Progress Report Enhancement of Project AEDES

Summary

This document summarizes the progress of Project AEDES Enhancement as of February 4, 2022, vis-à-vis the project's objectives/expected improvements to the platform.

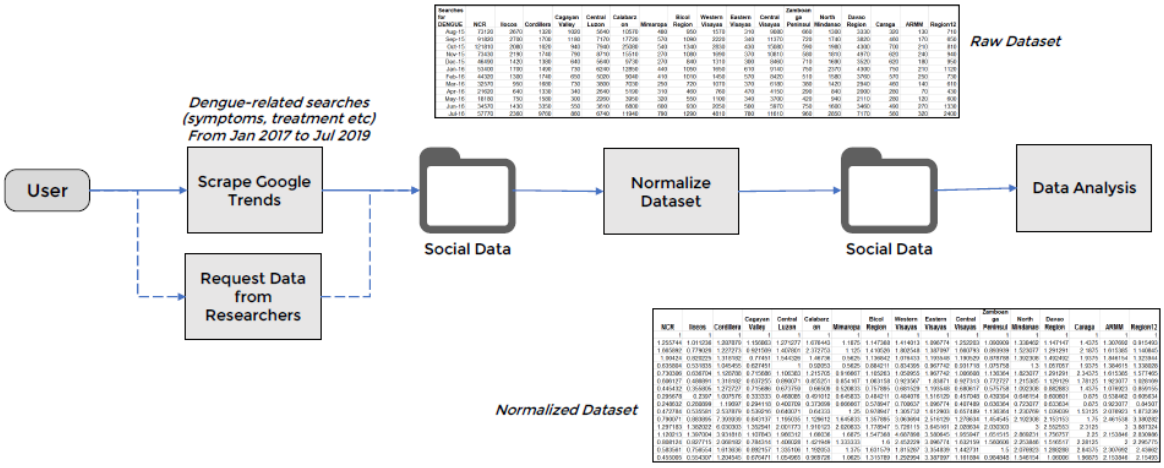
Improvements	Status
Automation of data gathering from various sources.	A working Python package is now available. It allows automated data collection covering the entire data stack. It also provides the capability of visualizing all the points of interest with their proper labels using one line of code.
Addition of new weather, satellite, geospatial and socioeconomic data to enrich dataset	Data stack has been enriched with new datasets. Refer to Data Stack section.
Open API	Data Management System (CKAN) has been created and being tested to include datasets generated from the Python package.
Enhancing the predictive modeling by adding additional ML algorithms to improve model fitting performance applicable to Dengue Forecasting and Hotspot Detection	Ongoing Machine Learning (ML) Model Training. Refer to Models and Frameworks section for more details.
Incorporating the INFORM Epidemic Risk Framework with data gathered by AEDES teams to generate location-based risk maps, and advise policy interventions to mitigate the impacts of dengue	Ongoing INFORM Risk model testing utilizing current datasets.
Improvement of User Interface to make it feel more like a consumer utility.	UI/UX mockup currently being developed.

Data Gathering Automation

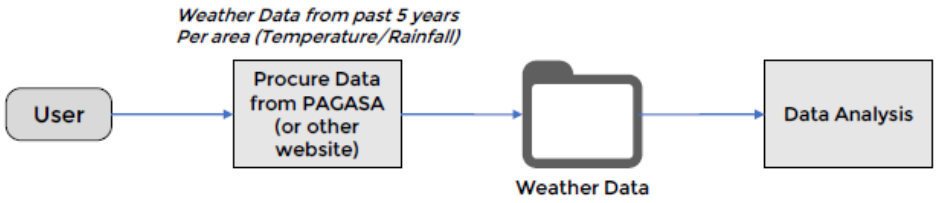
Previous Process

The following diagrams show the existing data gathering processes for each data category.

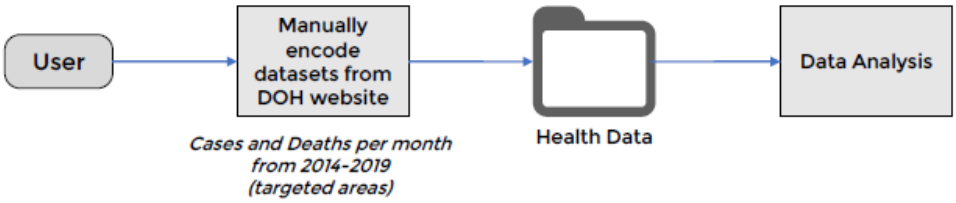
Social Listening Data



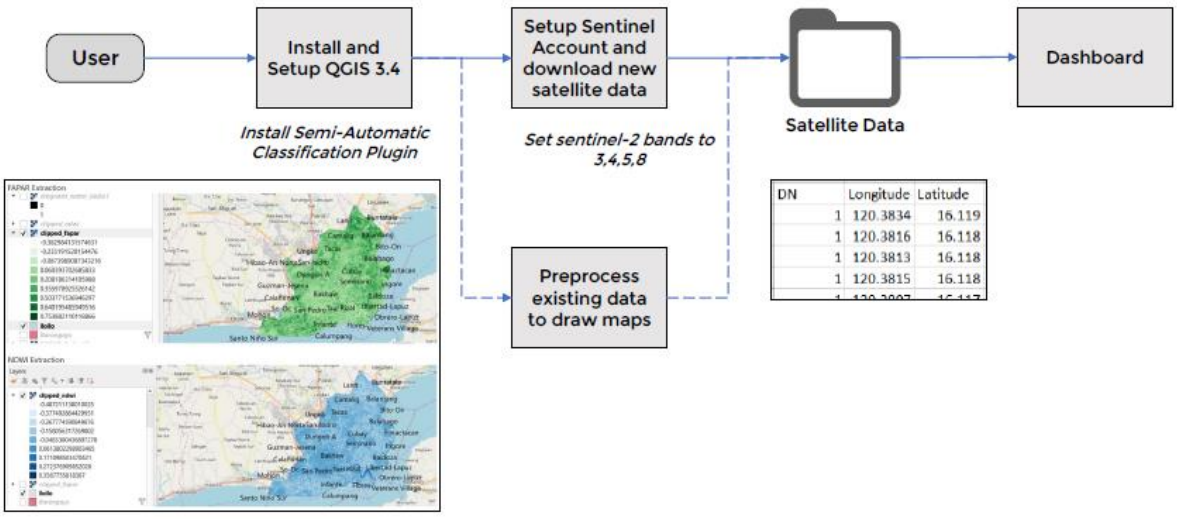
Weather Data



Health Data



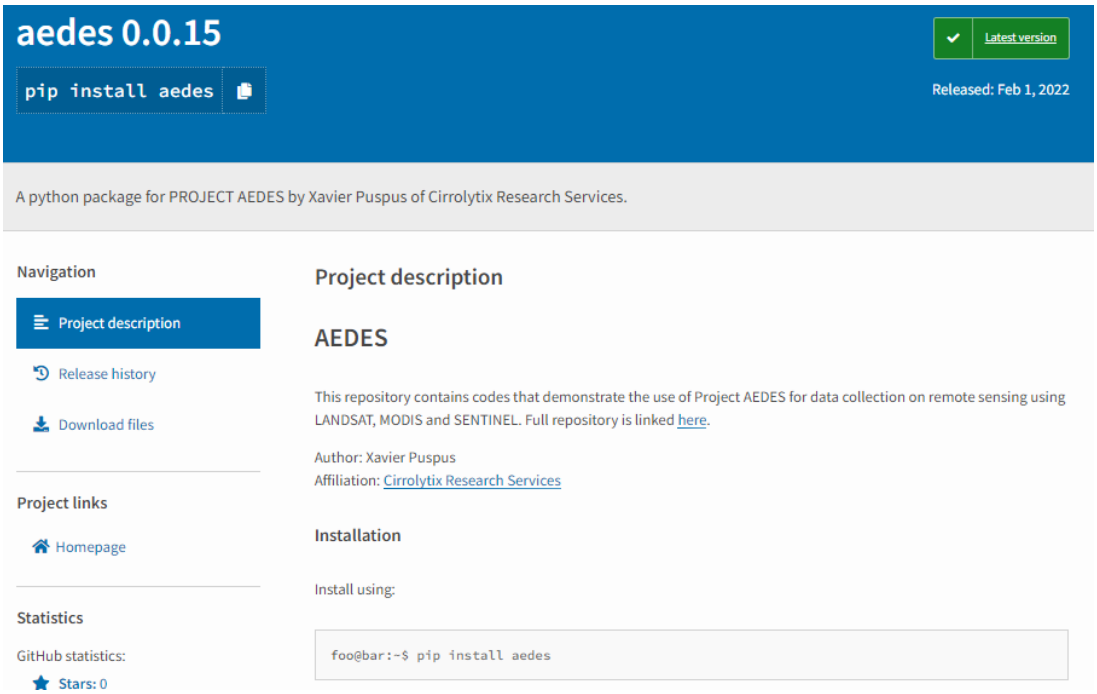
Geospatial Data



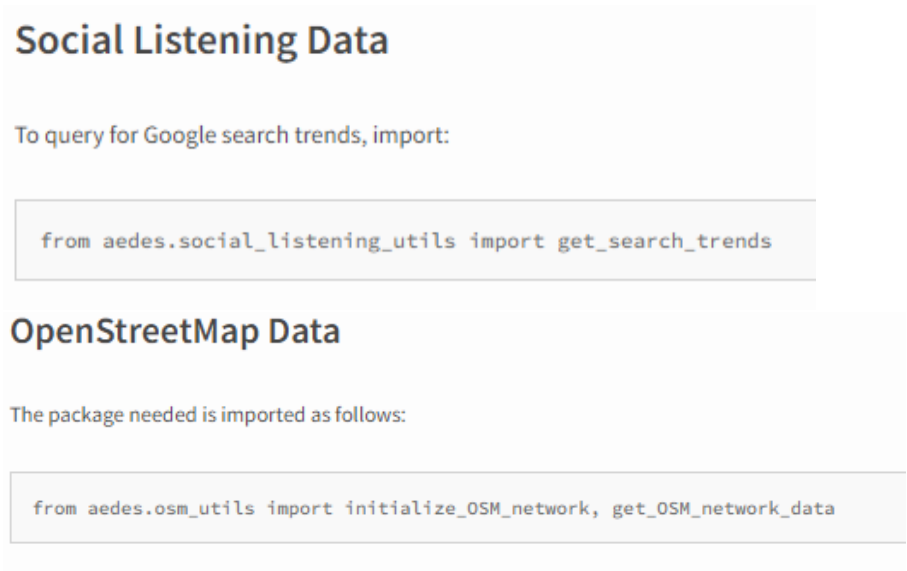
Improved Process

Data collection and processing will now be done in a Python package, effectively eliminating significant manual processes presented previously.

Python Package Index (PyPI): https://pypi.org/project/aedes/
Repository: https://github.com/xmpuspus/aedes



It utilizes algorithms that pull data from various resources thereby generating the datasets being utilized by the platform.



Satellite Data

Import the modules of the package using:

```
import aedes
from aedes.remote_sensing_utils import generate_random_ee_points, df_to_ee_points, get_satell
from aedes.remote_sensing_utils import perform_clustering, visualize_on_map

from aedes.osm_utils import reverse_geocode_points
```

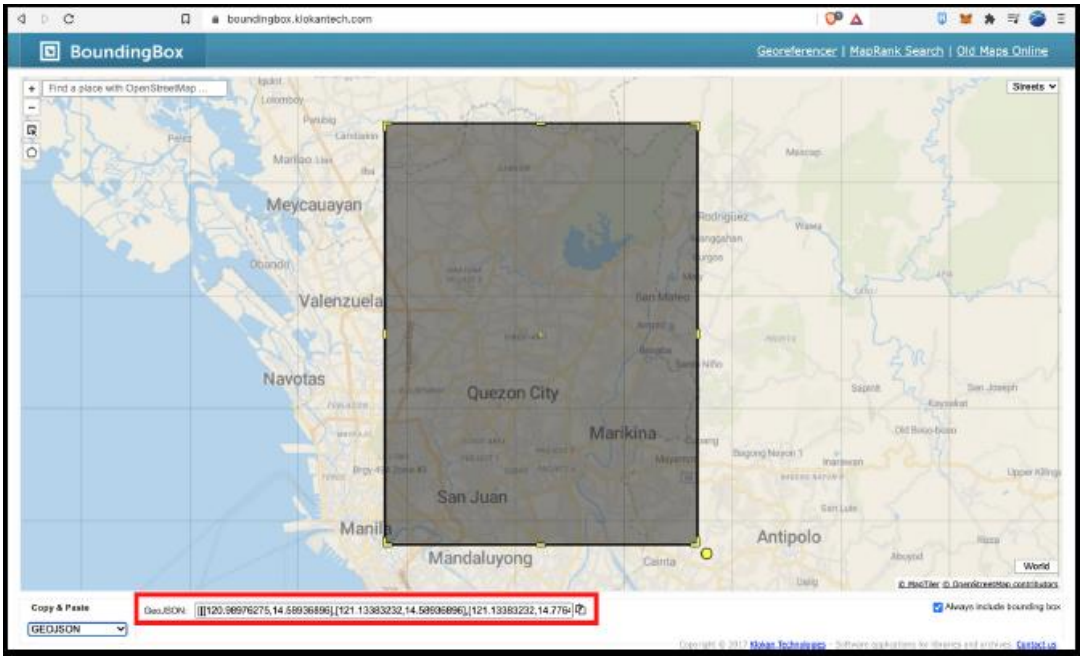
Get Normalized Difference Indices and Weather Data

Use the one-liner code `get_satellite_measures_from_points` to extract NDVI, NDWI, NDBI, Aerosol Index (Air Quality), Surface Temperature, Precipitation Rate and Relative Humidity for your preset number of points of interest `sample_points` within a specified date duration `date_from` to `date_to`.

```
%%time
QC_AOI = [[[120.98976275,14.58936896],
           [121.13383232,14.58936896],
           [121.13383232,14.77641364],
           [120.98976275,14.77641364],
           [120.98976275,14.58936896]]] # Quezon city
```

Sample Web Application Data Input

At a user level, the only input required to generate/collect necessary data and features for modelling is a bounding box geojson or a polygon.



Data Stack

Previous Datasets

- Google Search Trends
- PAGASA Precipitation
- PAGASA Temperature
- DOH EpiBureau Cases and Deaths
- Sentinel FAPAR
- Sentinel NDVI
- Sentinel NDWI

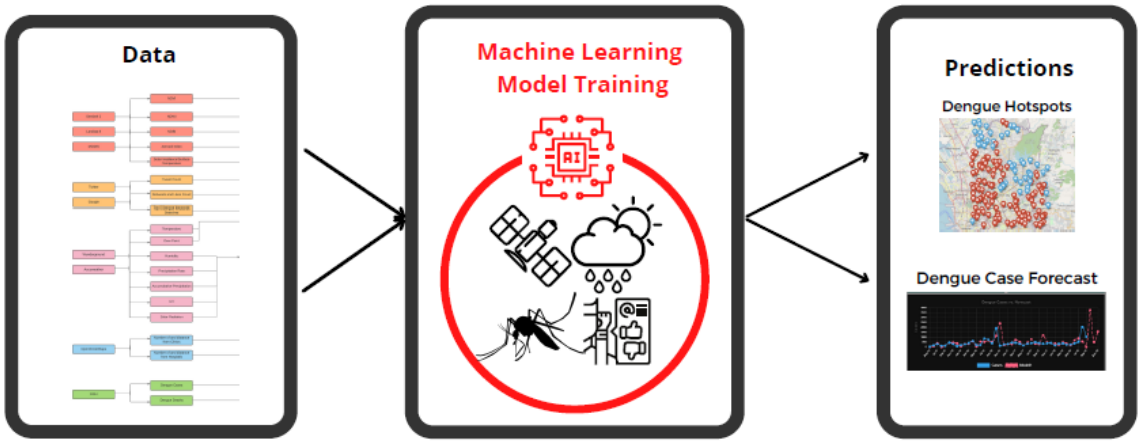
Enriched Datasets

Data	Data Usage Type	Modelling Use	INFORM Component
longitude	Geolocation	Spatial	NONE
latitude	Geolocation	Spatial	NONE
NDVI	Satellite Remote Sensing	Spatiotemporal	VULNERABILITIES
NDBI	Satellite Remote Sensing	Spatiotemporal	VULNERABILITIES
NDWI	Satellite Remote Sensing	Spatiotemporal	HAZARDS
NDMI	Satellite Remote Sensing	Spatiotemporal	VULNERABILITIES
Aerosol Index	Satellite Remote Sensing	Spatiotemporal	VULNERABILITIES
FAPAR	Satellite Remote Sensing	Spatiotemporal	VULNERABILITIES
Surface Temperature	Satellite Remote Sensing	Spatiotemporal	HAZARDS
Precipitation Rate	Satellite Remote Sensing	Spatiotemporal	HAZARDS
Relative Humidity	Satellite Remote Sensing	Spatiotemporal	HAZARDS
Search Trends	Social Listening	Temporal	VULNERABILITIES
Dengue Case Count	Government Data	Spatiotemporal	HAZARDS
Distance from n nearest clinics	Geolocation	Spatial	LACK OF COPING CAPACITY
Distance from n nearest hospitals	Geolocation	Spatial	LACK OF COPING CAPACITY
Distance from n nearest doctors	Geolocation	Spatial	LACK OF COPING CAPACITY
Count of clinics within d km	Geolocation	Spatial	LACK OF COPING CAPACITY
Count of hospitals within d km	Geolocation	Spatial	LACK OF COPING CAPACITY
Count of doctors within d km	Geolocation	Spatial	LACK OF COPING CAPACITY
Distance from n nearest school	Geolocation	Spatial	VULNERABILITIES
Distance from n nearest college	Geolocation	Spatial	VULNERABILITIES
Distance from n nearest university	Geolocation	Spatial	VULNERABILITIES
Distance from n nearest kindergarten	Geolocation	Spatial	VULNERABILITIES
Count of school within d km	Geolocation	Spatial	VULNERABILITIES
Count of college within d km	Geolocation	Spatial	VULNERABILITIES

Count of university within d km	Geolocation	Spatial	VULNERABILITIES
Count of kindergarten within d km	Geolocation	Spatial	VULNERABILITIES
Distance from n nearest toilets	Geolocation	Spatial	HAZARDS
Distance from n nearest water points	Geolocation	Spatial	HAZARDS
Count of toilets within d km	Geolocation	Spatial	HAZARDS
Count of water points within d km	Geolocation	Spatial	HAZARDS
Distance from n nearest sanitary dump station	Geolocation	Spatial	HAZARDS
Distance from n nearest waste disposal	Geolocation	Spatial	HAZARDS
Distance from n nearest waste transfer station	Geolocation	Spatial	HAZARDS
Count of sanitary dump stations within d km	Geolocation	Spatial	HAZARDS
Count of waste disposals within d km	Geolocation	Spatial	HAZARDS
Count of waste transfer stations within d km	Geolocation	Spatial	HAZARDS

Models and Frameworks

Model testing is ongoing. The datasets per geolocation are feature-engineered and fed through to a machine learning model. The inference inputs are classified into two: Spatial (longitude, latitude, ISO geotag) and Temporal (year, month, day).

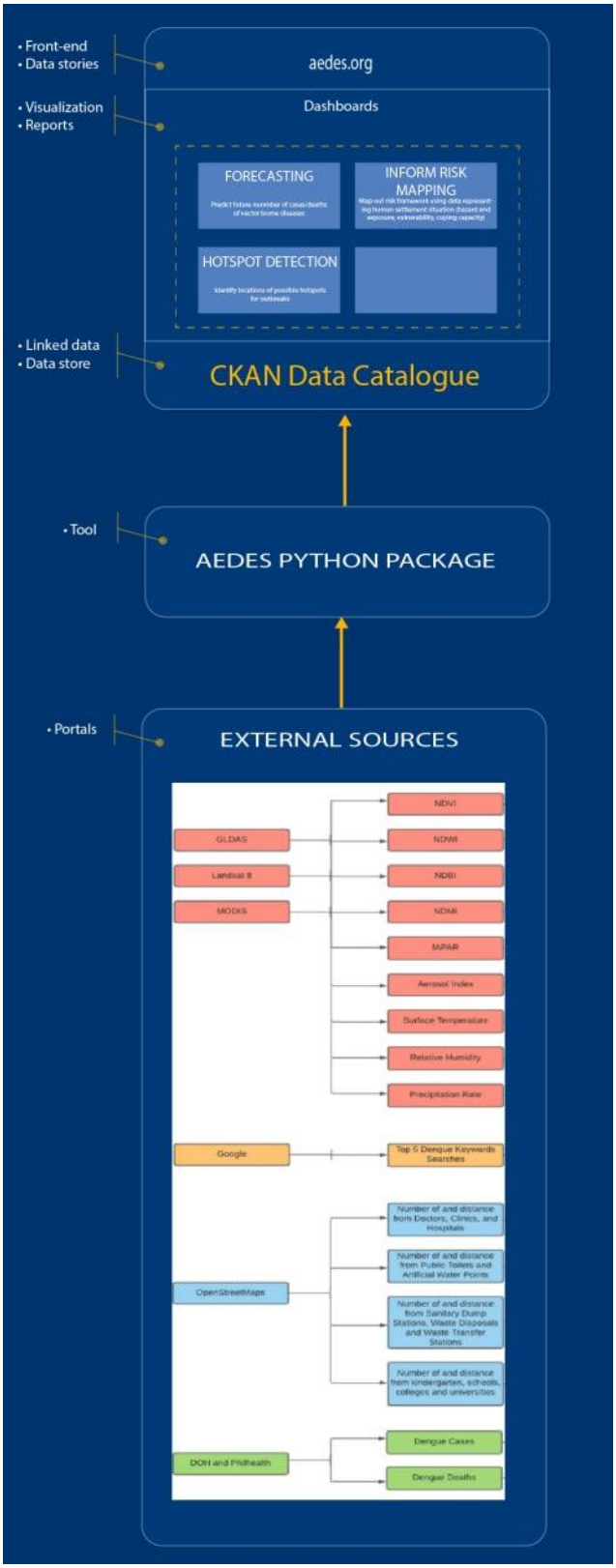


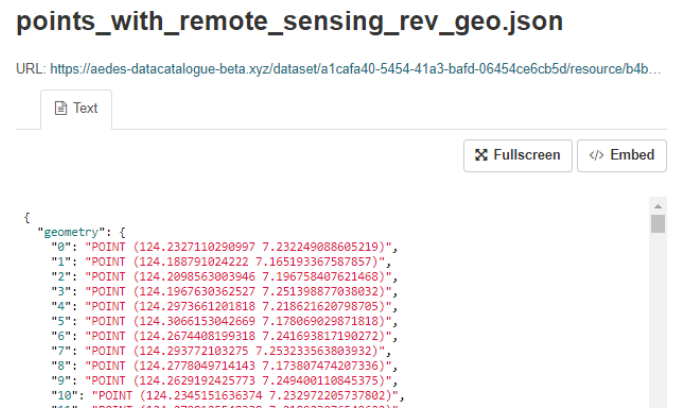
INFORM Risk model is being explored based on the datasets presented in the Enriched Datasets table. The exploration includes envisioning the kind of policies we want to influence with the given data and how to make the model effective on any granularity.

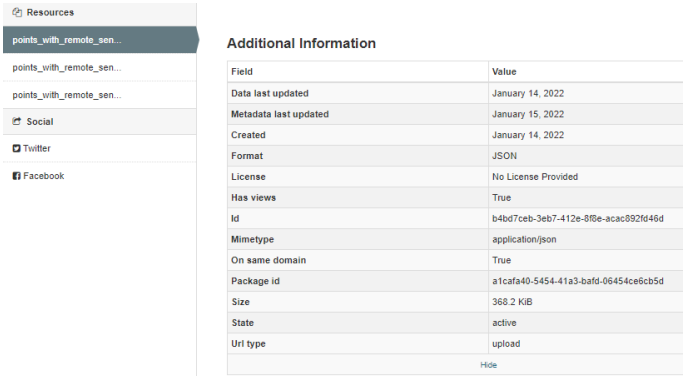
Data Management System

A more user-friendly way to access the data is through a data management system (CKAN), where the datasets can be retrieved through API.

Working URL: https://aedes-datacatalogue-beta.xyz/







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