

Semester Thesis / Interdisciplinary Project / Master thesis

Corner Case Detection for Autonomous Driving using World Model

Introduction

With the advancement of autonomous driving, many autonomous driving (AD) stacks are aiming at SAE level 4. However, even level 4 AD systems still encounter corner cases (CCs) and will disengage once they cannot solve the situation. To tackle these CCs will be an essential problem in autonomous driving. Therefore, it is crucial for the continuous development of AD systems to detect, collect, and eventually solve these CCs. In the light of this, world models provide a possibility to detect and to predict these CCs by predicting the near future based on current and previous vehicle states and actions.

Description

In the project, you will develop a framework for corner case detection in AD using existing world models. Furthermore, you will investigate the performance of the world models based on their input/output modalities and prediction horizons.

The project can be described with the following tasks:

- Develop a framework to integrate existing world models for corner case detection in AD
- Fine-tune the existing world models with simulation and real-world data
- Evaluate the performance of the world models for CC detection

Prerequisites

- Interest and self-motivation in the topic
- Hands-on experience with Python, Pytorch, Tensorflow
- (Preferred) Knowledge and/or previous experience with diffusion models
- (Preferred) Knowledge and previous experience with large model fine-tuning with multi-GPU setup

Recommended Literature

- [Bogdol et al. \(2023\) - Exploring the Potential of World Models for Anomaly Detection in Autonomous Driving](#)
- [Gao et al. \(2024\) - Vista: A Generalizable Driving World Model with High Fidelity and Versatile Controllability](#)
- [Bogdol et al. \(2025\) - MUVO: A Multimodal Generative World Model for Autonomous Driving with Geometric Representations](#)

Contact:

Xiyan Su, M.Sc. | xiyan.su@tum.de | +49 89 289 15340

Chair of Automotive Technology | Prof. Dr. Markus Lienkamp