Care Flow – Smart Healthcare Access Platform

Capstone Project Proposal

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# 1. Problem Statement

Canada faces a severe healthcare access challenge characterized by long wait times, physician shortages, and outdated communication methods. Patients often wait hours in harsh weather conditions to find family physicians or spend months on waiting lists for specialists. These inefficiencies lead to frustration, delayed treatments, and additional strain on the healthcare system.  
  
This problem affects patients, providers, and the healthcare system as a whole. Patients lose time and face health risks from delayed care, while providers struggle with inefficient scheduling and poor patient flow management. A modern, Smart AI based solution that can bridge this gap and significantly improve healthcare access and efficiency.

# 2. Proposed Solution & Key Benefits

We propose developing a Smart Healthcare Access Platform, a web-based application designed to streamline healthcare access through intelligent triage, provider matching, and real-time appointment booking.

Key Features:

1. **Patient Dashboard:** Patients get a centralized view of their health journey, with easy access to personal health records, appointment history, and automated preventive care reminders.
2. **Provider Dashboard:** This gives providers a powerful tool to manage their schedules, patient information, and appointments efficiently.
3. **Healthcare Provider Matching:** Patients can easily find and connect with nearby doctors or clinics based on their specific needs, location, and specialization.
4. **Smart Appointment Scheduling:** The platform allows for direct, real-time booking of available time slots, eliminating the need for phone calls and manual scheduling.
5. **AI Symptom Checker & Triage:** Using advanced Large Language Models (LLMs), the platform will accurately assess a patient's symptoms and recommend the appropriate level of care, ensuring urgent cases are prioritized.
6. **AI Chatbot for FAQs:** A 24/7 AI chatbot provides instant answers to common healthcare questions, empowering patients with information and reducing the administrative burden on clinics.

**Benefits:**  
• For Patients: Faster access, less waiting, and better clarity.  
• For Providers: Reduced administrative workload and better visibility of patient flow.  
• For Healthcare Systems: More efficient triage, reduced ER congestion, and enhanced patient satisfaction.

# 3. Project Goals & Scope

* **Goal 1:** Build a fully operational platform where patients can input their symptoms, receive AI-driven medical advice, and help to quickly find the right healthcare providers.
* **Goal 2:** Implement an intelligent appointment booking system. This system will allow patients to effortlessly schedule, view, and manage their appointments directly with providers, based on the providers (Doctors) availability.
* **Goal 3:** Design and develop user-friendly, role-specific dashboards for both patients and providers. These dashboards will feature essential tools like health records, appointment history, preventive care reminders, and schedule management.
* **Goal 4:** Integrate an AI chatbot that can answer frequently asked healthcare questions and offer guidance, thereby improving the overall patient experience.
* **Goal 5:** Ensure the platform's security by implementing robust authentication, role-based access controls, and thorough input validation for all interactions between patients and providers.

**Out of Scope:**• Mobile-native applications.  
• Handling real medical records (mock data only).  
• Full regulatory compliance with PIPEDA/HIPAA (demo purposes only).

# 4. Proposed Technology Stack & Market Relevance

**Frontend**:

***Next.js on React:*** Next.js with React makes development smoother as it comes with built-in routing, SSR/SSG for performance, and API routes without extra setup.

***Material UI (Optional: Tailwind CSS):*** It provides ready-to-use component library that gives a professional look without spending too much time on styling.

**Backend**:

***Node.js, Express, and RESTAPI:*** It helps to build a fast, lightweight backend in JavaScript and makes API implementation and integrations easier.

**Database:**

***Firebase Authentication***→ provides secure, ready-made login and built in JWT, OAuth services which save our auth logic implementation time.

***MongoDB*** → Easier implementation, flexible schema, scalable database to store structured and unstructured data.

**API:**

***Swagger* –** For API documentation, ***Postman* =** To test the API’s

**Caching & Performance optimization:**

***In-memory/LRU*** for super-fast local caching and Redis for shared, persistent caching to speed up responses and to reduceload.

**AI Integration:**

***Gemini API (Google AI Studio):*** Simple integration with Google ecosystem, provides high-quality models.

**Maps & Geolocation:**

***Google maps API:*** Industry standard with rich features (directions, places, geocoding) and $200 free monthly credit.

Leaflet.js (Optional)-Open source.

**Testing:** Gitlab CI/CD: Easier, faster setup, cloud-managed, minimal maintenance.

**Deployment:** Vercel – Free-tier hosting with CI/CD action in Github.

# 5. Preliminary Timeline (by Sprint Milestones)

# Sprint 1 (Weeks 1-2): Project setup with Next.js + React, Node.js + Express, MongoDB connection, Firebase Authentication integration, and basic patient & provider auth UI and logics. Configure MVC structure.

# Sprint 2 (Weeks 3-4): Implement core healthcare features including patient and provider dashboards, provider search with filters (specialty, location), Google Maps API integration, and appointment booking system with availability management.

# Sprint 3 (Weeks 5-6): Integrate AI symptom checker & triage using Gemini API, implement appointment confirmation workflow with email notifications, add Redis caching for performance, and start UI/UX polish for dashboards and forms.

# Sprint 4 (Weeks 7-8): Develop AI chatbot for FAQs, finalize dashboards with mobile responsiveness and accessibility improvements, implement unit and API testing (GitLab CI/CD), complete UI/UX polish, and deploy to live servers (Vercel frontend, Railway/Render backend). Prepare documentation and demo video.

# 6. Team Charter

**Roles & Responsibilities:**  
***Frontend Lead*** – Responsible for UI/UX development.

***Backend Lead*** – Implement API routes, managing MongoDB schema and handle Firebase authentication setup, connecting backend and frontend through axios.

***Full stack/DevOps in charge***– Managing deployment pipelines, CI/CD workflows, code reviews, monitor and improve the performance of the application.

***Documentation/Testing Lead*** – Proposal, docs, test cases, presentation.  
  
***Communication Plan:*** Weekly stand-ups -Microsoft Teams.

***Project Management tool:*** Jira

# 7. Links

[**GitHub Repository**](https://github.com/Mohamed495104/Capstone-Group3.git)