

Project Report

Heart Disease Analysis

Date	12 February 2026
Team ID	LTVIP2026TMIDS74725
Project Name	Heart Disease Analysis
Maximum Marks	

1. INTRODUCTION

1.1 Project Overview

The **Heart Disease Analysis System** focuses on analysing patient health data to identify risk factors and patterns associated with heart disease. The project applies data preprocessing techniques and machine learning methods to evaluate medical attributes such as age, blood pressure, cholesterol levels, heart rate, and other clinical parameters. Interactive visualizations and dashboards are used to present meaningful insights that support early detection and understanding of heart disease.

1.2 Purpose

The purpose of this project is to analyse and predict the likelihood of heart disease using patient health data. It helps in identifying key risk factors, understanding health trends, and supporting early diagnosis through data-driven insights. The system provides clear visualizations and analytical results to assist healthcare professionals and individuals in making informed health decisions.

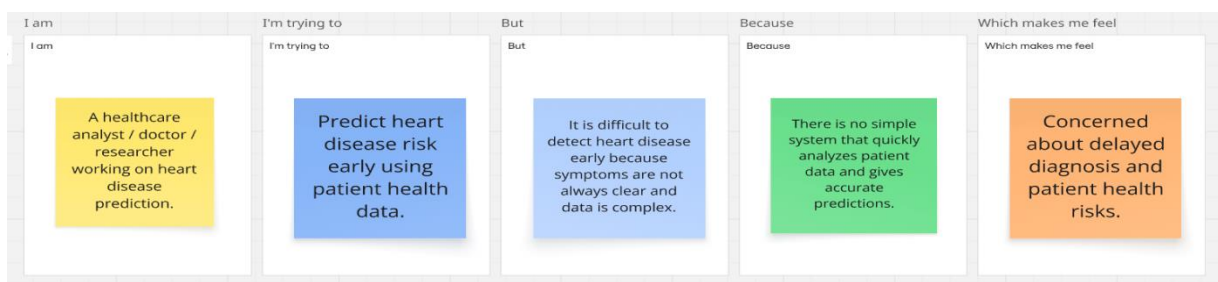
2. IDEATION PHASE

2.1 Problem Statement

Heart disease is one of the leading causes of health problems worldwide, but it is often detected only at later stages when treatment becomes more difficult. Many patients and doctors find it challenging to interpret medical data and identify risk factors early. There is a need for a simple and reliable system that can analyse patient health information and support early diagnosis. By using data analysis and prediction techniques, heart disease risk can be identified in advance. This helps in timely treatment, better prevention, and improved patient care.

Customer Problem Statement Template:

Problem Statement – 1: **THE PATIENT**



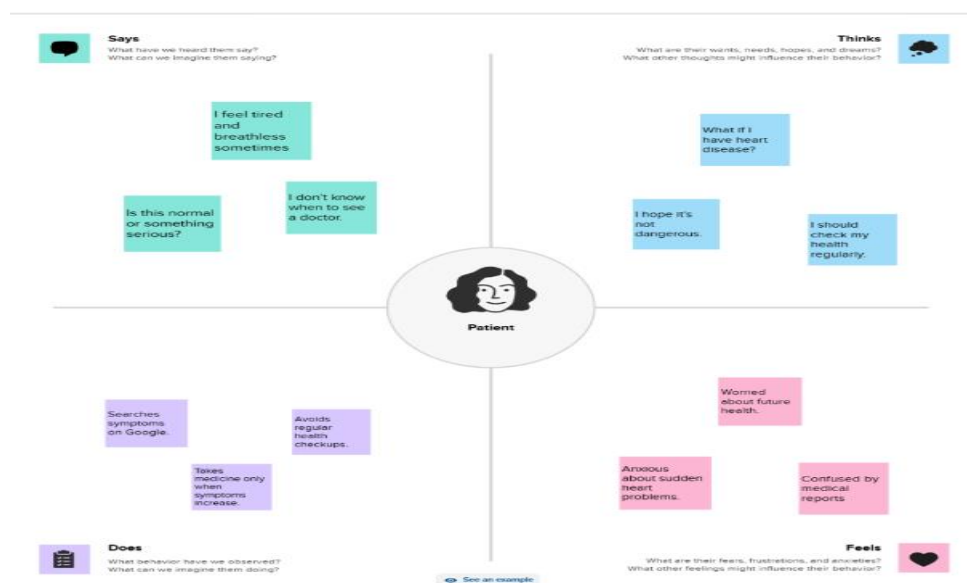
Problem Statement – 2: THE DOCTOR




Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
The Patient					
The Doctor					

2.2 Empathy Map Canvas

The Mind of an Patient



Step-1: Team Gathering, Collaboration and Select the Problem Statements



Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- 10 minutes to prepare
- 1 hour to collaborate
- 2-8 people recommended

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

- 10 minutes

1. Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

EXAMPLE

How might we quickly produce a new product?

How might we make our products more sustainable?

How might we make our products more affordable?


How might we make our products more accessible?

2. Brainstorm

Use the How Might We statement to generate ideas. Write down as many ideas as you can. Don't worry about whether an idea is good or bad. Just write it down.

3. Prioritize

Vote on the ideas. Each person gets 3 votes. Put a checkmark next to the ideas you like. The ideas with the most checkmarks are the ones to focus on.



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Step-2: Brainstorm, Idea Listing and Grouping

2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

15 minutes

Person 1

Create a MySQL database linking range data with interactive features for "Safety Net" scores.

Person 2

Access state charging codes to handle communication in state-to-state charging station data.

Develop a Twitter weather alert concerning EV use in response to identify high-risk road models.

Person 3

Implement a time-series visualization tool using interactive charts showing charging station locations.

Person 4

Design a "Range Efficiency" chatbot that recommends AC usage based on battery use.

Create a charging map for "Charging For All" (Public) for each use model.

Person 5

Build a responsive Bootstrap portal to host the "Safety Net" dashboard in a single web view.

Tip

Remember, cluster ideas are not meant to be perfect. The goal is to generate ideas that can be refined and improved upon.

20 minutes

3

Group Ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence like "Ideally, if I had a magic wand, I would..." to help you refine your ideas. Try to break it up into smaller sub-groups.

20 minutes

Cluster 1: Geographic & Regional Infrastructure Analysis

Ideas Included:

- Class and automatic state-to-state charging station density.
- Create heatmaps of EV sales vs. charging station density.
- Map and differentiate between Fast and Slow charging.
- Add filters for regional/home-state infrastructure views.

Label: We will map regional data to show infrastructure gaps and charger types across India.

Cluster 2: Performance & Value Comparison

Ideas:

- Tableau scatter plots for EV Price vs. Real-World Range.
- Interactive bar charts showing brand growth in India.
- "Top 5 Budget EVs" panel based on mileage data.
- Charts showing impact of speed and AC on battery life.
- Comparison tool for Home vs. Public charging times.

Label: We will use interactive charts to help buyers compare EV value and performance.

Cluster 3: Data Strategy & Platform Architecture

Ideas:

- MySQL database linking range data for "Safety Net" scores.
- Responsive Bootstrap portal to host all dashboards.

Label: We will build a MySQL and Bootstrap foundation for a seamless user experience.

Step-3: Idea Prioritization

4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

(2) 200 iterations

The diagram shows a 2x2 matrix with 'Importance' on the vertical axis and 'Feasibility' on the horizontal axis. Three clusters of ideas are plotted:

- Cluster 1: Infrastructure Hestrapas** (Teal oval) is located in the top-left quadrant (High Importance, Low Feasibility).
- Cluster 2: Performance & Value Analysis** (Pink oval) is located in the top-right quadrant (High Importance, High Feasibility).
- Cluster 3: Web Platform (Bootstrap)** (Orange oval) is located in the bottom-right quadrant (Low Importance, High Feasibility).

Two hyperbolic curves are drawn on the grid, separating the quadrants. A small yellow sticky note is placed in the top-right quadrant, containing the text: 'Top priority ideas are those that are both important and feasible. These are the ideas that should be prioritized for development and implementation.'

3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

The customer journey map shows the experience of patients and doctors while using health data to understand heart disease risk. It identifies common challenges such as difficulty in understanding medical reports, delayed diagnosis, and lack of clear risk prediction. The journey highlights decision-making problems and gaps in accessing meaningful health insights. This analysis helps identify the real needs of users. It ensures the system is designed to support early detection and better medical decisions effectively.



3.2 Solution Requirement

The system analyzes patient health data to predict the risk of heart disease. It presents the results using simple visuals so users can easily understand them. The system compares important health factors such as age, blood pressure, and cholesterol to identify possible risks. Proper data cleaning and processing help ensure accurate predictions. Overall, the system is easy to use and supports early detection and better health decisions.

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	View Website	Access Home, About, Team & Contact sections
FR-2	View Heart Disease Dashboard	Load Heart Disease Dataset & Display interactive charts, Responsive dashboard view
FR-3	View Heart Disease Story	Load Tableau Story Navigate between story tabs
FR-4	Contact Form	Submit user details Validate required fields Display submission confirmation
FR-5	Admin Data Management	Upload Heart Disease dataset to Tableau Update dashboard visuals Publish dashboard

Non-functional Requirements:

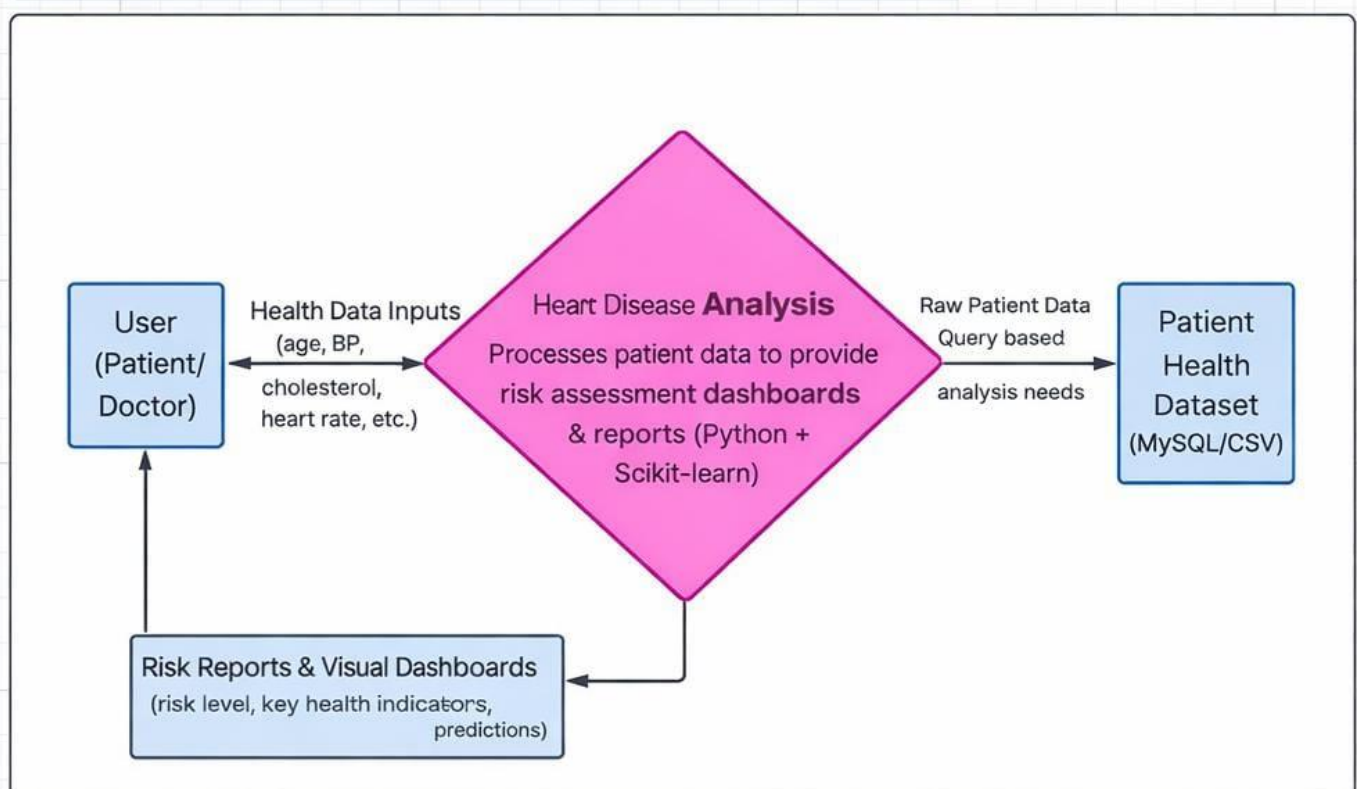
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The website should be user-friendly, easy to navigate, and visually clear with proper section alignment.
NFR-2	Security	User contact data must be protected and not publicly exposed. Tableau dashboards should be securely embedded.
NFR-3	Reliability	The system should consistently load dashboards and story without failure.
NFR-4	Performance	The website should load within 3–5 seconds and dashboard rendering should be responsive.
NFR-5	Availability	The system should be available 24/7 through web browsers.
NFR-6	Scalability	The system should support addition of new datasets and future dashboard extensions.

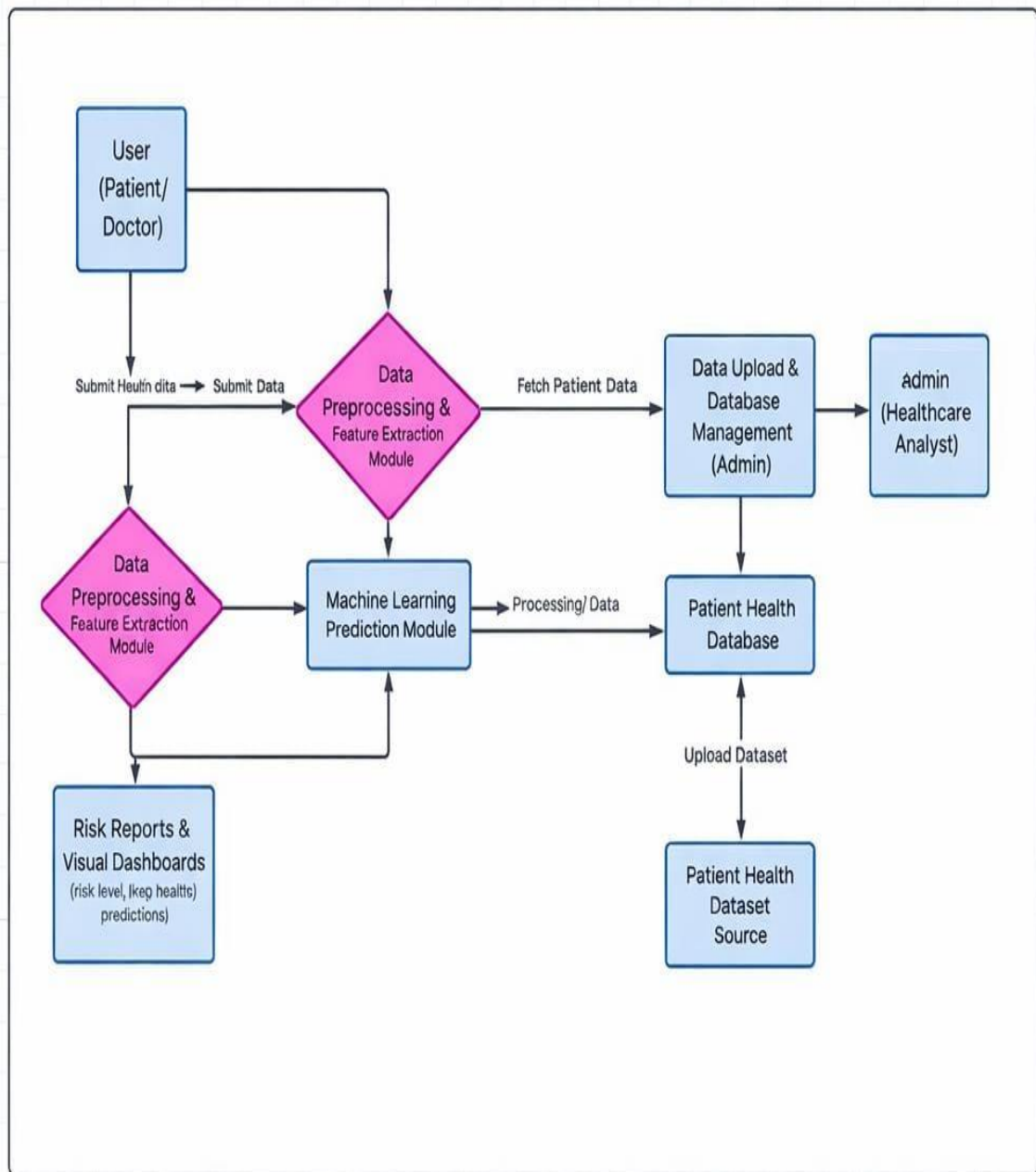
3.3 Data Flow Diagram

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.

"Level 0 DFD — Heart Disease Analysis System"



Heart Disease Analysis System — DFD Level 1



3.4 Technology Stack

The project uses Excel/CSV datasets for data storage. MySQL is used for database management and structured data storage. Tableau Desktop is used for data visualization and dashboard creation. Basic data preprocessing techniques are applied before visualization. These tools together ensure efficient data handling and presentation.

Table-1: Components & Technologies:

S. No	Component	Description	Technology
1.	User Interface	Web-based interface where users view Heart Disease dashboard, story and submit contact form	HTML, CSS, JavaScript, Bootstrap 5
2.	Application Logic – Dashboard Integration	Handles embedding and rendering of Tableau Dashboard inside the website.	JavaScript, Tableau Embed API
3.	Application Logic – Story Integration	Embeds Tableau Story and manages responsive display	JavaScript, Tableau Public
4.	Dataset Storage	Heart Disease dataset stored and processed within Tableau environment	Tableau Data Extract (TDE)
5.	File Storage	Heart Disease dataset files stored locally before upload to Tableau	Tableau Data Extract (TDE)
6.	Tableau Public API	Used to embed and display dashboard and story in website	Tableau Public Embed API
7.	Infrastructure (Web Hosting)	Website hosted on web server, dashboards hosted on Tableau Public Cloud:	Local Hosting / GitHub Pages / Render, Tableau Public Cloud

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Website built using open-source front-end frameworks	Bootstrap 5, HTML5, CSS3
2.	Security Implementations	Secure embedding of Tableau dashboards and form validation	HTTPS Protocol, Input Validation
3.	Scalable Architecture	Web-based modular structure allows addition of new dashboards and datasets	Modular Web Architecture, Cloud Hosting
4.	Availability	Dashboard available 24/7 via Tableau Public cloud	Tableau Public Cloud
5.	Performance	Optimized responsive UI and embedded dashboard loading	Bootstrap Grid System, Optimized Tableau Embed

4. PROJECT DESIGN

4.1 Problem Solution Fit

The system directly addresses the need for early detection and better understanding of heart disease risk. It combines patient health data with analytical insights to identify patterns and risk factors. Patients and doctors can easily understand how factors like age, blood pressure, cholesterol, and lifestyle affect heart health. The solution is based on user needs identified during analysis and helps support timely medical decisions.

Heart Disease Prediction & Analysis

1. CUSTOMER SEGMENTS CS <ul style="list-style-type: none"> Primary Segment: <ul style="list-style-type: none"> Patients who want to check their heart disease risk early. Health-conscious individuals monitoring heart health. People with family history of heart disease. Secondary Segment: <ul style="list-style-type: none"> Doctors and healthcare professionals. Hospitals and diagnostic centres. Medical students and health researchers. 	6. CUSTOMER CONSTRAINTS CC <ul style="list-style-type: none"> Limited knowledge about heart disease symptoms. Lack of easy tools for early risk prediction. Difficulty understanding medical reports. Time constraints for regular health checkups. For Healthcare Providers: <ul style="list-style-type: none"> Identify high-risk patients quickly. Support diagnosis using data analysis. Monitor patient health trends. Improve preventive healthcare decisions. 	5. AVAILABLE SOLUTIONS AS <ul style="list-style-type: none"> Hospital diagnostic tests and reports. Doctor consultations. Online health websites and medical blogs. Mobile health tracking apps. Medical research articles and videos.
2. JOBS-TO-BE-DONE / PROBLEMS JBP <ul style="list-style-type: none"> For Patients: <ul style="list-style-type: none"> Understand their risk of heart disease. Monitor important health parameters. Get early warnings for health problems. Take preventive actions in time. For Healthcare Providers: <ul style="list-style-type: none"> Identify high-risk patients quickly. Support diagnosis using data analysis. Monitor patient health trends. Improve preventive healthcare decisions. 	6. PROBLEM ROOT CAUSE RC <ul style="list-style-type: none"> Lack of simple prediction tools for early diagnosis. Health data is complex and hard to interpret. Limited awareness of risk factors. Delayed diagnosis due late testing. No centralized system for risk analysis. 	7. BEHAVIOUR BE <ul style="list-style-type: none"> User Behaviour: <ul style="list-style-type: none"> Searching symptoms online. Using fitness or health apps. Visiting doctors only after symptoms appear. Reading medical articles or watching health videos. Healthcare Behaviour: <ul style="list-style-type: none"> Reviewing patient reports manually. Conducting diagnostic tests. Monitoring patient history and records.
3. TRIGGERS TR <ul style="list-style-type: none"> Chest pain or health discomfort. Family history of heart disease. Doctor recommendations. Health awareness campaigns. Regular health checkups. Lifestyle changes or stress concerns. 	10. YOUR SOLUTION SL <p>A web-based heart disease prediction system that analyzes patient health data.</p> <ul style="list-style-type: none"> It predicts heart disease risk using machine learning. Provides simple visual reports and insights. Helps early diagnosis and preventive care. 	8. CHANNELS / BEHAVIOUR CH <ul style="list-style-type: none"> Online: <ul style="list-style-type: none"> Healthcare websites. Mobile health apps. Social media awareness. Online medical platforms. Offline: <ul style="list-style-type: none"> Hospitals and clinics. Health camps and screenings. Doctor consultations. Medical seminars and awareness programs.
4. EMOTIONS: BEFORE / AFTER EM <ul style="list-style-type: none"> Before Using System: <ul style="list-style-type: none"> Fear and uncertainty about health. Confusion about medical reports. Anxiety about possible disease. Better using System: 	8. YOUR SOLUTION SL <ul style="list-style-type: none"> A web-based heart disease prediction system that analyzes patient health data. It predicts heart disease risk using machine learning. Helps early diagnosis and preventive care. 	

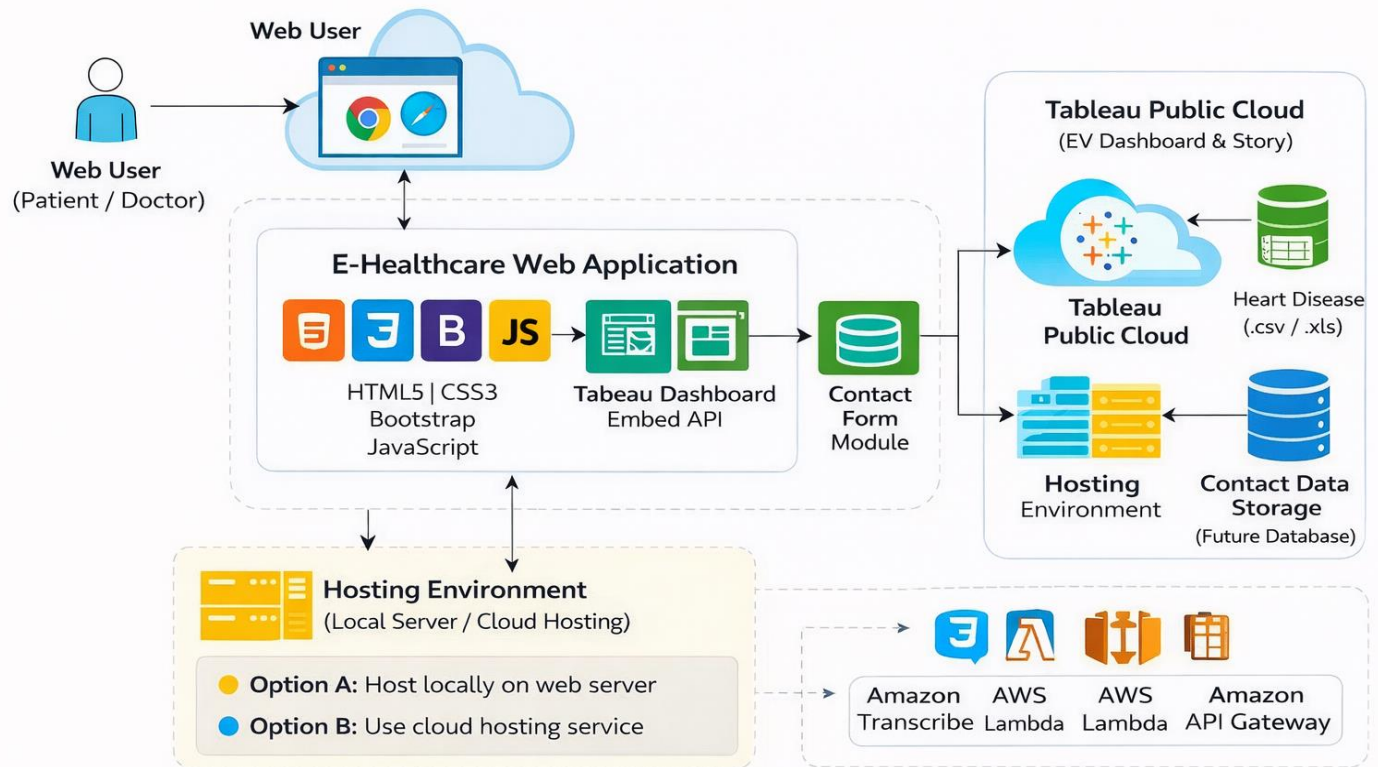
4.2 Proposed Solution

The proposed solution is a Heart Disease Analysis system with multiple visualizations and prediction features. It includes charts showing important health factors, risk level indicators, and summary insights for easy understanding. Interactive inputs allow users to explore how different health conditions affect heart disease risk. The system is designed to be simple, clear, and easy to use. It converts patient health data into meaningful insights to support early detection and better medical decisions.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Many people do not know they have heart disease until it becomes serious. Doctors need a simple system to detect heart disease early using patient health data.
2.	Idea / Solution description	We will create a system that analyzes patient health information and predicts the risk of heart disease. It helps doctors make faster and better decisions.
3.	Novelty / Uniqueness	The system uses data analysis and machine learning to give quick and accurate predictions. It reduces manual work and helps in early detection.
4.	Social Impact / Customer Satisfaction	This system helps people detect heart disease early and take treatment on time. It improves healthcare quality and saves lives.
5.	Business Model (Revenue Model)	Hospitals and clinics can use this system by paying a subscription or service fee. It can also be used in health checkup centers.
6.	Scalability of the Solution	The system can be used in many hospitals and healthcare centers. It can handle large patient data and can be expanded easily.

4.3 Solution Architecture

The architecture follows a simple data pipeline structure. Raw Herat Disease datasets are collected and cleaned. Cleaned data is stored in a database. Tableau connects to the database to create visual dashboards. Users interact with the dashboard to generate insights.



5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

The project was planned in stages: data collection, preprocessing, database integration, visualization, and testing. Each phase was executed sequentially. Timelines were set to ensure proper completion of tasks. Dashboard design and refinement were done iteratively. Proper planning ensured smooth execution.

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data Collection	USN-1	Download Heart Disease dataset from reliable source	3	High	P Janaki Ram
Sprint-1	Data Understanding	USN-2	Analyse and understand dataset attributes	3	High	P Janaki Ram
Sprint-1	Database Setup	USN-3	Import dataset into database	4	High	P Janaki Ram
Sprint-1	Tableau Connection	USN-4	Connect Tableau Desktop to database	4	High	P Janaki Ram
Sprint-1	Data Preparation	USN-5	Clean and prepare dataset for visualization	6	High	P Janaki Ram
Sprint-2	Data Visualization	USN-6	Create charts & Heart disease analysis visuals	5	High	P Janaki Ram
Sprint-2	Dashboard Creation	USN-7	Design interactive dashboard	5	High	P Janaki Ram
Sprint-2	Story Creation	USN-8	Create Heart Disease analytics story in Tableau	3	High	P Janaki Ram
Sprint-2	Publishing	USN-9	Publish dashboard to Tableau Public	3	High	P Janaki Ram
Sprint-2	Website Integration	USN-10	Embed dashboard into website	4	High	P Janaki Ram
Sprint-3	Website Navigation	USN-11	Develop website sections	4	High	P Janaki Ram
Sprint-3	Contact Form	USN-12	Implement form validation	4	High	P Janaki Ram
Sprint-3	Responsive Design	USN-13	Make website mobile responsive	5	Medium	P Janaki Ram
Sprint-3	Testing	USN-14	Cross-browser testing	3	Medium	P Janaki Ram
Sprint-3	Final Review	USN-15	Final deployment & bug fixing	4	High	P Janaki Ram

Project Tracker, Velocity & Burndown Chart:

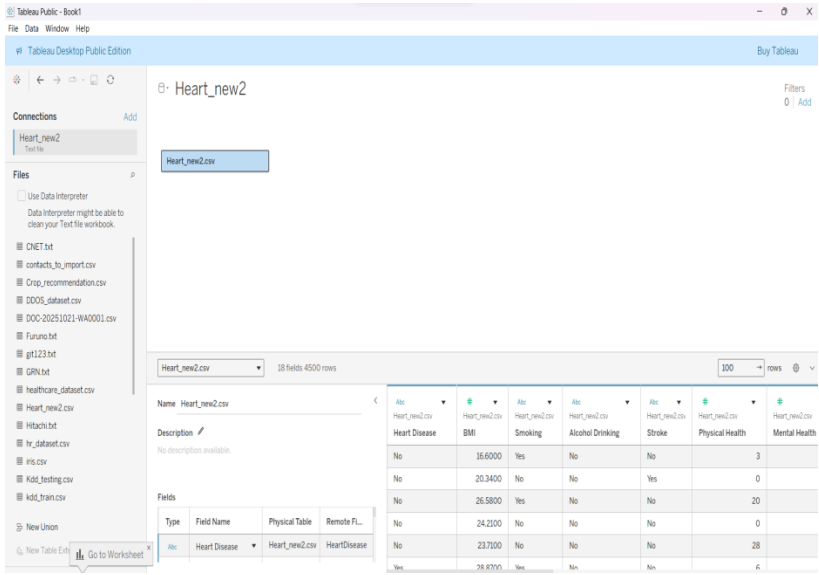
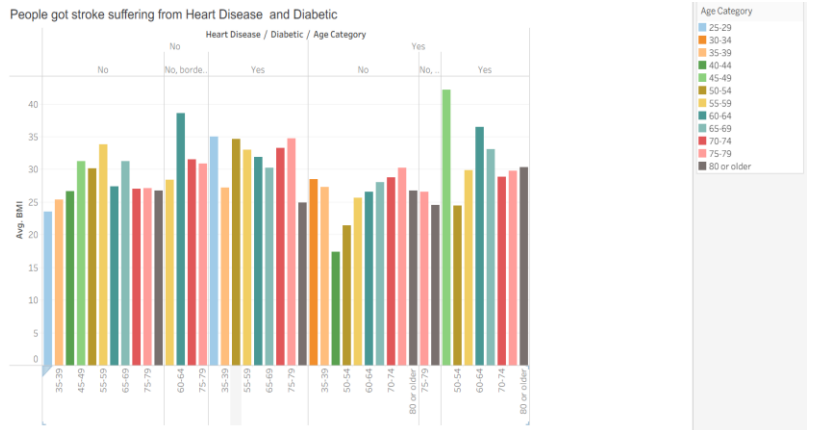
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	7 Days	28 Jan 2026	03 Feb 2026	20	03 Feb 2026
Sprint-2	20	7 Days	04 Feb 2026	10 Feb 2026	20	10 Feb 2026
Sprint-3	20	7 Days	11 Feb 2026	14 Feb 2026	20	14 Feb 2026

$$AV = \text{Sprint duration/velocity} = 20/7 = 2.85 \sim 3 \text{ story points per day}$$

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

The dashboard was tested for responsiveness and accuracy. Filters and interactive features were validated. Data consistency between database and visualizations was checked. Performance was monitored for loading time and smooth interaction. The system performs efficiently for the given dataset size.

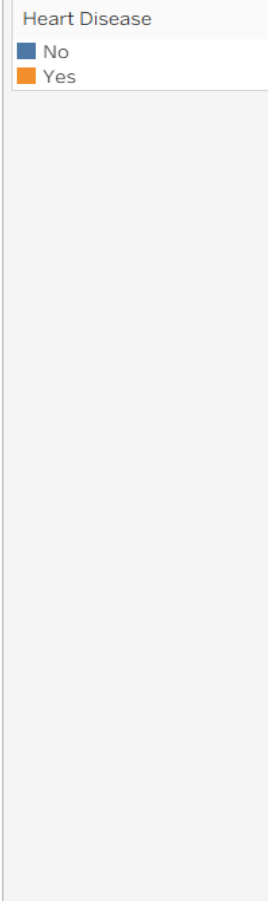
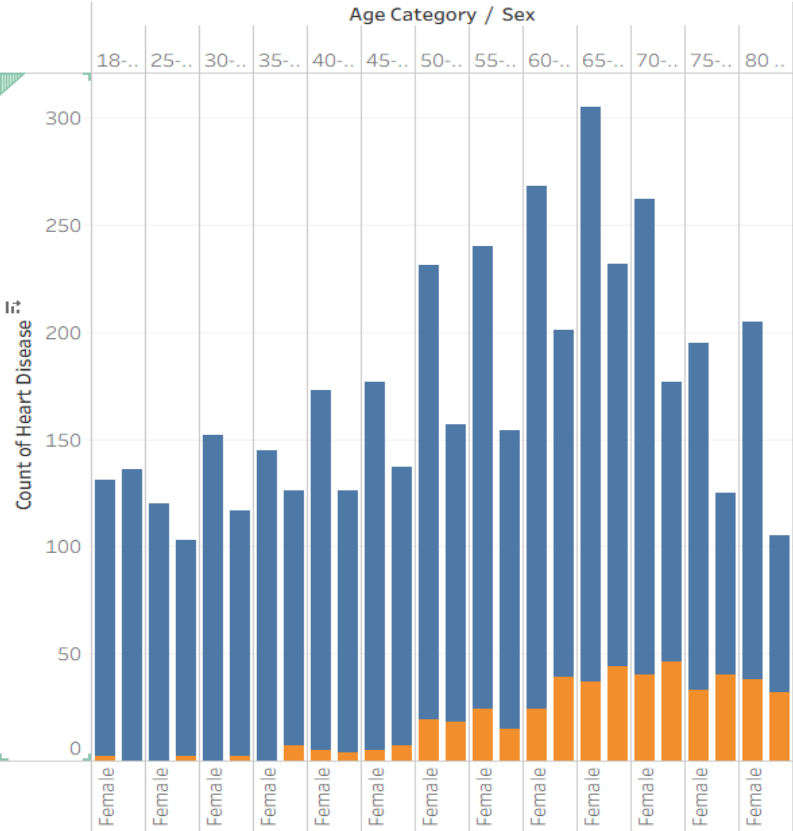
S.No.	Parameter	Screenshot / Values
1.	Data Rendered	The Heart Disease dataset was successfully rendered in Tableau Desktop. All fields including heart disease and other problems.
2.	Data Preprocessing	<p>Data preprocessing was performed by handling missing values, removing duplicate records, correcting data types, and creating calculated fields. Units were standardized and unnecessary columns were removed before visualization.</p> 
3.	Utilization of Filters	<p>Filters such as Style, Vehicle Type, Charging Type, and Range were applied to enable dynamic interaction in the dashboard.</p> 
4.	Calculation fields Used	<p>AVG([Range])</p> <p>COUNT([Vehicle Type])</p>

7. RESULTS

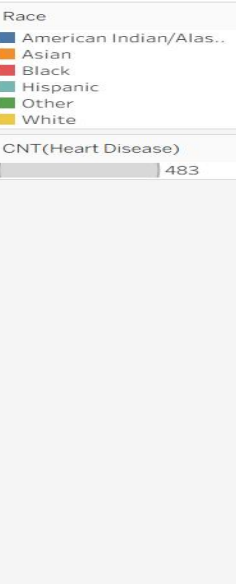
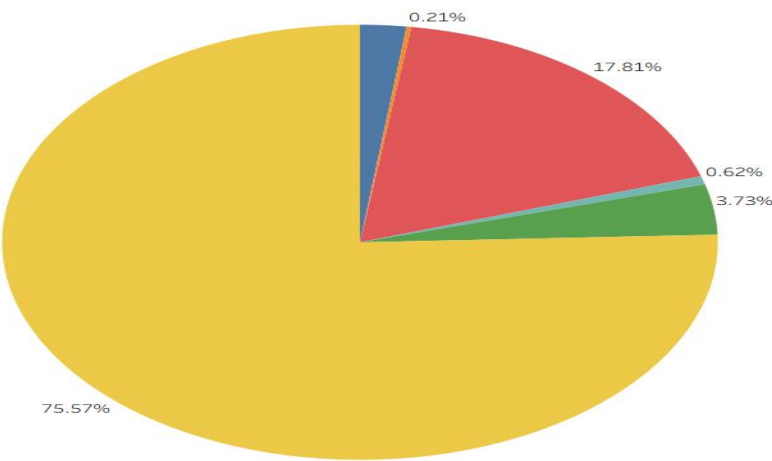
7.1 Output Screenshots

The final dashboard displays EV brand analysis, efficiency comparisons, and body style distribution. Summary cards highlight key metrics. Filters allow dynamic exploration of data. Visualizations provide clear and actionable insights. The results demonstrate successful implementation of the project objectives.

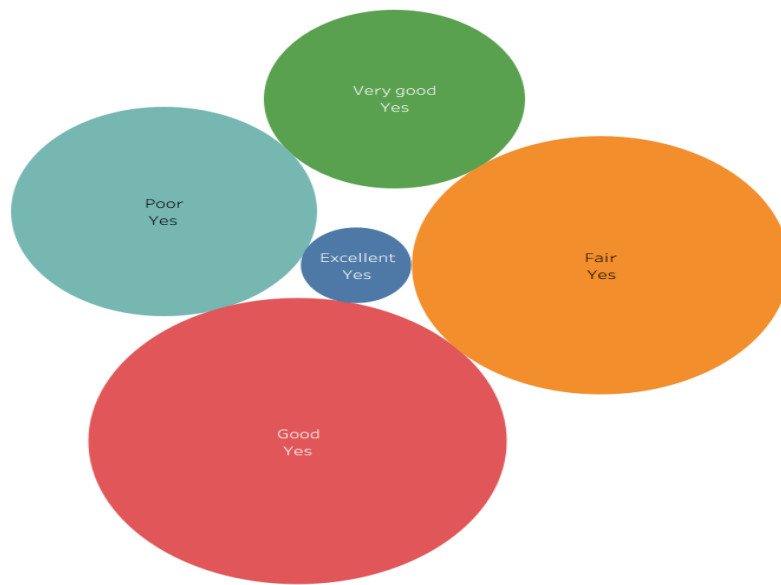
Age Vs Heart Disease



Race wise Heart Disease



General Health vs Heart Disease



Gen Health

- Excellent
- Fair
- Good
- Poor
- Very good

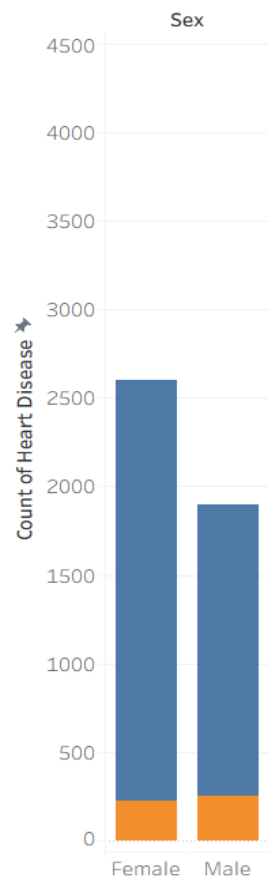
People got stroke suffering from Heart Disease and Diabetic



Age Category

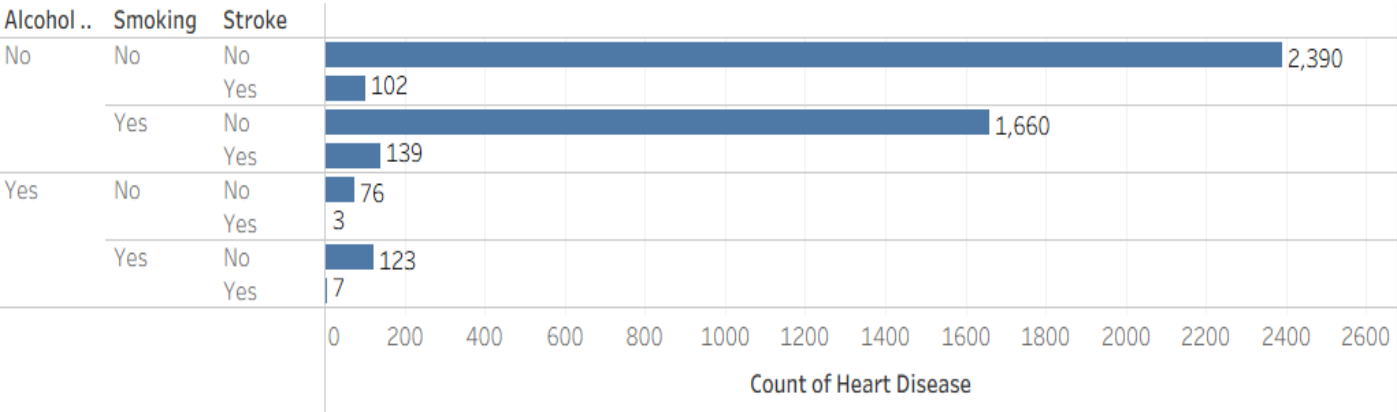
- 25-29
- 30-34
- 35-39
- 40-44
- 45-49
- 50-54
- 55-59
- 60-64
- 65-69
- 70-74
- 75-79
- 80 or older

Gender Vs Heart Disease



Heart Disease	
No	
Yes	

Impact of Smoking and Alcohol on Heart Disease



Heart Disease Analysis

[Get Started →](#)

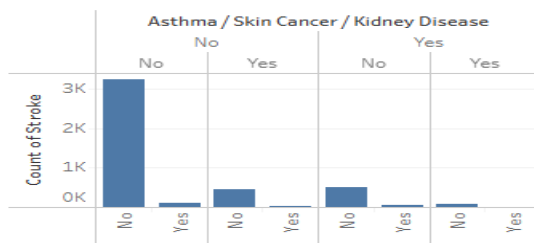
Welcome

Heart disease includes conditions affecting heart function and blood vessels. Data analysis helps detect risks early and support treatment.



Dashboard

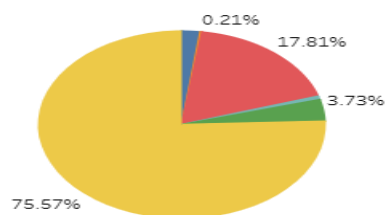
Other Heart Disease vs Stroke



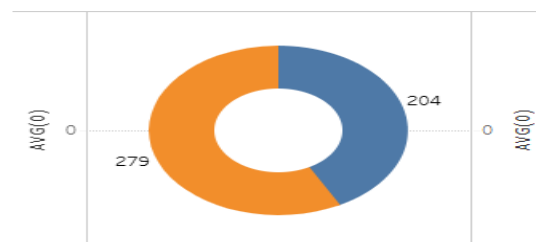
General Health vs Heart Disease



Race wise Heart Disease



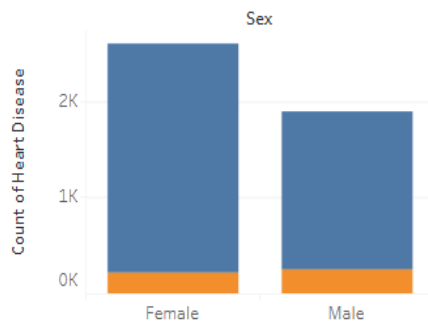
Physical Activity vs Heart Disease



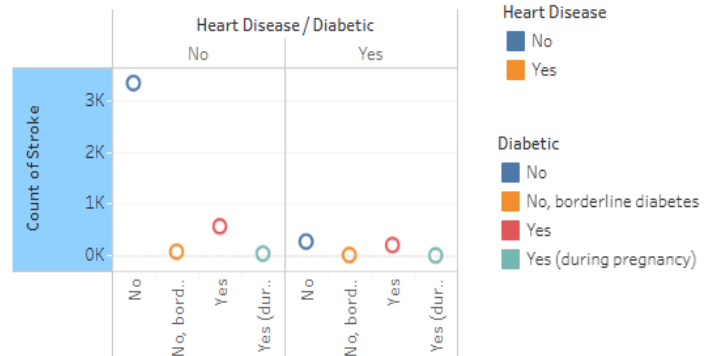
Story 1



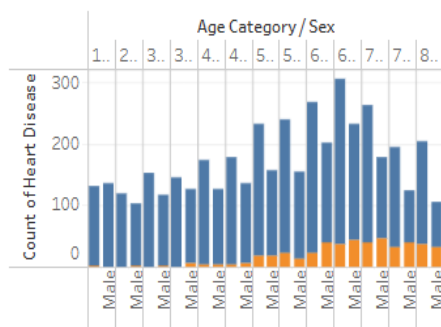
Gender Vs Heart Disease



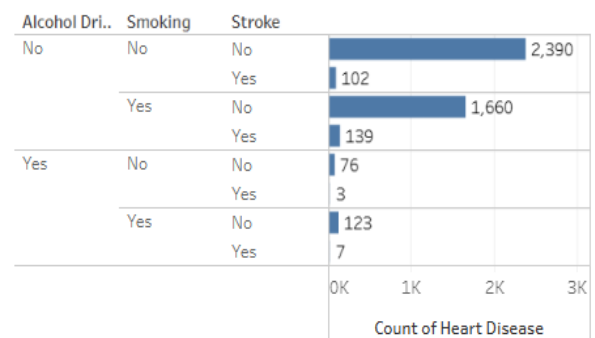
Diabetic Vs Stroke



Age Vs Heart Disease



Impact of Smoking and Alcohol on Heart Disease



8. ADVANTAGES & DISADVANTAGES

Advantages:

The system helps in early identification of heart disease risk using patient health data. It simplifies complex medical information into easy-to-understand visualizations. User-friendly inputs make the system simple for anyone to use. It supports informed health decisions and promotes preventive care.

Disadvantages:

The system depends on the quality and accuracy of the dataset used. It does not replace professional medical diagnosis. Real-time health monitoring is not included. Predictions may be limited to the features available in the dataset.

9. CONCLUSION

The Heart Disease Analysis system successfully converts patient health data into meaningful insights for risk prediction. It helps users understand important health factors and supports early detection of potential heart problems. The project demonstrates effective data preprocessing, analysis, and visualization techniques. It improves awareness and assists in better health-related decision-making. Overall, the system achieves its objective of providing a simple and useful heart disease risk analysis tool.

10. FUTURE SCOPE

The system can be enhanced by integrating real-time patient health monitoring data from wearable devices. More advanced machine learning models can be added to improve prediction accuracy. Integration with hospital databases or health apps can provide more comprehensive analysis. Personalized health recommendations can also be included. In the future, the system can be developed into a complete web or mobile healthcare support platform.

11. APPENDIX

Dataset Link:

https://drive.google.com/file/d/190Qmq27LeZZ_nWricP3Obl7ys_5otEsp/view

Github Documentation Link:

https://github.com/JanakiRamPiramalla/Heart_disease_Analysis

Github Project Link:

https://github.com/JanakiRamPiramalla/Heart_Analysis_Web_Dashboard

Project Demo Link:

<https://drive.google.com/file/d/1iJwJR03MEfjV2V8k0ux2sDSg9S3D0e0T/view?usp=sharing>