

HealthAI: Intelligent Healthcare Assistant Using IBM Granite Documentation

1.Introduction

- Project title : HealthAI - Intelligent Healthcare Assistant Using IBM Granite
- Team member: SHIREEN A
- Team member: VAISHNAVI R
- Team member: RITHIKA S
- Team member: THANUJA S

2.project overview

- Purpose :

The purpose of HealthAI is to assist patients, healthcare professionals, and general users by providing intelligent, AI-powered healthcare support. By leveraging LLMs (IBM Watsonx Granite) and real-time data, HealthAI offers:

- Symptom-based disease predictions
- Personalized treatment and lifestyle recommendations
- Medical history–aware suggestions
- Easy access to reliable healthcare information

This assistant acts as a decision-support partner for medical professionals and a guidance tool for patients, ensuring better health awareness, preventive care, and timely medical attention.

- Features:

Symptom Analysis (Disease Prediction)

Key Point: Early health risk detection

Functionality: Users enter symptoms, and the system predicts possible conditions with recommendations.

Personalized Treatment Plans

Key Point: Tailored healthcare guidance

Functionality: Provides lifestyle, medication, and diet suggestions based on user profile (age, gender, history).

Medical History Integration

Key Point: Context-aware AI

Functionality: Takes into account allergies, past conditions, or chronic diseases.

Medication & Lifestyle Advice

Key Point: Preventive healthcare support

Functionality: Takes into account allergies, past conditions, or chronic diseases.

Report Summarization

Key Point: Simplified medical understanding

Functionality: Converts long medical documents or reports into easy-to-read summaries.

Anomaly Detection (Vitals/Reports)

Key Point: Early warnings

Functionality: Flags abnormal patterns in patient vitals or lab reports.

Multimodal Input Support

Key Point: Flexible healthcare data handling

Functionality: Accepts text, PDFs, and CSVs (lab reports, prescriptions, datasets).

Gradio UI (Frontend)

Key Point: User-friendly interface

Functionality: Provides a clean, accessible dashboard for patients and doctors.

3. Architecture

Frontend (Gradio)

- Built using Gradio for interactive UI.
- Pages include:
 - Symptom analysis
 - Treatment recommendations
 - File upload (medical history/reports)
 - Chat assistant for health queries

Backend (FastAPI)

- FastAPI powers all API endpoints:
 - Symptom analysis
 - Report summarization
 - Treatment plan generation
 - Chatbot responses

Vector Database (Pinecone)

- Stores medical knowledge base embeddings.
- Supports semantic search of medical literature and reports.

ML Modules (Forecasting & Anomaly Detection)

- Forecast patient vitals trends.
- Detect anomalies in medical records or lab results using Scikit-learn and pandas.

4.Setup Instructions

Prerequisites:

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

Installation Process:

1. Clone the repository
2. Install dependencies via requirements.txt
3. Configure .env with API keys (IBM, Pinecone)
4. Start the FastAPI backend
5. Launch the Gradio UI
6. Upload symptoms/data and interact with the assistant

5. Folder Structure

- app/ – Backend logic (APIs, models, integrations)
- app/api/ – Symptom analysis, treatment, summarization routes
- ui/ – Gradio UI components
- granite_llm.py – Handles IBM Watsonx Granite integration
- medical_embedder.py – Converts medical docs into embeddings (Pinecone)
- anomaly_checker.py – Detects unusual patterns in health data
- report_generator.py – AI-generated medical summaries and recommendations

6. Running the Application

1. Start the FastAPI backend server
2. Run the Gradio UI
3. Navigate across modules (symptoms, treatment, reports)
4. Upload medical files for summarization/predictions
5. Interact with the chatbot for personalized health guidance

7. API Documentation

- POST /symptoms/analyze → Returns possible conditions
- POST /treatment/plan → Generates treatment plan
- POST /upload-doc → Upload and embed reports
- GET /search-docs → Retrieve similar medical documents
- GET /health-tips → AI-powered wellness tips
- POST /feedback → Collects patient feedback

8. Authentication

For secure deployment:

- Token-based authentication (JWT/API keys)
- Role-based access (doctor, patient, admin)
- Future: Session tracking and patient history

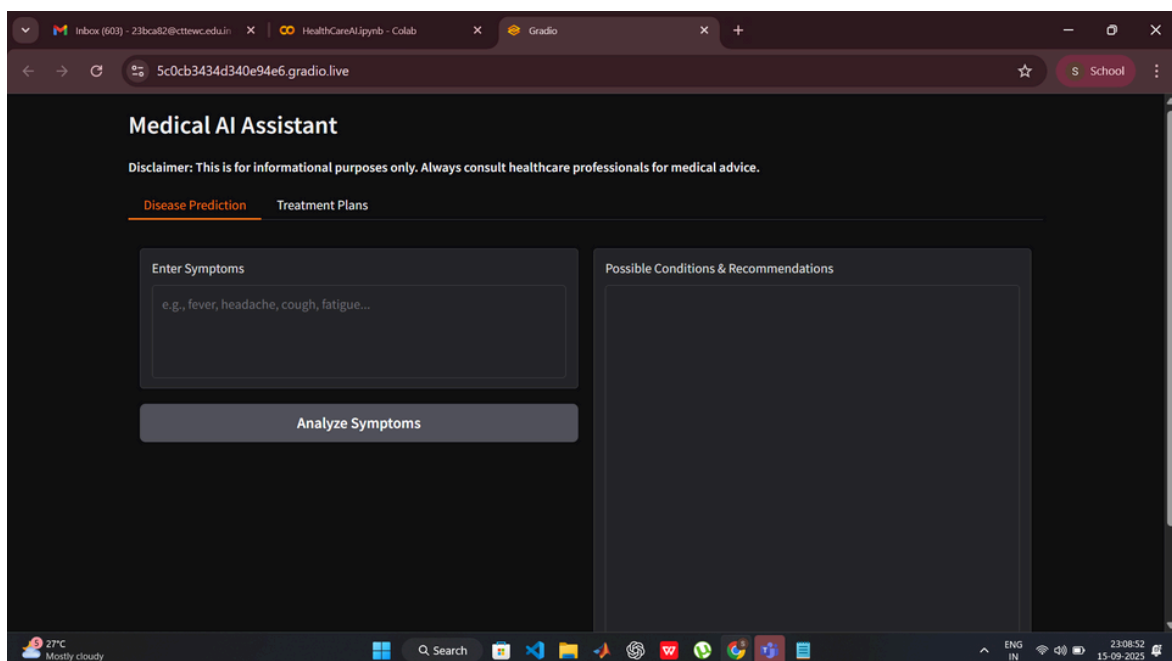
9. User Interface

- Tabs: Disease Prediction | Treatment Plans | Medical Report Summarization
- Input: Symptoms, medical history, reports
- Output: Possible conditions, lifestyle tips, and AI-generated reports
- Extra: PDF download of treatment plan

10. Testing

- Unit Testing: For prediction and summarization modules
- API Testing: Swagger/Postman
- Manual Testing: User flows in Gradio
- Edge Case Testing: Rare symptoms, empty inputs, invalid files

11. Screenshots



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Medical AI Assistant

Disclaimer: This is for informational purposes only. Always consult healthcare professionals for medical advice.

Disease Prediction

Treatment Plans

Enter Symptoms

fever,headache

Analyze Symptoms

Possible Conditions & Recommendations

1. **Common Cold or Flu (Viral Infection):**

- **Causative agent:** Rhinovirus, Coronavirus, Influenza virus, etc.

- **Symptoms:** Fever, headache, fatigue, sore throat, cough, runny or stuffy nose, body aches, and general feeling of unwellness.

- **Treatment:**

- **Acetaminophen or Ibuprofen** for headache and fever reduction (consult local guidelines for dosage, as medication should be age-appropriate).

- **Hydration** to prevent dehydration.

- **Rest and over-the-counter (OTC) cold remedies** to alleviate symptoms and support recovery.

- **Antiviral medications** (e.g., Oseltamivir, Zanamivir) may be recommended for influenza cases, but these should be used according to healthcare provider's guidance and may not be available over-the-counter.

2. **Migraine or Tension Headache:**

- **Causative agent:** Various, including stress, tension, or certain

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Disease Prediction

Treatment Plans

Medical Condition

e.g., diabetes, hypertension, migraine...

Age

30

Gender

Male

Medical History

Previous conditions, allergies, medications or None

Personalized Treatment Plan

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Disease Prediction

Treatment Plans

Medical Condition

diabetes

Age

28

Gender

Male

Medical History

allergies

Personalized Treatment Plan

1. **Lifestyle Modifications**

- **Diet:** Adopt a balanced diet rich in whole grains, lean proteins, fruits, vegetables, and healthy fats. Limit processed foods, sugars, and saturated fats. Monitor carbohydrate intake and maintain consistent meal times. Consider using a food diary to track progress.

- **Exercise:** Engage in regular physical activity for at least 150 minutes per week, including both aerobic and strength training exercises. Aim for 3 sessions of aerobic activity and 2 sessions of strength training. Choose enjoyable activities to maintain long-term adherence.

- **Weight Management:** If overweight, aim to achieve and maintain a healthy body mass index (BMI) through a combination of balanced diet and regular exercise.

2. **Medication Management**

- **Oral Hypoglycemic Agents:** Initially, consider starting with metformin, which is often the first-line medication for type 2

12. Known Issues

- Limited accuracy for rare diseases
- Dependent on quality of medical dataset embeddings
- Requires medical professional validation

13. Future enhancement

- Real-time IoT integration (patient monitoring)
- Voice-based interaction for accessibility
- Multi-language support
- Integration with hospital EHR systems

