

# Rooftop detection using satellite imagery

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## Problem

Using satellite images to detect flat and curved rooftops.

## Data

- Google Maps API
- buildings from cities around Serbia
- self annotation

## Methodology

- Mask RCNN
- Detectron2 implementation



## Results

- Overall AP = 50.36%
- AP50 = 79.23%
- AP75 = 57.77%
- APs (small) = 0.00%
- APm (medium) = 33.55%
- API (large) = 55.82%

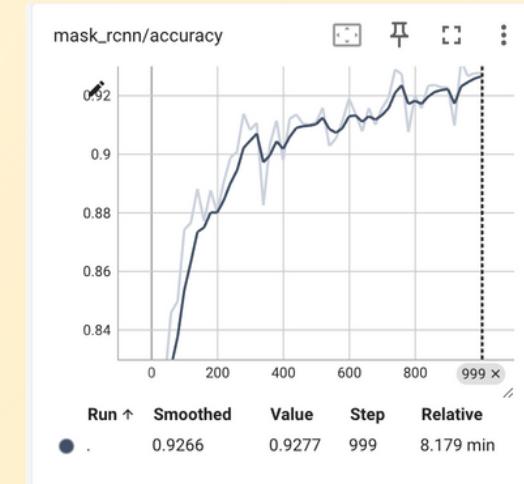
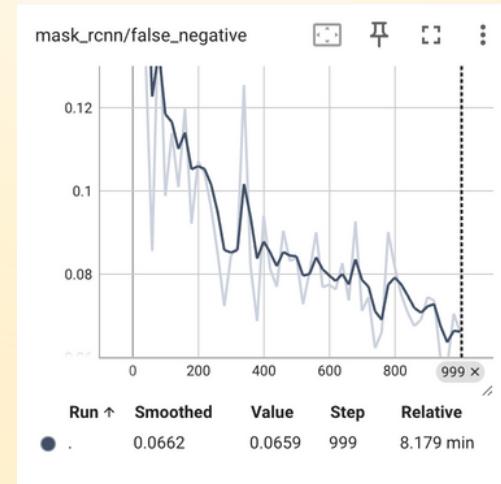
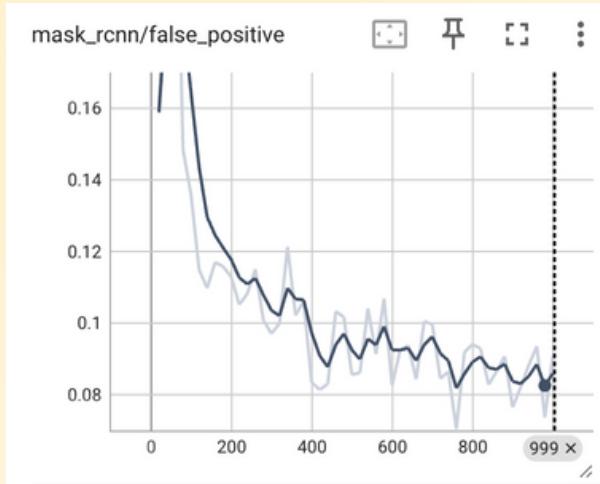
## Insights

- Model couldn't predict any small objects
- Overlapping of rooftops
- Tree obstacles
- Roof color

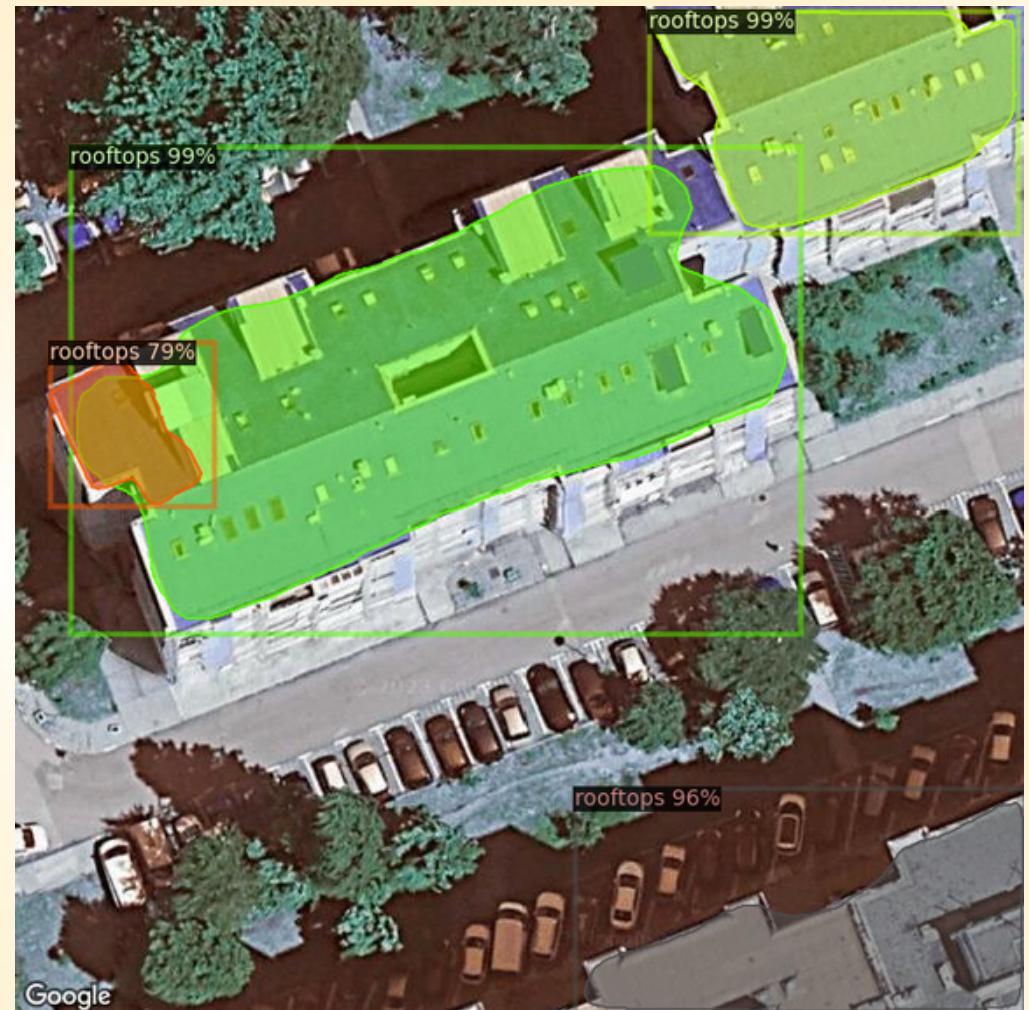
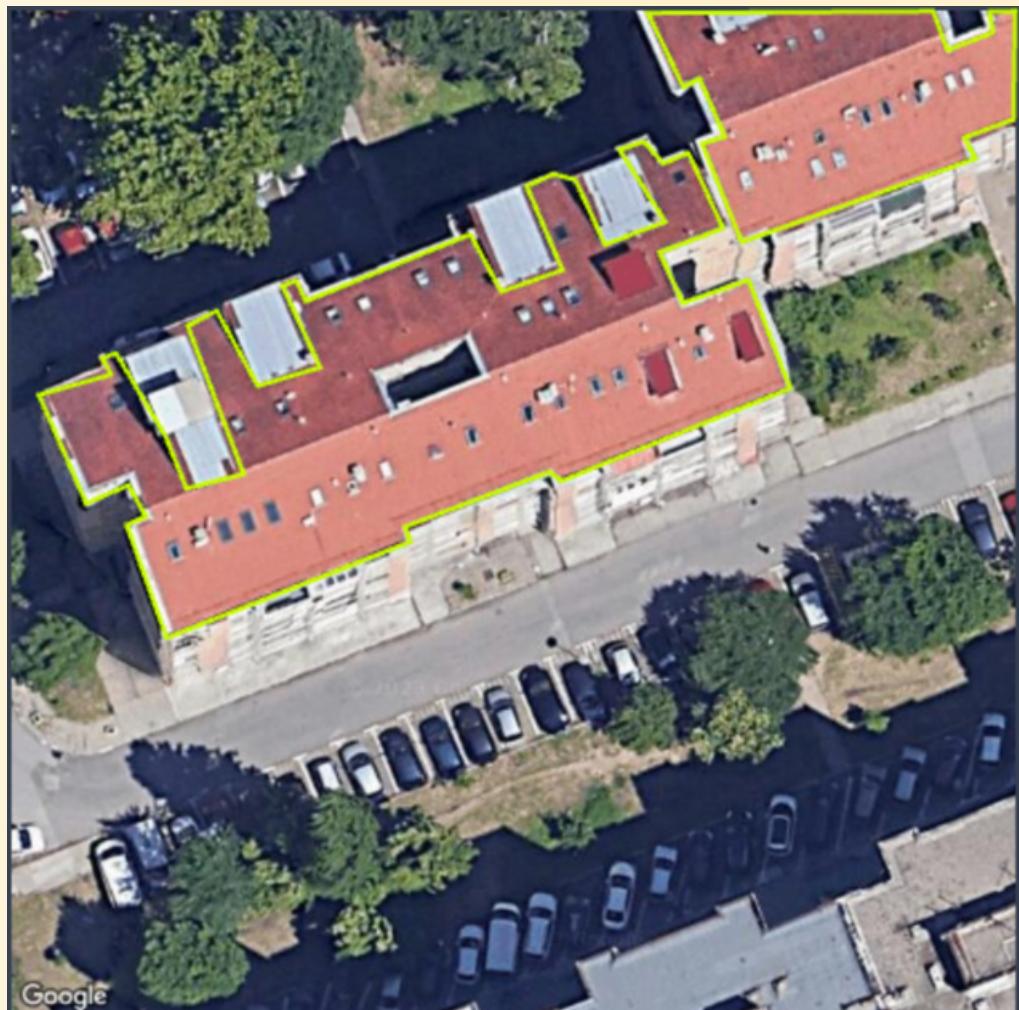
```

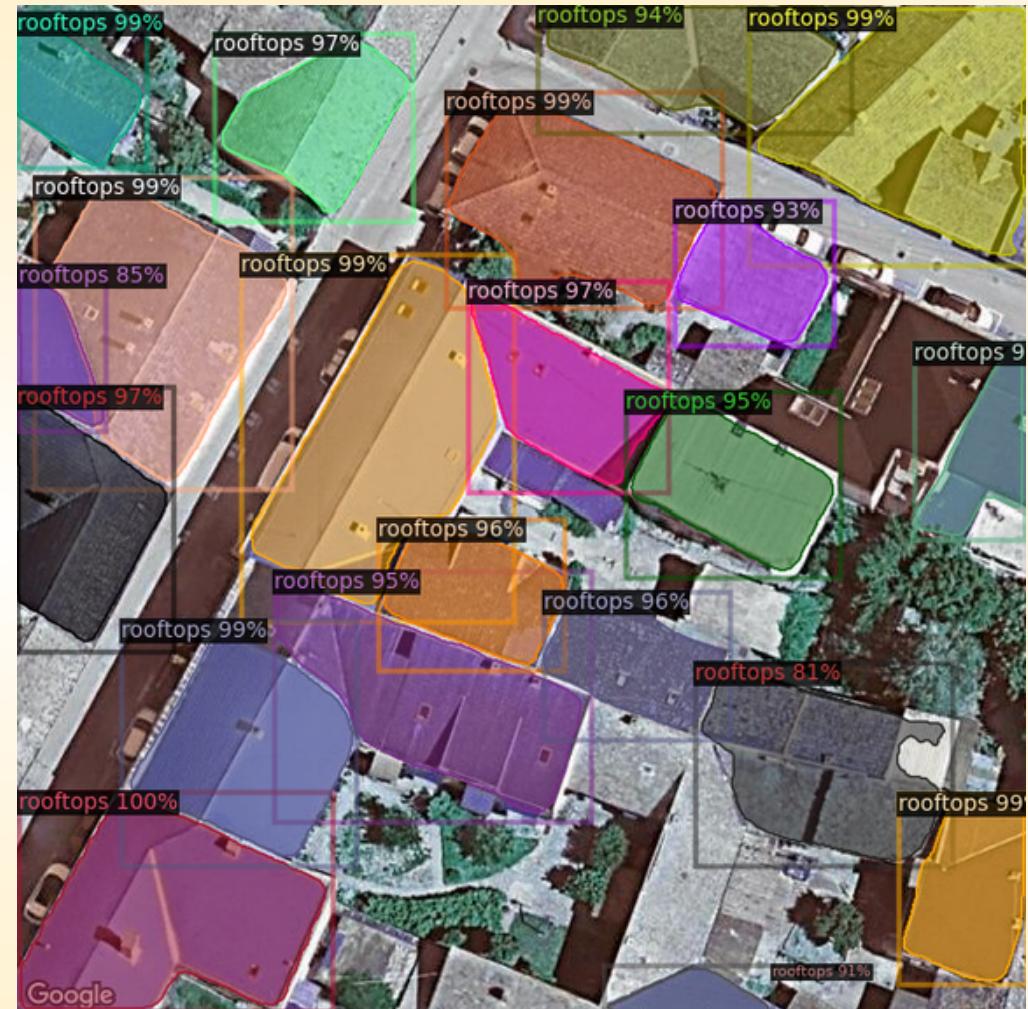
Average Precision (AP) @[ IoU=0.50:0.95 | area= all | maxDets=100 ] = 0.463
Average Precision (AP) @[ IoU=0.50 | area= all | maxDets=100 ] = 0.741
Average Precision (AP) @[ IoU=0.75 | area= all | maxDets=100 ] = 0.507
Average Precision (AP) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.000
Average Precision (AP) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.351
Average Precision (AP) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.506
Average Recall (AR) @[ IoU=0.50:0.95 | area= all | maxDets= 1 ] = 0.070
Average Recall (AR) @[ IoU=0.50:0.95 | area= all | maxDets= 10 ] = 0.412
Average Recall (AR) @[ IoU=0.50:0.95 | area= all | maxDets=100 ] = 0.565
Average Recall (AR) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.000
Average Recall (AR) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.584
Average Recall (AR) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.563
[01/22 16:58:10 d2.evaluation.coco_evaluation]: Evaluation results for segm:
| AP      | AP50     | AP75     | APs     | APm     | API     |
|:-----:|:-----:|:-----:|:-----:|:-----:|:-----:|
| 46.312 | 74.131  | 50.707  | 0.000  | 35.092  | 50.588 |
[01/22 16:58:10 d2.evaluation.coco_evaluation]: Per-category segm AP:
category | AP      | category | AP      |
|:-----:|:-----:|:-----:|:-----:|
rooftops  | nan     | rooftops | 46.312
[01/22 16:58:10 d2.engine.defaults]: Evaluation results for Roof-Top-detection-test in csv format:
[01/22 16:58:10 d2.evaluation.testing]: copypaste: Task: segm
[01/22 16:58:10 d2.evaluation.testing]: copypaste: AP,AP50,AP75,APs,APm,API
[01/22 16:58:10 d2.evaluation.testing]: copypaste: 46.3120,74.1312,50.7069,0.0000,35.0921,50.5884
OrderedDict([('segm',
{'AP': 46.311952713352674,
'AP50': 74.13123257698618,
'AP75': 50.70694419217126,
'APs': 0.0,
'APm': 35.09212346676066,
'API': 50.58843420979263,
'AP-rooftops': 46.311952713352674}))]

```

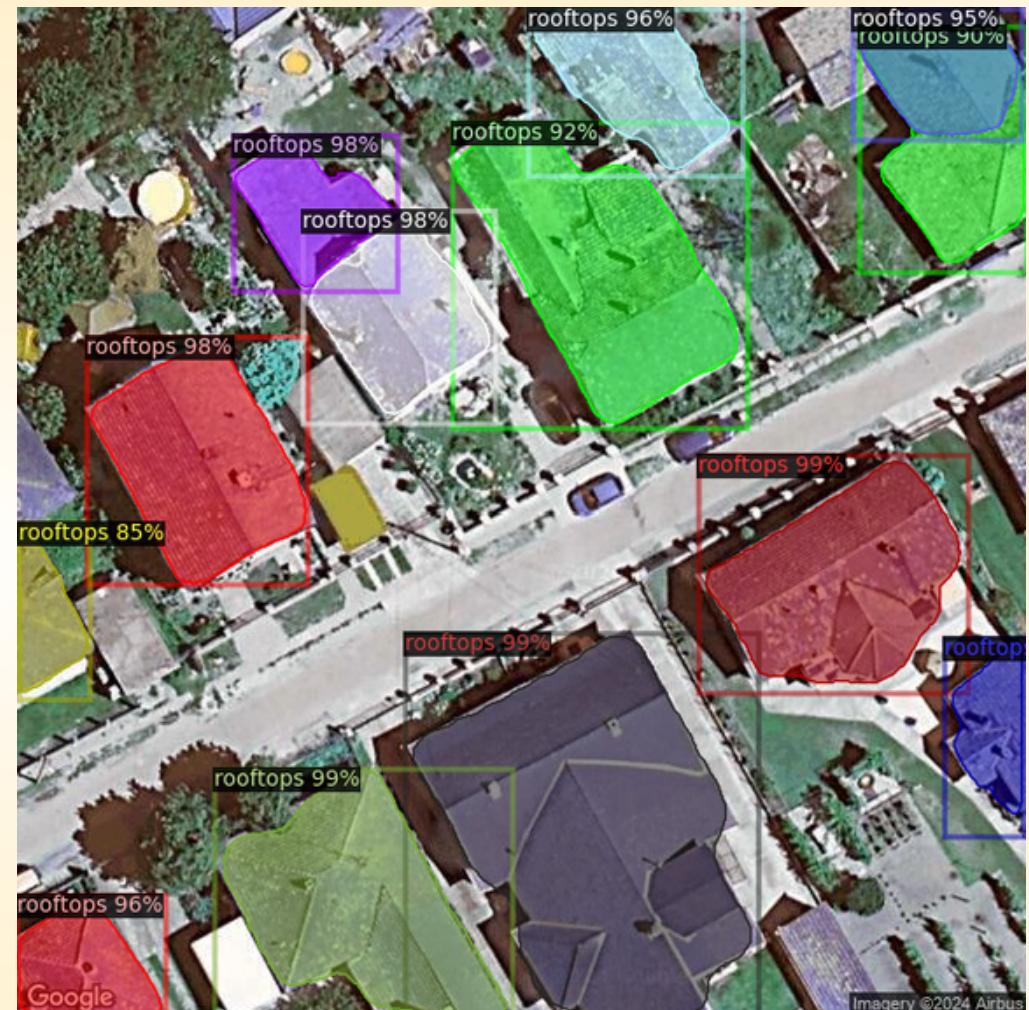


False positivly grouped, but predicted mistake in annotation





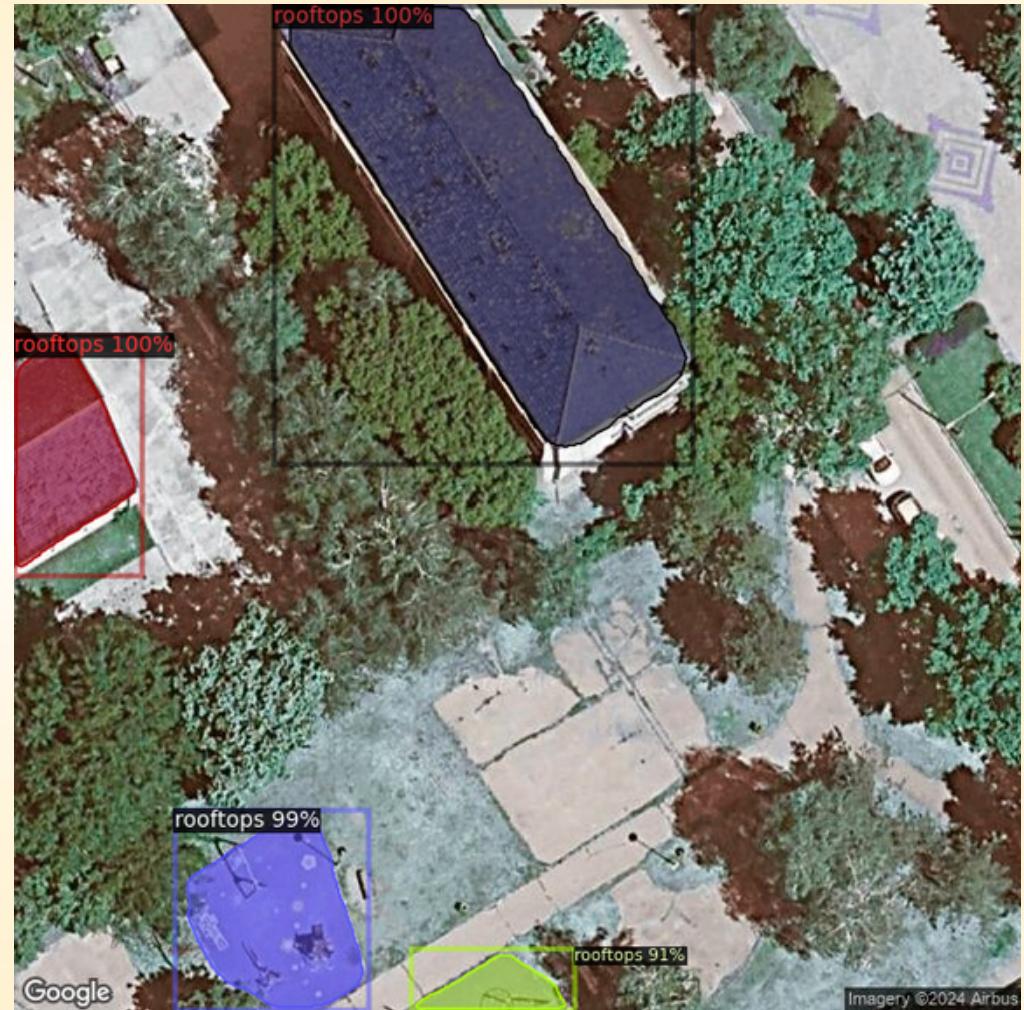
False instance



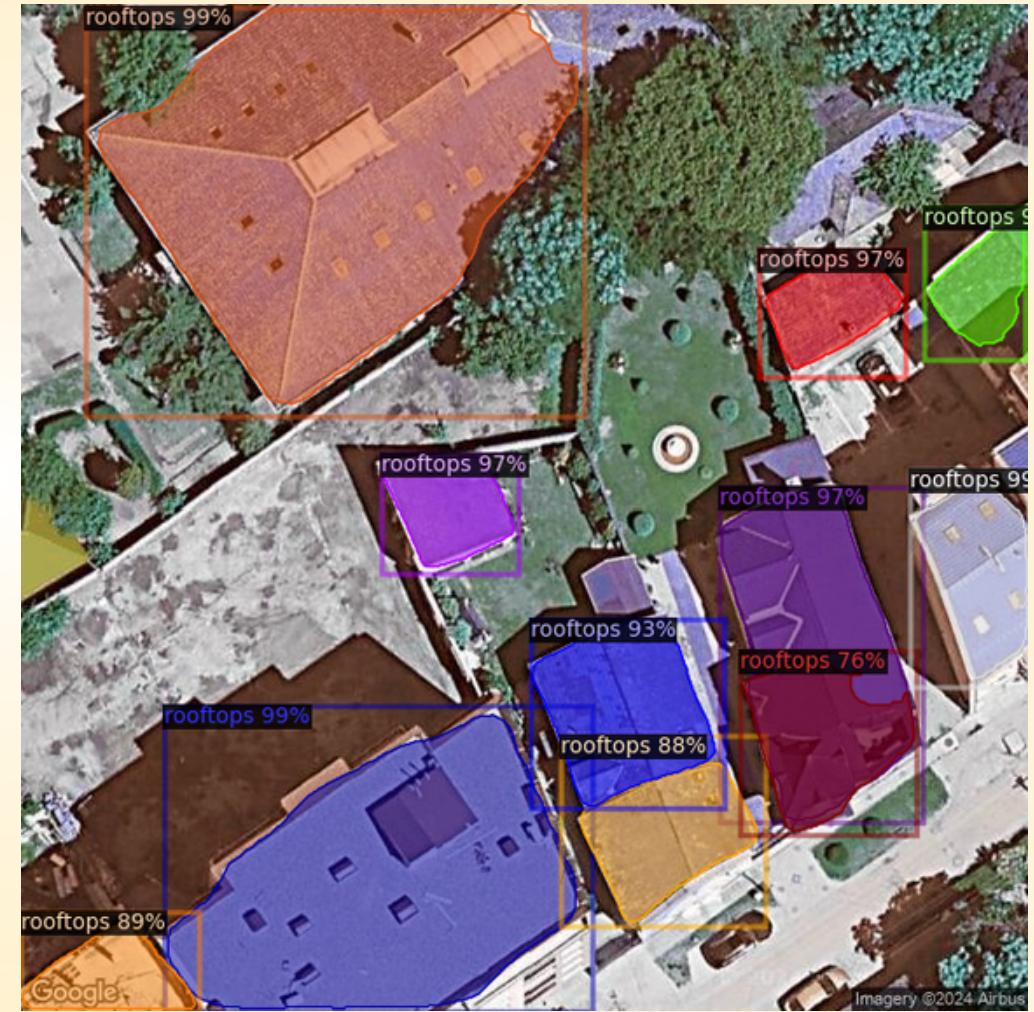


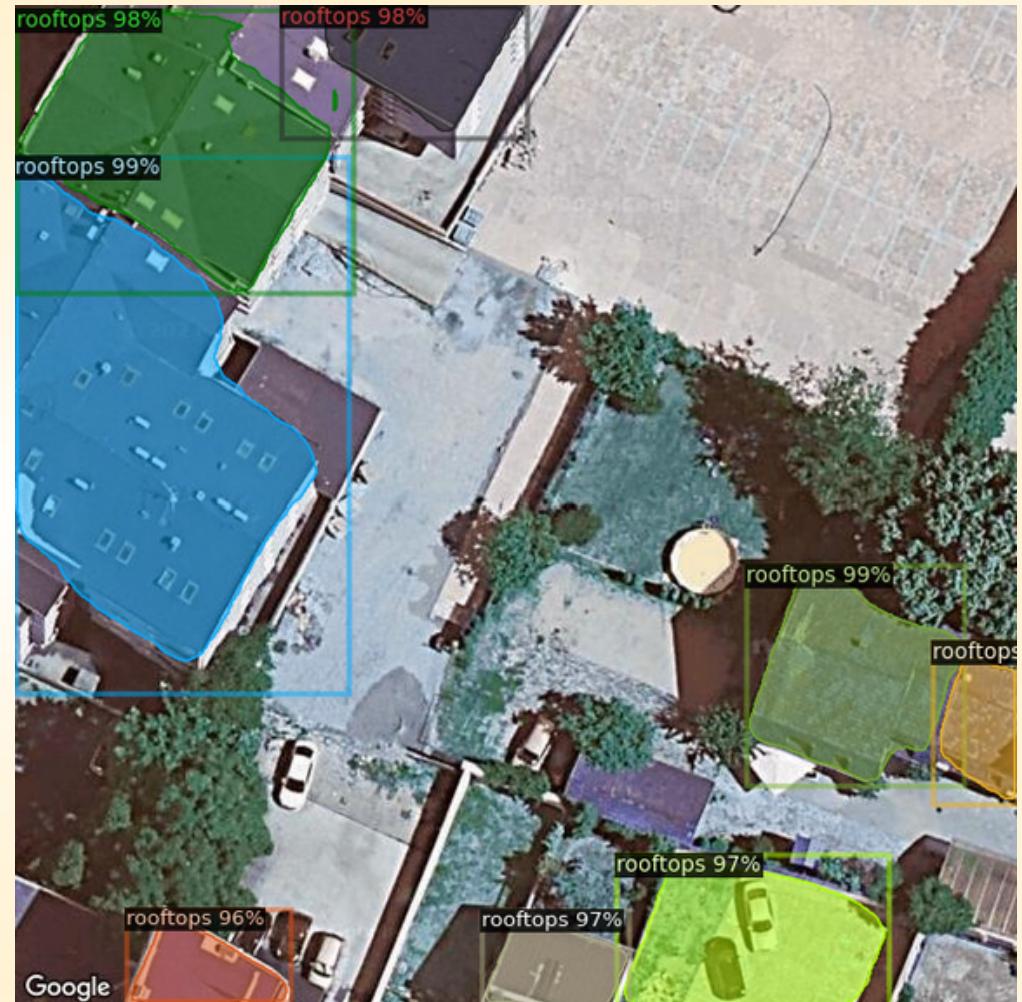


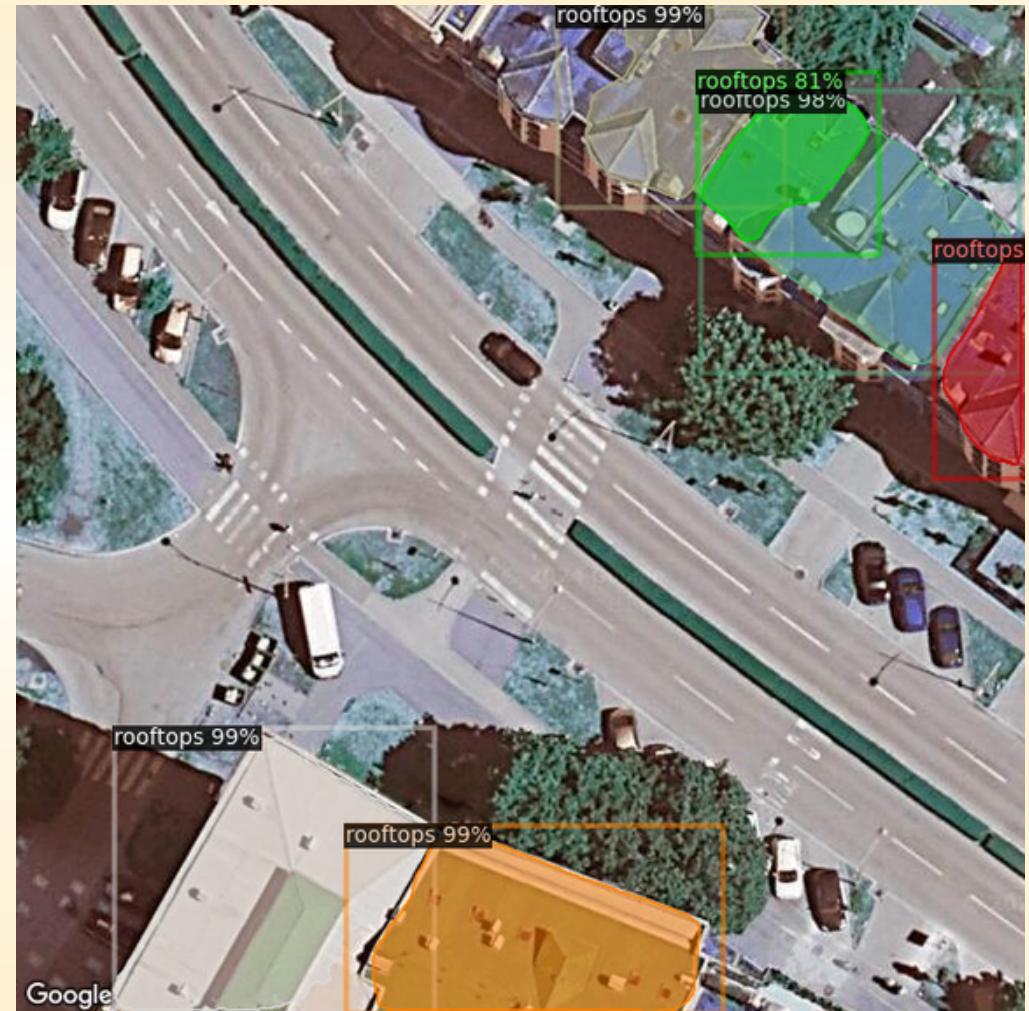
Roof color - false positive

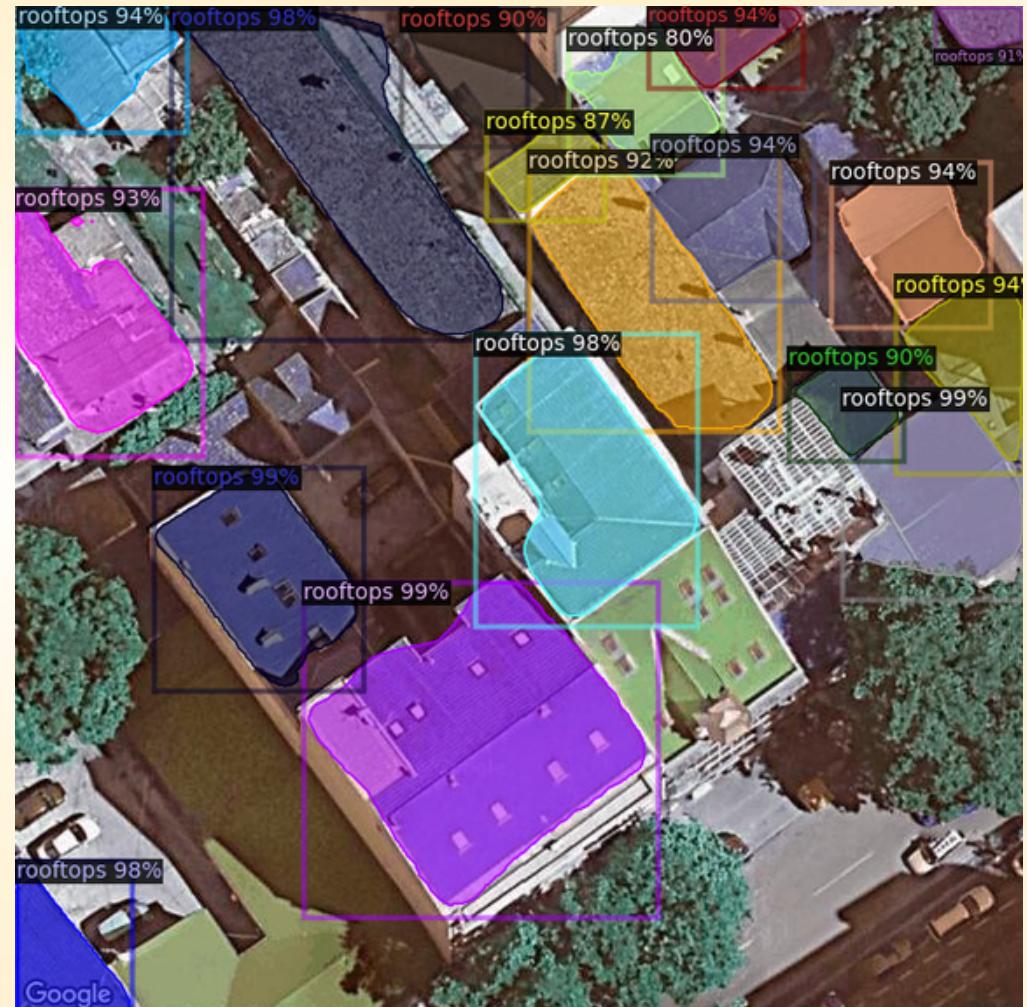
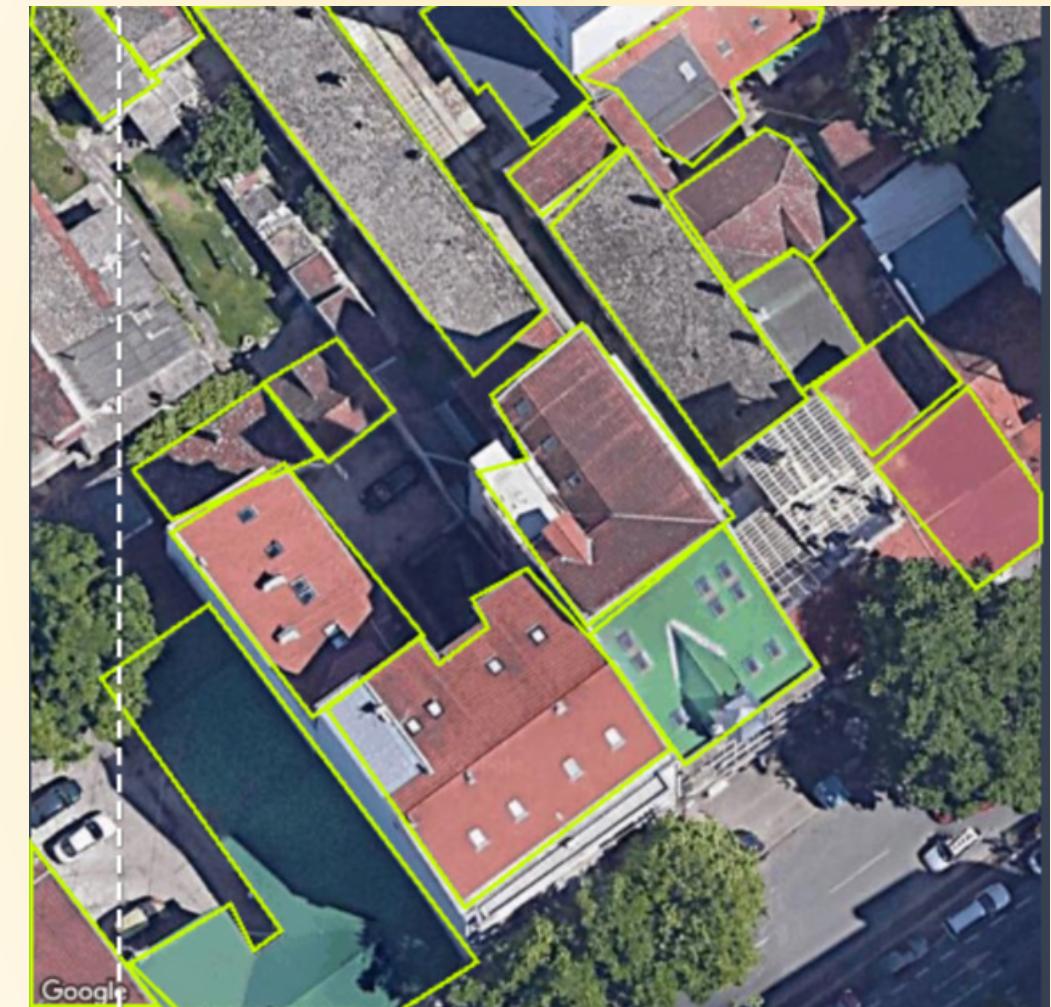


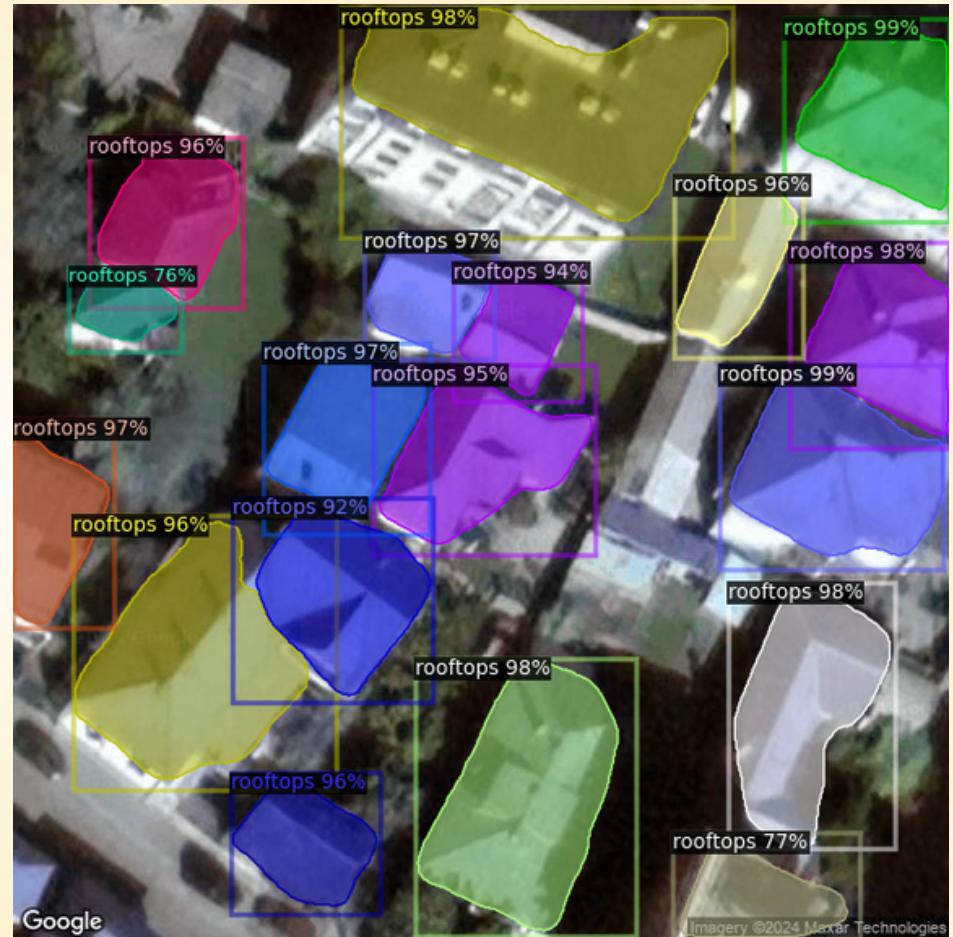
Tree obstacle - false negative

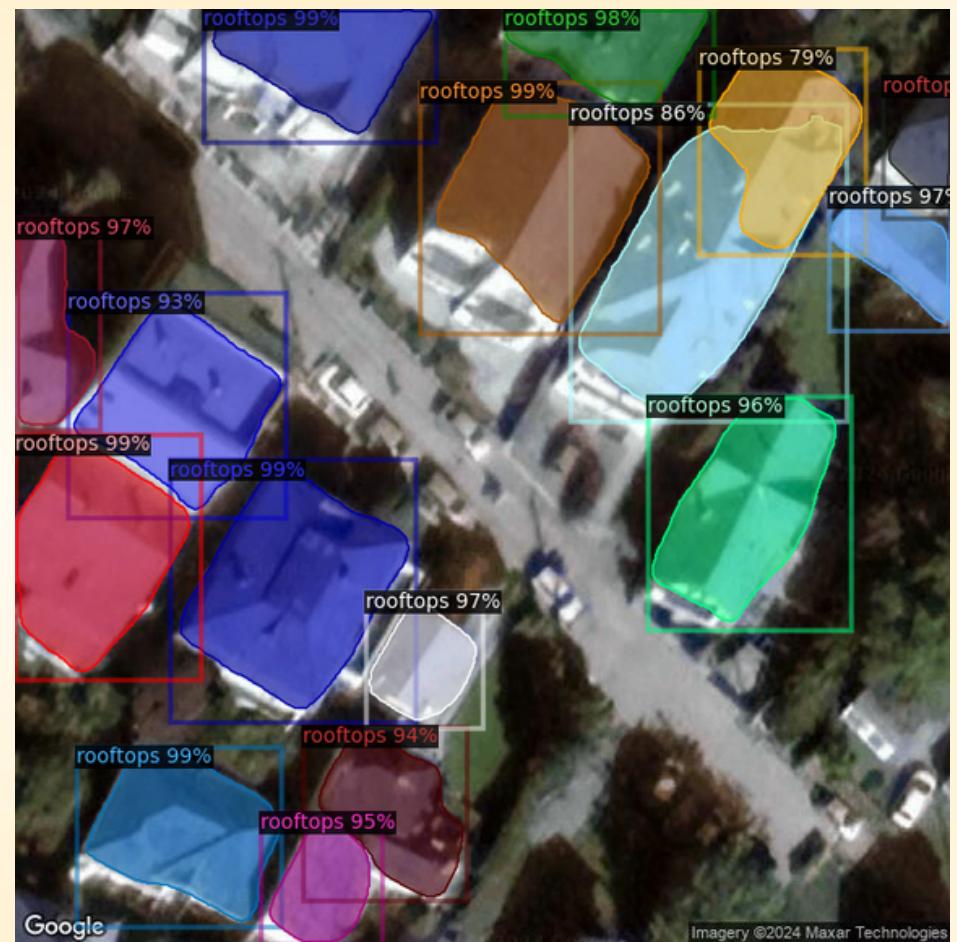












Small roof representations



Google



Google

