Profiling School Catchment Areas to Predict Grid Connectivity

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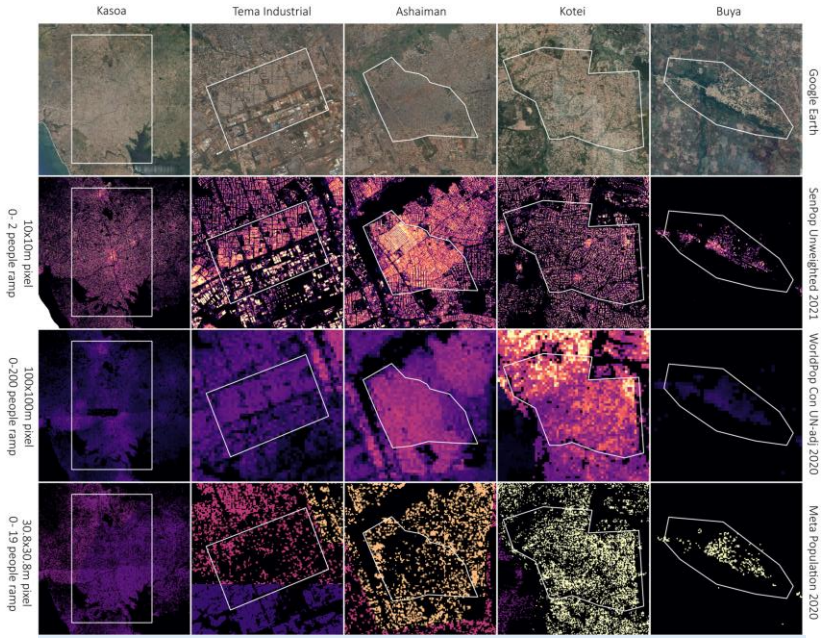
Profiling School Catchment Areas to Predict Grid Connectivity (1/3)



Population estimates in Africa derived from Sentinel Data

giga

"Using Sentinel and Nightlights data to help UNICEF-GIGA in their efforts to map and profile every single school in the world"

Objectives

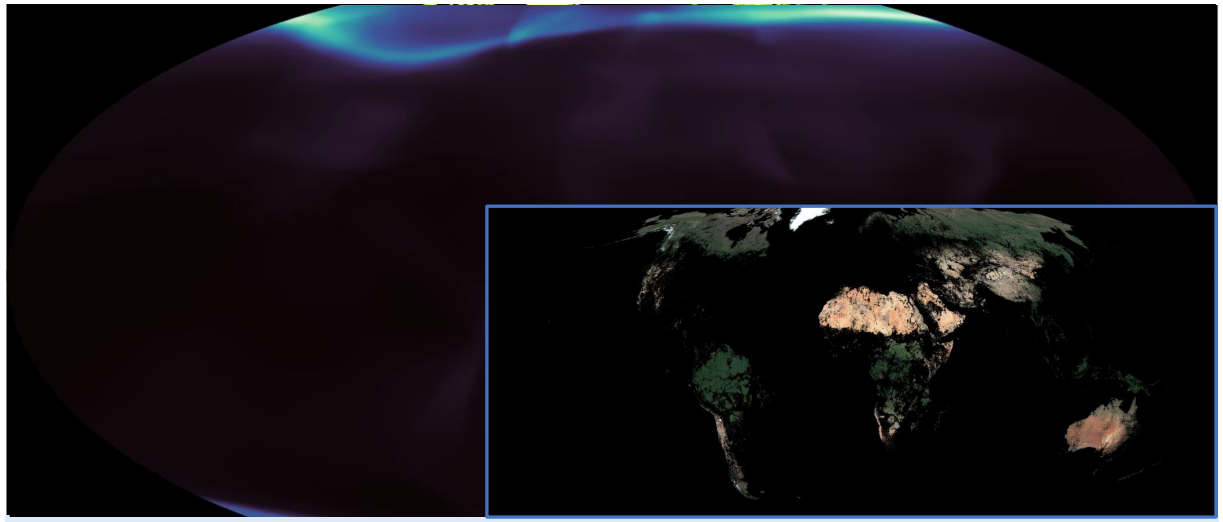
1) **How likely is it that a school is located at a given coordinate?**
   Using Sentinel 1, 2 and VIIRS nightlights data, estimate the likelihood of a school (*Multi-modal ConvNext V2*)

2) **Where would we have expected a school but found none?**
   Using Sentinel derived population maps, where are there less schools than would be assumed. (*EO derived Multicriteria Analysis*)

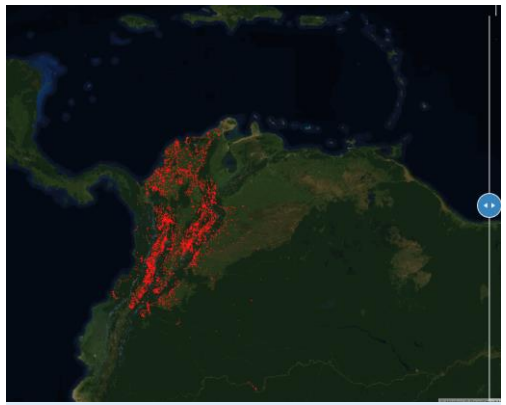
3) **What is the estimated student count at a given school?**
   For a verified school, estimate the amount of students in the catchment area. (*Deep Regression, Tabular + CV*)

4) **How likely is the school to be connected to the Internet & the Electric grid?**
   Using nightlights, Sentinel 2, and auxiliary data (census & UNICEF data), how likely is a given school to be connected to the internet and the electricity grid.
   (AutoML + Statistical modelling + Deep Learning)

Profiling School Catchment Areas to Predict Grid Connectivity (2/3)



Deep Learning NL background light trend removal



Schools mapped using VHR imagery

Students in Catchment	Nightlight over background	Urban classification (DEGURBA)
3	0.1	Rural (60%) Urban (40%)
435	3.2	Dense Urban (90%) Suburban (10%)
143	1.3	Peri-urban (40%) Rural (60%)

+ Many more

Data

- Sentinel 1 – GRD
- Sentinel 2 – Timeseries (+ Catalogue for SSL)
- SUOMI VIIRS Nightlights
- Facebook Roads (Daylight Project)
- Global Human Settlement Layers (Copernicus derived)
- OpenStreetMap (Citizen Science)

Methods

- Multi-modal ConvNext V2 models + Tabular data
- AutoML and Deep Regression models
- Multicriteria Analysis from EO Spatially summarised data.

Results

Question “two” and “three” have been partially answered for Brazil, and all the UNICEF data has been run through our models. This means that we, through an API, can determine if a given point is likely to contain a school or not. 65000 wrong locations removed so far in Brazil.

Profiling School Catchment Areas to Predict Grid Connectivity (3/3)

Role of Data acquired as part of NoR Request: 281935

Awarded:

Enterprise-S-monthly

1 Subscription(s)	3 month(s)	€1500.00
extract-PlanetScope	100 ha	€344.00

Via Sentinelhub

Sentinel 2 scene downloaded over Tanzania

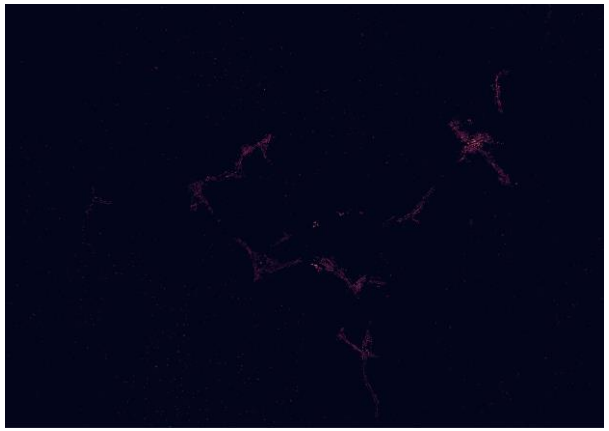
All credits were used to download 2500x2500px Sentinel 2 scenes from Sentinel Hub, covering regions in developing countries with diverse geographies and large clusters of population.

300 scenes (37.8 GB) were downloaded of over school areas in Brazil used in training

4235 scenes (328 GB) were downloaded over South America and Africa, and joined with building data from Microsoft Open Buildings, Google Open Buildings, OSM, as well as roads from OSM and the daylight project.

These scenes were used to train models to predict the likelihood of any given location containing a school, as well as estimating population and structural density. The labelled datasets are still in active use, both together with UNICEF, but also for the foundation model project taking place in the PHILAB. The dataset is planned to form part of a later dataset publication.

PlanetScope data was meant to be used for VHR verification of school locations but was never operationalised.



Buildings labels generated

Road labels generated