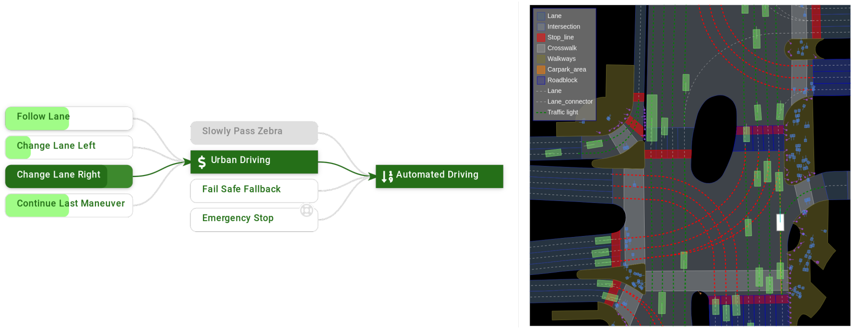
Karlsruhe Institute of Technology

Bachelor Thesis / Master Thesis



Arbitration graph for decision-making in autonomous driving (left). Example data from NuPlan dataset (right).

Integrating State-of-the-Art Motion Planning Algorithms into Decision-Making for Autonomous Driving

This thesis focuses on integrating advanced motion planning algorithms into arbitration graphs to enhance autonomous driving performance while ensuring safety and reliability. The goal is to combine the latest developments in learned motion planning with the arbitration graph framework [1] to optimize decision-making under various driving scenarios.
The arbitration graph framework is a decision-making system that is capable of combining multiple motion planning algorithms into one coherent system. This allows the vehicle to adapt to different driving scenarios and select the most appropriate algorithm for the situation.
A significant focus will be placed on maintaining or improving the safety and robustness of the system. Motion planning algorithms often provide excellent performance in ideal conditions but may struggle with edge cases or safety-critical scenarios. The challenge here is to embed these learned algorithms into an arbitration framework that ensures the vehicle can safely navigate in real-world, unpredictable conditions. The outcome of this thesis should be a decision-making system that is both cutting-edge in terms of planning and highly dependable for safety-critical applications like autonomous driving.
To benchmark the performance of the system, the algorithm will be tested using the nuPlan dataset [2], which contains a variety of real-world driving 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“

[2] NuPlan Dataset: `nuplan.org`

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

Advisor:
Nick Le Large, M.Sc.

Programming language(s)[1]:
C++ advanced
Python proficient

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