Object detection is hard. But even on lower quality images, masks still allowed 40% detection

Identifying and counting commercial solar installations in South Africa.

INTRO

- South Africa's electricity generation woes have continued to deteriorate recently, leading to enhanced vigor in the pursuit of renewable sources like solar energy.
- This form of electricity generation already has some foothold in some areas, but accurate information on the spread of solar panel installations is unavailable.
- By leveraging computer vision and satellite images, this project aims to equip the Tshwane municipality with information on the number and density of solar panels.

METHODS

1. Google Earth Pro image collection,
2. Object Masks for placement info
3. COCO format for object capturing
4. Detectron2 Package for actual and prediction visualizations, model build and predictions
5. Streamlit for application deployment

RESULTS

- Out of the 240 labeled and masked solar panel objects on the 211 validation image blocks, 119 (i.e. 50%) were identified correctly using the model predictions, whilst a further 232 model solar panel detections were false positives (i.e. not actually a solar panel based on solar panel object masks).
- Out of the 196 labeled and masked solar panel objects on the 192 stability testing image blocks, 84 (i.e. 43%) were identified correctly using the model predictions, whilst a further 215 model solar panel detections were false positives (i.e. not actually a solar panel based on solar panel object masks).

DISCUSSION

- Modelling attempts were made on raw images without masked solar panel objects but proved to be extremely susceptible to predicting false positives.
- To improve the final modelling results, higher resolution aerial images can be used to train the model but would also require more computational resources.

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Figure 1: Cropped validation image object visualization (left) and cropped validation image prediction (right).
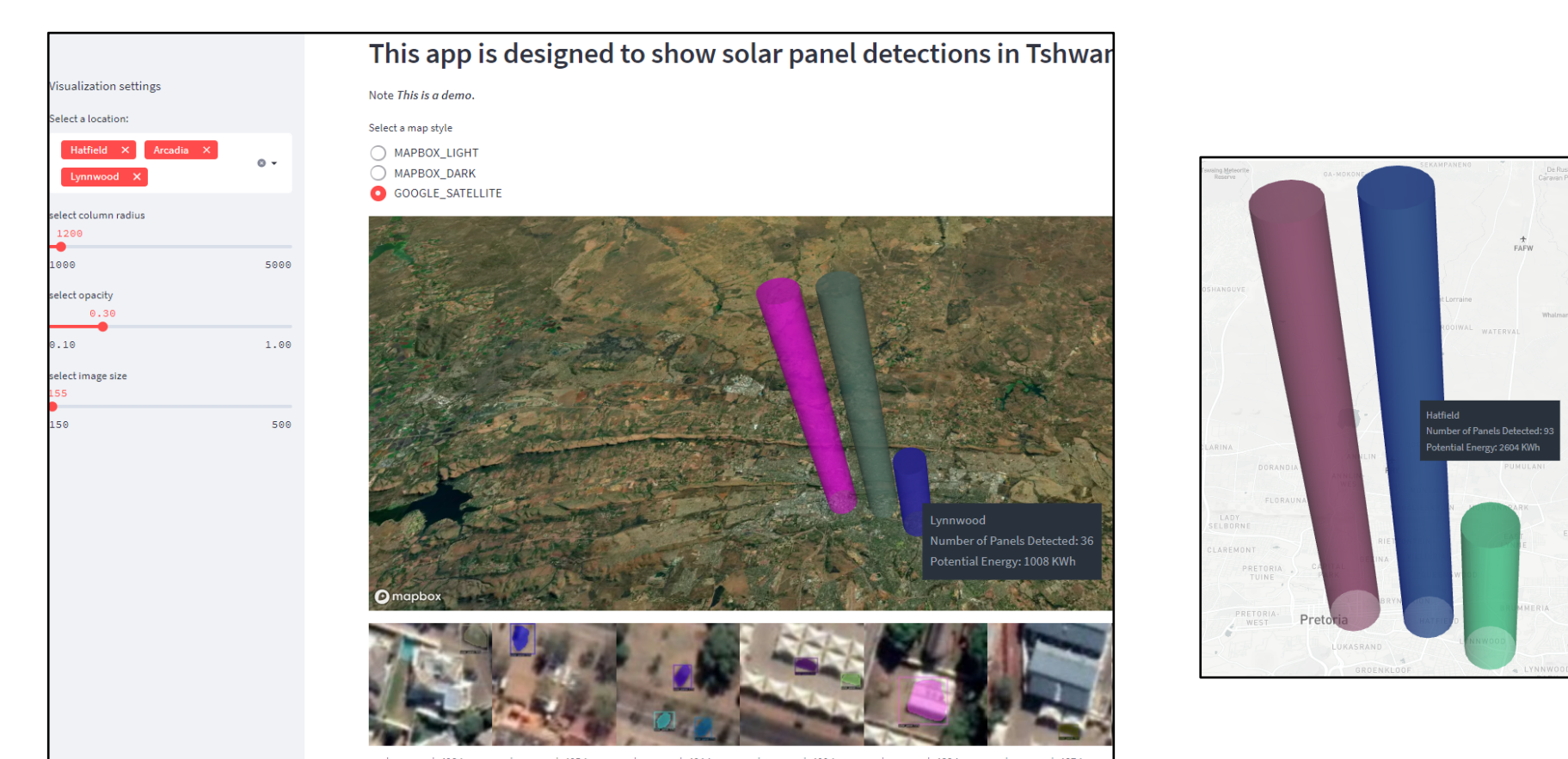

Figure 2: Overall view of Streamlit application (left) Alternate zoomed in map view (right).

Table 1 showing top 10 solar panel detections per 0,2 km² for areas in the Pretoria Old East area

Rank	Suburb	Solar Panel Detections	Potential Energy (KWh)
1	Hatfield	93	2604
2	Arcadia	90	2520
3	Pretoria Central	73	2044
4	Erasmus Park	71	1988
5	Sunnyside	64	1792
6	Muckleneuk	58	1624
7	Alphen Park	51	1428
8	Groenkloof	49	1372
9	Ashlea Gardens	49	1372
10	Berea	47	1316

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