GROUP 14

Final Review

MITRA: Elderly Companion Bot

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TABLE OF CONTENTS

Introduction

- As our world becomes faster and families more dispersed, the elderly are often left behind; emotionally and socially.
- Mitra is a smart, memory-aware virtual companion designed to bring comfort, care, and connection to the lives of aging individuals.
- Mitra listens, reminds, responds, and most importantly understands.

Project Objectives

Build a Secure, Full-Stack Application Framework

- Implement secure, OTP-based user authentication.
- Establish persistent user profiles using Cloud Firestore.
- Design distinct, role-based interfaces for Elders and Caregivers.
- Integrate a system for logging and monitoring health vitals.

Engineer a Voice-Enabled, Memory-Aware Conversational AI

- Integrate a Gemini Large Language Model for real-time, empathetic dialogue.
- Develop a cloud-powered memory system to recall past conversations.
- Incorporate Speech-to-Text and Text-to-Speech for a voice-accessible interface.

Empower Caregivers with a Remote Monitoring System

- Provide a real-time dashboard for caregivers to monitor health vitals.
- Enable management of medication schedules and adherence tracking.
- Deliver critical smart alerts for events like missed medications or inactivity.

Challenges Faced

- **API Dependency** – Added retry logic and fallback responses to handle downtime.
- **Context Retention** – Stored user preferences locally to simulate memory between sessions.
- **Prompt Engineering** – Refined prompts with role-based instructions and tested variations for more empathetic, relevant answers.
- **Flutter Plugin Limits** – Use stable STT/TTS plugins and customized integration for better reliability.
- **Data Privacy** – Ensured only necessary data sent to API, anonymized logs, and privacy-first approach.

Literature Review

Sl No.	Title	Relevant Concepts
1	Smart Sheba: Enhancing Elderly User Experience with LLM-Enabled Chatbots and User-Centered Design. (Sharfuddin Khan Chisty, Anika Tahsin Miami, and Jannatun Noor. 2025.)	**Context:** Elderly users often struggle with complex interfaces and limited digital literacy, reducing chatbot usability. **Solution Taken:** Adopted a user-centered, voice-first design with simple UI and large fonts, inspired by Smart Sheba, to improve accessibility and ease of use.

Literature Review

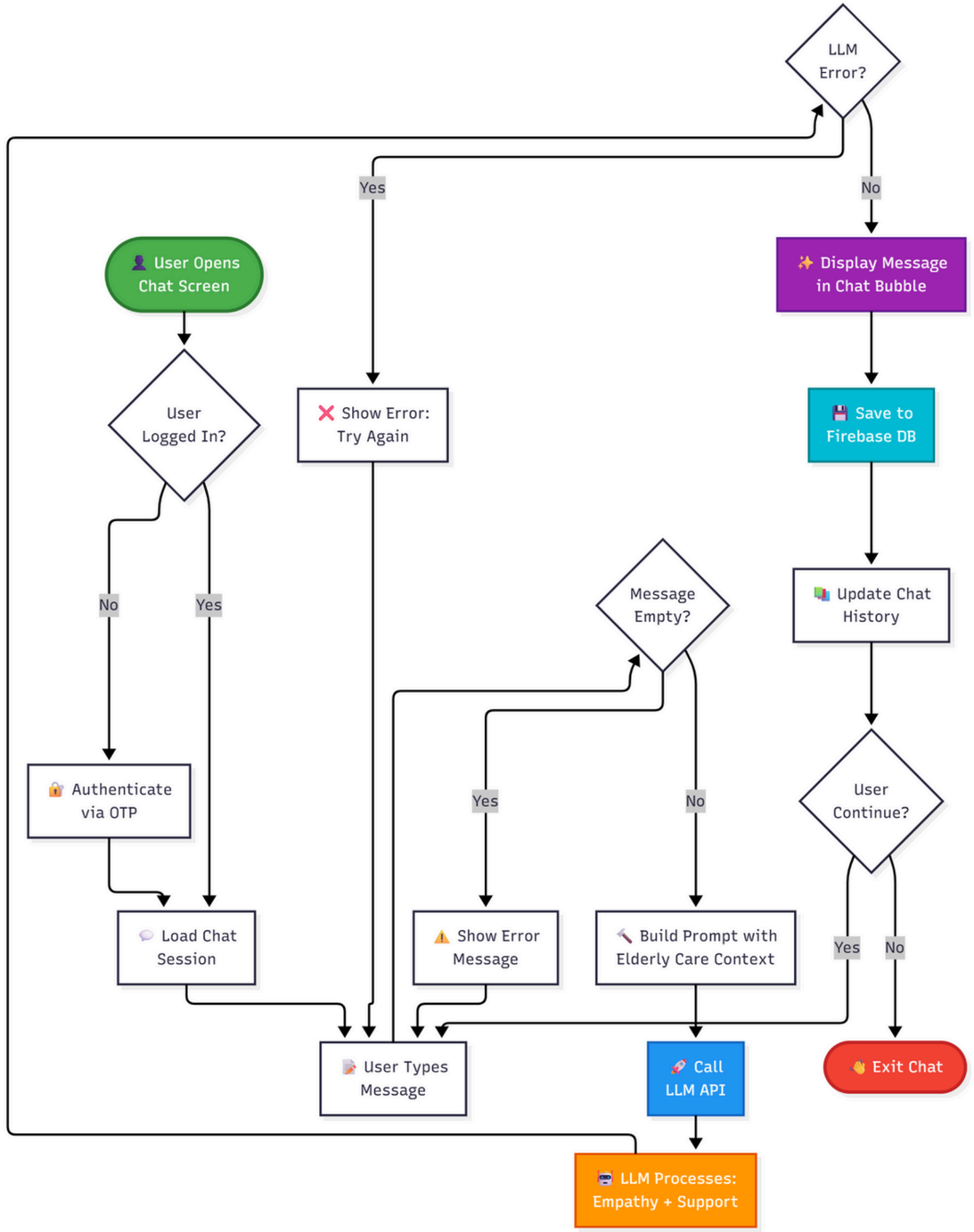
Sl No.	Title	Relevant Concepts
2	A Study on Performance Improvement of Prompt Engineering for Generative AI with a Large Language Model(Daeseung Park1 , Gi-taek An2 , Chayapol Kamyod3 and Cheong Ghil Kim,2024)	**Context**: Gemini's default responses were often generic and less empathetic, making interactions feel robotic. Training a custom model was not feasible due to dataset and resource limitations. **Solution Taken:** Used Prompt Engineering to refine responses — crafting prompts that improved empathy, focus, and conversational naturalness without retraining the model.

Proposed System Designs

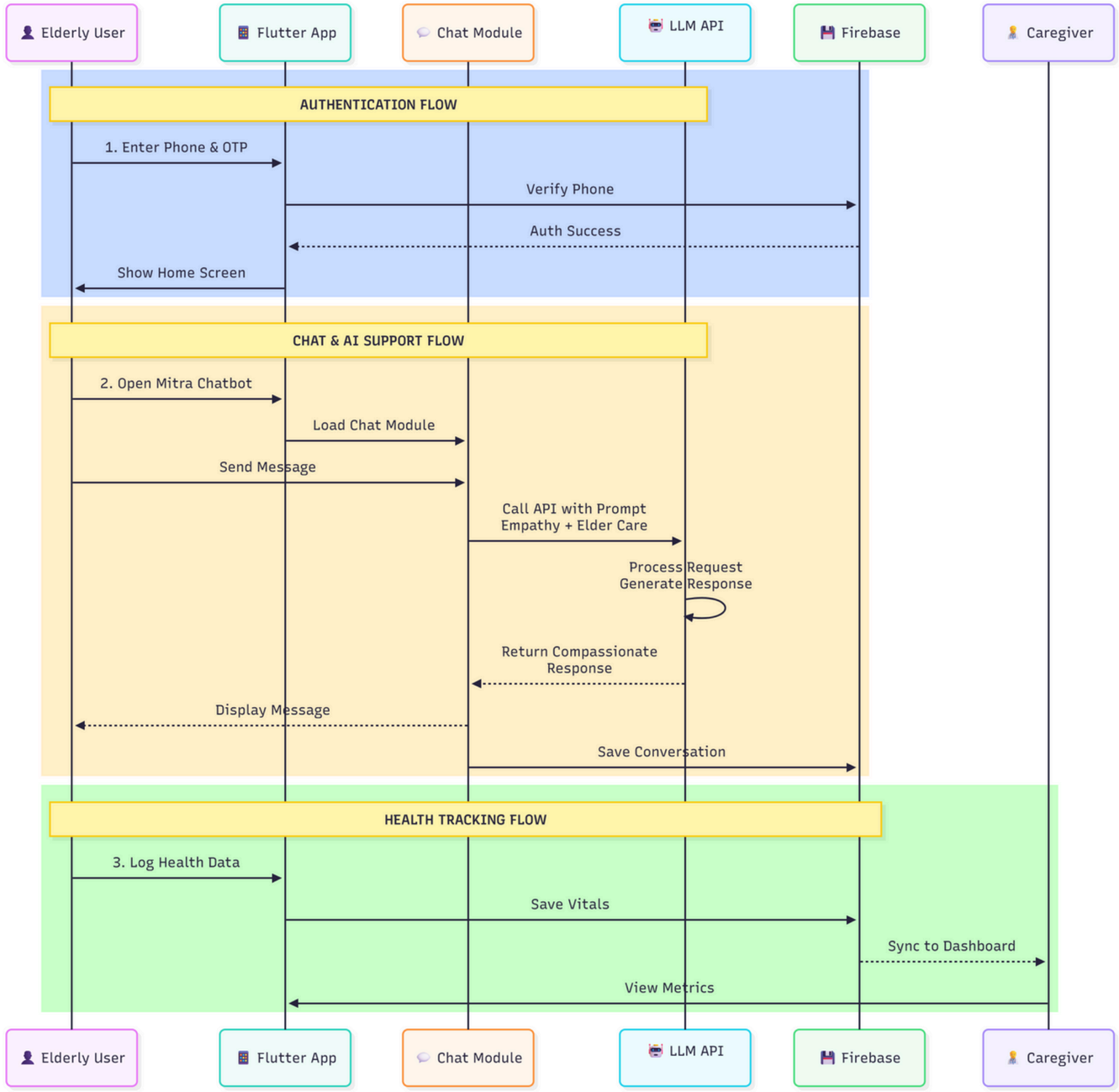
User Interface Design Principles

- Large fonts & clear icons
- Voice-first interaction
- Minimal navigation steps
- High-contrast colors for readability
- Simple & intuitive flow

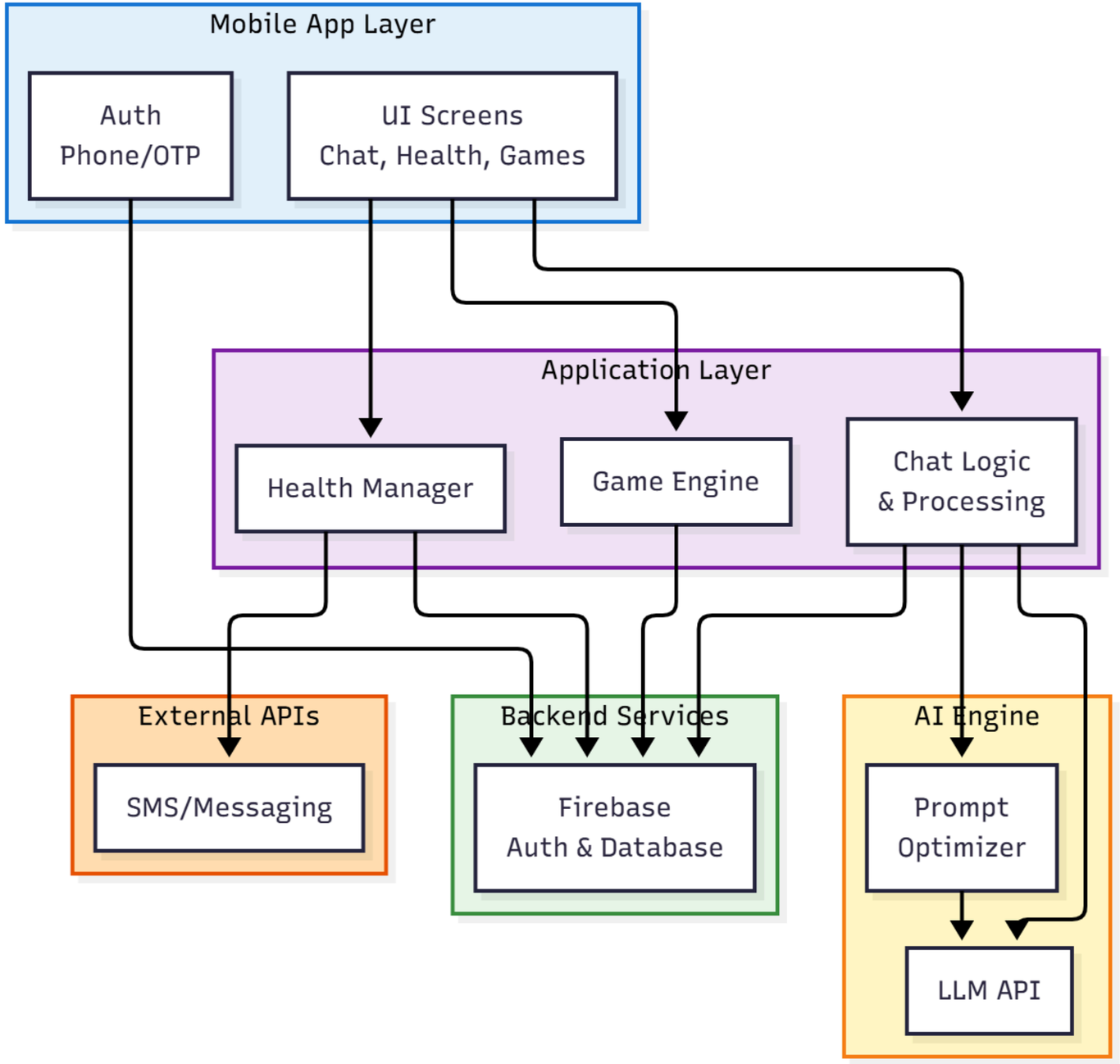
Activity Diagram



Sequence Diagram



Component Diagram



Implementation Details

User Authentication

- Initiates user sign-in by collecting a phone number and requesting a one-time password (OTP) via Firebase.
- Collects the 6-digit OTP, verifies the code with Firebase, and grants the user access by navigating directly to the HomeScreen

Elder Dashboard Features

- **Talk to Mitra**
  - **Chatbot**: Placeholder for the core AI companion feature, accessible via a one-tap button.
  - Provides emotional support and information through a friendly, conversational interface.
- **Elderly Care**
  - Brain Games (Sudoku): A fully implemented Sudoku game with logic to generate puzzles, check answers, provide hints, and track progress.
  - Offers cognitive stimulation and helps maintain mental agility.

Elder Dashboard Features

- **Safety**
  - **Emergency**: A feature icon dedicated to critical situations.
  - Ensures rapid access to emergency contacts/services when seconds matter.
- **Health & Utility**
  - Includes features for Health Tracker, Appointment, and Add Medicine.
  - Simplifies daily health management and provides essential services on demand.

Caregiver Dashboard

- A dedicated dashboard provides a centralized hub for caregivers to remotely monitor the user's well-being.
- An organized, tile-based interface allows for easy navigation to key functions like viewing health vitals and managing medications.
- Caregivers can access the elder's latest health data and check-in history in real-time.
- Includes tools to set medication schedules and check for adherence.

Technologies Used

- **Frontend:** Flutter (Dart) - Used to build the entire mobile UI/UX. This allows for a single codebase across Android and iOS.
- **Backend:** Firebase - Handles conversation, reminders, emergency alerts
- **LLM Model:** Google Gemini - LLM that provide the conversational intelligence for the "Mitra Chatbot".

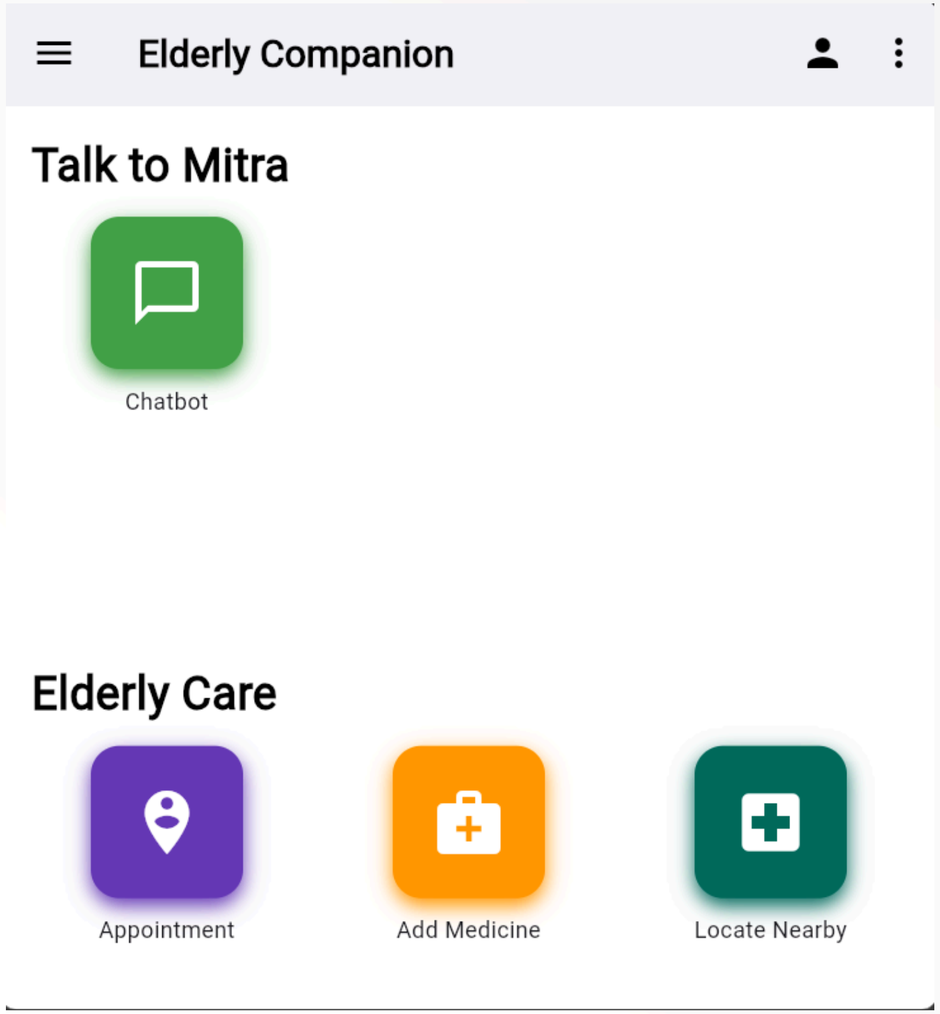
Technologies Used

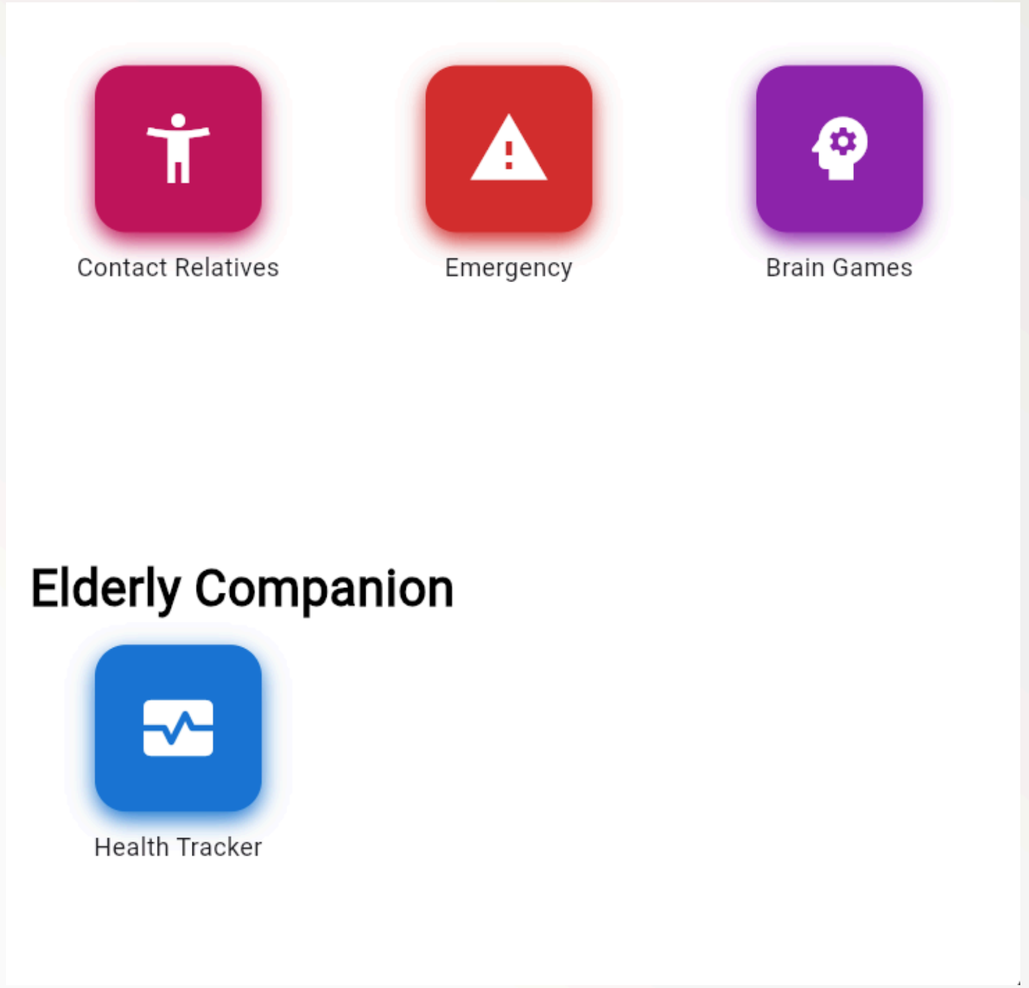
- **Authentication (BaaS):** Firebase Authentication
- **Database:** Firebase - Store reminders, preferences, memory
- **APIs:** Gemini API integration, Firebase API integration

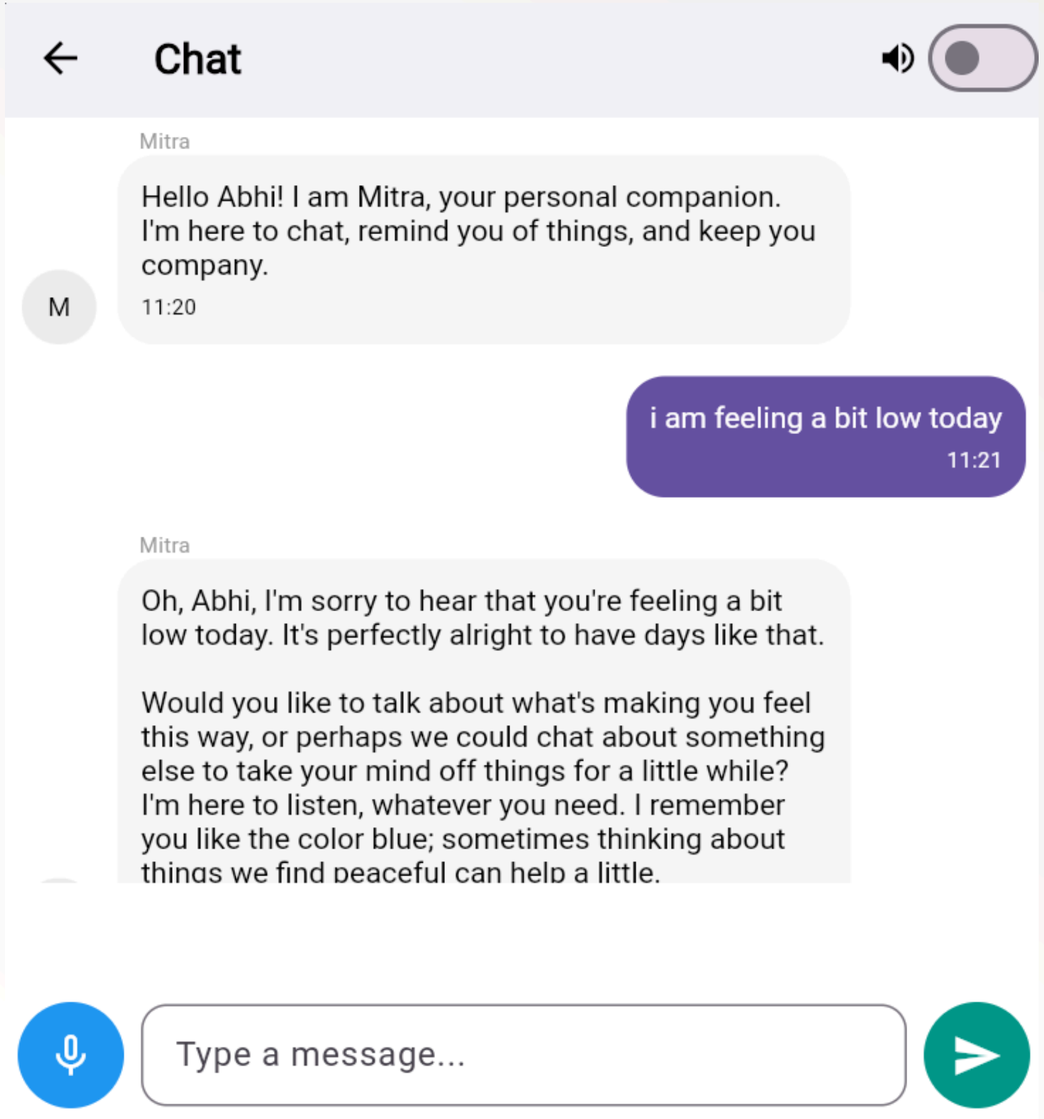
Testing & Pending Works

- **Functional Testing –** Chatbot, and emergency alerts verified.
- **Integration Testing** – Flutter frontend + LLM API working smoothly.
- **Speech Testing –** TTS accuracy and stability to be checked.
- **Ongoing –** Measuring response accuracy, latency, and memory consistency.
- **Pending –** User feedback collection, multilingual support, faster response optimization, STT implementation, final app release

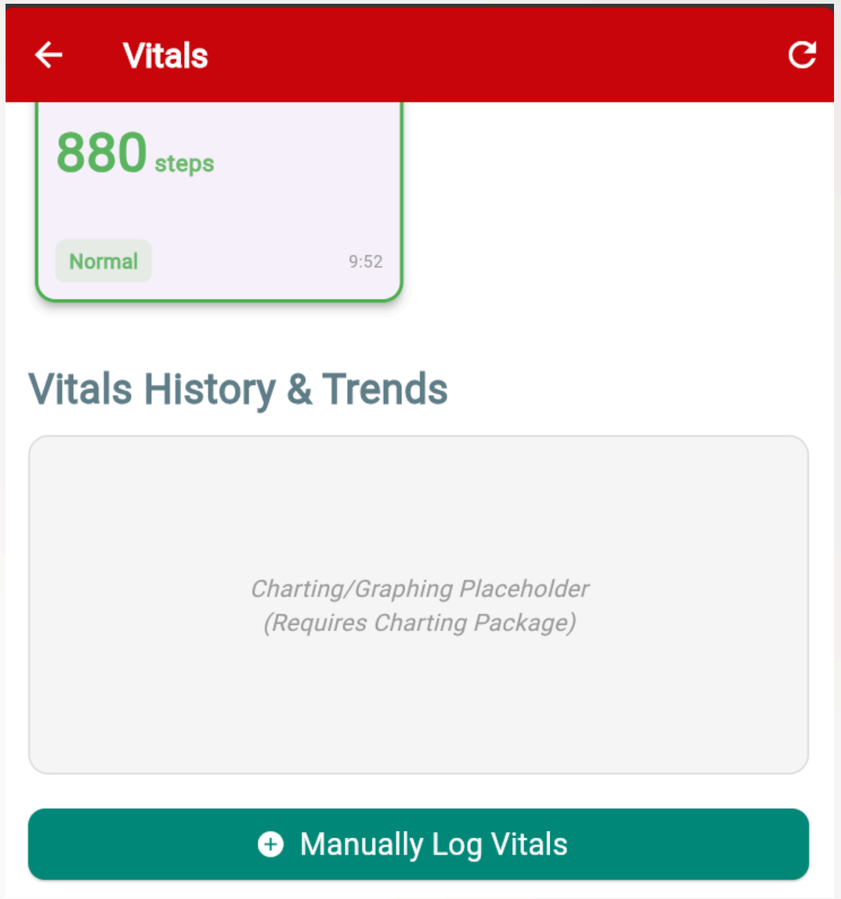
Output Screenshots

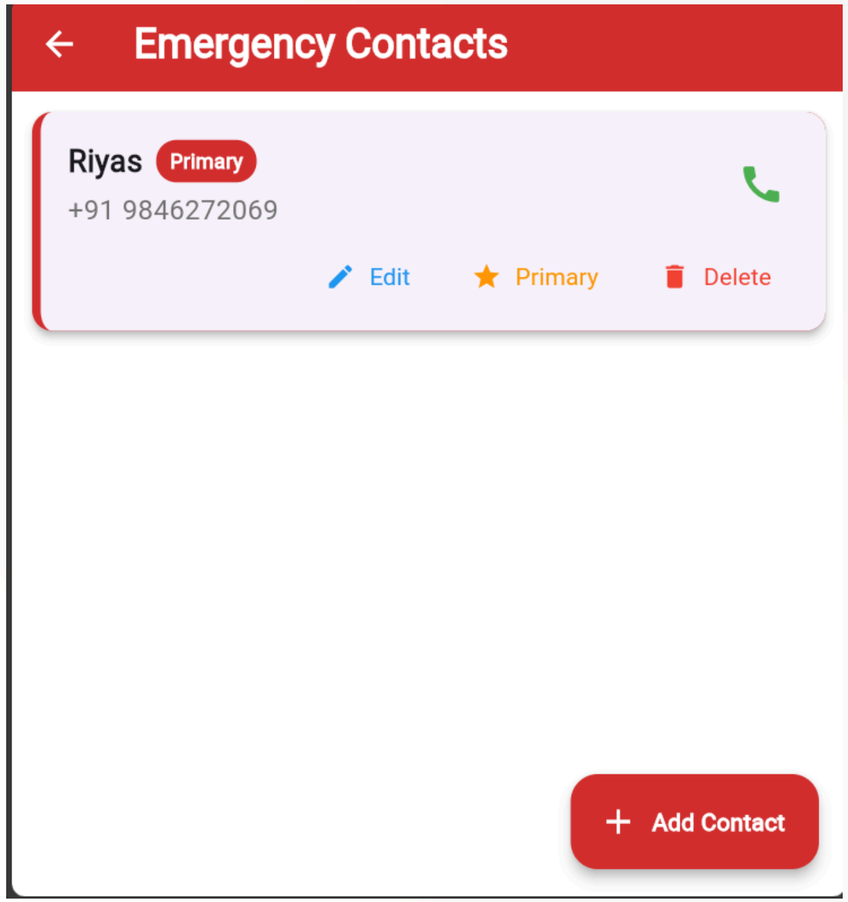

Elderly Companion
Talk to Mitra
Chatbot
Elderly Care
Appointment
Add Medicine
Locate Nearby

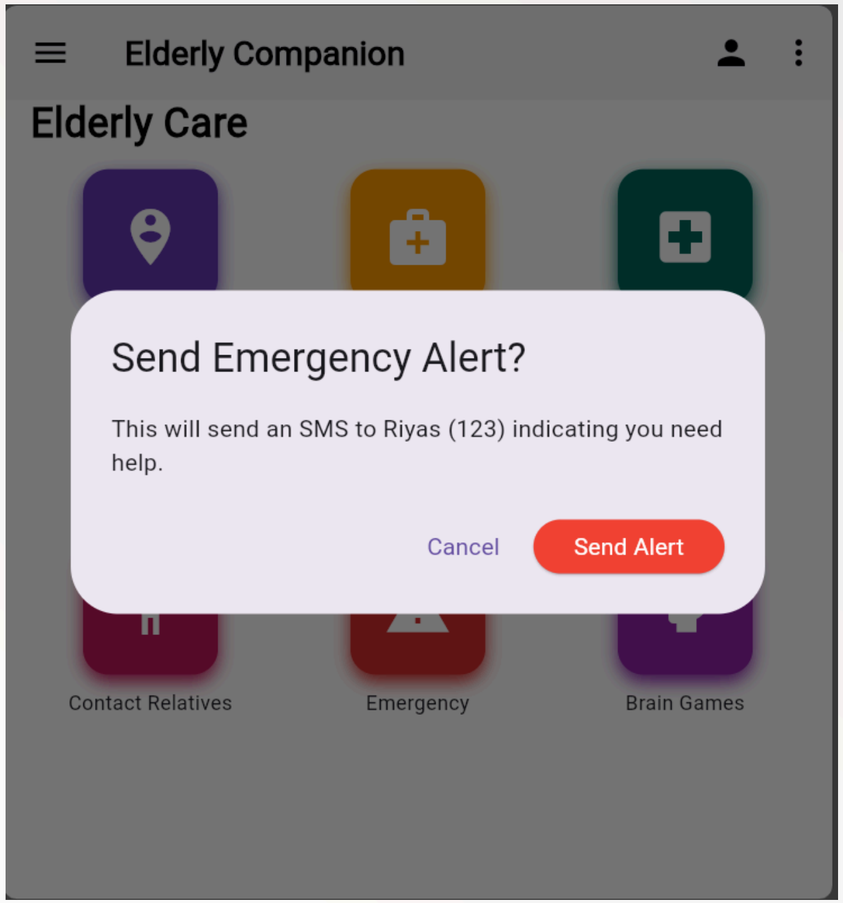

Contact Relatives
Emergency
Brain Games
Elderly Companion
Health Tracker

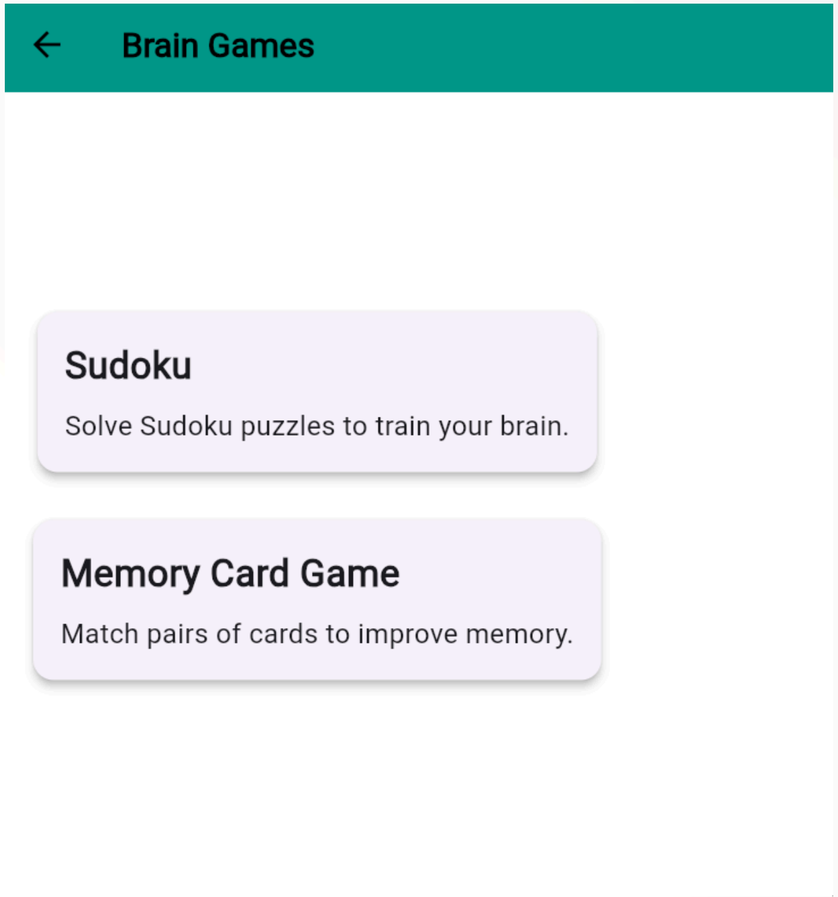

Chat
Mitra
Hello Abhi! I am Mitra, your personal companion. I'm here to chat, remind you of things, and keep you company.
11:20
M
i am feeling a bit low today
11:21
Mitra
Oh, Abhi, I'm sorry to hear that you're feeling a bit low today. It's perfectly alright to have days like that.
Would you like to talk about what's making you feel this way, or perhaps we could chat about something else to take your mind off things for a little while? I'm here to listen, whatever you need. I remember you like the color blue; sometimes thinking about things we find peaceful can help a little.
Type a message...

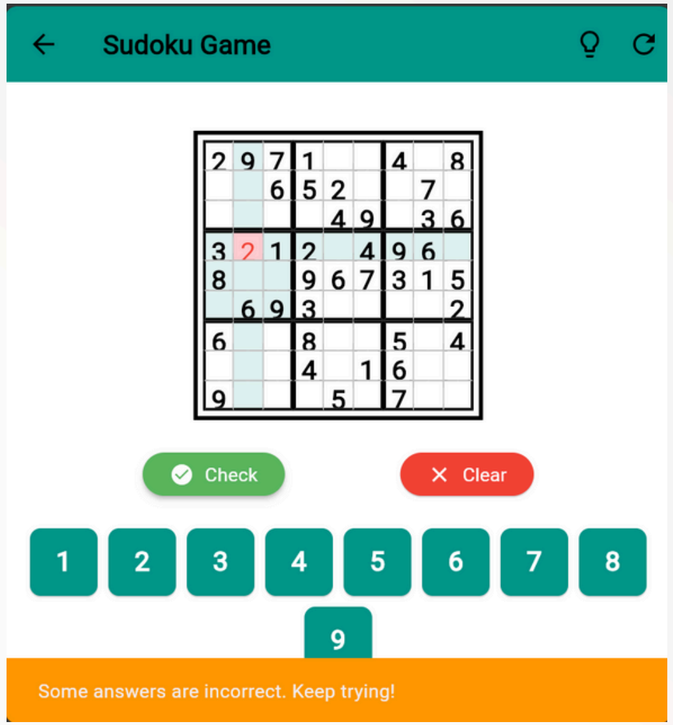

Vitals
Current Health Metrics
Heart Rate
73 BPM
Normal
9:52
Blood Pressure
120/80 mmHg
Normal
9:52
Blood Oxygen
98 %SpO2
Normal
9:52
Blood Glucose
110 mg/dL
Normal
9:52

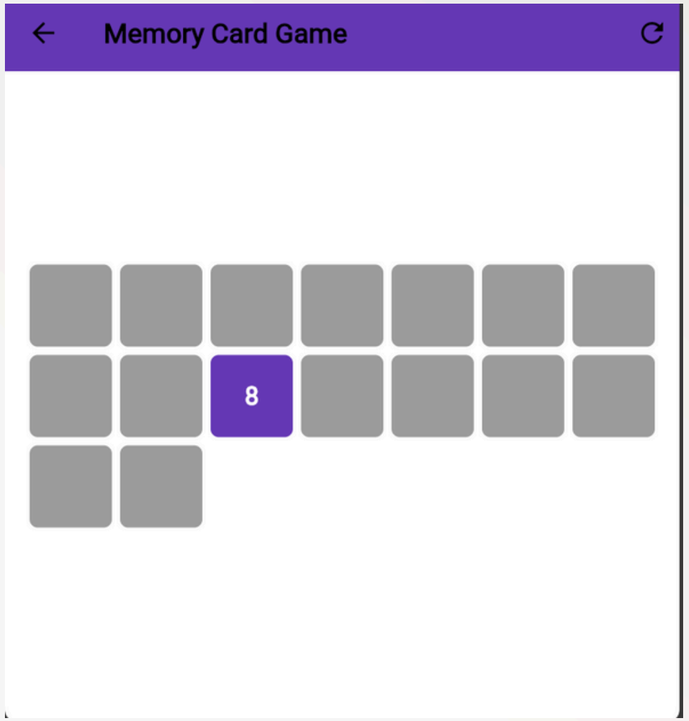

Vitals
880 steps
Normal
9:52
Vitals History & Trends
Charting/Graphing Placeholder
(Requires Charting Package)
Manually Log Vitals


Emergency Contacts
Riyas
Primary
+91 9846272069
Edit
Primary
Delete
Add Contact


Elderly Companion
Elderly Care
Send Emergency Alert?
This will send an SMS to Riyas (123) indicating you need help.
Cancel
Send Alert
Contact Relatives
Emergency
Brain Games


Brain Games
Sudoku
Solve Sudoku puzzles to train your brain.
Memory Card Game
Match pairs of cards to improve memory.


Sudoku Game
Check
Clear
1 2 3 4 5 6 7 8 9
Some answers are incorrect. Keep trying!


Memory Card Game
8

Caregiver Tools

Monitoring & Health for The Elder

Health Vitals Status
View latest vitals and check-in history for The Elder.

Manage Medications
Set and check adherence for The Elder's reminders.

Manage Appointments
View and set up appointments for The Elder.

View Smart Alerts
Check for missed meds, inactivity warnings, or low battery alerts.

Caregiver Tools

Remote Actions

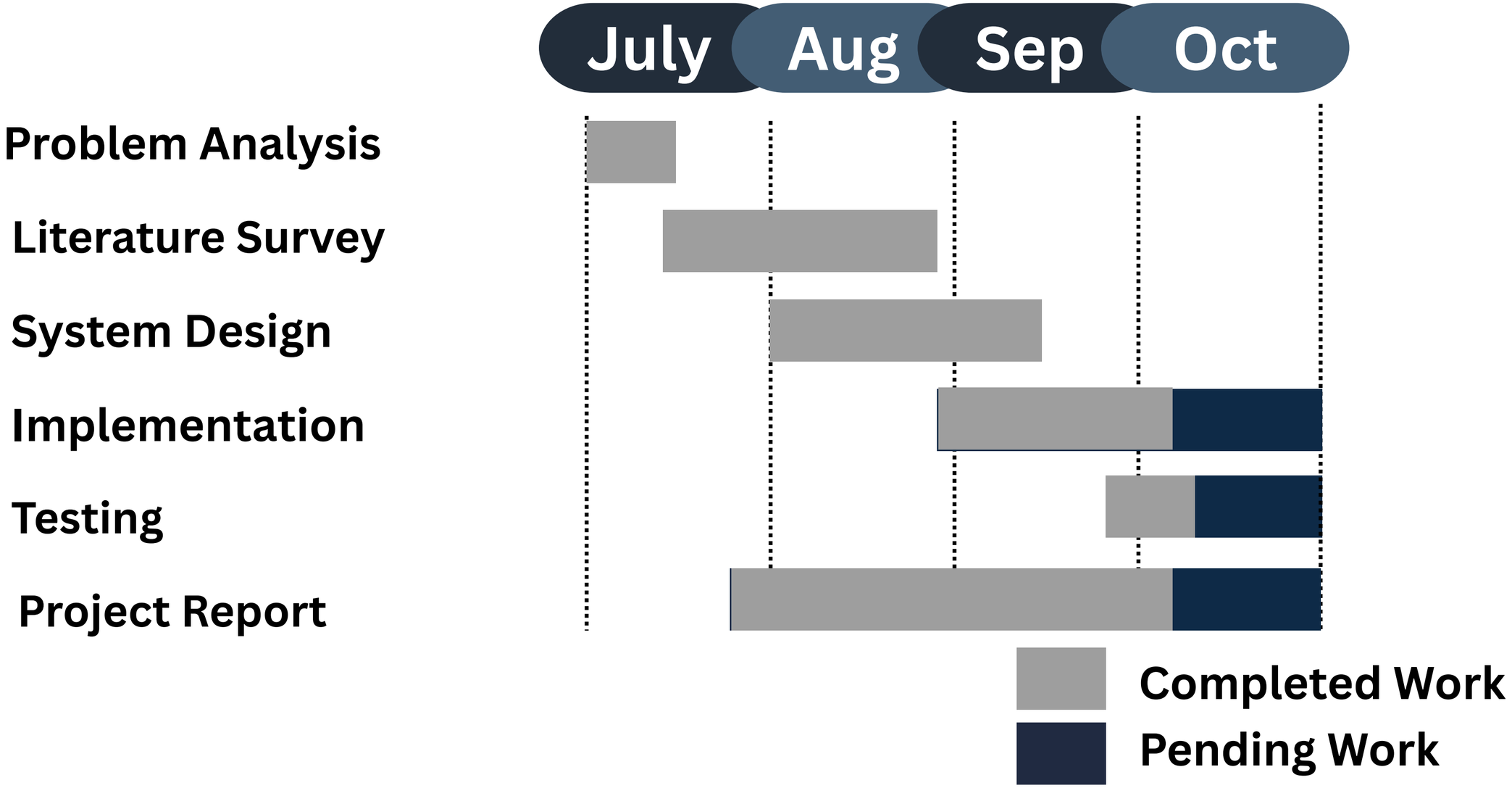
Send Custom Reminder
Push an immediate, custom notification to The Elder's device.

Remote SOS Activation
Emergency: Trigger the SOS protocol on The Elder's device remotely.

Safety & Emergency

Update Emergency Contacts
Manage SOS contacts for The Elder.

Project Timeline



Future Scopes

- **IoT Integration** – Connect with wearables and smart home devices for health monitoring
- **Emotion Detection** – Identify mood from voice tone and respond empathetically
- **Offline Support** – Lightweight models for limited internet connectivity
- **Integration with Healthcare** – Linking reminders with doctors and pharmacies
- **Scalability** – Deploy as a platform for other groups (patients, disabled, mental health)

Conclusion

- Mitra successfully utilizes the Gemini LLM for empathetic conversational support (Chatbot), providing natural, context-aware interaction.
- Key elder-focused features like Health Vitals logging and Brain Games (Sudoku) are fully implemented, promoting proactive wellness.
- Built on Flutter with OTP authentication, ensuring the app is highly secure, cross-platform, and accessible via a simple UI.
- The design is primed for the immediate development of the Caregiver Dashboard for remote monitoring and adherence tracking in the next phase.
- Promotes independence, dignity, and emotional well-being of seniors.

References

- Smart Sheba: Enhancing Elderly User Experience with LLM-Enabled Chatbots and User-Centered Design
- Generative AI in the context of assistive technologies: Trends, limitations and future directions
- A Study on Performance Improvement of Prompt Engineering for Generative AI with a Large Language Model

THANK YOU