

BA/SA/MA

## Model Predictive Control for Autonomous Vehicles

At the Chair of Automotive Technology, we are developing a new complete software stack to operate autonomous vehicles not only in a motorsport context, but also on public roads: the AV2.0. The AV 2.0 represents a scalable and modular platform. The main modules are: Perception, Planning and Control. This enables us to quickly evaluate novel concepts and to operate our different experimental vehicle types, e.g. multivan, race car or truck.



focus.de



atlas-l4.com



indyaautonomouschallenge.com

Do you want to put your own mark on the future of autonomous vehicles with your ideas and concepts? You will be part of a team conducting state-of-the-art research in the trajectory control of autonomous vehicles.

If you are interested in a student research project, feel free to send me an initiative application and we will arrange a call to discuss the topics. Just send me an e-mail with a short motivation, curriculum vitae, and a recent transcript of records.

Currently, the following topics can be addressed:

- Model Predictive Control (MPC):
  - Design of a robust real-time capable non-linear MPC for trajectory tracking
  - Learning-Based MPC
  - Adaptive robust MPC
  - Neural Network-Based MPC (NNMPC)
  - Reinforcement Learning of MPC parameters
- Vehicle Dynamics Modeling:
  - Approximation of a non-linear vehicle dynamics model for real-time feasibility, e.g. using (cascaded) neural networks and investigation of different approximation strategies, e.g. end-to-end- or modular cascaded approximation.
  - Online learning/ online parameter identification for an adaptive dynamics model
- Robust Vehicle Dynamics Control:
  - Investigation and modeling of uncertainties and disturbance in the vehicle context (e.g. crosswind)
  - Sensitivity analysis of the uncertainties and disturbances on the system state.

The student research project/ thesis will handle upon agreement a single or multiple bullet point work packages.

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