

Bachelor's Thesis | Semester's Thesis | IDP or Guided Research Project

Can Deep Neural Networks Learn Vehicle Motion Prediction for Autonomous Racing from Sim-Racing Data?



The TUM Autonomous Motorsport team is at the forefront of developing advanced software for autonomous racing vehicles, participating in and winning cutting-edge racing series such as the Indy Autonomous Challenge (IAC) and the Abu Dhabi Autonomous Racing League (A2RL). Pushing the limits of autonomy, performing precise overtaking maneuvers at speeds exceeding 270 km/h - where milliseconds count - requires highly efficient software.

Training data for real-world vehicle motion prediction in autonomous racing, particularly involving complex interactions between multiple agents in the unstructured environment of a race-track, is limited due to the high costs involved. Sim-Racing, however, provides a unique opportunity to gather large amounts of data from both simulated agents and human drivers.

This research project investigates the limitations of current state-of-the-art autonomous driving motion prediction algorithms when applied to a Sim-Racing dataset. Based on these insights, it aims to define further requirements for the training data and network design necessary to deploy the trained networks in real-world autonomous racing scenarios.

Work packages:

- Literature research on state-of-the-art vehicle motion prediction methods
- Implementation and training of various algorithms
- Evaluation of their applicability to autonomous racing
- Analysis of the results and identification of directions for future research

Requirements:

- Enthusiasm about deep learning and autonomous driving
- Good programming skills in Python
- Previous experience with deep learning frameworks is preferred
- Ability to collaborate in a team and engage in interdisciplinary research

If you are interested in this project or any other project in the context of autonomous racing, please send me (marcel.weinmann@tum.de) your CV and grade report.