HealthAI: Intelligent Healthcare Assistant

# Project Report

# 1. INTRODUCTION

## 1.1 Project Overview

HealthAI is an innovative AI-driven healthcare assistant application developed to provide accessible, timely, and personalized health guidance. It aims to empower individuals to proactively manage their health concerns by offering immediate medical insights, symptom-based disease predictions, tailored treatment recommendations, and interactive health analytics. The current prototype is built using Streamlit for the user interface and leverages the Google Gemini API to simulate advanced Generative AI functionalities, with a strategic roadmap for future integration with IBM Granite-13B-instruct-v2 via IBM Watson Machine Learning.

## 1.2 Purpose

The primary purpose of HealthAI is to bridge the existing gaps in conventional healthcare access and information reliability. It seeks to reduce user anxiety stemming from confusing online health searches and provide a dependable digital tool for preliminary health assessments and guidance, ultimately fostering more informed health decisions and promoting proactive wellness.

# 2. IDEATION PHASE

## 2.1 Problem Statement

The project addresses two core problems:  
  
For the everyday health-seeker: Difficulty accessing timely, personalized symptom analysis and general medical information, leading to anxiety and delayed care for minor concerns.  
  
For the proactive health manager: Lack of actionable insights from personal health data provided by existing tools, hindering effective chronic condition management and preventative wellness.  
HealthAI aims to be a simple, intelligent, and integrated solution for these challenges.

## 2.2 Empathy Map Canvas

User Persona (Dhanish, 34, IT Professional): Frequently experiences minor symptoms but lacks time for regular doctor visits.  
  
Thinks & Feels: Wonders about symptom severity, overwhelmed by conflicting online info, wants quick trustworthy guidance, values privacy.  
Sees: Health ads, AI health news, overwhelming medical sites.  
Says & Does: "I wish for a smart assistant like a doctor," checks symptoms online, tries home remedies, submits feedback.  
Hears: "Go to a doctor," "Don't rely on internet," news about AI in hospitals.  
Pains: Confusing online advice, waiting times/fees, generic app responses, unclear symptom seriousness, data security concerns.  
Gains: Personalized AI advice, quick/reliable answers, health trend visualization, actionable treatment plans, data privacy, peace of mind.  
  
Summary: Empathy map shaped features: Patient Chat, Disease Prediction, Health Analytics dashboard, Treatment Plan generator, ensuring a human-centered design.

## 2.3 Brainstorming

Brainstorming led to categorizing features:  
  
Conversational AI & Chatbot Features: AI assistant for medical queries, symptom interpretation, context-aware replies.  
Disease Prediction & Diagnosis Support: Symptom-based probable conditions, likelihood scoring.  
Personalized Treatment & Guidance: AI-generated care recommendations, lifestyle tips.  
Health Analytics & Dashboard: Visualization of vitals, symptom frequency, AI insights.  
System & UI Enhancements: Streamlit UI, secure API access, session state management, responsive design.  
  
Prioritization (Value vs. Effort Matrix) highlighted Patient Chat, Disease Prediction, Personalized Treatment Plans, Health Analytics Dashboard, and Patient Profile Management as high-priority features for initial development.

# 3. REQUIREMENT ANALYSIS

## 3.1 Customer Journey Map

The customer journey map outlines Dhanish's interaction with HealthAI across 5 stages:  
  
Awareness → Engagement → Insight Generation → Exploration & Future Action → Retention  
  
Opportunities identified include improving clarity, optimizing dashboard performance, and implementing data persistence.

## 3.2 Solution Requirement

Functional Requirements (FRs):  
- Patient Chat  
- Symptom-Based Disease Prediction  
- Personalized Treatment Plan Generation  
- Health Analytics Dashboard  
- AI-Generated Health Insights  
- Patient Profile Management  
- Session State Management  
  
Non-Functional Requirements (NFRs):  
- Usability  
- Security  
- Reliability  
- Performance  
- Availability  
- Scalability

## 3.3 Data Flow Diagram

User Input → Python Backend → Gemini API → Response Parsing → Plotly Visualization → Session State Storage → UI Output

## 3.4 Technology Stack

- User Interface: Streamlit  
- App Logic: Python, Pandas, aiohttp  
- AI Models: Google Gemini (current), IBM Granite (target)  
- Data Visualization: Plotly  
- Session Management: Streamlit Session State  
- Infrastructure: Localhost, Streamlit Cloud / IBM Cloud  
- Security: python-dotenv

# 4. PROJECT DESIGN

## 4.1 Problem Solution Fit

HealthAI directly addresses identified problems:  
- Provides reliable AI-based info  
- Offers personalized insights  
- Empowers users with data visualization  
- Emphasizes privacy and accuracy

## 4.2 Proposed Solution

AI-powered healthcare assistant with:  
- Chatbot  
- Disease prediction  
- Treatment plans  
- Analytics dashboard  
- Scalable, responsive design

## 4.3 Solution Architecture

Frontend: Streamlit UI  
Backend: Python Logic  
AI Service Layer: Gemini API → IBM Granite  
Data: Session State  
Visualization: Plotly  
Security: API token management

# 5. PROJECT PLANNING & SCHEDULING

## 5.1 Project Planning

- Agile Sprints (6 days each)  
- Estimated Velocity: 10 Story Points/sprint  
- Tools: Jira/Trello, VS Code, Git, Gemini API, Streamlit, Plotly  
- Sprint Goals:  
 Sprint 1: UI & Chat  
 Sprint 2: Prediction & Treatment  
 Sprint 3: Analytics & Session  
 Sprint 4: Finalization & Deployment

# 6. FUNCTIONAL AND PERFORMANCE TESTING

## 6.1 Performance Testing

Functional Tests:  
- Input Validation  
- AI Response  
- Prediction & Treatment Generation  
- Dashboard & Insight Updates  
  
Performance Tests:  
- Chatbot < 5s  
- Dashboard < 3s  
- Responsive UI  
  
Summary: All functions passed; Gemini AI simulation validated; IBM integration planned.

# 7. RESULTS

## 7.1 Output Screenshots

(Include screenshots of each feature: Chat, Prediction, Treatment, Analytics Dashboard, Profile Sidebar)

# 8. ADVANTAGES & DISADVANTAGES

## 8.1 Advantages

- 24/7 Access  
- Personalization  
- Proactive Management  
- Simple UI  
- Rapid Prototyping  
- Scalability

## 8.2 Disadvantages

- AI still simulated (not IBM-integrated)  
- No persistent data  
- Informational only (not diagnostic)  
- Synthetic data in dashboard

# 9. CONCLUSION

## Conclusion

HealthAI proves the potential of AI in healthcare assistance. While currently in prototype with Google Gemini, the project lays a solid foundation for IBM Granite integration, database persistence, and broad user impact in digital health and wellness.

# 10. FUTURE SCOPE

## Future Enhancements

- IBM Granite Integration  
- Firestore for persistence  
- User Auth system  
- Advanced Analytics  
- Report Export  
- Voice Chat Integration  
- Wearable Data Import  
- Medical Knowledge Expansion

# 11. APPENDIX

## Appendix

- Source Code: [GitHub Link]  
- Demo: [Demo Link]  
- Dataset: (N/A – synthetic data used)