AI Wound Analysis System

- ## *Overview*

  The **AI Wound Analysis System** is an intelligent web-based platform designed to simplify wound assessment for both patients and healthcare professionals. It utilizes a machine learning model capable of analyzing **both images and videos** of wounds to evaluate healing progress, detect potential infections, and identify complications early. The system provides **personalized AI-generated advice** and **suggests medical consultation** when infection levels or abnormal patterns are detected. By making wound monitoring accessible through a simple upload, it enables patients to **analyze their condition remotely** without visiting a doctor for every minor check-up, saving both time and resources while ensuring timely medical intervention when necessary.

- ## *Problem Statement*

  Chronic wounds—such as diabetic ulcers, burns, or pressure sores—require regular monitoring to ensure proper healing.
  However, **manual wound assessment** is often **subjective**, **time-consuming**, and **inconsistent** across healthcare providers.
  In many areas, especially rural or resource-limited settings, access to experienced clinicians or dermatologists is scarce.
  This leads to **delayed treatment decisions**, **misjudged healing progress**, and in severe cases, **infections or amputations**.

- ## **Proposed Solution**

  The **AI Wound Analysis System** addresses this gap by combining **machine learning**, **computer vision**, and **web technologies** to analyze wound images automatically.
  The model detects wound type, estimates healing status, and provides an objective progress report.
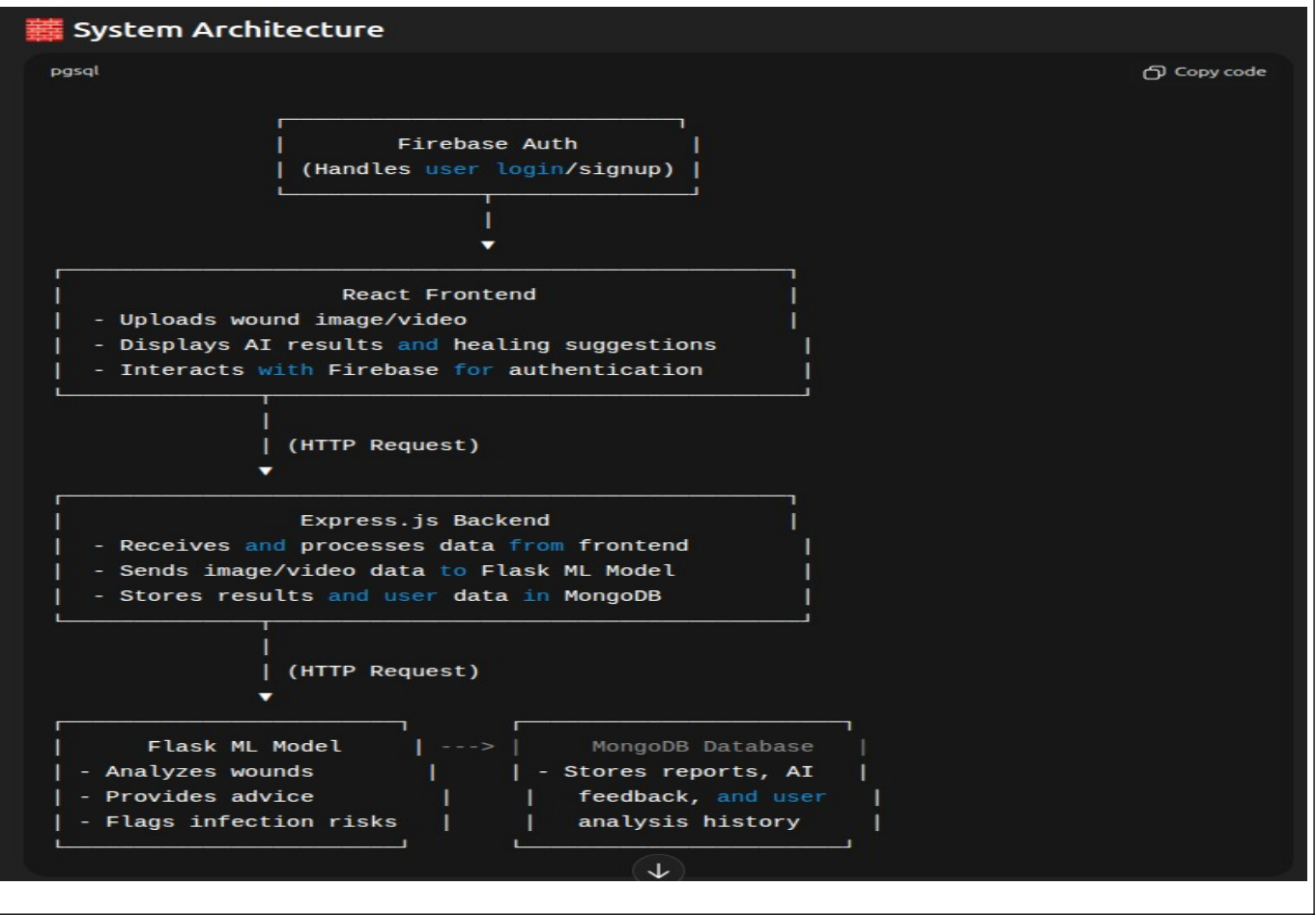 Doctors and patients can access these reports remotely, monitor healing trends, and make early interventions when anomalies are detected.
  The system minimizes diagnostic delays, reduces human error, and democratizes access to quality wound care analytics.

- **_Tech Stack_**

⚙ Tech Stack

Component	Technology Used	Description
Frontend	React.js	Handles user interface, image and video upload, and displays AI analysis results
Backend	Express.js (Node.js)	Manages HTTP requests from the frontend and connects to the database and ML model
Database	MongoDB	Stores user details, wound analysis data, and AI-generated suggestions
Machine Learning Model	Flask (Python)	Processes wound images and videos, analyzes healing status, and provides recommendations
Communication	Direct HTTP requests	Frontend communicates directly with the Express backend through standard HTTP calls

- **_System Architecture_**

▥ System Architecture

```pgsql
                    ┌─────────────────────────────┐
                    │         Firebase Auth        │
                    │  (Handles user login/signup) │
                    └─────────────────────────────┘
                                  │
                                  ▼
        ┌─────────────────────────────────────────────────┐
        │                   React Frontend                  │
        │  - Uploads wound image/video                      │
        │  - Displays AI results and healing suggestions    │
        │  - Interacts with Firebase for authentication     │
        └─────────────────────────────────────────────────┘
                      │
                      │ (HTTP Request)
                      ▼
        ┌─────────────────────────────────────────────────┐
        │                 Express.js Backend                │
        │  - Receives and processes data from frontend      │
        │  - Sends image/video data to Flask ML Model       │
        │  - Stores results and user data in MongoDB        │
        └─────────────────────────────────────────────────┘
                      │
                      │ (HTTP Request)
                      ▼
   ┌────────────────────────────┐       ┌────────────────────────────┐
   │      Flask ML Model         │ --->  │      MongoDB Database       │
   │  - Analyzes wounds          │       │  - Stores reports, AI       │
   │  - Provides advice          │       │     feedback, and user      │
   │  - Flags infection risks    │       │     analysis history        │
   └────────────────────────────┘       └────────────────────────────┘
                                  ↓
```

- ### *System Architecture Description*

  The AI Wound Analysis System is designed around a modular, centralized backend for efficiency and scalability.
  Users interact with a React frontend for uploading images and videos, while authentication is handled by Firebase.
  The Express backend acts as the central hub: it sends uploaded data to the Flask ML model for analysis, stores results in MongoDB, and returns insights to the frontend.
  This setup ensures secure, consistent data handling, seamless AI integration, and clear separation of responsibilities among all components.

- ### *Conclusion*

  The AI Wound Analysis System bridges technology and healthcare, making wound care accessible, intelligent, and proactive. Through AI-powered analysis of images and videos, it provides actionable insights and alerts users when professional attention is needed. By simplifying wound monitoring and supporting timely intervention, this system has the potential to improve recovery outcomes, reduce medical costs, and extend quality care to those with limited access to doctors.

- ### *Project Team*

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