

Rooftop Solar Potential through Image Segmentation and Structured Data



nam.R: overview

nam.R is a Paris-based company founded in 2017

We provide data-driven solutions to projects in fields such as Energy, Renovation, Insurance and Retail

We also sell access to our unified database called Digital Twin

Domains of expertise:

- Computer Vision
- Natural Language Processing
- Geographic Information Systems



solaR project



Objective: predict the solar potential of residential and non-residential rooftops

First version: more than 500,000 buildings in Southern France

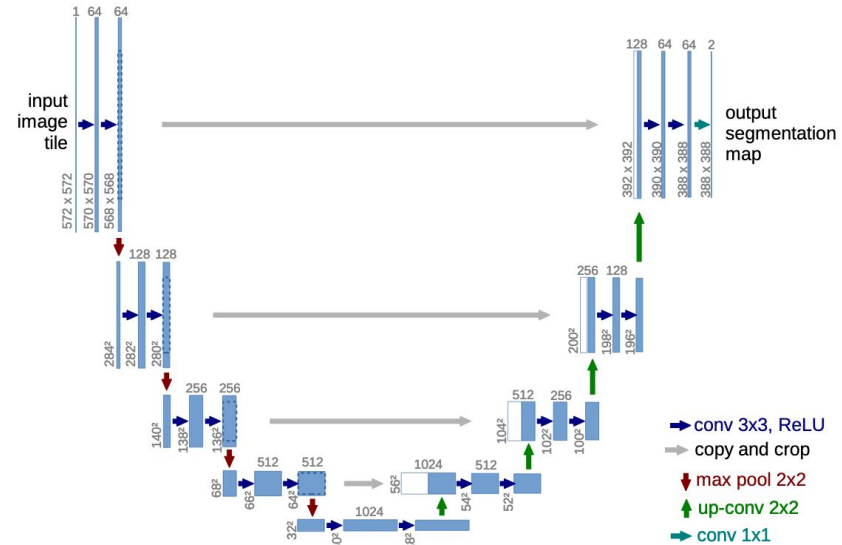
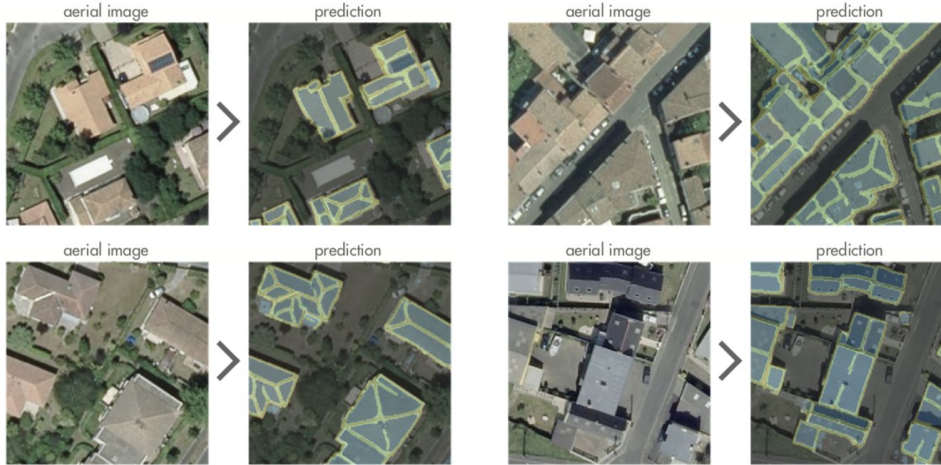


Five steps to predict solar potential



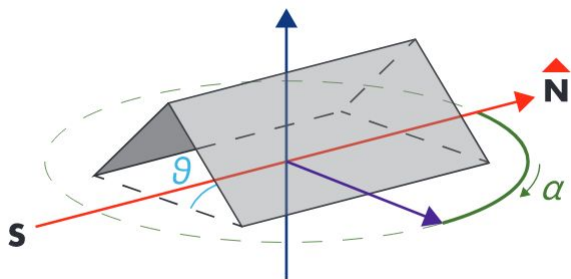
Roof Segmentation: Image Segmentation

- Training set : image + 30,000 rasterized roof slope geometries
- Segmentation with a pixel-wise classification
- U-Net with a ResNet34
- Ridge/Slope Accuracy : 77.3%



[1] O. Renneberger, P. Fischer, T. Brox, "U-Net: Convolutional Networks for Biomedical Image Segmentation" (2015).

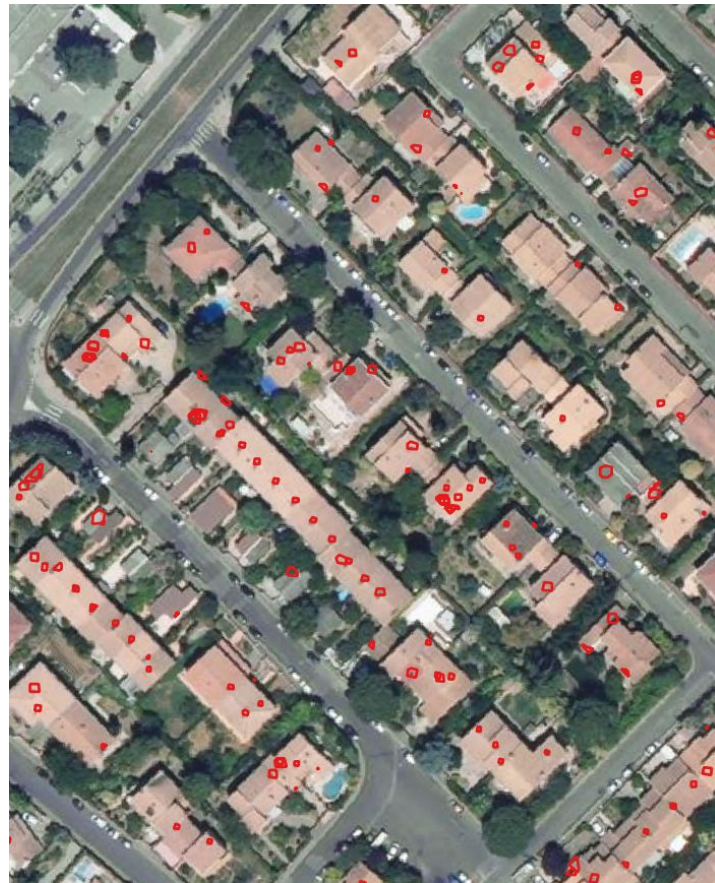
Roof Segmentation: Post-processing



- Roof Segmentation is regularized with geometric operations using PostGIS
- Slope's Azimuth obtained through spatial considerations
- Pitch is estimated using a Random Forest regressor with building structured features

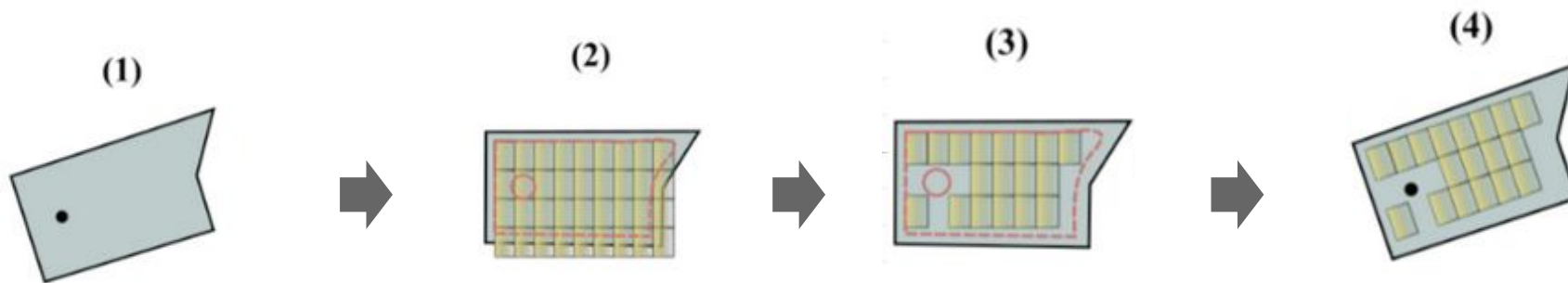
Roof objects detection

- Roof object classification and segmentation
- Same architecture than roof segmentation
- Training set : Tagging campaign
- Low accuracy (IoU = 30.2%) mainly because of too few training data



Module Packing

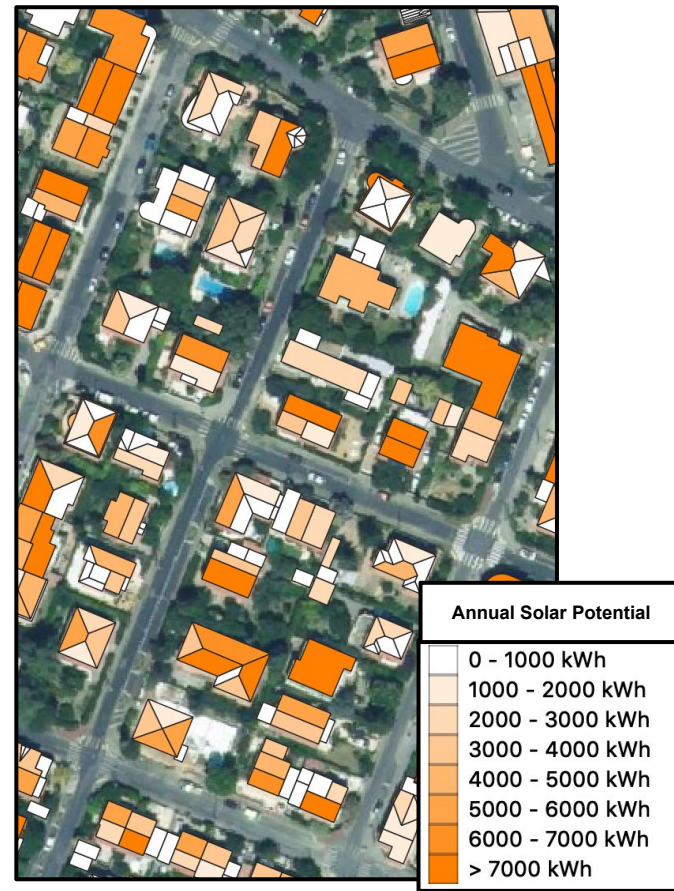
- Size dimensions for a given module
- Greedy packing algorithms on a roof slope
- Remove modules intersecting obstructing objects



Annual Solar Potential

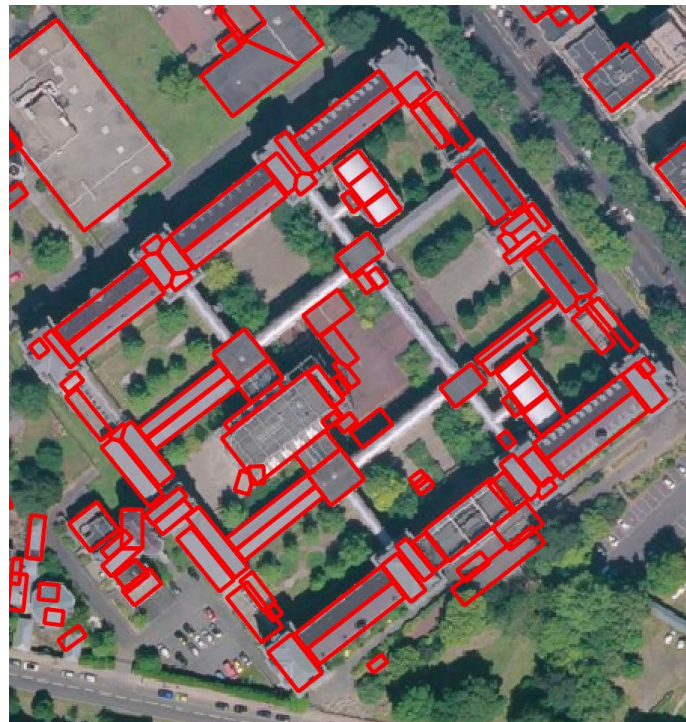
$$\text{solar potential (kWh/year)} = N_{\text{panels}} \times P_{\text{max}} \times PV_{\text{out}}$$

- N_{panels} => maximum number of solar modules on a roof slope
- P_{max} (kW) => module nominal maximum power
- PV_{OUT} (kWh/kW/year) => specific photovoltaic power output



Conclusion

- Prediction of rooftops solar potential through aerial images and structured data
- Needs improvement: object detection and pitch prediction
- Solar energy is part of our larger offer on energy and building renovation
- Next step: scale our solutions to other parts of the world



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