Specialized Evaluation Metrics for Perception Tasks in Autonomous Driving

Bachelor / Master Thesis

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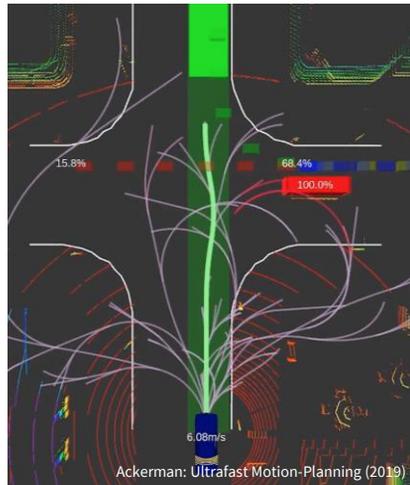For a Bachelor Thesis, we can customize it.

Autonomous Driving **Path Planning** **Perception** **Simulation**

In computer vision, we often deal with metrics that evaluate results irrelevant of the task at hand. However, for the field of autonomous driving, this method is flawed - you don't necessarily care about misclassifications etc. if they do not affect the current trajectory. In this thesis, based on a 3D voxel space, you will develop a relevance metric that is adapted to the task of autonomous driving.

Dosovitskiy et al.: CARLA (2017)

Ackerman: Ultrafast Motion-Planning (2019)

Elluswamy: Occupancy Networks (2022)

The Topic

- You will perform state-of-the-art research on evaluation metrics for the task of autonomous driving
- You will implement a vanilla version of a path planner for the autonomous vehicle in the CARLA simulation environment
- You will represent the world in a 3D voxel space
- You will develop a method that assigns a weight to each voxel, enabling any perception task (object detection, anomaly detection, …) to receive a weighted version of their output, adapted to the driving task
- You will create appealing image and video visualizations

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 <u>daniel.bogdoll@kit.edu</u> with your CV, grades, and a few sentences why you are interested. No cover letter necessary ☺