Bachelor's/Semester/Master's Thesis, Guided Research, Interdisciplinary Project (IDP)

Control using LLM model in autonomous driving

Keywords: autonomous driving – LLM – RL – simulation

Background

As part of the research project CeCaS, we have come up to build a new system architecture for future vehicles with a focus on autonomous driving. The development of new autonomous vehicles requires a rethinking of the systems and software engineering to keep up with the growing complexity and the Implementation of the latest technologies such as AI-based functions in automotive engineering. For this purpose, our developed software is first integrated on an HPC system and then tested on real vehicles.

Description

In recent years, autonomous driving systems have undergone constant improvements. The latest results from research and development recommend an end-to-end approach when implementing these systems. Neural networks are utilized along the entire autonomous driving chain (detect, plan, control). While the end-to-end approach offers plenty of improvements, it still comes with a lot of open research topics e.g. the tedious training and dataset preparation process. The goal of the thesis is to utilize the zero-shot property of LLM to simplify the autonomous driving development process. Possible focus can be:

- Research on state-of-the-art autonomous driving systems using LLM
- Integration and benchmarking of different LLM-assisted autonomous driving algorithm for this use case
- Record the performance for further use
- **Your ideas:** If you have any other ideas for research in this area you are welcome to suggest your own topic.
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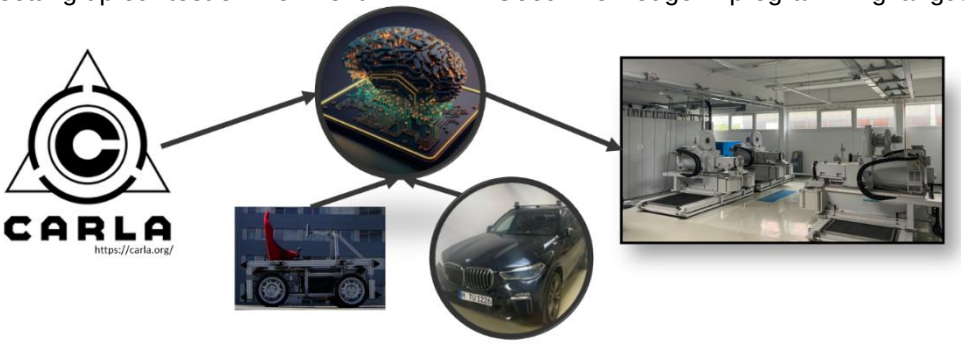
Your Tasks

- Familiarization with LLM and RL for autonomous vehicles
- Research the problem (study state-of-the-art LLM-assisted autonomous driving systems)
- Development of a novel solution approach for the specific problem
- Evaluation of the solution in our simulation environment
- Support in setting up our test environment

Requirements

- You are currently studying Computer Science, Electrical Engineering, Robotics, Mechanical Engineering (or similar)
- High motivation and ability to work independently on your research topic as well as contributing to our teamwork.
- Interest in autonomous driving and simulation
- Good understanding and previous experience in machine learning
- Good understanding and previous experience in vehicle control problems
- Good knowledge in programming languages: Python, C++



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