

PROJECT DOCUMENTATION

WellNexAI

Description

The Personal Health Coach is an AI-powered health monitoring agent that compresses medical history and wellness data to generate personalized health recommendations while minimizing processing and computational costs.

The system analyzes structured and unstructured health data and provides actionable insights such as lifestyle improvements, risk alerts, and wellness suggestions.

Problem Statement

Healthcare data is often:

- Large and unstructured
- Scattered across multiple sources
- Difficult for patients to interpret
- Expensive to process using large AI models

There is a need for:

- A lightweight AI health assistant
- Efficient medical history summarization
- Personalized, data-driven health suggestions
- Cost-effective AI inference

Objectives

The main objectives of this project are:

1. Compress and summarize medical history efficiently.
2. Analyze wellness metrics (e.g., steps, sleep, heart rate).
3. Generate personalized health recommendations.
4. Reduce token usage and processing costs.
5. Provide a scalable AI agent architecture.

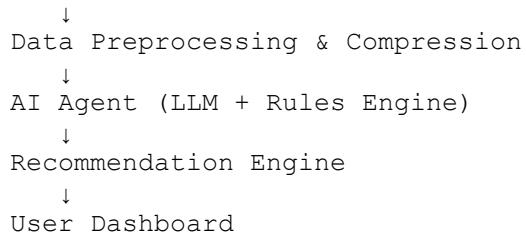
System Architecture

High-Level Architecture

User Input

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Data Collection Layer



Functional Requirements

1. User Management

- User registration and login
- Profile creation (age, gender, medical history)
- Secure authentication

2. Data Collection

- Upload medical history (PDF/Text)
- Input wellness data (manual entry or API)
- Store historical records

3. Data Processing

- Extract key medical details
- Summarize long health reports
- Normalize health metrics

4. AI Agent Features

- Context compression before LLM call
- Risk factor detection
- Trend analysis (sleep, heart rate, weight)
- Personalized suggestions

5. Recommendation System

- Lifestyle improvements
- Diet suggestions
- Exercise recommendations
- Preventive alerts
- Follow-up reminders

Non-Functional Requirements

- Low latency responses
- Cost-efficient token usage
- Secure and encrypted data storage
- Scalable architecture

- Responsive UI

Technology Stack

Frontend

- React / HTML / CSS / JavaScript

Backend

- Python (Flask / FastAPI)
- Node.js (optional)

AI Layer

- OpenAI API / LLM
- Prompt engineering
- Embeddings for compression

Database

- MySQL / PostgreSQL
- MongoDB (optional)

Deployment

- AWS / Azure / GCP
- Docker (optional)

Data Flow

1. User uploads medical data.
2. System extracts key information.
3. Data is compressed using summarization techniques.
4. AI model analyzes compressed data.
5. Personalized recommendations are generated.
6. Results are displayed on dashboard.

AI Model Design

1. Context Compression Strategy

- Extract only relevant symptoms
- Remove redundant medical terms
- Convert long reports into structured summary

Example:

Input (Long Report):

Patient diagnosed with hypertension in 2018... (3 pages)

Compressed Output:

- Hypertension (2018)
- On Amlodipine
- BP average: 145/95

2 .Prompt Design

You are a health coach AI.

Based on the following summarized medical data,
provide personalized health recommendations.

Medical Summary:
{compressed_data}

Database Design

Users Table

Field	Type
user_id	INT
name	VARCHAR
email	VARCHAR
password	VARCHAR

Medical History Table

Field	Type
record_id	INT
user_id	INT
diagnosis	TEXT
medications	TEXT
notes	TEXT

Wellness Data Table

Field	Type
entry_id	INT
user_id	INT
date	DATE
heart_rate	INT
steps	INT
sleep_hours	FLOAT

User Interface Design

Screens

1. Login/Register
2. Profile Setup
3. Upload Medical History
4. Wellness Dashboard
5. AI Recommendations Page

Security Considerations

- Password hashing (bcrypt)
- HTTPS communication
- Role-based access
- Encrypted health data
- Compliance considerations (HIPAA-like best practices)

Cost Optimization Techniques

- Context compression before LLM calls
- Use embeddings instead of full prompts
- Caching repeated queries
- Limit token size
- Rule-based filtering before AI usage

Future Enhancements

- Wearable device integration
- Real-time health alerts
- Doctor consultation integration
- Predictive disease risk modeling
- Mobile application version

Advantages

- Personalized health insights
- Low-cost AI usage
- Preventive healthcare support
- Easy-to-use dashboard

Unique Feature: Health Risk Trend Score (HRTS)

Instead of just giving recommendations, our system calculates a **Health Risk Trend Score (0–100)** based on:

- Heart rate
- Sleep hours
- Steps
- Weight changes
- Past medical conditions

Then it:

- Shows a **daily score**
- Shows a **weekly trend (Improving / Stable / Declining)**
- Gives suggestions based on trend change

Why It Is Unique

Most platforms:

- Show raw numbers
- Give general suggestions

Our system:

- Converts all health metrics into **one simple risk score**
- Tracks trend changes over time
- Gives early warnings before risk becomes serious

This makes our project look more intelligent and analytical.

Final Remarks

The Personal Health Coach – AI Agent successfully demonstrates the practical application of Artificial Intelligence in preventive healthcare. The system efficiently processes medical history and wellness data to generate meaningful and personalized recommendations.

By incorporating intelligent data compression and health trend analysis, the project ensures cost-effective AI usage while maintaining accurate and relevant insights. The implementation highlights the importance of digital health monitoring in modern society and showcases how AI can assist individuals in making informed lifestyle decisions.

The project lays a strong foundation for future enhancements and real-world deployment in healthcare environments.