

# A METHOD TO SELECT RELEVANT SCENARIOS FOR A V&V-PROCESS

## From Data and Knowledge to Scenarios for Testing

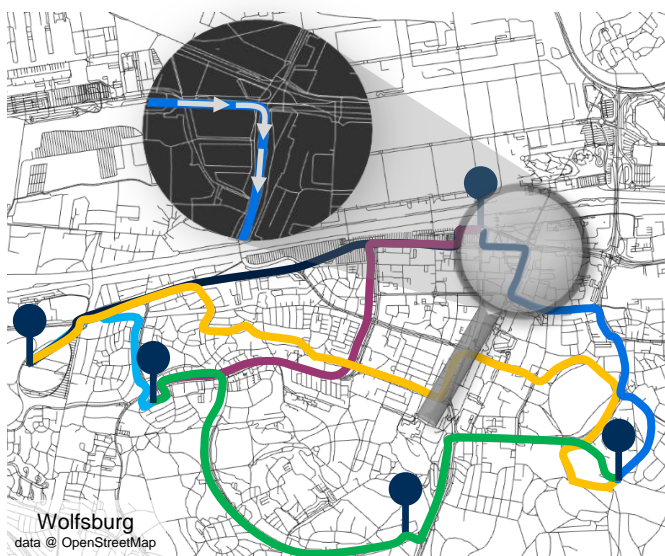
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### Motivation

The release of automated driving systems (ADS) requires the safety approval of testing agencies that can only review a limited amount of tests, due to finite resources using sample tests. Therefore, a finite set of tests agreed by relevant stakeholders for a practical verification of a systems' capabilities is necessary, though not yet finally defined. The proposed method contributes exemplary cases as one part to build a catalog of tests that an ADS needs to pass in an overall V&V-process.

### Goal

- A **catalog of high risk** scenarios extracted from data as test cases
- Focus on high risk cases (high severity and exposure) as necessary condition an ADS needs to pass
- Limit catalog size by only selecting a proportion of the riskiest cases



### Method

- Detect **exposure of basic maneuver sequences** in data
- Evaluate **severity** corresponding to basic maneuvers based on e.g. GIDAS accident database
- Create **distribution of risk** from severity & exposure
- **Select proportion** of risky cases from distribution as foundation for **functional scenarios**
- Transform scenarios to **test cases**
- Catalog of high risk cases to cover maximum risk in a limited amount of tests

Basic Maneuvers			
Layer 1: Vehicle State Maneuver			
Accelerate	Keep Velocity	Decelerate	Reversing
Driveaway	Standstill	Halt	
Layer 2: Infrastructure Maneuver			
Follow Lane		Lane Change {left, right}	
Approach Junction	Cross Junction	Turn {left, right, U}	
Approach Crosswalk		Cross Crosswalk	
Park			
Layer 3: Object-related Maneuver			
Follow Object	Approach Object	Fall behind	
Passing			

„Classification of Driving Maneuvers in Urban Traffic for Parametrization of Test Scenarios“, Hartjen, L.; Philipp, R.; Schuldt, F.; et al., 2019

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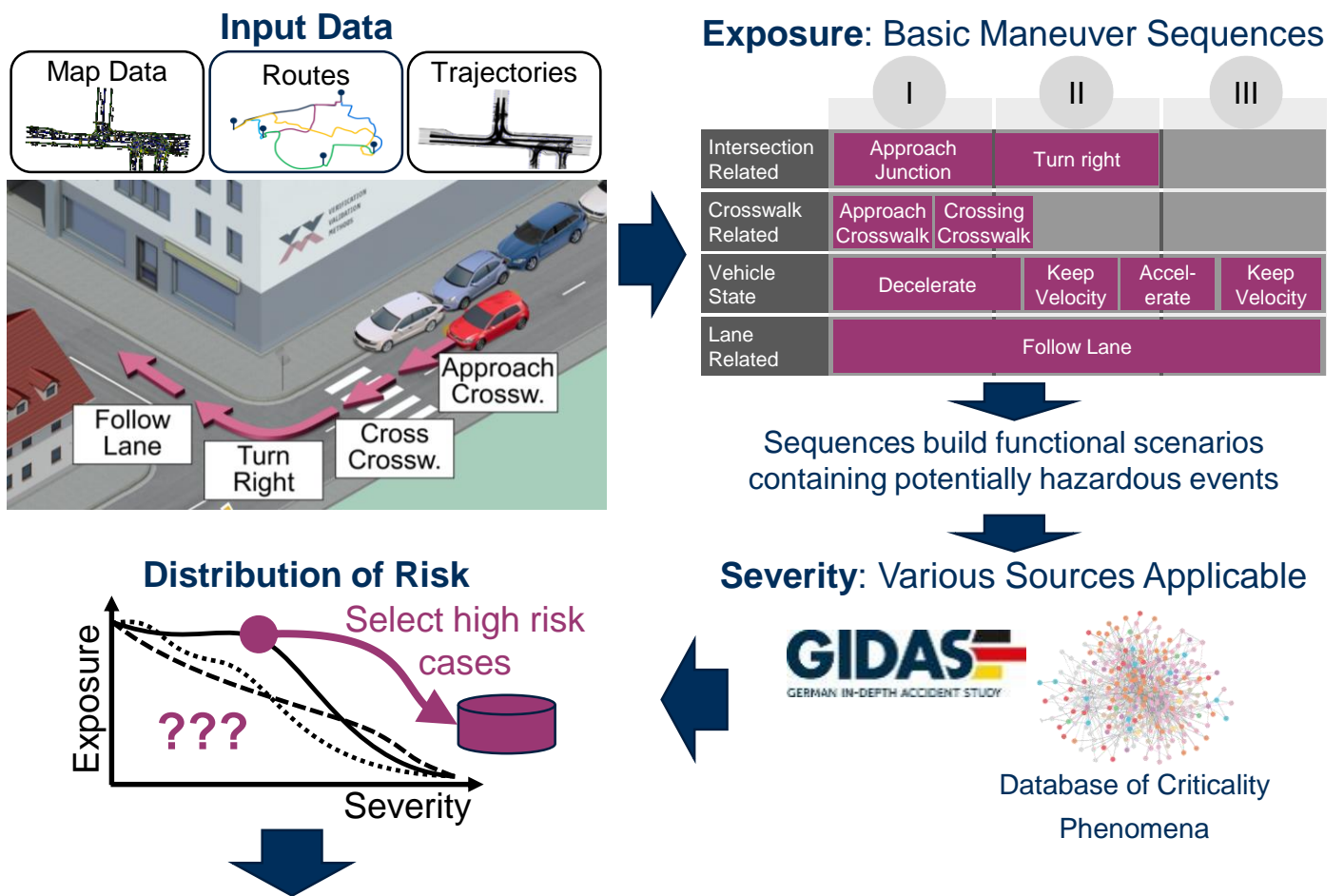
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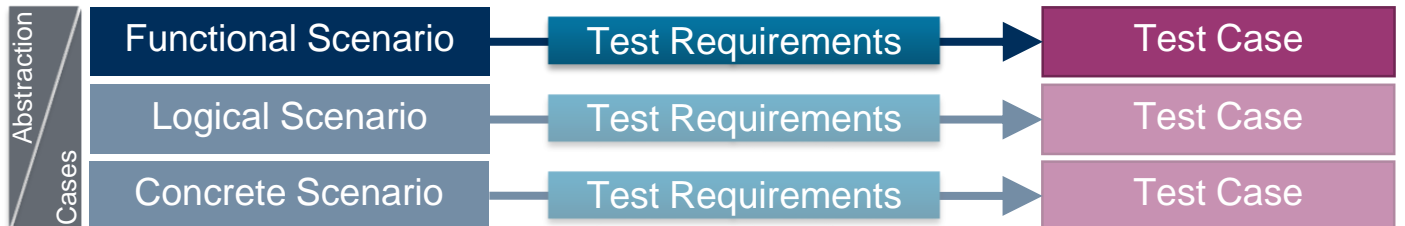
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## Transform Scenarios to Test Cases on Different Levels of Abstraction



### Test requirements:

- SUT in the context of the scenario
- Target behavior as a test objective
- Metrics incl. pass criteria
- [...]

Link measured events of scenarios to an argumentation strategy. The proposed extension of scenarios into test cases along abstraction layers may improve traceability.

## Catalog of Test Cases

The proposed method creates a collection of high risk functional scenarios extracted from input data as one part of a catalog of test cases for an overall V&V-process.

- Enables to generate a catalog with a limited number of cases as exemplary contribution to a necessary (not sufficient) condition of tests an ADS needs to pass.
- Collecting high risk cases maximizes the coverage of highly exposed and severe – therefore relevant – scenarios in a limited amount of tests. New riskier cases may replace existing ones.
- Catalog may change over time, if exposure or severity changes.
- Adjustment to individual needs by choosing certain severity metrics or input data.

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