PROJECT REPORT

Heart Disease Data Analysis and Visualization Using Tableau

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1. INTRODUCTION

1.1 Project Overview

Heart disease is one of the leading causes of mortality worldwide. Increasing lifestyle risk factors such as smoking, obesity, physical inactivity, and poor dietary habits have significantly contributed to the rise in cardiovascular diseases. Healthcare institutions collect large volumes of medical data, but analyzing this data effectively remains a challenge.

This project focuses on analyzing heart disease data using MySQL, Tableau, and Flask integration. The system transforms raw health data into interactive visual dashboards, helping healthcare professionals, policymakers, and individuals understand risk factors and trends clearly.

1.2 Purpose

The purpose of this project is to:

- Identify key risk factors contributing to heart disease.
- Create interactive visualizations using Tableau.
- Develop responsive dashboards for better decision-making.
- Integrate dashboards into a Flask web application.
- Support preventive healthcare awareness through data-driven insights.

2. IDEATION PHASE

2.1 Problem Statement

Healthcare organizations struggle to analyze large and complex heart disease datasets effectively. Traditional analysis methods lack interactivity and fail to highlight correlations between risk factors such as age, smoking, diabetes, and physical activity. There is a need for a visual, interactive, and scalable system to support preventive healthcare decisions.

2.2 Empathy Map Canvas

Users Identified:

- Cardiologists
- Government Health Officers
- Individuals at Risk

User Insights:

Says:
“I need better insights to identify high-risk patients.”

Thinks:
“How can I reduce heart disease cases?”

Does:
Analyzes reports and monitors medical indicators.

Feels:
Concerned about rising cases and data complexity.

This helped design a user-friendly and interactive dashboard solution.

2.3 Brainstorming

During brainstorming, the following ideas were generated:

- Use Tableau for interactive visualization.

- Create 8–10 unique visualizations.
- Develop responsive dashboard.
- Integrate dashboard into Flask web app.
- Provide storytelling feature for better explanation.

Final idea selected:

Database + Tableau + Flask Integration Architecture

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3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

Stage	User Action	Pain Points	Solution
Awareness	Identify heart disease trends	Hard to interpret data	Interactive dashboards
Analysis	Compare risk factors	Static reports	Dynamic filtering
Decision	Plan preventive strategy	Lack of insights	Data-driven visuals

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3.2 Solution Requirement

Functional Requirements:

- Store dataset in MySQL.
- Perform SQL operations.
- Create 8–10 visualizations.
- Provide interactive filters.
- Develop responsive dashboard.
- Embed dashboard in Flask web app.

Non-Functional Requirements:

- Fast loading performance.
- Secure database connection.
- User-friendly interface.
- Scalability for large datasets.

3.3 Data Flow Diagram

Dataset

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MySQL Database

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SQL Processing

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Tableau Visualization

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Flask Web Application

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End Users

3.4 Technology Stack

Component	Technology Used
Database	MySQL
Query Language	SQL
Visualization	Tableau
Backend	Python

Component	Technology Used
Web Framework	Flask
Deployment	Browser-based Access

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4. PROJECT DESIGN

4.1 Problem Solution Fit

The project addresses the challenge of complex heart disease data analysis by transforming raw data into meaningful visual insights. It directly aligns with the needs of healthcare professionals and policymakers.

4.2 Proposed Solution

The system stores heart disease data in MySQL, processes it using SQL queries, and connects Tableau for visualization. Interactive dashboards are developed and embedded into a Flask web application for browser-based access.

The solution enables:

- Risk factor identification
- Trend comparison
- Interactive filtering
- Story-based data explanation

4.3 Solution Architecture

The architecture follows a three-tier model:

1. Data Layer – MySQL Database
2. Application Layer – Tableau Dashboard
3. Presentation Layer – Flask Web Interface

This ensures scalability, modularity, and efficient performance.

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5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

Phase	Activity
Week 1	Problem Understanding
Week 2	Data Collection & DB Setup
Week 3	SQL Operations
Week 4	Tableau Visualization
Week 5	Dashboard & Story
Week 6	Flask Integration
Week 7	Testing
Week 8	Documentation & Demo

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6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

- Verified database connection.
- Checked SQL query performance.
- Ensured dashboard loads without delay.
- Tested responsiveness on multiple devices.
- Confirmed smooth filter functionality.

No major performance issues observed.

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7. RESULTS

The system successfully:

- Created 10 interactive visualizations.
- Developed a responsive dashboard.
- Embedded dashboard into Flask web application.
- Enabled dynamic data filtering and storytelling.

7.1 Output Screenshots

(Insert screenshots of:)

- Tableau Dashboard
- Individual Visualizations
- Flask Web Interface
- Storyboard Scenes

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8. ADVANTAGES & DISADVANTAGES

Advantages:

- Interactive visualization.
- Easy understanding of complex data.
- Web-based accessibility.
- Scalable architecture.
- Supports preventive healthcare decisions.

Disadvantages:

- Dependent on Tableau license.
- No predictive ML model included.
- Requires internet for web access.

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9. CONCLUSION

The Heart Disease Data Analysis project successfully demonstrates how Tableau, MySQL, and Flask can be integrated to provide interactive and meaningful healthcare insights. The system enhances preventive healthcare awareness and supports data-driven decision-making for doctors, policymakers, and individuals.

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10. FUTURE SCOPE

- Integration of Machine Learning for risk prediction.
- Cloud deployment.
- Mobile application development.
- Real-time patient monitoring.
- AI-based health recommendations.

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11. APPENDIX

Dataset Link

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

GitHub & Project Demo Link

https://drive.google.com/file/d/17wLcE1YL9tiwbDT3d3VhJYdyhttps://drive.google.com/file/d/17wLcE1YL9tiwbDT3d3VhJYdybRPBe9G7/view?usp=drivesdkbRPBe9G7/view?usp=drivesdk