

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

## Real Time Communication in the context of Vehicle Systems

**Keywords:** autonomous driving – simulation – real time network protocol

### 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

Since a car must react to the environment in a timely manner while being potentially dangerous to anyone around it and the passengers inside of it, it is crucial to ensure a deterministic reaction time of its sensors, control software and actuators. Those systems are connected with each other over one or multiple communication channels inside of the car. Over the years, the amount of communication bandwidth needed has steadily increased and is still rapidly increasing because of the dozens of sensors needed for autonomous driving and more advanced infotainment systems. On the other hand, reliable real time communication becomes even more important the more safety critical functions of the car are automated.

- Research on state-of-the-art real time communication protocols
- Integration of a state-of-the-art real time protocol and validation experiments on top if it
- **Your ideas:** If you have any other ideas for research in this area you are welcome to suggest your own topic.

### Your Tasks

- Familiarization with real time network protocols
- Research the problem (study state-of-the-art time sensitive networking)
- 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
- Interest in simulation environments like CARLA
- Good understanding of network protocols, preferably time sensitive network protocols
- Good knowledge in programming languages: Python, C++

