Heart Disease Prediction System

Objective

- To develop a predictive system that estimates the likelihood of heart disease in patients using machine learning algorithms and patient health data (such as age, sex, blood pressure, cholesterol, ECG, etc.)
- The system aims to assist healthcare professionals and patients in early detection and decision-making by extracting hidden patterns from historical heart disease datasets

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Audience

- **Primary Users:**
  - Healthcare professionals (doctors, cardiologists, nurses) who need decision support for diagnosing heart disease[14].
  - Patients seeking risk assessment and early warning about potential heart disease[1].
- **Secondary Users:**
  - Hospital administrators and healthcare organizations aiming to improve patient outcomes and operational efficiency.
  - Researchers and data scientists interested in medical data analytics and model improvement.

Stakeholders

- **Patients:** Benefit from early detection, personalized risk assessment, and improved health outcomes.

- **Healthcare Providers:** Use the system for enhanced diagnostic accuracy and treatment planning.
- **Hospital/Clinic Management:** Interested in improved service delivery and reduced healthcare costs.
- **Data Scientists/Developers:** Responsible for system development, model training, and maintenance.
- **Regulatory Bodies:** Ensure compliance with medical data privacy and security standards.

Requirements

Functional Requirements:

- Allow users (doctors/patients) to input patient health parameters.
- Predict the risk of heart disease based on input data.
- Display risk level and, if possible, suggest further medical action or consultation.
- Provide admin and user interfaces with different access privileges (e.g., admin can manage data, users can only input and view results).
- Maintain a record of predictions for future reference and analysis.

Non-Functional Requirements:

- **Accuracy:** The system should achieve high predictive accuracy, as validated by standard metrics (e.g., >85% accuracy).
- **Performance:** Provide quick responses to user queries.
- **Usability:** The interface should be user-friendly for both medical professionals and laypersons.
- **Security s Privacy:** Ensure patient data is securely stored and handled in compliance with healthcare regulations.
- **Scalability:** The system should handle increasing amounts of data and users as adoption grows.

Data Requirements:

- Use a reliable dataset (e.g., UCI Heart Disease dataset) with relevant features.
- Store and manage data in a structured format for easy retrieval and analysis

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Methodology

Waterfall for Heart Disease Prediction Project

• Clear Requirements Upfront:
All project requirements—data sources, model accuracy goals, privacy constraints, and UI features—are gathered and documented at the beginning before any development starts.
• Structured Development Phases:
The project follows a linear sequence of phases—starting with requirements gathering, then system design, implementation, testing, deployment, and maintenance—with each phase completed before the next begins.
• Comprehensive Documentation:
Each stage is thoroughly documented (e.g., data specs, model design plans), which is critical in regulated environments like healthcare.
• Predictable Timelines:
With a fixed scope and schedule, stakeholders can clearly understand the timeline for each milestone and final delivery.
• Final Delivery-Focused:
Unlike Agile's incremental outputs, the Waterfall approach delivers the complete heart disease prediction system at the end of the project lifecycle.

Waterfall Implementation Outline for the Project

1. Requirement Analysis:
   Gather and document all system requirements, including patient data sources, performance targets, and regulatory compliance needs.
2. System Design:
   Design system architecture, including data preprocessing pipelines, machine learning models, and user interface components.
3. Implementation:
   Develop the system based on the design document—code the preprocessing modules, train prediction models, and build the UI.
4. Testing:
   Thoroughly test the entire system for accuracy, privacy compliance, and usability, ensuring it meets initial specifications.
5. Deployment:

Launch the complete, validated heart disease prediction system for end-users.

6. Maintenance:

   Perform ongoing maintenance, bug fixes, and updates as needed post-deployment.

Summary Table

Aspect	Details
Objective	Predict heart disease risk using ML on patient data
Audience	Healthcare professionals, patients, admins, researchers
Stakeholders	Patients, providers, management, developers, regulators
Methodology	**Waterfall**
Requirements	Functional: input, prediction, reporting; Non-functional: accuracy, privacy, usability

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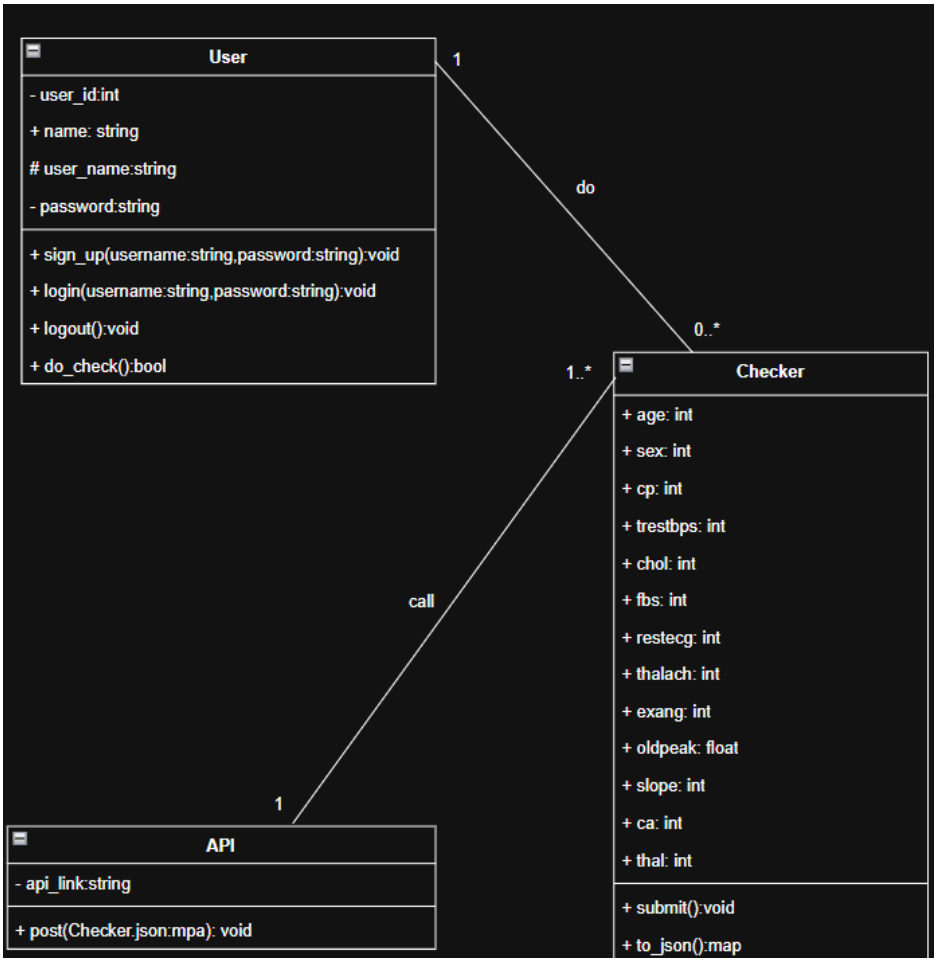
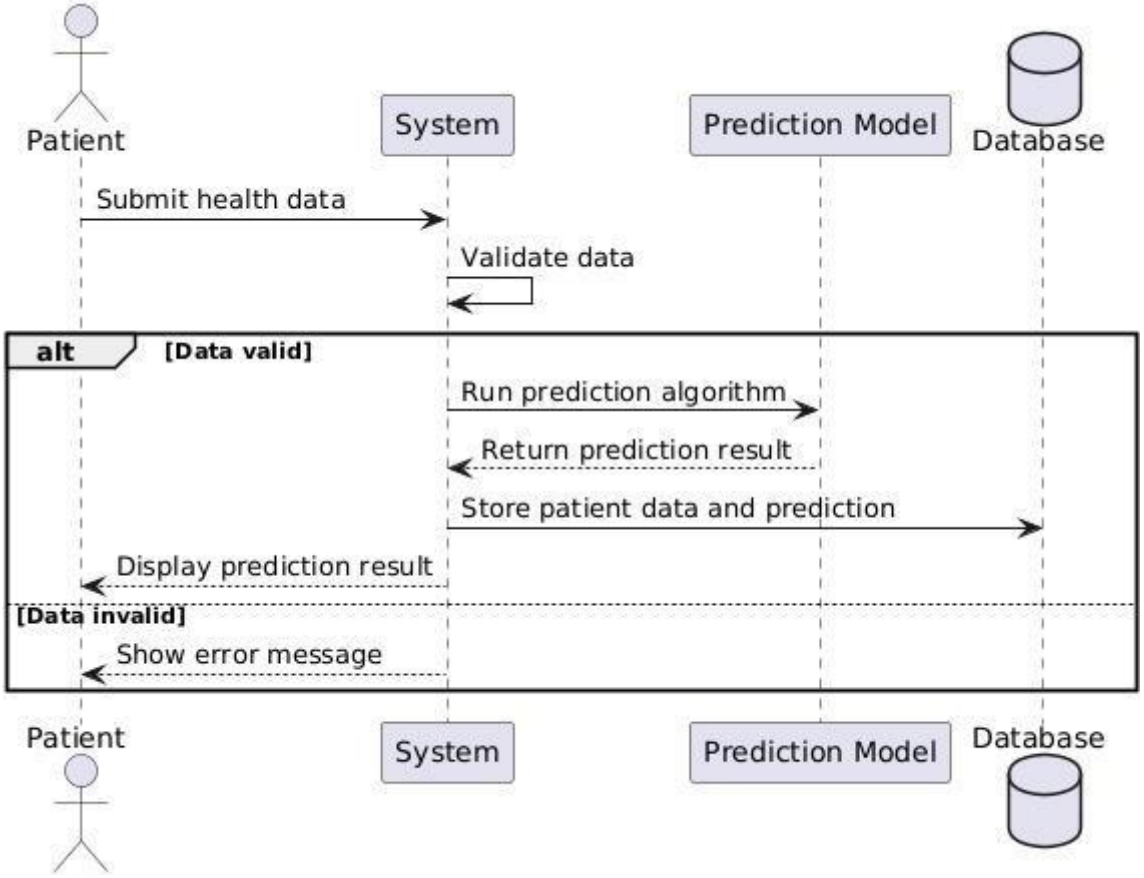
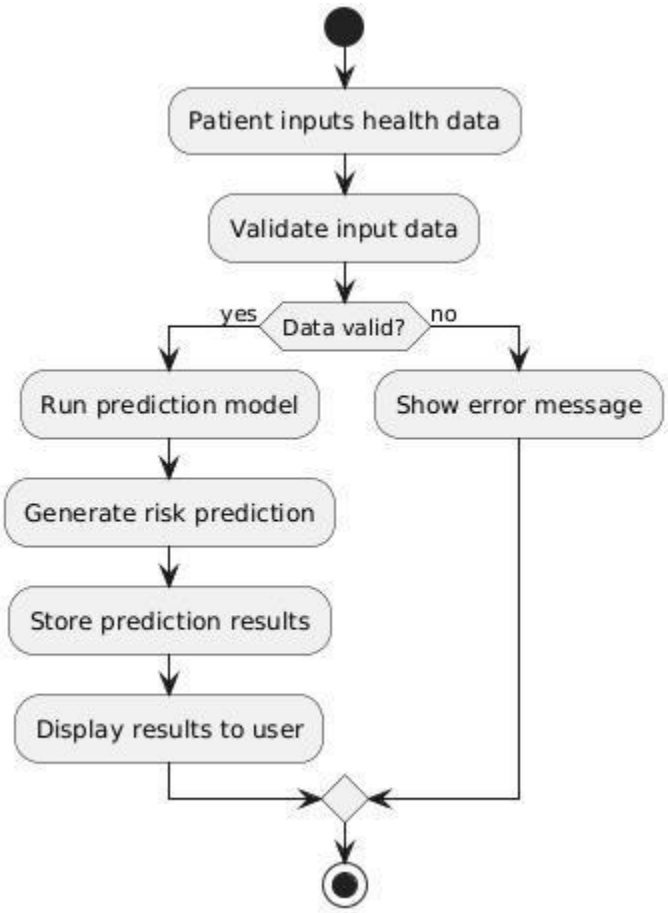
Clase diagram



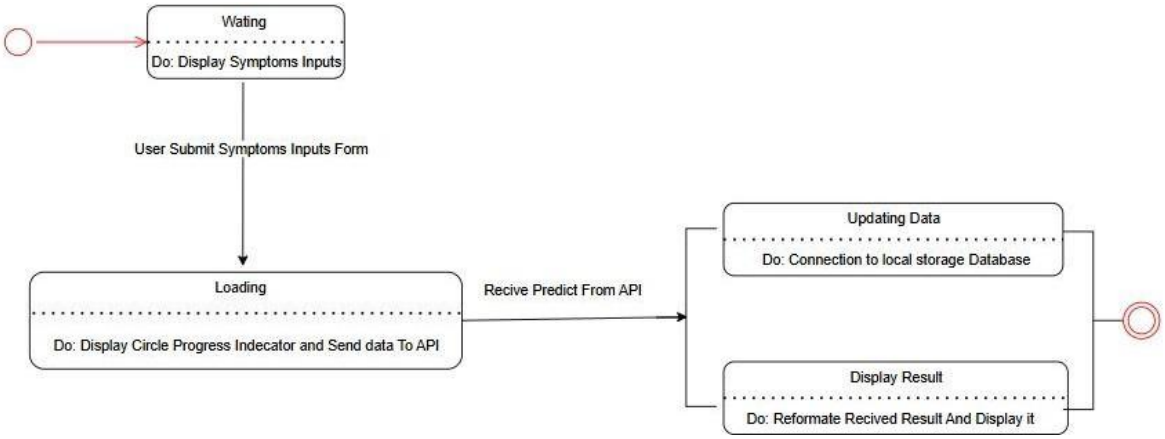
Sequence Diagram



Activity Diagram



State Diagram



Use case