

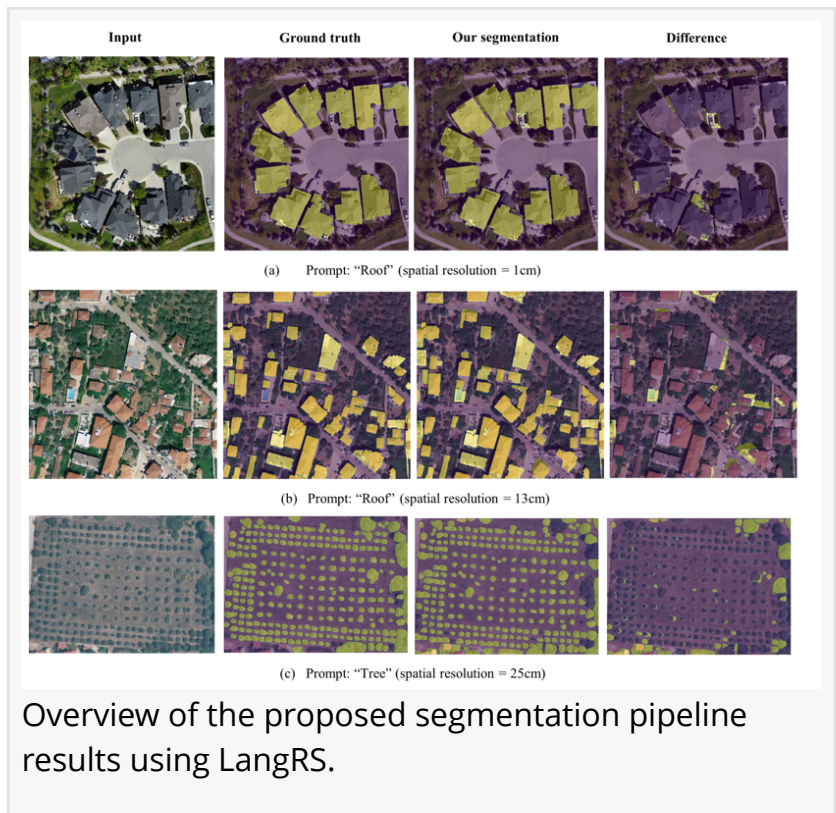
# Zero-Shot AI for Remote Sensing: A New Pipeline for Automated Image Segmentation

GA, UNITED STATES, February 27, 2025 /EINPresswire.com/ -- Researchers have developed a pipeline that integrates zero-shot AI detection and segmentation tools to achieve robust, automated segmentation of remote sensing images. By leveraging a sliding window hyper-inference approach and an outlier rejection step, the pipeline enhances the identification of features such as buildings, trees, and vehicles in aerial and satellite imagery. This solution is implemented as a user-friendly Python package, LangRS, making advanced remote sensing segmentation accessible to a wide range of users.

The amount of aerial and satellite imagery captured worldwide continues to grow at an incredible pace. Yet, efficiently identifying and labeling features in these images—like roofs, cars, or trees—can be challenging. A new pipeline developed by researchers at Politecnico di Milano and the National Technical University of Athens tackles this issue by combining advanced AI models with smart data-handling strategies.

“General-purpose AI models are powerful, but they often struggle when asked to locate unfamiliar objects without explicit training,” says Professor Maria Antonia Brovelli from Politecnico di Milano. “By using a sliding window hyper inference approach to cut large images into smaller, more manageable patches, and by applying an outlier-rejection step to remove erroneous detections, we greatly reduce computational burden of the models and improve the accuracy in identifying specific features.”

Their pipeline leverages open-source foundation models like Segment Anything Model ([SAM](#)) and Grounding DINO in a strategic two-step process. First, it intentionally over-detects objects to



ensure even the smallest details are captured. This is achieved through a sliding window approach, which applies the detection model to smaller image patches. This method not only reduces the computational burden—critical for large-scale remote sensing imagery—but also enhances detection accuracy.

Next, the system refines the results by filtering out irrelevant bounding boxes, such as those that are excessively large or poorly positioned, using statistical and data-driven techniques. The remaining high-quality bounding boxes are then passed to SAM, which generates precise segmentation masks.

The pipeline operates in a zero-shot manner, meaning the models were used in an off-the-shelf fashion, retaining their original training parameters without any additional fine-tuning or retraining on external data. In aerial images with a spatial resolution of less than 1 meter, the developed pipeline achieved outstanding segmentation results, reaching up to 99% accuracy.

“Essentially, we’re taking advantage of the versatility of off-the-shelf, large-scale AI models, by building a robust processing pipeline developed by Mohanad Diab to achieve the best results,” Kolokoussis adds. The researchers hope this pipeline will make automated remote sensing imagery analysis more accessible, speeding up everything from environmental surveys to urban planning.

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