Universität Stuttgart
Institut für Automatisierungstechnik und Softwaresysteme
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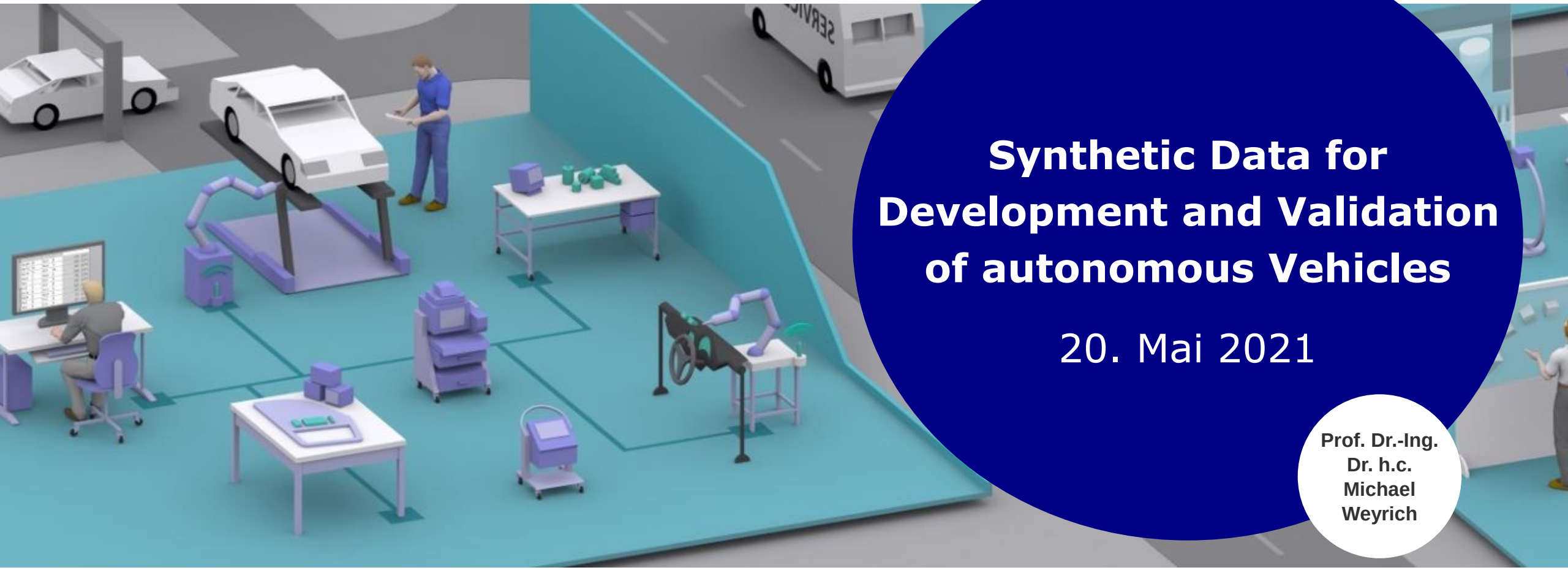

Synthetic Data for Development and Validation of autonomous Vehicles

20. Mai 2021

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GESELLSCHAFT FÜR INFORMATIK

Data Science: Industrieerfahrung und Praxistipps
Virtueller Workshop der Gesellschaft für Informatik e.V. (GI) und der Plattform Lernende Systeme (PLS)

On the Future of Autonomous Systems

Where we are and what we need …

- By 2030 – driverless systems will have emerged, especially for trucks and Robotaxis
- Level 5 – Autonomy is going to yield benefits, e.g. for special mobile robots, transportation etc.
- Level 3 – Automation and assistance functions pose great challenges to drivers

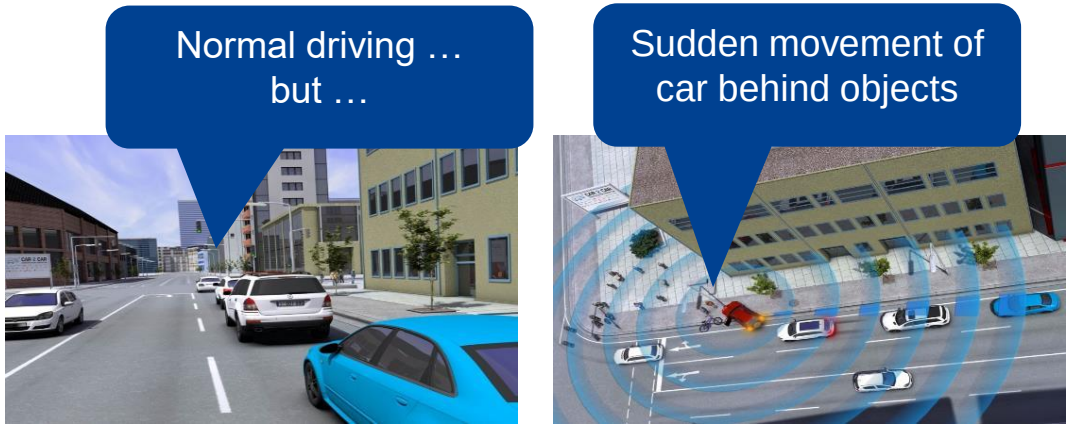
DOI: 10.1016/J.TRA.2016.09.010 • Corpus ID: 18112817

Driving to safety: How many miles of driving would it take to demonstrate autonomous vehicle reliability?

N. Kalra, S. Paddock • Published 2016 • Engineering • Transportation Research Part A-policy and Practice

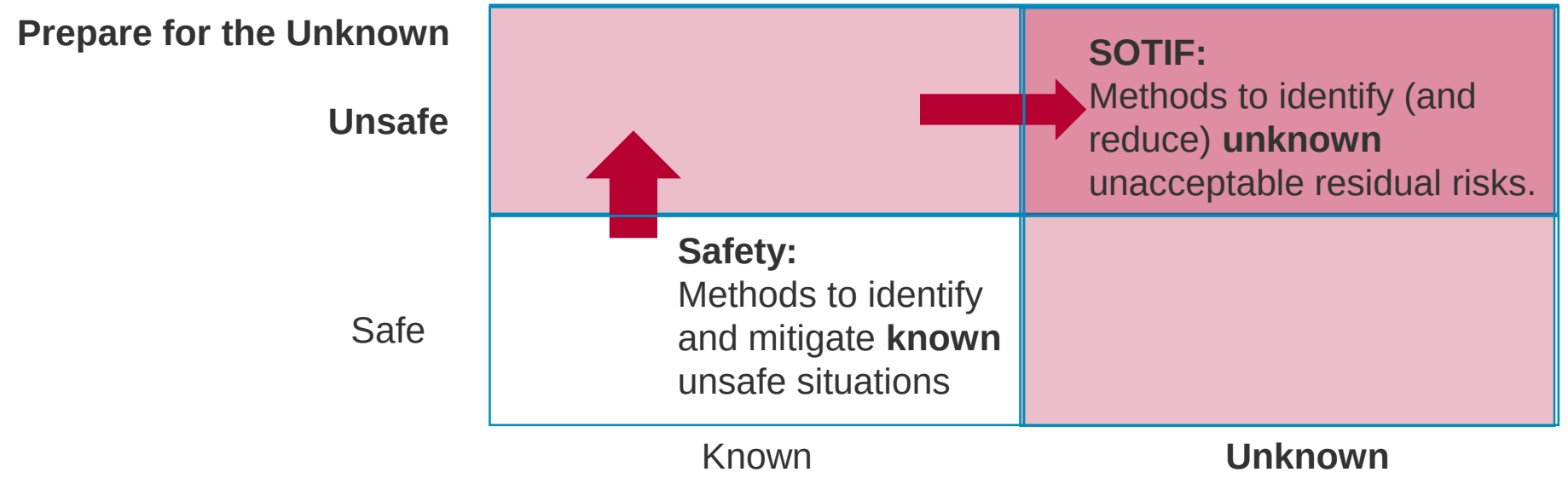
To demonstrate that fully autonomous vehicles have a fatality rate of 1.09 fatalities per 100 million miles (R=99.9999989%) with a C=95% confidence level, the vehicles would have to be driven **275 million failure-free miles**.

Synthetic data is needed for development, verification and validation



Autonomous Systems Validation and Homologation

Safety of Autonomous Systems: Brute Force Will Not Help



- Automated Driving

- Robotics

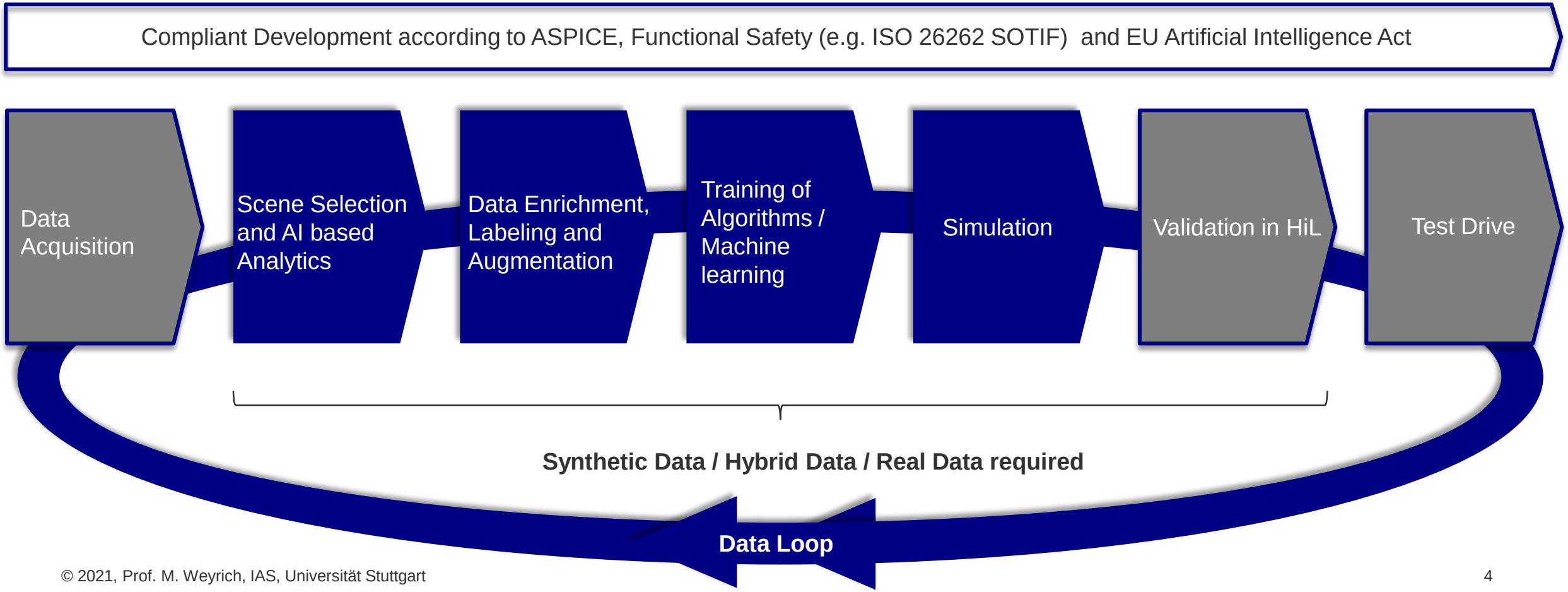
- Off-road Vehicles

- Mobile Platforms

Quality matters: Anticipate the Unthinkable. Specify the Unknown Unknowns.

Data for Autonomous Driving Safety

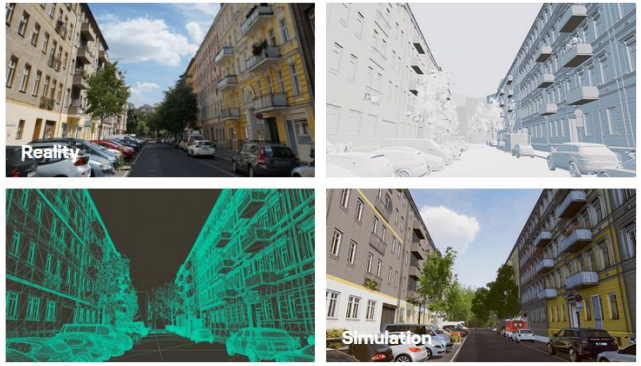
Development and Validation of autonomous Vehicles requires a bunch of new capabilities to create safe functionalities



New offerings of Data provision are required …

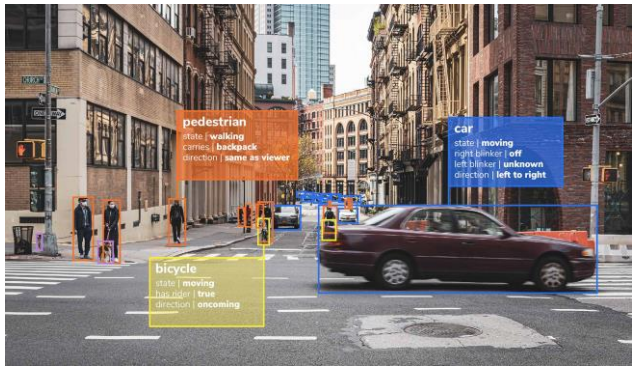
Training and test of various algorithms such as Neural Networks, Bayesian Networks are required for image processing and action planning.

Reproduce reality in simulation:
Environment and traffic Simulations as realistic as possible.



Source: www.automotive-ai.com/

Turn raw data automatically into annotated data : create Bounding-Boxes and implement Semantic Segmentation.



Source: understand.ai/

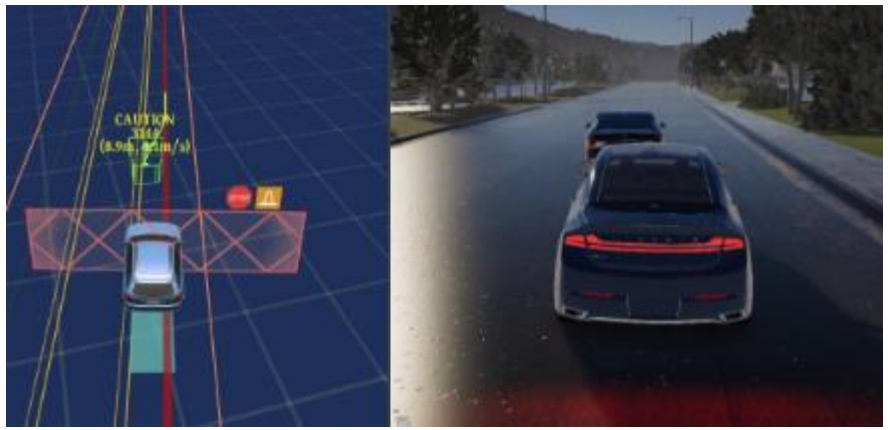
Reveal Cognition Gaps of Neural Networks: Automatically create scenarios which produce malfunction in image processing.

Source: https://www.ias.uni-stuttgart.de/forschung/publikationen/

Scenario Databases: ASAM OpenDrive, SHRP2 NDS, highD-dataset, inD-dataset etc.
Exchange Formats: ASAM OpenSCENARIO, MSDL (SISO), …

The **RoboTest** Approach …

Provide for efficient and transparent validation, certification and homologation for safe and reliable behavior of autonomous systems.

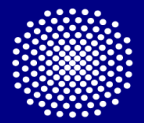


Indexing based on principal component analysis of corner cases and Bayesian Networks

Source: www.robo-test.com

Robo-Test is the solution for cognitive testing through AI-optimized specification, selection and traceability of test requirements and associated scenarios:

- Test-Driven Requirement Engineering with traceability in a seamless validation and verification process
- Maximum test coverage and optimized test plans based on AI
- Testcase selection and automatic scenario specification based on real-world KPI feedback



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Vielen Dank!

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