HEALTHAI: INTELLIGENT HEALTHCARE ASSISTANT

PROJECT TEAM

- **Team ID:** NM2025TMID03856
- **Team Size:** 4
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1. PROJECT OVERVIEW

HealthAI is an innovative AI-powered web application designed to serve as a personal healthcare companion. Developed using Python and leveraging the robust capabilities of the IBM Granite-3.2-2B-Instruct Large Language Model (LLM), the project utilizes Gradio for its user-friendly web interface. HealthAI aims to provide users with accessible healthcare information, assist in understanding potential health conditions, and offer insights into health data analysis.

2. PROJECT DESCRIPTION

At its core, HealthAI harnesses the power of IBM's Granite LLM to offer a conversational AI experience for healthcare-related queries. Users can interact with the assistant to ask questions, explore symptoms to identify possible conditions, generate informational treatment plans, and analyze synthetic health data. The application is built with a strong emphasis on responsible AI principles, ensuring user safety and data privacy.

⚠️ **Disclaimer:** This application is a prototype and is not a substitute for professional medical advice, diagnosis, or treatment. Always seek the advice of your physician or other qualified health provider with any questions you may have regarding a medical condition.

3. USER INTERFACE (UI) AND WORKFLOW

The HealthAI application features an intuitive interface designed for ease of use:

- **Patient Profile:** Users can input and manage their personal health information, including Name, Age, Gender, Medical History, Current Medications, and Allergies. This information aids in personalizing the AI's responses.
- **Core Modules:** The application is organized into distinct modules accessible via tabs:
  - 💬 **Patient Chat:** A conversational interface for users to interact with the AI, ask health-related questions, and receive responses.
  - 🔍 **Disease Prediction:** Allows users to input symptoms and receive an AI-generated analysis of potential conditions.
  - 📋 **Treatment Plans:** Enables the generation of personalized, informational treatment plans based on diagnosed conditions.
  - 📊 **Health Analytics:** Provides a dashboard to visualize and analyze key health metrics over time, offering AI-driven insights.
- **Health Metrics Dashboard:** Displays synthetic data for Heart Rate, Blood Pressure, and Blood Glucose, presented with trend analysis and AI-generated insights into the user's health status.

4. TECHNICAL ARCHITECTURE

The technical foundation of HealthAI is built upon a modern stack:

- **Frontend:** Developed using Gradio Blocks API, with custom CSS for styling, ensuring a responsive and visually appealing user experience.
- **Backend:** Powered by Hugging Face Transformers, integrating the `ibm-granite/granite-3.2-2b-instruct` model for natural language processing and response generation.
- **Data Processing & Visualization:** Libraries such as `pandas` and `numpy` are used for data manipulation, while `plotly.express` facilitates the creation of insightful visualizations.
- **State Management & Caching:** Gradio's state management is employed for maintaining user session data, and in-memory hash caching is utilized for performance optimization.

5. SAFETY & COMPLIANCE MEASURES

Safety and responsible AI practices are paramount in HealthAI:

- **Emergency Keyword Detection:** The system is designed to identify and flag critical health terms (e.g., 'chest pain', 'suicide') to prompt users to seek professional medical help immediately.
- **PII Filtering:** Robust mechanisms are in place to detect and filter Personally Identifiable Information (PII) such as phone numbers, emails, and identification numbers from user inputs.
- **Clear Disclaimers:** All AI-generated outputs are accompanied by clear disclaimers emphasizing that the information is for educational purposes only and not a substitute for professional medical advice.
- **Structured JSON Outputs:** Responses are formatted in JSON to ensure consistency and safe, predictable handling of information.

6. HOW TO RUN THE APPLICATION

Prerequisites

- Python version 3.9 or higher
- pip package installer

Installation Steps

1. Clone the repository: `git clone https://github.com/yourusername/healthai.git`
2. Navigate to the project directory: `cd healthai`
3. Install the required dependencies: `pip install -r requirements.txt`

Running the Application

- Execute the main script: `python healthai_app.py`
- Access the application via your web browser at: `http://127.0.0.1:7860/`

7. PLATFORM AVAILABILITY

HealthAI is designed for flexibility and scalability:

- **Local Deployment:** Easily run on personal computers and laptops.
- **Web Hosting:** Deployable on cloud platforms like Hugging Face Spaces, AWS, and Azure for broader accessibility.
- **Docker Containerization:** Supports containerization for streamlined deployment and scaling.
- **API Integration:** The application can be integrated with other systems via REST endpoints.

8. POTENTIAL USE CASES

The HealthAI application has a wide range of potential applications:

- **Patient and Family Health Companion:** Empowering individuals to manage their health proactively.
- **Hospital Prototype:** Serving as a secure and informative AI assistant for healthcare providers.
- **Research Tool:** A valuable resource for developers and researchers exploring LLM applications in healthcare.
- **Educational Aid:** A supplementary learning tool for students and medical professionals.

9. LIMITATIONS

While HealthAI offers significant capabilities, it's important to note its current limitations:

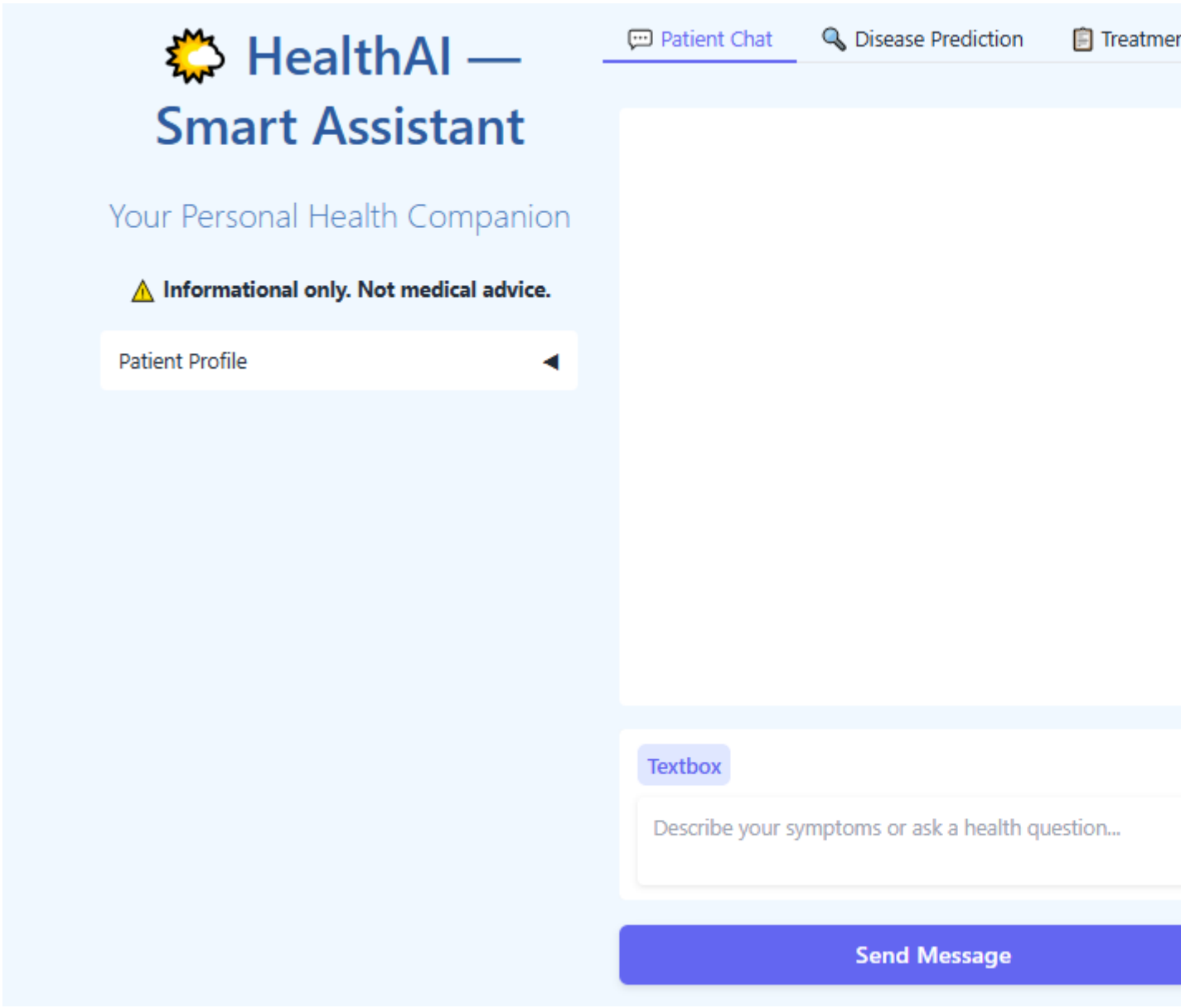
- **Synthetic Data Only:** The application currently processes only synthetic health data, not real patient information.
- **Informational Purpose:** All outputs are strictly for informational and educational purposes and do not constitute medical diagnosis.
- **No Clinical Certification:** The prototype is not certified for clinical deployment and should not be used in direct patient care settings without further validation and regulatory approval.

10. CONCLUSION

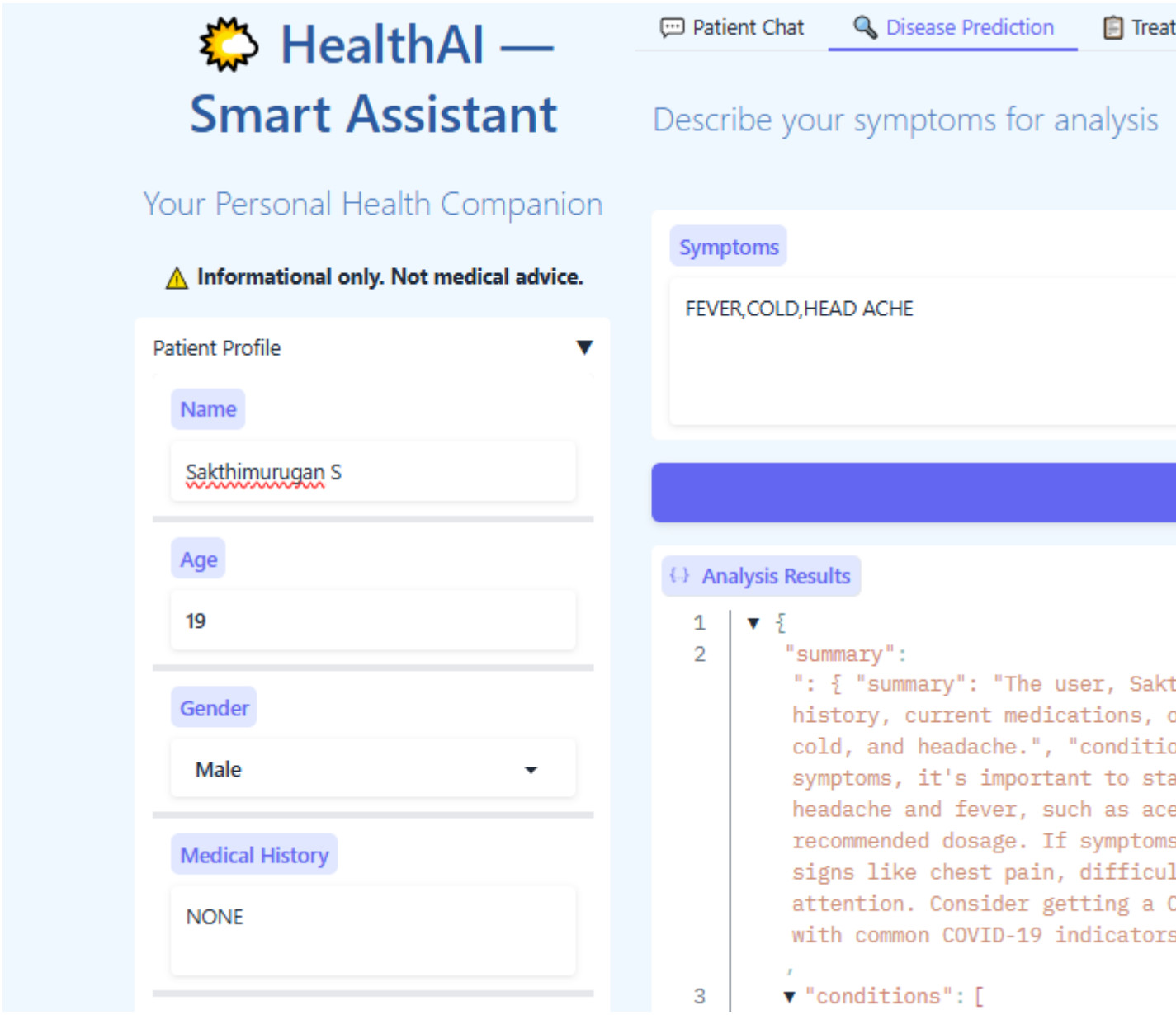
HealthAI represents a responsible and forward-thinking approach to integrating LLMs into the healthcare domain. By prioritizing usability, safety, and accessibility, this prototype lays a solid foundation for future advancements in AI-driven healthcare solutions. It demonstrates the potential of LLMs to empower users with health knowledge and contribute to a more informed approach to personal well-being.

HEALTHAI APPLICATION INTERFACE SHOWCASE

PATIENT CHAT INTERFACE



DISEASE PREDICTION INTERFACE



HEALTH ANALYTICS INTERFACE