

## 2. CASUS Annual Workshop

“Fusing Artificial Intelligence & Simulation”

### “Simulation and autonomous driving”



Henryk Michalewski a professor at the University of Warsaw and a visiting researcher at Google. Henryk obtained a Ph.D. in mathematics and habilitation in computer science. Since 2014 his research has focused on topics related to optimization, machine learning, and automated reasoning. He cooperated on commercial and research projects with deepsense.ai, Google, Intel, and Volkswagen.

**Date:** will be announced soon

**Time:** will be announced soon

**Location:** livestream link follows

**Abstract:**

In a joint project with Volkswagen we used reinforcement learning in simulation to obtain a driving system controlling a full-size real-world vehicle. The driving policy takes RGB images from a single camera and their semantic segmentation as input. We used mostly synthetic data, with labelled real-world data appearing only in the training of the segmentation network.

Using reinforcement learning in simulation and synthetic data is motivated by lowering costs and engineering effort. In real-world experiments, we achieved successful sim-to-real policy transfer. Based on the extensive evaluation, we analyzed how design decisions about perception, control, and training impact real-world performance. The project was presented at the ICRA 2020 conference.



In a continuation of the above project, we introduced interactive traffic scenarios in the CARLA simulator, which are based on real-world traffic. We concentrated on tactical tasks lasting several seconds, which are especially challenging for current control methods. The new dataset called CARLA Real Traffic Scenarios (CRTS) is intended to be a training and testing ground for autonomous driving systems.

CRTS combines the realism of traffic scenarios and the flexibility of simulation. We used it to train agents using a reinforcement learning algorithm. Experimentally, we find that bird's-eye view and dense rewards combined with a penalty for a failure to complete an episode generalize best to validation scenarios.