

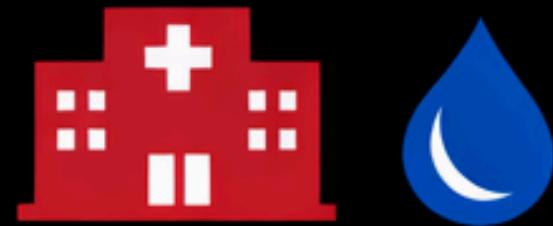
VECTOR SHIELD

Predictive Disease Outbreak Dashboard

- PROBLEM STATEMENT ID : PS5
- TEAM NAME : Vector Shield
- TEAM ID : HK-200
- TEAM MEMBERS :
 - Dhrumil Parikh
 - Dhruv Kumar Singh
 - Aditya Gautam
 - Kartik Kansal



PROBLEM & SOLUTION



PROBLEM

- Late detection of disease outbreaks
- No unified hospital + water data system
- Lack of predictive intelligence
- No real-time geospatial monitoring
- No automated early alerts

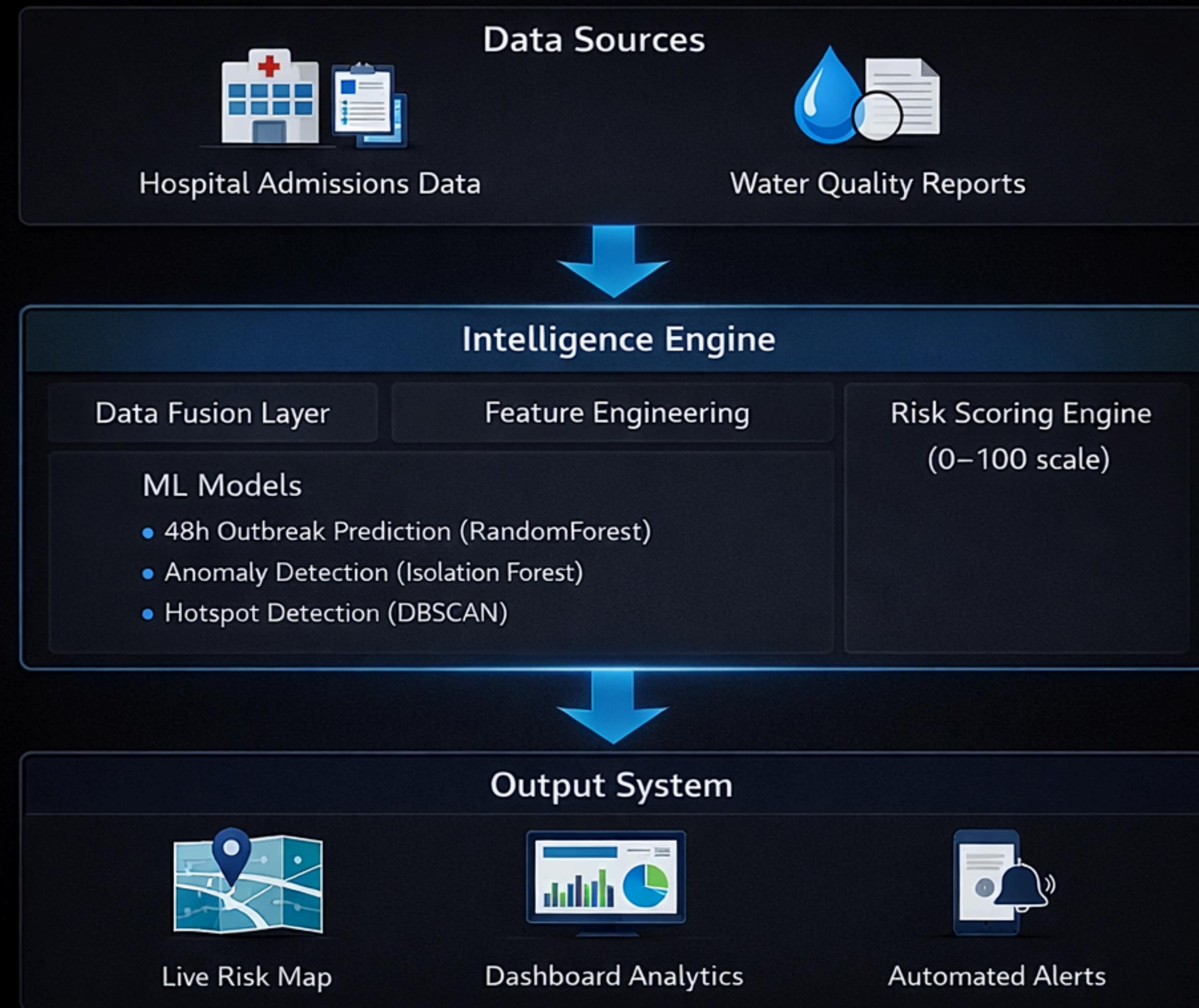


SOLUTION

- Integrates hospital + water datasets
- Detects anomalies & correlations
- Predicts outbreaks 48 hours in advance
- Identifies geographic hotspots
- Classifies risk levels (0-100 scale)
- Live interactive geospatial dashboard
- Automated alerts



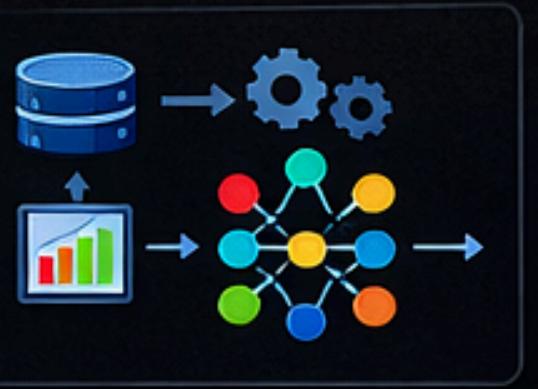
Flow of Solution





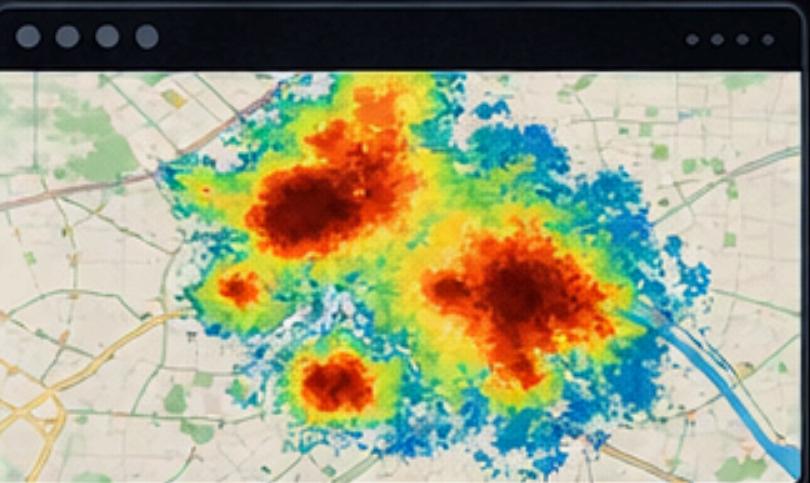
Machine Learning

- RandomForest → 48-hour outbreak prediction
- Isolation Forest → anomaly detection
- DBSCAN → hotspot clustering
- Risk Scoring Engine



Frontend

- React + Vite
- Tailwind CSS
- Leaflet Maps
- Real-time Dashboards



Backend

- FastAPI
- Python
- Pandas, NumPy
- Scikit-learn
- SQLite



Data

- 6 Months Hospital Data
- Water Quality Reports
- Geo Enrichment



- 48-hour outbreak prediction capability
- Combines medical + environmental intelligence
- ML-driven anomaly detection
- Real-time risk classification (0-100 scale)
- Automated hotspot detection
- Scalable architecture for IoT integration



FEASIBILITY & CHALLENGES

FEASIBILITY

- ✓ Lightweight ML models
- ✓ Scalable FastAPI backend
- ✓ Modular architecture
- ✓ Frontend ready for real-time integration

CHALLENGES

- ⚠ Real-time data availability
- ⚠ Data standardization across hospitals
- ⚠ Deployment scale
- ⚠ Validation accuracy

RESEARCH & REFERENCE

- WHO Water Quality Guidelines
<https://www.who.int/water-sanitation-health/publications/2017/water-quality-guidelines/en/>
- CDC Disease Surveillance Models
https://www.cdc.gov/surveillance/diabetes-report-card/ds_health_indicators/index.html
- Random Forest Time Series Forecasting
https://scikit-learn.org/stable/auto_examples/ensemble/plot_forest_eco.html
- Isolation Forest Anomaly Detection
https://scikit-learn.org/stable/auto_examples/ensemble/_plot_isolation_forest.html
- DBSCAN Clustering Research
https://scikit-learn.org/stable/auto_examples/cluster/_plot_dbSCAN.html