St. Lucia
The Roof is On Fire

Client Project

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Contents

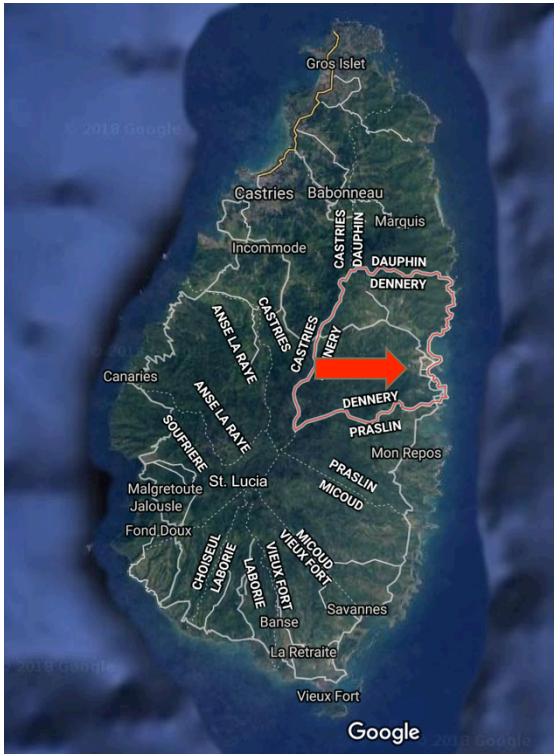
About Dennery and the Two Problems

Dennery, St. Lucia is a fishing village along the Atlantic Ocean side of St. Lucia.

Help St. Lucia prepare for next hurricane season by predicting rooftop quality and integrity using drone image to prioritize interventions.

2 Problems:

- Classify objects (roof or not)
- Determine Rooftop Quality



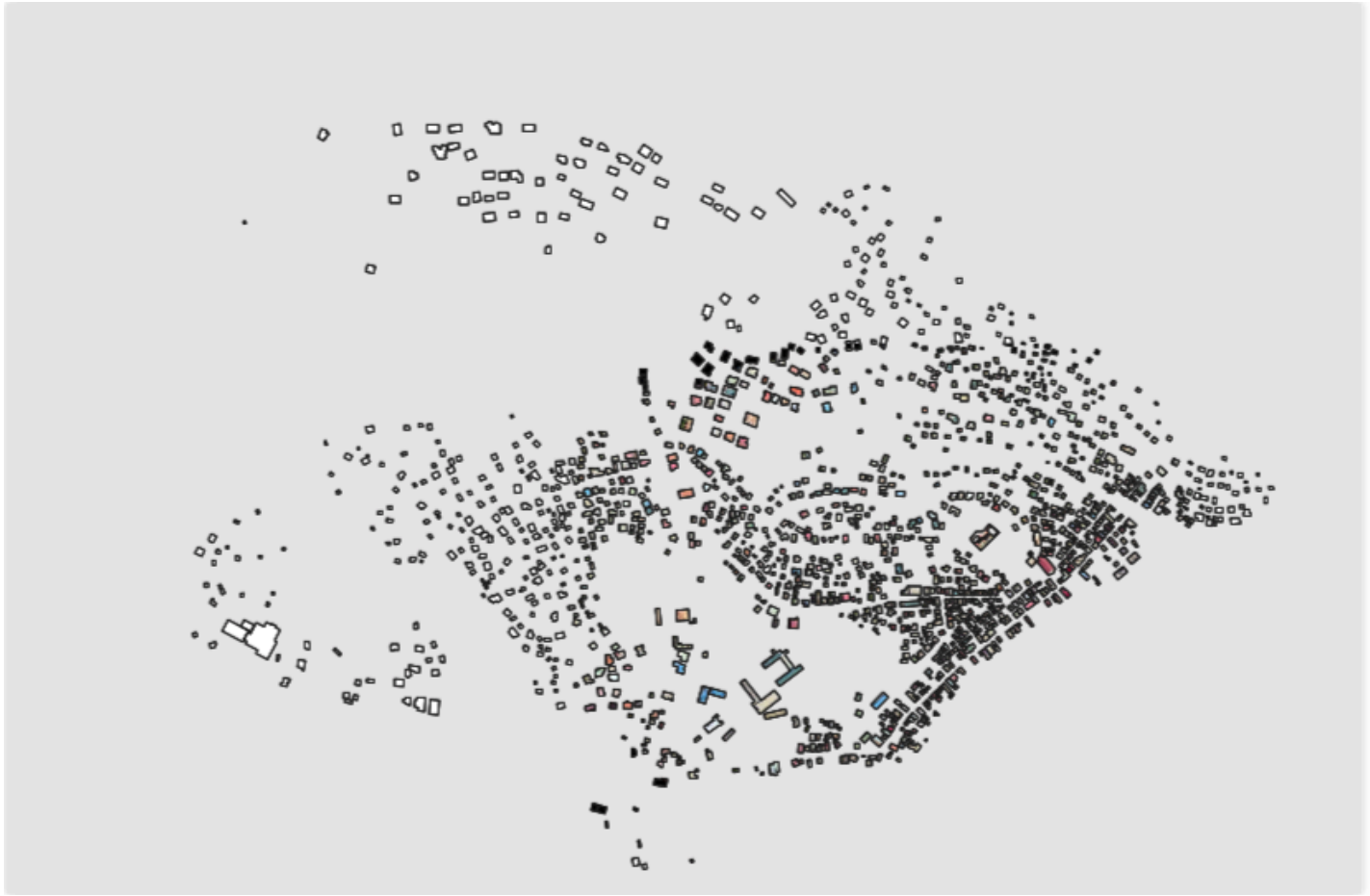
Data on Dennery

Data provided:

- Drone images of Dennery
  - 3,519,622,414 bytes
  - RGB
  - Elevation - Digital Terrain Model (DTM)
  - Lidar - Digital Surface Model (DSM)
  - DSM - DTM = Height
- GIS Layers from OpenStreetMap and Charim
- Containing .tiff, .aux, .prj files
- Metadata of Geo Coordinates

The Image - Dennery

The Roofs



Challenges

GIS

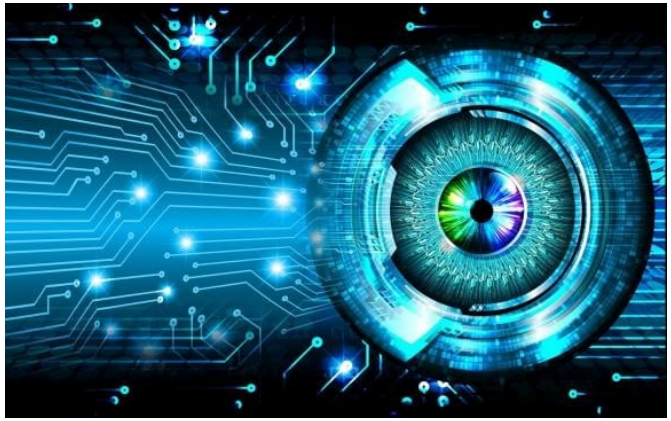
Image Processing

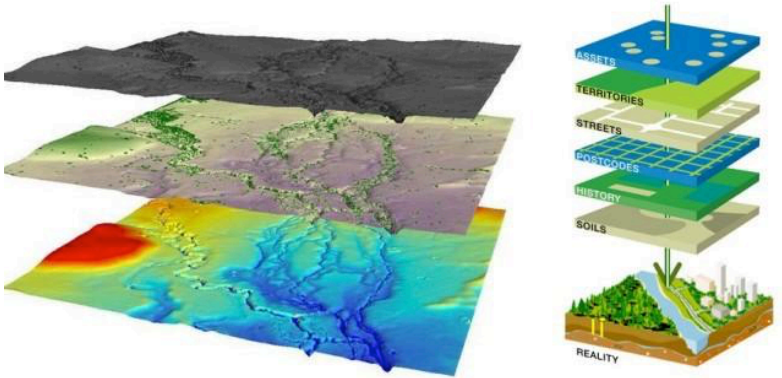
Deep learning

How does GIS work?

Which libraries / systems to use?

Which neural networks to work with?





The First Approach - Manual Labeling

Create Tiles

Label data Manually to Classify Quality

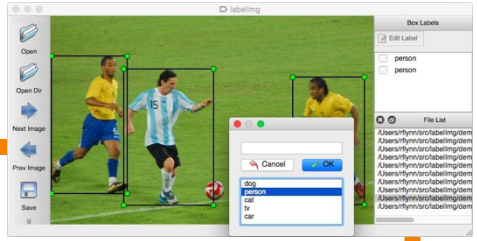
Train Convolutional Neural Network

Classify

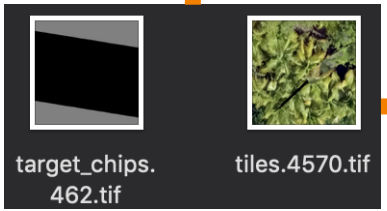
Hand-labelling for Condition Classification

Map tiles from QGIS

Imagery into QGIS



LabelIMG API

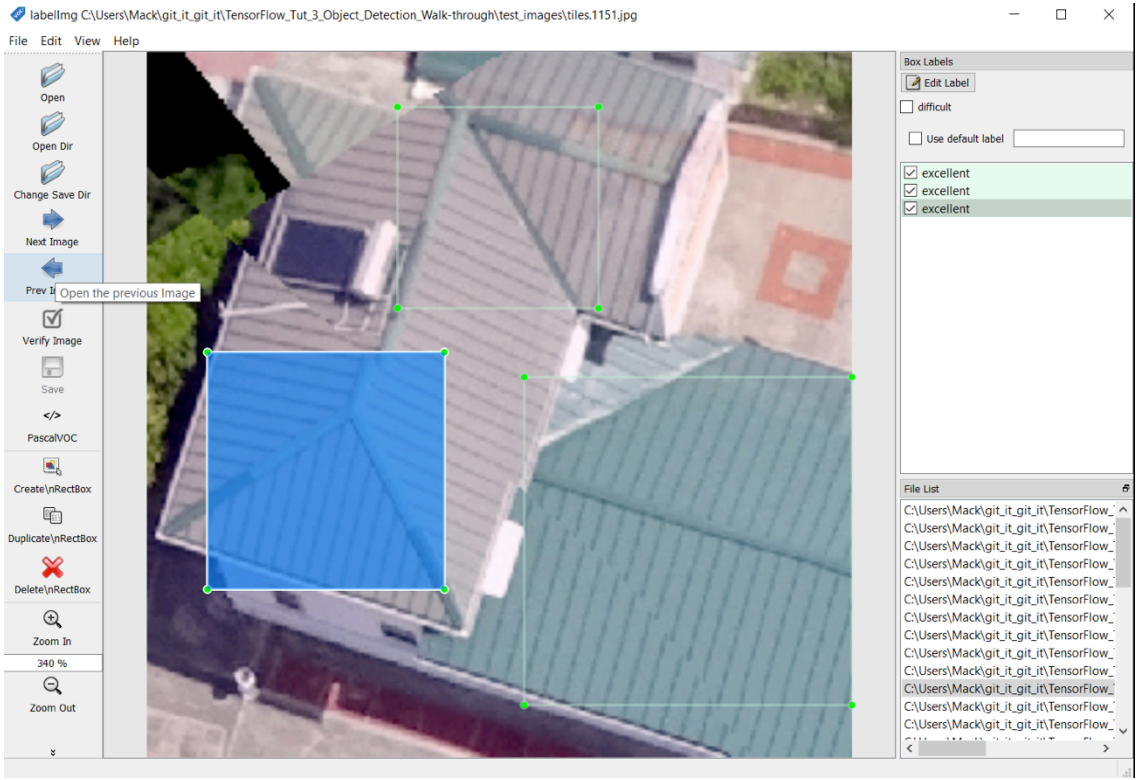


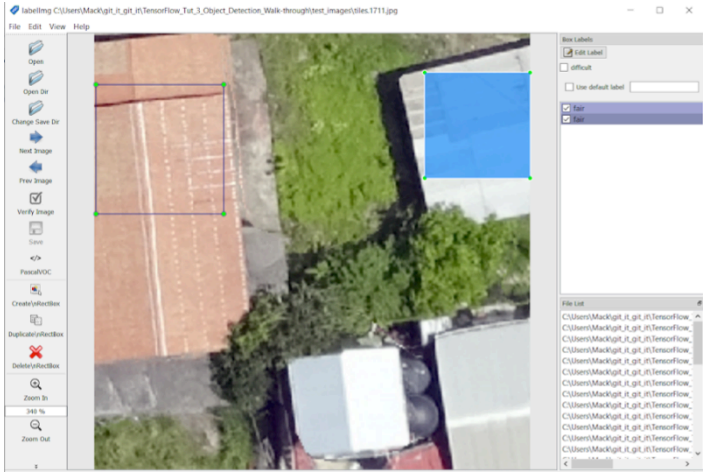
Multi-class labeling of tiles

TensorFlow - RCNN for Object Recognition

Train on local GPU (Mask RCNN Inception V2)

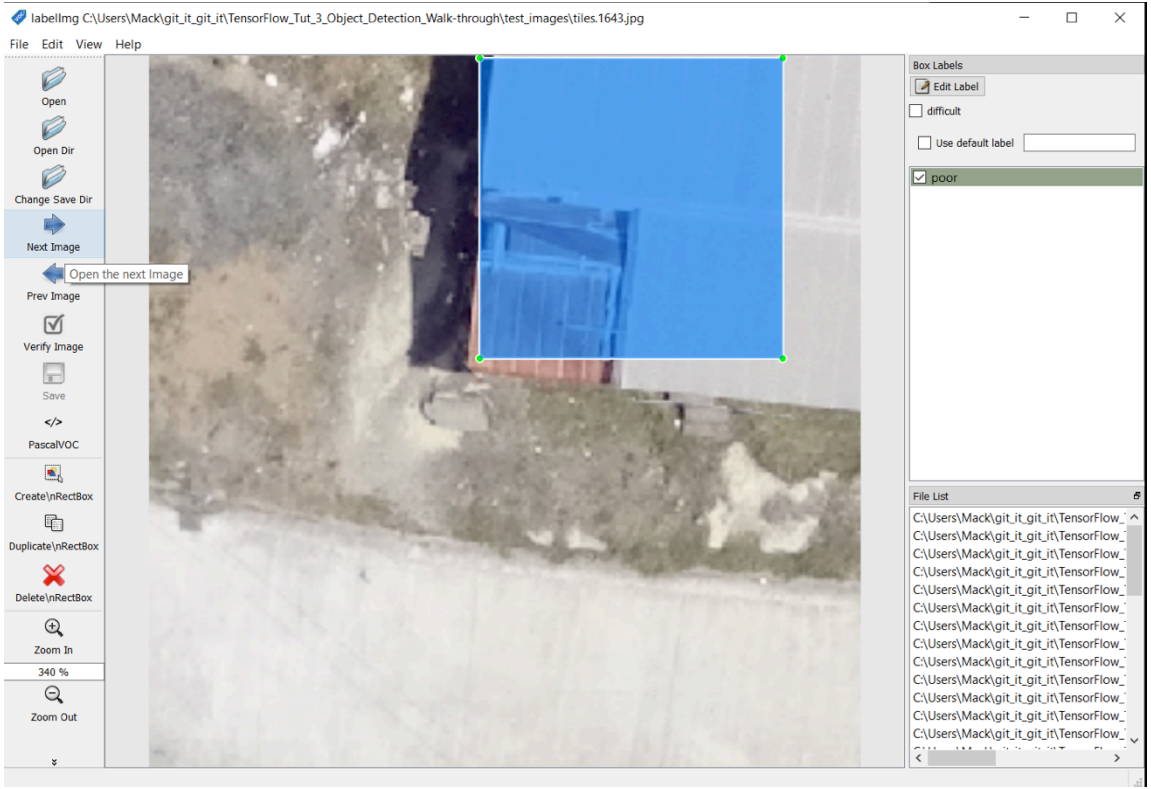
Label IMG process





Set bounding box over class example

Label IMG process



1 - Poor

2 - Fair

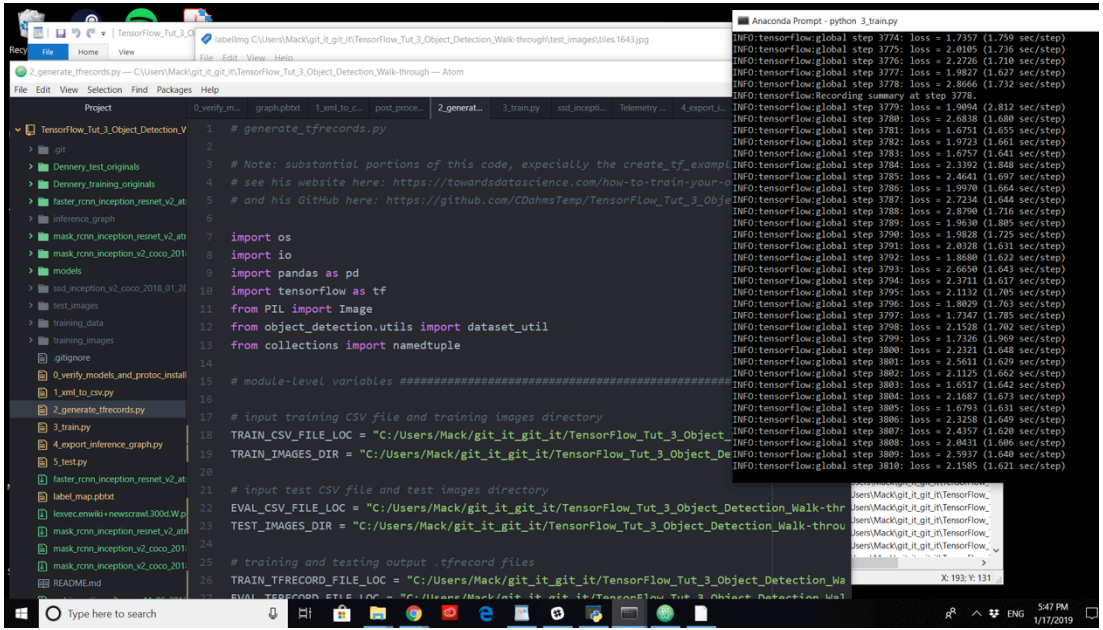
3 - Good

4 - Excellent

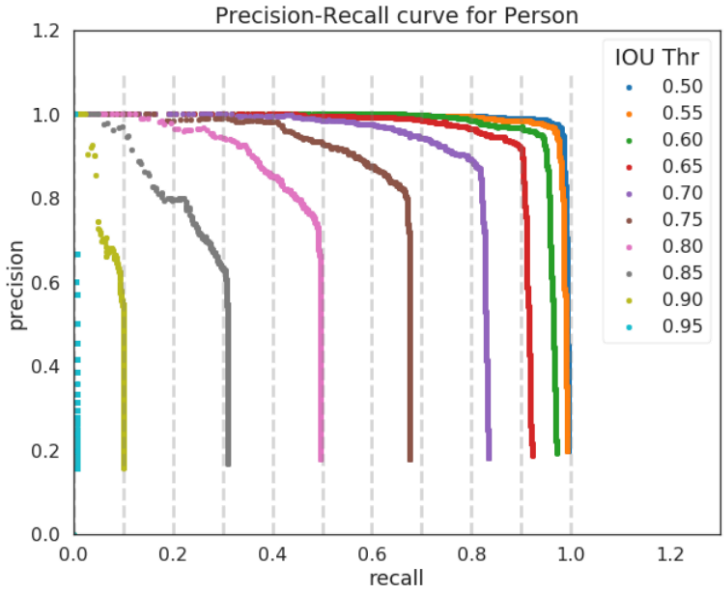
Training with Mask RCNN

A slow, but accurate model

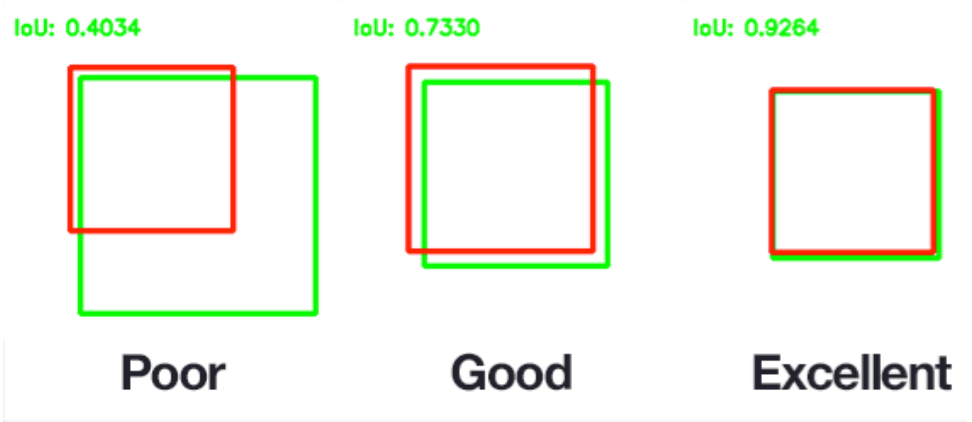
Very “greedy”



Current Issue - TensorFlow not producing key params

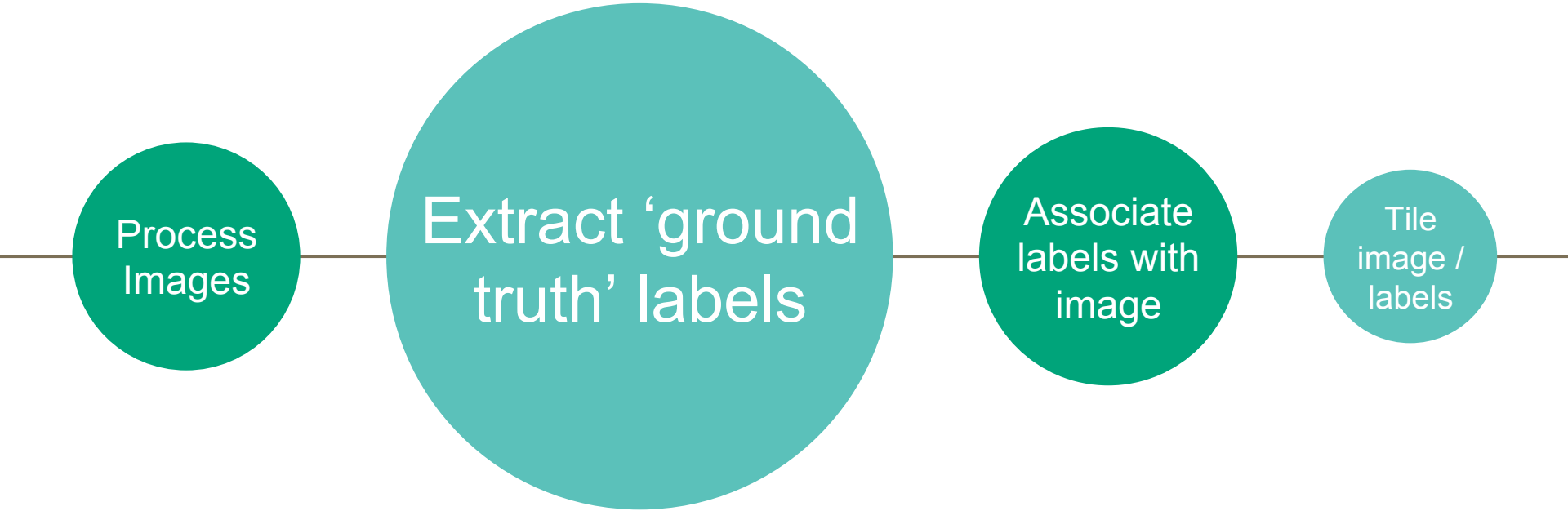


Score Threshold



Intersection over Union

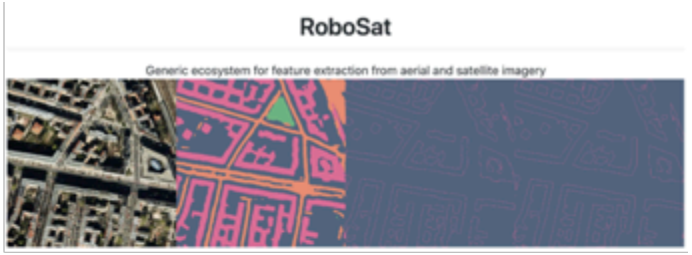
The Second Approach



Automatic Labeling of Geospatial Data

label-maker

ArcGIS



mapbox

OSGeo Project

OSM QA TILES

GDAL

OpenStreetMap

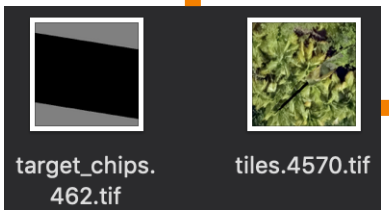
Semi-automatic labelling of Geospatial Data

Shapefile from OSM

Imagery into QGIS

Create vector mask (Fiona & Rasterio)

Mask into QGIS



Tile mask and Image

TO AWS AND MODEL (Keras ResNet50)

The Model

- ResNet50
  - 50 layer residual neural network
  - Pre-trained on ImageNet datasets
  - Suitable for working with geospatial data

- Run on an AWS GPU instance (p2.xlarge)

- Using the Keras API

Evaluating Process

Data

Understanding Data

Manipulating / Using Drone Data

Model

Which models

How to model

Evaluating models