Project Title: HealthAI: Intelligent Healthcare Assistant Using IBM Granite

Project Documentation

1.Introduction:

- Team ID : NM2025TMID03328
- Team member : SUBAKAMACHI C
- Team member : SRI LAKSHMY R
- Team member : SRIMATHI P
- Team member : HARISHANKARI V

2.Project overview:

Purpose :

The purpose of the Health AI Assistant is to provide users with an accessible and interactive platform for basic health awareness and guidance. By leveraging IBM Granite LLM and AI-powered natural language processing, the assistant helps analyze user-provided symptoms and generates possible medical condition insights along with general recommendations. It also offers personalized treatment plan suggestions based on age, gender, and medical history, including home remedies and medication guidelines. This tool empowers users with quick, educational health information while emphasizing that professional consultation is necessary for proper diagnosis and treatment. Ultimately, this assistant bridges technology and healthcare awareness, helping users make informed decisions about their well-being.

Features:

- **Conversational Symptom Analysis:**
  Key Point: AI-powered natural language interaction

Functionality: Users can enter symptoms in plain language, and the assistant provides possible medical conditions and general recommendations.

- **Personalized Treatment Plan Generator**
  Key Point: Patient-specific suggestions
  Functionality: Generates customized treatment suggestions (including home remedies and general medication guidelines) based on condition, age, gender, and medical history.

- **Safety & Ethical Disclaimer**
  Key Point: Responsible health guidance
  Functionality: Every response includes a reminder to consult a healthcare professional for accurate diagnosis and treatment.

- **IBM Granite LLM Integration**
  Key Point: Context-aware AI responses
  Functionality: Uses IBM Granite-3.2-2B-Instruct model to generate precise, human-like answers for health-related queries.

- **Gradio-Based User Interface**Key Point: Intuitive and easy-to-use
  Functionality: Provides a tab-based layout with separate sections for "Disease Prediction" and "Treatment Plans," making it simple for users to interact with the system.

- **Real-Time Response Generation**
  Key Point: Instant feedback
  Functionality: Uses live model inference to generate responses immediately after user input.

- **Cross-Platform Support**
  Key Point: Accessible anywhere
  Functionality: Runs on any device with a web browser via Gradio shareable links, no complex installation required.

3.Architecture:

Frontend (Gradio):

The frontend is built using Gradio Blocks, providing an interactive, tab-based web

UI. Users can switch between "Disease Prediction" and "Treatment Plans," input symptoms or patient details, and instantly view AI-generated results. The design is simple, responsive, and accessible on any device.

Backend (Python):

The backend is implemented in pure Python. It loads the IBM Granite-3.2-2B-Instruct model via Hugging Face Transformers and handles text processing, prompt construction, and response generation.

LLM Integration (IBM Granite):

The project integrates IBM Granite LLM, which powers natural language understanding and generation. Carefully crafted prompts ensure safe, educational, and context-aware health recommendations.

Workflow:

1. User provides input (symptoms or condition details).
2. The backend formats the input into a structured prompt.
3. IBM Granite LLM generates possible conditions or treatment suggestions.
4. The result is displayed in the Gradio interface instantly.

4.Setup Instructions

Prerequisites:

- Python 3.9 or later
- pip package manager
- Internet connection (for model download)

Installation Process:

1. Install dependencies:
2. pip install transformers torch gradio
3. Save the provided code as health_ai_app.py.
4. Run the application:
5. python health_ai_app.py
6. Open the Gradio link displayed in the terminal to launch the web interface.

5. Folder Structure:

```
health_ai_app/
│
├── health_ai_app.py      # Main application script
├── requirements.txt      # List of dependencies
└── README.md             # Documentation and usage guide
```

6.Running the Application

1. Run the script:
2. python health_ai_app.py
3. Open the Gradio share link (local or public).
4. Navigate through the two main tabs:
    - Disease Prediction: Enter symptoms → Get possible medical conditions & suggestions.
    - Treatment Plans: Enter condition, age, gender, and history → Generate personalized treatment plan.
5. Review results and follow the disclaimer's advice to consult a doctor.

6. API / Function Documentation

Core Functions (Internal):

- generate_response(prompt): Sends a prompt to Granite LLM and returns AI-generated text.
- disease_prediction(symptoms): Builds a structured symptom-analysis prompt and returns a result.
- treatment_plan(condition, age, gender, history): Produces a custom treatment plan based on patient details.

7. Authentication:

Currently, no authentication is required (for demo purposes).
For production deployments, the following can be added:

- Token-based authentication (JWT or API keys)
- OAuth2 integration
- Role-based access control (admin, doctor, patient)
- Secure patient session and history tracking

8. User Interface:

The UI is minimalist, responsive, and designed for ease of use:

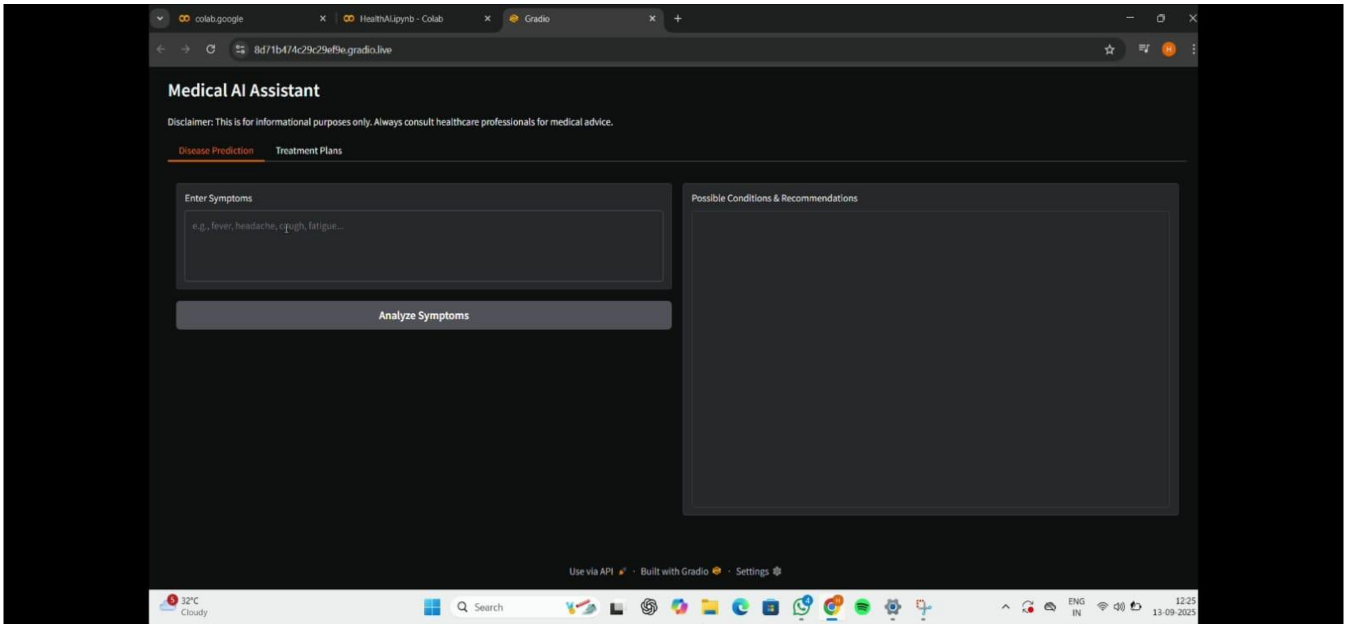
- Tabs: Clear navigation for "Disease Prediction" and "Treatment Plans"
- Text Inputs: For entering symptoms, condition, and medical history
- Dropdown & Number Inputs: For gender and age selection
- Large Output Boxes: Display clear, readable AI-generated responses
- Action Buttons: Trigger instant analysis with a single click
-

9.Testing:

Testing was performed in multiple phases:

- Unit Testing: Verified prompt construction and model response decoding.
- Manual Testing: Tested a wide range of symptom inputs and treatment queries for accuracy and consistency.
- Edge Case Handling: Checked system response to empty inputs, irrelevant text, and very long histories.

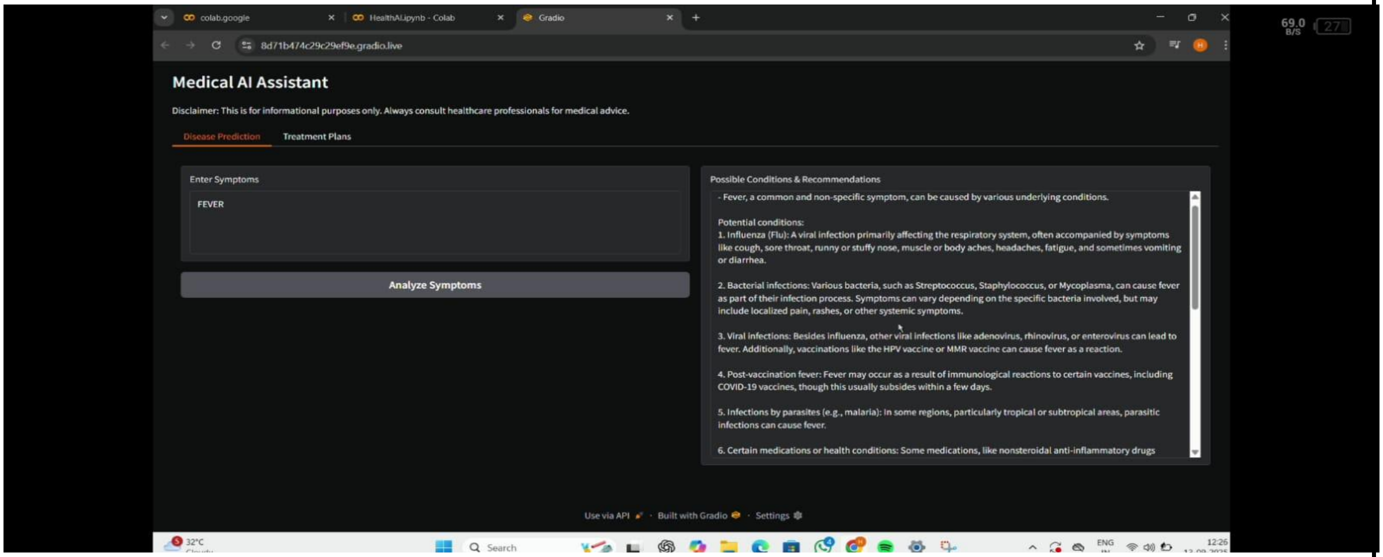
10.Screen shots:



Medical AI Assistant

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

Enter Symptoms: e.g., fever, headache, cough, fatigue...



Medical AI Assistant

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

Enter Symptoms

FEVER

Possible Conditions & Recommendations

- Fever, a common and non-specific symptom, can be caused by various underlying conditions.

Potential conditions:
1. Influenza (Flu): A viral infection primarily affecting the respiratory system, often accompanied by symptoms like cough, sore throat, runny or stuffy nose, muscle or body aches, headaches, fatigue, and sometimes vomiting or diarrhea.

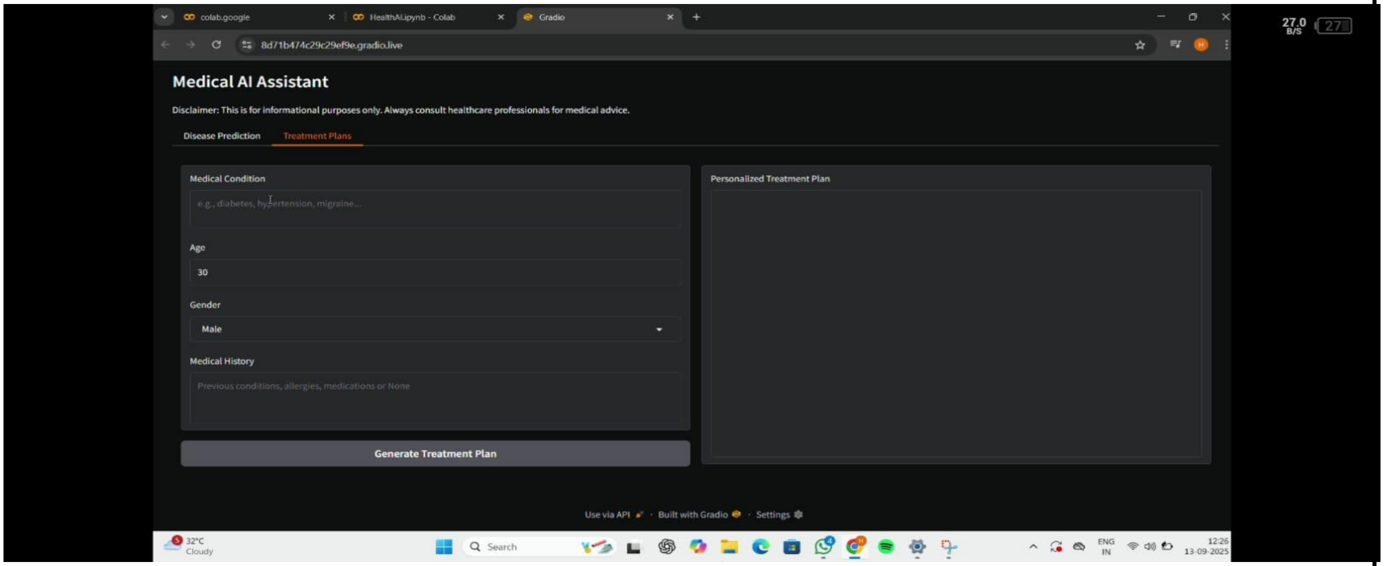
2. Bacterial infections: Various bacteria, such as Streptococcus, Staphylococcus, or Mycoplasma, can cause fever as part of their infection process. Symptoms can vary depending on the specific bacteria involved, but may include localized pain, rashes, or other systemic symptoms.

3. Viral infections: Besides influenza, other viral infections like adenovirus, rhinovirus, or enterovirus can lead to fever. Additionally, vaccinations like the HPV vaccine or MMR vaccine can cause fever as a reaction.

4. Post-vaccination fever: Fever may occur as a result of immunological reactions to certain vaccines, including COVID-19 vaccines, though this usually subsides within a few days.

5. Infections by parasites (e.g., malaria): In some regions, particularly tropical or subtropical areas, parasitic infections can cause fever.

6. Certain medications or health conditions: Some medications, like nonsteroidal anti-inflammatory drugs



Medical AI Assistant

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

Medical Condition

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

Age

30

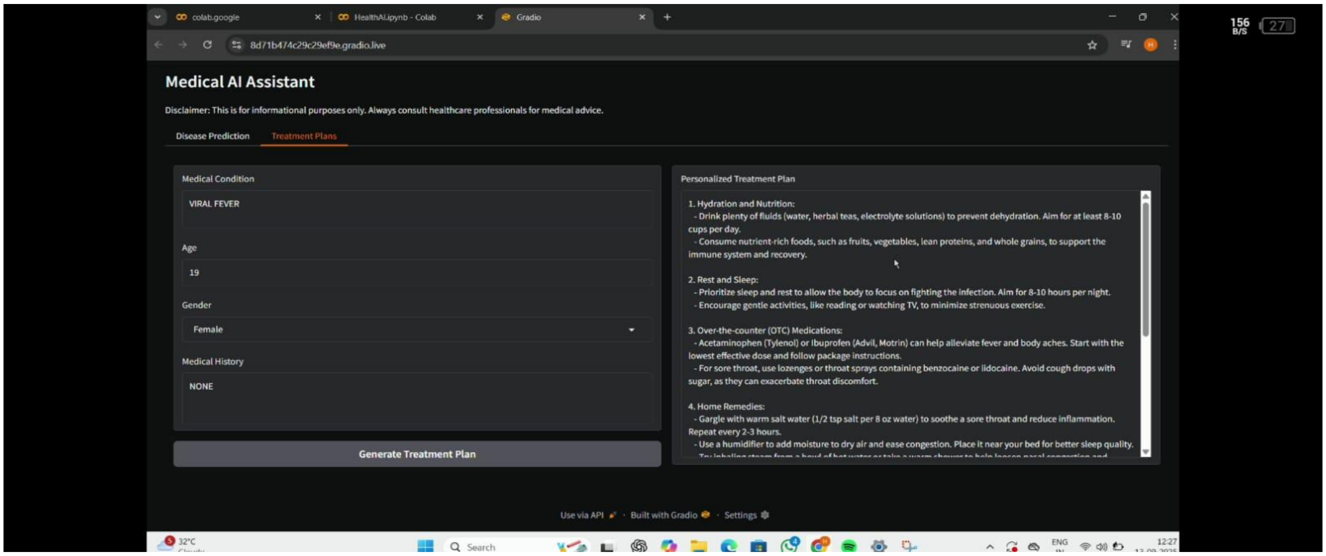
Gender

Male

Medical History

Previous conditions, allergies, medications or None

Personalized Treatment Plan



Medical AI Assistant

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

Medical Condition: VIRAL FEVER

Age: 19

Gender: Female

Medical History: NONE

Personalized Treatment Plan

1. Hydration and Nutrition:
   - Drink plenty of fluids (water, herbal teas, electrolyte solutions) to prevent dehydration. Aim for at least 8-10 cups per day.
   - Consume nutrient-rich foods, such as fruits, vegetables, lean proteins, and whole grains, to support the immune system and recovery.

2. Rest and Sleep:
   - Prioritize sleep and rest to allow the body to focus on fighting the infection. Aim for 8-10 hours per night.
   - Encourage gentle activities, like reading or watching TV, to minimize strenuous exercise.

3. Over-the-counter (OTC) Medications:
   - Acetaminophen (Tylenol) or Ibuprofen (Advil, Motrin) can help alleviate fever and body aches. Start with the lowest effective dose and follow package instructions.
   - For sore throat, use lozenges or throat sprays containing benzocaine or lidocaine. Avoid cough drops with sugar, as they can exacerbate throat discomfort.

4. Home Remedies:
   - Gargle with warm salt water (1/2 tsp salt per 8 oz water) to soothe a sore throat and reduce inflammation. Repeat every 2-3 hours.
   - Use a humidifier to add moisture to dry air and ease congestion. Place it near your bed for better sleep quality.
   - Try inhaling steam from a bowl of hot water or take a warm shower to help loosen nasal congestion and

11.Known Issues

1. No Real Medical Database Integration

   - The system currently relies only on AI-generated text and does not cross-check with real medical databases, which can limit accuracy.

2. No Offline Mode

   - The application requires an internet connection to load the IBM Granite model and generate responses.

3. Basic UI Only

   - The interface is functional but minimal. There are no advanced features like saving chat history or exporting results.

4. No Authentication or User Data Security

   - User information is not stored securely as the project runs in an open environment, which may not be suitable for sensitive data.

5. Generalized Recommendations

- Since this is an AI-powered system, responses are general in nature and may not be highly specific for rare medical conditions.
- Future Enhancements

12.Future enhancement

Integration with Trusted Medical Databases

- Connect the system with official medical databases (WHO, MedlinePlus, etc.) to improve accuracy and reliability.

Voice Input and Output

- Allow users to speak their symptoms and hear AI-generated recommendations for better accessibility.

Downloadable Health Reports

- Provide an option to export predictions and treatment plans as PDF reports for future reference.

User Authentication and Data Privacy

- Implement login, encryption, and secure data storage to safely manage patient history.

Mobile-Friendly Version

- Create a mobile-optimized interface or a standalone app for easy access on smartphones.

Real Doctor Consultation Integration

- Provide a feature to connect users directly with healthcare professionals for teleconsultation after getting AI suggestions.