CodeSmiths

June
2025

Case Study ↗

AI-Powered Disease Surveillance System for Vector-Borne Illnesses

Prepared by :
Shubham Chavda

Prepared for :
Comline Auto Parts Ltd

Table of Contents

Introduction

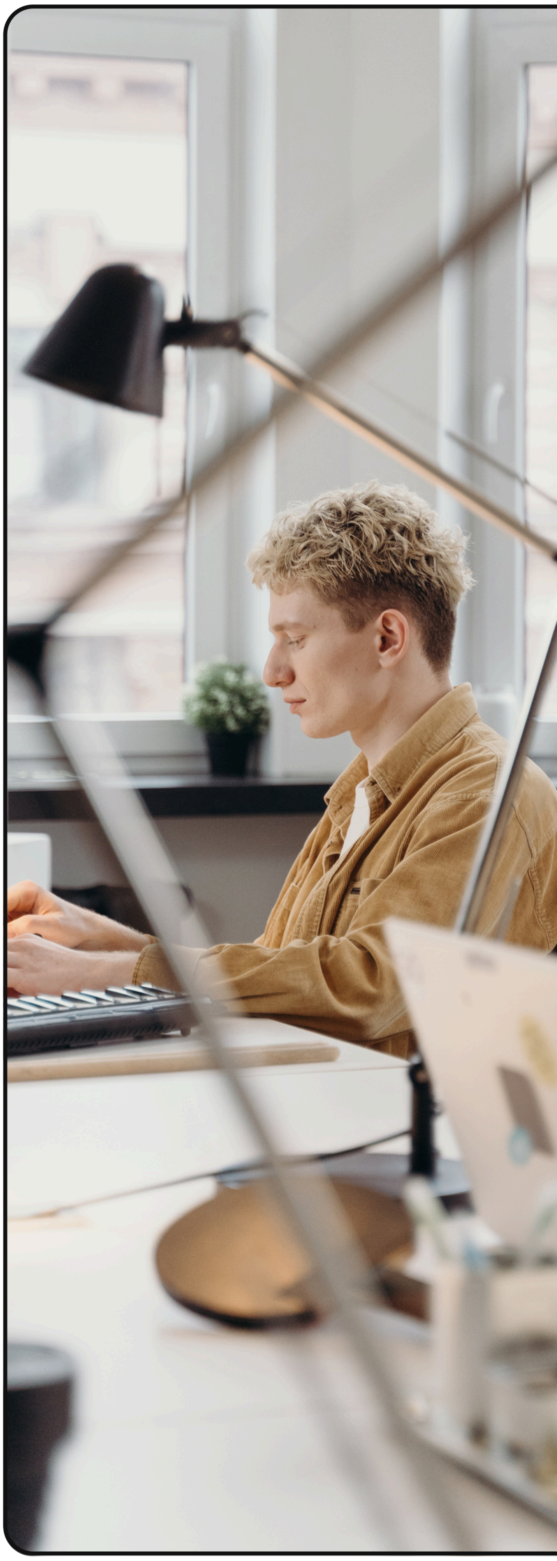
Siyana Info Solutions Pvt. Ltd., a key IT solution provider for government and public health departments, partnered with our team to revolutionize the process of disease surveillance across the state of Gujarat. The goal was to replace outdated, manual, and delayed reporting systems for tracking vector-borne diseases such as dengue, malaria, and chikungunya.

Previously, health authorities faced significant challenges due to manual data collection, poor communication across departments, and the inability to forecast outbreaks. The new system leverages artificial intelligence, real-time analytics, and multilingual capabilities to provide accurate, actionable insights and alerts, ensuring faster, more proactive responses to public health risks.

Business Challenges

01

Data from hospitals and labs was reported manually via physical forms or emails, causing delays of up to a week before cases could be validated or acted upon.



02

Case reports were handwritten or scanned as PDFs, resulting in data loss, low traceability, and difficulties in trend analysis.

03

The public health departments had no way of forecasting potential outbreaks or identifying high-risk zones in advance based on historical and environmental data

04

Alerts were typically communicated through phone calls or emails, often too late to trigger preventive field action. There was also no system to send area-specific alerts.

05

Officers from rural and semi-urban districts had limited proficiency in English, making it difficult to access central dashboards or interpret technical reports accurately.

Objective

01

Eliminate delays in capturing and reporting disease data across all districts.

02

Build an AI-driven forecasting engine to predict outbreaks in advance.

03

Introduce natural language query interfaces to simplify system interaction

04

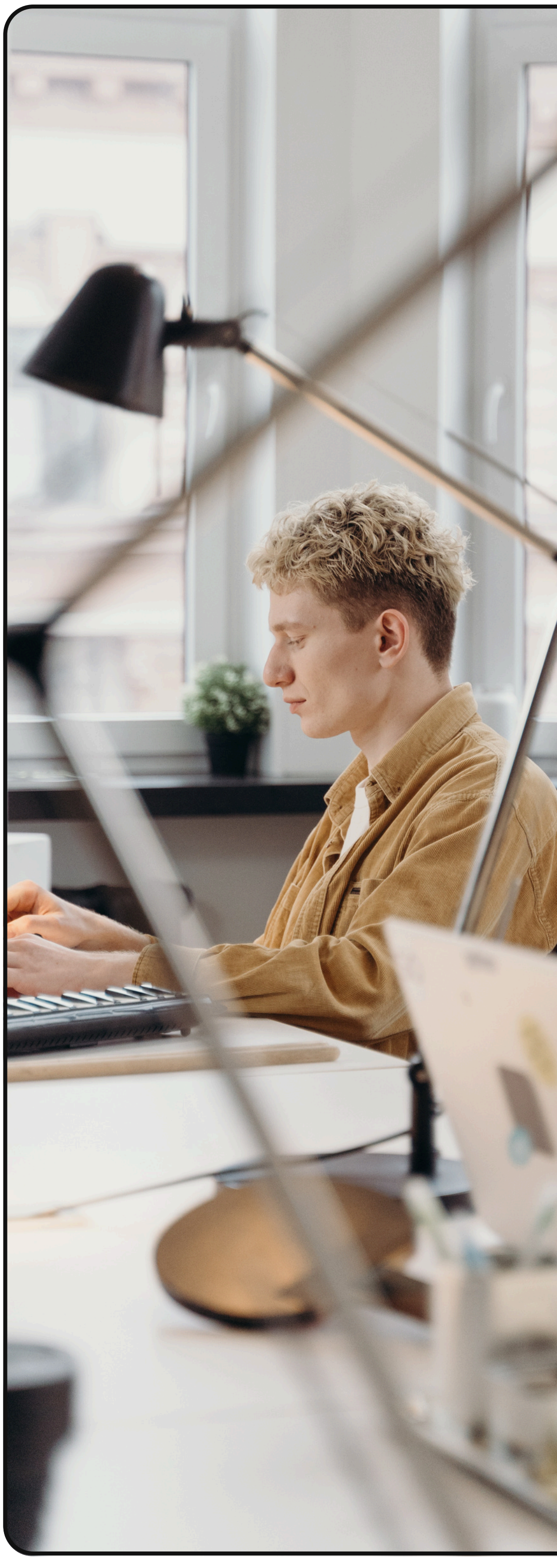
Automate geo-fenced alerts and public health notifications

05

Ensure all features are multilingual to accommodate Gujarat’s diverse workforce

06

Enable seamless integration across hospitals, laboratories, and municipalities



Solution Overview

We developed a cloud-native, AI-powered disease surveillance and forecasting platform that consolidates reporting, analytics, forecasting, and multilingual communication into a unified system. This was achieved using the Microsoft Azure ecosystem, ensuring high scalability, security, and future extensibility.

➔ Smart Data Collection & Aggregation

- APIs were developed to connect with hospitals, diagnostic labs, and local health departments.
- AI-based Optical Character Recognition (OCR), powered by Azure Cognitive Services, was used to digitize handwritten or scanned reports.
- The collected data was stored and organized in Azure Data Lake and SQL Server for further analysis and historical reference.

AI Forecasting Engine

- A predictive model was built using Azure Machine Learning Studio, combining historical disease incidence with real-time environmental data (rainfall, humidity, temperature).
- The model accurately forecasts outbreak risks 7–14 days in advance, enabling early intervention.

Natural Language Interface

- Azure OpenAI (GPT-4) powers a query interface for health officers to interact in natural language.
- Example queries include:
  "Show me malaria cases in Vadodara this month"
  "Generate dengue trend reports for Ahmedabad"
- This feature democratized access to insights regardless of technical expertise.

Real-Time Dashboards and AI Insights

- Azure Logic Apps and Twilio integration enabled automated SMS and WhatsApp alerts.
- Geo-fencing was implemented using Azure Maps to notify field officers and health workers when outbreaks crossed threshold values within a district.
- Threshold-based logic ensured alerts were only sent when necessary.

Automated Alerts and Geo-Fencing

- Azure Logic Apps and Twilio integration enabled automated SMS and WhatsApp alerts.
- Geo-fencing was implemented using Azure Maps to notify field officers and health workers when outbreaks crossed threshold values within a district.
- Threshold-based logic ensured alerts were only sent when necessary.

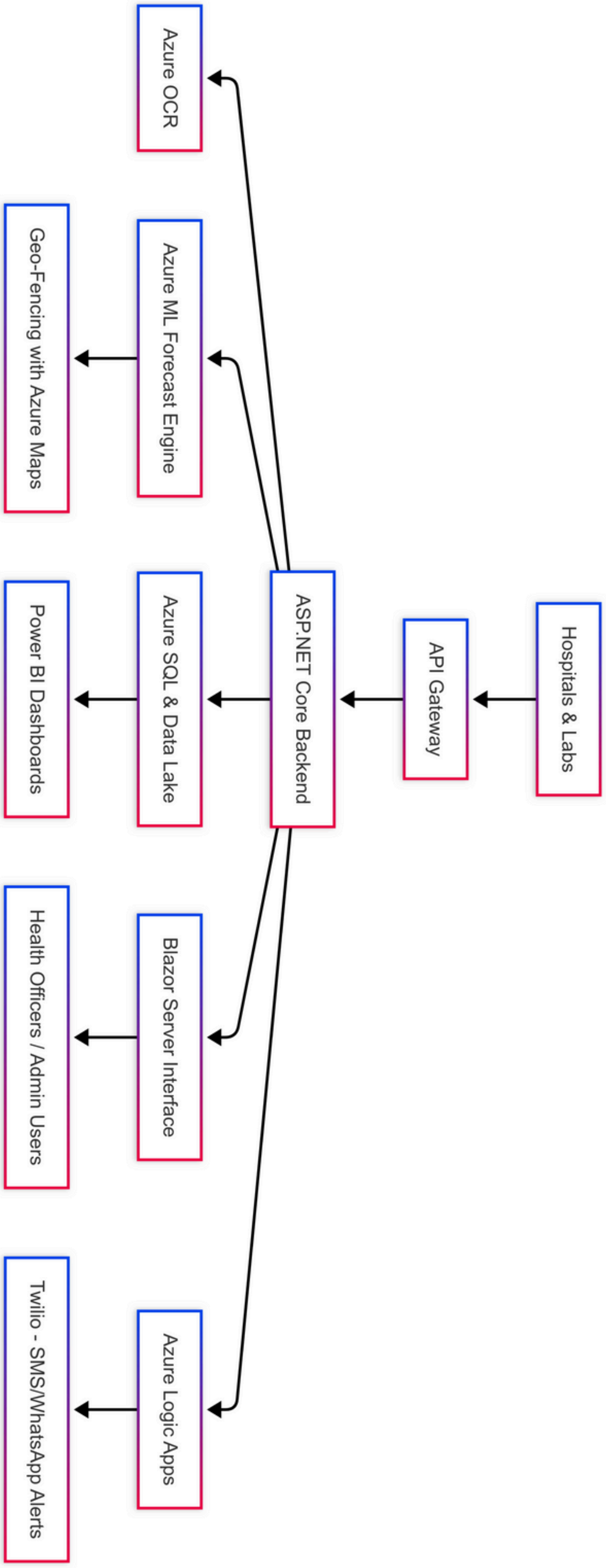
Multilingual Support

- Azure Translator enabled the platform to support Gujarati, Hindi, Marathi, and English.
- Officers can view dashboards, receive alerts, and interact with chatbots in their preferred language.
- PDF reports and summaries are auto-generated in the selected language.

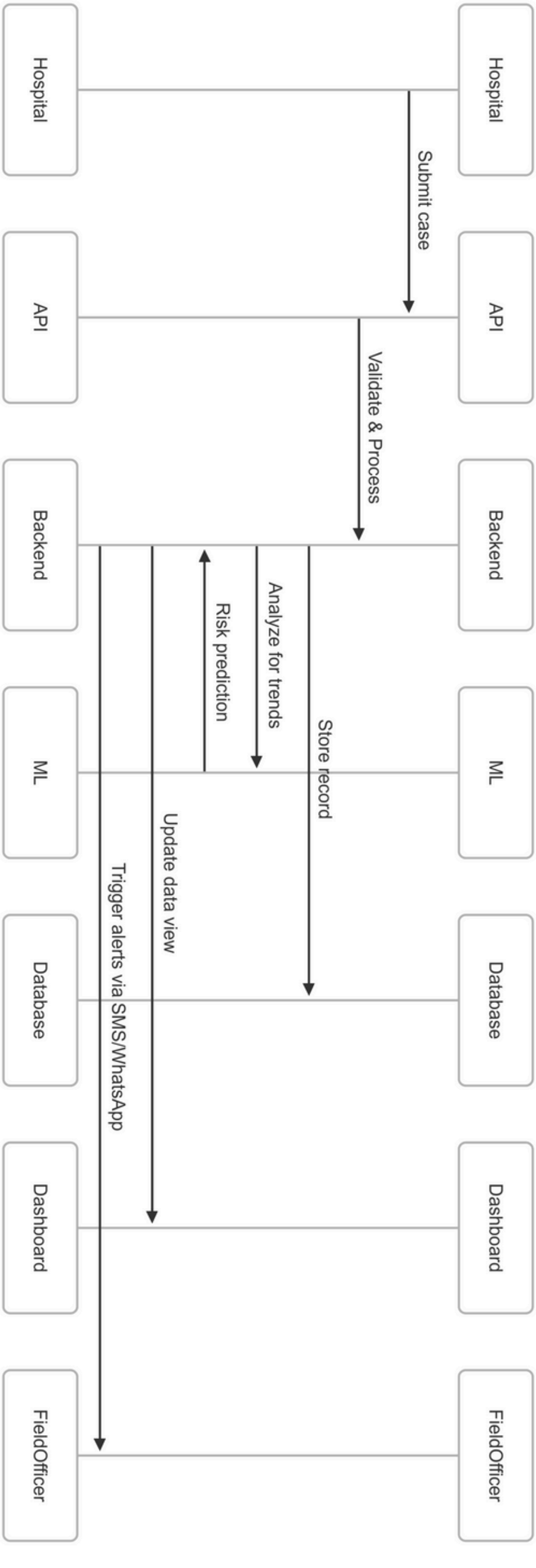
Timeline

Phase	Timeline	Key Milestones
Discovery & Planning	3 Weeks	Process mapping, requirement gathering, data structure
Infrastructure Setup	2 Weeks	Azure services setup, security policies, access control
Core Development	5 Weeks	API integration, AI OCR, database architecture
AI Forecasting Model	3 Weeks	ML model training with historical + environmental data
UI & Dashboard Dev	4 Weeks	Blazor interfaces, Power BI dashboards
NLP & Multilingual	2 Weeks	GPT-4 integration and Azure Translator enablement
Testing & Training	3 Weeks	System testing, officer training, stakeholder walkthrough
Production Launch	1 Weeks	Final deployment, monitoring setup, support handover

Solution Architecture Diagram



Data Flow Diagram



CodeSmiths

June
2025

Solution Architecture Overview

Component	Purpose
ASP.NET Core	Backend logic and API orchestration
Blazor Server	Real-time web interface for field and administrative users
Azure OpenAI (GPT-4)	Natural language interface and report summarization
Azure ML Studio	Predictive modeling for outbreak detection
Azure Cognitive Services OCR	Digitization of scanned documents
Azure Maps	Geo-fencing, risk zone visualization, and location tracking
Azure Logic Apps + Twilio	Automation of alerts via SMS and WhatsApp
Azure Data Lake + SQL Server	Centralized health data storage
Azure Translator	Multilingual communication across users
Power BI Embedded	Interactive dashboards with real-time data
Azure Active Directory	Secure, role-based authentication and access control

June 2025

Impact and Results

Metric	Before Implementation	Mitigation Plan
Reporting Time	5–7 Days	Real-time (under 1 hour)
Outbreak Forecasting	Not Available	88% Accuracy, 7–14 days in advance
Alert Mechanism	Manual Calls and Emails	Automated SMS/WhatsApp with geo-fencing
Officer Engagement	Static PDF Reports	Interactive dashboards and chatbots
Language Accessibility	English Only	Multilingual (GU, HI, MR, EN)
Public Communication	Manual, occasional	Real-time via live dashboards