



Integrating Shielding into Realistic, Perception-Based Autonomous Systems

Advisor: **Liam Plank**

Motivation

Bilateral AI is the concept of combining symbolic (logic-based) and subsymbolic (data-driven) approaches into a unified system that aims to achieve high performance while supporting formal reasoning and, where applicable, formal guarantees. This topic investigates how **shielding**, a model-based safety mechanism, can be integrated into realistic, perception-based autonomous systems.

The resulting system combines machine-learning-based perception with formal, model-based safety reasoning, taking a step towards safer and more trustworthy autonomous systems.

Goals and Tasks

-  Get familiar with the provided framework, the simulation environment CARLA 0.9.16 and the PRISM Modeling language
-  Train a Convolutional Neural Network (CNN) for real-time pedestrian detection; together with a regressor for distance estimation.
-  Design suitable probabilistic models for the ego vehicle and pedestrian behaviour.
-  Construct and evaluate a set of interesting scenarios that demonstrate the effectiveness your integrated shielding approach.



A typical safety-critical scenario in CARLA.

Literature

- > [M. Plank](#)
Safety Shielding for Safe Autonomous Driving
<https://doi.org/10.3217/q4w6z-wxd74>
- > [A. Dosovitskiy et al.](#)
CARLA: An Open Urban Driving Simulator
<https://arxiv.org/abs/1711.03938>

Courses & Deliverables

☒ Master Project

Project code
Report
Presentation

– OR –

☒ Master's Thesis

Initial presentation
Project code
Thesis (60+ pages)
Final presentation

Recommended if you're studying

☒ CS ☒ ICE ☒ SEM

Prerequisites

- > Basic knowledge in perception-based machine learning (e.g. CNNs)
- > Programming (Python)

Advisor Contact

liam.plank@tugraz.at