3D Voxel Benchmark for Anomaly Detection in Autonomous Driving

Bachelor / Master Thesis

The scope is designed for a Master Thesis.
For a Bachelor Thesis, we can customize it.

Autonomous Driving   **Simulation**   **Camera Data**   **Lidar Data**

We don't have autonomous vehicles yet because they're bad at dealing with the crazy things we see on the roads. Thus, anomaly detection is particularly important to detect the unknown. However, there exists no strong benchmark to compare deep learning anomaly detection methods. In this thesis, you will develop a multimodal benchmark with hundreds of anomalies and ground truth in the voxel space.

Dosovitskiy et al.: CARLA (2017)

Xu et al.: RPVNet (2021)

Elluswamy: Occupancy Networks (2022)
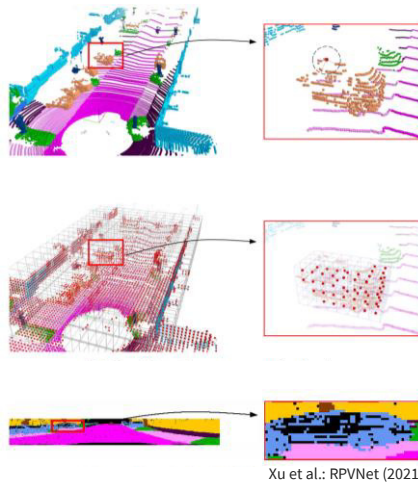
The Topic

- You will perform state-of-the-art research on multimodal anomaly detection benchmarks with camera and lidar data
- Based on the CARLA simulation engine, you will develop „normal" and „abnormal" scenarios that include anomalies, especially unknown objects and unknown driving behaviors
- You will perform research on representation spaces and provide groundtruth in the 3D voxel space
- Your benchmark will follow high quality standards, as set by popular benchmarks, such as KITTI or Cityscapes

Your Skills

- You study Computer Science or a related course of study
- You are <u>deeply interested</u> in topics such as Autonomous Driving, Robotics, Deep Learning or Computer Vision
- You are able to read and write scientific texts in English
- You are fluid in Python and familiar with Linux
- You show an <u>above-average degree of initiative</u> and commitment as well as a thorough way of working

What We and I Offer

- You get exciting insights into our research and gain valuable practical experience
- We use the latest hardware and software. Together with us you work in first-class laboratories (on-site or remotely)
- <u>Regular and extensive support</u>: Weekly 1:1 meetings, bi-weekly student group meetings, monthly 1:1 strategy meetings
- Collaboration with other students to get tips, learn together, and fix issues quickly
- High-quality theses will be published on KITopen, with the code on GitHub
- We aim to publish this work in an <u>IEEE paper</u> with shared first authorship

Application

- Start: Immediately
- Shoot me an e-mail at daniel.bogdoll@kit.edu with your CV, grades, and a few sentences why you are interested. No cover letter necessary ☺