■ Project Documentation: Medical AI

Project Title

Medical AI

Team Details

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1. Objective

The aim of the Medical AI project is to develop an intelligent, interactive, and informative web application that assists users in predicting possible diseases based on symptoms and suggests general treatment plans. This AI-driven system provides informational support and emphasizes that users should consult healthcare professionals for accurate diagnosis and treatment.

2. Technologies Used

Programming Language: Python

Libraries & Frameworks:
- Gradio (for frontend interface)
- Transformers (from Hugging Face)
- PyTorch (for model execution)

Model Used:
- ibm-granite/granite-3.2-2b-instruct – A pre-trained LLM designed for instruction-based tasks.

3. Project Overview

The Medical AI system is a web-based application built using Gradio. It integrates a powerful language model to:
1. Predict possible medical conditions based on the symptoms entered.
2. Generate personalized treatment plans by taking into account the user's age, gender, and medicalhistory.

The model does not replace medical advice, but serves as a first-level informational assistant.

4. Functionalities

■ Disease Prediction

Input: Symptoms entered by the user (e.g., fever, cough, headache).
Output:
- A list of possible medical conditions.
- General medication suggestions.
- Home remedy recommendations.
- Reminder disclaimer to consult a professional.

■ Treatment Plan Generation

Input:

- Medical condition
- Age
- Gender
- Medical history

Output:
- Personalized treatment suggestions.
- Basic home remedies.- Medication guidelines.
- Informational disclaimer.

5. System Architecture

[User Input] → [Gradio Frontend] → [LLM Prompt Generation] → [HuggingFace Transformers Model] → [Model Response] → [Gradio Output Display]

- The frontend collects user input via Gradio.
- Prompts are formatted based on the user's inputs.
- Prompts are passed to the IBM Granite LLM, which runs using HuggingFace Transformers.
- The response is decoded and presented in a user-friendly textbox.

6. Model Details

Model Name: ibm-granite/granite-3.2-2b-instruct
Type: Causal Language Model (AutoModelForCausalLM)
Tokenizer: AutoTokenizer from Hugging Face
Precision: FP16 (if CUDA available), otherwise FP32
Device Mapping: Automatic for GPU if available

7. User Interface Design

Built using Gradio Blocks, the application features:
- A clear header with disclaimers for ethical usage.
- Two separate tabs:
1. Disease Prediction Tab
2. Treatment Plan Tab
- Responsive design for desktops and mobile browsers.

8. Code Explanation

■ **Model Loading** model_name = "ibm-granite/granite-3.2-2b-instruct" tokenizer = AutoTokenizer.from_pretrained(model_name)
model = AutoModelForCausalLM.from_pretrained(model_name, ...)
Loads the IBM Granite model for generating responses.

■ **Generation Function** def generate_response(prompt, max_length=1024): ...
Takes prompt input, tokenizes, passes to model, and decodes the output.

■ **Disease Prediction Function** def disease_prediction(symptoms): ...
Formats prompt using symptoms and calls generate_response.

■ **Treatment Plan Function**
def treatment_plan(condition, age, gender, medical_history): ...

Formats prompt using personal and condition data, returns treatment plan.

■ **Gradio UI Setup**
with gr.Blocks() as app: ...
Designs the layout using Gradio tabs, buttons, textboxes, and interactivity.

9. Deployment

The app is hosted using Gradio Live Share.

Live Link: https://colab.research.google.com/drive/1Qj_FBDsJKRB9EiR-PS8npYGhR600qtZX

10. Limitations

- Not a substitute for medical diagnosis.
- Depends on internet and cloud model availability.
- Model may hallucinate — always shows a medical disclaimer.

11. Future Improvements

- Integration with real medical databases (like WHO or Mayo Clinic).
- Language support for regional languages.
- Voice input capability.
- Detailed prescription breakdown (upon validation with medical authorities).

12. Screenshots

(Include screenshots of both tabs: Disease Prediction and Treatment Plan, from your live app.)

13. References

- HuggingFace Transformers Documentation
- Gradio Documentation
- IBM Granite Model on HuggingFace

14. Disclaimer

This application is for informational and educational purposes only. It is not a certified medical tool and must not be used to replace professional healthcare advice. Always consult with a licensed medical practitioner.