Revolutionizing Dengue Outbreak Management
AI - Driven Space Application in a Smart City Platform The Brazilian Case

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Dengue Fever Overview

Global Impact

Dengue fever is a significant public health concern, affecting millions of people worldwide annually.

Epidemiology

Dengue fever is prevalent in tropical and subtropical regions, with periodic outbreaks causing substantial morbidity and mortality.

Source: sciencedirect.com

ENDEMIC IN OVER 100 COUNTRIES

Aedes aegypti
Primary carrier of the virus

>5,000 cities at risk

Areas that are

- Highly suitable
- Moderately suitable
- Unsuitable

Source: sciencedirect.com
**Impact of Dengue Outbreaks**

**Health Burden**
Dengue outbreaks strain healthcare systems and lead to economic burdens due to treatment costs and productivity losses.

**Community Impact**
Outbreaks disrupt daily life, causing fear and anxiety among affected populations.

**Challenges in Management**
Rapid spread and varying severity of dengue outbreaks pose significant challenges for effective management and control.

US$ 39.3 billion (annual global cost)
Global Impact

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Epidemiology

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Dengue Outbreak Challenges

Understanding the complexity of Dengue Outbreaks and need for efficient and real-time solutions

Limitations of traditional disease management approaches

Geographic Information System (GIS)
Satellite-Based Forecasting Systems

Predictive Modeling
Space technology supports the development of forecasting models to predict dengue outbreaks based on environmental and climatic variables.

Early Warning Alerts
Satellite-based systems generate alerts for potential dengue outbreaks, enabling timely response and resource mobilization.

Community Engagement
Forecasting systems empower local communities to take proactive measures in dengue prevention and control.
Earth Observation Data
Geographic Information System (GIS)
Artificial Intelligence (AI)
Smart City Platform
DIPTERON Application

SOLUTION

EARLY-WARNING SYSTEM FOR DENGUE OUTBREAKS

TRAINING AND TEST DATA

PREDICTION MODEL
4 weeks in advance

NEW EARTH OBSERVATION DATA

SÃO JOSÉ DOS CAMPOS city PROJECT: MAY-AUG 2021
Earth Observation for Dengue Management

**Satellite Imagery**
Remote sensing satellites capture data on environmental conditions, water bodies, and land use, aiding in dengue risk mapping.

**Vegetation Indices**
Analysis of vegetation health and density helps identify potential mosquito breeding sites and dengue-prone areas.

**Urban Heat Mapping**
Space technology provides insights into urban heat islands, influencing mosquito habitat suitability and dengue transmission dynamics.
Spatial Analysis
GIS tools integrate satellite data to map dengue hotspots, analyze population vulnerability, and plan targeted interventions.

Risk Assessment
GIS-based risk assessment models aid in identifying high-risk areas for dengue outbreaks, guiding preventive measures.

Data Visualization
GIS platforms enable the visualization of dengue-related data, facilitating informed decision-making for public health authorities.
Artificial Intelligence (AI)

Machine Learning Algorithms
AI models analyze historical dengue data and environmental parameters to forecast potential outbreaks in 4 weeks advanced.

Spatial-Temporal Analysis
Spatiotemporal AI models identify geographical and seasonal patterns of dengue transmission for targeted interventions.

Explainable AI
AI models provide interpretable insights into the factors contributing to dengue outbreaks, aiding in decision-making.
Smart City Infrastructure

**Integrated Surveillance**
Smart city platforms enable real-time monitoring of environmental and health data to detect potential dengue outbreaks.

**Data Analytics**
AI algorithms process diverse data sources to identify patterns and predict potential dengue hotspots.

**Early Warning Systems**
Space applications provide satellite data for environmental monitoring, aiding in early detection of dengue risk factors.
DIPTERON AT SMART CITY WebVis PLATFORM

SATELLITES AVAILABLE

- SPOT-6/7
- PLéiades 1A/1B
- WORLDVIEW-1
- WORLDVIEW-2
- WORLDVIEW-3
- WORLDVIEW-4
- GEOSAT-1
- SENTINEL-1A/1B
- SENTINEL-2A/2B
- LANDSAT 4/5
- LANDSAT 7
- LANDSAT 8
- CBERS-4

FULLY PROCESSED IMAGES
(accurated, mosaized, balance color, etc.)
media, high & very high spatial resolution imagens

OPEN GEOSPATIAL CONSORTIUM (OGC)
FORMAT THROUGH CLOUD SERVICES

100% CLOUD INFRASTRUCTURE

AIRBUS, MAXAR, esa, USGS
PRODUCT

INPUTS

PARAMETERS:
- Precipitation
- Temperature
- Humidity
- NDVI
- EVI
- Altitude
- Wind

MODEL

DIPTERON MODEL USES:
- Dengue cases, Infestation Data from Health Municipality
- Socio Economic data from Statistical Institute
- Scalable and Robust Cloud Infrastructure
- Parameters from Satellite

POOLS
GARBAGES
Services

Smart City WebVIS Platform

Pilot: São José dos Campos, Brazil

- Advance localization of outbreaks
- Visualization of potential breeding sites
- Access number of cases and deaths in areas
Benefits

4 weeks in advance for risk areas

Help to plan and support logistical emergency management

Team time optimization

Saves money by reducing the costs of campaigns and remediation actions

Saves lives by minimizing the risk of Aedes viral diseases

Potential breeding sites spatial analysis

Fumigation action decrease
Space technology enables the development of early warning systems to predict and monitor dengue outbreaks.

Satellite-derived insights enable evidence-based decision-making in local health authorities' response to dengue outbreaks.

DIPTERON innovation has contributed to a quick, precise and economical way in combating Dengue Outbreaks.
THANK YOU!

Do you have any questions?

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