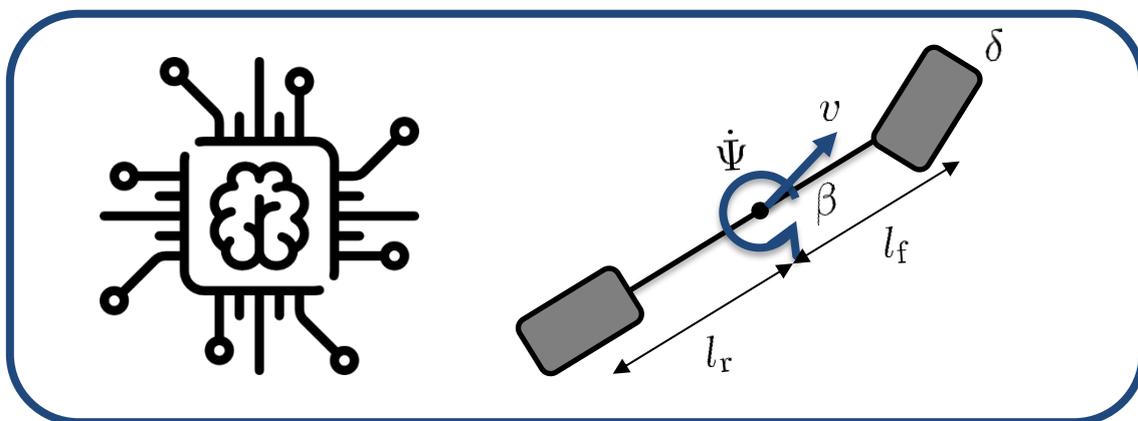


BA/SA/MA/IDP

Using Artificial Intelligence to Enhance Vehicle Dynamics Simulation

The TUM Autonomous Motorsport Team is developing software for the autonomous racecars participating in the Indy Autonomous Challenge. In the past, major achievements have included winning a \$1 million prize and autonomous overtaking maneuvers at over 270 mph. To be able to achieve this, the vehicle software must be developed and parameterized in a simulation that is as realistic as possible even before the first real-world tests.



In many areas of an autonomous software stack (e.g. perception), algorithms based on artificial intelligence are already well established. In the area of control and vehicle dynamics simulation, on the other hand, no AI methods are currently in use. Therefore, the goal of this thesis is to investigate how AI algorithms can be used to improve vehicle dynamics simulation in particular. An improvement can be achieved by a simplified parameterization of an existing model or by an increase of the modeling quality (e.g. by the use of hybrid vehicle models).

The thesis is comprised of the following work packages:

- Literature research on the current state of vehicle dynamics modeling and applications of AI algorithms in modeling of dynamic systems.
- Selection of a suitable vehicle dynamics model (open source, accuracy, implementation effort, computation effort)
- Combining the vehicle dynamics model with an AI algorithm to improve its performance or simplify its parametrization.
- Validating the developed approach using the data from the Indy Autonomous Challenge

You are welcome to contribute your own ideas and help shape the focus of the work.

The thesis can be written in **German** as well as in **English!**

The thesis can be done from home for the most part. However, if desired, there is also the possibility to work on site at the Institute.

Contact:

Simon Sagmeister, M.Sc. | simon.sagmeister@tum.de