

# **PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP**

## **VISUALIZING AND PREDICTING HEART DISEASE WITH AN INTERACTIVE DASHBOARD Team ID - PNT2022TMID17743**

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## **1. INTRODUCTION**

### **1.1 Project Overview**

This project aims to visualize and predict the presence of heart disease based on various factors that might cause heart disease. We will analyze the heart disease dataset and gain insights which then helps to know the factor which causes high severity to patients. Based on that, we will be choosing a suitable machine learning model to detect the probability of a patient having heart disease. Machine Learning models helps us to make better decisions. Even though, heart disease might occur in variant forms, there are several factors which are quite common. Taking those into account, we propose an effective method to predict the heart disease by analyzing and visualizing the causes of heart disease.

### **1.2 Purpose**

At all times, doctors might not be available due to some reasons. So, a patient will not be able to consult doctors in case of emergency. In order to eliminate these problems, Heart Disease Prediction application, an online consultant helps user to know if they have heart disease by providing immediate results. Our research will help students and doctors better understand the causes of heart attacks and has led to improved treatment options for this condition. This helps find ways to prevent and treat heart attacks in an earlier manner.

## **2. LITERATURE SURVEY**

### **2.1 Existing Problem**

#### **[a] Heart Disease Prediction using Exploratory Data Analysis (2020)**

**R.Indrakumari, et al.(2020)**, worked with K-means unsupervised algorithm on heart disease prediction by exploiting features of publicly available dataset for heart disease. The study finds necessary hidden patterns for predicting heart diseases and the proposed method is robust to noisy training data. But, KNN works well with small number of input variables but as the numbers of variables grow K-NN algorithm struggles to predict the output of new data point.

#### **[b] Weight optimized neural network for heart disease prediction using hybrid lion plus particle swarm algorithm (2020)**

**Renji P. Cherian, et al. (2020)**, proposed a new heart disease prediction model with the inclusion of specific processes like Feature Extraction, Record, Attribute Minimization and Classification. The proposed method has improved accuracy in the prediction and works well on dimensionally reduced features. But, it is computationally expensive than traditional algorithms.

**[c] Heart disease prediction using supervised machine learning algorithms (2021)**

**Md Mamun Ali, et.al (2021)** worked with machine learning classifiers for highest accuracy of such diagnostic purposes. The RF method achieved 100% accuracy along with 100% sensitivity and specificity. But, the data quantity on heart disease data provided by this dataset was not large enough to adequately address all issues.

**[d] Heart disease prediction system using machine learning (2021)**

**K.Aruljothi, et.al(2021)** proposed a system which predicts the chances of getting heart disease in advance using KNN and Decision tree algorithm for guessing the risk level of heart disease. The proposed work can be used for the automated work analysis and reduces the manual work like other existing systems. This paper didn't work on multiclass classification problem.

**[e] Heart disease prediction based on pre-trained deep neural networks combined with principal component analysis (2022)**

**Dimman Hassan, et al. (2022)** proposed a new approach utilizing a pre-trained Deep Neural Network (DNN) for feature extraction, Principal Component Analysis (PCA) for dimensionality reduction, and Logistic Regression (LR) for prediction. The method provides high accuracy rate not only on the training data but also on the testing data, resulting in outstanding generalization capabilities. No sign of overfitting or underfitting in the proposed model, which is the main problem that plagues the DNN-like methods.

## 2.2 References

1. R. Indrakumari , T. Poongodi , Soumya Ranjan Jena, “**Heart Disease Prediction using Exploratory Data Analysis**”, ELSEVIER – Smart Sustainable Intelligent Computing, (2020).
2. Renji P. Cherian, Noby Thomas, Sunder Venkitachalam, “**Weight optimized neural network for heart disease prediction using hybrid lion plus particle swarm algorithm**”, ELSEVIER – Journal of Biomedical Informatics, Vol.110, (2020).
3. Md Mamun Ali, Bikash Kumar Paul, Kawsar Ahmed, Francis M. Bui, Julian M. W. Quinn, Mohammad Ali Moni, “**Heart disease prediction using supervised machine learning algorithms: Performance analysis and comparison**”, ELSEVIER – Computers in Biology and Medicines, Vol.136, (2021).
4. K. Arul Jothi, S. Subburam, V. Umadevi, K. Hemavathy, “**Heart disease prediction system using machine learning**”, ELSEVIER – Materials Today: Proceedings, (2021).
5. Diman Hassan, Haval I. Hussein, Masoud M. Hassan, “**Heart disease prediction based on pre-trained deep neural networks combined with principal component analysis**”, ELSEVIER – Biomedical Signal Processing and Control, (2022).

## 2.3 Problem Statement Definition

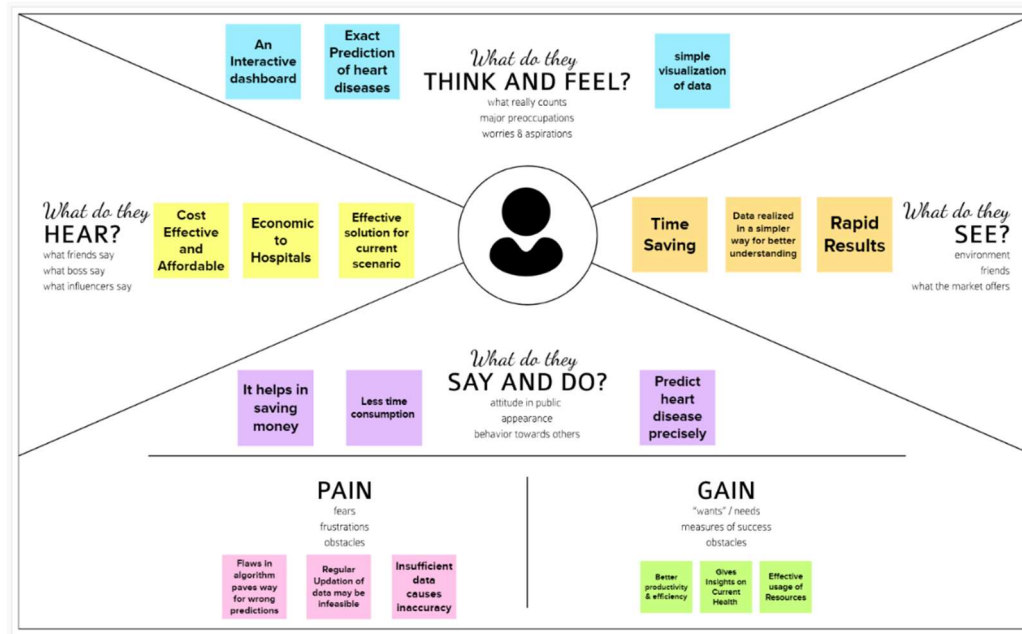
Heart disease refers to several types of abnormalities in heart conditions. The leading cause of death in the developed world is heart disease. It is infeasible for a common man to frequently undergo costly tests for ECG and so on. Hence, there needs a replacement to be done which must be handy and reliable. Thus, we propose an interactive dashboard for visualizing and predicting heart diseases in which user can view his medical report analysis and the predicted final result.

## 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 behavior and attitudes. It is a useful tool to help 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 and Brainstorming:

#### 3.2.1 Brainstorm, Idea Listing and Grouping

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.

## Brainstorm & Idea prioritization

- 10 minutes to prepare
- 1 hour to brainstorm
- 1-2 weeks implementation

### Before you collaborate

1. Think of an important problem you face. Write the biggest reasons that you face it down on sticky notes.

2. 10 minutes

- Brainstorming: Brainstorming happens in the meeting and not at home. Brainstorming happens in a group and not in a group.
- No filter: Brainstorming happens in the meeting and not at home. Brainstorming happens in a group and not in a group.
- Don't filter: Brainstorming happens in the meeting and not at home. Brainstorming happens in a group and not in a group.

Open notes

### Define your problem statement

1. Write down the problem statement of your problem. Write down the problem statement of your problem. Write down the problem statement of your problem.

2. 10 minutes

How to use the problem statement

- 1. Write down the problem statement of your problem. Write down the problem statement of your problem. Write down the problem statement of your problem.
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### Brainstorm

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How to use the problem statement

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### Group ideas

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How to use the problem statement

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### Prioritize

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2. 10 minutes

How to use the problem statement

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### After you collaborate

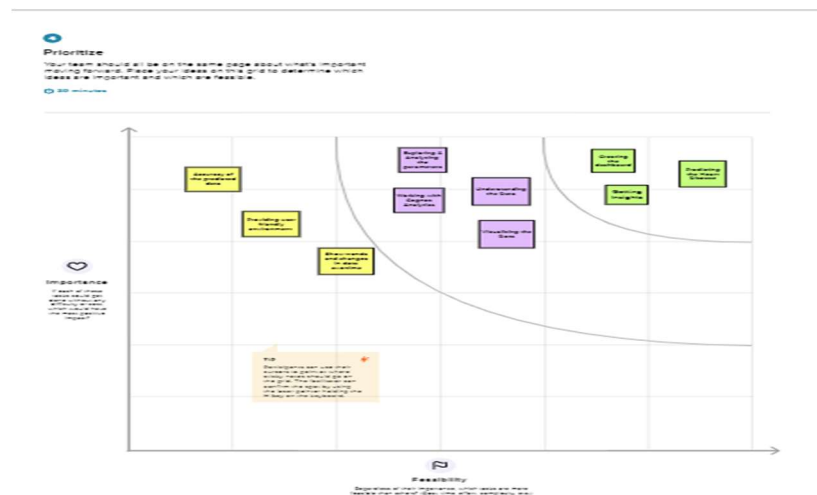
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How to use the problem statement

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- 3. Write down the problem statement of your problem. Write down the problem statement of your problem. Write down the problem statement of your problem.

## 3.2.2 Idea Prioritization



### 3.3 Proposed Solution

Project team shall fill the following information in proposed solution template.

| S.No. | Parameter                                | Description  |
|-------|--|--|
| 1.    | Problem Statement (Problem to be solved) | Heart disease refers to several types of abnormalities in heart conditions. The leading cause of death is heart disease. It is infeasible for a common man to frequently undergo tests for ECG and so on. Hence, there needs a replacement for this, which must be handy and reliable.   |
| 2.    | Idea / Solution description              | The idea behind the proposed solution is to propose an interactive dashboard for visualizing and predicting heart diseases in which user can view his/her medical report analysis and the predicted final result. The dashboard will be generated using IBM Cognos. The heart disease will be predicted using Decision Tree Algorithm. |
| 3.    | Novelty / Uniqueness                     | The novelty behind the proposed system is to provide suggestions to the user based on his/her medical analysis. It will provide the preventive measures to take care of the user himself.  |
| 4.    | Social Impact / Customer Satisfaction    | The system helps the user as well as the doctor to make better decisions to predict heart disease. It is useful in predicting the disease in an earlier stage and makes the user alert about his current condition periodically.   |



|    |                                |  |
|----|--------------------------------|--|
| 5. | Business Model (Revenue Model) | This interactive dashboard for heart disease prediction can be deployed in Health care centres and Hospitals, so that it makes the analysis in a fast manner.                        |
| 6. | Scalability of the Solution    | The proposed solution will work efficiently in both smaller and larger datasets in a similar manner. In future, it can be changed to predict some other diseases with more accuracy. |

### 3.4 Problem Solution fit

|  |   |  |
|--|---|--|
| <p><b>1. CUSTOMER SEGMENT(S)</b><br/>Who is your customer?</p> <p><b>a). Adults who are in the age of above 18.</b></p> <p><b>b). Doctors and Health care Assistants in hospitals who help in heart disease prediction.</b></p> <p><b>c). People who are more health conscious.</b></p> <p style="text-align: right;"><b>CS</b></p>                        | <p><b>6. CUSTOMER CONSTRAINTS</b><br/>What constraints prevent your customers from taking action or lead of solution?</p> <p><b>a). The updates of the medical analysis of user can be done periodically via internet . It is impossible without network connection.</b></p> <p><b>b). It is mandatory for a user to have a smartphone as a minimum requirement.</b></p> <p><b>c). Customer data might not be safe sometimes.</b></p> <p style="text-align: right;"><b>CC</b></p>                   | <p><b>5. AVAILABLE SOLUTIONS</b><br/>Which solutions are available to the customers where they face the problem or need to get the job done? What have they tried in the past? What else is there to do there?</p> <p><b>a). The users must follow the healthy life style by considering the medical analysis of themselves.</b></p> <p><b>b). Based on that, the user can prevent himself from doing things which could harm his/her health conditions.</b></p> <p style="text-align: right;"><b>AS</b></p> |
| <p><b>2. JOBS-TO-BE-DONE / PROBLEMS</b><br/>Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.</p> <p><b>a). Proper input should be given to get the proper prediction.</b></p> <p><b>b). They should have an account.</b></p> <p style="text-align: right;"><b>J&amp;P</b></p> | <p><b>9. PROBLEM ROOT CAUSE</b><br/>What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations.</p> <p><b>a). Less seriousness among people about heart disease</b></p> <p><b>b). This kind of applications were not well founded among people</b></p> <p><b>c). Most of the applications are build concerned with money-making</b></p> <p style="text-align: right;"><b>RC</b></p> | <p><b>7. BEHAVIOUR</b><br/>What does your customer do to address the problem and get the job done?<br/>i.e. directly related; find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)</p> <p><b>a). Providing the accurate parameters will lead to the appropriate prediction of disease.</b></p> <p style="text-align: right;"><b>BE</b></p>  |

|  |   |  |
|--|---|--|
| <p><b>3. TRIGGERS</b><br/>What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.</p> <p><b>a). Positive feedback from the existing users might trigger a customer to use the dashboard.</b></p>   | <p><b>10. YOUR SOLUTION</b><br/>If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.<br/>If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.</p> <p><b>a). Our proposed solution is to predict the heart disease using Naive Bayes Algorithm and visualizing the parameters of heart disease using IBM cognos analytics.</b></p> | <p><b>8. CHANNELS of BEHAVIOUR</b><br/><b>8.1 ONLINE</b><br/>What kind of actions do customers take online? Extract online channels from #7</p> <p><b>a). The updated medical analysis of the customer can be viewed online.</b></p> |
| <p><b>4. EMOTIONS: BEFORE / AFTER</b><br/>How do customers feel when they face a problem or a job and afterwards?<br/>i.e. lost, insecure &gt; confident, in control - use it in your communication strategy &amp; design.</p> <p><b>a). The User might feel tense about his health condition, before.</b></p> <p><b>b). The user might feel secure and stay alert about his/her health condition.</b></p> |   | <p><b>8.2 OFFLINE</b><br/>What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.</p> <p><b>a). The customer can view their recently saved reports offline.</b></p>  |

## 4. Requirement Analysis

### 4.1 Functional requirements

Following are the functional requirements of the proposed solution.

| FR No. | Functional Requirement (Epic) | Sub Requirement (Story / Sub-Task)                                  |
|--------|-------------------------------|---|
| FR-1   | User Registration             | Enables user to make registration for the application through Gmail |
| FR-2   | User Confirmation             | Once after registration, the user will get confirmation via Email   |

|      |                   |   |
|------|-------------------|---|
| FR-3 | Visualizing Data  | User can visualize the trends on the heart disease through Dashboard created using IBM Cognos Analytics |
| FR-4 | Generating Report | User can view his/her health report and can make decisions accordingly                                  |

#### 4.2 Non-Functional requirements

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

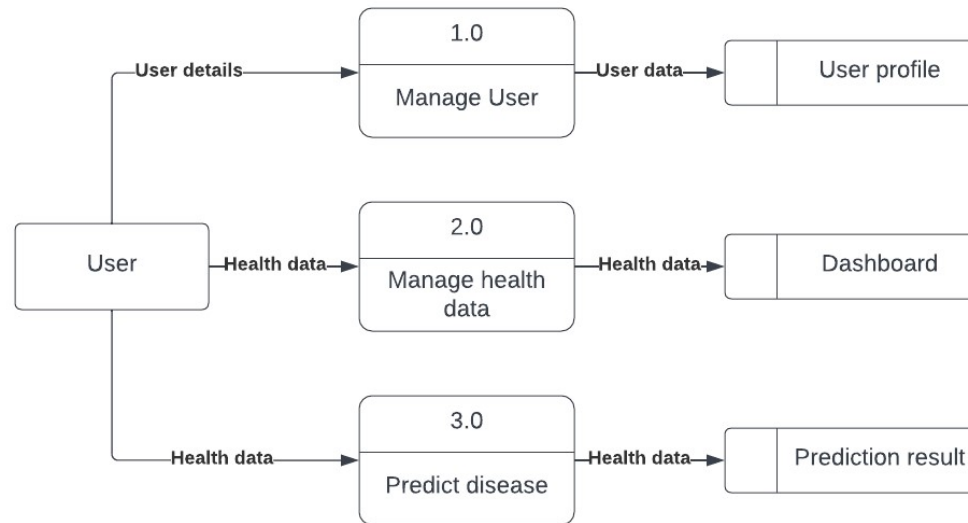
| <b>NFR No.</b> | <b>Non-Functional Requirement</b> | <b>Description</b>  |
|----------------|-----------------------------------|---|
| NFR-1          | Usability                         | The application will have a simple and user-friendly graphical interface. Users will be able to understand and use all the features of the application easily. Any action has to be performed with just a few clicks      |
| NFR-2          | Security                          | For security of the application the technique known as database replication should be used so that all the important data should be kept safe. In case of crash, the system should be able to backup and recover the data |

|       |              |  |
|-------|--------------|--|
| NFR-3 | Reliability  | The application has to be consistent at every scenario and has to work without failure in any environment  |
| NFR-4 | Performance  | Performance of the application depends on the response time and the speed of the data submission. The response time of the application is direct and faster which depends on the efficiency of implemented algorithm |
| NFR-5 | Availability | The application has to be available 24 x 7 for users without any interruption  |
| NFR-6 | Scalability  | The application can withstand the increase in the no. of users and has to be able to develop higher versions   |

## **5.PROJECT DESIGN**

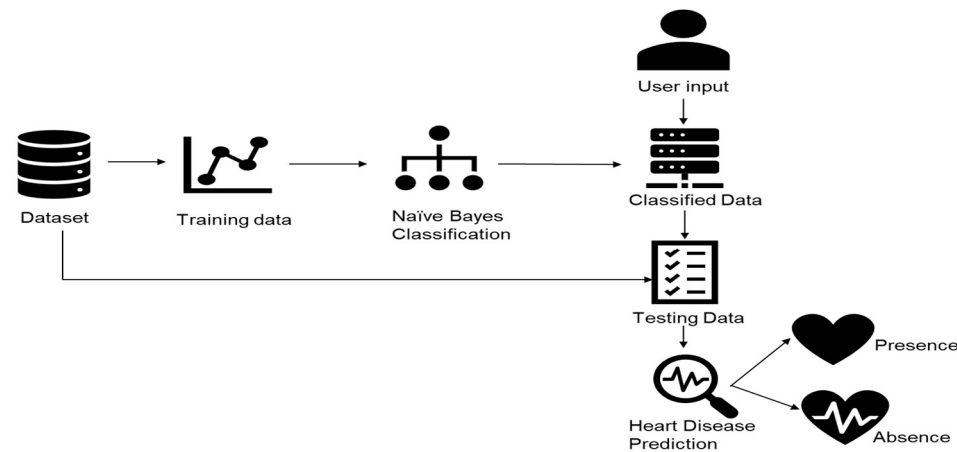
### **5.1 Data Flow Diagrams**

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 enters and leaves the system, what changes the information, and where data is stored.

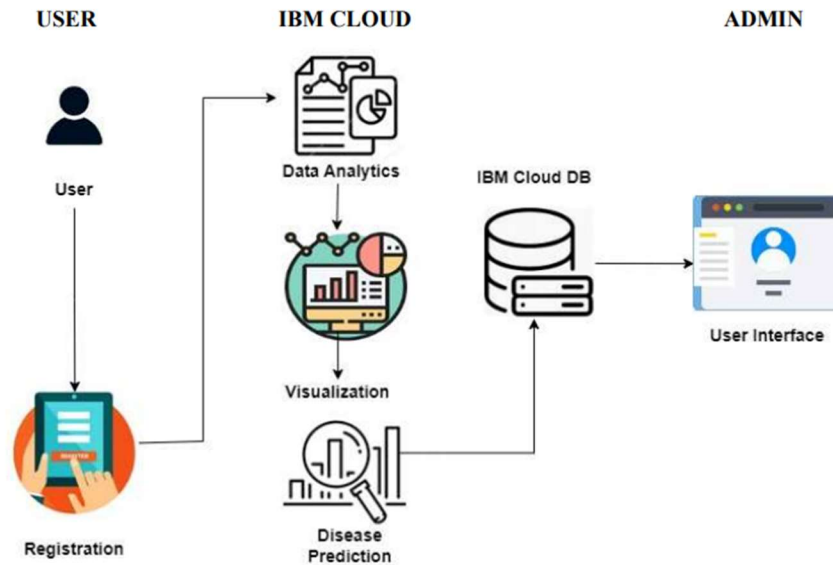


## 5.2 Solution & Technical Architecture

The below diagram represents the solution architecture.



The below diagram represents the technical architecture.



### 5.3 User Stories

| User Story No | User Story/Talk   |
|---------------|---|
| USN-1         | As a user, I can view the details of data.  |
| USN-2         | As an analyst, I will explore the data and clean the data for building the efficient model.                           |
| USN-3         | As an analyst, I will create a data module  |
| USN-4         | As an analyst, I will create an exploratory data analysis to identify the significant factors for disease prediction. |
| USN-5         | As an analyst, I will visualize the various causes for the disease using various chart types.                         |
| USN-6         | As an analyst, I will generate different models to find the model with high accuracy and efficiency.                  |

|        |  |
|--------|--|
| USN-7  | As an analyst, I will choose a suitable model for my solution.             |
| USN-8  | As an analyst, I will create a dashboard showing the analysis of the user. |
| USN-9  | As an analyst, I will generate the result of heart disease prediction.     |
| USN-10 | As an analyst, I will import my model into a suitable framework.           |

## 6.PROJECT PLANNING & SCHEDULING

### 6.1 Sprint Planning & Estimation

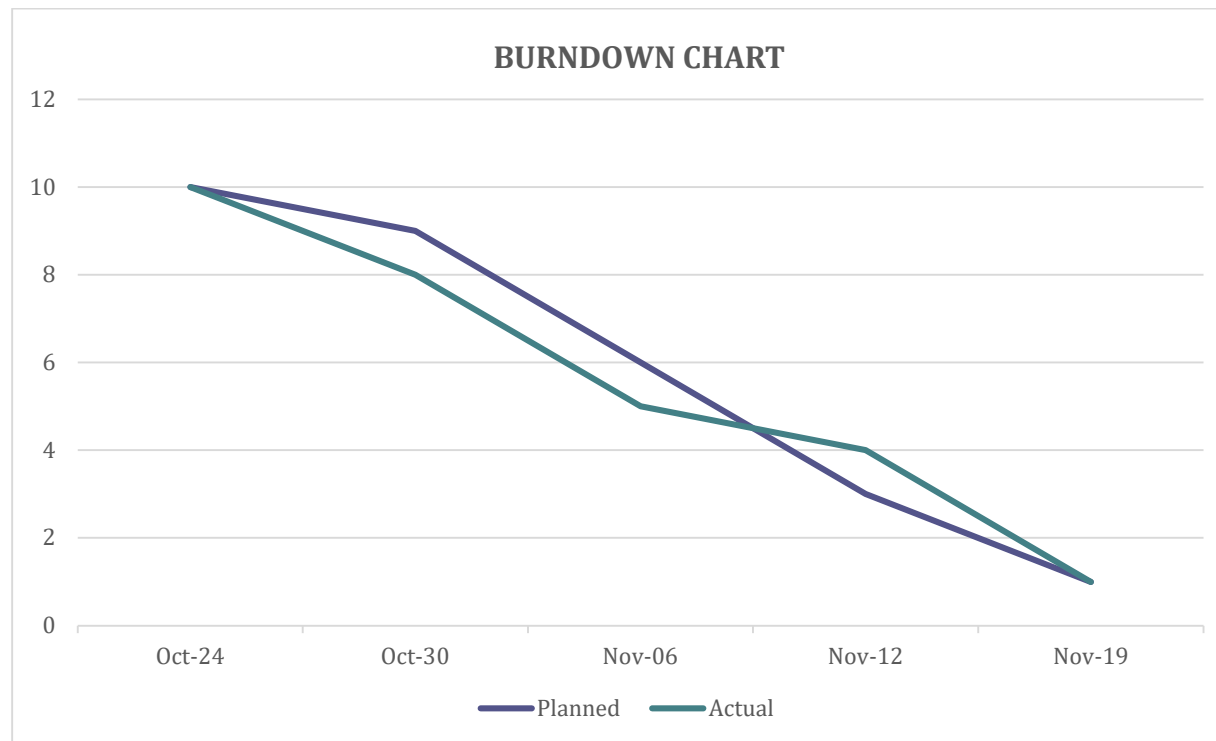
| <b>Sprint</b> | <b>Functional Requirement (Epic)</b> | <b>User Story Number</b> | <b>User Story / Task</b>  | <b>Story Points</b> | <b>Priority</b> | <b>Team Members</b>              |
|---------------|--------------------------------------|--------------------------|---|---------------------|-----------------|----------------------------------|
| Sprint-1      | Exploring the dataset                | USN-1                    | As a user, I can view the details of data.  | 3                   | High            | Joe Antony Celshiya JA           |
|               |                                      | USN-2                    | As an analyst, I will explore the data and clean the data for building the efficient model.                           | 3                   | High            | Harini G                         |
|               |                                      | USN-3                    | As an analyst, I will create a data module.   | 4                   | High            | Sripoornima T                    |
| Sprint-2      | Data Visualization                   | USN-4                    | As an analyst, I will create an exploratory data analysis to identify the significant factors for disease prediction. | 5                   | High            | Hanna S, Sripoornima T           |
|               |                                      | USN-5                    | As an analyst, I will visualize the various causes for the disease using various chart types.                         | 5                   | High            | Hanna S, Sripoornima T           |
| Sprint-3      | Disease Prediction                   | USN-6                    | As an analyst, I will generate different models to find the model with high accuracy and efficiency                   | 5                   | Medium          | Joe Antony Celshiya JA, Harini G |
|               |                                      | USN-7                    | As an analyst, I will choose a suitable model for my solution.  | 5                   | High            | Joe Antony Celshiya              |

| <b>Sprint</b> | <b>Functional Requirement (Epic)</b> | <b>User Story Number</b> | <b>User Story / Task</b>  | <b>Story Points</b> | <b>Priority</b> | <b>Team Members</b>                   |
|---------------|--------------------------------------|--------------------------|---|---------------------|-----------------|---------------------------------------|
|               |                                      |                          |   |                     |                 | JA, Harini G                          |
| Sprint-4      | Dashboard Creation                   | USN-8                    | As an analyst, I will create a dashboard showing the analysis of the user | 3                   | High            | Harini G                              |
|               |                                      | USN-9                    | As an analyst, I will generate the result of heart disease prediction.    | 3                   | High            | Sripoornima T                         |
|               |                                      | USN-10                   | As an analyst, I will import my model into a suitable framework.          | 4                   | High            | Joe Antony<br>Celshiya JA,<br>Hanna S |

| <b>Sprint</b> | <b>Story Points</b> | <b>Duration</b> | <b>Sprint Start Date</b> | <b>Sprint End Date (Planned)</b> | <b>Sprint Release Date (Actual)</b> |
|---------------|---------------------|-----------------|--------------------------|----------------------------------|-------------------------------------|
| Sprint 1      | 10                  | 5 Days          | 24 Oct 2022              | 29 Oct 2022                      | 29 Oct 2022                         |
| Sprint 2      | 10                  | 5 Days          | 31 Oct 2022              | 05 Nov 2022                      | 05 Nov 2022                         |
| Sprint 3      | 10                  | 5 Days          | 07 Nov 2022              | 12 Nov 2022                      | 12 Nov 2022                         |
| Sprint 4      | 10                  | 5 Days          | 14 Nov 2022              | 19 Nov 2022                      | 19 Nov 2022                         |



### BurnDown Chart:



### 6.2 Sprint Delivery Schedule

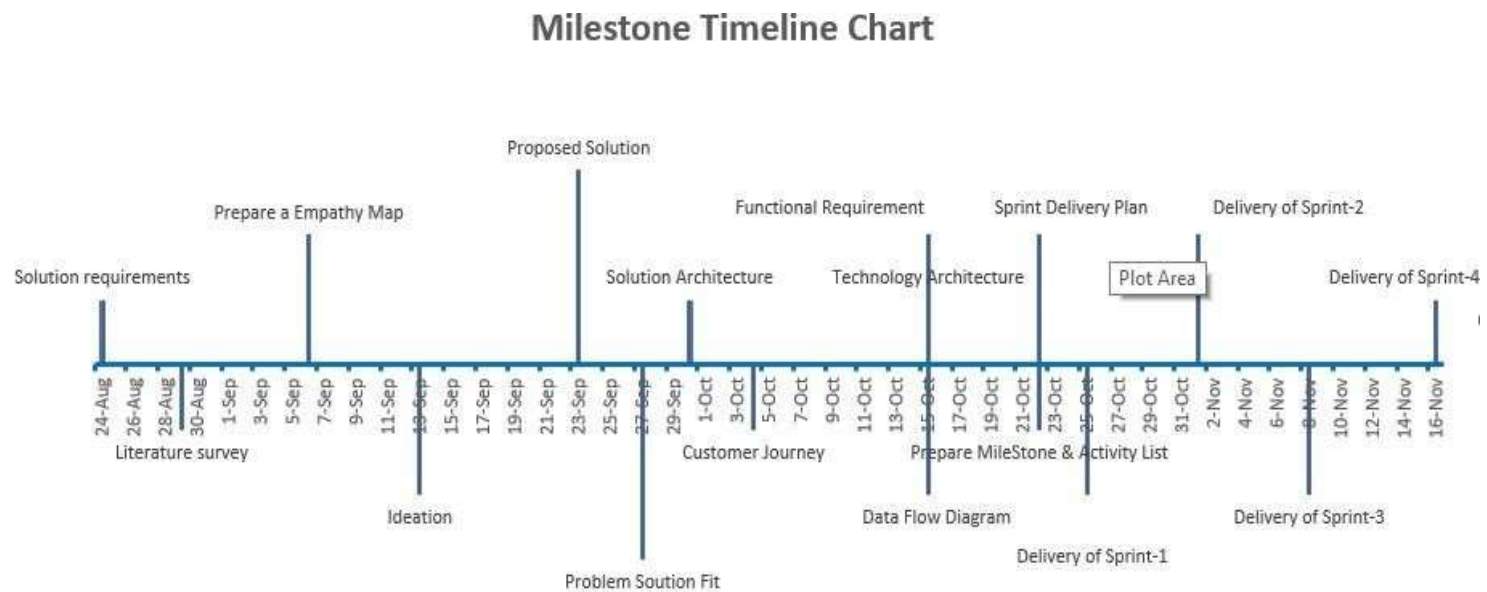
A milestone schedule, or milestone chart, is a timeline that uses milestones to divide a project schedule into major phases. A milestone chart is a way to visualize the most important steps of our project. Each milestone the team achieves brings us closer to completing the project. As a result, milestones provide a sense of accomplishment and show the team how the work they're doing contributes to the overarching project objective.

| Activity Name          | Activity Number | Activity Description  | Tasks Assigned   | Status    |
|------------------------|-----------------|---|--|-----------|
| Preparation Phase      | 1               | a) Access the resources in project dashboard<br>b) Explore the dataset provided in workspace<br>c) Create GitHub account & collaborate with Project Repository in project workspace<br>d) Set-up the prerequisites for the project                          | SRIPOORNIMA T<br>HANNA S<br>HARINI G<br>JOE ANTONY CELSHIYA JA | Completed |
| Ideation Phase         | 2               | a) Literature survey relevant to the selected project<br>b) Preparation of Empathy Map to identify the user pros and cons<br>c) List the ideas by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance | SRIPOORNIMA T<br>HANNA S<br>HARINI G<br>JOE ANTONY CELSHIYA JA | Completed |
| Project Design Phase-I | 3               |   |  |           |
| Proposed Solution      | 3.1             | Preparation of proposed solution document, which includes the novelty, feasibility of idea, business model, social impact and solution scalability solution   | HANNA S  | Completed |
| Problem Solution Fit   | 3.2             | Prepared problem solution fit which provides effective solutions for the problem  | JOE ANTONY CELSHIYA JA   | Completed |
| Solution Architecture  | 3.3             | Develop effective architecture for the proposed solution  | SRIPOORNIMA T<br>HARINI G                                      | Completed |

|                                    |     |   |  |             |
|------------------------------------|-----|---|--|-------------|
| Project Design Phase-II            | 4   |   |  |             |
| Requirement Analysis               | 4.1 | Identify the Functional and Non-Functional requirements   | JOE ANTONY CELSHIYA JA   | Completed   |
| Customer Journey                   | 4.2 | Preparation of customer journey map to understand the user interactions & experiences with the application from the entry level to exit level | HANNA S  | Completed   |
| Data Flow Diagram and User stories | 4.3 | Generate Data flow diagram of the project   | SRIPOORNIMA T  | Completed   |
| Technical Architecture             | 4.4 | Develop effective technical architecture for the proposed solution  | HARINI G   | Completed   |
| Project Planning Phase             | 5   |   |  |             |
| Milestones & Activity List         | 5.1 | Prepare Milestone and Activity list of the project  | SRIPOORNIMA T<br>HANNA S<br>HARINI G<br>JOE ANTONY CELSHIYA JA | Completed   |
| Sprint Plan                        | 5.2 | Prepare Sprint Delivery plan of the project   | SRIPOORNIMA T<br>HANNA S<br>HARINI G<br>JOE ANTONY CELSHIYA JA | Completed   |
| Project Development Phase          | 6   |   |  |             |
| Delivery of Sprint-1               | 6.1 | Implement the coding phase of Sprint-1  | SRIPOORNIMA T<br>HANNA S<br>HARINI G<br>JOE ANTONY CELSHIYA JA | In Progress |
| Delivery of Sprint-2               | 6.2 | Implement the coding phase of Sprint-2  | JOE ANTONY CELSHIYA JA   | In Progress |
| Delivery of Sprint-3               | 6.3 | Implement the coding phase of Sprint-3  | SRIPOORNIMA T<br>HANNA S                                       | In Progress |

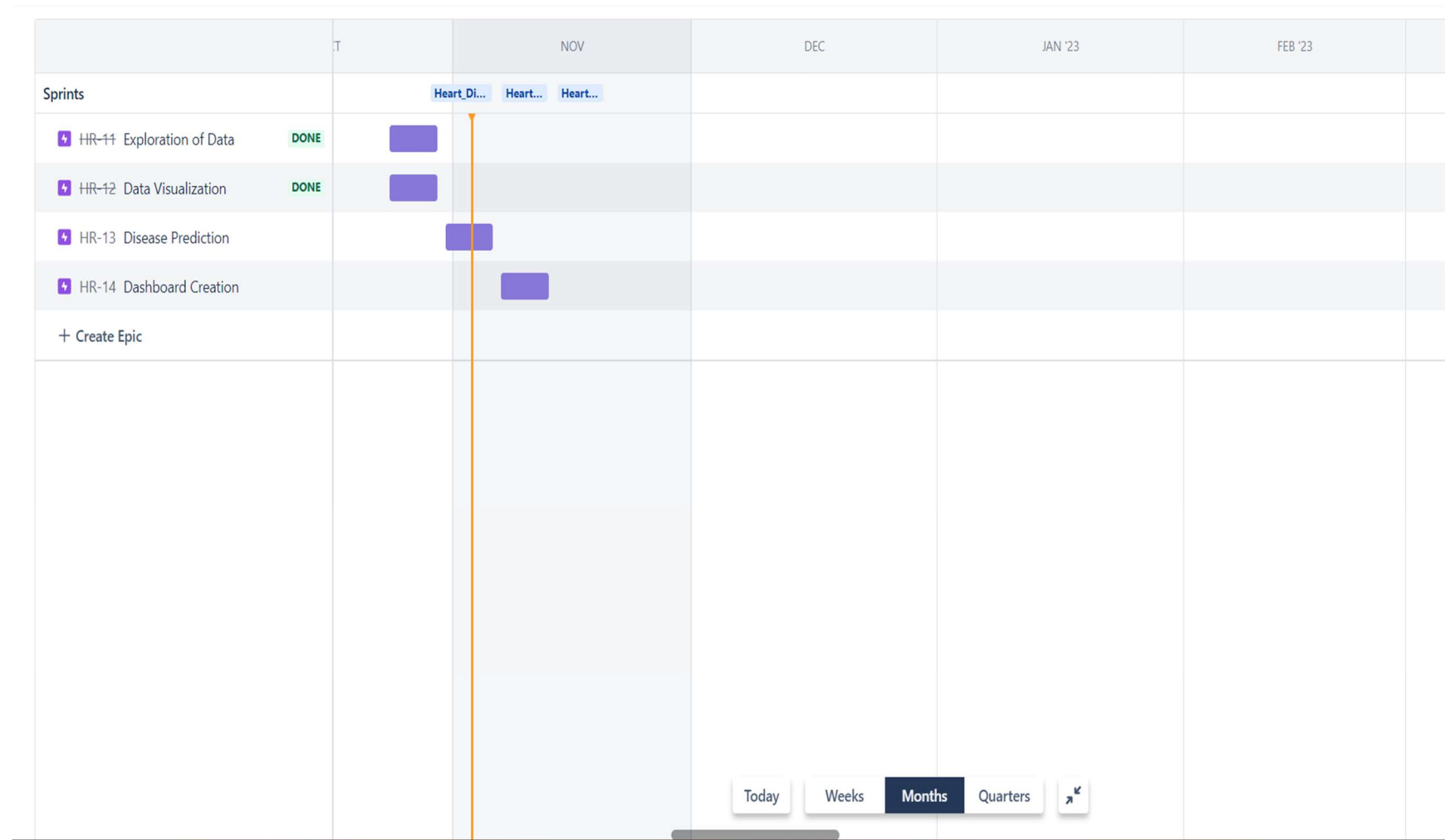
|                      |     |  |  |             |
|----------------------|-----|--|--|-------------|
|                      |     |  | HARINI G<br>JOE ANTONY CELSHIYA JA                             |             |
| Delivery of Sprint-4 | 6.4 | Implement the coding phase of Sprint-4 | SRIPOORNIMA T<br>HANNA S<br>HARINI G<br>JOE ANTONY CELSHIYA JA | In Progress |

### Milestone Timeline Chart:



## 6.3 Reports from JIRA

### Project Roadmap:



## Project Backlog:

The screenshot displays the Jira Software interface for a project named 'HeartDiseasePrediction'. The top navigation bar includes 'Jira Software', 'Your work', 'Projects', 'Filters', 'Dashboards', 'People', 'Apps', and a 'Create' button. A search bar and utility icons are on the right. A banner at the top of the main content area asks if the team needs more from Jira, linking to a free trial of the Standard plan.

The left sidebar shows the project's navigation menu with sections for 'PLANNING' (Roadmap, Backlog, Board, Reports) and 'DEVELOPMENT' (Code). Below this are links for 'Project pages', 'Add shortcut', and 'Project settings'. A note at the bottom of the sidebar states 'You're in a team-managed project' with a 'Learn more' link.

The main content area is titled 'Backlog' and shows two sprints:

- Heart\_Disease\_Sprint 1** (29 Oct – 5 Nov, 3 issues):
  - HR-1: As a user, I can view the details of data. (3 points, DONE)
  - HR-2: As an analyst, I will explore the data and clean the data for building the effic... (3 points, DONE)
  - HR-3: As an analyst, I will create a data module. (4 points, DONE)
- Heart\_Disease\_Sprint 2** (31 Oct – 5 Nov, 2 issues):
  - HR-4: As an analyst, I will create an exploratory data analysis to identify the signifi... (5 points, DONE)
  - HR-5: As an analyst, I will visualize the various causes for the disease using various... (5 points, DONE)

Each sprint entry includes a description, a progress bar (0, 0, 10), and a 'Complete sprint' button. A '+ Create issue' button is available at the bottom of each sprint list.

On the right, a 'Quickstart' panel provides a checklist of tasks: 'Create a project', 'Create an issue', 'Invite your teammates', 'Connect your tools', 'Get the mobile app', and 'Find help'. It also includes a 'Show me' button and a 'View issue tutorial' link. A 'Dismiss Quickstart' link is at the bottom.

Jira Software

Your work ▾Projects ▾Filters ▾Dashboards ▾People ▾Apps ▾Create

Q Search

🔊?⚙️👤

HeartDiseasePrediction  
Software project

PLANNING

📅 Roadmap

📋 Backlog

📊 Board

📈 Reports

DEVELOPMENT

📄 Code

📄 Project pages

📌 Add shortcut

⚙️ Project settings

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Projects / HeartDiseasePrediction

Backlog

🔍

👤👤👤H👤

Epic ▾Label ▾

📈 Insights

▼ Heart\_Disease\_Sprint 3 7 Nov – 12 Nov (2 issues)0100Complete sprint

To identify a suitable model for heart disease prediction and implementing it.

🟢 HR-6 As an analyst, I will generate different models to find the model with ...5IN PROGRESS👤

🟢 HR-7 As an analyst, I will choose a suitable model for my solution.5IN PROGRESS👤

+ Create issue

▼ Heart\_Disease\_Sprint 4 14 Nov – 19 Nov (3 issues)1000Complete sprint

To create an interactive dashboard for heart disease prediction.

🟢 HR-10 As an analyst, I will import my model into a suitable framework.4TO DO👤

🟢 HR-9 As an analyst, I will generate the result of heart disease prediction.3TO DO👤

🟢 HR-8 As an analyst, I will create a dashboard showing the analysis of the user.3TO DOH

+ Create issue

Quickstart

✓ Create a project ▾

✓ Create an issue ▴

Issue

Issues are individual pieces of work that you assign to teammates.

Issues can be tasks or stories.

Show meView issue tutorial

✓ Invite your teammates ▾

✓ Connect your tools ▾

✓ Get the mobile app ▾

✓ Find help ▾

Dismiss Quickstart

## Sprint Creation:

Jira Software Your work ▾ Projects ▾ Filters ▾ Dashboards ▾ People ▾ Apps ▾ Create

Search

HeartDiseasePrediction Software project

PLANNING

- Roadmap
- Backlog
- Board
- Reports

DEVELOPMENT

- Code

Project pages

Add shortcut

Project settings

You're in a team-managed project

Learn more

Does your team need more from Jira? [Get a free trial of our Standard plan.](#)

Projects / HeartDiseasePrediction

### All sprints

Complete sprint

GROUP BY None Insights

TO DO 3 ISSUES

- As an analyst, I will import my model into a suitable framework.  
USERPROFILE  
HR-10 4
- As an analyst, I will generate the result of heart disease prediction.  
USERPROFILE  
HR-9 3
- As an analyst, I will create a dashboard showing the analysis of the user.  
USERPROFILE

IN PROGRESS 2 ISSUES

- As an analyst, I will generate different models to find the model with high accuracy and efficiency  
HELPDESK  
HR-6 5
- As an analyst, I will choose a suitable model for my solution.  
HELPDESK  
HR-7 5

DONE 5 ISSUES

- As a user, I can view the details of data.  
REGISTRATION  
HR-1 3
- As an analyst, I will explore the data and clean the data for building the efficient model.  
REGISTRATION  
HR-2 3
- As an analyst, I will create a data module.  
LOGIN  
HR-3 4

### Quickstart

- ✓ Create a project
- ✓ Customize your board
- ✓ Create an issue

Issues are individual pieces of work that you assign to teammates.

Issues can be tasks or stories.

Show me View issue tutorial

- ✓ Invite your teammates
- ✓ Connect your tools
- ✓ Get the mobile app

Dismiss Quickstart



## 7. CODING & SOLUTIONING

### 7.1 Embedded Dashboard.html

```
<html>

<head>

<title>Visualizing and Predicting HeartDisease</title>

<meta charset="utf-8">

<meta name="viewport" content="width=device-width, initial-scale=1">

<link href="https://cdn.jsdelivr.net/npm/bootstrap@5.2.1/dist/css/bootstrap.min.css" rel="stylesheet">

<script src="https://cdn.jsdelivr.net/npm/bootstrap@5.2.1/dist/js/bootstrap.bundle.min.js">

</script>

</head>

<body>

<div class="container-fluid p-5 bg-info text-secondary text-center">

<h1> Visualizing and Predicting HeartDisease with an Interactive Dashboard</h1>

<p>

<iframe

src="https://us3.ca.analytics.ibm.com/bi/?perspective=dashboard&pathRef=.my_folders%2FHeart_Disease_Prediction%2FDashboard%2BVisuals&closeWindowOnLastView=true&ui_appbar=false&ui_navbar=false&shareMode=embedde
```

d&amp;action=view&amp;mode=dashboard&amp;subView=model000000183705ee369\_000000003" width="1200" height="700"

frameborder="0" gesture="media" allow="encrypted-media" allowfullscreen="">

</iframe>

</p>

</div>

</body>

</html>

### **Embedded Story.html:**

<!DOCTYPE html>

<html lang="en">

<head>

<title>Visualizing and Predicting HeartDisease</title>

<meta charset="utf-8">

<meta name="viewport" content="width=device-width, initial-scale=1">

<link href="https://cdn.jsdelivr.net/npm/bootstrap@5.2.1/dist/css/bootstrap.min.css"

rel="stylesheet">

<script

```

src="https://cdn.jsdelivr.net/npm/bootstrap@5.2.1/dist/js/bootstrap.bundle.min.js"></script>

</head>

<body>

<div class="container-fluid p-5 bg-warning text-success text-center"> <h1>Visualizing and Predicting HeartDisease with an
Interactive Dashboard</h1>

<p>

<iframe src="https://us1.ca.analytics.ibm.com/bi/?perspective=story&pathRef=.public_folders%2FAssignment-
1%2FStory&closeWindowOnLastView=true&ui_appbar=false&ui_navbar=false&shareMode=embedded&a
ction=view&sceneId=model000001847b70980f_00000002&sceneTime=0" width="1200" height="600" frameborder="0"
gesture="media" allow="encrypted-media" allowfullscreen="">

</iframe>

</p>

</div>

</body>

</html>

```

## **7.2 Heart Disease Prediction Model Building.ipynb:**

### **IMPORT DATASETS:**

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
```

### **READ DATASET:**

```
dt=pd.read_csv("Heart_Disease_Prediction.csv")
```

### **ENCODING LABELS:**

```
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
label = le.fit_transform(dt['Heart_Disease'])
label
```

### **EXPLORATION:**

```
dt.drop("Heart_Disease", axis=1, inplace=True)
dt["Heart_Disease"] = label
dt
```

```
dt.describe()
```

```
dt.isnull().sum()
```

### **TRAIN AND TEST DATA:**

```
from sklearn.model_selection import train_test_split
x = dt.drop("Heart_Disease",axis=1)
y = dt["Heart_Disease"]
```

```
X_train,X_test,Y_train,Y_test = train_test_split(x,y,test_size=0.30,random_state=0)
```

### **NAÏVE BAYES CLASSIFIER:**

```
from sklearn.naive_bayes import GaussianNB
```

```
nb = GaussianNB()
```

```
nb.fit(X_train,Y_train)
```

```
Y_pred_nb = nb.predict(X_test)
```

```
from sklearn.metrics import accuracy_score
```

```
score_nb = round(accuracy_score(Y_pred_nb,Y_test)*100,2)
```

```
print("The accuracy score achieved using Naive Bayes is: "+str(score_nb)+" %")
```

```
from sklearn.metrics import confusion_matrix
```

```
plt.figure(figsize=(8, 8))
```

```
CM=confusion_matrix(Y_test,Y_pred_nb)
```

```
sns.heatmap(CM, annot=True)
```

### **DECISIONTREE CLASSIFIER:**

```
from sklearn.tree import DecisionTreeClassifier
```

```
decTree = DecisionTreeClassifier(max_depth=6, random_state=0)
```

```
decTree.fit(X_train,Y_train)
```

```
y_pred_decTree = decTree.predict(X_test)
```

```
import sklearn.metrics as metrics
```

```
score_decree = round(accuracy_score(y_pred_decTree,Y_test)*100,2)
```

```
print("The accuracy score achieved using Decision Tree Classifier is: " , metrics.accuracy_score(Y_test,y_pred_decTree))
```

```
plt.figure(figsize=(8, 8))
```

```
CM=confusion_matrix(Y_test,y_pred_decTree)
sns.heatmap(CM, annot=True)
```

### **LOGISTIC REGRESSION:**

```
from sklearn.linear_model import LogisticRegression
lr = LogisticRegression()
lr.fit(X_train,Y_train)
Y_pred_lr = lr.predict(X_test)
```

```
score_lr = round(accuracy_score(Y_pred_lr,Y_test)*100,2)
print("The accuracy score achieved using Logistic Regression is: "+str(score_lr)+" %")
```

```
plt.figure(figsize=(8, 8))
CM=confusion_matrix(Y_test,Y_pred_lr)
sns.heatmap(CM, annot=True)
```

### **RANDOM FOREST CLASSIFIER:**

```
from sklearn.ensemble import RandomForestClassifier
model=RandomForestClassifier()
model.fit(X_train,Y_train)
Y_pred_rfc=model.predict(X_test)
```

```
score_rfc = round(accuracy_score(Y_pred_rfc,Y_test)*100,2)
print("The accuracy score achieved using Random Forest Classifier is: "+str(score_rfc)+" %")
```

```
plt.figure(figsize=(8, 8))
CM=confusion_matrix(Y_test,Y_pred_rfc)
sns.heatmap(CM, annot=True)
```

### **SUPPORT VECTOR MACHINE:**

```
from sklearn.svm import SVC
classifier = SVC(kernel='rbf', random_state = 1)
classifier.fit(X_train,Y_train)
Y_pred_svm = classifier.predict(X_test)

score_svm = round(accuracy_score(Y_pred_svm,Y_test)*100,2)
print("The accuracy score achieved using Support Vector Machine is: "+str(score_svm)+" %")

plt.figure(figsize=(8, 8))
CM=confusion_matrix(Y_test,Y_pred_svm)
sns.heatmap(CM, annot=True)
```

### **ACCURACY SCORES:**

```
scores = [score_nb,score_dectree,score_lr,score_rfc,score_svm]
models = ["Naive Bayes Classifier","Decision Tree Classifier","Logistic Regression","Random Forest Classifier","Support Vector Machine"]

for i in range(len(models)):
    print("The accuracy score achieved using "+models[i]+" is: "+str(scores[i])+" %")
```

## **8.TESTING**

### **8.1 User Acceptance Testing**

#### **1. Purpose of Document**

The purpose of this document is to briefly explain the test coverage and open issues of the Visualizing and Predicting Heart Disease with an Interactive Dashboard 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 |
|-----------------|------------|------------|------------|------------|----------|
| BP              | 10         | 4          | 2          | 3          | 19       |
| Cholesterol     | 9          | 3          | 3          | 0          | 15       |
| EKG Results     | 2          | 3          | 0          | 1          | 6        |
| ST Depression   | 1          | 2          | 4          | 7          | 14       |
| Exercise Angina | 9          | 6          | 1          | 0          | 16       |
| Thallium        | 3          | 4          | 1          | 1          | 9        |
| Totals          | 34         | 22         | 11         | 12         | 79       |

### 3. Test Case Analysis

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

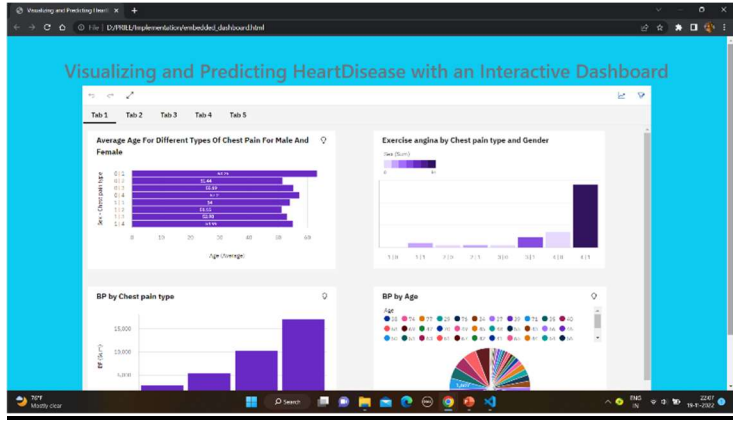
| Section         | Total Cases | Not Tested | Fail | Pass |
|-----------------|-------------|------------|------|------|
| BP              | 15          | 0          | 0    | 15   |
| Cholesterol     | 20          | 0          | 0    | 20   |
| EKG Results     | 3           | 0          | 0    | 3    |
| ST Depression   | 4           | 0          | 0    | 4    |
| Exercise Angina | 2           | 0          | 0    | 2    |
| Thallium        | 3           | 0          | 0    | 3    |



## 8.2 Testcases Report

|                 |                             |                      |   | Date                   | 21-Nov-22   |   |                     |                     |        |                               |                        |          |                                   |
|-----------------|-----------------------------|----------------------|---|------------------------|---|---|---------------------|---------------------|--------|-------------------------------|------------------------|----------|-----------------------------------|
|                 |                             |                      |   | Team ID                | PNT2022TMD17743   |   |                     |                     |        |                               |                        |          |                                   |
|                 |                             |                      |   | Project Name           | Project - Visualizing and Predicting  |   |                     |                     |        |                               |                        |          |                                   |
|                 |                             |                      |   | Maximum Marks          | 4 marks   |   |                     |                     |        |                               |                        |          |                                   |
| Test case ID    | Feature Type                | Component            | Test Scenario                                   | Pre-Requisite          | Steps To Execute  | Test Data   | Expected Result     | Actual Result       | Status | Comments                      | TC for Automation(Y/N) | BUG ID   | Executed By                       |
| BP              | Dashboard, Report and Story | IBM Cognos Analytics | Verify if the dataset is clean and preprocessed | A Preprocessed dataset | 1. Upload the dataset<br>2. Explore the dataset<br>3. Visualize the features<br>4. Create Dashboard, Story and report | <a href="https://github.com/IBM-EPBL/IBM-Project-2206-1658466325/blob/main/Financial%20Deliverables/HeartDisease_Prediction.csv">https://github.com/IBM-EPBL/IBM-Project-2206-1658466325/blob/main/Financial%20Deliverables/HeartDisease_Prediction.csv</a> | Accurate Prediction | Working as expected | Pass   |                               | Yes                    |          | Sripoornima T, Hanna S            |
| Cholesterol     | Dashboard, Report and Story | IBM Cognos Analytics | Verify if the dataset is clean and preprocessed | A Preprocessed dataset | 1. Upload the dataset<br>2. Explore the dataset<br>3. Visualize the features<br>4. Create Dashboard, Story and report | <a href="https://github.com/IBM-EPBL/IBM-Project-2206-1658466325/blob/main/Financial%20Deliverables/HeartDisease_Prediction.csv">https://github.com/IBM-EPBL/IBM-Project-2206-1658466325/blob/main/Financial%20Deliverables/HeartDisease_Prediction.csv</a> | Accurate Prediction | Working as expected | Pass   | Steps are not clear to follow | Yes                    | BUG-1234 | Hanna S, Harini G                 |
| EKG Results     | Dashboard, Report and Story | IBM Cognos Analytics | Verify if the dataset is clean and preprocessed | A Preprocessed dataset | 1. Upload the dataset<br>2. Explore the dataset<br>3. Visualize the features<br>4. Create Dashboard, Story and report | <a href="https://github.com/IBM-EPBL/IBM-Project-2206-1658466325/blob/main/Financial%20Deliverables/HeartDisease_Prediction.csv">https://github.com/IBM-EPBL/IBM-Project-2206-1658466325/blob/main/Financial%20Deliverables/HeartDisease_Prediction.csv</a> | Accurate Prediction | Working as expected | Pass   |                               | Yes                    |          | Joe Antony Celshiya J A, Harini G |
| ST Depression   | Dashboard, Report and Story | IBM Cognos Analytics | Verify if the dataset is clean and preprocessed | A Preprocessed dataset | 1. Upload the dataset<br>2. Explore the dataset<br>3. Visualize the features<br>4. Create Dashboard, Story and report | <a href="https://github.com/IBM-EPBL/IBM-Project-2206-1658466325/blob/main/Financial%20Deliverables/HeartDisease_Prediction.csv">https://github.com/IBM-EPBL/IBM-Project-2206-1658466325/blob/main/Financial%20Deliverables/HeartDisease_Prediction.csv</a> | Accurate Prediction | Working as expected | Pass   |                               | Yes                    |          | Sripoornima T, Hanna S            |
| Exercise Angina | Dashboard, Report and Story | IBM Cognos Analytics | Verify if the dataset is clean and preprocessed | A Preprocessed dataset | 1. Upload the dataset<br>2. Explore the dataset<br>3. Visualize the features<br>4. Create Dashboard, Story and report | <a href="https://github.com/IBM-EPBL/IBM-Project-2206-1658466325/blob/main/Financial%20Deliverables/HeartDisease_Prediction.csv">https://github.com/IBM-EPBL/IBM-Project-2206-1658466325/blob/main/Financial%20Deliverables/HeartDisease_Prediction.csv</a> | Accurate Prediction | Working as expected | Pass   |                               | Yes                    |          | Sripoornima T, Hanna S            |
| Thallium        | Dashboard, Report and Story | IBM Cognos Analytics | Verify if the dataset is clean and preprocessed | A Preprocessed dataset | 1. Upload the dataset<br>2. Explore the dataset<br>3. Visualize the features<br>4. Create Dashboard, Story and report | <a href="https://github.com/IBM-EPBL/IBM-Project-2206-1658466325/blob/main/Financial%20Deliverables/HeartDisease_Prediction.csv">https://github.com/IBM-EPBL/IBM-Project-2206-1658466325/blob/main/Financial%20Deliverables/HeartDisease_Prediction.csv</a> | Accurate Prediction | Working as expected | Pass   |                               | Yes                    |          | Joe Antony Celshiya J A, Harini G |

### 8.3 PerformanceTesting

| S.No. | Parameter                   | Screenshot / Values   |
|-------|-----------------------------|---|
| 1.    | Dashboard design            | <p>No of Visualizations / Graphs – 20 Visualizations in 5 Dashboard tabs ( 4 Visualizations in each Dashboard tab)</p>  |
| 2.    | Data Responsiveness         | The visualizations show the relationship between the features. It shows how each factor affects the target “Heart Disease”.   |
| 3.    | Utilization of Data Filters | Filters are used to aggregate or group common data.   |
| 4.    | Effective User Story        | No of Scene Added – 14 Stories with 2 visualizations each.  |

|    |                     |  |
|----|---------------------|--|
|    |                     |  |
| 5. | Descriptive Reports | <p>No of Visualizations / Graphs – 4 reports with 2/4 Visualizations each.</p> |

## 9.RESULTS

### 9.1 Performance Metrics

Accuracy Score Of Machine Learning Models

+ Code

+ Markdown

```
scores = [score_nb,score_dectree,score_lr,score_rfc,score_svm]
models = ["Naive Bayes Classifier","Decision Tree Classifier","Logistic Regression","Random Forest Classifier","Support Vector Machine"]

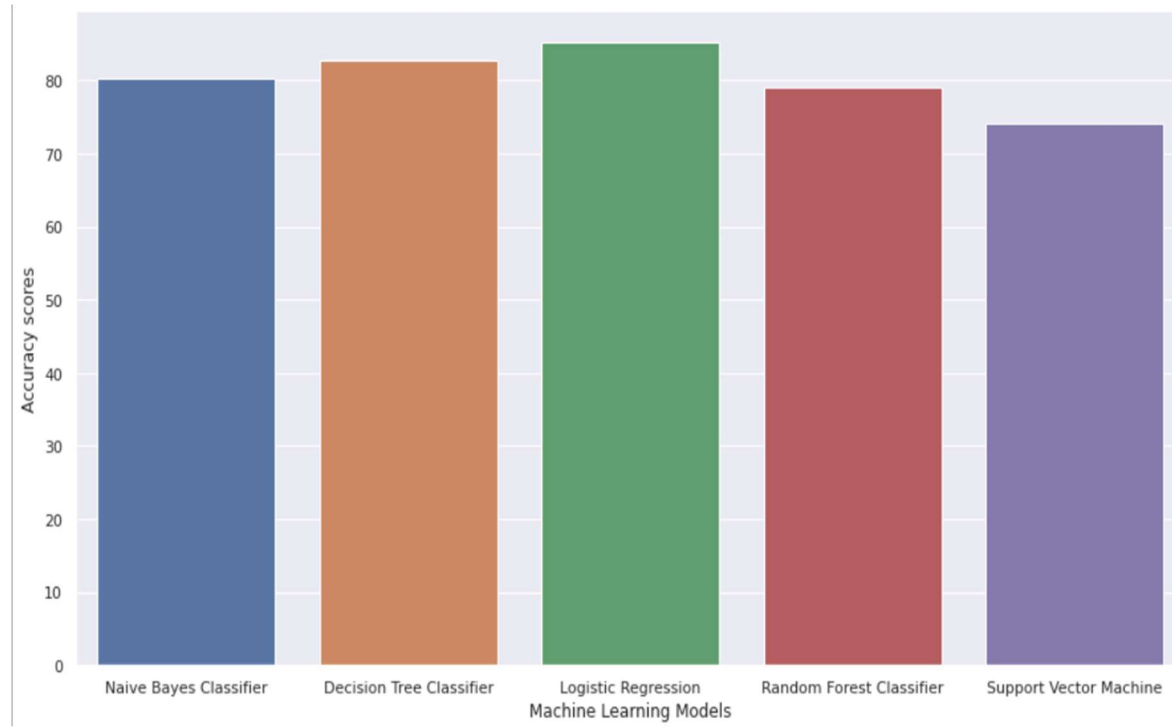
for i in range(len(models)):
    print("The accuracy score achieved using "+models[i]+" is: "+str(scores[i])+" %")
```

[38]

```
... The accuracy score achieved using Naive Bayes Classifier is: 80.25 %
The accuracy score achieved using Decision Tree Classifier is: 82.72 %
The accuracy score achieved using Logistic Regression is: 85.19 %
The accuracy score achieved using Random Forest Classifier is: 79.01 %
The accuracy score achieved using Support Vector Machine is: 74.07 %
```

| ML Model | NaïveBayes<br>Classifier | DecisionTree<br>Classifier | Logistic<br>Regression | RandomForest<br>Classifier | SupportVector<br>Machine |
|----------|--------------------------|----------------------------|------------------------|----------------------------|--------------------------|
| Accuracy | 80.25%                   | 82.72%                     | 85.19%                 | 79.01%                     | 74.07%                   |

### Comparative Analysis:



## 9.2 Result Screenshots

The screenshot displays a web browser window with the address bar showing '127.0.0.1:5000/predict'. The page has a yellow header with the text 'Welcome to Heart Disease Prediction Portal!'. Below this is a title 'Heart Disease Prediction Platform'. The main content area is a pink form with the following fields:

| Age | Sex  | Chest Pain Type | Blood Pressure | Cholesterol | Fasting Blood Sugar over 120 | EKG Results                | Maximum Heart Rate | Exercise Angina | ST Depression | Slope of ST | Number of fluro Vessels | Thallium          |
|-----|------|-----------------|----------------|-------------|------------------------------|----------------------------|--------------------|-----------------|---------------|-------------|-------------------------|-------------------|
| 67  | Male | Asymptomatic    | 160            | 286         | Absence                      | Having ST wave abnormality | 108                | Presence        | 1             | Flat        | 3                       | Reversible defect |

Below the form is a teal 'Result' button. Underneath the button, a red message states: 'Kindly check with your cardiologist..this test says you are suffering from heart disease...'

## Welcome to Heart Disease Prediction Portal!

### Heart Disease Prediction Platform

|  |                                     |  |                                      |
|--|-------------------------------------|--|--------------------------------------|
| Age  | Sex                                 |  |                                      |
| <input type="text" value="56"/>  | <input type="text" value="Female"/> |  |                                      |
| Chest Pain Type  | Blood Pressure                      | Cholesterol                                    | Fasting Blood Sugar over 120         |
| <input type="text" value="Non-anginal Pain"/>  | <input type="text" value="140"/>    | <input type="text" value="294"/>               | <input type="text" value="Absence"/> |
| EKG Results  | Maximum Heart Rate                  | Exercise Angina                                | ST Depression                        |
| <input type="text" value="Having ST wave abnormality"/>  | <input type="text" value="153"/>    | <input type="text" value="Absence"/>           | <input type="text" value="1"/>       |
| Slope of ST  | Number of fluoro Vessels            | Thallium                                       |                                      |
| <input type="text" value="Flat"/>  | <input type="text" value="0"/>      | <input type="text" value="Reversible defect"/> |                                      |
| <input type="button" value="Result"/>  |                                     |  |                                      |
| Hurray !! The Patient is Healthy and not likely to have Heart Disease if the health is maintained... |                                     |  |                                      |

## **10. ADVANTAGES & DISADVANTAGES**

### **10.1 Advantages**

Following are some of the advantages of the web app,

- 1) User can check for heart disease prediction at any point of time.
- 2) User can get immediate results for prediction of heart disease.
- 3) The System helps user to know about their current health conditions.
- 4) The system alerts user if they have heart disease.

### **10.2 Disadvantages**

Following are some of the disadvantages of the web app,

- 1) Sometimes the results being predicted are not accurate.
- 2) Thus, better decisions cannot be made.
- 3) The system does not provide deeper insights about the disease rather it just predicts presence or absence of disease.

## **11. CONCLUSION**

Heart stroke and vascular disease are the major cause of disability and premature death. In this work, the heart diseases are predicted by considering major factors. The factors are analyzed and visualized using IBM Cognos Analytics. Various Machine Learning algorithms were applied to the heart disease dataset and we obtained high accuracy using Decision Tree Classifier. Using this model, we predict whether a person has heart disease or not.

## **12. FUTURE SCOPE**

The heart disease prediction accuracy can be improved by tuning the parameters of the dataset. It can be extended to an independent mobile app by predicting the heart disease and provide solutions to keep their health fit. Based on the prediction results, it may provide online consultation with doctors. Then, it can be deployed into an android app to make heart disease prediction by our own. It can also be deployed to hospitals to make a quick prediction in emergency situation.



## 13. APPENDIX

### 13.1 Source Code

#### flask\_app.py

```
import numpy as np

from flask import Flask,render_template,request

import pickle

app = Flask(__name__)

model = pickle.load(open('decmodel.pkl', 'rb'))

@app.route('/')

def home():

    return render_template('index.html')

@app.route('/predict',methods=['POST'])

def predict():

    int_features = [float(x) for x in request.form.values()]

    features = [np.array(int_features)]

    prediction = model.predict(features)

    output = prediction
```

```

if output == 1:

    return render_template('index.html',result="Kindly check with your cardiologist..this test says you are suffering from heart
disease...")

else:

    return render_template('index.html',result="Hurray !! The Patient is Healthy and not likely to have Heart Disease if the health
is maintained...")

if __name__ == "__main__":

    app.run(debug=True)

```

### **model.py**

```

#!/usr/bin/env python

# coding: utf-8

from sklearn.model_selection import train_test_split

from sklearn.tree import DecisionTreeClassifier

import pickle

import pandas as pd

import numpy as np

dt=pd.read_csv("F:/IBM/Heart_Disease_Prediction.csv")

```

```

from sklearn.preprocessing import LabelEncoder

le = LabelEncoder()

label = le.fit_transform(dt['Heart_Disease'])

label

dt.drop("Heart_Disease", axis=1, inplace=True)

dt["Heart_Disease"] = label

dt

x = dt.drop("Heart_Disease",axis=1)

y = dt["Heart_Disease"]

X_train,X_test,Y_train,Y_test = train_test_split(x,y,test_size=0.30,random_state=0)

decTree = DecisionTreeClassifier(max_depth=6, random_state=0) #Decision Tree Classifier

decTree.fit(X_train,Y_train)

pickle.dump(decTree, open('decmodel.pkl', 'wb'))

```

### **index.html:**

```
<html>
```

```
<head>
```

```
<title>Heart Disease Prediction</title>
```

```

<link rel="stylesheet" href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.2/css/bootstrap.min.css" integrity="sha384-
JcKb8q3iqJ61gNV9KGb8thSsNjpSL0n8PARn9HuZOnIxN0hoP+VmmDGMN5t9UJ0Z" crossorigin="anonymous">

<script src="https://code.jquery.com/jquery-3.5.1.slim.min.js" integrity="sha384-
DfXdz2htPH0lsSSs5nCTpuj/zy4C+OGpamoFVy38MVBnE+IbbVYUew+OrCXaRkfj" crossorigin="anonymous"></script>

<script src="https://cdn.jsdelivr.net/npm/popper.js@1.16.1/dist/umd/popper.min.js" integrity="sha384-
9/reFTGAW83EW2RDu2S0VKA1Zap3H66lZ81PoYlFhbGU+6BZp6G7niu735Sk7lN" crossorigin="anonymous"></script>

<script src="https://stackpath.bootstrapcdn.com/bootstrap/4.5.2/js/bootstrap.min.js" integrity="sha384-
B4gt1jrGC7Jh4AgTPSdUtOBvfO8shuf57BaghqFfPIYxofvL8/KUEfYiJOMMV+rV" crossorigin="anonymous"></script>

</head>

<body background-image="cardiac_blues.jpg" background-repeat="no-repeat" background-size="cover">

<script src="https://code.jquery.com/jquery-3.5.1.slim.min.js" integrity="sha384-
DfXdz2htPH0lsSSs5nCTpuj/zy4C+OGpamoFVy38MVBnE+IbbVYUew+OrCXaRkfj" crossorigin="anonymous"></script>

<script src="https://cdn.jsdelivr.net/npm/popper.js@1.16.1/dist/umd/popper.min.js" integrity="sha384-
9/reFTGAW83EW2RDu2S0VKA1Zap3H66lZ81PoYlFhbGU+6BZp6G7niu735Sk7lN" crossorigin="anonymous"></script>

<script src="https://stackpath.bootstrapcdn.com/bootstrap/4.5.2/js/bootstrap.min.js" integrity="sha384-
B4gt1jrGC7Jh4AgTPSdUtOBvfO8shuf57BaghqFfPIYxofvL8/KUEfYiJOMMV+rV" crossorigin="anonymous"></script>

```

```

<nav class="navbar navbar-dark" style="background-color: rgb(243, 216, 13);">

<marquee style="font-size:20pt;color:blueviolet"behavior="alternate" direction="left"><b>Welcome to Heart Disease Prediction
Portal!</b></marquee>

</nav>

<div class="container">

<br>

<form action = "{{url_for('predict')}}" method ="POST" >

<fieldset>

<legend style="color: rgb(219, 117, 21); text-align: center;"><b>Heart Disease Prediction Platform</b></legend><br>

<div class="card card-body" style="background-color: rgba(224, 162, 188, 0.795);">

<div class="form-group row">

<div class="col-sm-3">

<label for="age">Age</label>

<input type="number" class="form-control" id="age" name="age" min="18" max="100" required>

</div>

<div class="col-sm-3">

<label for="sex">Sex</label>

```

```
<select class="form-control" id="sex" name="sex" required>
  <option disabled selected value> Choose Field </option>
  <option value = "0">Female</option>
  <option value = "1">Male</option>
</select>
</div>
</div>
<br>
<div class="form-group row">
  <div class="col-sm">
    <label for="cp">Chest Pain Type</label>
    <select class="form-control" id="cp" name = "cp" required>
      <option disabled selected value> Choose Field </option>
      <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">
```

```
<label for="trestbps">Blood Pressure</label>
```

```
<input type="number" class="form-control" id="trestbps" name="trestbps" min="60" max="200" required>
```

```
</div>
```

```
<div class="col-sm">
```

```
<label for="chol">Cholesterol</label>
```

```
<input type="number" class="form-control" id="chol" name="chol" min="100" max="600" required>
```

```
</div>
```

```
<div class="col-sm">
```

```
<label for="fbs">Fasting Blood Sugar over 120</label>
```

```
<select class="form-control" id="fbs" name="fbs" required>
```

```
<option disabled selected value> Choose Field </option>
```

```
<option value = "0">Absence</option>
```

```
<option value = "1">Presence</option>
```

```
</select>
```

</div>

</div>

<br>

<div class="form-group row">

<div class="col-sm">

<label for="restecg">EKG Results </label>

<select class="form-control" id="restecg" name="restecg" required>

<option disabled selected value> Choose Field </option>

<option value = "0">Normal </option>

<option value = "1">Having ST wave abnormality </option>

<option value = "2">Having High abnormality</option>

</select>

</div>

<div class="col-sm">

<label for="thalach">Maximum Heart Rate</label>

<input type="number" class="form-control" id="thalach" name="thalach" min="100" max="200" required>

</div>



```
<div class="col-sm">
```

```
<label for="exang">Exercise Angina </label>
```

```
<select class="form-control" id="exang" name="exang" required>
```

```
<option disabled selected value> Choose Field </option>
```

```
<option value = "0">Absence</option>
```

```
<option value = "1">Presence</option>
```

```
</select>
```

```
</div>
```

```
<div class="col-sm">
```

```
<label for="oldpeak">ST Depression</label>
```

```
<input type="number" step="any" class="form-control" id="oldpeak" name="oldpeak" min="0" max="7" required>
```

```
</div>
```

```
</div>
```

```
<br>
```

```
<div class="form-group row">
```

```
<div class="col-sm">
```

```
<label for="slope">Slope of ST</label>
```

```
<select class="form-control" id="slope" name="slope" required>
<option disabled selected value> Choose Field </option>
<option value = "1">Upslope</option>
<option value = "2">Flat</option>
<option value = "3">Downslope</option>
</select>
</div>
<div class="col-sm">
<label for="ca">Number of fluro Vessels</label>
<select class="form-control" id="ca" name = "ca" required>
<option disabled selected value> Choose Field </option>
<option value = "0">0</option>
<option value = "1">1</option>
<option value = "2">2</option>
<option value = "3">3</option>
</select>
</div>
```

```
<div class="col-sm">

<label for="thal">Thallium</label>

<select class="form-control" id="thal" name = "thal" required>

<option disabled selected value> Choose Field </option>

<option value = "3">Normal</option>

<option value = "6">Fixed defect</option>

<option value = "7">Reversible defect</option>

</select>

</div>

</div>

<br>

<div class="form-group">

<input class="btn btn-info" type="submit" value="Result">

</div>

<div id ="result">

<strong style="color:red">{{ result }}</strong>

</div>
```

</div>

</fieldset>

</form>

</div>

</body>

</html>

### 13.2 GitHub & Project Demo Link

<https://github.com/IBM-EPBL/IBM-Project-2206-58466325/>

<https://drive.google.com/file/d/1GGLIPcFnEtTiedZq5KAxKsk6bqv6K1J/view?usp=sharing>