Hybrid ML Model for Dengue Outbreak Prediction

Deployed System with Real Results

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Rationale

Problem Context

- Dengue = Major public health crisis
- Philippines: Tropical high-risk zone
- Current methods: Reactive approach
- Need for early warning systems

Solution Implemented

- Hybrid ML model deployed
- Real-time 4-week forecasting
- Web dashboard interface
- National scale coverage

Key Objectives

- Accurate outbreak prediction
- Early warning for authorities
- Optimized resource allocation
- Data-driven decision support

Current Status

- **Status:** Operational
- **Data Sources:** DOH + PAGASA
- **Update:** Weekly forecasts
- **Coverage:** National

Methodology

Data Pipeline

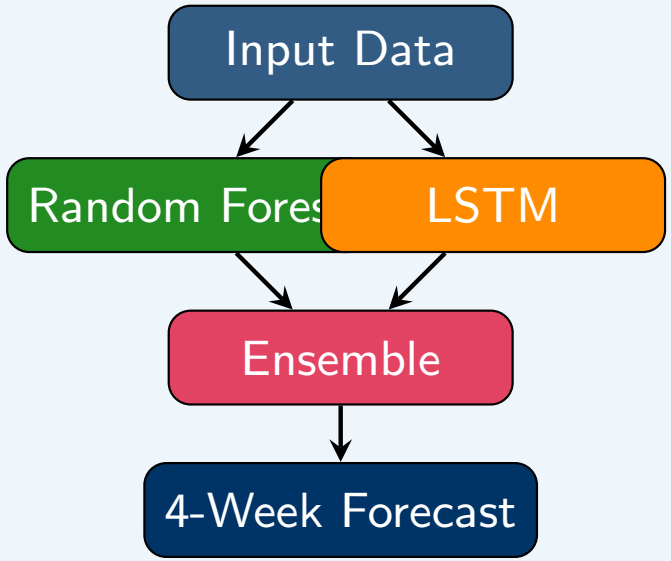
Sources:

- DOH case reports
- PAGASA climate data
- 10+ years historical

Key Features:

- Temperature metrics
- Rainfall patterns
- Case history lags
- Rolling averages

Model Architecture



Model Training

- Training: 2010-2019
- Testing: 2020-2021
- Time-series validation

Key Features

- Rolling averages
- Climate variables
- Seasonal patterns
- 1-6 weeks

Results and Discussion

Performance Metrics

RMSE: 155.47 cases

MAE: 119.31 cases

MAPE: 33.63%

Accuracy: 66.37%

Prediction Analysis

Testing: Feb 2020 - Jan 2021

Case Range:

- Actual: 91 - 1,150 cases
- Predicted: 218 - 808 cases

Current Forecast:

- Next Month: 236.5 cases
- Trend: Decreasing

Key Findings

- Captures outbreak trends effectively
- Conservative peak prediction
- Best in medium-risk periods
- Climate variables crucial

Top Predictors

1. Log cases transformation
2. 6-week temperature
3. 4-week case average
4. 3-week dengue lag

Recommendation

Current Deployment

Operational Features:

- Real-time forecasting
- Weekly model updates
- DOH dashboard access
- Automatic alerts

Future Enhancements

Technical:

- Mobile app development
- Enhanced features
- Real-time validation
- API development

Immediate Actions

- Expand to all regions
- DOH protocol integration
- Health officer training
- Performance monitoring

Strategic Impact

- Proactive outbreak management
- Data-driven resource allocation
- 4-week early warning
- Public health optimization