HealthAI Project Documentation

1. Introduction

• Project Title: HealthAI: Intelligent Healthcare Assistant Using IBM Granite

• Team Members:

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2. Project Overview

• Purpose:

The purpose of HealthAI is to harness IBM Watson Machine Learning and Generative AI to provide intelligent healthcare assistance. The system delivers accurate medical insights, predicts diseases, recommends treatment plans, and visualizes patient health analytics. By leveraging IBM Granite-13B Instruct v2, the platform improves healthcare accessibility, empowers users to make informed decisions, and enhances the patient experience.

• Features:

Patient Chat
Key Point: Conversational healthcare guidance
Functionality: Provides natural language interaction for health-related questions with AI-generated responses.

Disease Prediction
Key Point: Symptom-based diagnosis
Functionality: Analyzes user symptoms and health data to suggest possible conditions with likelihoods and next steps.

Treatment Plans
Key Point: Personalized medical advice
Functionality: Generates tailored treatment recommendations including medications, lifestyle changes, and follow-up testing.

Health Analytics
Key Point: Data-driven insights
Functionality: Visualizes patient health metrics (vital signs, trends) and provides AI-generated insights.

Secure API Management
Key Point: Data safety
Functionality: Ensures responsible handling of healthcare data with API key protection.

3. Architecture

Frontend (Streamlit): Provides an interactive interface for chat, prediction, treatment, and analytics with intuitive dashboards and visualizations.

Backend (FastAPI): Manages requests, communicates with IBM Granite, and handles core healthcare functionalities.

LLM Integration (IBM Watsonx Granite): IBM Granite-13B Instruct v2 model processes natural language queries and generates medical insights.

Data Visualization (Plotly, Pandas): Displays patient metrics and trends in interactive graphs.

ML Modules: Support disease prediction and health analytics using patient-reported data.

4. Setup Instructions

Prerequisites:
• Python 3.9+
• pip & virtual environment
• IBM Watsonx API key
• Streamlit, Plotly, Pandas installed

Installation Process:
• Clone the repository
• Install dependencies from requirements.txt
• Configure credentials in .env file
• Run backend server (FastAPI)
• Launch frontend via Streamlit
• Upload health data and interact with modules

5. Folder Structure

app/ – FastAPI backend logic including chat, prediction, treatment, and analytics modules

ui/ – Streamlit frontend components for dashboards and health visualization

app.py – Entry script to run the main Streamlit interface

granite_llm.py – Handles IBM Granite model interactions

prediction_engine.py – Implements disease prediction logic

treatment_planner.py – Generates treatment recommendations

health_dashboard.py – Visualizes health data and insights

6. Running the Application

➢ Launch FastAPI server
➢ Run Streamlit dashboard
➢ Navigate via sidebar
➢ Input symptoms, request treatment plans, or view analytics
➢ Receive AI-generated responses in real-time

7. API Documentation

POST /chat/ask – Submit health-related queries

POST /disease/predict – Submit symptoms for disease prediction

POST /treatment/generate – Generate personalized treatment plan

GET /analytics/view – Retrieve health metrics and visualizations

POST /upload-data – Upload patient health data

8. Authentication

- Token-based authentication (JWT / API Keys)
- OAuth2 with IBM Cloud
- Role-based access (patient, doctor, researcher)
- Secure API credential handling via .env file

9. User Interface

- Sidebar navigation
- Chat interface for Patient Chat
- Symptom input and prediction display
- Treatment recommendation output
- Interactive health dashboard with visualizations

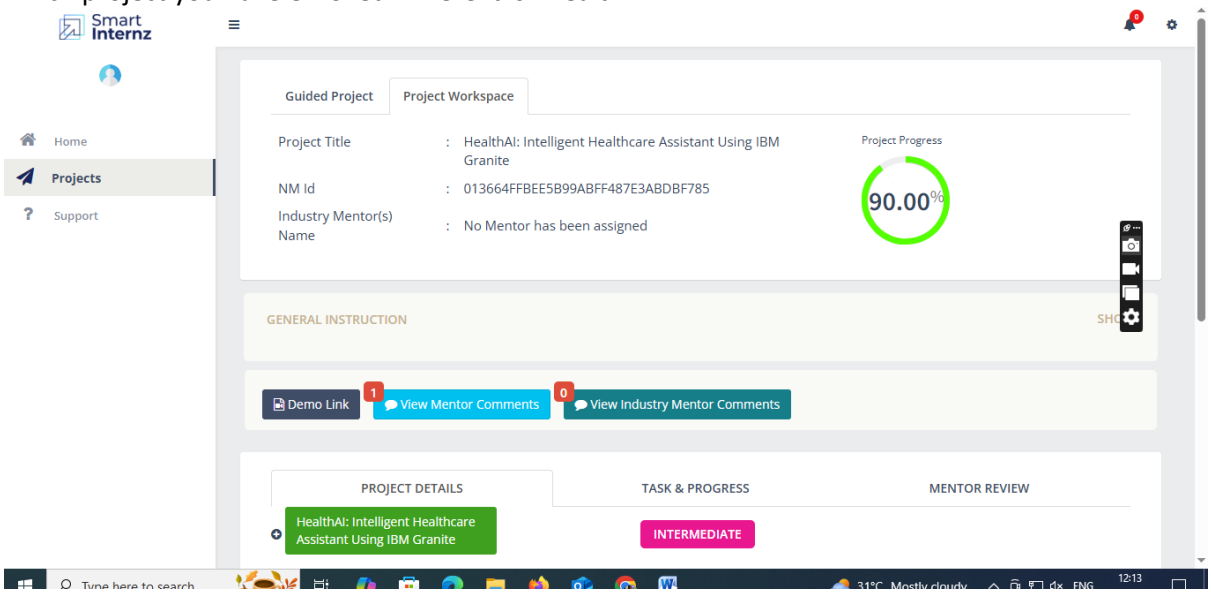
10. Testing

- Unit Testing: For AI prompting and data utilities
- API Testing: Swagger UI and Postman
- Manual Testing: For chat, prediction, and visualization consistency
- Edge Case Handling: Invalid inputs, missing symptoms, large datasets

11. Screenshort

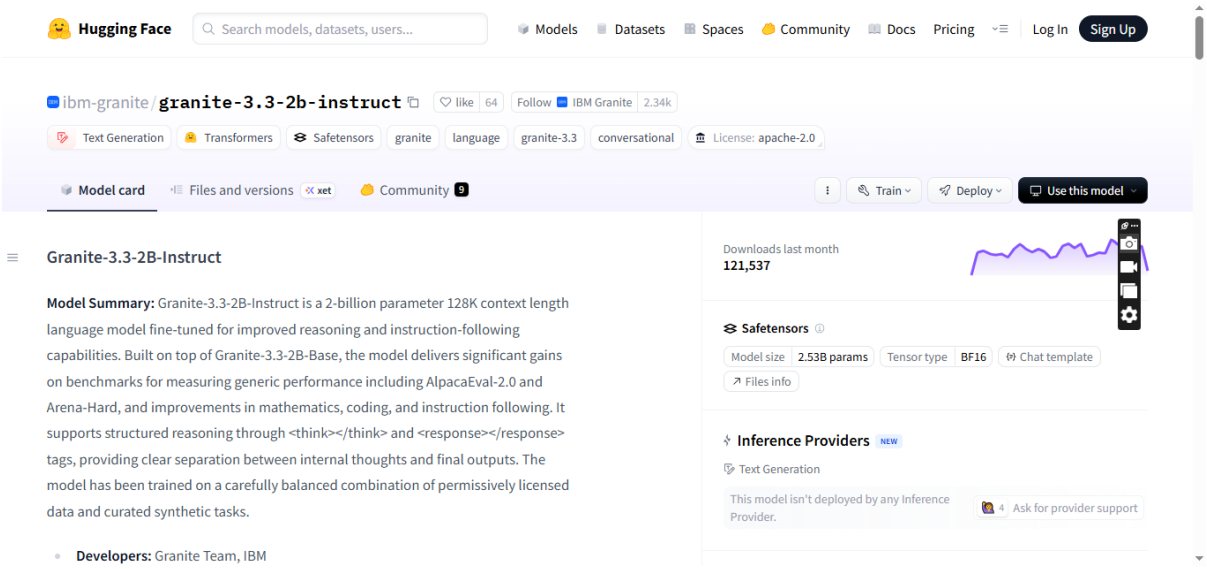
- Then Click (**Naanmudhalvan Smartinternz**) Then login with your details.

- Then you will be redirected to your account then click on “Projects” Section. There you can see which project you have enrolled in here it is “Health AI”.



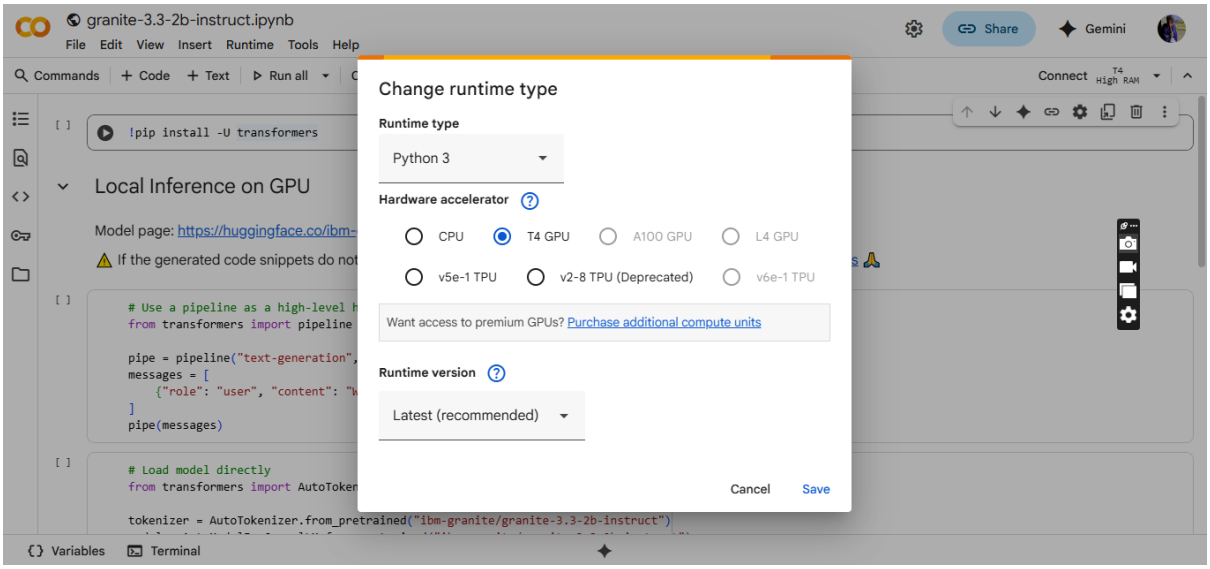
• Click on “Project Workspace”, there you can find your project progress and Place to upload “Demo link”.

IBM Granite model From Hugging Face.

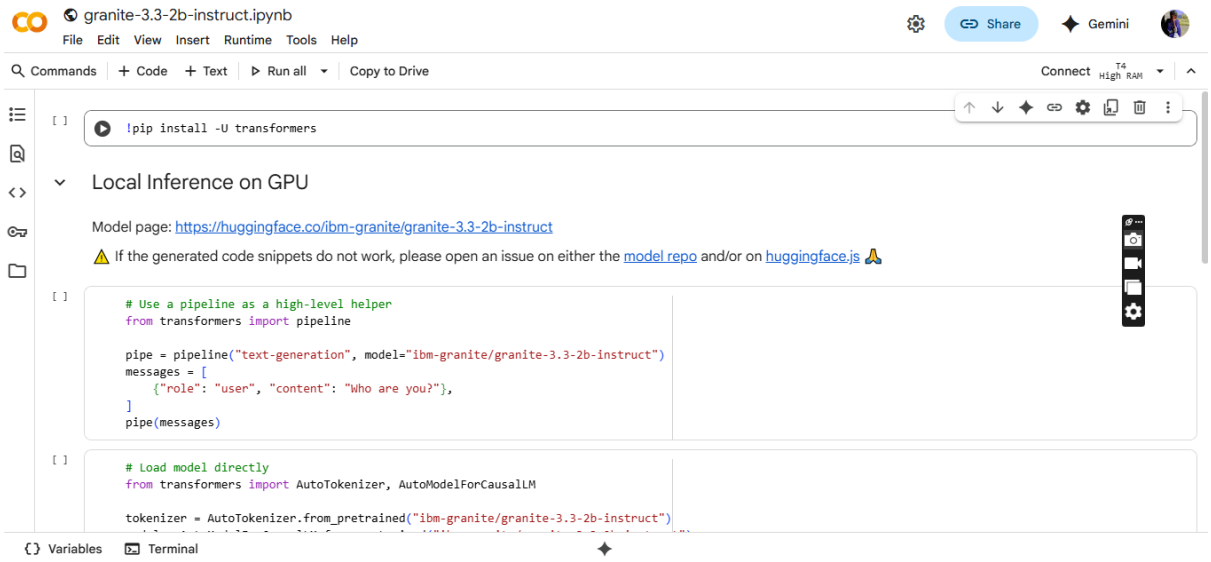


• Then click (Hugging Face), then click on signup and create your own account in Hugging Face. Then search for “IBM-Granite models” and choose any model

• Here for this project we are using “granite-3.2-2b-instruct” which is compatible fast and light weight.

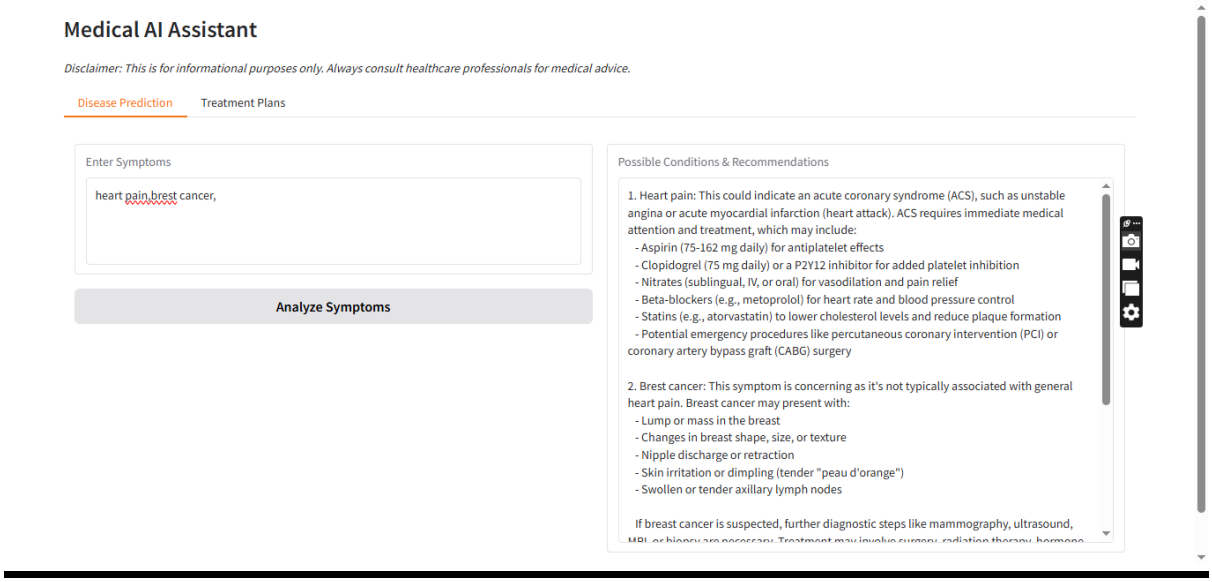


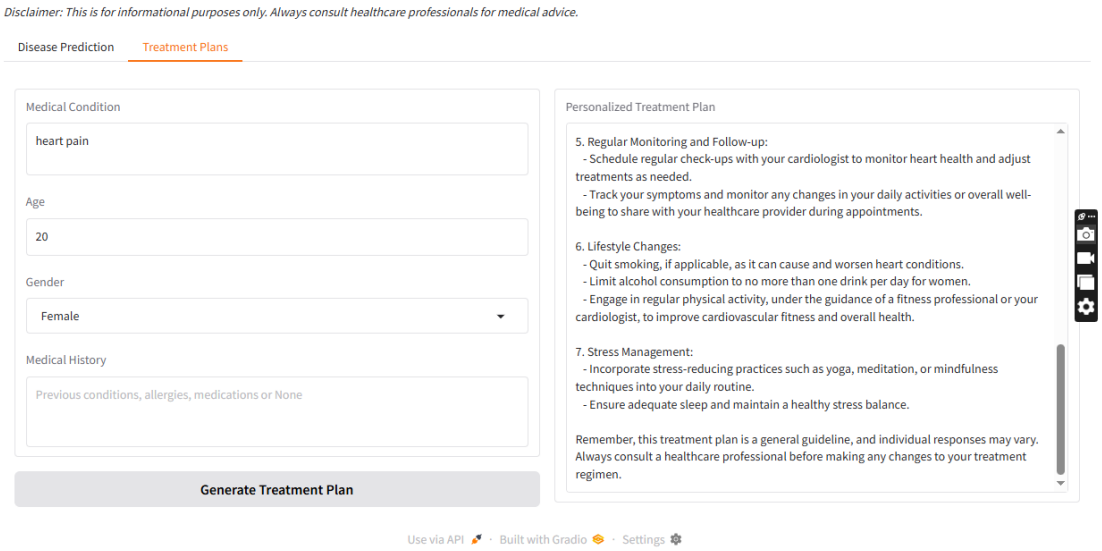
• Choose “T4 GPU” and click on “Save”



- Then run the code in the next cell.

- You can View the Application is running in the other tab.





12. Known Issues

- Limited coverage of rare medical conditions
- Requires stable internet for real-time AI queries
- Dependent on IBM Watson API quota

13. Future Enhancements

- Integration with wearable health devices
- Expanded medical condition coverage
- Doctor-verified treatment plans
- Multi-language support
- Advanced anomaly detection in patient data