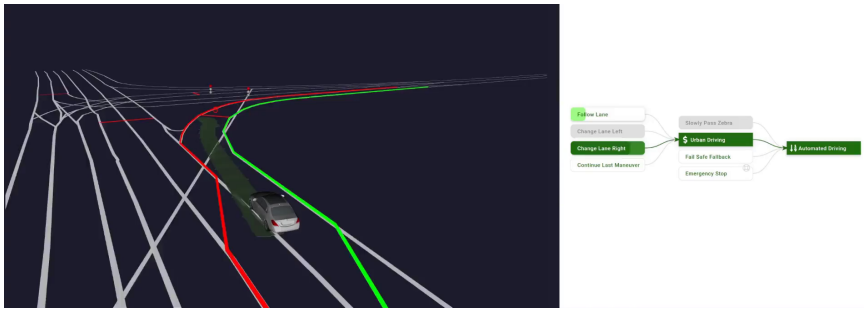
Karlsruhe Institute of Technology

Bachelor Thesis / Master Thesis



Arbitration graph for autonomous driving. A cost arbitrator selects the *Change Lane Right* behavior based on the computed cost.

Machine Learning for Decision-Making in Autonomous Driving

Arbitration graphs [1] are a decision-making framework where the behavior of an autonomous system is broken down into atomic behavior components and organized into a hierarchical structure. Arbitrators at each level of the hierarchy decide which behavior to execute based on their implemented policy. Cost arbitrators do this by evaluating the cost of executing each behavior and selecting the one with the lowest cost.
This thesis explores the integration of machine learning into the decision-making process of arbitration graphs, aiming to enhance the autonomy and flexibility of such systems in autonomous driving applications. The primary objective is to replace or augment traditional cost arbitrators in the graph with a learned decision maker, which can assess situations more intelligently by leveraging data-driven insights. Another potential avenue is to learn the optimal structure of the arbitration graph itself, adapting it dynamically to better handle different driving contexts.
By incorporating machine learning techniques, the decision-making process can become more adaptive, evolving with new data and experiences. This thesis will involve selecting appropriate machine learning models, training them on relevant datasets, and carefully evaluating their performance in comparison to traditional approaches. The final system should show improvements in decision quality, robustness, and adaptability, allowing for better navigation and safer autonomous driving in complex scenarios.

I am happy to answer any questions you might have, just send me an email!

References

[1] Orzechowski, P., Burger, C., & Lauer, M. (2020). “Decision-Making for Automated Vehicles Using a Hierarchical Behavior-Based Arbitration Scheme“

Institute of Measurement and Control Systems (MRT)
Prof. Dr.-Ing. Christoph Stiller

Advisor:
Nick Le Large, M.Sc.

Programming language(s)[1]:

C++	proficient
Python	advanced

System, Framework(s):
Linux, Docker, PyTorch

Required skills:
- Prior experience with machine learning
- Prior knowledge of motion planning
- Capable of working independently

Language(s):
German, English

For more information please contact:

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Or directly send in your application including your current grades as well as our questionnaire!

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[1] **skill levels:**

beginner	< 500 lines of code (LOC)
advanced	500 – 5000 LOC
proficient	> 5000 LOC