

Health AI: Intelligent Health Care Assistant

1. Introduction

Project Title: Health AI – Intelligent Health Care Assistant

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2. Project Overview

Purpose:

The purpose of Health AI: Intelligent Health Care Assistant is to revolutionize healthcare services by providing

Features:

- **Conversational Interface:** Allows users to ask health-related questions, receive symptom assessments, treatment plans, and advice.
- **Personal Health Insights:** Offers daily health tips, diet plans, exercise schedules, and mental health support based on user data.
- **Medical History Tracking:** Stores past diagnoses, prescriptions, and test results to provide personalized guidance.
- **Appointment Scheduling Support:** Helps users schedule doctor visits, follow-ups, and manage prescriptions.
- **Emergency Alerts:** Sends alerts for abnormal readings like heart rate, blood pressure, or glucose levels.
- **Resource Forecasting:** Provides future medication needs, therapy planning, and recovery trends based on historical data.
- **Multimodal Input Support:** Accepts voice, text, medical reports, images (X-rays), and CSV files for analysis.
- **Data Security & Privacy:** Implements encryption, token-based authentication, and role-based access.
- **User-Friendly Interface:** Provides dashboards, reports, reminders, and visualization tools for users with various health needs.

3. Architecture

Frontend (Streamlit or Gradio): An intuitive interface that allows users to interact with health data, upload medical records, and receive recommendations.

Backend (Fast API): Manages API endpoints for symptom checking, medical record uploads, appointment scheduling, and data processing.

LLM Integration (IBM Watsonx Granite): The AI-powered language models interpret symptoms, generate treatment plans, and provide health advice.

Vector Search (Pinecone): Medical documents and patient history are embedded using Sentence Transformers for efficient retrieval.

ML Modules (Forecasting and Anomaly Detection): Scikit-learn-based models analyze trends in patient data to predict health risks.

4. Setup Instructions

Prerequisites:

- Python 3.9+
- pip, virtual environment tools
- API keys for IBM Watsonx and Pinecone
- Internet connection

Installation:

1. Clone the repository
2. Install dependencies via requirements.txt
3. Configure .env with API credentials
4. Run the FastAPI backend server
5. Launch the Streamlit or Gradio frontend
6. Upload patient data and start interacting

5. Folder Structure

app/: Backend logic including API routes, data models, and utilities

app/api/: Modules for chat, feedback, reports, and medical document processing
ui/: Frontend components for dashboards, forms, and visualization
health_dashboard.py: Entry point for the UI
granite_llm.py: Interfaces with IBM Watsonx Granite AI models
document_embedder.py: Processes medical records and stores embeddings
forecast_module.py: Predicts health trends
anomaly_checker.py: Detects irregular health patterns
report_generator.py: Creates patient health reports

6. Running the Application

1. Start the FastAPI server
2. Open the dashboard using Streamlit or Gradio
3. Navigate through the interface
4. Upload health records or input symptoms
5. Access personalized insights, summaries, and forecasts

7. API Documentation

POST /chat/ask: Answer health queries
POST /upload-doc: Upload medical reports
GET /search-docs: Find similar medical cases
GET /get-health-tips: Get wellness advice
POST /submit-feedback: Provide user feedback

8. Authentication

For secure deployments, integrate:

- Token-based authentication (JWT, API keys)
- OAuth2 with healthcare cloud providers
- Role-based access control (patient, doctor, admin)

9. User Interface

- Sidebar navigation
- Interactive forms for symptom input
- Visual health reports and charts
- Appointment tracking
- Real-time notifications and alerts

10. Testing

• Unit testing for prompt generation and logic • API testing using Postman and Swagger UI • Manual testing for data uploads and response accuracy • Validation against malformed data and security breaches

11. Future Enhancements

- Integration with wearable devices
- Enhanced privacy tools and encrypted data storage
- AI-driven diagnosis based on imaging data
- Expanded multilingual support