# Functional & Performance Testing – HealthAI

Date: 25 JUNE 2025

Team ID: LTVIP2025TMID34578

Project Name: HealthAI

Maximum Marks: 5

## Test Scenarios & Results

### Functional Testing

* FT-01 | Text Input Validation (User Query to Chatbot)

Test Steps: Enter a valid medical query (e.g., "What causes fatigue?") and an empty text string into the "Patient Chat" input box.

Expected: The chatbot accepts valid input and processes it. For an empty input, it should not generate a response or provide a clear prompt to enter text.

Actual: Valid inputs are processed. Empty inputs do not trigger an AI response.

Result: PASS

* FT-02 | Number Input Validation (Patient Profile Metrics)

Test Steps: In the Patient Profile sidebar, attempt to input non-numeric or out-of-range values into fields like "Age", "Avg. Heart Rate (bpm)", "Systolic BP", "Diastolic BP", and "Avg. Blood Glucose (mg/dL)".

Expected: Streamlit's number input widgets inherently restrict non-numeric input and enforce min/max value ranges where defined, preventing invalid data entry.

Actual: System only accepts valid numeric entries within defined ranges for vital signs and age fields.

Result: PASS

* FT-03 | Chatbot Content Generation

Test Steps: In the "Patient Chat" tab, provide a symptom query (e.g., "I have a sore throat and fever").

Expected: AI (via Gemini API) generates a relevant, structured medical reply providing possible causes, self-care advice, and guidance on when to seek professional medical attention.

Actual: Gemini model responds contextually with appropriate health advice.

Result: PASS

* FT-04 | API Connection Check (Gemini Simulation)

Test Steps: Start the Streamlit application (streamlit run app.py). Monitor the console for any immediate API connection errors during initialization or upon first AI interaction.

Expected: The application successfully establishes a connection to the Google Gemini API (simulated for IBM Granite) without errors. AI responses are generated.

Actual: Connection to Gemini API is successful, and AI functions are operational.

Result: PASS

* FT-05 | Disease Prediction Content Generation

Test Steps: In the "Disease Prediction" tab, enter relevant symptoms (e.g., "headache, nausea, stiff neck") and ensure patient profile is filled. Click "Generate Prediction."

Expected: AI (via Gemini API) generates a list of potential conditions with their likelihood (High, Medium, Low), a brief explanation for each, and clear next steps.

Actual: Structured predictions are displayed as expected.

Result: PASS

* FT-06 | Treatment Plan Content Generation

Test Steps: In the "Treatment Plans" tab, enter a common medical condition (e.g., "Common Cold") and click "Generate Treatment Plan."

Expected: AI (via Gemini API) generates a comprehensive, personalized treatment plan, including sections for medications, lifestyle modifications, follow-up, dietary recommendations, physical activity, and mental health.

Actual: A well-structured treatment plan with relevant advice is generated.

Result: PASS

* FT-07 | Dashboard Update & Data Visualization

Test Steps: Navigate to the "Health Analytics" tab. Observe the Heart Rate, Blood Pressure, Blood Glucose, and Symptom Frequency charts, and the Health Metrics Summary.

Expected: Charts correctly render the synthetic 90-day health data. Metrics summary displays average values and trend deltas accurately.

Actual: Charts are visually correct and metrics reflect the generated data.

Result: PASS

* FT-08 | AI-Generated Health Insights

Test Steps: In the "Health Analytics" tab, click the "Generate AI Insights" button.

Expected: AI provides a textual summary of observations and recommendations based on the displayed health metrics and trends.

Actual: Insights are generated and displayed, offering interpretive analysis of the simulated data.

Result: PASS

### Performance Testing

* PT-01 | AI Response Time Test (Chatbot)

Test Steps: Initiate a simple query in the "Patient Chat" tab and observe the time until a full response is displayed.

Expected: Chatbot response time should be <5 seconds.

Actual: Response times are approximately 2−4 seconds (may vary slightly based on network and Gemini API load).

Result: PASS

* PT-02 | Dashboard Rendering Speed

Test Steps: Navigate to the "Health Analytics" tab and observe the time it takes for all charts and metrics to render.

Expected: Dashboard rendering time should be <3 seconds for the default simulated data (90 days).

Actual: Charts and metrics load smoothly, typically within 1−2 seconds.

Result: PASS

* PT-03 | Application Responsiveness Under Interaction

Test Steps: Rapidly switch between tabs, update patient profile fields, and trigger multiple AI generations consecutively.

Expected: The Streamlit UI remains responsive, without significant lag or freezing.

Actual: Application maintains good responsiveness; no significant delays or crashes observed during rapid interaction.

Result: PASS

## Summary:

All implemented functionalities of HealthAI (Patient Chat, Disease Prediction, Treatment Plans, Health Analytics, and Patient Profile Management) passed validation and stress tests within the defined scope. The AI model simulation using Google Gemini API performed as expected for content generation and structured outputs. Model latency is within acceptable limits for a prototype, and the Streamlit interface is stable under test loads. No critical bugs or unexpected behaviors were observed. The system is ready for continued development, focusing on the planned integration with IBM Granite and persistent data storage.