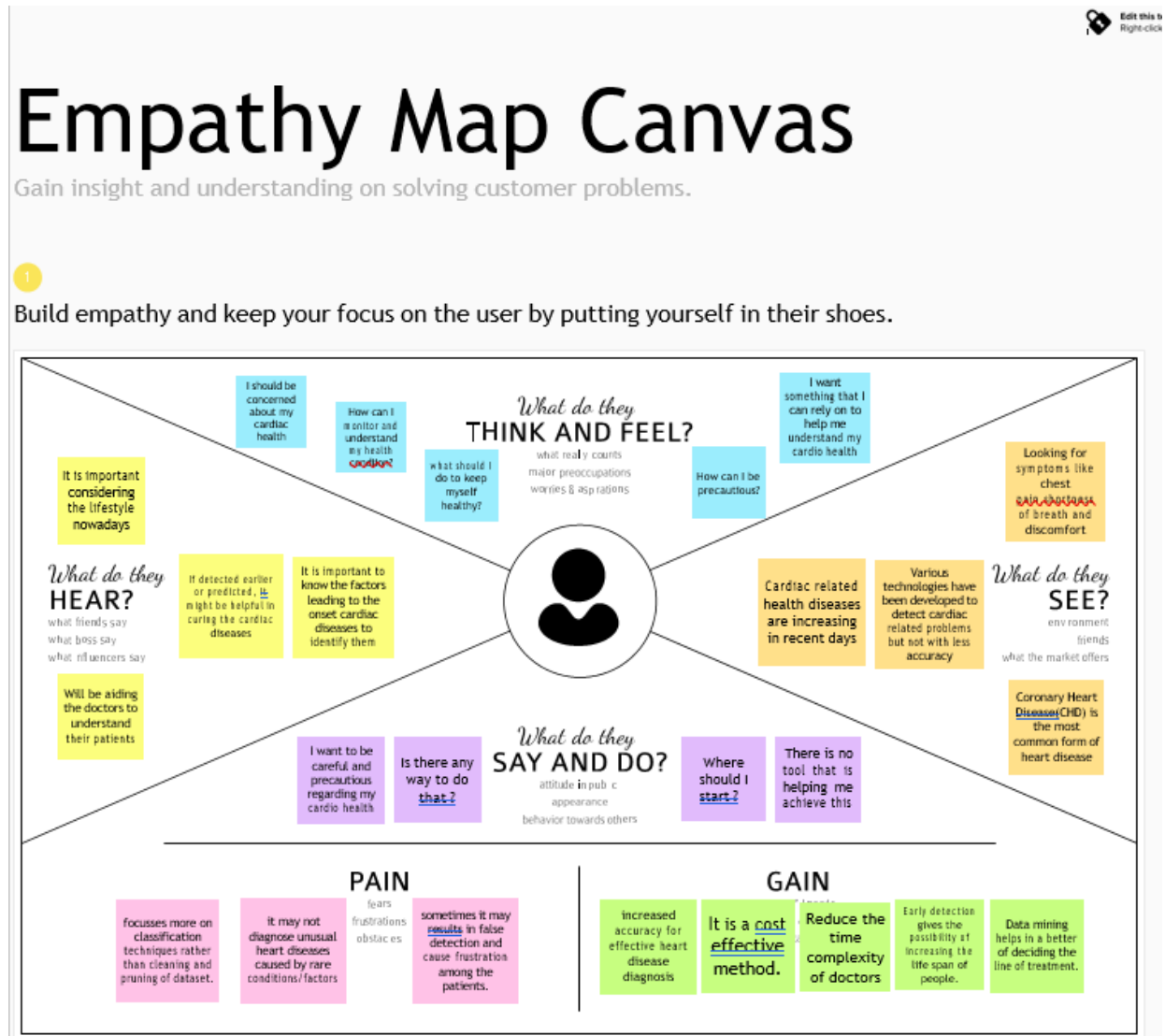
2.2 REFERENCES

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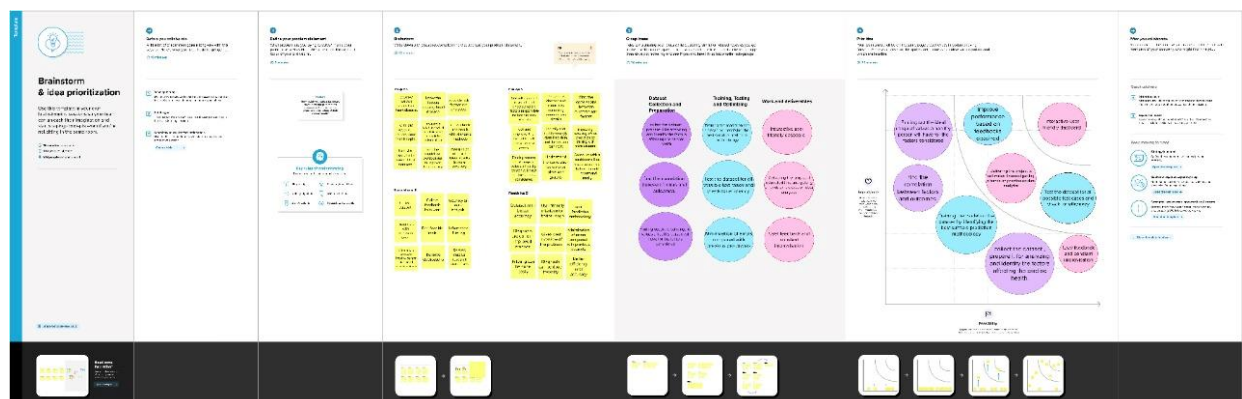
CHAPTER 3

IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



3.2 IDEATION AND BRAINSTORMING



3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To predict whether the patient has heart disease or not.
2.	Idea / Solution description	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.
3.	Novelty / Uniqueness	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 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.
4.	Social Impact / Customer Satisfaction	Users can find out if they have heart diseases very easily hence minimising death rate around the world.
5.	Business Model (Revenue Model)	Not for profit model.
6.	Scalability of the Solution	A future update shall comprise of section for viewing renowned cardiologists and scan centres in their city.

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: Visualizing and Predicting Heart Diseases
with an Interactive Dash Board

Project Design Phase-I - Solution Fit Template

Team ID: PNT2022TMID53250

Define CS, fit into CC	1. CUSTOMER SEGMENT(S) CS Doctors, Medical professionals and patients or people who want to know whether they are prone to heart disease all come under individual users	6. CUSTOMER CONSTRAINTS CC Patients may have a constrained budget and might not be willing to spend for the necessary tests and consultations for the diagnosis of any heart related disease. Patient may not have the time to visit a professional or doctors may be unavailable	5. AVAILABLE SOLUTIONS AS In the available solution: A Health care provider will examine you and ask about your personal and family medical history. Many different tests are used to diagnose heart disease. Besides blood tests and a chest X-ray, tests to diagnose heart disease can include: <ul style="list-style-type: none">• Electrocardiogram (ECG or EKG).• Holter Monitoring• Echocardiogram• Exercise test or stress tests• Cardiac catheterization• CT or MRI Scan	Explore AS, differentiate
	2. JOBS-TO-BE-DONE / PROBLEMS J&P Patients susceptible to heart disease would face the difficulty of visiting the hospital each and every time. But the patients can now check their health status by directly providing the necessary data to the machine learning algorithm	9. PROBLEM ROOT CAUSE RC Users are lazy or maybe due to other commitments are not able to meet the doctors at the right time. This system will be more effective in that manner	7. BEHAVIOUR BE Given necessary data, users expect accurate analysis, visualisations and prediction whether there is a possibility of occurrence of heart disease or not	

3. TRIGGERS TR The system is user friendly and the users can find out the problem by just feeding in the necessary data instead of waiting for a doctor's appointment 4. EMOTIONS: BEFORE / AFTER EM Before: User doesn't have much time in his hands to visit the doctors frequently and thus would be annoyed and uncertain whether there is heart disease or not After: User feels much more comfortable with the system due to its ease of access and user-friendly features and is able to attain instant results.	10. YOUR SOLUTION SL A system that provides visualization and prediction whether or not a person has heart disease. The user feeds in the necessary data required and system outputs the possibility of the person having a heart disease	8. CHANNELS of BEHAVIOUR CH 8.1 OFFLINE As Patients use and share their experience, other patients are introduced to it. For Medical Institutions, a group of professionals are involved and through word-of-mouth, other Medical Institutions and individuals will become aware of this application. 8.1 ONLINE The system can be accessed through modern-day browsers like Chrome, Safari, Firefox, etc.
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CHAPTER 4 REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

- Users have to register.
- 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 visualisations of the final results.
- Function to provide dashboard to user.

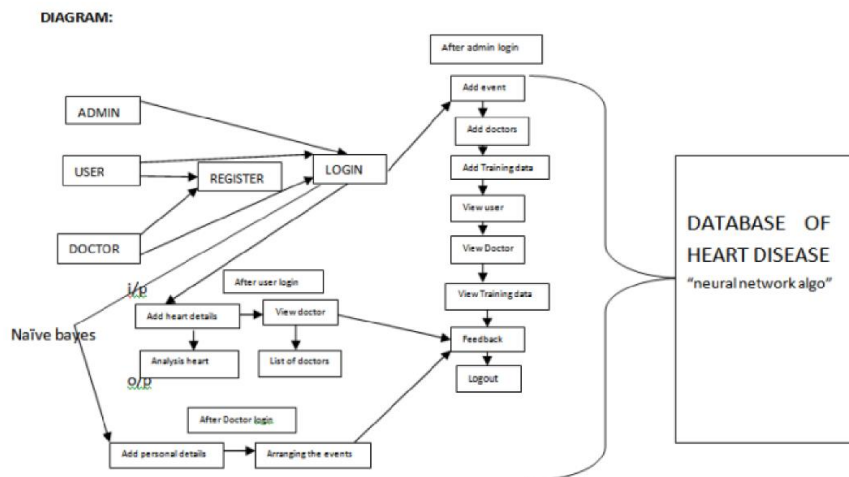
4.2 NON-FUNCTIONAL REQUIREMENTS

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

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The website will utilise better user interface for easy navigation. The process of finding out the results will be smooth and easy for the user.
NFR-2	Security	The website will be protected against SQL injection, DDoS attacks and SHA are used making the website very safe for use.
NFR-3	Reliability	The tool will give accurate and reliable results most of the time.
NFR-4	Performance	The website will be well optimized which includes fast rendering of the pages, providing a bug-free, smooth and hassle-free experience for the user.
NFR-5	Availability	The tool will be available for users most of the time.
NFR-6	Scalability	The system will be scalable enough to support a lot of users at the same time while maintaining optimal performance.

Data Flow Diagrams ,Solution & Technical Architecture

5.1 Data Flow Diagrams: A Data Flow Diagram (DFD) is a graphical representation of the flow of data in a business information system. It describes the processes that are involved in a system to transfer data from the input to the file storage and reports generation. It shows how data enters and leaves the system, what changes the information, and where data is stored.

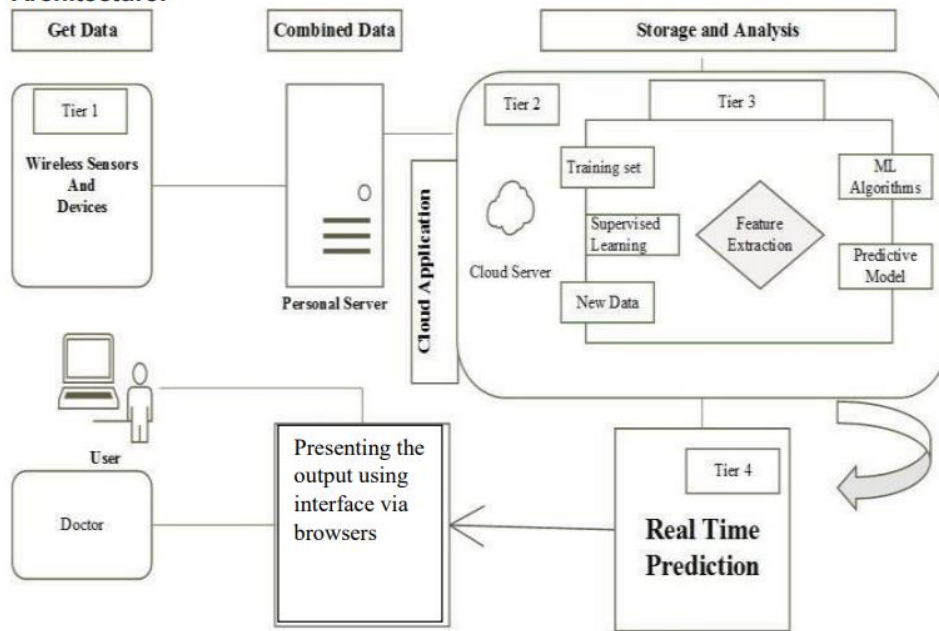


5.2 Solution and Architecture diagram:

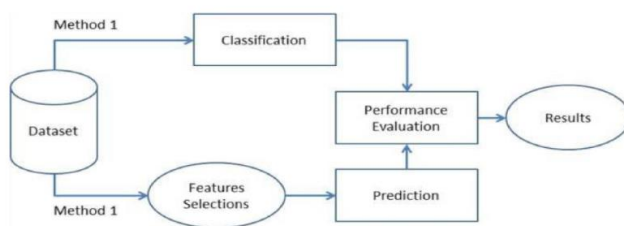
Solution Architecture: Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.

Architecture:



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 (Patient)	Registration	USN-1	As a user, I can register by entering my email, phone number, Date of birth, password, and confirm password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive the confirmation message in my email once I have registered or OTP will be sent.	I receive confirmation email & click confirm. or by entering the OTP received	High	Sprint-1
		USN-3	As a user, I can register through Gmail		Medium	Sprint-1
	Login	USN-4	As a user, I can log in by entering email & password		High	Sprint-1
	Forgot Password	USN-5	As a user, if i forgot my password, by clicking forgot password an OTP is sent to	By entering the OTP sent via phone number or email.	High	Sprint-1

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
			my number or email,			
	Data collection	USN-6	As a user, I can upload the input data set to diagnose.		High	Sprint-1
Admin	Login	USN-1	As an admin, I can login by using email id and password.		High	Sprint-1
	Data collection	USN-2	As an admin, I can upload the data set to train the machine.		High	Sprint-1

CHAPTER 6

PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION:

Project Planning Phase

Project Planning Template (Product Backlog, Sprint Planning, Stories, Story points)

Date	22 October 2022
Team ID	PNT2022TMID53250
Project Members	Bharanidharan S, Elakkiya S, Pooja T S, Reethika S
Project Name	Visualizing and Predicting Heart Diseases with an Interactive Dash Board
Project mentors	Industry mentor - Mahidhar, Saumya Faculty mentor – Dr. Arulkumar Venkatachalam

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	5	High	Reethika S , Elakkiya S
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	3	High	Pooja T S , Bharanidharan S
Sprint-1		USN-3	As a user, I can register for the application through Facebook	2	Low	Reethika S
Sprint-1		USN-4	As a user, I can register for the application through Google	2	Medium	Bharanidharan S

Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password	3	High	Pooja T S , Elakkiya S
Sprint-2	Dashboard	USN-6	As a User, I can view my complete medical analysis & accuracy and prediction of heart disease in a dashboard	5	High	Reethika S , Bharanidharan S , Pooja T S , Elakkiya S
Sprint-2	User entry	USN-7	As a User, I can enter my personal details for analysis	3	High	Reethika S
Sprint-2		USN-8	As a User, I can entry my medical records & symptoms	3	High	Bharanidharan S
Sprint-3	User profile	USN-9	As a user, I can update the health details of users.	5	High	Pooja T S
Sprint-3	Helpdesk	USN-10	As a user, I can post my queries & view the frequently asked question (FAQ)	5	High	Elakkiya S
Sprint-3		USN-11	As an admin, I can view the user queries	3	High	Reethika S , Bharanidharan

						S , Pooja T S , Elakkiya S
Sprint-4	Rating	USN-12	As a user, I can rate the app and give feedback	2	Low	Pooja T S
Sprint-4	User profile	USN-13	As an admin, I can update the health details of users.	5	High	Reethika S
Sprint-4		USN-14	As an admin, I can add or delete users.	3	High	Elakkiya S
Sprint-4		USN-15	As an admin, I can manage the user details.	3	High	Bharanidharan S

Project Tracker, Velocity & Burndown Chart: (4 Marks)

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	13	6 Days	24 Oct 2022	29 Oct 2022	13	29 Oct 2022
Sprint-2	13	6 Days	31 Oct 2022	05 Nov 2022	13	05 Nov 2022
Sprint-3	13	6 Days	07 Nov 2022	12 Nov 2022	13	12 Nov 2022
Sprint-4	13	6 Days	14 Nov 2022	19 Nov 2022	13	19 Nov 2022

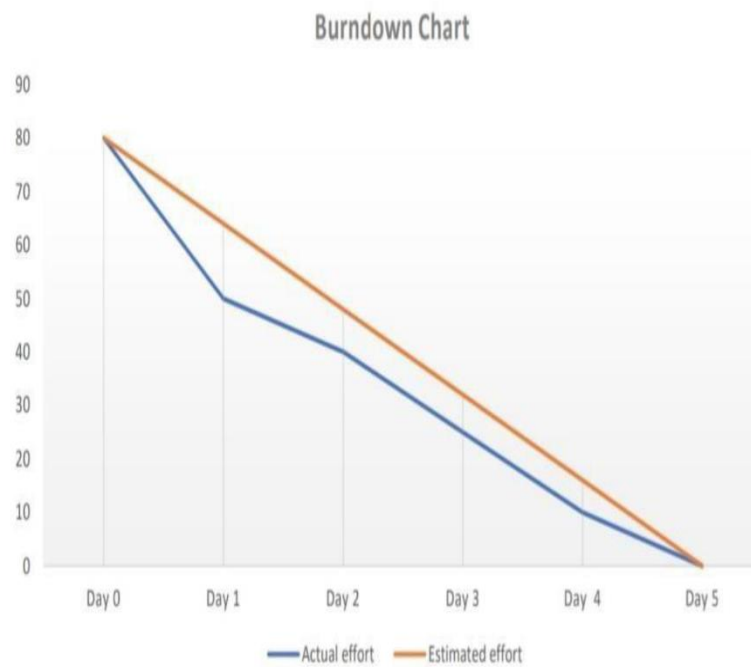
Velocity:

Imagine we have a 6-day sprint duration, and the velocity of the team is 13 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

6.2 SPRINT DELIVERY SCHEDULE:

Project Tracker, Velocity & Burndown Chart: (4 Marks)

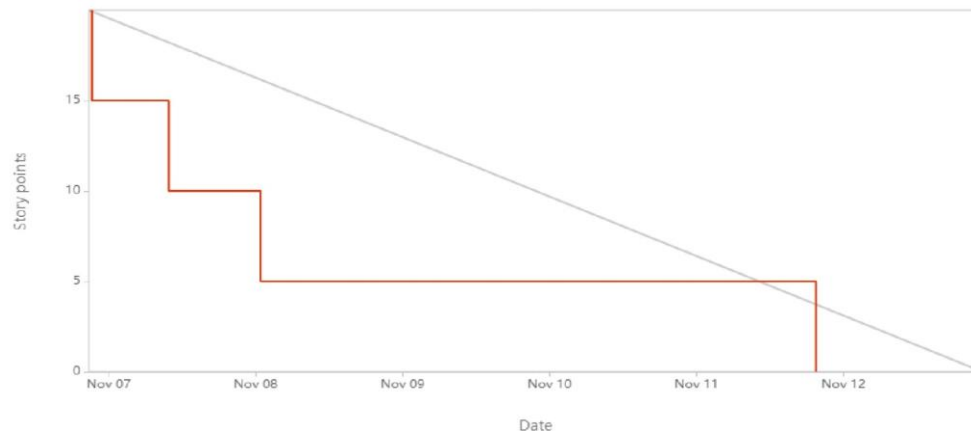
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	13	6 Days	24 Oct 2022	29 Oct 2022	13	29 Oct 2022
Sprint-2	13	6 Days	31 Oct 2022	05 Nov 2022	13	05 Nov 2022
Sprint-3	13	6 Days	07 Nov 2022	12 Nov 2022	13	12 Nov 2022
Sprint-4	13	6 Days	14 Nov 2022	19 Nov 2022	13	19 Nov 2022



REPORTS FROM JIRA:

Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.



Backlog



Epic

Insights

HDCRD Sprint 4

11 Nov – 18 Nov

(4 issues)

5 5 10

Complete sprint

...

HDCRD-13

Dashboard - Homepage

5

DONE

HDCRD-14

Dashboard - Logout Option

5

DONE

HDCRD-15

Dashboard - Fetching Data for Visualizations

5

IN PROGRESS

HDCRD-16

Dashboard - Visualization Pages

5

TO DO

+ Create issue

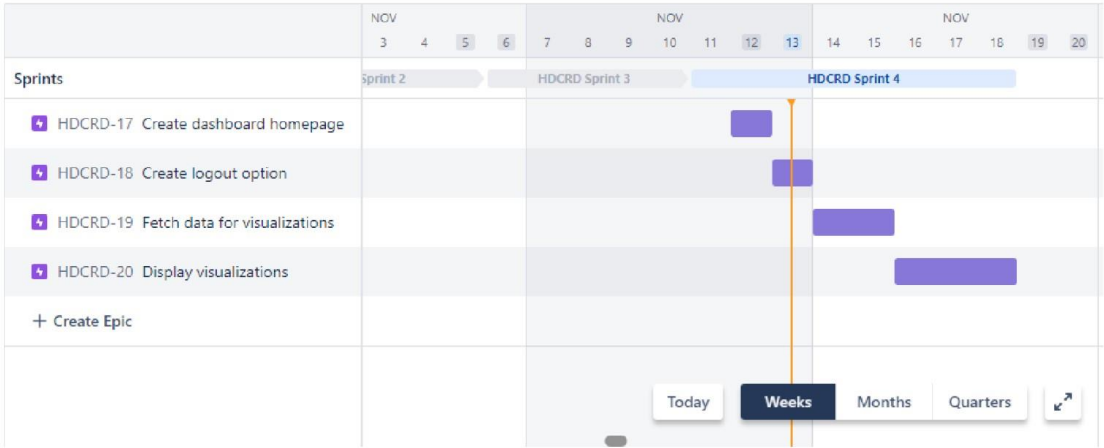
Roadmap

Give feedback Share Export



Status category

Epic



HDCRD Sprint 2

0 days remaining Complete sprint



GROUP BY

None

Insights

TO DO

IN PROGRESS

DONE 4 ISSUES

Treatment options section

HDCRD-5

5

FAQs section

HDCRD-8

5

Causes section

HDCRD-6

5

Prevention tips section

HDCRD-7

5

CHAPTER 7

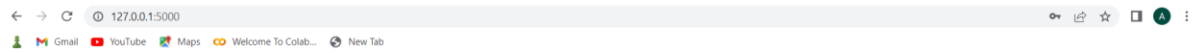
CODING & SOLUTIONING

Feature 1: Log In login.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
    href="https://cdn.jsdelivr.net/npm/bootstrap@4.0.0/dist/css/bootstrap.min.css"
    integrity="sha384-
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    crossorigin="anonymous"></script>
  <link rel="stylesheet" href="{ { url_for('static',filename='styles.css') } } ">
  <title>Log in</title>
</head>
<body>
  <div class="login">
    <form action="" method="post">
      <h3 class="topic">Login</h3>
      <label class="ll">Email: </label>
      <input type="email" name="email">
      <br>
      <label class="ll">Password:</label>
      <input type="password" name="pwd">
      <br>
      <Button class="btn">Log in</Button>
    </form>
    <p class="ll">{ { msg } }</p>

    <label class="ll">Not a user? </label>
    <a href="/signup">signup</a>
  </div>

</body>
</html>
```

Feature 2: Sign Up signup.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 href="https://cdn.jsdelivr.net/npm/bootstrap@4.0.0/dist/css/bootstrap.min.css"
    integrity="sha384-
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    crossorigin="anonymous">
  <script src="https://code.jquery.com/jquery-3.2.1.slim.min.js" integrity="sha384-
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    crossorigin="anonymous"></script>
  <script src="https://cdn.jsdelivr.net/npm/popper.js@1.12.9/dist/umd/popper.min.js"
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    crossorigin="anonymous"></script>
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    integrity="sha384-
    JZR6Spejh4U02d8jOt6vLEHfe/JQGiRRSQQxSfFWpi1MquVdAyjUar5+76PVCmYl"
    crossorigin="anonymous"></script>
  <link rel="stylesheet" href="{ {url_for('static',filename='styles.css')} }">
  <title>Sign Up</title>
</head>
<body>
  <div class="login">
    <form action="" method="post">
      <h3 class="topic">Sign Up</h3>
      <label class="l1">Email: </label>
```

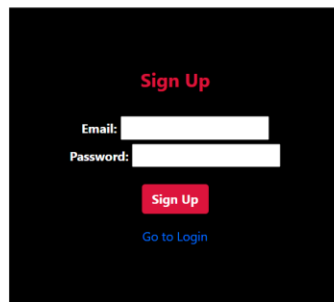
```

        <input type="email" name="email">
        <br>
        <label class="l1">Password:</label>
        <input type="password" name="pwd">
        <br>
        <Button class="btn">Sign Up</Button>
        </form>
        <p class="l1">{{ msg }}</p>

        <a href="/">Go to Login</a>
    </div>

</body>
</html>

```



Feature 3: Home Page

home.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="stylesheet"
href="https://cdn.jsdelivr.net/npm/bootstrap@4.0.0/dist/css/bootstrap.min.css"
integrity="sha384-
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crossorigin="anonymous">
    <script src="https://code.jquery.com/jquery-3.2.1.slim.min.js" integrity="sha384-
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crossorigin="anonymous"></script>
    <script src="https://cdn.jsdelivr.net/npm/popper.js@1.12.9/dist/umd/popper.min.js"
integrity="sha384-
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crossorigin="anonymous"></script>

```

```

<script src="https://cdn.jsdelivr.net/npm/bootstrap@4.0.0/dist/js/bootstrap.min.js"
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<link rel="stylesheet" href="{ {url_for('static',filename='styles.css')} }">
<title>Visualisation of heart disease</title>
</head>
<body>
<section id="NavBar">
<nav class="navigation navbar navbar-expand-lg navbar-light sticky-top"
style="background-color: #fff" ;>
<div class="container-fluid">
<a class="navbar-brand" href="/home">

</a>
<a class="topic" href="#">Visualising and Predicting Heart Disease</a>

<div class="collapse navbar-collapse" id="navbarTogglerDemo02">
<ul class="navbar-nav ml-auto">
<li class="nav-item">
<a class="nav-link" href="/home">Home Page</a>
</li>
<li class="nav-item">
<a class="nav-link" href="/visualise">Visualisation</a>
</li>
<li class="nav-item">
<a class="nav-link" href="/predict">Predict</a>
</li>
<li class="nav-item">
<a class="nav-link" href="/logout">Log out</a>
</li>
</ul>
</div>
</div>
</nav>
</section>
<div class="container">
<section class="about">
<h3 class="wel">Welcome to our Project</h3>
<p>The leading cause of death in the developed world is Heart disease. Therefore, there
needs to be work done to help prevent the risks of having a heart attack or stroke.
The aim of this project to use a dataset to predict which patients are most likely to suffer
from a heart disease in the near future using the a set of features given. The features include:
</p>
<div class="list">
<ul>
<li>Age</li>
<li>Sex</li>
<li>Chest Pain Type</li>

```

```

<li>Blood Pressure</li>
<li>Cholesterol</li>
<li>Fasting Blood Sugar(FBS) Over 120 or not</li>
<li>Cholesterol</li>
<li>EKG Results</li>
<li>Maximum Heart Rate</li>
<li>Exercise Angina</li>
<li>ST Depression</li>
<li>Slope of ST</li>
<li>Number of vessels fluroscopy</li>
<li>Thallium</li>
</ul>
</div>
<p>The model that we are going to use to predict the disease is Logistic Regression.
The Training and Testing accuracy was recorded 87 and 83 respectively.</p>
</section>
</div>

</body>
</html>

```



Welcome to our Project

The leading cause of death in the developed world is Heart disease. Therefore, there needs to be work done to help prevent the risks of having a heart attack or stroke. The aim of this project is to use a dataset to predict which patients are most likely to suffer from a heart disease in the near future using a set of features given. The features include:

- Age
- Sex
- Chest Pain Type
- Blood Pressure
- Cholesterol
- Fasting Blood Sugar(FBS) Over 120 or not
- Cholesterol
- EKG Results
- Maximum Heart Rate
- Exercise Angina
- ST Depression
- Slope of ST
- Number of vessels fluroscopy
- Thallium

The model that we are going to use to predict the disease is Logistic Regression. The Training and Testing accuracy was recorded 87 and 83 respectively.

Feature 4: Visualisations

visual.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="stylesheet" href="{ { url_for('static',filename='styles.css') } }">
  <link rel="stylesheet"
href="https://cdn.jsdelivr.net/npm/bootstrap@4.0.0/dist/css/bootstrap.min.css"
integrity="sha384-
Gn5384xqQ1aoWXA+058RXPxPg6fy4IWvTNh0E263XmFcJlSAwiGgFAW/dAiS6JXm"
crossorigin="anonymous">

```

```

<script src="https://code.jquery.com/jquery-3.2.1.slim.min.js" integrity="sha384-
KJ3o2DKtIkVYIK3UENzmM7KCKRr/rE9/Qpg6aAZGJwFDMVNA/GpGFF93hXpG5KkN"
crossorigin="anonymous"></script>
<script src="https://cdn.jsdelivr.net/npm/popper.js@1.12.9/dist/umd/popper.min.js"
integrity="sha384-
ApNbgh9B+Y1QKtv3Rn7W3mgPxhU9K/ScQsAP7hUibX39j7fakFPskvXusvfa0b4Q"
crossorigin="anonymous"></script>
<script src="https://cdn.jsdelivr.net/npm/bootstrap@4.0.0/dist/js/bootstrap.min.js"
integrity="sha384-
JZR6Spejh4U02d8jOt6vLEHfe/JQGiRRSQQxSfFWpi1MquVdAyjUar5+76PVCmYI"
crossorigin="anonymous"></script>
<link rel="stylesheet" href="{ {url_for('static',filename='styles.css')} }">
<title>Visualisations</title>
</head>
<body>
<div class="visual">
<section id="NavBar">
<nav class="navigation navbar navbar-expand-lg navbar-light sticky-top"
style="background-color: #fff" ;>
<div class="container-fluid">
<a class="navbar-brand" href="/home">

</a>
<a class="topic" href="#">Visualising and Predicting Heart Disease</a>
<button class="navbar-toggler" type="button" data-toggle="collapse" data-
target="#navbarTogglerDemo02"
aria-controls="navbarTogglerDemo02" aria-expanded="false" aria-label="Toggle
navigation">
<span class="navbar-toggler-icon"></span>
</button>

<div class="collapse navbar-collapse" id="navbarTogglerDemo02">
<ul class="navbar-nav ml-auto">
<li class="nav-item">
<a class="nav-link" href="/home">Home Page</a>
</li>
<li class="nav-item">
<a class="nav-link" href="/visualise">Visualisation</a>
</li>
<li class="nav-item">
<a class="nav-link" href="/predict">Predict</a>
</li>
<li class="nav-item">
<a class="nav-link" href="/logout">Log out</a>
</li>
</ul>
</div>
</div>
</nav>

```

```

</section>
<h3 class="title">Average age for different Chest pain</h3>


<h3 class="title">Average exercise angina during chest pain</h3>


<h3 class="title">Bp variation with respect to age</h3>


<h3 class="title">Effect of heart disease on Average of Exercise angina</h3>


<h3 class="title">Average age for different types of heart pain in existing heart disease</h3>

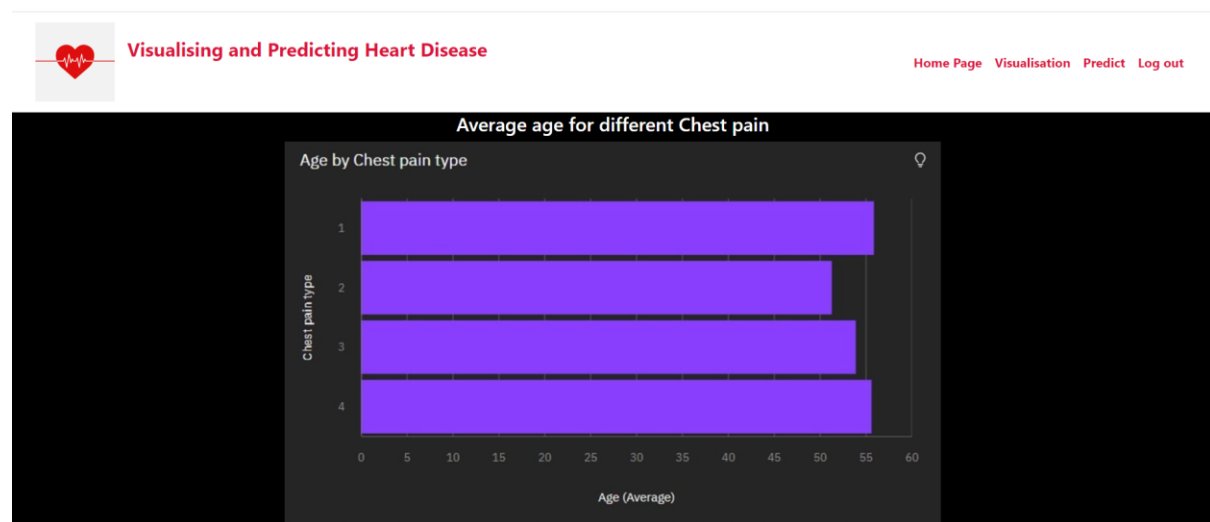

<h3 class="title">Maximum heart rate in existing heart disease by exercise angina</h3>


<h3 class="title">Serum cholesterol vs age</h3>

</div>

</body>
</html>

```



Feature 5: Prediction

predict.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="stylesheet"
href="https://cdn.jsdelivr.net/npm/bootstrap@4.0.0/dist/css/bootstrap.min.css"
integrity="sha384-
Gn5384xqQ1aoWXA+058RXPxPg6fy4IWvTNh0E263XmFcJlSAwiGgFAW/dAiS6JXm"
crossorigin="anonymous">
<script src="https://code.jquery.com/jquery-3.2.1.slim.min.js" integrity="sha384-
KJ3o2DKtIkVYIK3UENzmM7KCkRr/rE9/Qpg6aAZGJwFDMVNA/GpGFF93hXpG5KkN"
crossorigin="anonymous"></script>
<script src="https://cdn.jsdelivr.net/npm/popper.js@1.12.9/dist/umd/popper.min.js"
integrity="sha384-
ApNbgh9B+Y1QKtv3Rn7W3mgPxhU9K/ScQsAP7hUibX39j7fakFPskvXusvfa0b4Q"
crossorigin="anonymous"></script>
<script src="https://cdn.jsdelivr.net/npm/bootstrap@4.0.0/dist/js/bootstrap.min.js"
integrity="sha384-
JZR6Spejh4U02d8jOt6vLEHfe/JQGiRRSQQxSfFWpi1MquVdAyjUar5+76PVCmYl"
crossorigin="anonymous"></script>
<link rel="stylesheet" href="{ {url_for('static',filename='styles.css')} }">
<title>Prediction</title>
</head>
<body>

<section id="NavBar">
<nav class="navigation navbar navbar-expand-lg navbar-light sticky-top"
style="background-color: #fff" ;>
<div class="container-fluid">
<a class="navbar-brand" href="/home">

</a>
<a class="topic" href="#">Visualising and Predicting Heart Disease</a>
<button class="navbar-toggler" type="button" data-toggle="collapse" data-
target="#navbarTogglerDemo02"
aria-controls="navbarTogglerDemo02" aria-expanded="false" aria-label="Toggle
navigation">
<span class="navbar-toggler-icon"></span>
</button>

<div class="collapse navbar-collapse" id="navbarTogglerDemo02">
<ul class="navbar-nav ml-auto">
<li class="nav-item">
<a class="nav-link" href="/home">Home Page</a>
</li>
<li class="nav-item">
<a class="nav-link" href="/visualise">Visualisation</a>
</li>
<li class="nav-item">
<a class="nav-link" href="/predict">Predict</a>
</li>
<li class="nav-item">
<a class="nav-link" href="/logout">Log out</a>

```

```

        </li>
    </ul>
</div>
</div>
</nav>
</section>
<div class="login ag">
    <h3 class="topic">Please Enter the below details</h3>
    <form action="/predict" method="post">
        <label class="l1">Age: </label>
        <input type="text" name="n1">
        <br>
        <label class="l1">Sex(0-Male 1-Female): </label>
        <input type="text" name="n2">
        <br>
        <label class="l1">Chest pain type(1-4): </label>
        <input type="text" name="n3">
        <br>
        <label class="l1">BP: </label>
        <input type="text" name="n4">
        <br>
        <label class="l1">Cholesterol: </label>
        <input type="text" name="n5">
        <br>
        <label class="l1">FBS over 120(Yes-1 No-0): </label>
        <input type="text" name="n6">
        <br>
        <label class="l1">EKG results(0 or 2): </label>
        <input type="text" name="n7">
        <br>
        <label class="l1">Max HR: </label>
        <input type="text" name="n8">
        <br>
        <label class="l1">Exercise angina(0 or 1): </label>
        <input type="text" name="n9">
        <br>
        <label class="l1">ST depression(0-6.2): </label>
        <input type="text" name="n10">
        <br>
        <label class="l1">Slope of ST(1 or 2 or 3): </label>
        <input type="text" name="n11">
        <br>
        <label class="l1">Number of vessels fluoro(0-3): </label>
        <input type="text" name="n12">
        <br>
        <label class="l1">Thallium(3 or 6 or 7): </label>
        <input type="text" name="n13">
        <br>
        <button class="btn">Predict</button>
    </form>

```



```

    <p class="ll">Result: {{result}}</p>
</div>

</body>
</html>

```

Integration:

app.py

```

from flask import Flask, request, session, redirect, render_template, url_for
import numpy as np
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score
import warnings
warnings.filterwarnings("ignore")
import sqlite3

app=Flask(__name__)

# conn=sqlite3.connect("signup.db")
# c=conn.cursor()
# arr=c.execute("SELECT *FROM person").fetchall()
# conn.commit()
# conn.close()
# print(arr)

```

```

@app.route("/",methods=['GET','POST'])
def main():
    msg=""
    if(request.method=="POST"):
        email=request.form["email"]
        passwd=request.form["pwd"]
        conn=sqlite3.connect("signup.db")
        c=conn.cursor()
        c.execute("SELECT * FROM person WHERE email='"+email+"'and
pwd='"+passwd+"'")
        r=c.fetchall()
        print(r)
        for i in r:
            if(email==i[0] and passwd==i[1]):
                return redirect(url_for("home"))
            else:
                msg="Please enter valid username and password"
        return render_template("login.html",msg=msg)

@app.route("/signup",methods=['GET','POST'])
def signup():
    msg=""
    if(request.method=="POST"):
        if(request.form["email"]!="" and request.form["pwd"]!=""):
            email=request.form["email"]
            passwd=request.form["pwd"]
            conn=sqlite3.connect("signup.db")
            c=conn.cursor()
            c.execute("INSERT INTO person VALUES('"+email+"','"+passwd+"')")
            msg="Account created"
            arr=c.execute("SELECT *FROM person").fetchall()
            print(arr)
            conn.commit()
            conn.close()
        else:
            msg="Input fields are empty"
        return render_template("signup.html",msg=msg)

@app.route("/home")
def home():
    return render_template("home.html")

@app.route("/logout")
def logout():
    return redirect(url_for("main"))

@app.route("/visualise")
def visualise():
    return render_template("visual.html")

```

```

@app.route("/predict",methods=["GET","POST"])
def predict():
    res=""
    if(request.method=="POST"):
        heart_data = pd.read_csv(r"C:\Users\abira\Desktop\IBM\venv\Heart_Disease_Prediction.csv")
        X = heart_data.drop(columns='Heart Disease', axis=1)
        Y = heart_data['Heart Disease']
        X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.2, stratify=Y, random_state=2)
        model = LogisticRegression()
        model.fit(X_train, Y_train)

        n1=request.form['n1']
        n2=request.form['n2']
        n3=request.form['n3']
        n4=request.form['n4']
        n5=request.form['n5']
        n6=request.form['n6']
        n7=request.form['n7']
        n8=request.form['n8']
        n9=request.form['n9']
        n10=request.form['n10']
        n11=request.form['n11']
        n12=request.form['n12']
        n13=request.form['n13']

        if(n1!="" and n2!="" and n3!="" and n4!="" and n5!="" and n6!="" and n7!="" and n8!="" and n9!="" and n10!="" and n11!="" and n12!="" and n13!=""):
            t1=(float)(n1)
            t2=(float)(n2)
            t3=(float)(n3)
            t4=(float)(n4)
            t5=(float)(n5)
            t6=(float)(n6)
            t7=(float)(n7)
            t8=(float)(n8)
            t9=(float)(n9)
            t10=(float)(n10)
            t11=(float)(n11)
            t12=(float)(n12)
            t13=(float)(n13)
            input_data=(t1,t2,t3,t4,t5,t6,t7,t8,t9,t10,t11,t12,t13)
            input_data_as_numpy_array= np.asarray(input_data)
            input_data_reshaped = input_data_as_numpy_array.reshape(1,-1)
            prediction = model.predict(input_data_reshaped)
            if(prediction=="Absence"):
                res="Yayy! The Probability that you may get a heart disease is Low :)"
            else:
                res="Oh no! The Probability that you may get a heart disease is High :("

```

```
        else:
            res="Please enter values in all the fields"
        return render_template("predict.html",result=res)

if __name__=="__main__":
    app.run(debug= True)
```

Stylesheet

styles.css

```
.visual{
    text-align: center;
    background-color: #000;
}
.topic{
    text-decoration: none;
    font-size: 1.5em;
    color: crimson;
    font-weight: bolder;
    margin-bottom: 32px;
}
.topic:hover{
    color: crimson;
    text-decoration: none;
}
.navbar-light .navbar-nav .nav-item .nav-link{
    color:crimson;
    font-weight: bold;
}
.navbar-light .navbar-nav .nav-item .nav-link:hover{
    color:black;
}
.about{
    text-align: center;
}
.list{
    text-align: justify;
    margin-left: 38%;
}
.wel{
    color: crimson;
}
.login{
    text-align: center;
    margin-top: 10%;
    background-color: black;
    margin-left: 35%;
    padding: 5%;
    width: fit-content;
}
```

```
.ll{
  color: #fff;
  font-weight: bold;
}
.btn{
  margin-top: 16px;
  background-color: crimson;
  color: #fff;
  font-weight: bold;
}

.title{
  font-size: 1.5em;
  color: #fff;
}
.ag{
  margin-top: 0;
}
```

CHAPTER 8

TESTING

Project Development Phase

Model Performance Test

Date	10 November 2022
Team ID	PNT2022TMID53250
Project Name	Visualizing and Predicting Heart Diseases with an Interactive Dash Board
Maximum Marks	10 Marks

Model Performance Testing:

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

S.No.	Parameter	Screenshot / Values
1.	Dashboard design	No of Visualizations / Graphs - 10
2.	Data Responsiveness	Good
3.	Amount Data to Rendered (DB2 Metrics)	-
4.	Utilization of Data Filters	Yes for filtering out visualisations concerning people with existing heart disease
5.	Effective User Story	No of Scene Added - 8
6.	Descriptive Reports	No of Visualizations / Graphs - 7

Acceptance Testing

UAT Execution & Report Submission

Date	03 November 2022
Team ID	PNT2022TMIDxxxxxx
Project Name	Project - xxx
Maximum Marks	4 Marks

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	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't Fix	0	5	2	1	8
Totals	24	14	13	26	77

3. Test Case Analysis

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

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

5 RESULTS

5.1 Performance Metrics

1. Hours worked: 50 hours
2. Stick to Timelines: 100%
3. Stay within budget: 100%
4. Consistency of the product: 85%
5. Efficiency of the product: 85%
6. Quality of the product: 85%

6 ADVANTAGES & DISADVANTAGES:

ADVANTAGES:

- Smooth User Interface
- Accuracy is achieved quickly

DISADVANTAGES:

Random forest can be used for both classification and regression tasks, but it is not more suitable for Regression tasks

7 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 analyse 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.

8 FUTURE SCOPE

A future update shall comprise of section for viewing renowned cardiologists and scan centres 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.

9 APPENDIX

Source Code:

<https://github.com/IBM-EPBL/IBM-Project-17316-1659633912/tree/main/Final%20Deliverables/Code>

GitHub & Project Demo Link:

GitHub Link: <https://github.com/IBM-EPBL/IBM-Project-17316-1659633912>

Project Demo link: