PROBLEM STATEMENT

Current Challenges in Rural Healthcare:

- Lack of preventive healthcare awareness
- Delayed recognition of diseases like dengue, malaria, Rickettsial infections, Leptospirosis
- Communication gaps, language and digital literacy barriers
- Lack of real-time health data sharing in rural areas. Inefficient data collection and dissemination

Why This Matters:

- Low awareness leads to higher incidences of preventable diseases. Delays in diagnosis can cause severe health complications and increased costs.
- Lack of real-time data complicates timely interventions and resource allocation.
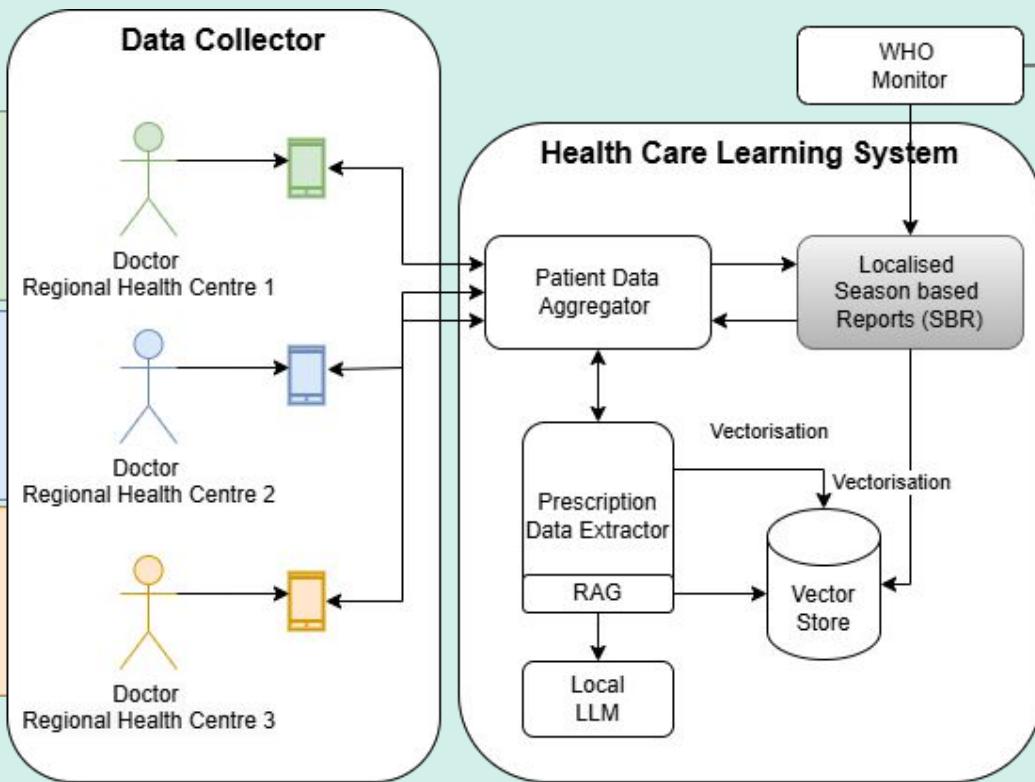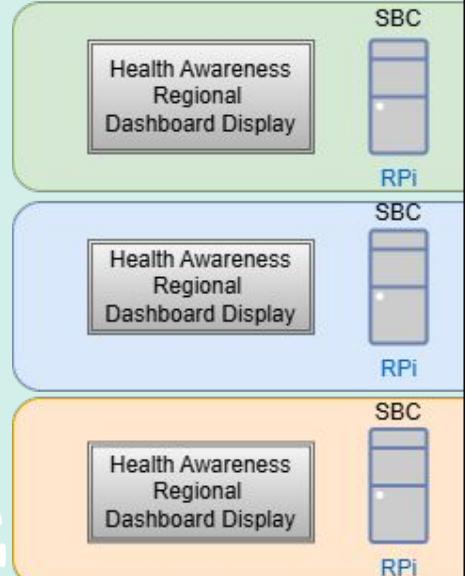
SOLUTION

- **What We Can Build:**
  - Realtime data driven health alert generation which can be broadcasted and displayed on public screens and social media
  - An app for doctors of local hospitals in rural areas to provide contextual information to health alert website
  - Gamified learning to educate rural population about communicable and common diseases
- **Key Technologies:**
  - **Retrieval-Augmented Generation (RAG)** for context based responses
  - **Broadcasting system** for general public accessibility
  - **Mobile & Web Interface** for remote access

SYSTEM ARCHITECTURE DIAGRAM

SOLUTION

Our solution entails three functional modules:

1. <u>Data collector:</u>

- The system collects data from two sources- doctor app (which reads age, gender and diagnosis on the prescriptions ignoring patient identity), general season based reports and public health alert system/ database (WHO).
- Possible Health alerts (Dengue, Diarrhea) from other nearby regional health centers can be pushed to doctors' app by providing an early indication to doctors to provide an early precautionary suggestion to visiting patients

2. <u>Healthcare Learning System:</u>

- Prescription data is digitised and a summary is generated using LLM. Statistics for health alters is monitored and upon crossing a threshold in a localised region (using RAG) is sent to the broadcast module.
- Using the symptoms, diagnosis and medication, it learns by extracting similar data from vector store and aggregates the data and stores it back in the vector store.

3. <u>Message Broadcastor:</u>

- Fetches the content that needs to be displayed on Public Screen or to Send as Bulk SMS or WhatsApp message, from Learning / Knowledge System.
- Public Display Screens will have a Single Board Computer like Rpi which can fetch content from Broadcaster. They can be installed near popular public locations (bus stands, railway stations, cinema halls, etc.) to reach a maximum audience.

TECH STACK AND IMPLEMENTATION

☐1 **Frontend (User Interface)**

✅ **Tech:** React.js/ Flutter (Web & Mobile), TailwindCSS, Axios
✅ **Features:**

- Mobile-friendly UI
- Hosted on Vercel / Firebase

☐2 **Backend (API & AI Processing)**

✅ **Tech:** FastAPI (Python), Redis (Caching), PostgreSQL (database)
✅ **Functions:**

- Handles user queries (Text/Voice)
- Communicates with AI Model
- Manages response caching

☐3 **AI Model - Retrieval-Augmented Generation (RAG)**

✅ **Tech:** OpenAI GPT-4, LangChain, FAISS / ChromaDB
✅ **How It Works:**

- Retrieves health data from **WHO, CDC** sources
- Uses **vector embeddings** for search
- Enhances responses with **GPT-4**

☐4 **Speech Processing - Voice Input & Output**

✅ **Tech:** Whisper AI (Speech-to-Text), Google TTS (Text-to-Speech)
✅ **Flow:**

- Converts voice to text → AI processes query → Returns spoken response

☐5 **Deployment & Cloud Infrastructure**

✅ **Tech:** AWS Lambda / GCP Cloud Run, PostgreSQL (AWS RDS)
✅ **Setup:**

- Serverless backend (scalable & cost-effective)
- API secured with **JWT authentication**

REAL-LIFE APPLICABILITY

Early Disease Detection – AI analyzes symptoms like fever and suggests preventive measures.

Maternal Health Guidance – AI provides diet and nutrition, basic counseling advice and mental health awareness resources for pregnant women.

Community Health Education – AI-powered digital screens educate on hygiene, vaccinations, and disease prevention.

Season Based Disease Alerts- Broadcasts season based preventative measures and disease remedies.

Pros:

- Enhances accessibility to education
- Provides real-time health information
- Increases engagement through interactive content
- Can reach remote or underserved populations

Cons:

- Limited by internet access and data connectivity
- Requires device ownership or public screen access
- Risk of misinformation if content is not properly vetted

FUTURE ENHANCEMENTS AND CONCLUSION

AI-based Symptom Checker: Integrating AI-powered tools to assess user-reported symptoms, providing personalized health advice, and guiding users towards appropriate care pathways based on real-time data and machine learning algorithms using blockchain for secured and distributed access.

Integration with Government Health Programs: Collaborating with governmental health initiatives to align content, resources, and services, ensuring that the platform supports national health goals and provides seamless access to public healthcare programs.

Potential Impact:

- Increased health awareness
- Early disease detection and prevention
- Empowerment through accessible healthcare

Why Our Project Stands Out:

- Focus on rural healthcare challenges
- Scalable and accessible tech solutions
- Real-time, learning and recommendation health alert system for both public and doctors