



# Safe Autonomous Driving

Advisor: **Bettina Könighofer**

## Motivation



**Are you interested in Reinforcement Learning?**  
**Are you interested in Logics?**  
**Let's combine them to get the best of both!**

CARLA is an open source tool developed to support development, training, and validation of autonomous driving systems. Let's extend CARLA such that the learning agents can be supported by formal methods to guarantee safety during learning.

- > **Get familiar with CARLA:** Create your own simulations and generate your own maps, define traffic scenarios, pedestrian behaviors, weathers, sensors . . .
- > **Train an agent for autonomous driving:** CARLA provides runnable learning agents. Play with them.
- > **Integrate formal methods to make learning safe.**

## Goals and Tasks

- > Let's figure out together, how FM could assist a learning agent in CARLA (SAT, SMT, Model Checking, Synthesis).
- > Implement everything and play with it.

## Literature

- > M. Alshiekh et al.  
Safe Reinforcement Learning via Shielding  
Conference on Artificial Intelligence (AAAI-18)  
<https://www.aaai.org/ocs/index.php/AAAI/AAAI18/paper/view/17211>
- > S. Pranger et al.  
Adaptive Shielding under Uncertainty  
CoRR 2020  
<https://arxiv.org/abs/2010.03842>

## Courses & Deliverables

- Introduction to Scientific Working**  
Short report on background  
Short presentation
- Bachelor Project**  
Project code and documentation
- Bachelor's Thesis**  
Project code  
Thesis  
Final presentation

## Recommended if you're studying

- CS
- ICE
- SEM

## Prerequisites

- > Interest in Logics
- > Interest in Machine Learning

## Advisor / Contact

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