HEALTH AI : INTELLIGENT HEALTHCARE ASSISTANT

Project Documentation

1. Introduction

- **Project title** : Healthcare Generative AI Assistant
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- **Team member :** S.Pinkly **NM ID** : CE4B6DE196F5A1CA38C4295ABBC3AB25
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Project Overview

✓ 2 Purpose :

The Healthcare Generative AI Assistant aims to support healthcare professionals and patients by offering AI-powered diagnostics, personalized treatment plans, medical report summarization, and wellness tips. The assistant leverages real-time data and historical records to improve healthcare delivery, optimize resources, and enhance patient care.

✓ Features :

- Conversational Interface
- Key Point: Natural language interaction
- Functionality: Allows healthcare providers and patients to ask medical queries, receive real-time responses, and access treatment recommendations in plain language.

- Medical Report Summarization
- Key Point: Simplified medical understanding
- Functionality: Converts lengthy clinical reports and research papers into concise, actionable summaries for both patients and healthcare professionals.

- Predictive Diagnosis Support
- Key Point: Data-driven diagnosis assistance
- Functionality: Analyzes symptoms and patient history to suggest possible diagnoses, helping clinicians make informed decisions quickly.

- Treatment Plan Generator
- Key Point: Personalized care guidance
- Functionality: Generates tailored treatment recommendations based on patient demographics, medical history, and ongoing therapies.

- Resource Forecasting
- Key Point: Predictive analytics for hospital resources
- Functionality: Estimates demand for beds, medical equipment, and personnel using historical and real-time data.

- Health Tip Generator
- Key Point: Personalized wellness advice
- Functionality: Recommends daily health and lifestyle tips to patients to improve adherence to prescribed treatments and preventive care.

- Feedback Loop Integration
- Key Point: Continuous learning from patient interaction
- Functionality: Collects user feedback to refine recommendations and improve future responses.

3. Architecture

The architecture is designed to be scalable, modular, and secure.

✓ **Components:**

Frontend (UI Layer): React.js-based interface allowing patients and doctors to interact

2. Backend API Server: Node.js/Express server handling requests and interacting with the AI engine.

3. AI Engine: Python-based service using TensorFlow/PyTorch models for diagnostics and recommendations.

4. Database: MongoDB for storing user profiles, medical history, session data.

5. Authentication Service: JWT-based secure login for patients and healthcare providers.

6. Cloud Integration: AWS EC2 instances for hosting, S3 for storing medical reports.

✓ Architecture Diagram:

User ↔ Frontend ↔ API Server ↔ AI Engine ↔ Database

↘ Authentication ↘ Cloud Storage

4. Setup Instructions

Prerequisites:

Node.js v16+

Python 3.8+

MongoDB installed or cloud-based instance

AWS credentials (if using cloud storage)

5. Folder Structure

```
healthcare-ai/
├── backend/          # Node.js API server
|   ├── controllers/
|   ├── models/
|   ├── routes/
|   ├── middleware/
|   └── server.js
├── frontend/          # React.js user interface
|   ├── public/
|   ├── src/
|   └── package.json
├── ai-engine/         # Python AI services
|   ├── models/
|   ├── utils/
|   └── main.py
├── .env               # Environment configuration
├── README.md          # Project overvie
└── requirements.txt   # Python dependencies
```

6. Running the Application

1. Run AI Engine first to ensure models are loaded.

2. Start the backend server to handle API requests.

3. Launch the frontend to interact with users.

4. Register a new user, log in, and start using the assistant.

7. API Documentation & Authentication

✓ Overview:

The Healthcare Generative AI Assistant’s API allows communication between the user interface and the backend services. It provides endpoints for registering users, authenticating them, summarizing reports, offering diagnosis support, and generating health tips. All communication is secured through authentication tokens.

- ✓ **Available Endpoints:**
- ✓ **User Registration:**

Users can create an account by providing basic information such as name, email, and password. This helps personalize their experience and securely store their data.

- ✓ **User Login:**

Registered users can log in using their email and password. Upon successful authentication, they receive a secure access token (JWT), which is used to access other services.

- ✓ **Report Summarization:**

Users can upload medical reports. The system processes these reports and generates a concise summary, highlighting key information such as diagnosis, test results, and recommendations.

- ✓ **Diagnosis Support:**

Users can input symptoms they are experiencing. The assistant analyzes the symptoms and provides possible diagnoses, helping users and healthcare professionals understand potential health conditions.

Health Tips:

Based on the user’s profile and medical history, the assistant generates personalized health tips and wellness advice to support better health management.

Authentication:

All sensitive endpoints are protected. Users must include a valid authentication token (JWT) with each request. The token ensures that only authorized users can access the services. The token remains valid for a limited time (e.g., two hours), after which users must log in again to continue using the assistant.

8. User Interface

The user interface (UI) of the Healthcare AI application is designed to be simple, intuitive, and user-friendly. It allows users to interact with the system easily without requiring technical knowledge.

Key features of the UI include:

✓ Homepage

The homepage displays a clean layout with navigation options to access different functionalities such as disease prediction, health tips, and reports.

✓ Input Section

Users can enter relevant health data such as symptoms, age, and other medical details in clearly labeled fields. The UI uses text boxes, dropdown menus, and radio buttons to collect this information.

✓ Submit Button

After entering the data, users can click the “Submit” button to get the analysis or predictions. The button is prominently placed for ease of access.

✓ Results Display

The output section shows the results in a structured format, highlighting the possible health conditions, recommendations, or next steps.

✓ Navigation Menu

A simple navigation menu is available at the top or side, providing links to different sections such as “Home”, “Report”, “Settings”, and “Help”.

✓ Error Handling

The interface provides clear error messages if the user enters incorrect or incomplete data, ensuring a smooth experience.

✓ Responsiveness

The UI is designed to be responsive, allowing it to work seamlessly across different devices like desktops, tablets, and smartphones.

9. Testing

✓ Unit Tests:

- Run backend tests using Jest:
- npm run test

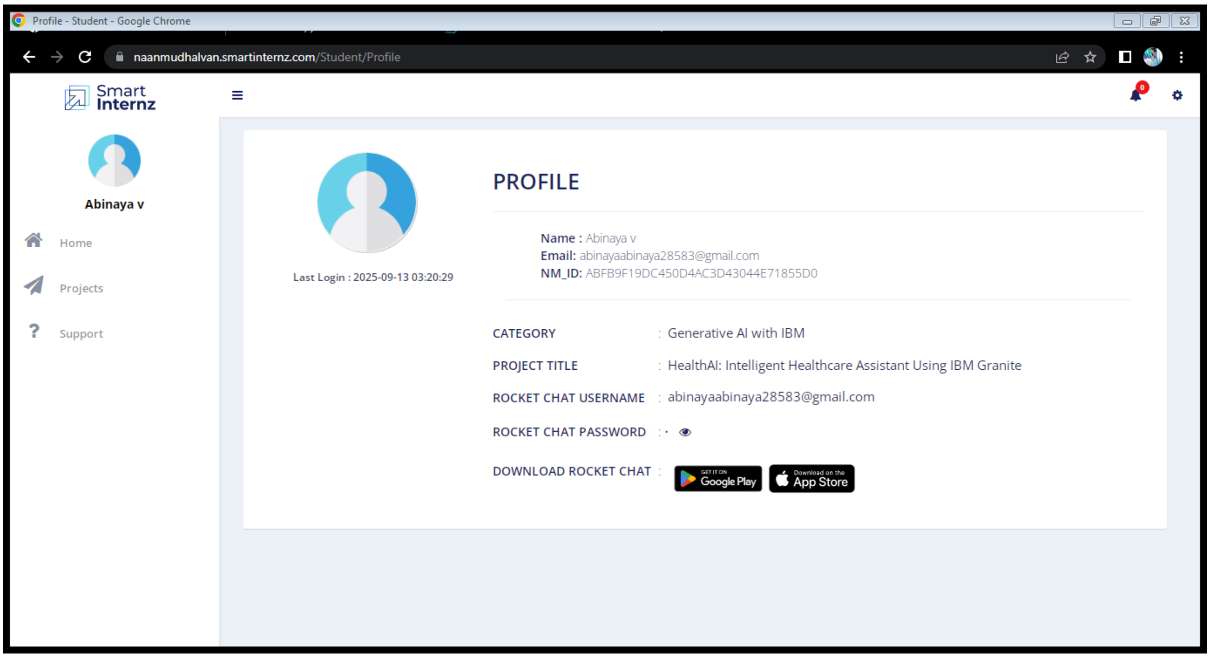
✓ Integration Tests:

- Verify API endpoints with Postman.

✓ Manual Testing

- Check UI responsiveness.
- Validate report upload and summarization accuracy.
- Test JWT expiration and error handling.

10. Screenshot



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Abinaya v

Last Login : 2025-09-13 03:20:29

PROFILE

Name : Abinaya v
Email: abinayaabinaya28583@gmail.com
NM_ID: ABFB9F19DC450D4AC3D43044E71855D0

CATEGORY : Generative AI with IBM

PROJECT TITLE : HealthAI: Intelligent Healthcare Assistant Using IBM Granite

ROCKET CHAT USERNAME : abinayaabinaya28583@gmail.com

ROCKET CHAT PASSWORD : ·

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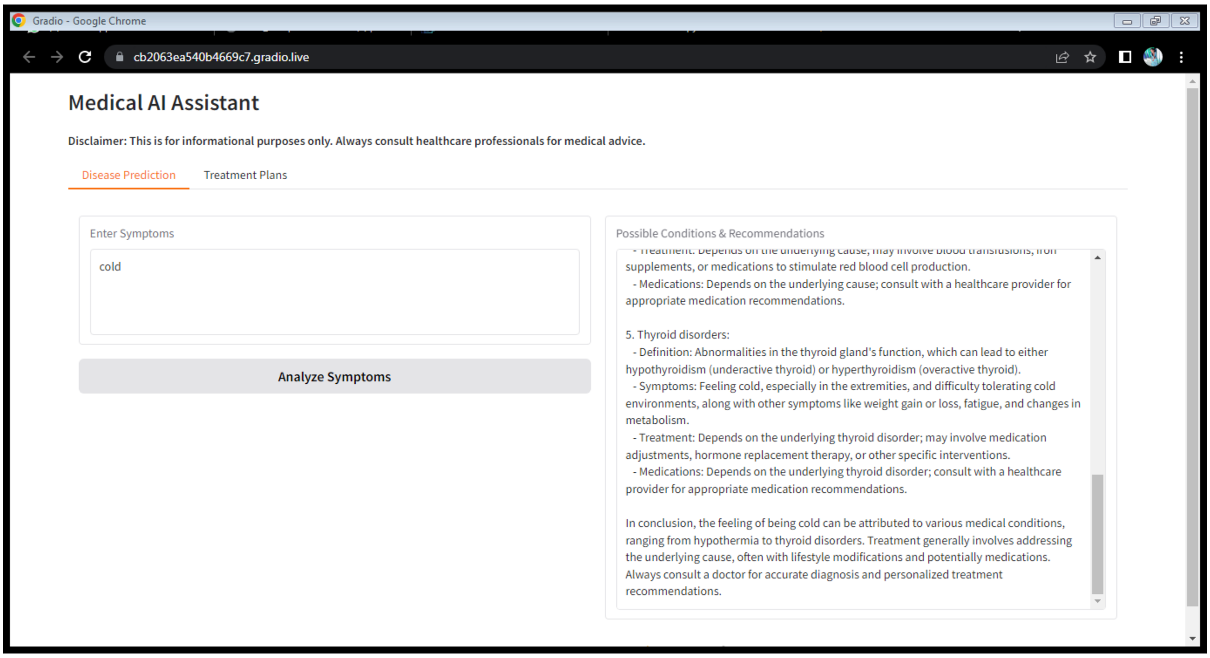


Medical AI Assistant

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

Enter Symptoms

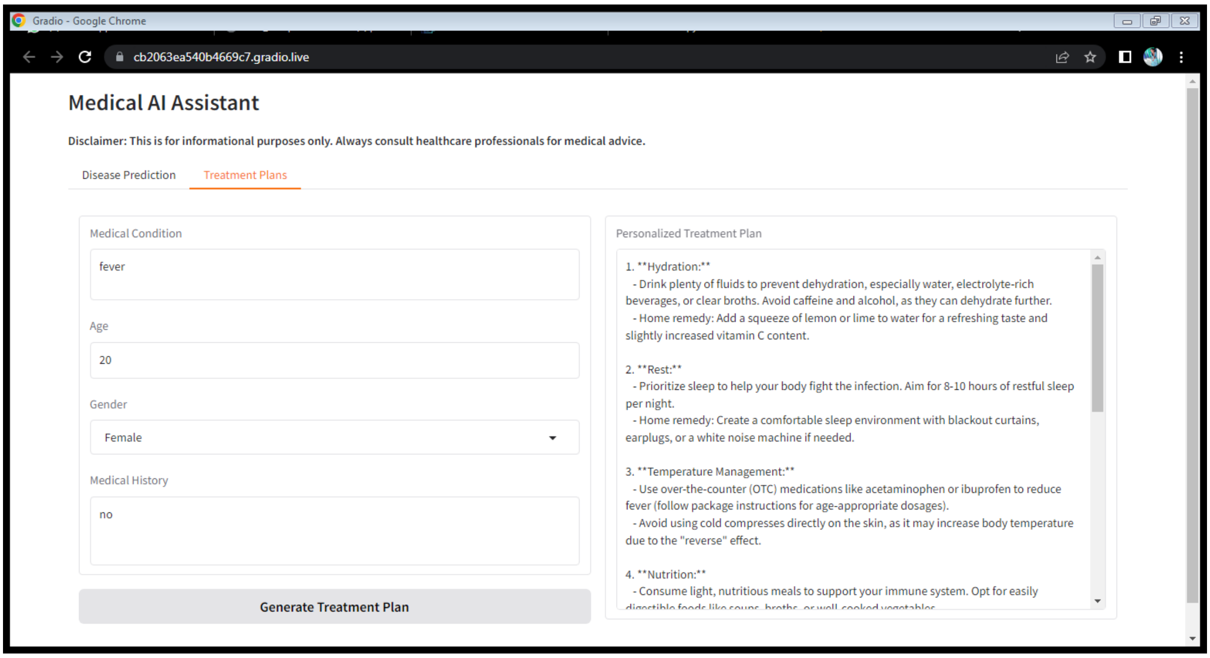
cold

Possible Conditions & Recommendations

- Treatment: Depends on the underlying cause; may involve blood transfusions, iron supplements, or medications to stimulate red blood cell production.
  - Medications: Depends on the underlying cause; consult with a healthcare provider for appropriate medication recommendations.

5. Thyroid disorders:
  - Definition: Abnormalities in the thyroid gland's function, which can lead to either hypothyroidism (underactive thyroid) or hyperthyroidism (overactive thyroid).
  - Symptoms: Feeling cold, especially in the extremities, and difficulty tolerating cold environments, along with other symptoms like weight gain or loss, fatigue, and changes in metabolism.
  - Treatment: Depends on the underlying thyroid disorder; may involve medication adjustments, hormone replacement therapy, or other specific interventions.
  - Medications: Depends on the underlying thyroid disorder; consult with a healthcare provider for appropriate medication recommendations.

In conclusion, the feeling of being cold can be attributed to various medical conditions, ranging from hypothermia to thyroid disorders. Treatment generally involves addressing the underlying cause, often with lifestyle modifications and potentially medications. Always consult a doctor for accurate diagnosis and personalized treatment recommendations.



Medical AI Assistant

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

Medical Condition: fever

Age: 20

Gender: Female

Medical History: no

Personalized Treatment Plan

```
1. **Hydration:**
  - Drink plenty of fluids to prevent dehydration, especially water, electrolyte-rich beverages, or clear broths. Avoid caffeine and alcohol, as they can dehydrate further.
  - Home remedy: Add a squeeze of lemon or lime to water for a refreshing taste and slightly increased vitamin C content.

2. **Rest:**
  - Prioritize sleep to help your body fight the infection. Aim for 8-10 hours of restful sleep per night.
  - Home remedy: Create a comfortable sleep environment with blackout curtains, earplugs, or a white noise machine if needed.

3. **Temperature Management:**
  - Use over-the-counter (OTC) medications like acetaminophen or ibuprofen to reduce fever (follow package instructions for age-appropriate dosages).
  - Avoid using cold compresses directly on the skin, as it may increase body temperature due to the "reverse" effect.

4. **Nutrition:**
  - Consume light, nutritious meals to support your immune system. Opt for easily digestible foods like soups, broths, or well-cooked vegetables.
```

11. Known Issues

- Some rare symptoms may not yield accurate diagnosis due to limited dataset.
- JWT expiration requires users to log in again frequently.
- Uploading large medical reports may result in timeout errors.
- Health tip recommendations are not fully localized for regional variations.

12.Future Enhancements

Integrate with wearable devices to track health metrics in real-time.

Expand dataset with multilingual medical records.

Add voice-based interaction for accessibility.

Implement AI explainability to improve trust among users.

Develop mobile app versions for Android and iOS.

Provide API throttling and rate limits to enhance security.