HEALX

Health Platform

PSB6: Free Health Camps and Emergency Services

Presented By: K S ABISHEK
DEVARANJAN J
HARINI S
BIRUNDHA S

Problem Statement

Why HEALX was built

HEALX

❌ Fragmented Healthcare Access

Rural and underserved communities lack coordinated platforms to access free health camps and medical services.

⏱️ Delayed Emergency Response

No real-time ambulance tracking or intelligent dispatch leads to critical delays during medical emergencies.

📋 Disconnected Medical Records

Patient histories, prescriptions, and lab results are scattered across systems with no unified patient record.

🔍 Reactive Instead of Predictive

Healthcare providers lack AI-driven tools to predict disease outbreaks or assess emergency severity in advance.

⚡ The gap: no unified platform combining emergency dispatch, AI triage, camp management, and real-time tracking in one place.

Existing Solutions & Limitations

What's already out there — and what's missing

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Solution	What It Does	Key Limitation
eSanjeevani	Telemedicine for rural India	✗ No emergency SOS, no ambulance tracking
EMRI / 108	Emergency ambulance dispatch	✗ No patient records, no AI prediction
NHA / ABDM	Unified health ID scheme	✗ No real-time coordination, no camp management
Hospital Apps	Appointment booking, records	✗ Siloed per hospital, no inter-op

🔶 Common Gap: None of these solutions offer a unified platform with real-time tracking + AI triage + health camps + patient records in one place. PSB6 bridges this gap.

Proposed Solution

HEALX— A unified MERN + AI health platform

HEALX

Health Camps

Create, manage & register patients for free health camps with full logistics.

Emergency SOS

One-tap SOS with geo-location, auto-ambulance dispatch & AI severity scoring.

Ambulance Tracking

Real-time GPS-based tracking with status updates & route optimization.

Patient Records

Unified medical history, prescriptions, lab results & doctor notes.

AI Predictions

ML-powered disease classification, outbreak detection & triage scoring.

Analytics

Live dashboards, disease prevalence charts & response time analytics.

Making healthcare accessible to everyone — anytime, anywhere.

Technology Stack

MERN + Python AI Microservice + Docker

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Frontend	Backend	AI / ML
React.js	Node.js	Python 3.9+
React Router	Express.js	FastAPI
Tailwind CSS	Socket.io	Scikit-learn
Chart.js	JWT Auth	NumPy
Open street map	bcryptjs	Pandas
Socket.io Client	Helmet.js	Uvicorn
Axios	Morgan	
Context API	Mongoose	

Database: MongoDB with Geospatial Indexes • Mongoose ODM • Aggregation Pipelines

DevOps: Docker • Docker Compose • MongoDB Container

System Architecture

Three-tier distributed system with real-time communication

HEALX

Presentation Layer

- React App (Port 3000)
- Admin Dashboard
- Open Street Maps

HTTP / REST API + WebSocket (Socket.io)

Application Layer

- Node.js / Express (Port 5000)
- Socket.io Real-time
- JWT Middleware

MongoDB + FastAPI ML Calls

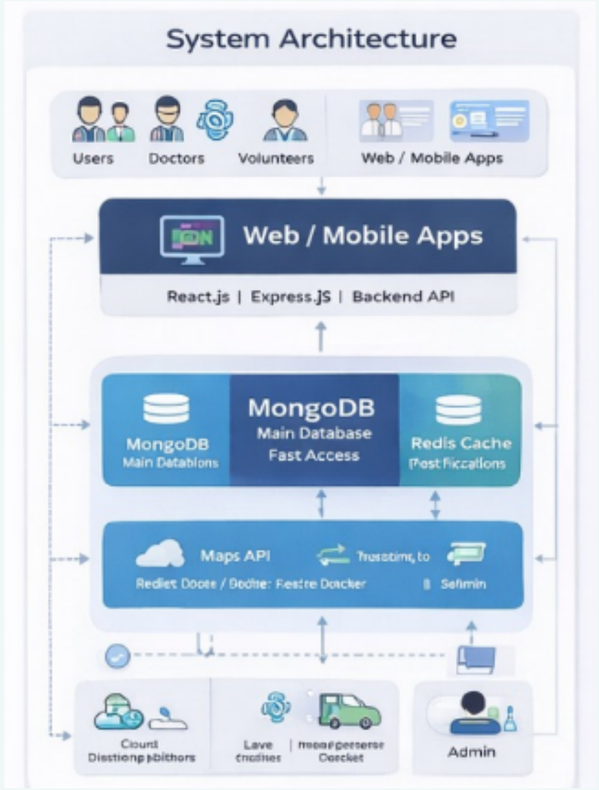
Data / AI Layer

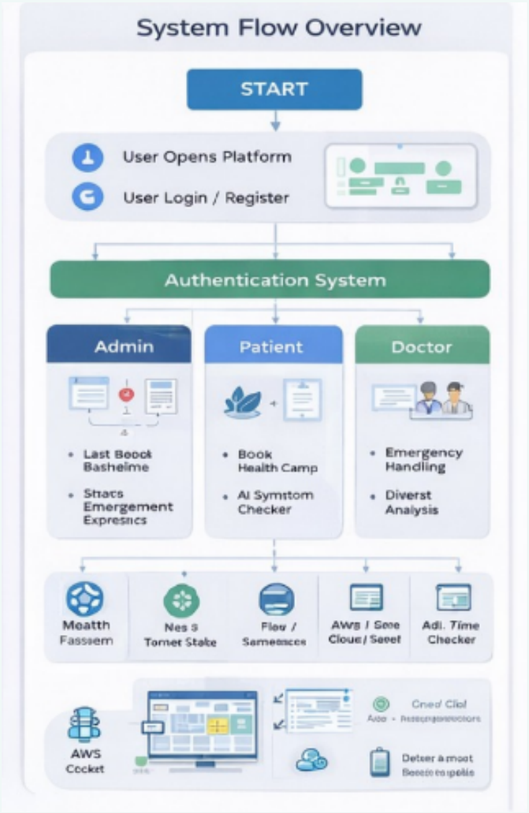
- MongoDB (Port 27017)
- FastAPI AI (Port 8000)
- Geospatial Queries

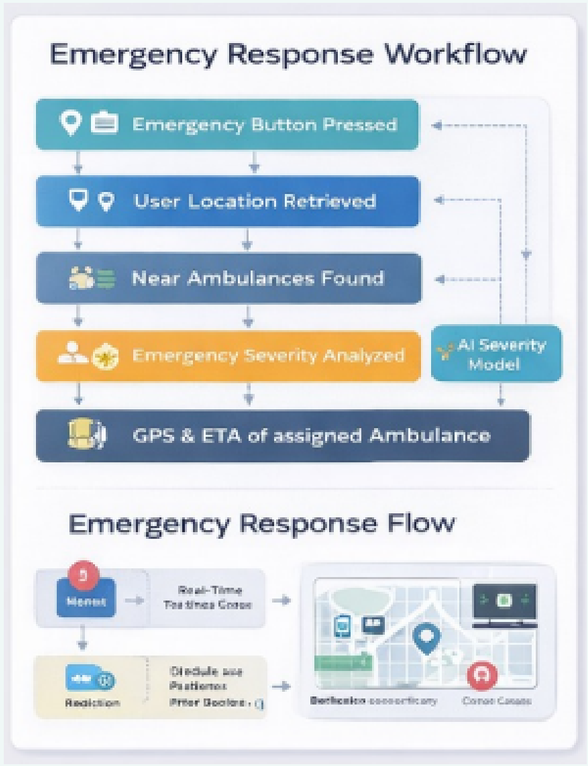
All services containerized with Docker • Scalable to 100k+ users • Load balancer ready

System Architecture

HEALX







Data Flow Diagram

How information moves through the system

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1 User Login

JWT token issued & stored; role-based access granted

2 Emergency SOS

Geolocation captured → Emergency record created → AI severity scored

3 Ambulance Dispatch

Nearest available ambulance located → Assigned → Real-time updates via Socket.io

4 Dashboard

Live stats fetched via WebSocket → Charts.js renders analytics → Heatmap updated

5 Medical Records

Patient-doctor records queried → Nearby camps via geospatial index → History displayed

6 AI Microservice

Symptoms + vitals sent to FastAPI → ML model classifies severity → Score returned

Methodologies

Principles driving development and design

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🔗 RESTful API Design

- 40+ REST endpoints with clear resource naming
- Stateless communication with JWT bearer tokens
- Rate limiting and input validation on all routes

⚡ Real-time Communication

- Socket.io for bidirectional event streaming
- Events: ambulance:move, emergency:update, dashboard:refresh
- WebSocket fallback to HTTP long-polling

🤖 AI/ML Pipeline

- Scikit-learn models for severity classification
- FastAPI microservice decoupled from main backend
- Outbreak prediction via historical disease data

🔒 Security-First Approach

- JWT + bcrypt for auth & password hashing
- Helmet.js security headers + CORS policy
- Role-based access: Admin, Doctor, Patient, Volunteer

📍 Geospatial Querying

- MongoDB 2dsphere geospatial indexes
- Find nearest health camps & ambulances
- Real-time location tracking with GPS coordinates

🐳 Containerized DevOps

- Docker Compose for multi-service orchestration
- Separate containers: React, Node, MongoDB, FastAPI
- Cloud-ready: AWS, Azure, GCP, Kubernetes

System Modules

Core components of the HEALX platform

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01 User & Auth Module

Registration, login, JWT auth, role management (Admin / Doctor / Patient / Volunteer / Driver)

02 Health Camp Module

Camp creation, scheduling, patient registration, doctor/volunteer assignment, camp reports

03 Emergency SOS Module

SOS trigger, geolocation capture, AI severity prediction, ambulance dispatch, timeline tracking

04 Ambulance Management Module

Real-time GPS tracking, status updates (available/busy/offline), location history, route-optimization ready

05 Medical Records Module

Patient health records, prescriptions, lab tests, doctor consultation notes, geospatial camp finder

06 AI / Prediction Module

Emergency severity classifier, disease classification, health risk scoring, outbreak predictor, medical chatbot

07 Analytics & Dashboard Module

Real-time statistics, disease prevalence charts, response time analytics, heatmaps via Chart.js

08 Notification Module

In-app + push notifications, priority-based delivery (Critical/High/Normal), multi-channel support

HEALX Health Platform

One platform. Every emergency. Every patient. Every camp.

- ✓ Unified emergency + camp + records platform
- ✓ AI-powered triage & outbreak prediction
- ✓ Real-time ambulance GPS tracking (Socket.io)
- ✓ Secure, scalable MERN + Python microservice architecture
- ✓ Docker-containerized & cloud-deployment ready