AI Health Assistant App

the role of Generative AI on Tigray Healthcare

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Requirement Analysis Document

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# Introduction

## Project Overview

This mobile-first application is an AI health chatbot (Assistant) that users can interact with to ask health related questions such as general health, guidance on trauma recovery (physical and mental), symptom checking and first-level advice, access mental support and stress management resources. It will serve as a 24/7, private and accessible assistant for communities with limited access to healthcare professionals or facilities.

## Goals

* AI powered chatbot for accessible and multilingual health support (English + Tigrigna)
* Deliver trauma related guidance
* Offer basic medical knowledge
* Ensure safety by avoiding dangerous and misleading recommendations
* Lightweight and reliable application, even with limited internet access
* Lay a foundation for a future integration

## Target Users

* Individuals in Tigray seeking basic, trustworthy health guidance
* People experiencing war-related trauma
* Health workers recommending chatbot as a community resource

## Project Rationale and Importance

The people of Tigray face unique health challenges due to the war and its aftermath:

* Inaccessibility to healthcare facilities (damaged hospitals, lack of ambulances, overcrowding)
* Shortage of healthcare professionals
* Financial barriers
* Cultural stigma and unawareness around mental health and sensitive topics
* Psychological trauma caused by conflict, displacement, and violence
* Due to limited and unreliable internet access in much of Tigray, the chatbot must be able to function offline. A rule-based approach ensures that users can still access critical first-aid and health information without connectivity

This project is going to work on addressing these issues by providing an accessible, affordable, private, scalable, and education providing platform accessible in the local languages. The project aims to reduce avoidable suffering by providing timely, first-aid guidance, empower users with health knowledge to make informed decisions, provide a safe, stigma-free environment for mental health conversations, and support trauma recovery with empathetic AI-driven interactions.

# Scope

## In-scope

* Provide general health information in Tigrigna and English
* Offer first-level guidance on common symptoms
* Deliver mental health support
* Give basic first-aid instructions for emergencies
* Provide health education
* Offer referrals to healthcare professionals
* Ensure privacy and anonymity
* Ensure offline usability through a rule-based engine, since internet access is limited or unreliable
* AI fallback when there is internet access and the query is not included

## Out-of-scope

* Diagnose medical conditions
* Prescription of medications
* Handle real-time emergency medical services
* Guarantee real-time medical conditions or outcomes
* Replace professional therapy or counseling
* Interaction with hospital systems

# Requirements

## Functional Requirements

1. The system should allow users to input health-related questions in Tigrigna and get responses in Tigrigna (Tigrigna inputs will be translated to English, processed and then translated back to Tigrigna).
2. The system should cover key health-awareness topics
3. The system should have a simple mobile-based chat interface
4. The system should be able to analyze a situation and provide a first-aid guidance
5. The system should give a step-by-step instruction for first aid scenarios
6. The system should filter and only provide information only from legitimate sources (such as WHO, Health ministry and so on)
7. Allow symptom reporting without storing personal health data
8. The system must provide rule-based health guidance offline, without requiring internet connectivity
9. AI fallback (when available) can be used for queries not covered by the rule-based engine
10. Knowledge base is maintained in English. Translation APIs are used to handle other languages in online mode, while localized JSON files handle offline mode.

## Non-functional Requirements

1. The system must be delivered as a mobile-first progressive web app (PWA) and wrapped as a native Android application using capacitor. Enabling both online and offline usage.
2. Responses must be medically reliable and validated against trusted sources
3. The system should be easy to use for every individual, especially for users with limited digital literacy
4. Responses should be generated with a short time
5. The system should be clear and culturally appropriate
6. Enable scalability to handle multiple concurrent users
7. Ensure security and privacy
8. The system must function offline with limited features (rule-based KB).
9. When internet is available, the system may call external APIs (Google Translate, OpenAI GPT) for improved performance.

# Methodology

* 1. Data Sources
* WHO
* Ethiopian Ministry of Health
* Verified health guidelines
* Trauma recovery protocols
  1. AI and Rule-based Model
* **Rule-based knowledge base (offline-first):** JSON-based medical guidelines in multiple languages for reliable operation without internet.
* **Generative AI fallback (online):**GPT model used only when internet is available, providing flexible responses and handling scenarios beyond the KB.
* **Translation module:** Google Translate API used to process Amharic and Tigrigna inputs into English for consistent AI/KB processing, and to return responses in the user’s language. Google Translate is chosen over GPT’s built in translation because it provides significantly more accurate results for low-resource languages, reducing the risk of mistranslation.
  1. Safety Filtering
* **Rule-based safety checks (offline):** Block unsafe or irrelevant queries based on predefined keyword filters.
* **AI-powered safety filter (online):** OpenAI’s moderation API used to detect harmful, unsafe, or misleading content before responses are displayed. And only fetch information from reliable sources.
  1. Testing and validation
* Accuracy testing using verified health questions
* Feedback from local healthcare professionals and volunteers
* Usability testing for users with varying digital literacy

The rule-based engine will serve as the primary offline module, while AI fallback will be used only when internet or sufficient computing resources are available.

# Tools and Technologies

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| Layer | Technology | Purpose |
| Frontend | Vue.js +Vite | Mobile-first, lightweight, PWA for chat interface; supports offline caching |
| Backend | FastAPI | Handles requests, session managements, translation calls, AI integration, logging, and safety filtering |
| Rule-based engine | Python dictionary/ JSON KB | Provides structured offline-first responses for first-Aid, general health and trauma care |
| AI Engine (Online) | GPT (via API) | Provides flexible, empathetic responses when internet is available; fallback if KB lacks answer |
| Knowledge Base | JSON / SQLite | Stores rule-based responses, FAQs, health guides, multilingual content |
| Multilingual Support | Google Translate API | Ensures input/output in English and Tigrigna, balancing accuracy with offline reliability |
| Safety Filter | Rule-based checks + AI moderation API | Prevents unsafe, harmful, or misleading outputs |