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Safe AI for Automated Driving

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KI Absicherung

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Project vision and goals

Making the safety of AI-based function modules for highly automated driving verifiable
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Pedestrian detection

Challenge

AI Land

Promising new technology with unimagined possibilities

Established safety processes cannot be applied

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Safety Land

Safe, trustworthy driving function

Consensus in industry and academia on the Safety of AI

2

Methodological and conceptual approach

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Provide the AI functions for pedestrian detection

AI Function-Pedestrian detection

Function

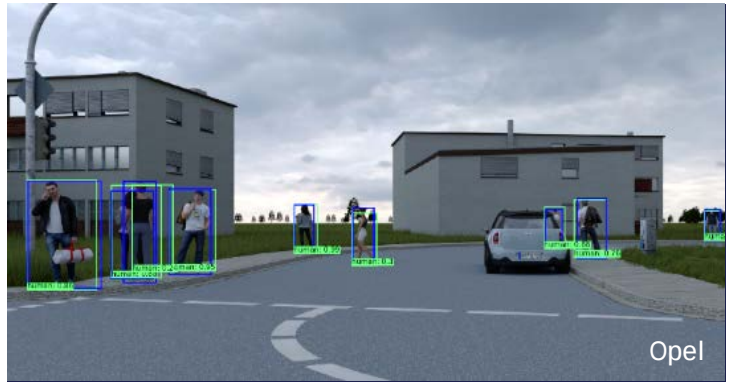
Environment

System architecture

AI Function

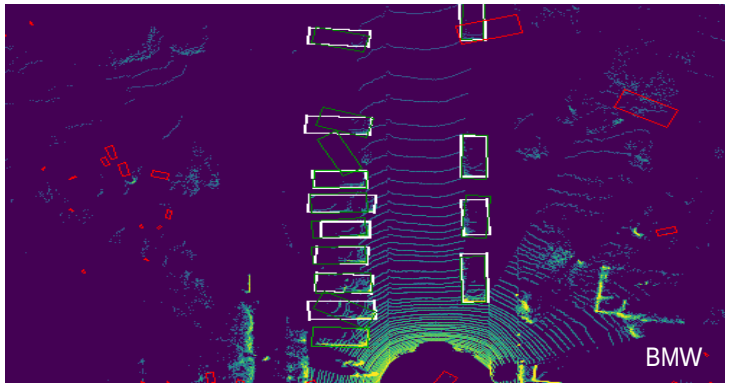
Semantic Segmentation

2D Bounding Box Detection

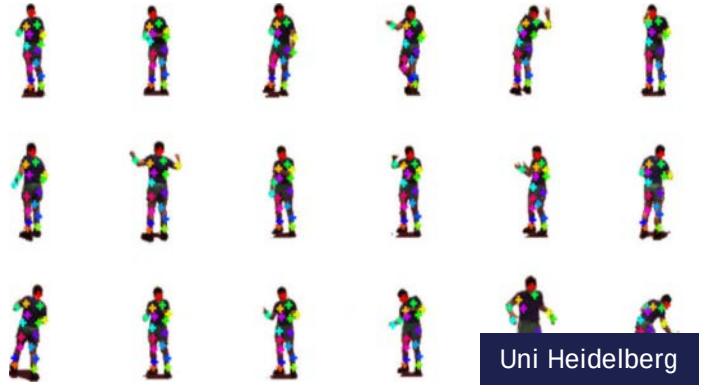


Instance Segmentation

3D Bounding Box Detection



3D Pose estimation



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- **Provide the AI functions for pedestrian detection**
- **Generate synthetic data**

ML-Lifecycle-Validation data

ML LIFECYCLE

- ML-Data
- Model design
- Pre-Processing
- Training
- Post-Processing
- **Test/ V&V incl. Daten**
- Monitoring
- Maintenance

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- Provide the AI functions for pedestrian detection
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- Develop methods and measures

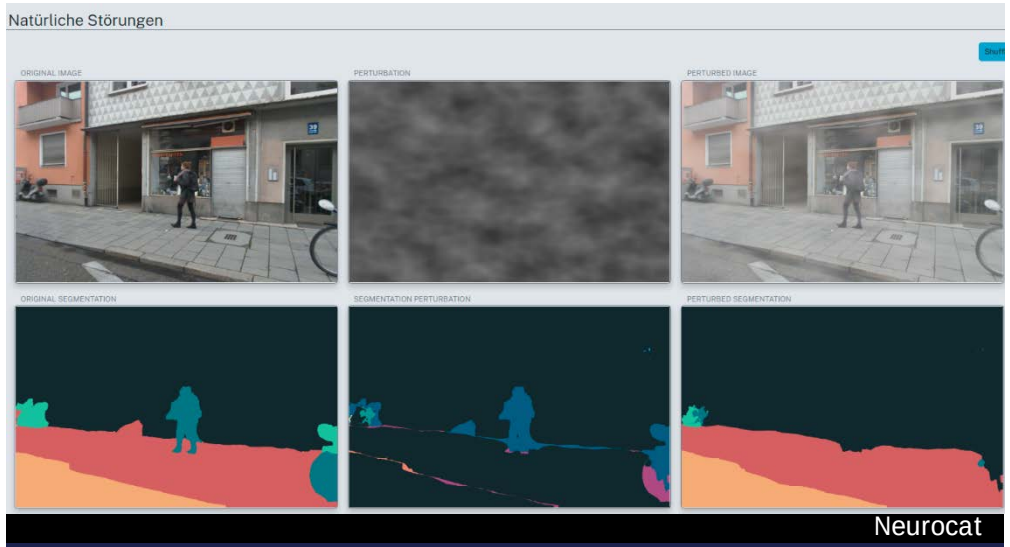
Identify, Measure and & Counteract „DNN-specific Safety Concerns”

DNN-specific safety concern:

- False positive / negative: Pedestrian detection is incorrect resp. not robust enough

Method:

- Assessment of uncertainty: Stochastic evaluation of a multitude of model variations (Monte Carlo Dropout)



DNN-specific safety concern:

- Adversarial error: leads to overlooking (false negative)

Method:

- Systematic analysis of adversarial errors
- Methods to evaluate adversarial resilience
- Counter mechanisms during training or operation

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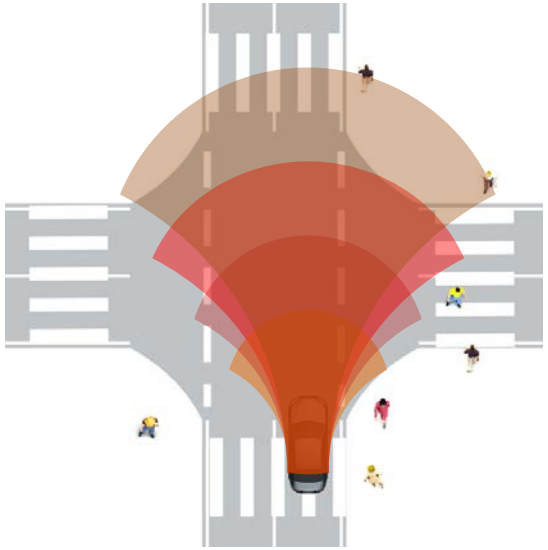
- Establish an overall safety argument for the AI function

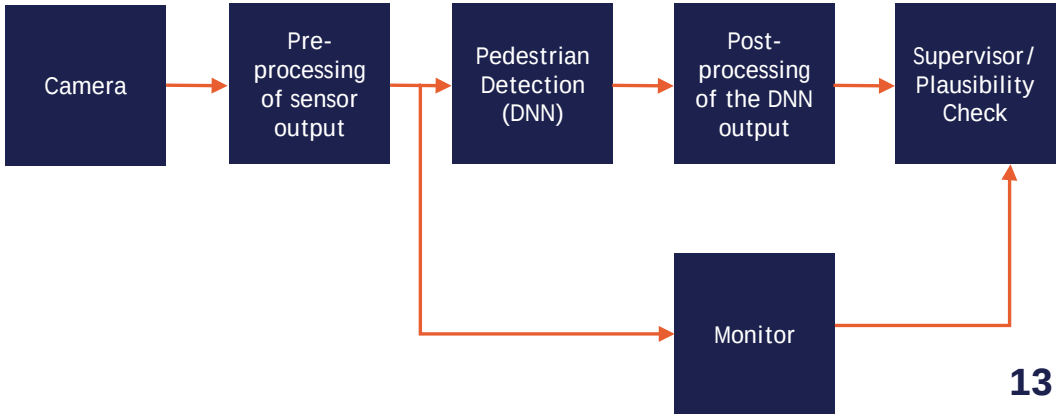
Specification

Function

Environment

System Architecture





Our Approach: Establishment of a Holistic Safety strategy

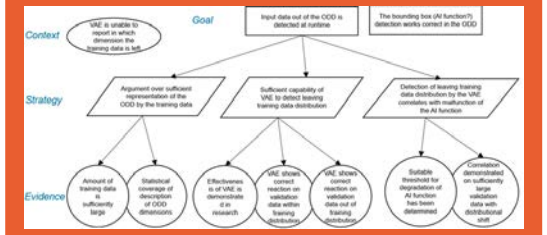
Identification: DNN specific insufficiencies & "safety concerns"

Quality metric and data: Methods for the evaluation

Countermeasure: to reduce the remaining risk

Effectiveness: Contribution to safety? Yes / no

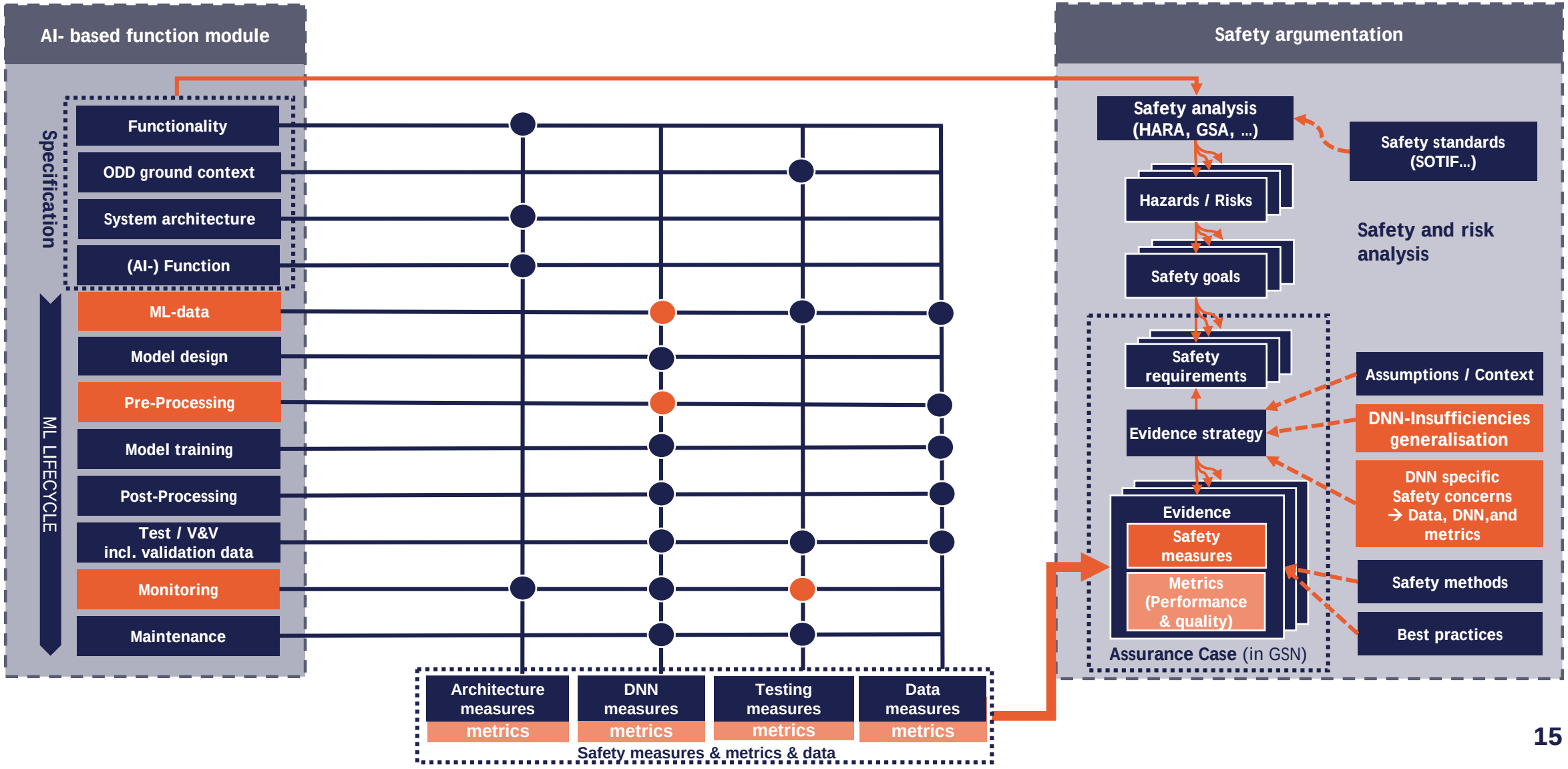
Safety Argument: GSN-based Notation



Structured safety argument

Assurance Case

AI Specific Evidence-Based Safety Argumentation



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- Provide the AI functions for pedestrian detection
- Generate synthetic data
- Develop methods and measures
- Establish an overall safety argument for the AI function
- Communicate the results

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Safe AI for Automated Driving

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KI FAMILIE

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