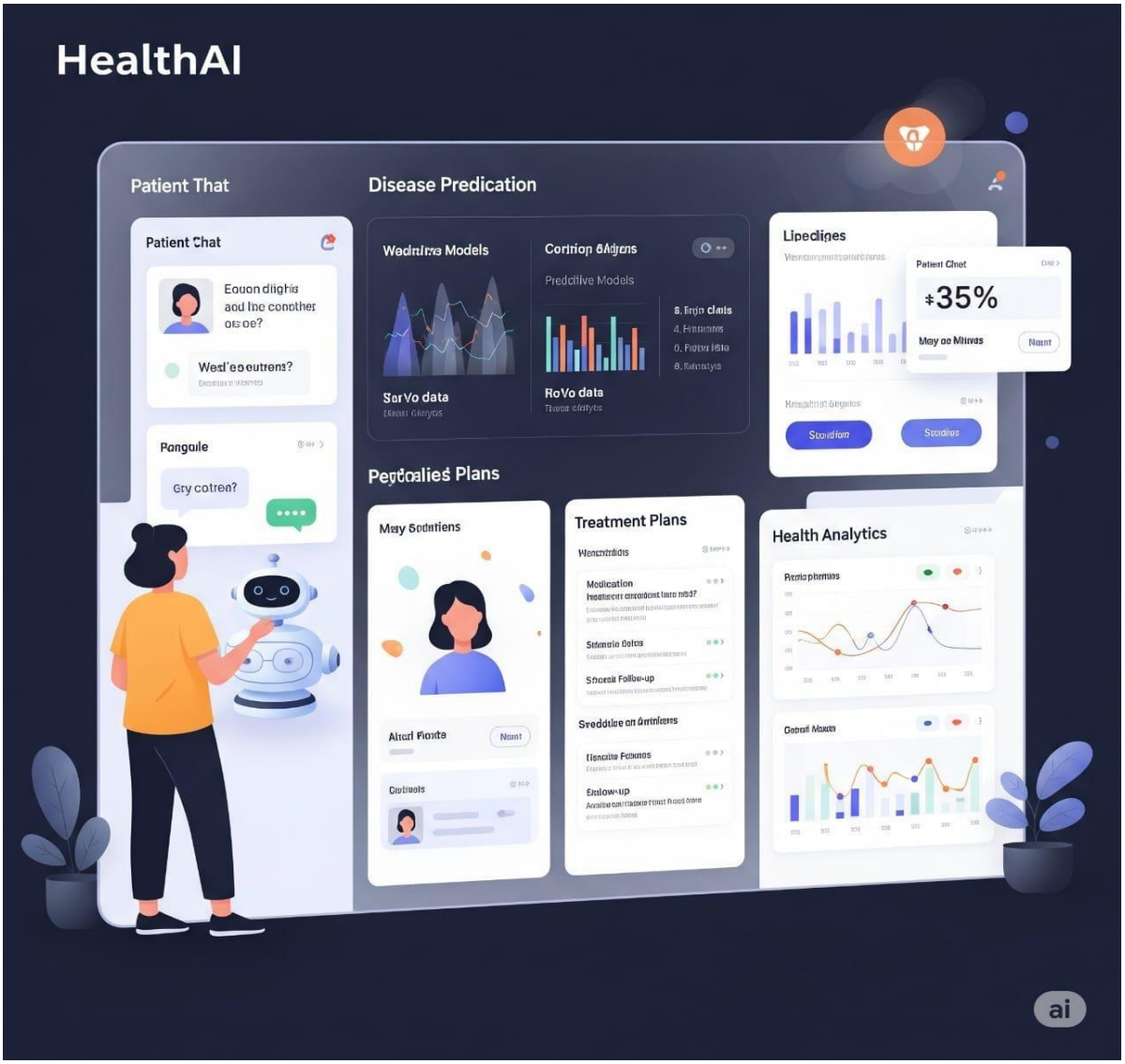
Health AI: Intelligent Healthcare Assistant

Generative AI With IBM



1. Introduction

Project Title: *Health AI: Intelligent Healthcare Assistant Using IBM Granite*
Team Leader : D. Omprakash
Team Member: S. Surya
Team Member: M. Dhanish
Team Member: S. Saravanakumar

- The Medical AI Assistant is designed to bring Artificial Intelligence into healthcare for better accessibility, decision-making, and efficiency.

- Using IBM Granite models,Gradio and PyTorch, this project offers a conversational AI tool for predicting diseases, suggesting treatments, and providing real-time health insights.

2. Project Overview

- The Medical AI Assistant provides intelligent healthcare support with features like disease prediction, treatment planning, and eco-friendly practices.

Purpose:

1. Provide a conversational AI interface for healthcare information.
2. Summarize healthcare policies efficiently.
3. Offer real-time r esource forecasting & anomaly detection.
4. Promote eco-friendly healthcare practices.

Key Features:

- Conversational Interface for medical queries.
- Policy Summarization for healthcare guidelines.
- Resource Forecasting for medicines & staff needs.
- Eco-Tip Generator for sustainable practices.
- Citizen Feedback Loop for continuous improvement.
- KPI Forecasting & Anomaly Detection for hospital data.
- Multimodal Input Support (text, image, voice in future versions).
- Migration from Streamlit to Gradio for better UI/UX.

3. Architecture

Architecture Overview:

- Frontend: Gradio-based UI with multiple tabs for disease prediction & treatment planning.
- Backend: IBM Granite model integrated with PyTorch for inference.
- API Layer: Handles user input, processes via model, returns results.
- Future Support: Multimodal inputs & external APIs for real-time hospital data.

4. Setup Instructions

Prerequisites:

- Python 3.8+
- PyTorch, Transformers, Gradio libraries installed

Installation:

1. Clone the repository.

2. Install dependencies:pip install -r requirements.txt
3. Ensure GPU drivers are properly configured (if available).

5. Folder Structure

```
project-root/
|-- app.py              # Main application code
|-- requirements.txt    # Dependencies
|-- models/             # Model storage (if ofline)
|-- docs/               # Documentation files
|-- tests/              # Testing scripts
```

6. Running the Application

1. Open terminal in project folder.
2. Run:

   ```
   python app.py
   ```

3. Access the Gradio link shown in the terminal.

7. API Documentation

Available Functions:

- disease_prediction(symptoms): Returns possible medical conditions based on symptoms.
- treatment_plan(condition, age, gender, history): Generates a personalized treatment plan.

8. Authentication

- Currently open for demo purposes.
- Future versions will use OAuth2 / JWT for secure authentication & user privacy.

9. User Interface

The UI provides two main tabs:

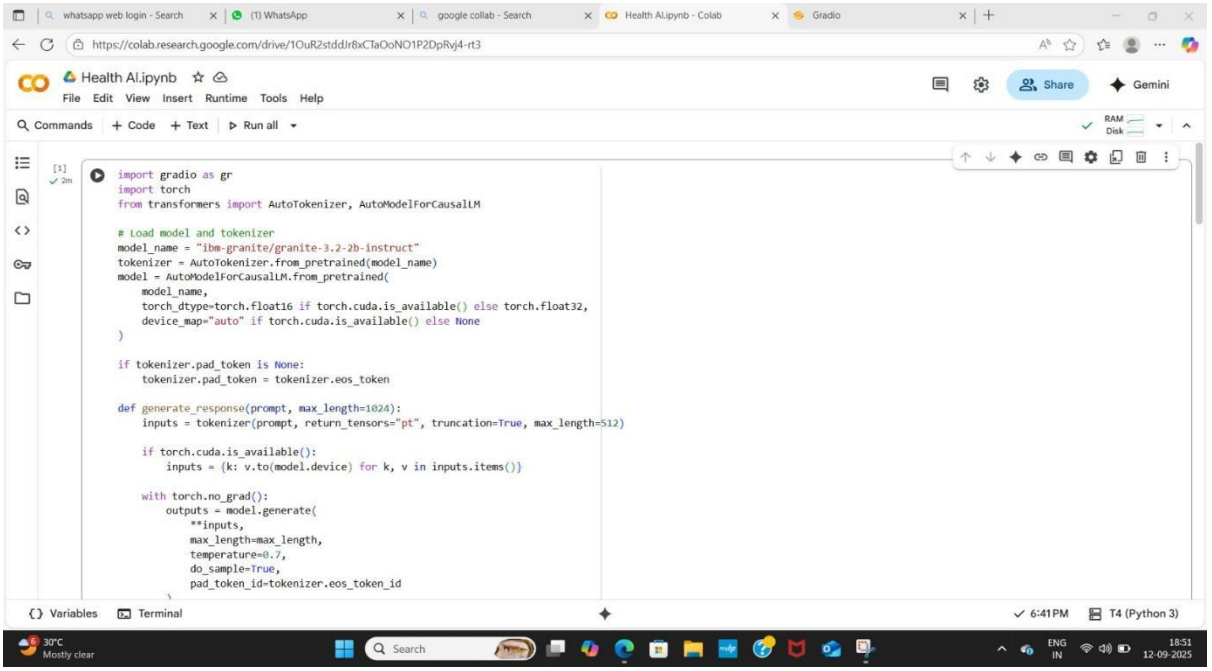
- Disease Prediction Tab: Accepts symptoms and suggests possible conditions.
- Treatment Plan Tab: Accepts patient info and recommends treatments

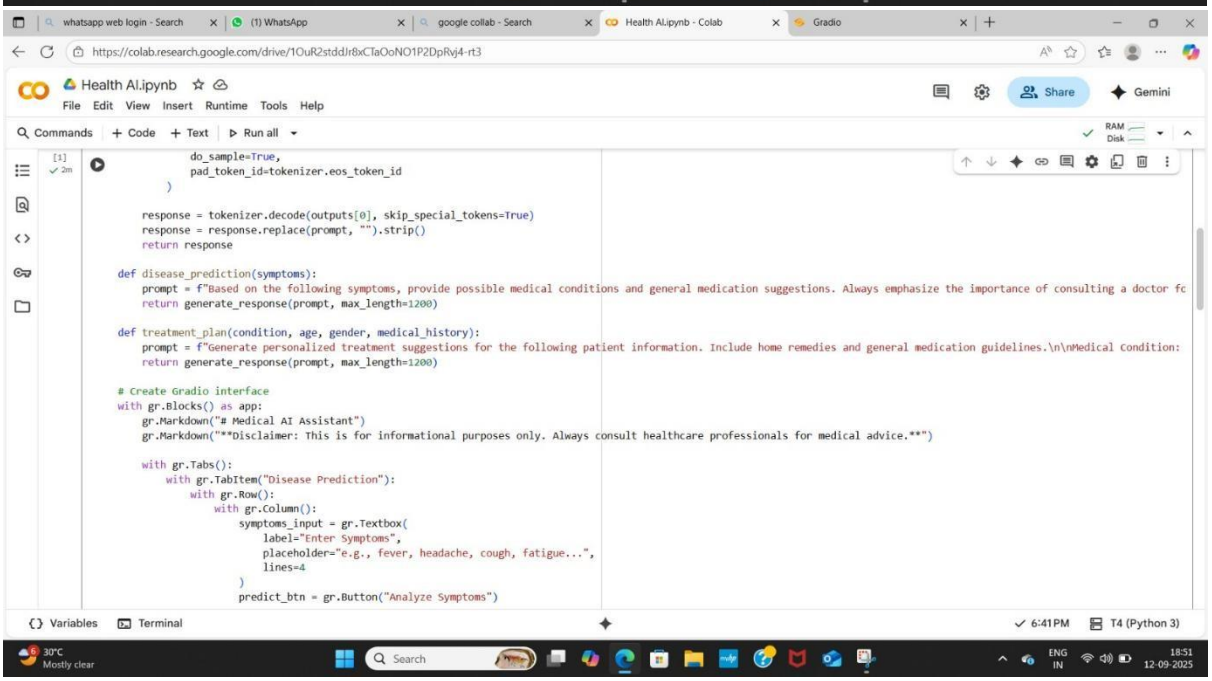
10. Testing

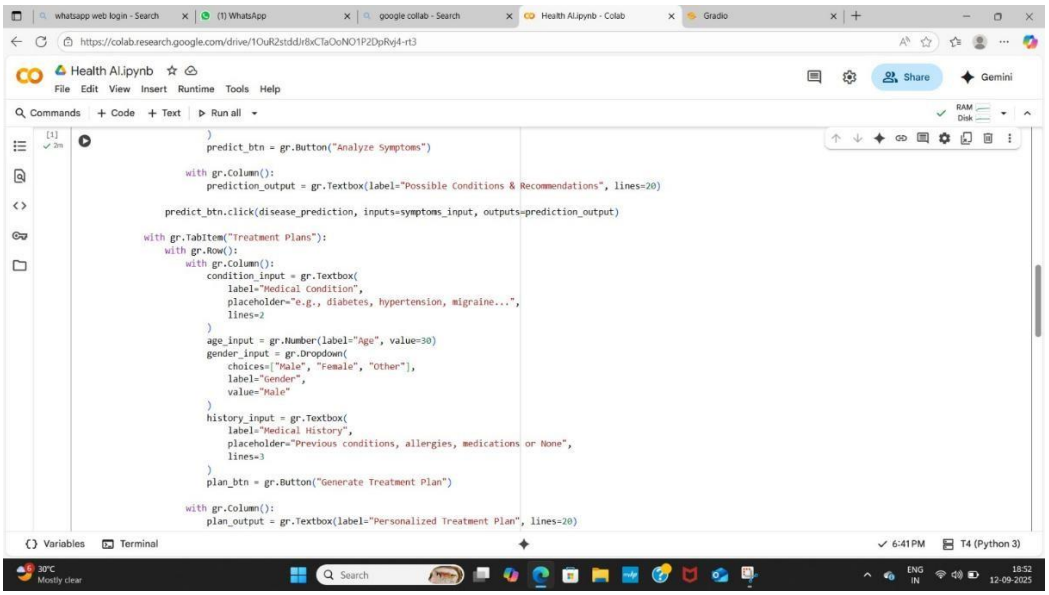
Testing involves:

- Unit tests for model inference.
- Manual testing for Gradio UI functionalities.
- CI/CD pipeline integration (planned for future).

11. Project ScreenShot







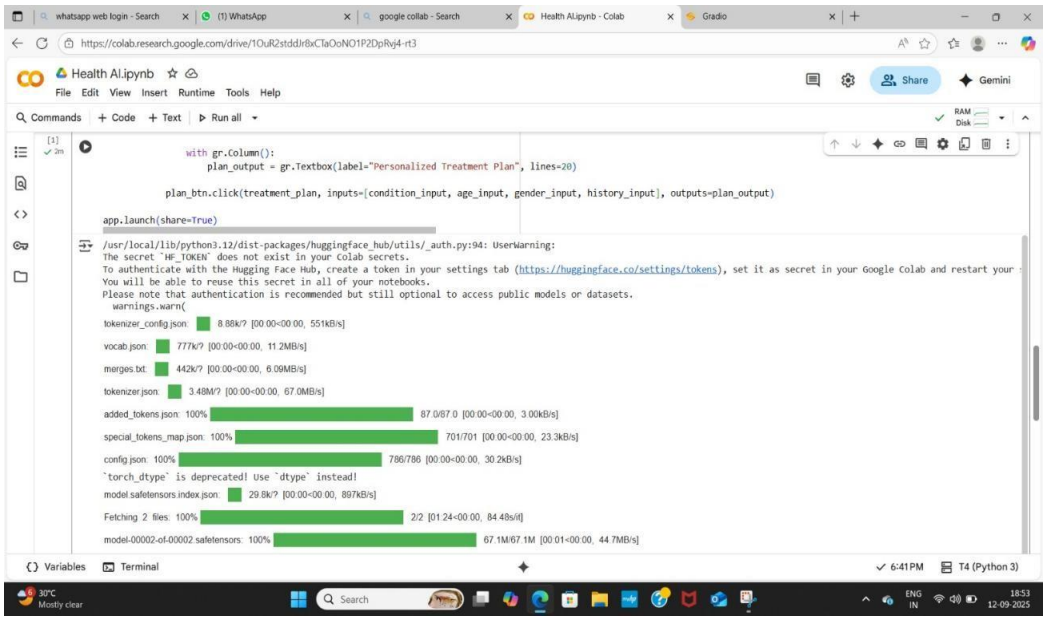
```
                    )
                    predict_btn = gr.Button("Analyze Symptoms")

                with gr.Column():
                    prediction_output = gr.Textbox(label="Possible Conditions & Recommendations", lines=20)

            predict_btn.click(disease_prediction, inputs=symptoms_input, outputs=prediction_output)

        with gr.TabItem("Treatment Plans"):
            with gr.Row():
                with gr.Column():
                    condition_input = gr.Textbox(
                        label="Medical Condition",
                        placeholder="e.g., diabetes, hypertension, migraine...",
                        lines=2
                    )
                    age_input = gr.Number(label="Age", value=30)
                    gender_input = gr.Dropdown(
                        choices=["Male", "Female", "Other"],
                        label="Gender",
                        value="Male"
                    )
                    history_input = gr.Textbox(
                        label="Medical History",
                        placeholder="Previous conditions, allergies, medications or None",
                        lines=3
                    )
                    plan_btn = gr.Button("Generate Treatment Plan")

                with gr.Column():
                    plan_output = gr.Textbox(label="Personalized Treatment Plan", lines=20)
```

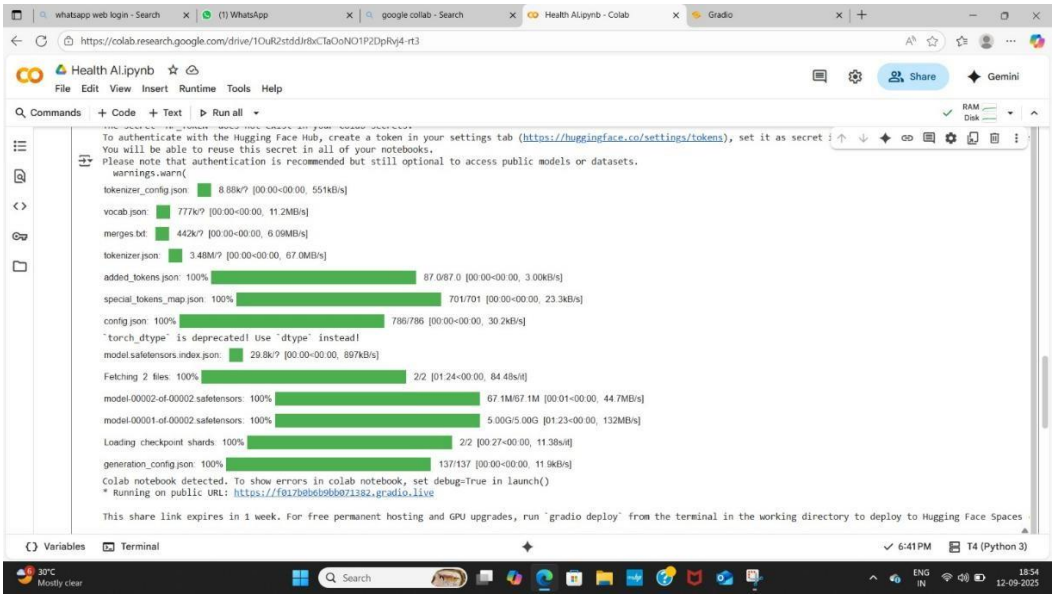


```
                with gr.Column():
                    plan_output = gr.Textbox(label="Personalized Treatment Plan", lines=20)

            plan_btn.click(treatment_plan, inputs=[condition_input, age_input, gender_input, history_input], outputs=plan_output)

app.launch(share=True)
```

```
/usr/local/lib/python3.12/dist-packages/huggingface_hub/utils/_auth.py:94: UserWarning:
The secret `HF_TOKEN` does not exist in your Colab secrets.
To authenticate with the Hugging Face Hub, create a token in your settings tab (https://huggingface.co/settings/tokens), set it as secret in your Google Colab and restart your
You will be able to reuse this secret in all of your notebooks.
Please note that authentication is recommended but still optional to access public models or datasets.
  warnings.warn(
tokenizer_config.json: 8.88k/? [00:00<00:00, 551kB/s]
vocab.json: 777k/? [00:00<00:00, 11.2MB/s]
merges.txt: 442k/? [00:00<00:00, 6.09MB/s]
tokenizer.json: 3.48M/? [00:00<00:00, 67.0MB/s]
added_tokens.json: 100% 87.0/87.0 [00:00<00:00, 3.00kB/s]
special_tokens_map.json: 100% 701/701 [00:00<00:00, 23.3kB/s]
config.json: 100% 786/786 [00:00<00:00, 30.2kB/s]
`torch_dtype` is deprecated! Use `dtype` instead!
model.safetensors.index.json: 29.8k/? [00:00<00:00, 897kB/s]
Fetching 2 files: 100% 2/2 [01:24<00:00, 84.48s/it]
model-00002-of-00002.safetensors: 100% 67.1M/67.1M [00:01<00:00, 44.7MB/s]
```



```
To authenticate with the Hugging Face Hub, create a token in your settings tab (https://huggingface.co/settings/tokens), set it as secret
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added_tokens.json: 100% 87.0/87.0 [00:00<00:00, 3.00kB/s]
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model-00001-of-00002.safetensors: 100% 5.00G/5.00G [01:23<00:00, 132MB/s]
Loading checkpoint shards: 100% 2/2 [00:27<00:00, 11.38s/it]
generation_config.json: 100% 137/137 [00:00<00:00, 11.9kB/s]
Colab notebook detected. To show errors in colab notebook, set debug=True in launch()
* Running on public URL: https://f017b0b6b9bb071382.gradio.live

This share link expires in 1 week. For free permanent hosting and GPU upgrades, run `gradio deploy` from the terminal in the working directory to deploy to Hugging Face Spaces
```

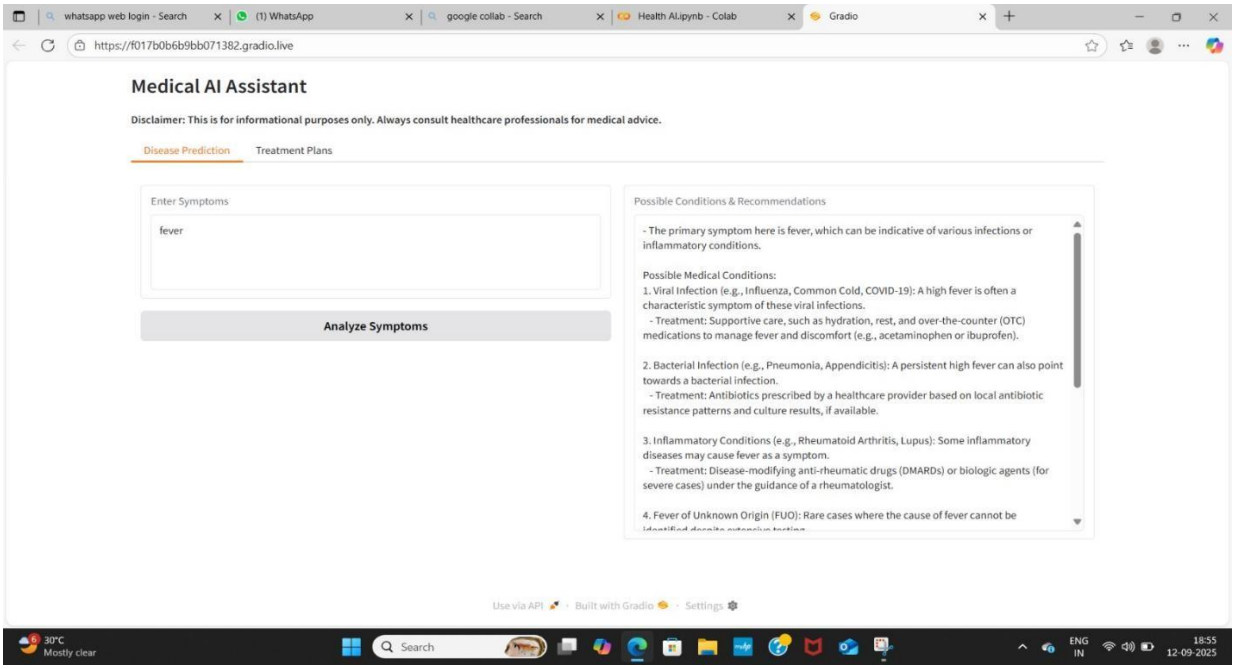
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Medical AI Assistant
Disclaimer: This is for informational purposes only. Always consult healthcare professionals for medical advice.
Disease Prediction
Treatment Plans
Enter Symptoms
fever
Analyze Symptoms
Possible Conditions & Recommendations
- The primary symptom here is fever, which can be indicative of various infections or inflammatory conditions.
Possible Medical Conditions:
1. Viral Infection (e.g., Influenza, Common Cold, COVID-19): A high fever is often a characteristic symptom of these viral infections.
- Treatment: Supportive care, such as hydration, rest, and over-the-counter (OTC) medications to manage fever and discomfort (e.g., acetaminophen or ibuprofen).
2. Bacterial Infection (e.g., Pneumonia, Appendicitis): A persistent high fever can also point towards a bacterial infection.
- Treatment: Antibiotics prescribed by a healthcare provider based on local antibiotic resistance patterns and culture results, if available.
3. Inflammatory Conditions (e.g., Rheumatoid Arthritis, Lupus): Some inflammatory diseases may cause fever as a symptom.
- Treatment: Disease-modifying anti-rheumatic drugs (DMARDs) or biologic agents (for severe cases) under the guidance of a rheumatologist.
4. Fever of Unknown Origin (FUO): Rare cases where the cause of fever cannot be
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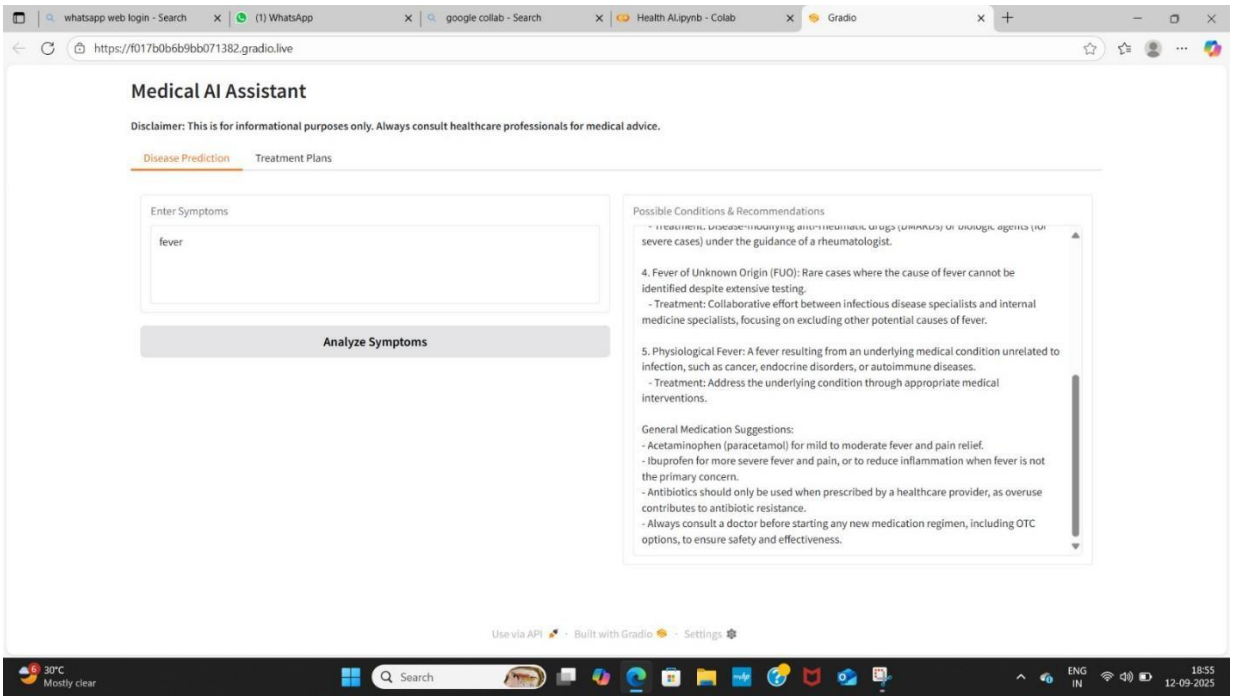
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severe cases) under the guidance of a rheumatologist.
4. Fever of Unknown Origin (FUO): Rare cases where the cause of fever cannot be identified despite extensive testing.
- Treatment: Collaborative effort between infectious disease specialists and internal medicine specialists, focusing on excluding other potential causes of fever.
5. Physiological Fever: A fever resulting from an underlying medical condition unrelated to infection, such as cancer, endocrine disorders, or autoimmune diseases.
- Treatment: Address the underlying condition through appropriate medical interventions.
General Medication Suggestions:
- Acetaminophen (paracetamol) for mild to moderate fever and pain relief.
- Ibuprofen for more severe fever and pain, or to reduce inflammation when fever is not the primary concern.
- Antibiotics should only be used when prescribed by a healthcare provider, as overuse contributes to antibiotic resistance.
- Always consult a doctor before starting any new medication regimen, including OTC options, to ensure safety and effectiveness.
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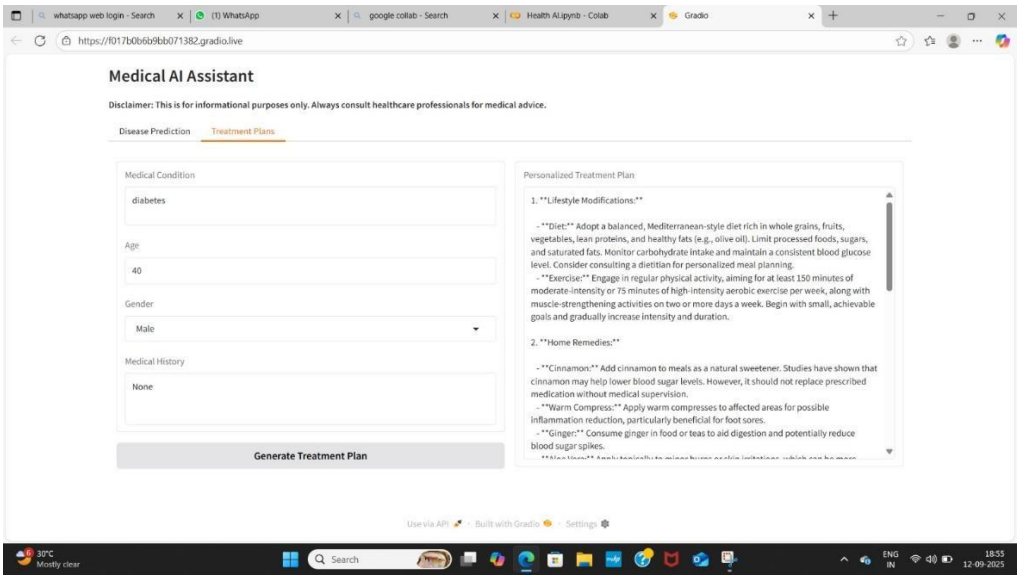
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Medical AI Assistant
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Disease Prediction
Treatment Plans
Medical Condition
diabetes
Age
40
Gender
Male
Medical History
None
Generate Treatment Plan
Personalized Treatment Plan
1. **Lifestyle Modifications:**
- **Diet:** Adopt a balanced, Mediterranean-style diet rich in whole grains, fruits, vegetables, lean proteins, and healthy fats (e.g., olive oil). Limit processed foods, sugars, and saturated fats. Monitor carbohydrate intake and maintain a consistent blood glucose level. Consider consulting a dietitian for personalized meal planning.
- **Exercise:** Engage in regular physical activity, aiming for at least 150 minutes of moderate-intensity or 75 minutes of high-intensity aerobic exercise per week, along with muscle-strengthening activities on two or more days a week. Begin with small, achievable goals and gradually increase intensity and duration.
2. **Home Remedies:**
- **Cinnamon:** Add cinnamon to meals as a natural sweetener. Studies have shown that cinnamon may help lower blood sugar levels. However, it should not replace prescribed medication without medical supervision.
- **Warm Compress:** Apply warm compresses to affected areas for possible inflammation reduction, particularly beneficial for foot sores.
- **Ginger:** Consume ginger in food or teas to aid digestion and potentially reduce blood sugar spikes.
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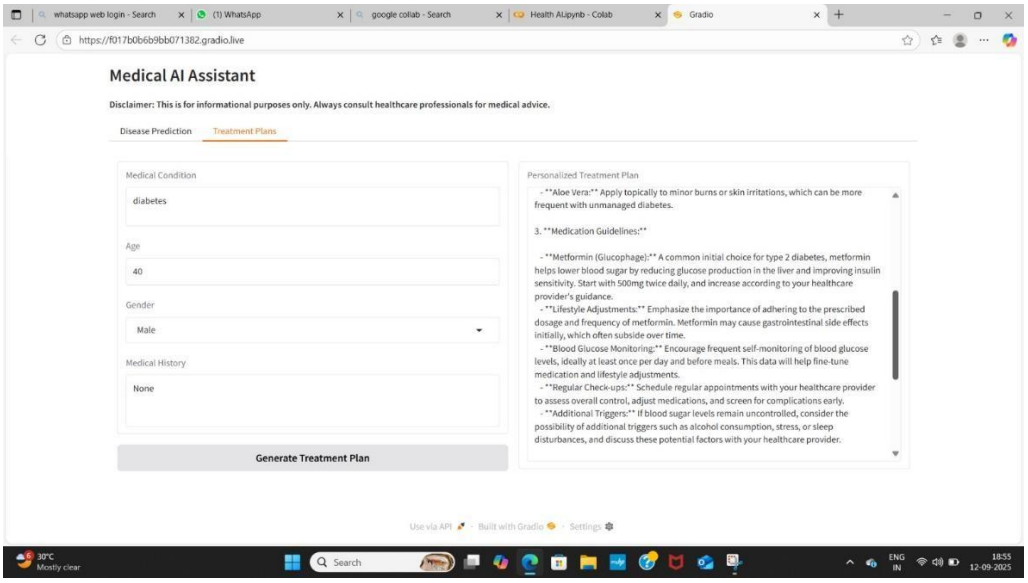
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Disease Prediction
Treatment Plans
Medical Condition
diabetes
Age
40
Gender
Male
Medical History
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Generate Treatment Plan
Personalized Treatment Plan
- **Aloe Vera:** Apply topically to minor burns or skin irritations, which can be more frequent with unmanaged diabetes.
3. **Medication Guidelines:**
- **Metformin (Glucophage):** A common initial choice for type 2 diabetes, metformin helps lower blood sugar by reducing glucose production in the liver and improving insulin sensitivity. Start with 500mg twice daily, and increase according to your healthcare provider's guidance.
- **Lifestyle Adjustments:** Emphasize the importance of adhering to the prescribed dosage and frequency of metformin. Metformin may cause gastrointestinal side effects initially, which often subside over time.
- **Blood Glucose Monitoring:** Encourage frequent self-monitoring of blood glucose levels, ideally at least once per day and before meals. This data will help fine-tune medication and lifestyle adjustments.
- **Regular Check-ups:** Schedule regular appointments with your healthcare provider to assess overall control, adjust medications, and screen for complications early.
- **Additional Triggers:** If blood sugar levels remain uncontrolled, consider the possibility of additional triggers such as alcohol consumption, stress, or sleep disturbances, and discuss these potential factors with your healthcare provider.
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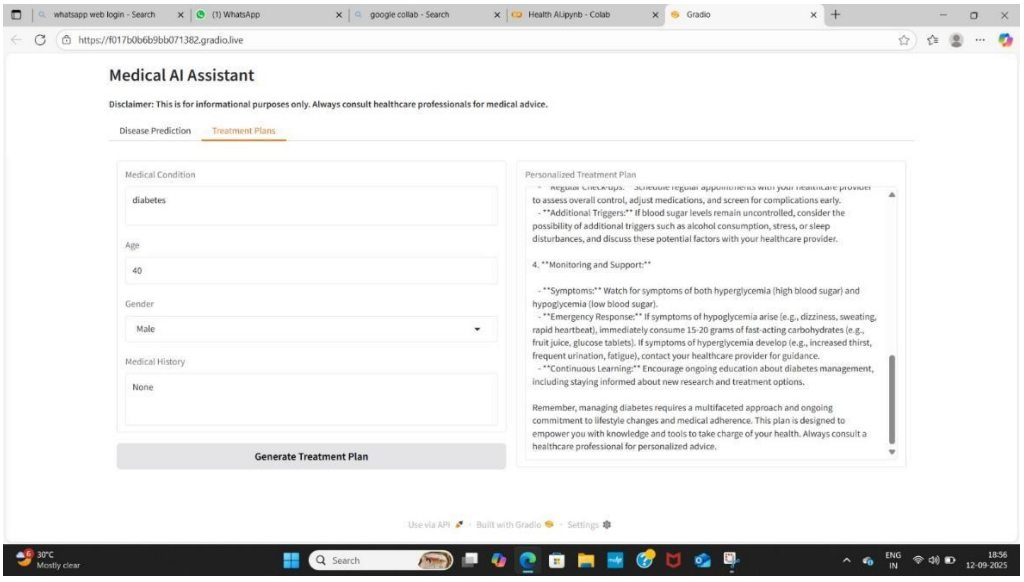
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Treatment Plans
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diabetes
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to assess overall control, adjust medications, and screen for complications early.
- **Additional Triggers:** If blood sugar levels remain uncontrolled, consider the possibility of additional triggers such as alcohol consumption, stress, or sleep disturbances, and discuss these potential factors with your healthcare provider.
4. **Monitoring and Support:**
- **Symptoms:** Watch for symptoms of both hyperglycemia (high blood sugar) and hypoglycemia (low blood sugar).
- **Emergency Response:** If symptoms of hypoglycemia arise (e.g., dizziness, sweating, rapid heartbeat), immediately consume 15-20 grams of fast-acting carbohydrates (e.g., fruit juice, glucose tablets). If symptoms of hyperglycemia develop (e.g., increased thirst, frequent urination, fatigue), contact your healthcare provider for guidance.
- **Continuous Learning:** Encourage ongoing education about diabetes management, including staying informed about new research and treatment options.
Remember, managing diabetes requires a multifaceted approach and ongoing commitment to lifestyle changes and medical adherence. This plan is designed to empower you with knowledge and tools to take charge of your health. Always consult a healthcare professional for personalized advice.
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12. Known Issues

- Model inference can be slow on CPU.
- Limited to text input in the current version.
- No authentication in the demo version.

13. Future Enhancements

Planned improvements:

- Multimodal support (text + images + voice)
- Real-time hospital API integration.
- Secure user authentication.
- Cloud deployment for scalability.
- Mobile-friendly UI version.