

Motivation and Contribution

Out of Distribution (OOD) objects are objects with a semantic class outside the semantic space of an underlying image segmentation algorithm, or a semantic space instance that looks significantly different from instances in the training data. OOD objects occurring on video sequences should be detected on single frames as early as possible and tracked over their time of appearance as long as possible.

Our contribution:

- Introduction of the first OOD detection video dataset for traffic scenes with detailed annotations and comprehensive sensor data, providing methods for benchmarking OOD detection systems.



Figure 1: The OOD-dog Chewie and his digital twin in the Unreal Editor as an example of an OOD object in the CWL dataset.

Overview CARLA-Wildlife (CWL)

- Created using CARLA driving simulator and Unreal Engine 4 assets
- Consists of 26 video sequences recorded at 10 frames per second with 18 different object types, e.g. dogs, balls, canoes, pylons
- Includes semantic segmentation masks with Cityscapes labels, instance segmentation masks, tracking information, pixelwise distance information and depth information
- Main advantages of synthetic datasets are the ability to produce large amounts of data with accurate pixelwise labels

Dataset Applications

- OOD object segmentation: Pixelwise recognition of OOD objects
- OOD object tracking throughout video scenes
- OOD object retrieval: Content-based image retrieval-like method for clustering of OOD objects

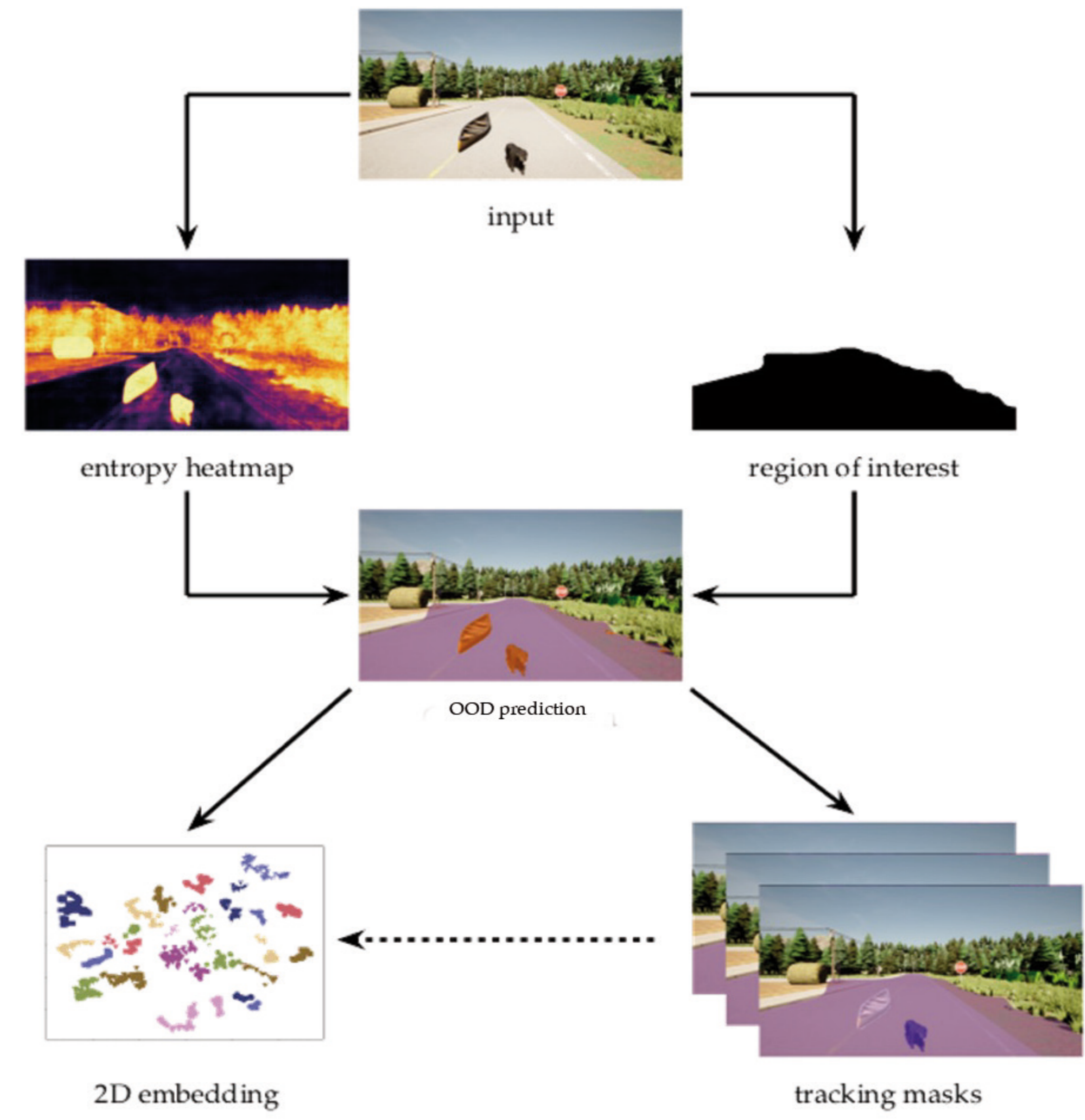


Figure 2: OOD detection, tracking and retrieval method using entropy heatmaps.

Baseline System

The baseline system (see Figure 2) detects OOD objects as areas with high prediction uncertainty within the region of interest as seen in the entropy heatmap. Once encountered, an OOD object is assigned a tracking ID for tracking in subsequent images from the scene. Object retrieval is performed by using a classifier network to project objects into a low-dimensional space and clustering similar-looking objects.

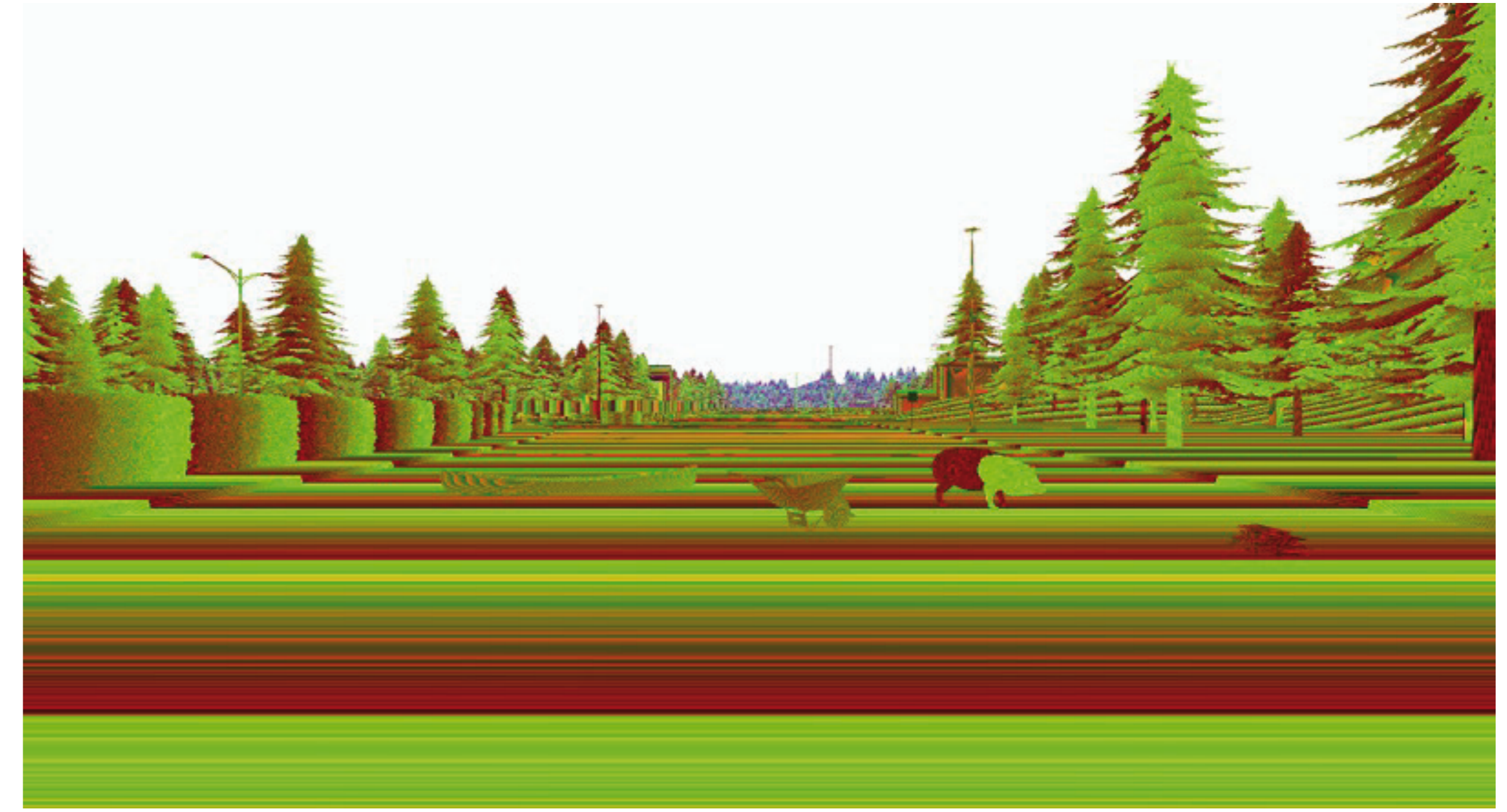


Figure 3: Depth sensor image of road scene with OOD objects.

References:

- [1] Maag, Kira, et al., Two Video Data Sets for Tracking and Retrieval of Out of Distribution Objects. In: *Proceedings of the Asian Conference on Computer Vision* (pp. 3776-3794).

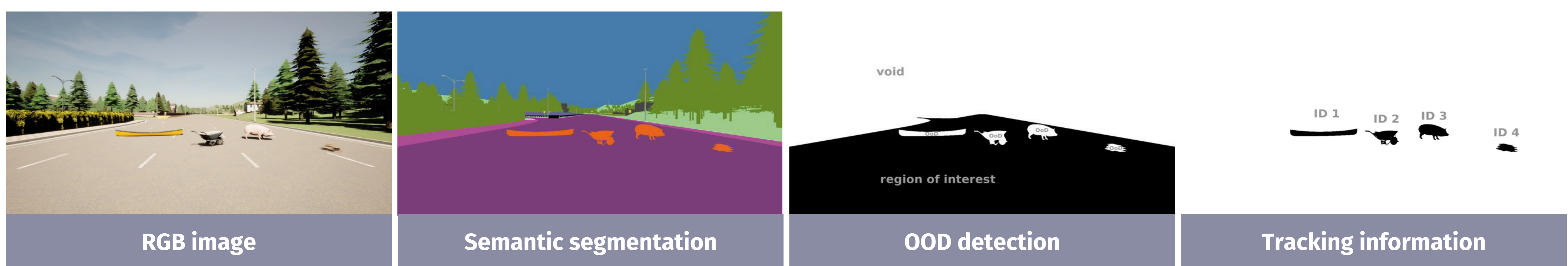


Figure 4: Input and ground truth for OOD detection system: the labels are available for all scenes.

Partners



External partners



For more information contact:

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