Technische Hochschule Ingolstadt
Fakultät Elektro- und Informationstechnik

Bachelor/Master‘s Thesis

„LiDAR-camera fusion-based Road Unknown Obstacle Detection (anomaly detection) “

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 explore and implement anomaly detection for autonomous driving
- To analyze the effectiveness of LiDAR-camera fusion in anomaly detection tasks
- To evaluate the robustness of the anomaly detection algorithms on different datasets

Tasks:

- Conduct a literature review on anomaly detection for driving scenes
- Develop LiDAR-camera fusion-based anomaly detection algorithm
- Perform experiments with both simulated and real-world data sets
- Evaluation and comparison with SOTA anomaly detection algorithms

Requirements:

- Strong interest in computer vision, deep learning, autonomous driving, sensor technology
- Experience with deep learning frameworks (PyTorch, TensorFlow, etc) and computer vision tasks
- Good knowledge of at least one programming languages (Python, C++, etc)

Duration: 3/6 months

Location: Institute of Innovative Mobility (IIMo), THI

Workplace: Institute of Innovative Mobility (IIMo), THI

Supervisor: Prof. Dr. Gordon Elger

Contact: M. Sc. Zhiran Yan
zhiran.yan@thi.de