Project Report: HealthCare AI

A Holistic AI-Powered Health Management Platform

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# 1. Introduction

## 1.1 Project Overview

HealthCare AI is built to simplify personal health management by providing a single, intelligent dashboard that caters to both physical and mental wellness needs. It eliminates the need for multiple apps and combines analytics, AI, and UI design to empower users with actionable health insights.

## 1.2 Problem Statement

- Data Fragmentation: Health data scattered across multiple platforms.  
- Limited Personalization: Difficulty accessing contextual, AI-powered health recommendations.  
- Mental Health Overlooked: Most tools ignore mental well-being.  
- Low Engagement: Poor UI/UX and lack of interactivity in existing health apps.

## 1.3 Objectives

- Create a dual-mode system for physical and mental health.  
- Integrate Gemini AI for dynamic, personalized responses.  
- Enable push notifications for medications and appointments.  
- Provide users with full data control and export capabilities.  
- Promote engagement through interactive wellness tools.

## 1.4 Target Audience

- Users: Individuals managing personal health.  
- Admins: Platform managers with capabilities to monitor and manage users.

# 2. System Architecture & Technologies Used

## 2.1 Technology Stack

|  |  |  |
| --- | --- | --- |
| **Component** | **Technology/Library** | **Purpose** |
| Backend | Python 3, Flask | Routing, logic, and API integration |
| Database | SQLite 3 | Persistent data storage |
| AI Engine | Google Gemini API | Chat, symptom analysis, and diet generation |
| Frontend | HTML5, CSS3, JS (ES6) | UI and interactivity |
| Templating | Jinja2 | Dynamic HTML rendering |
| Push Notifications | pywebpush, Service Workers | Device-level notifications |
| Data Handling | BeautifulSoup4, markdownify | Clean AI output and formatting |
| Environment Config | python-dotenv | API key and secret management |

## 2.2 Database Design

Relational schema with cascading deletes.  
Tables: users, medications, appointments, reminders, exercise\_log, diet\_plans, journal\_log, push\_subscriptions, physical\_chat\_history, mental\_chat\_history, history\_log.

# 3. Key Features & Functionality

## 3.1 Core Features

- Authentication & Roles: Secure login, role-based access (user/admin).  
- Dual-Mode UI: Switch between Physical and Mental Health views.  
- Admin Dashboard: View, block/unblock, and delete users.  
- Push Notifications: Timezone-aware reminders, even when app is closed.  
- Data Export: Download full health reports (.txt) including diet plans.

## 3.2 Physical Health Module

- Health Dashboard: BMI, weight trends, and activity charts.  
- Management Tools: CRUD for medications and appointments.  
- AI Features:  
 • Symptom Checker  
 • Health Metrics Analysis  
 • Diet Plan Generator  
 • Clinical Chatbot (Health Assistant)

## 3.3 Mental Wellness Module

- Dark-Themed UI for a calming experience.  
- Journaling & Mood Tracking: Emoji-based logs and text entries.  
- MindWell Chatbot: Empathetic tone, non-prescriptive conversations.  
- Relaxation Tools:  
 • Zen Garden  
 • Mindful Coloring  
 • Breathing Animation  
 • Memory Game  
 • Auto-updating Affirmations

# 4. System Implementation & Challenges

## Challenge 1: Push Notifications

Issue: Complex setup with Service Workers, scope, and VAPID keys.  
Solution: Created a root-level service worker and JS push manager; used Python threading to trigger reminders per timezone.

## Challenge 2: AI Content Formatting

Issue: Raw or messy AI HTML in downloadable reports.  
Solution: Added explicit prompt formatting and markdownify for clean, human-readable reports.

## Challenge 3: UI State Management

Issue: UI elements (e.g., 'Download Plan') not appearing reliably.  
Solution: Replaced session flags with direct template booleans (plan\_generated).

# 5. Future Enhancements

- Enhanced Security: Add password hashing with werkzeug.security.  
- Advanced AI Analysis: Train custom model for behavioral insights.  
- Clinician Portal: Enable doctor/therapist access (with consent).  
- Scalable Task Queue: Replace threading with Celery + Redis.  
- Mobile App: Build native iOS/Android apps for full mobility.

# 6. Conclusion

HealthCare AI provides a powerful and holistic solution to modern health management. Through smart design, AI integration, and attention to user experience, the platform bridges the gap between physical and mental well-being. It proves that personalized, AI-powered healthcare tools can be both effective and user-centric, laying the foundation for scalable future healthtech solutions.