



*Semester-Thesis*

## Radar-Camera SLAM for Autonomous Driving

The aim of this study is to implement and evaluate a state-of-the-art Radar-Camera SLAM approach.

### Background

Reliable and robust simultaneous localization and mapping (SLAM) is a cornerstone of autonomous driving, as accurate localization must be maintained even under adverse sensing conditions. While LiDAR-based systems are common, the fusion of Radar and Camera sensors offers a promising alternative due to their complementary strengths: cameras provide rich semantic information, while Radar offers robust range sensing and velocity measurements even in adverse weather or lighting conditions.

The aim of this study is to implement and evaluate a state-of-the-art Radar-Camera SLAM approach. The student will investigate how the fusion of these two modalities can overcome the limitations of monocular vision (such as depth ambiguity) and the sparsity of Radar data to achieve accurate vehicle ego-motion estimation and environment mapping. The student will evaluate the accuracy and robustness of the developed approach by benchmarking it against common datasets to quantify its performance in real-world urban environments.

### Language

English/German

### Your Role

- Literature research: Review of current state-of-the-art methods in Radar-Camera fusion and SLAM algorithms.
- Development & implementation: Setup and implementation of a suitable Radar-Camera SLAM pipeline
- Evaluation: Benchmarking the model on common datasets such as KITTI
- Discussion: Interpretation of the results, focusing on the modality-specific weaknesses and strengths

### What should you bring along?

- Strong interest & motivation for autonomous driving
- High motivation & independent way of working
- Good Programming skills, e.g. C++/Python
- Experience with ROS2 and Docker are a bonus

If you are interested, please send me a grade sheet with your CV!

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Prof. Dr.-Ing. Markus Lienkamp

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