# Solution Requirements – HealthAI

Date: 25 JUNE 2025

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Project Name: HealthAI

Maximum Marks: 10

## Functional Requirements

### FR-1 | Patient Chat for Health Q&A

Enable users to ask diverse health-related questions in a conversational style.  
Input: Text query via a dedicated input text box within the "Patient Chat" tab.  
Output: Display AI-generated, empathetic, and fact-based responses from the AI model (currently Google Gemini, targeting IBM Granite).  
Features: Support chronological display of chat history within the current session.

### FR-2 | Symptom-Based Disease Prediction

Allow users to input symptoms and receive predictions of potential medical conditions.  
Input: Symptoms described via a text area in the "Disease Prediction" tab, leveraging patient profile data from the sidebar (age, gender, medical history, recent metrics).  
Output: Return a structured output including potential medical conditions, their likelihood (High, Medium, Low), a brief explanation, and recommended next steps (e.g., self-care, doctor visit).

### FR-3 | Personalized Treatment Plan Generation

Provide tailored treatment recommendations based on a specified medical condition and the user's patient profile.  
Input: Medical condition (e.g., "Common Cold", "Hypertension") via a text input in the "Treatment Plans" tab, utilizing contextual patient profile data.  
Output: Generate a comprehensive plan covering recommended medications, lifestyle modifications, follow-up testing/monitoring, dietary advice, physical activity guidelines, and mental health considerations.

### FR-4 | Health Analytics Dashboard

Visualize historical health data and trends through interactive charts.  
Features:  
- Generate line charts for Heart Rate, Blood Pressure (Systolic & Diastolic), and Blood Glucose using Plotly.  
- Generate a pie chart for Symptom Frequency.  
- Display key metrics (Avg. Heart Rate, Avg. Blood Pressure, Avg. Blood Glucose, Avg. Sleep) with trend indicators.  
- Allow for real-time updates of charts based on simulated data.

### FR-5 | AI-Generated Health Insights

Provide intelligent insights and recommendations based on the analyzed health metrics.  
Input: Aggregated health metrics from the Health Analytics dashboard.  
Output: Display AI-generated observations on health trends and actionable advice within the dashboard.

### FR-6 | Patient Profile Management

Enable users to input and manage their demographic and medical information.  
Features: Provide input fields for Name, Age, Gender, Medical History, Current Medications, Allergies, and recent vital signs (Heart Rate, Blood Pressure, Blood Glucose) in the sidebar.

### FR-7 | Session State Management

Ensure continuity of user interaction and data within a single application session.  
Features: Preserve chat history, patient profile data, and generated health data throughout the user's active session.  
Note: Data currently resets upon full application restart; future enhancement for database persistence is planned.

## Non-Functional Requirements

### NFR-1 | Usability

The application must provide an intuitive, responsive, and aesthetically pleasing user interface.  
Metrics: Streamlit UI with clear layout, easy navigation via tabs, legible text and chart elements, and consistent interactive feedback.

### NFR-2 | Security

Ensure secure handling of API keys and protect simulated user data.  
Metrics: API token-based authentication for AI models (e.g., secure loading of Gemini API Key). Local file storage (for logs, if implemented) adheres to basic security practices. (Future: Data privacy and security for persistent storage will be paramount).

### NFR-3 | Reliability

The application's AI functionalities and dashboard should perform consistently without frequent crashes or unexpected behavior.  
Metrics: Consistent chatbot responses, accurate disease predictions and treatment plans, and stable dashboard performance.

### NFR-4 | Performance

Key AI responses and dashboard rendering should be timely to ensure a smooth user experience.  
Metrics:  
- AI Chatbot response time: <5 seconds (for typical queries using Gemini API simulation).  
- Disease Prediction/Treatment Plan generation: <8 seconds per request.  
- Dashboard render time: <3 seconds (for initial load and updates with simulated data).

### NFR-5 | Availability

The application must be runnable in various environments.  
Metrics: Works robustly offline (localhost development setup) and is deployable to cloud platforms (e.g., Streamlit Cloud).

### NFR-6 | Scalability

The architecture should allow for future expansion and handling of increased user load or data volume.  
Metrics: Modular architecture facilitating the integration of new AI models (e.g., transitioning to IBM Granite) or additional features. Design allows for potential future database integration for user scalability.

## Summary

HealthAI is designed to address essential healthcare guidance needs through a blend of intuitive user experience and reliable, performant AI modules. These solution requirements prioritize a human-centered design, ensuring the application is usable, secure, and provides timely, relevant health information. The current implementation demonstrates core functionalities with a clear roadmap for achieving full integration with IBM Granite and persistent data storage for future scalability.