

Segment-then-Classify: Few-shot Instance Segmentation for Environmental Remote Sensing

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Tackling Climate Change with Machine Learning



Instance segmentation is pivotal for environmental science

Instance Segmentation:

- Classify
- Delineate Boundaries



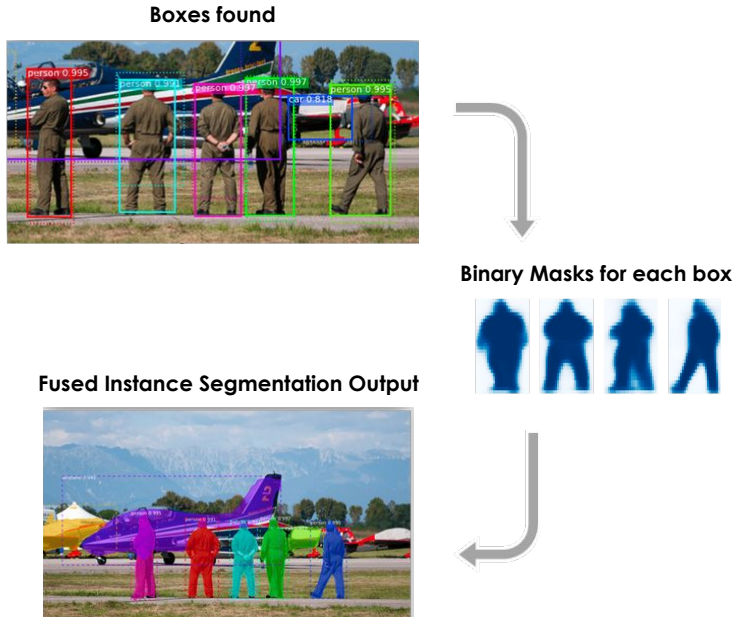
Land cover classification



Glacier monitoring



Current methods require extensive training data



Conventional Approach

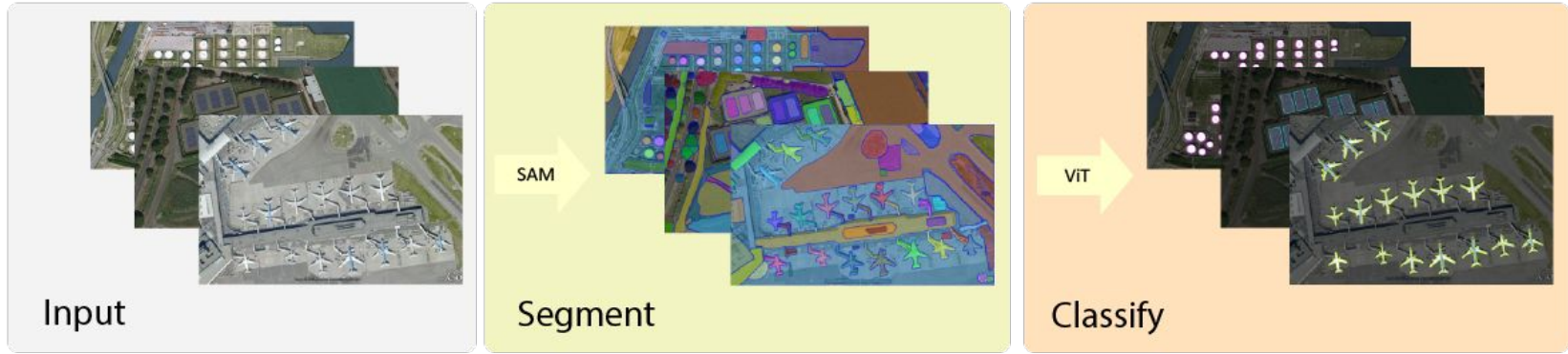
- **Detect-then-Segment**
- Require **extensive** training data

Data Scarcity

YOLOv8: A state-of-the-art model using the Detect-then-Segment strategy



The Segment-then-Classify (STC) Strategy



Step 1: Automated Instance Mask Generation

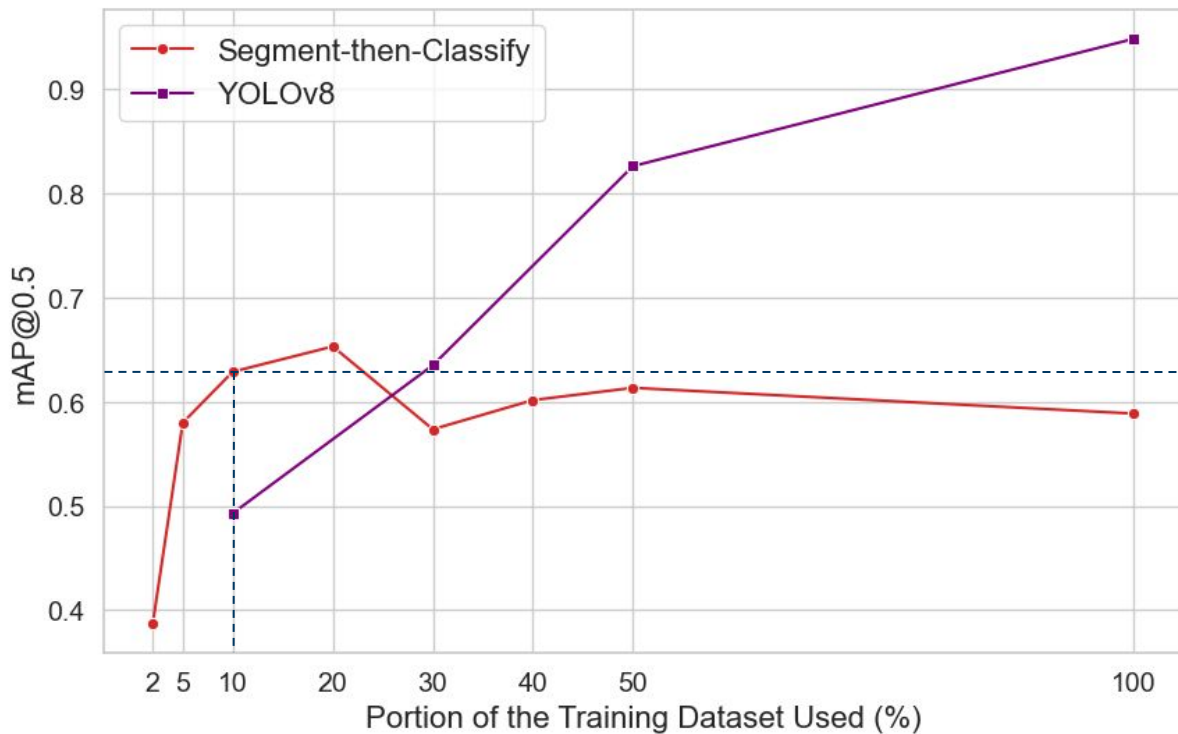
- Use Segment Anything Model (SAM)'s "everything" mode

Step 2: Filter with a classification model

- The only step that requires training



STC outperforms YOLOv8 on small datasets



Good Performance in Certain Scenarios

Good

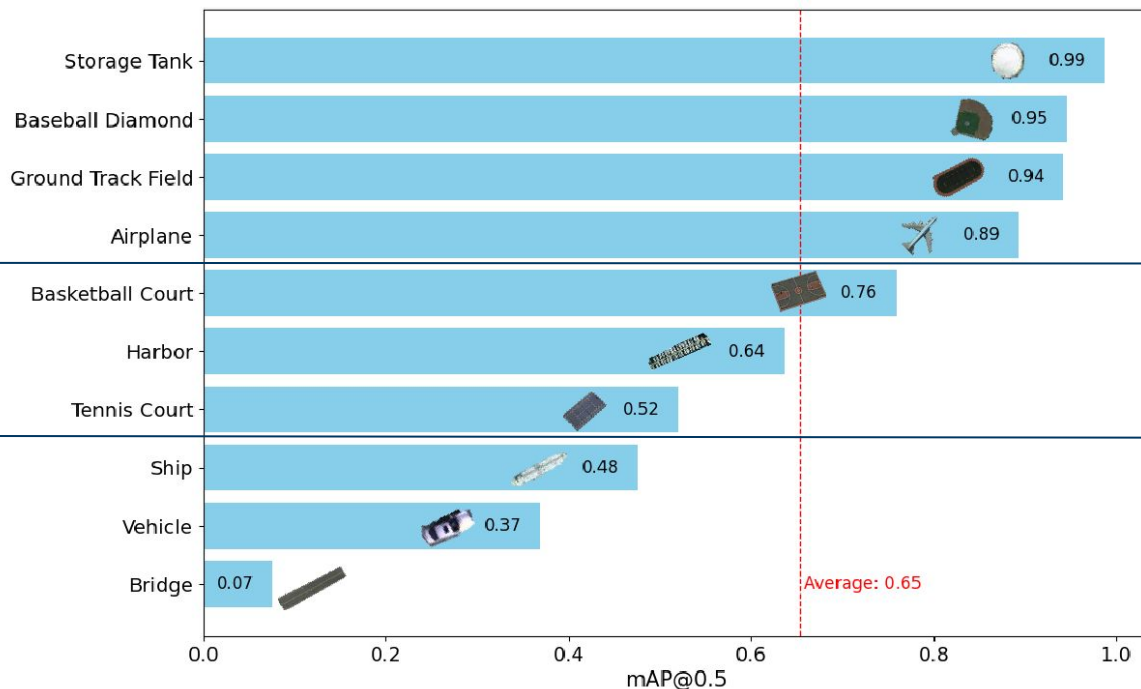
- **Distinct, regular shapes** and clear boundaries

Moderate

- **Closely spaced** fields

Bad

- Relatively **small** objects on **cluttered** backgrounds



Key takeaways

- **Segment-then-Classify**: a data-efficient strategy
- **Good** at geometrically well-defined objects
- Future work: **Fine-tuning** for better performance