

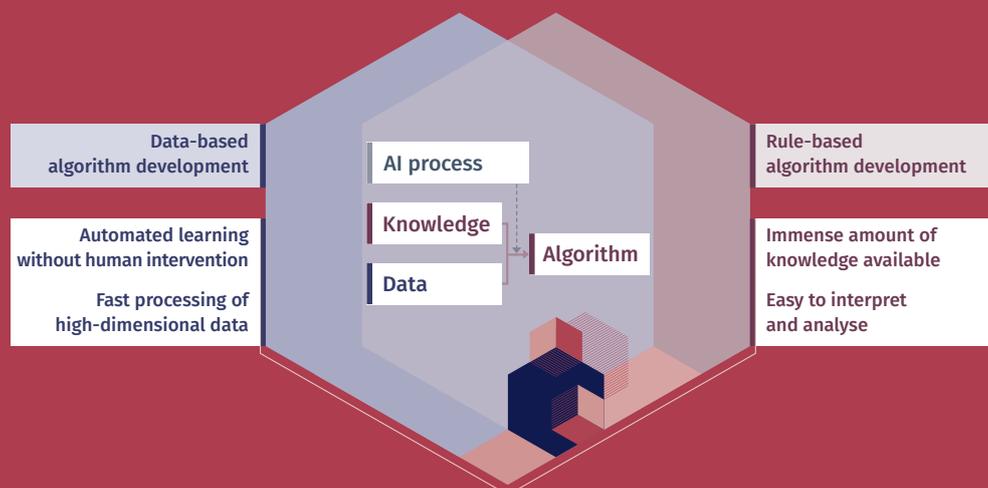
# Developing methods for integrating knowledge into machine learning

## Challenge and Goal

AI-based processes are paving the way to fully automated driving. Up until now, the development of AI solutions has been purely driven by data. This data-driven approach requires enormous amounts of data for the training and validation of AI functions, with the collection and processing of this data being very resource-intensive and expensive. In addition to the dependence on extensive amounts of data, data-based AI processes have another weakness: they are still generally black-box models for which the decision-making process cannot be directly reconstructed.

In the research project KI Wissen, methods for integrating existing knowledge into the data-driven AI functions of autonomous vehicles are being developed and investigated. The goal of the project is to create a comprehensive ecosystem for the integration of

knowledge into the training and safeguarding of AI functions. By combining conventional data-based AI methods with the knowledge- or rule-based methods developed in the project, the basis for training and validating of AI functions will be completely redefined: This basis now includes not only data, but information, i.e., data and knowledge. The development from data- to information-based AI carried out in the project addresses the central challenges towards autonomous driving: the generalisation of AI to phenomena with small data bases, the increase of the stability of the trained AI to disturbances in the data, the data efficiency, the plausibility check and the validation of AI-supported functions as well as the increase of the functional quality.



Combine the advantages and eliminate the disadvantages of both worlds in one approach

## Facts and Figures

Project duration

**36 months**

01/01/2021 – 31/12/2023

Project budget

**€25.9 M**

Funding budget

**€17.4 M**

Project consortium

**15 partners**

**1 external partner**

Project coordinator

**Simon Heinz,**

**Continental AG**

## Approach

In the project KI Wissen the following types of knowledge are examined: mathematical-physical knowledge as well as world and expert knowledge. The consideration of these knowledge types as well as the identification and formalisation of relevant knowledge is the first necessary step for the intended use within the project. Thereupon, methods for the integration of formalised knowledge into an AI, the extraction of learned knowledge from an AI, and the plausibility check of AI decisions with respect to existing knowledge will be developed. The approaches developed in the project will be evaluated and demonstrated on the basis of three defined use cases. Specifically, the following core scientific and technical innovations will be addressed:

### Scientific innovations:

- Development of approaches to identify and formalise relevant domain knowledge for L3 to L5 driving

functions

- Development of evaluated approaches for knowledge-based training of AI components
- Development of learning techniques for training reduction and performance improvement
- Creation of an ecosystem for knowledge as a basis for efficient training and the safeguarding of AI components based on formalised knowledge

### Technical innovations:

- Development of reusable qualified and formalised modules for application, safeguarding, and network knowledge (e.g., formalised road traffic regulations with exceptions)
- Creation of a tool kit of formalised knowledge and corresponding AI methods for companies and research
- Creation of demonstrators with knowledge-based AI components

## Partners



## External partner

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