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An Intelligent Approach to Cities through Open Data

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dans le mouvement mondial pour l'ouverture des données

Des opportunités exceptionnelles et de nouveaux défis naissent tous les jours

produire des données originales est notre vocation

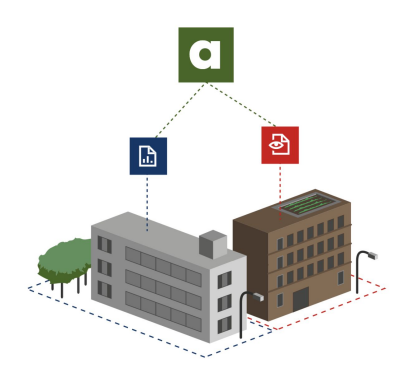
Produire des données originales et actionnables est notre façon d'enrichir cet énorme gisement d'opportunités

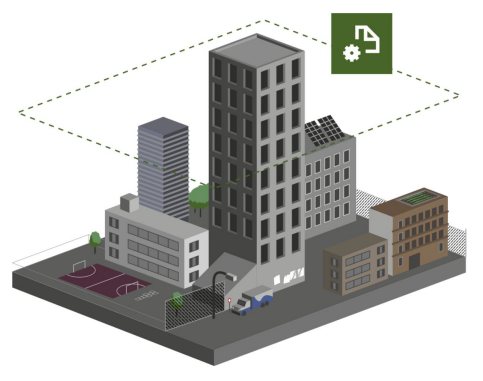
en développant une intelligence artificielle au service de l'Humain

Produire ces données nécessite un investissement constant en intelligence artificielle

et en construisant des infrastructures numériques performantes et solides

Construire des infrastructures à partir de données originales est notre objectif





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Artificielle :
une opportunité sans
précédent pour accélérer
la transition écologique

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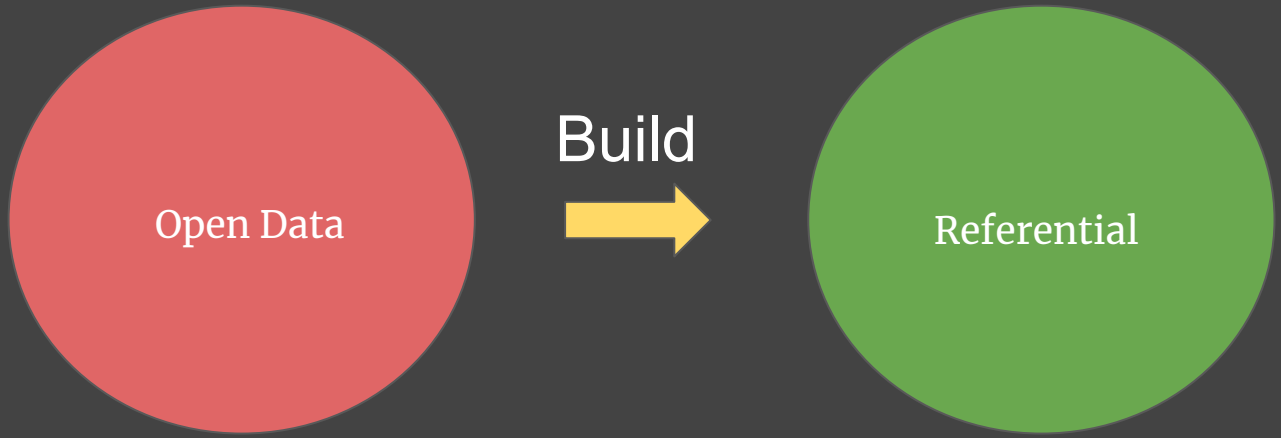
250+
Open Data platforms available in France

3000+
Open Data platforms available in the world

1.500k
datasets accessible in France

HR imagery
infrared and RGB
20 cm resolution
in
France

The digital twin: the Open Data made actionable


Open Data
Build
Referential

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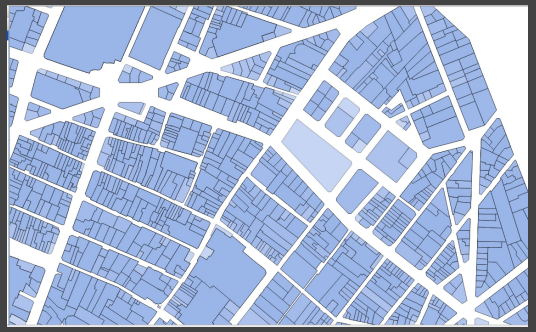
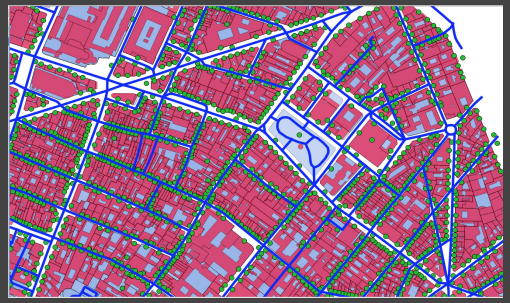
Parcels



Buildings

Addresses

Roads




Open Data
Describe
Referential

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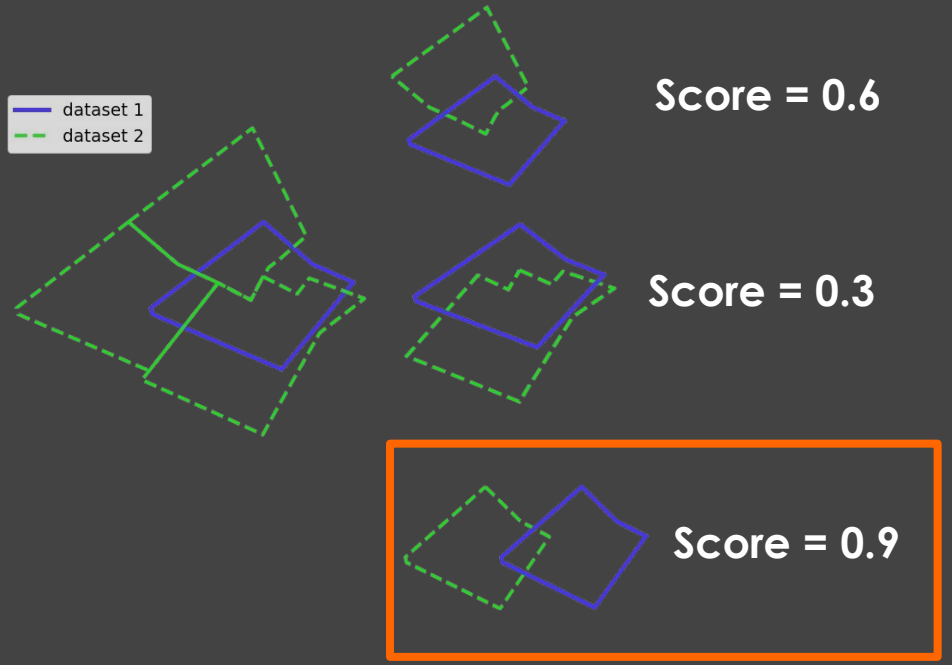
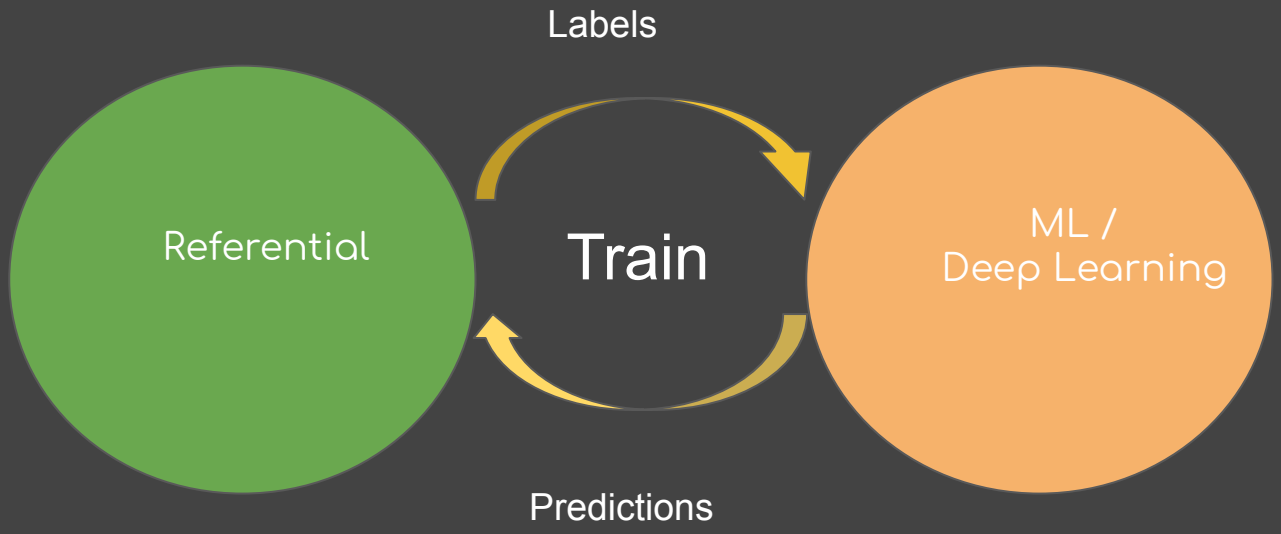
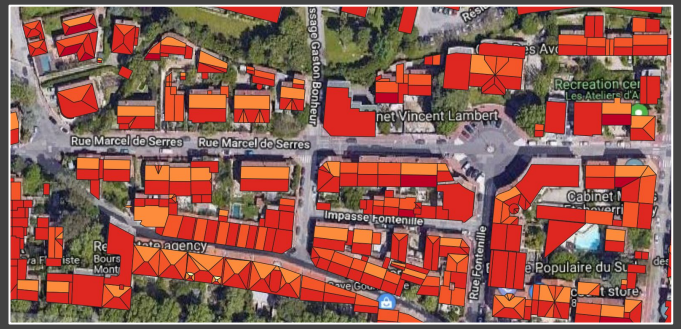
Geocoding

Shape Matching

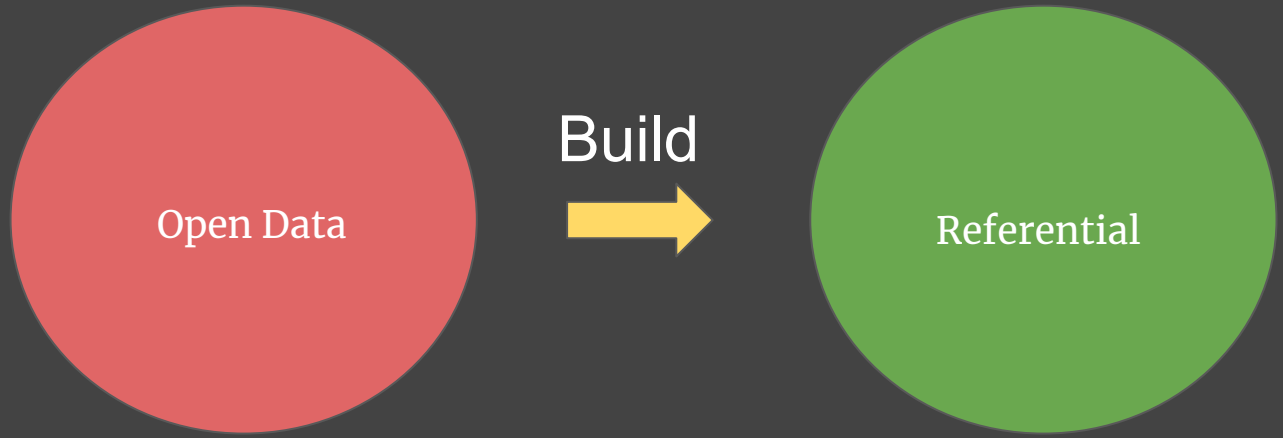



Labels
Referential
Train
ML /
Deep Learning
Predictions

Working Example: Roofs Solar Potential Estimation



1. **Clean 3D Roof Coordinates from the open data.**
2. **Use vector data to crop images.**
3. **Deep Learning for Roof Segmentation.**
4. **Infer Roof Attributes.**
5. **Infer Solar Potential**


Open Data
Build
Referential

Build Roof Slope Referential: 3D vector data

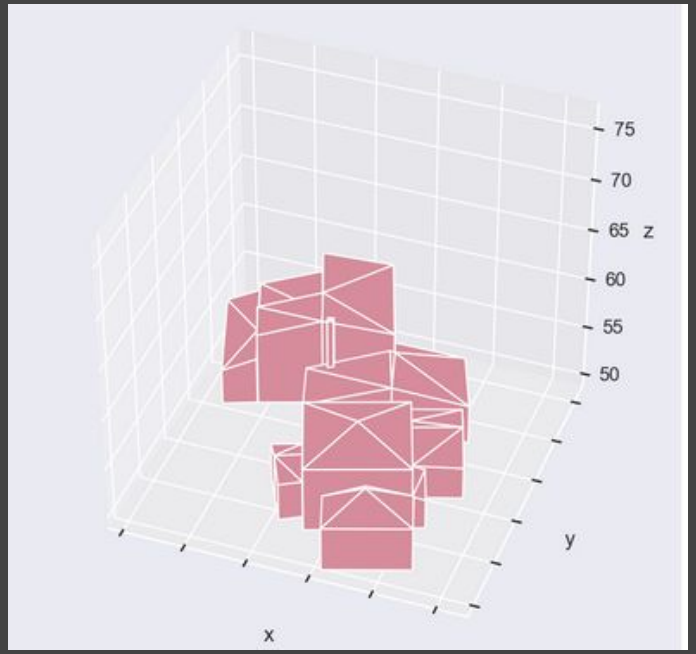
Open Data 3D Building coordinates

roof segments
(257,475)

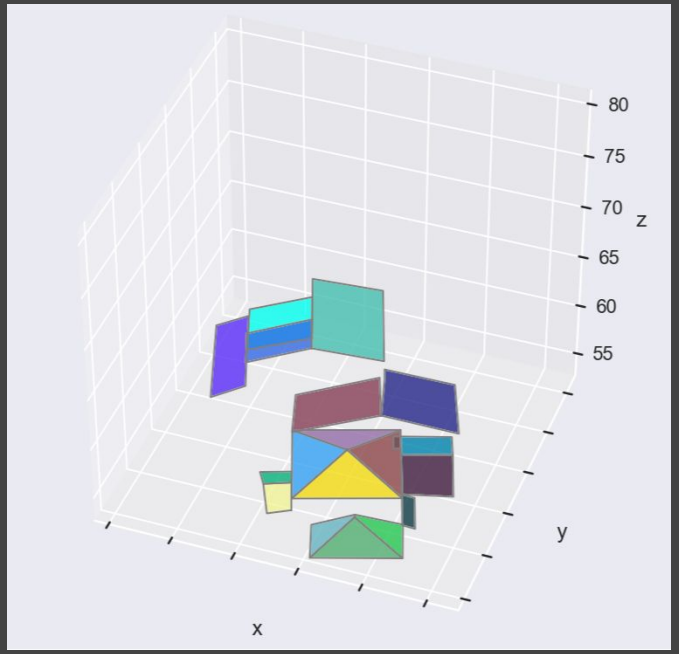
Treated Data

roof slopes
(221,950)

Roof Slope 3D View



Before



After

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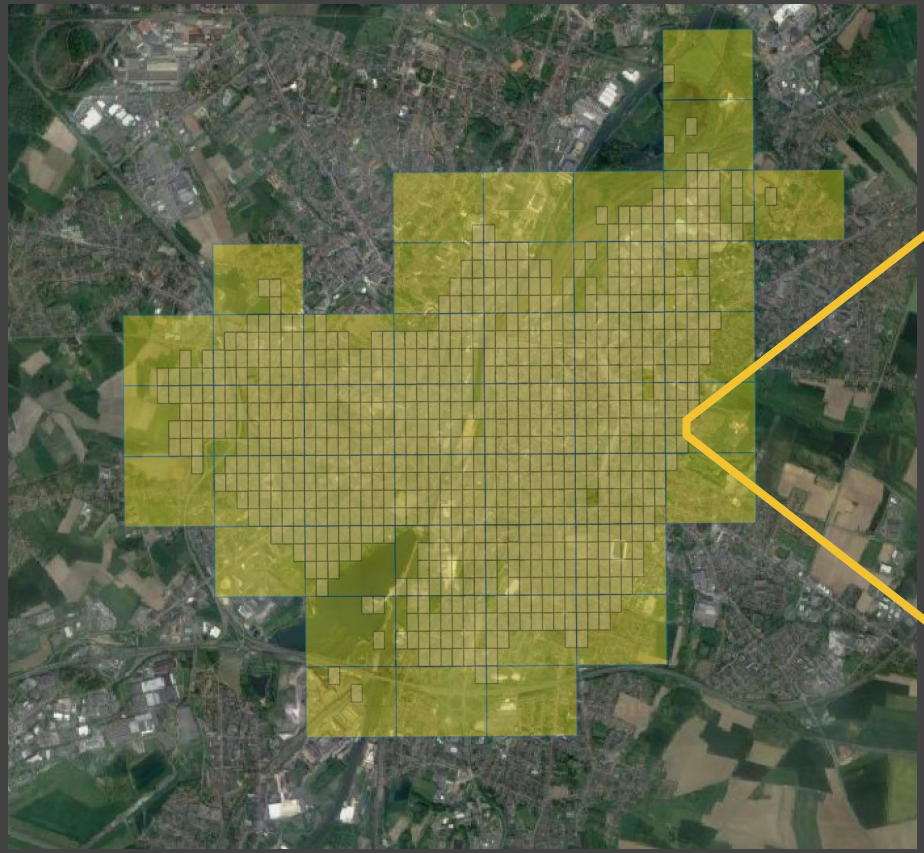
aggregate, clean and organise data

Build Roof Slope Referential: Aerial Imagery



enrich data

n a m.R Deep Learning model

- Datasets
- Model architecture
- Data augmentation
- Training
- Production pipeline
- Examples

n a m.R Deep Learning model

- **Datasets**
- Model architecture
- Data augmentation
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- Examples

Input:
HR Aerial Imagery

Target:
Rasterized vector roof slopes

Volume:
~75000 images (256x256)

Train/Test/Validation split:
80% / 10% / 10%

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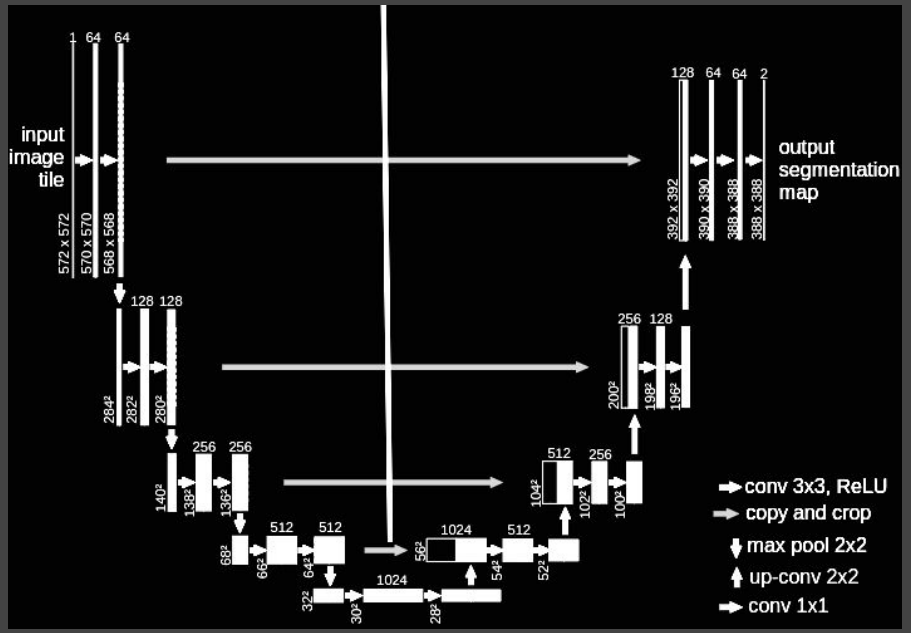

Dynamic UNet based on ResNet encoder

Framework: FastAI on PyTorch

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All standard augmentations like
left-right flip, zoom, rotation, skew

\+ we've aerial images, so *up-down flip* too

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Parameters: batch size: 16, epochs: 30

Training batch sample:

nam.R Deep Learning model

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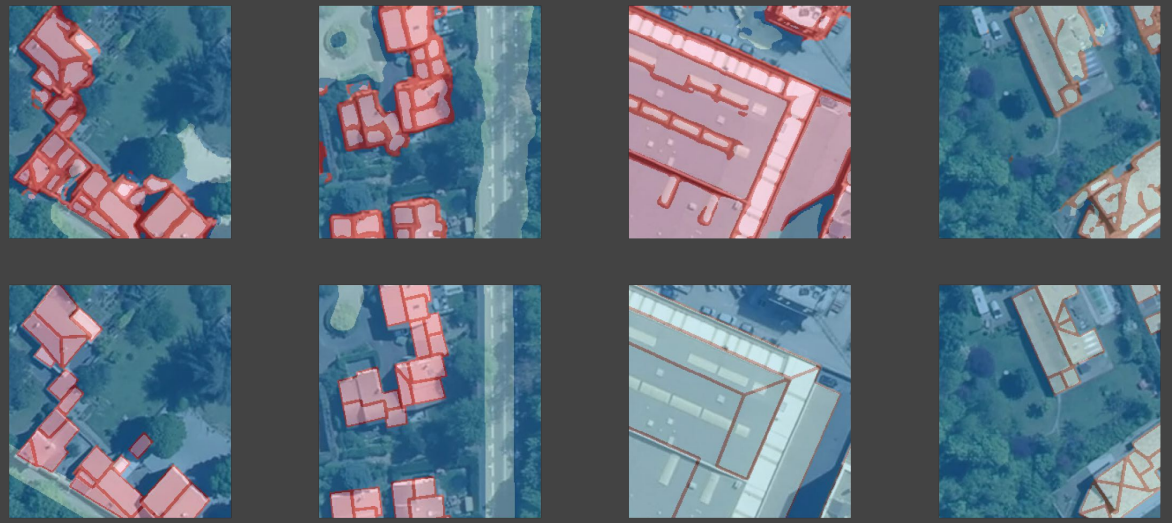
Parameters: batch size: 16, epochs: 30

Predictions (top) vs Ground Truth (bottom)



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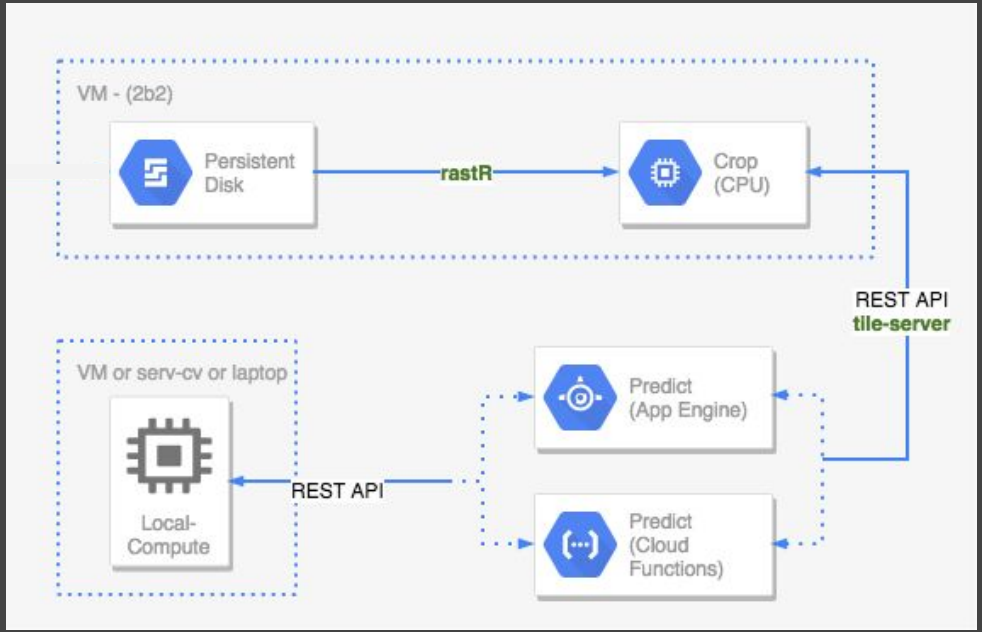
Google Cloud Platform:

VMs + AppEngine + Cloud Functions



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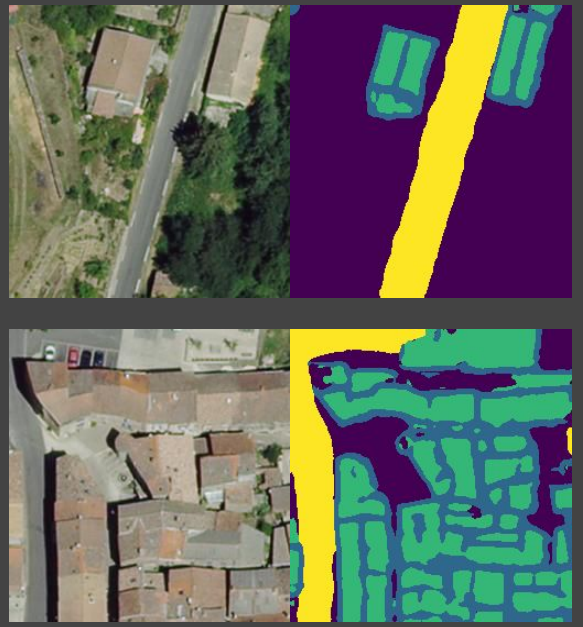


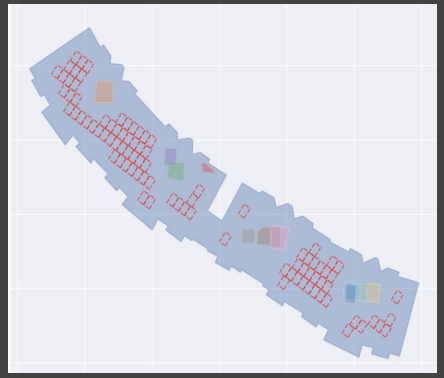
Predictions are vectorized and integrated to the *Referential*

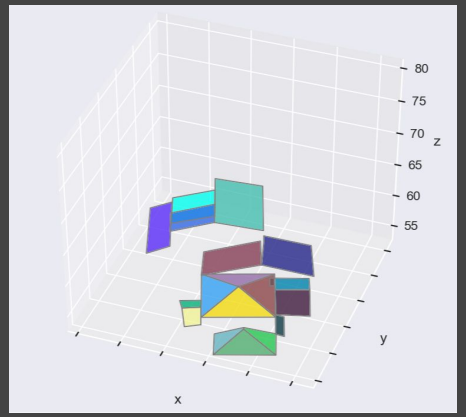
Other entities: *Solar Panels* segmentation

nam.R Other entities: *Roof Objects* segmentation

Roof Attributes

Position Solar Modules on the Roofs

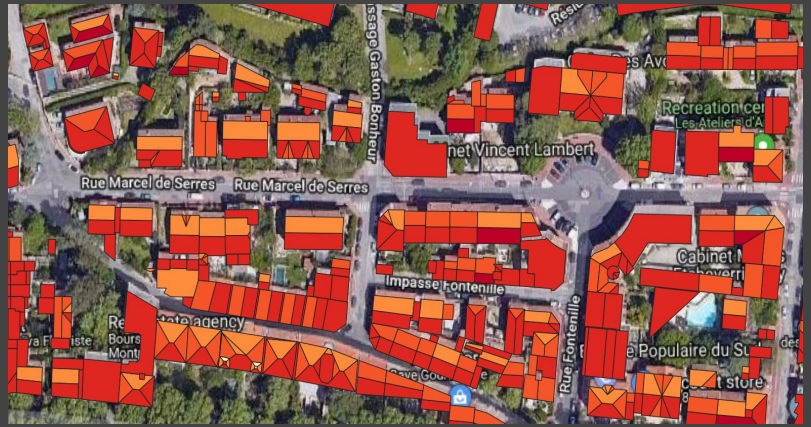


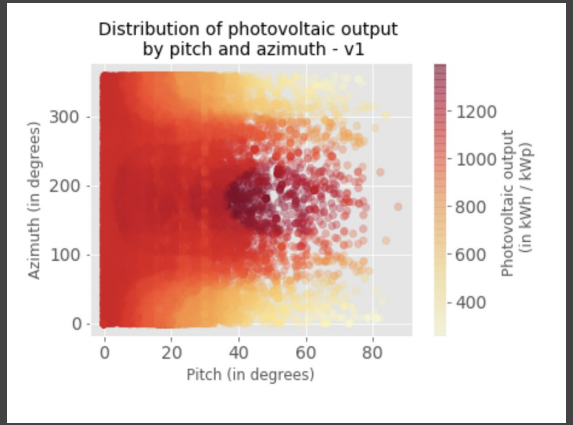


Roof Orientation
Roof Inclination
(Data + ML)

Building the Photovoltaic Potential

putting all the elements together we can give an estimate of the slopes solar potential





Thank you for your attention