**Student Research Assistant (HIWI)**

**Comparing Different Bi-level Optimization Approaches For Automated Driving**

State-of-the-art motion planning techniques for automated vehicles often follow a pipeline approach, meaning that first a prediction of what other traffic participants will do is made, and using these the ego-motion is planned. While this approach is useful in many scenarios it fails in dense traffic. By separating prediction and planning the interaction between traffic participants is neglected, e.g. how will the other vehicle react to my maneuver? One way to explicitly consider interactions is by modeling the motion planning task in a game-theoretic manner. This formulation leads to a Stackelberg game which can be treated as a bi-level optimization problem.

[1]

The goal of this Hiwi-job is to implement and compare different bi-level approaches to solve cooperative scenarios in automated driving. One scenario of particular interest is a merge in dense traffic, as can be seen in the figure above. Suitable solvers to compare the different methods are already available as a Matlab toolbox [2].

The proposed task consists of the following parts:

+ Literature research about bi-level optimization in the context of automated driving.
+ Implement multiple motion planners for cooperative automated driving using bi-level optimization.
+ Evaluate and compare the implemented methods


I am happy to answer questions you might have. Feel free to ask for an appointment or directly ask at my office!