Design, Generate, Validate: Satellite Data-Free Machine Learning Model Evaluation from Earth to Space

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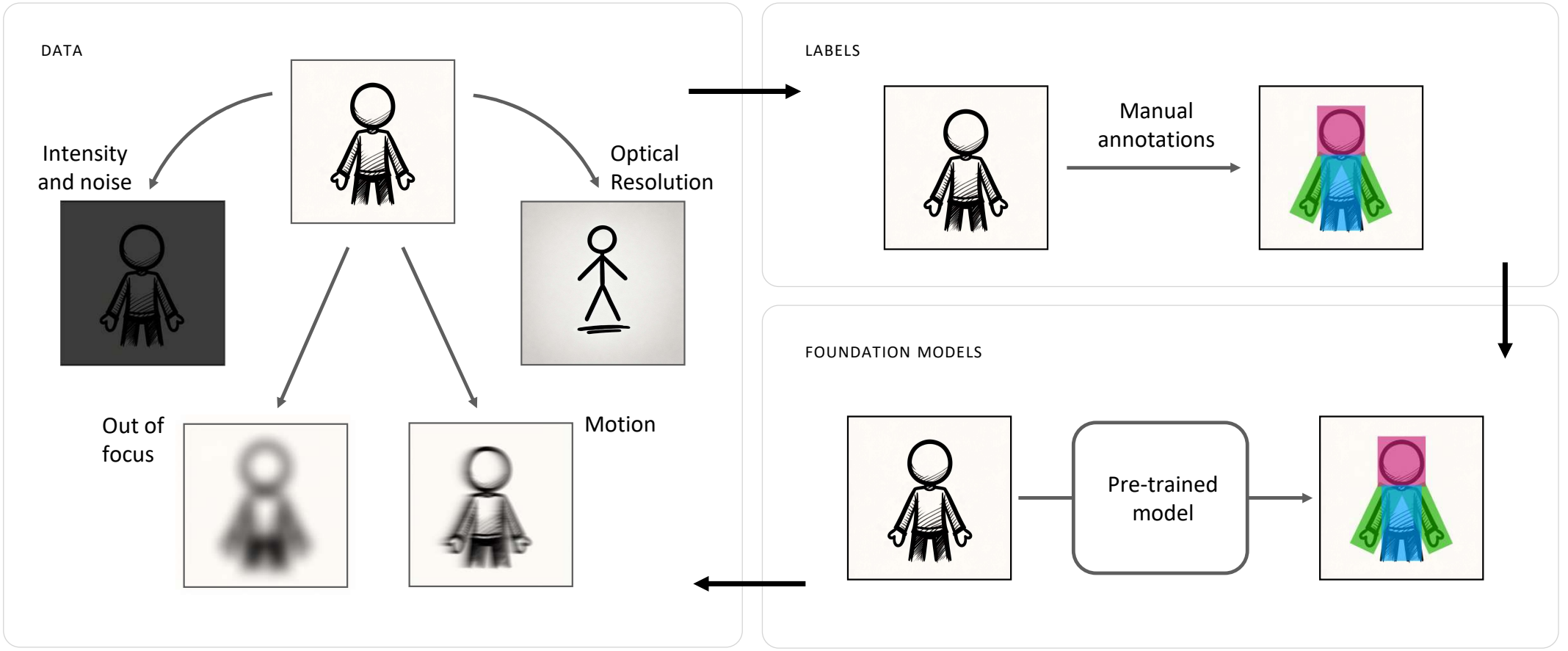
[1] Dotphoton, [2] Planet



Acquired by GEISAT over the Tiber Valley (Italy) compressed with Jetraw Core

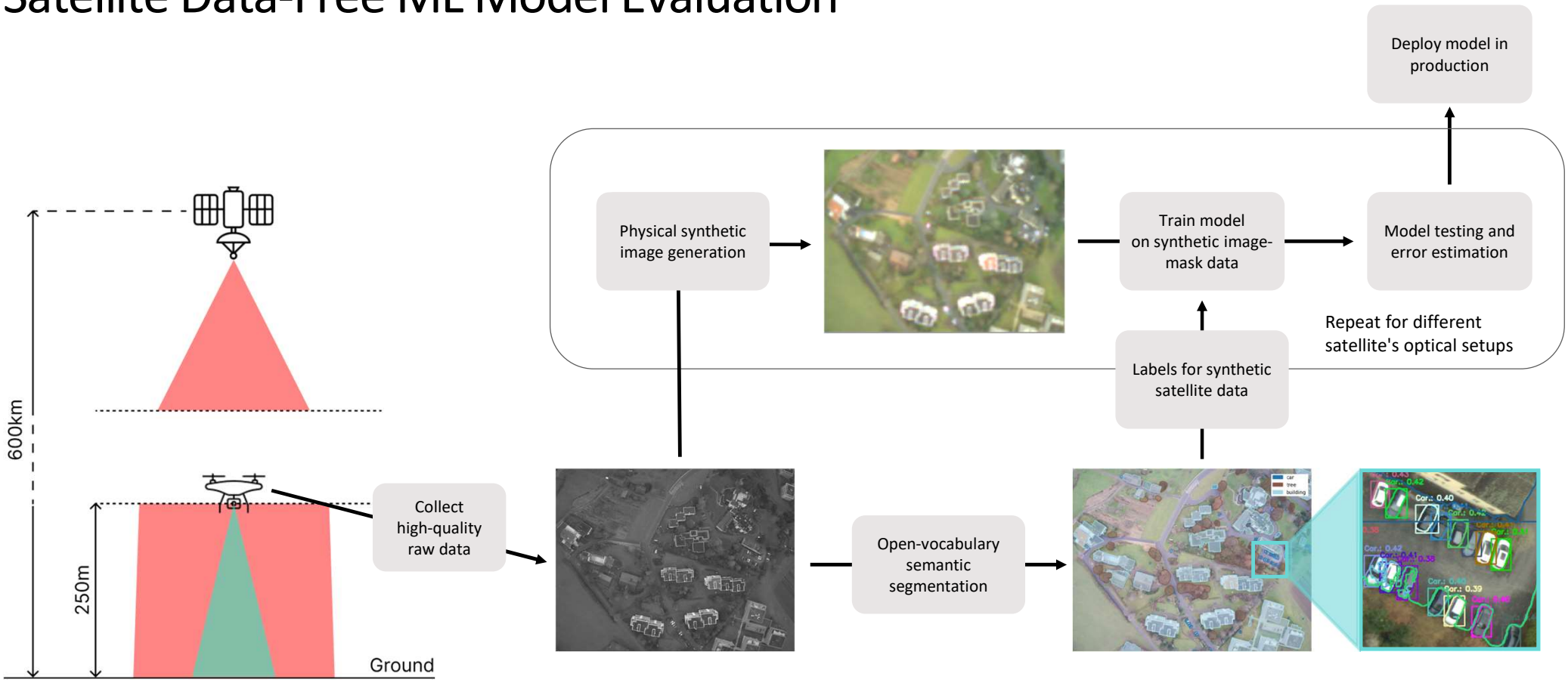
Introduction

Machine Learning Ingredients



Methods

Satellite Data-Free ML Model Evaluation

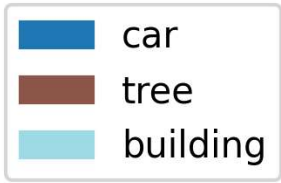


Methods

Semantic Segmentation with Foundation Models

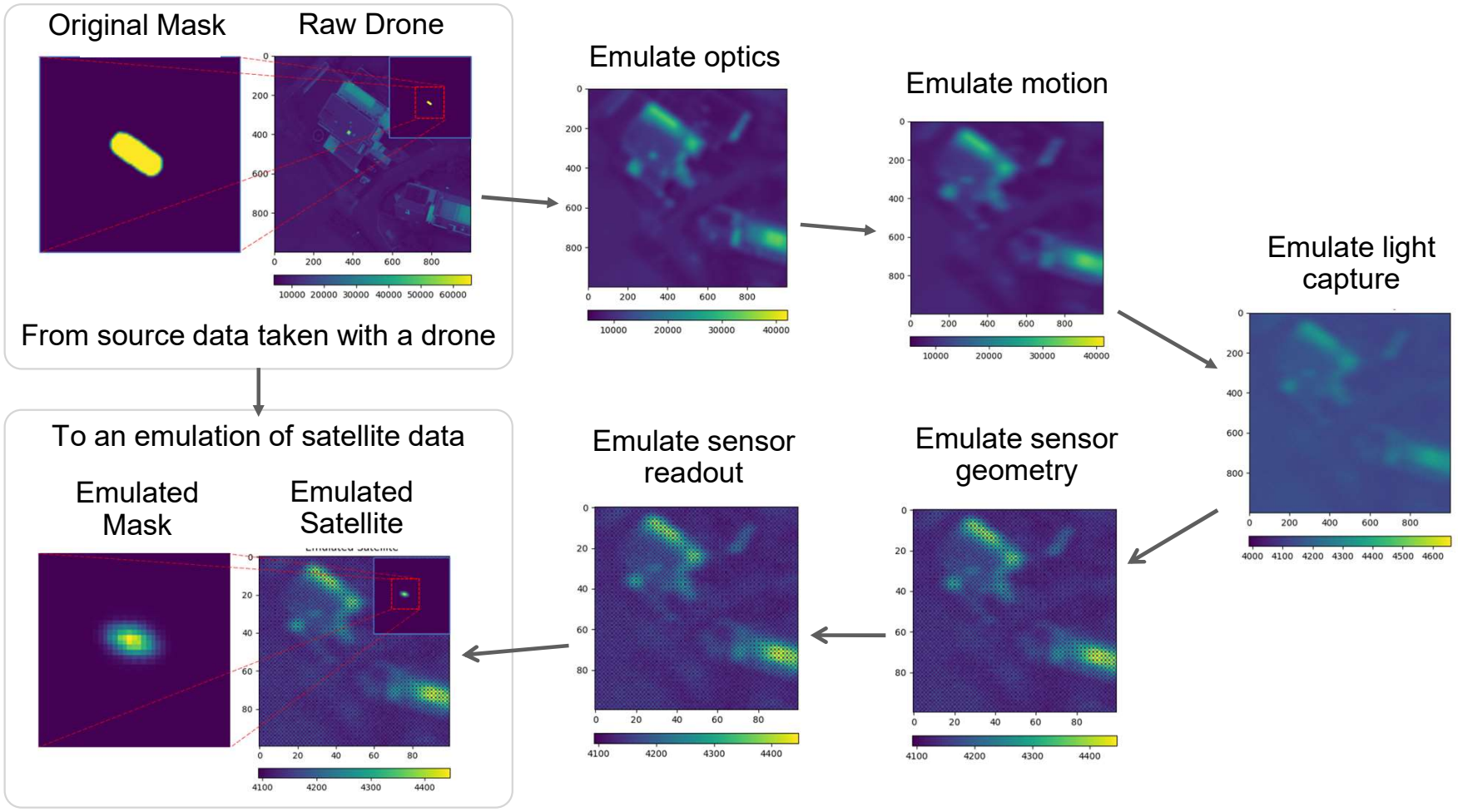






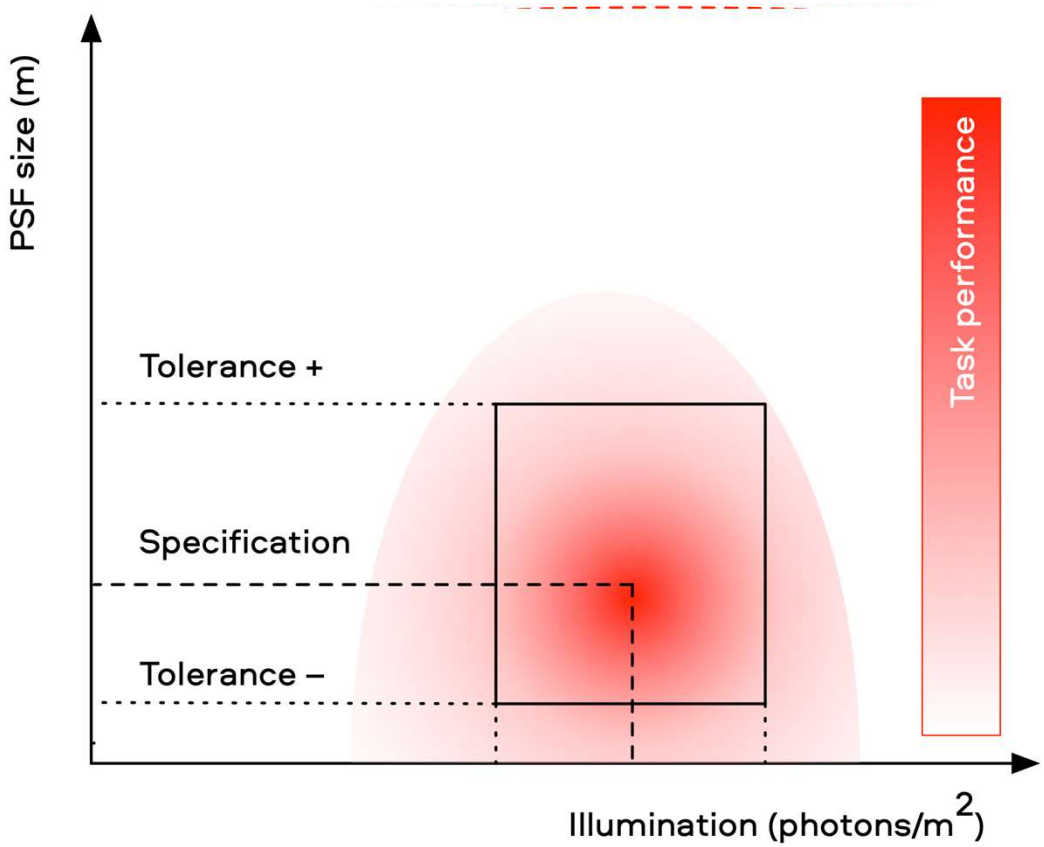
Methods

Satellite Emulation from Raw Drone Data



Methods

Model tolerancing



Drone data

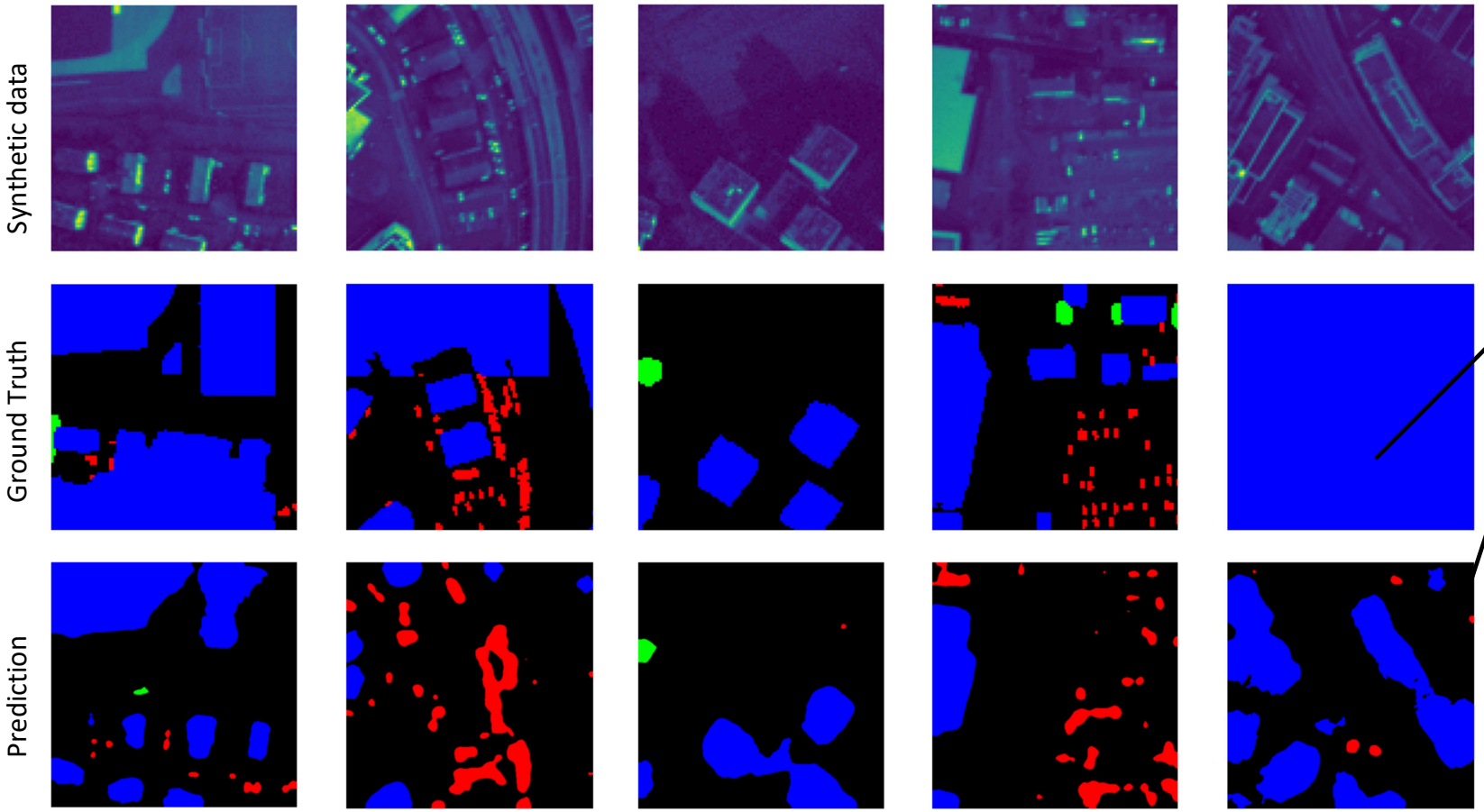


Satellite synthetic data



Results

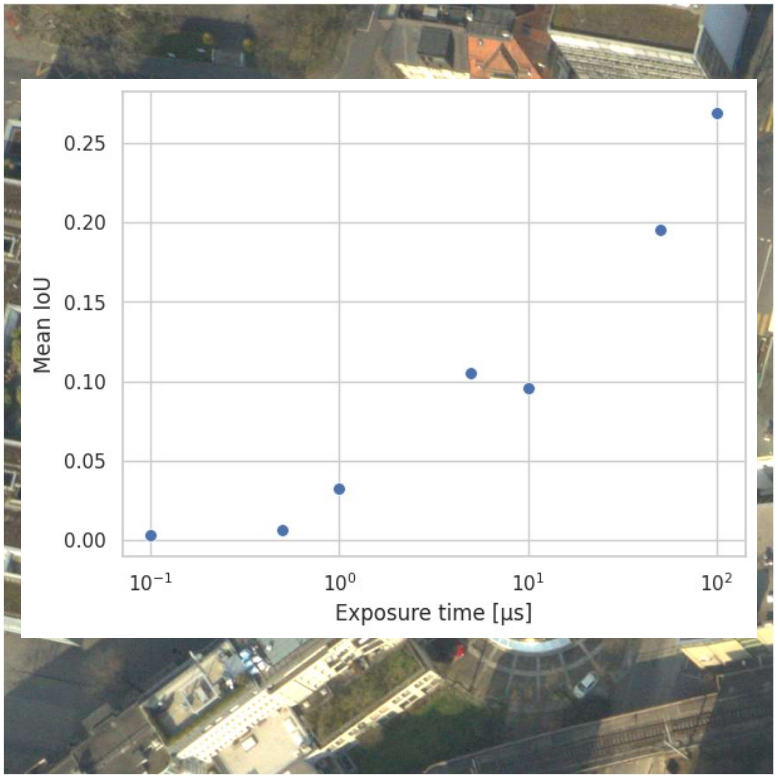
Distilled Model Results

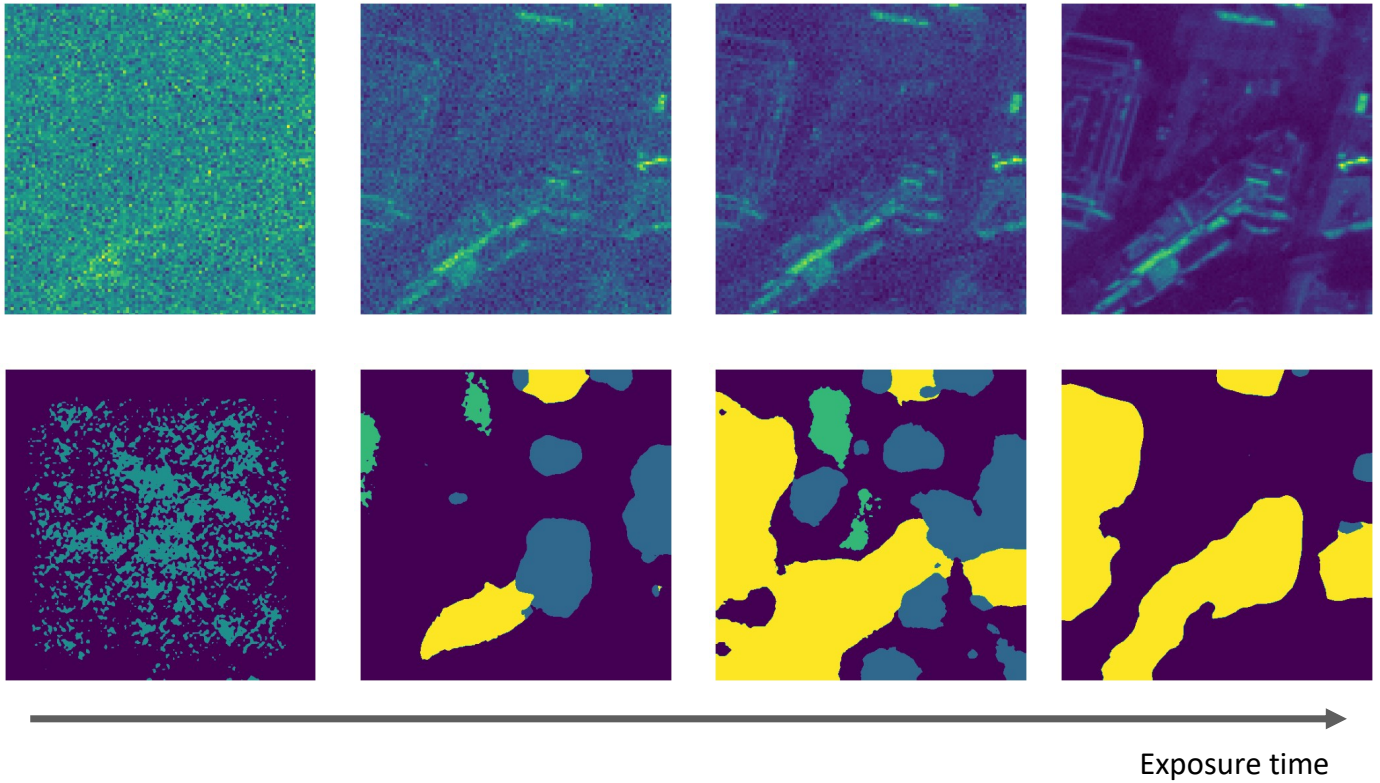


Transformer-based distilled model detects better than original foundation models outputs (over segmented)

Results

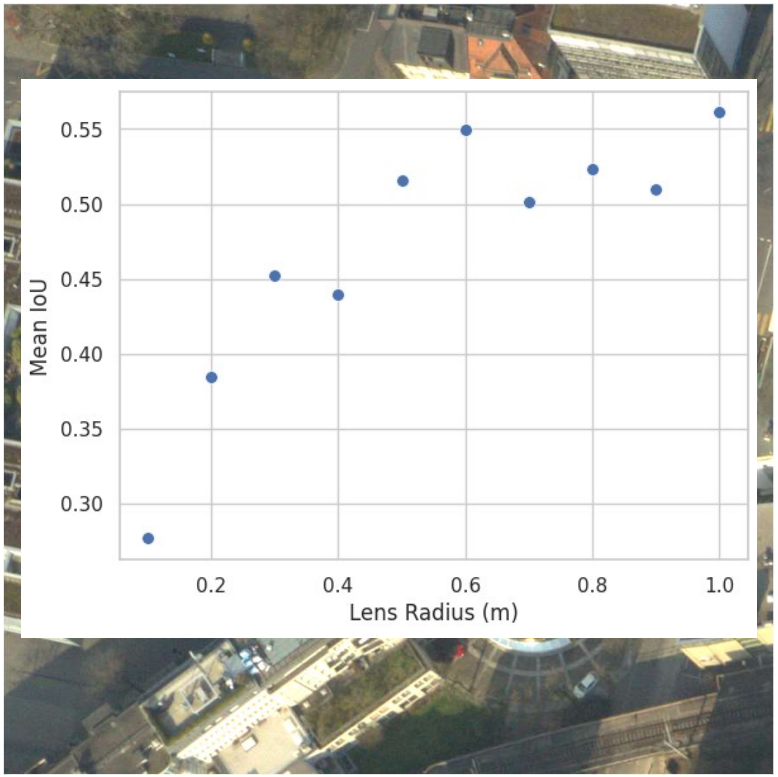
Informational Lower Bound (Noise)

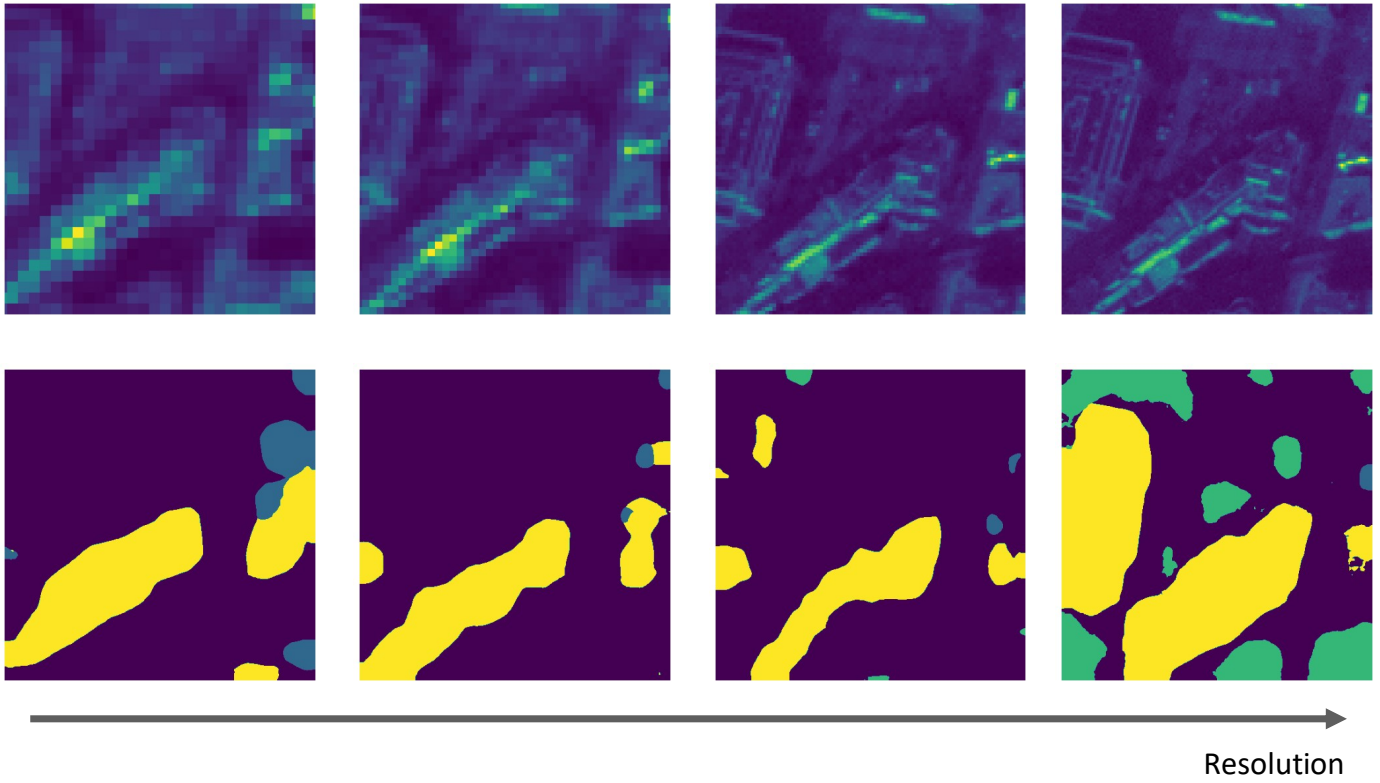




Results

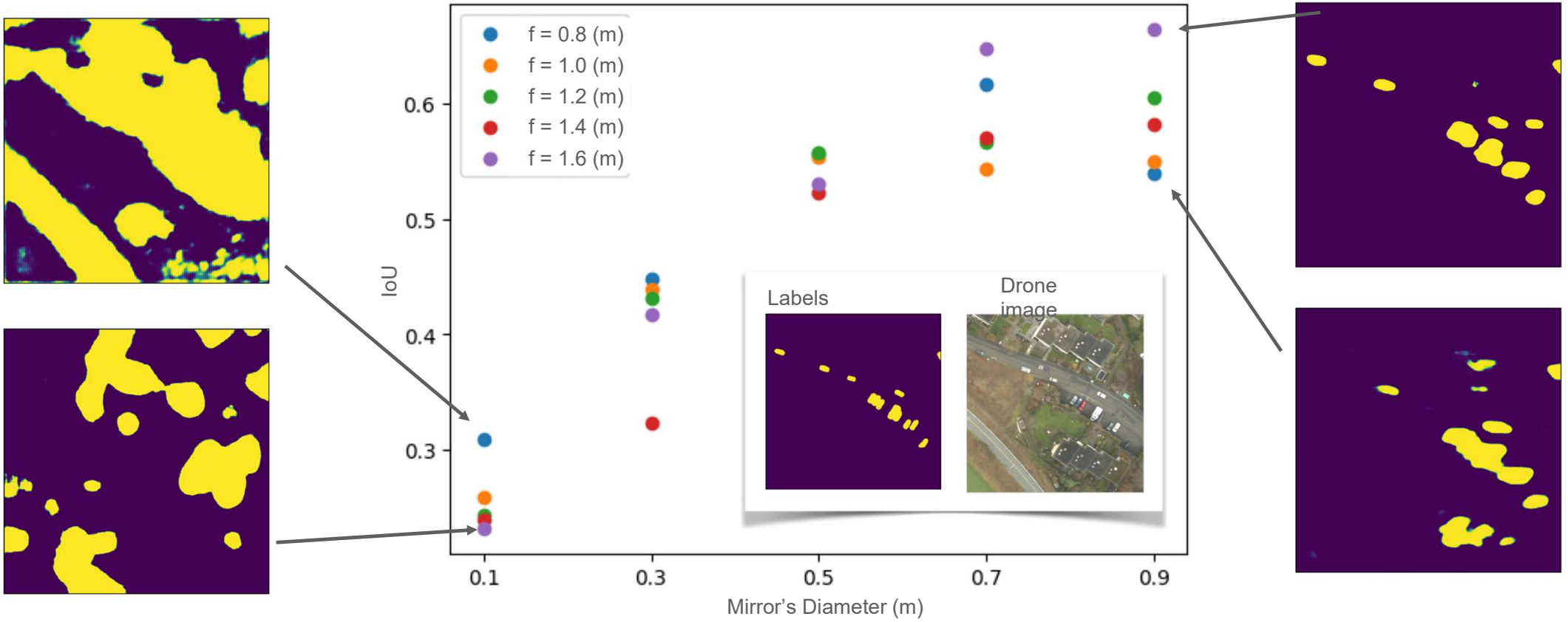
Informational Lower Bound (Resolution)





Results

In-Silico Satellite Design



Conclusions and next steps

Data-free ML Evaluation

Summary

- Generate labels from foundation models on drone data
- Generate synthetic satellite data from raw drone data
- Evaluate in-silico ML model performance with different satellite optics payload

Next steps

- Collect drone-satellite data pairs
- Test satellite performance on tasks beyond the resolution limit