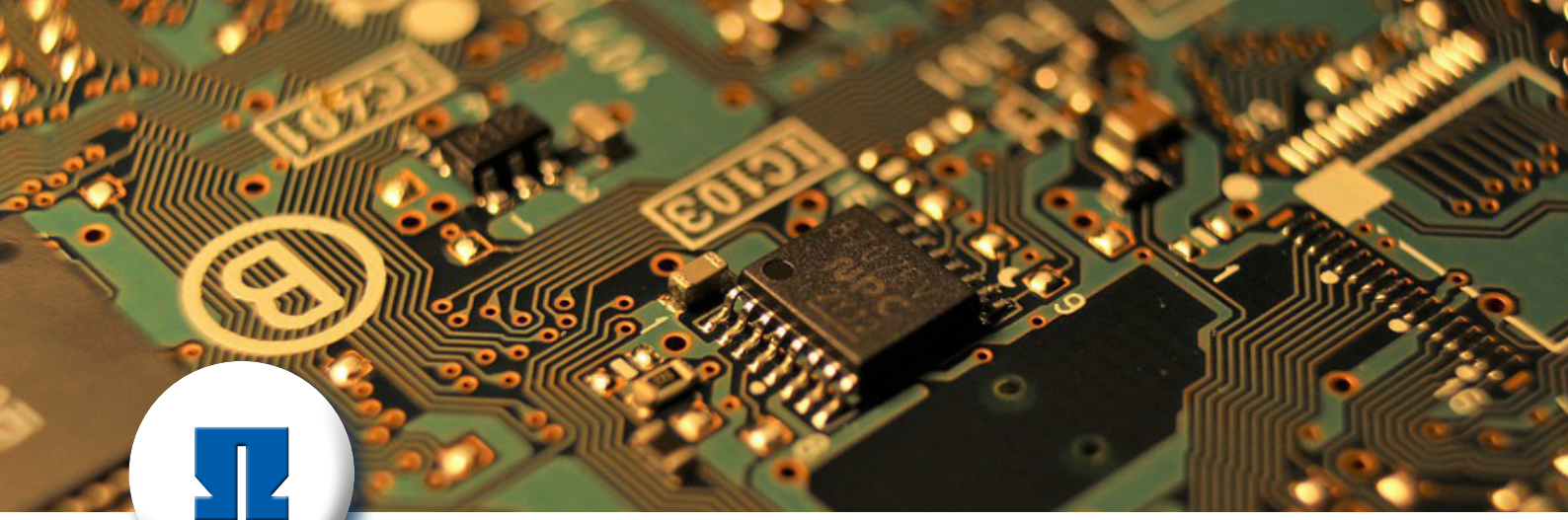

OHMeta Runner

AUTONOMOUS MODEL VEHICLES BASED ON EXPLAINABLE META LEARNING CLASSIFIERS

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The development of autonomous driving software systems must meet a high and constantly evolving standard in order to comply with societally acceptable requirements in the future. Machine learning (ML) methods have made the implementation of the vision of autonomous driving possible in the first place. Long-term successes with ML have been achieved through what is known as 'meta learning'. Meta learning is a subfield of machine learning and refers to learning algorithms that are optimized for learning itself and are therefore able to quickly adapt to environments that are unfamiliar to them. More precisely, meta learning is a technology that — can be trained based on a generally trained classifier — for a specialized task with only a small amount of specialized data (a 'classifier' here refers to a trained ML algorithm in practical use that makes decisions based on input data).

Current surveys of societal acceptance of autonomous driving in Germany demonstrate that this is a polarizing technology, with around a third of respondents placing themselves at each extreme of the scale. The sceptical attitude is often a result of three areas of uncertainty: autonomous driving is not credited with having the required level of competence comparable to that of human actors. Due to the black-box nature of ML components, it is also not clear whether correct decisions are reached systematically and what role chance plays. And finally, there is also still the lingering thought that modern driving systems may be captured by malicious actors.

State of the art in science and technology

The OHMeta Runner project builds upon the experiences gained in OHM Runner, a predecessor project (likewise funded by the Staedtler Foundation) which developed an intelligent course for autonomous model vehicles and focused especially on communication with an intelligent environment.

With OHMeta Runner, the autonomous navigation of a course is now to be mastered independently of the environment using innovative approaches.

Project aims

The OHMeta Runner research project aims to promote autonomous driving by creating transparency for ML algorithms and gaining concrete experience in applications of meta learning. This experience will be gained using an innovative robotic assembly of an autonomous model vehicle at model scale (approx. 1:8) and a course. The project will also analyse the applicability of Explainable Artificial Intelligence (XAI) approaches to the meta learning method, in order to ensure transparency and traceability of the classifier's decisions. On an architectural level, an abstract security risk analysis will be performed. The results of OHMeta Runner will be scientifically grounded analyses describing risks and borderline ethics cases associated with autonomous driving, on the basis of which informed decisions regarding societal position statements can be made.

Project structure

The first phase of the project concerns the robotics assembly, which will enable a high-performance design of ML components and include all relevant sensors and actuators. In the second phase, the current state of research will be surveyed and the suitability of various meta learning approaches assessed. A specification of the design for the robotic application technology will then be created. Based on an inventory, an XAI method will be investigated and prepared for the meta learning interfaces. The meta learning classifier will first be trained, and will then autonomously drive the course with just a few training datasets. Finally, the application will be modelled using the developed SAM (security abstraction model).

PROJECT LEADER
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