

Safeguarding AI-based perception functions for highly automated driving

Goal and Challenge

KI Absicherung makes the safety of AI-based function modules for highly automated driving verifiable.

An autonomous vehicle must be able to perceive its environment and react adequately to it. The solutions for such environment perception must be able to correctly interpret the movements of other road users and derive intentions for their continued behaviour. In highly automated vehicles, these tasks are increasingly performed by artificial intelligence (AI). One of the greatest challenges in integrating these technologies in highly automated vehicles is to ensure

the usual functional safety of previous systems. Existing and established safety processes cannot simply be transferred to machine learning methods. In the KI Absicherung project, a stringent and provable safety argumentation is being set up for the first time, with which AI-based function modules (AI-modules) can be secured and validated for highly automated driving.

Methodological approach

In the KI Absicherung project, methods and measures are developed that provide performance and safety and quality metrics. These methods, measures and metrics support the general safeguarding of an AI function in a car.

On the concrete use case of the AI-based perception of pedestrians, consensual approaches to the following focal points are developed:

- Selection and further development of AI algorithms for pedestrian detection with regards to their detection performance against the backdrop of their

safeguarding capability.

- Development and combination of methods and measures to identify and reduce inherent insufficiencies of the AI modules.
- Stringent development of a safety argumentation and test methodology to prove the adequate mitigation of inherent insufficiencies of an AI module
- In-process creation of synthetic training and test data sets for the analysis and evaluation of inherent insufficiencies of AI-based processes.

Facts and Figures

Project duration

36 months

01/07/2019 – 30/06/2022

Project budget

€41 M

Funding budget

€19.2 M

Project consortium

24 partners

4 external technology partners

Project coordinator

**Dr. Stephan Scholz,
Volkswagen AG**

Scientific coordinator and consortium co-lead

**PD Dr. Michael Mock,
Fraunhofer IAIS**

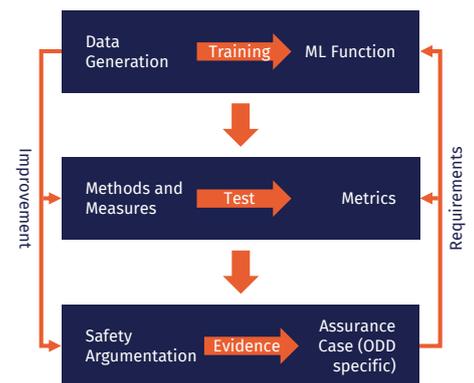
Illustration: Methodological approach in KI Absicherung

In order to move from the data-driven AI function to an assurance case, using the example of pedestrian detection to provide a stringent argument for demonstrating the safeguarding capability of this AI function, the following steps are taken (see illustration):

- Process-accompanying generation of synthetic learning,

test and validation data

- Developing methods and measures to improve the AI function with respect to a wide range of metrics
- Development and validation of test methods for these metrics
- Stringent safety argumentation for an exemplary Operational Design Domain (ODD)



Unique features of the project

In the KI Absicherung project, experts from the fields of artificial intelligence and machine learning, functional safety and synthetic sensor data generation are working together for the first time. In communication with standardisation committees and certification bodies, the findings gained in the project will be used to work towards building an industry consensus on a general AI test strategy.

Partners

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External partners

KI Absicherung is a project of the KI Familie. It was initiated and developed by the VDA Leitinitiative autonomous and connected driving and is funded by the Federal Ministry for Economic Affairs and Energy.



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on the basis of a decision by the German Bundestag