



Technische Hochschule
Ingolstadt

Fakultät Elektro-
und Informationstechnik

Master Thesis

„LiDAR-camera fusion-based 3D Anomaly/Open-set Segmentation“

Background:

Significant advancements have been made in the field of perception for autonomous driving, particularly in closed-set tasks such as 2D/3D object detection, 2D/3D segmentation and BEV segmentation, multiple object tracking, etc. In general, these detection models are trained to recognize a pre-defined set of semantic categories (In-Distribution); however, in real-world applications, they may encounter objects (Out-of-Distribution) that do not belong to such categories, such as a large rock, an unexpected animal, etc. These objects cannot be detected by closed-set object detection algorithms or are incorrectly categorized by closed-set segmentation algorithms into some predefined category, which may result in potentially fatal traffic accidents. Addressing such failure cases is crucial to road safety for autonomous driving vehicles.

Objective of the Thesis:

- To generate custom dataset
- To evaluate the 3D anomaly/open-set segmentation algorithms on different datasets, including public/custom datasets

Tasks:

- Conduct a literature review on 3D anomaly/open-set segmentation for driving scenes
- Generate custom dataset using a combination of semi-automated labeling and manual correction
- Benchmark of existing SOTA algorithms on the public/custom datasets
- Develop LiDAR-camera fusion-based 3D anomaly/open-set segmentation algorithm (optionally)

Requirements:

- Highly motivated on research and willing to contribute to publishing papers
- Strong interest in computer vision, deep learning, autonomous driving, sensor technology
- Willing to support manual correction work.
- Experience with deep learning frameworks (PyTorch, TensorFlow, etc) and computer vision tasks
- Good knowledge of at least one programming languages (Python, C++, etc)

Duration: 6 months

Location: Institute of Innovative Mobility (IIMo), THI

Workplace: Institute of Innovative Mobility (IIMo), THI

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