

# Medical AI Assistant

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## 1. Introduction

**Project Title: Medical AI Assistant**

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## 2. Project Overview

- Purpose:

The Medical AI Assistant is designed to serve as an accessible healthcare information support tool. It leverages natural language processing (NLP) and large language models to deliver accurate, concise, and user-friendly responses to health-related queries. It empowers users to understand their symptoms, receive health tips, and gather insights into possible conditions and medications while ensuring that users are reminded that professional consultation is mandatory.

- Features:

- Conversational Interface: Natural language chat with the AI model.
- Disease Prediction: Predicts possible medical conditions based on symptoms.
- Treatment Plans: Suggests home remedies and general medication guidelines.
- Health Tips: Provides 5 actionable tips for a selected topic.
- Medication Information: Details about usage, side effects, and precautions.
- Authentication System: Login/Logout mechanism for controlled access.
- Gradio Web UI: Simple and responsive user interface with multiple tabs.

### 3. Architecture

Frontend (Gradio):

The frontend is implemented using Gradio Blocks, Tabs, Rows, and Columns. It provides a modern, user-friendly interface with distinct sections for login, disease prediction, treatment plans, health tips, and medication information. It also supports a clean layout with markdown headers, textboxes, dropdowns, and buttons.

Backend (Transformers + PyTorch):

The backend integrates Hugging Face's Transformers library along with PyTorch. The IBM Granite LLM is used for conversational AI, capable of understanding natural language queries and generating human-like responses.

Authentication:

A basic authentication system is implemented where users must log in using predefined credentials (user/password). Once authenticated, the user is redirected to the main application. Logout resets the session.

### 4. Setup Instructions

Prerequisites:

- Python 3.9 or higher
- pip installed
- Installed libraries: gradio, torch, transformers
- Internet access to download models

Installation Process:

- Clone or download the project repository.
- Run ``pip install -r requirements.txt`` to install dependencies.
- Start the application using ``python app.py``.
- Access the Gradio interface via localhost or the shareable link.

### 5. Folder Structure

medical\_ai\_assistant/

```
├── app.py          # Main Gradio application
├── requirements.txt # Required dependencies
└── README.md       # Project documentation
```

## 6. Running the Application

- Run the script using ``python app.py``.
- Use demo credentials (Username: user, Password: password).
- Explore functionalities:
  - \* Enter symptoms for disease prediction.
  - \* Provide condition, age, gender, and history for a treatment plan.
  - \* Enter a health topic to get 5 practical tips.
  - \* Search for information about medications.

## 7. Authentication

The application uses a very simple authentication method for demonstration:

- Username: user
- Password: password

Once logged in, the user can access all features of the app. The logout button ends the session and redirects back to the login page.

## 8. User Interface

The UI is divided into sections:

- Login Page: Provides username and password fields.
- Disease Prediction Tab: Input symptoms and view possible conditions.
- Treatment Plans Tab: Input medical details to generate a treatment plan.
- Health Tips Tab: Input topic and get useful tips.
- Medication Information Tab: Input medicine name and get details.

Each output is displayed in a text area for easy readability.

## 9. Testing

Testing was carried out in different scenarios:

- Entering valid and invalid login credentials.
- Providing different sets of symptoms to test disease prediction.
- Inputting different conditions and ages for treatment plan outputs.
- Asking for health tips on diet, exercise, and stress management.

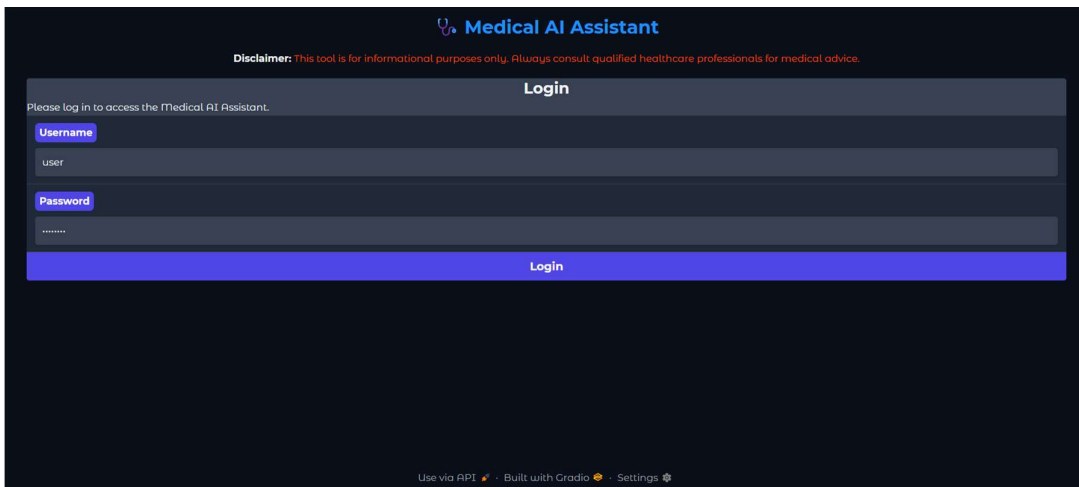
- Searching medication info for Paracetamol, Ibuprofen, and antibiotics.
- Verifying logout functionality returns to login page.

## 10. Future Enhancements

- Enhanced authentication (JWT, OAuth).
- Secure storage of user health history.
- Integration with official medical databases.
- Multi-language support for accessibility.
- Voice-based interaction for hands-free use.
- Deployment on cloud with scalability (Docker/Kubernetes).

## 11. Screenshots

Login screen:



The screenshot displays the login interface for the 'Medical AI Assistant'. At the top, the title 'Medical AI Assistant' is shown in blue, accompanied by a stethoscope icon. Below this, a red disclaimer states: 'Disclaimer: This tool is for informational purposes only. Always consult qualified healthcare professionals for medical advice.' The main login area is a dark grey box with the heading 'Login' and the instruction 'Please log in to access the Medical AI Assistant.' It contains two input fields: 'Username' with the value 'user' and 'Password' with masked characters. A blue 'Login' button is positioned at the bottom of the form. The footer of the page includes links for 'Use via API', 'Built with Cradio', and 'Settings'.

Disease Prediction:

Medical AI Assistant

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

Welcome, user!

Disease Prediction

Treatment Plans

Health Tips

Medication Information

Logout

Analyze your symptoms to get possible conditions and recommendations.

Enter Symptoms

fever, headache, fatigue

Analyze Symptoms

Possible Conditions & Recommendations

5. Autoimmune disorders (e.g., lupus): Can present with persistent fever, headache, and fatigue. Disease-modifying therapies (e.g., hydroxychloroquine) may be prescribed to manage symptoms.

6. Chronic fatigue syndrome (CFS): Characterized by extreme fatigue not alleviated by rest. Treatment is symptom-focused, often involving lifestyle modifications, cognitive-behavioral therapy, and, in some cases, medications to manage specific symptoms.

7. Dehydration: Caused by excessive sweating, urination, or diarrhea. Treatment involves rehydrating with oral fluids or intravenous solutions.

General medication suggestions:

- Analgesics (acetaminophen or ibuprofen) for moderate to severe headaches.
- Antipyridics (e.g., chlorpheniramine or diphenhydramine) for non-sedating antihistamine effects, which may help with headache or anxiety.
- Anti-inflammatory drugs (e.g., naproxen or meloxicam) for managing fever and inflammation.
- Rest and hydration to support overall recovery.
- Over-the-counter cold and flu remedies (e.g., throat lozenges, decongestants) for symptomatic relief.
- For bacterial meningitis or suspected meningitis, immediate administration of antibiotics as prescribed by a doctor.

Remember, it's crucial to consult a doctor for a proper diagnosis and tailored treatment plan based on individual symptoms, medical history, and other relevant factors. Misdiagnosis or inappropriate treatment can lead to complications or worsening of health conditions.

Treatment Plans:

Medical AI Assistant

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Welcome, user!

Disease Prediction

Treatment Plans

Health Tips

Medication Information

Logout

Get personalized treatment suggestions based on your condition.

Medical Condition

diabetes

Age

30

Gender

Male

Medical History

None

Generate Treatment Plan

Personalized Treatment Plan

4. General Prevention Tips:

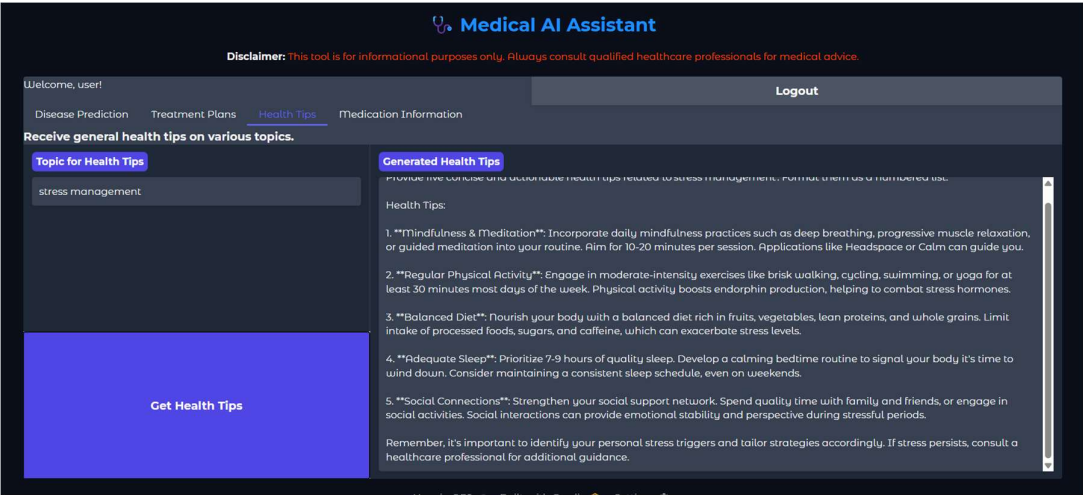
- Regular Screenings: Encourage routine diabetes screenings every 3 years for asymptomatic individuals without risk factors, as recommended by the American Diabetes Association.
- Avoid Smoking: Smoking cessation is crucial for overall health, especially for those with diabetes.
- Limit Alcohol Consumption: Excessive alcohol intake can exacerbate insulin resistance and negatively impact blood glucose control.

5. Education and Support:

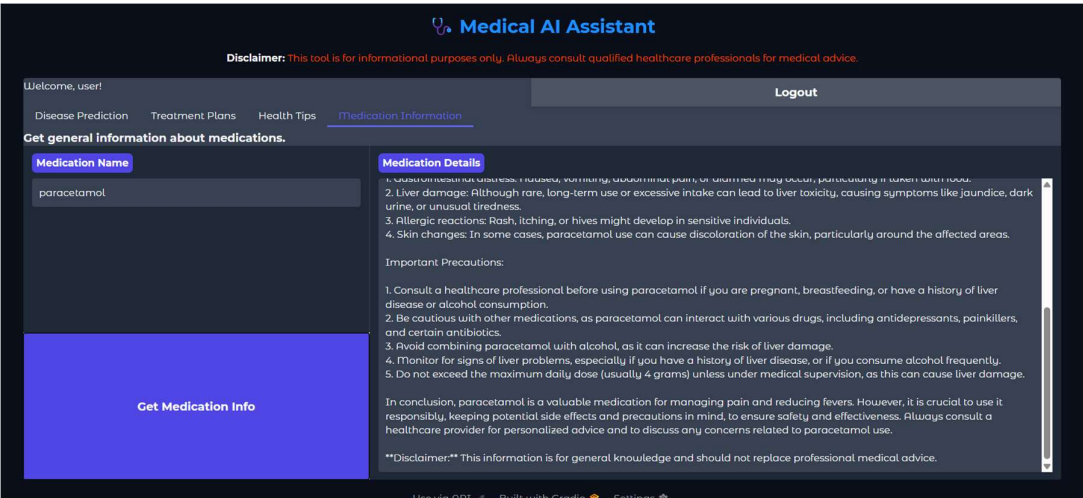
- Provide written materials and resources on diabetes management, emphasizing the importance of adherence to medication and lifestyle recommendations.
- Consider referring the patient to a diabetes educator or support group to enhance understanding and empower self-management.

By following this personalized treatment plan, the patient can effectively manage his diabetes through a combination of lifestyle changes, medication, and potentially helpful home remedies. Always consult a healthcare professional for advice tailored to an individual's unique situation.

Health Tips:



Medication Information:



## **12. Known Issues**

- Model response may vary due to randomness in text generation.
- Login credentials are hardcoded (not secure).
- No database integration; all data is session-based.
- Cannot replace professional medical advice.

## **13. Conclusion**

The Medical AI Assistant demonstrates how large language models can be applied to healthcare information systems. It shows how AI can support patients and general users by offering quick access to medical knowledge. With future improvements, it has the potential to become a robust tool for health awareness and patient engagement.