Towards a traffic understanding

by ontology-based rules

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HITeC

Hamburger Informatik
Technologie – Center e.V.

WHO IS

We are **the institution for technology transfer** between the Department of Informatics at Hamburg University and Companies and Research Institutions.

Managing Director	Dr. Lothar Hotz
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Legal form	**Registered non-profit association**
Members	Scientists of the Department of Informatics, companies as sponsoring members

OUR FOCUS

Our projects always have the focus on
research & development

→ Contract research and development
→ Funded cooperation projects (BMBF, BMWI, BMVI, EU, ZIM, IFB etc.)
→ Consulting and studies
→ Seminars
→ Project support

Important aspect:

We realize **cooperation** projects with relevant **research** content

DO YOU UNDERSTAND WHAT IS GOING ON HERE?
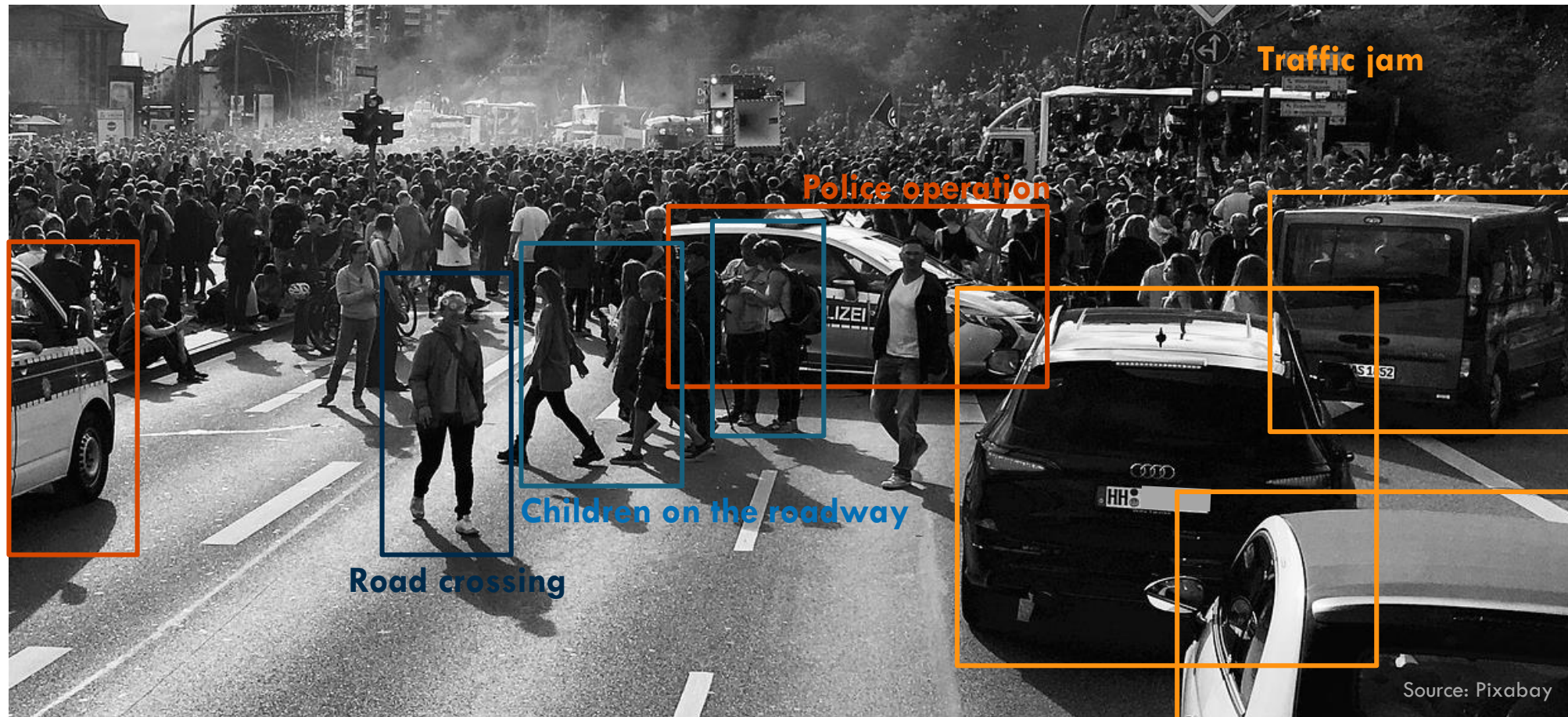

Source: Pixabay

DO YOU UNDERSTAND WHAT IS GOING ON HERE?

Humans can understand situations in fractions of a second.

Source: Pixabay

# DO YOU UNDERSTAND WHAT IS GOING ON HERE?

Machines cannot with ease.

Traffic jam

Police operation

Children on the roadway

Road crossing

Source: Pixabay

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WHAT IS SCENE UNDERSTANDING?

Scene   temporal sequence of actions and states of one
or more actors (road users like pedestrians, cars)

Understanding   a system can create a comprehensive,
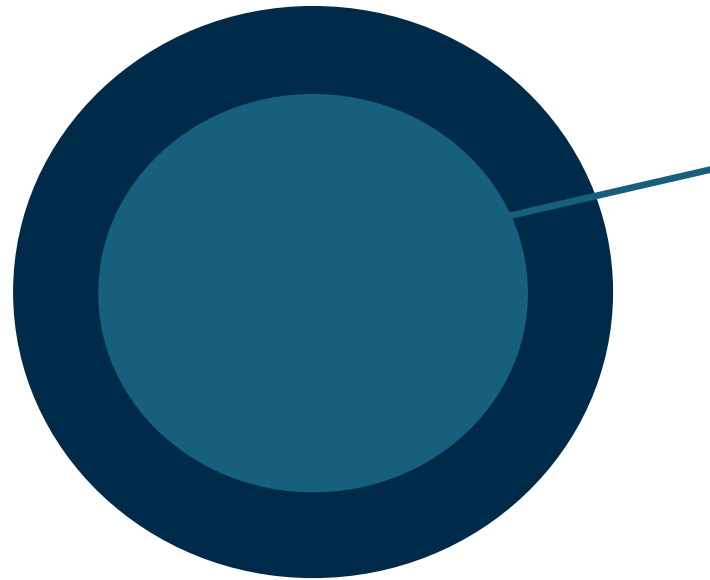contextualized, formal description of what is
happening and the description can be used to
answer questions

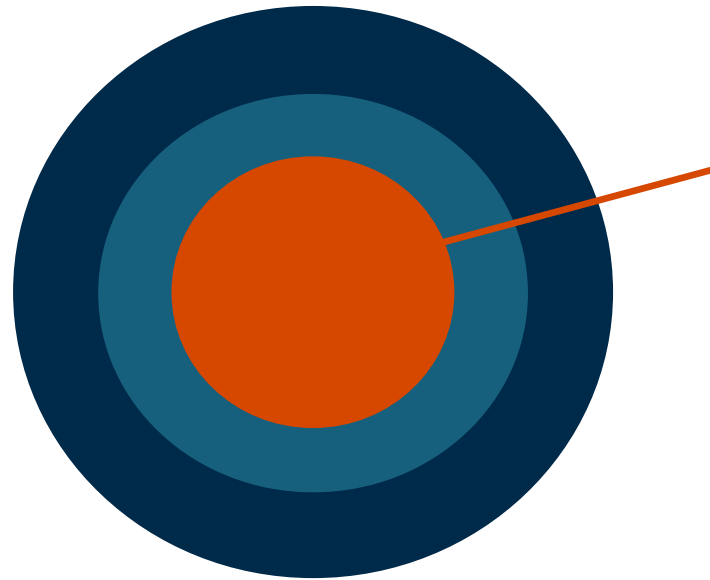# TOWARDS SCENE UNDERSTANDING
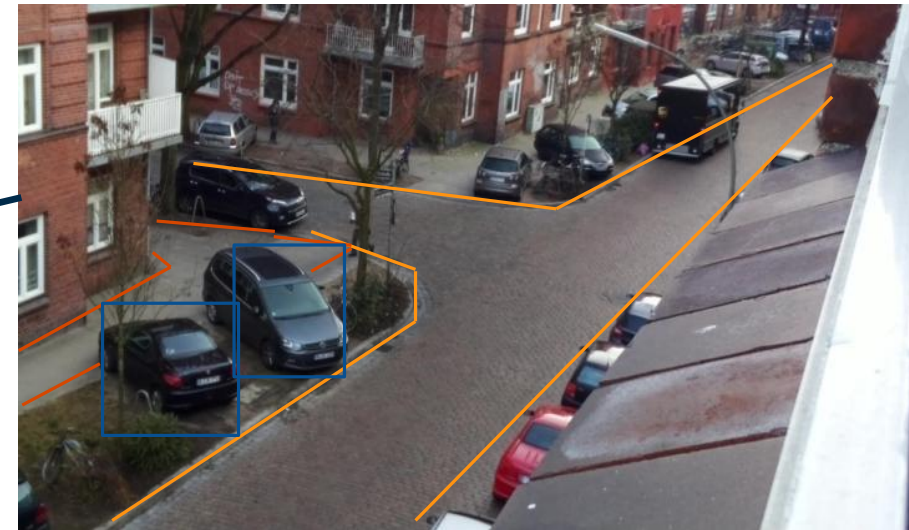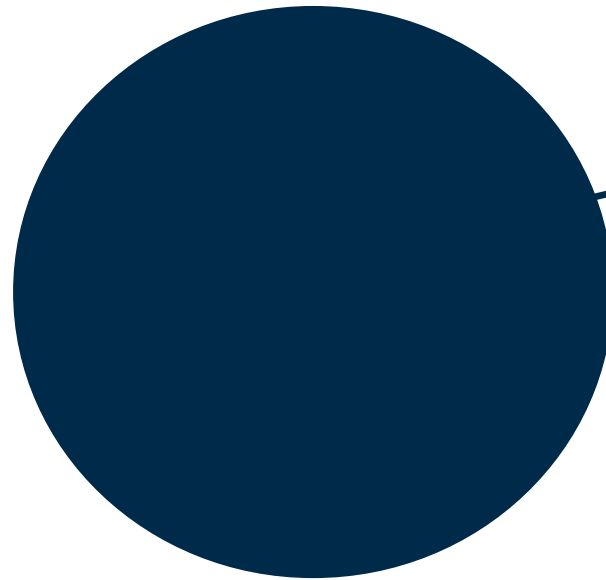
Object classification:
each segment of a frame or image will be labled with a certain type,
foreground objects or backround regions, e.g. cyclist, foot path, road

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TOWARDS SCENE UNDERSTANDING
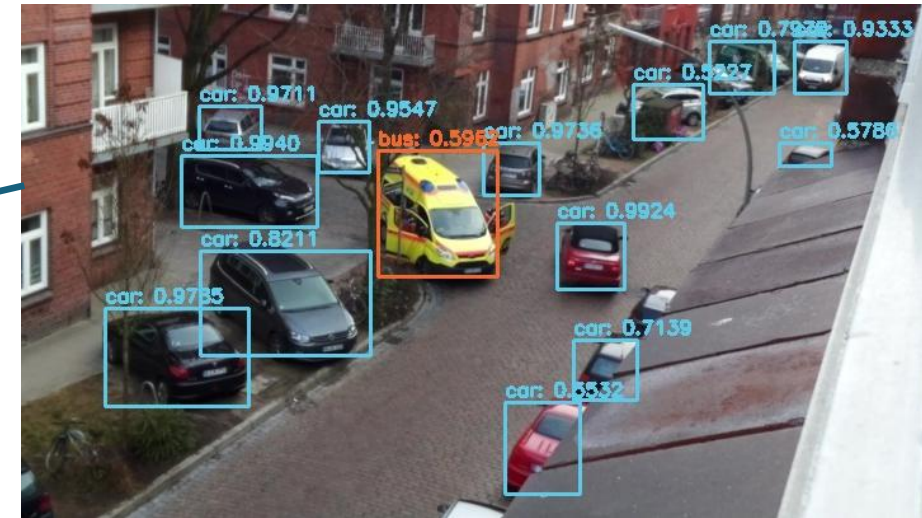
Object identification & tracking:

enables the identification and naming of certain objects
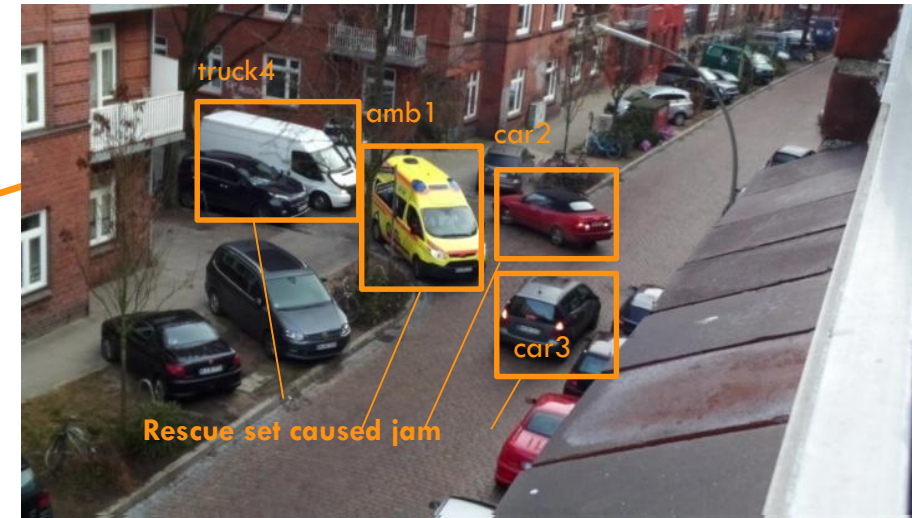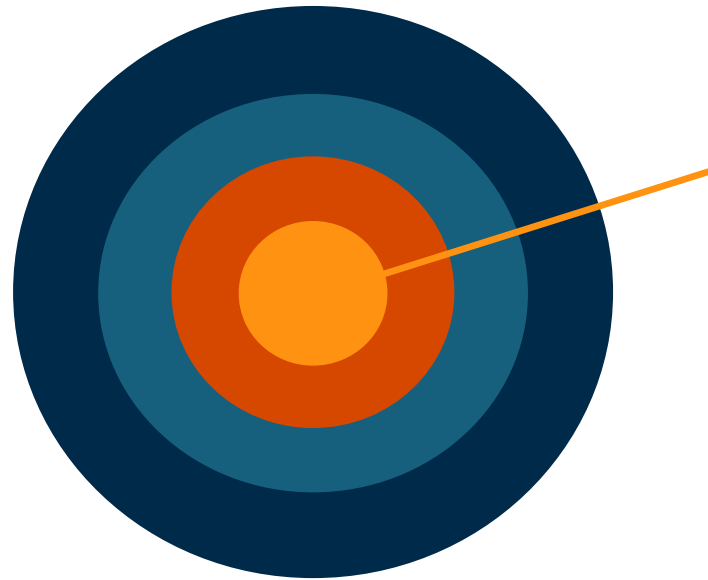and tracking in time and space, e.g. cyclist2, footpath1

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TOWARDS SCENE UNDERSTANDING

Primitive Events:

    represents the movement of an object through type, identification,

    start and endtime and trajectory e.g. drive(car2, road3, starttime, endtime, path)
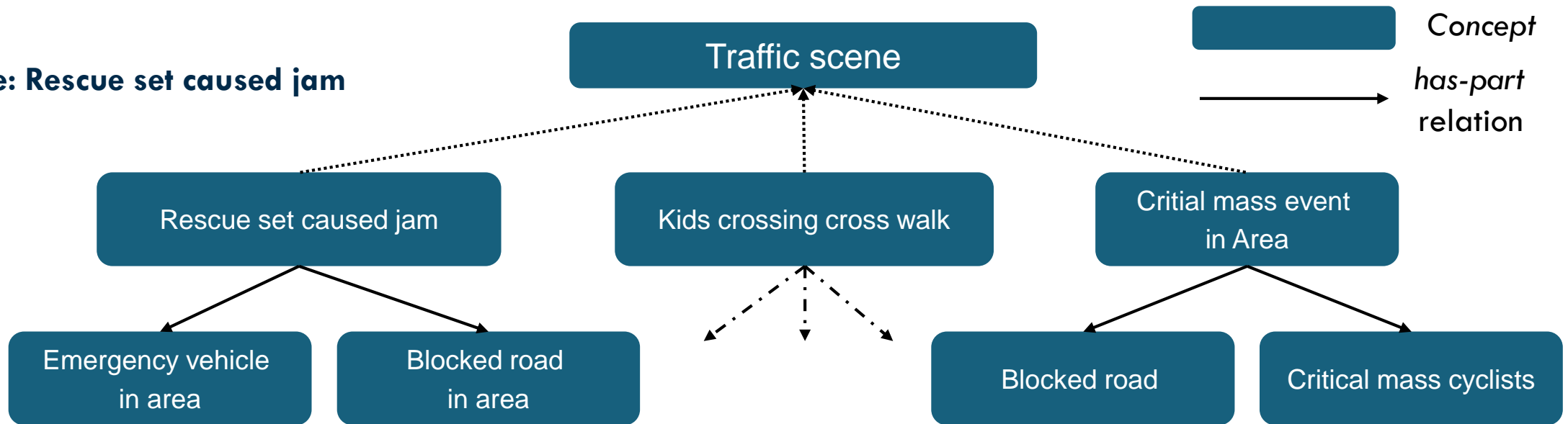
TOWARDS SCENE UNDERSTANDING

Rescue set caused jam

Scene composition:

is an aggregation of primitive events that fulfill certain contraints

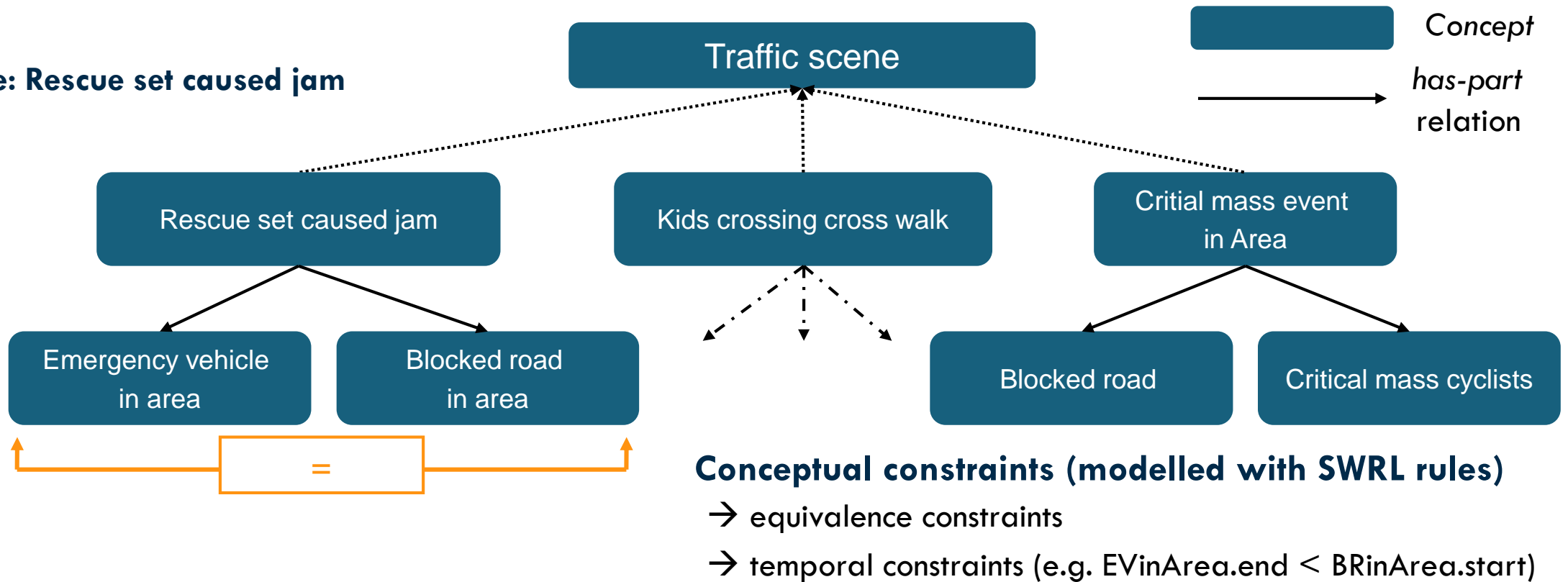related to time, space and context like weather e.g. rescue_set_jam(rescue_set, blockage)

MODELING SCENES WITH ONTOLOGIES

Example: Rescue set caused jam

MODELING SCENES WITH ONTOLOGIES

Example: Rescue set caused jam

Traffic scene

Concept

has-part relation

Rescue set caused jam

Kids crossing cross walk

Critial mass event in Area

Emergency vehicle in area

Blocked road in area

Blocked road

Critical mass cyclists

=

Conceptual constraints (modelled with SWRL rules)

→ equivalence constraints

→ temporal constraints (e.g. EVinArea.end < BRinArea.start)

*Concept + conceptual constraints => **aggregate***

SCENE INTERPRETATION BY ONTOLOGY-BASED RULES
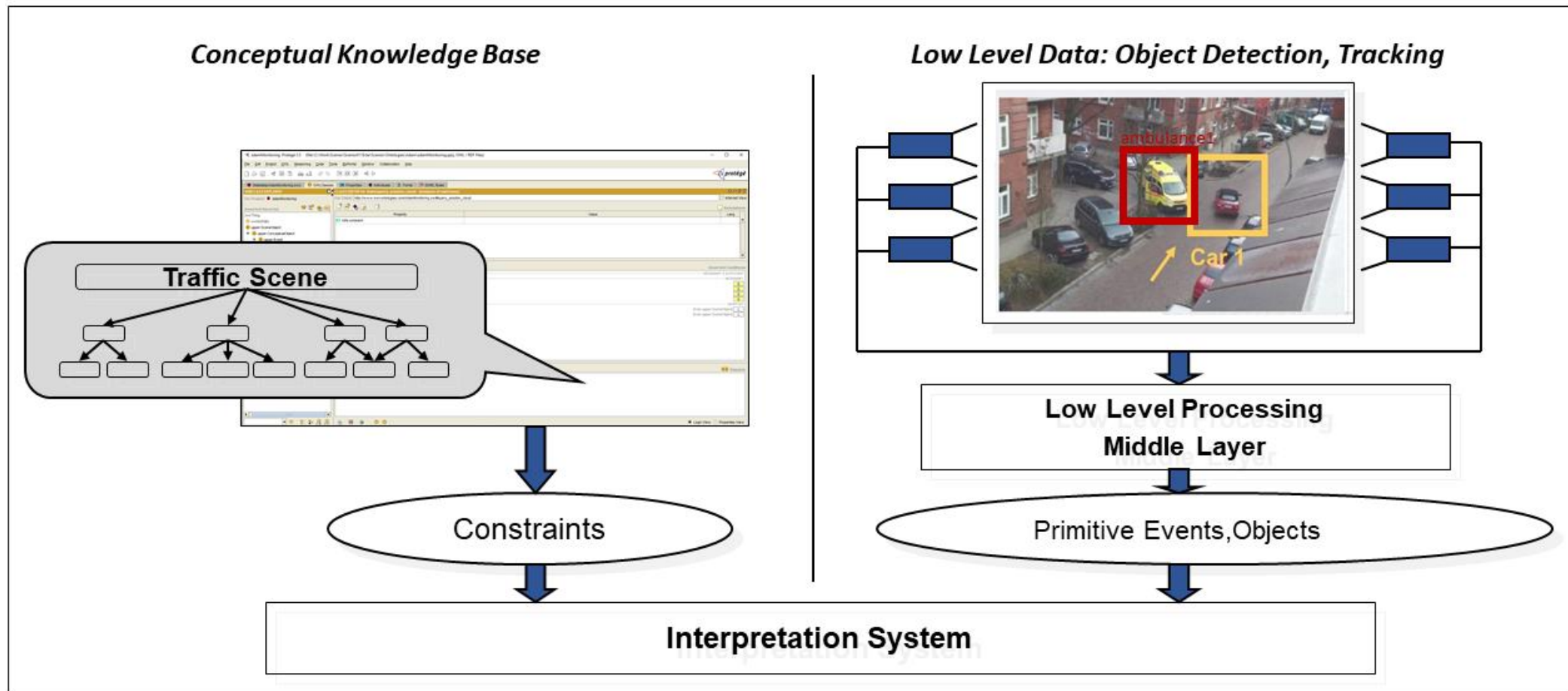
TOOL
SCENIOR – SCENE INTERPRETATION BY ONTOLOGY-BASED RULES

- Scenes and events are described in compositional models in a knowledge base.

- Models are provided with constraints.

- **Scenior** translates the knowledge base with the constraints into a **rule system that evaluates the real time data** based on the modeled events.

TOOL
SCENIOR IN ACTION

OUR EXPERIENCE IN SCENE INTERPRETATION

- Monitoring tasks (e.g. adapting autonomous machines or airport activity recognition)

- Criminal acts recognition (e.g. cyber security)

- Learned activity models for scene interpretation, planning, and prediction in robotics

- Traffic scene interpretation

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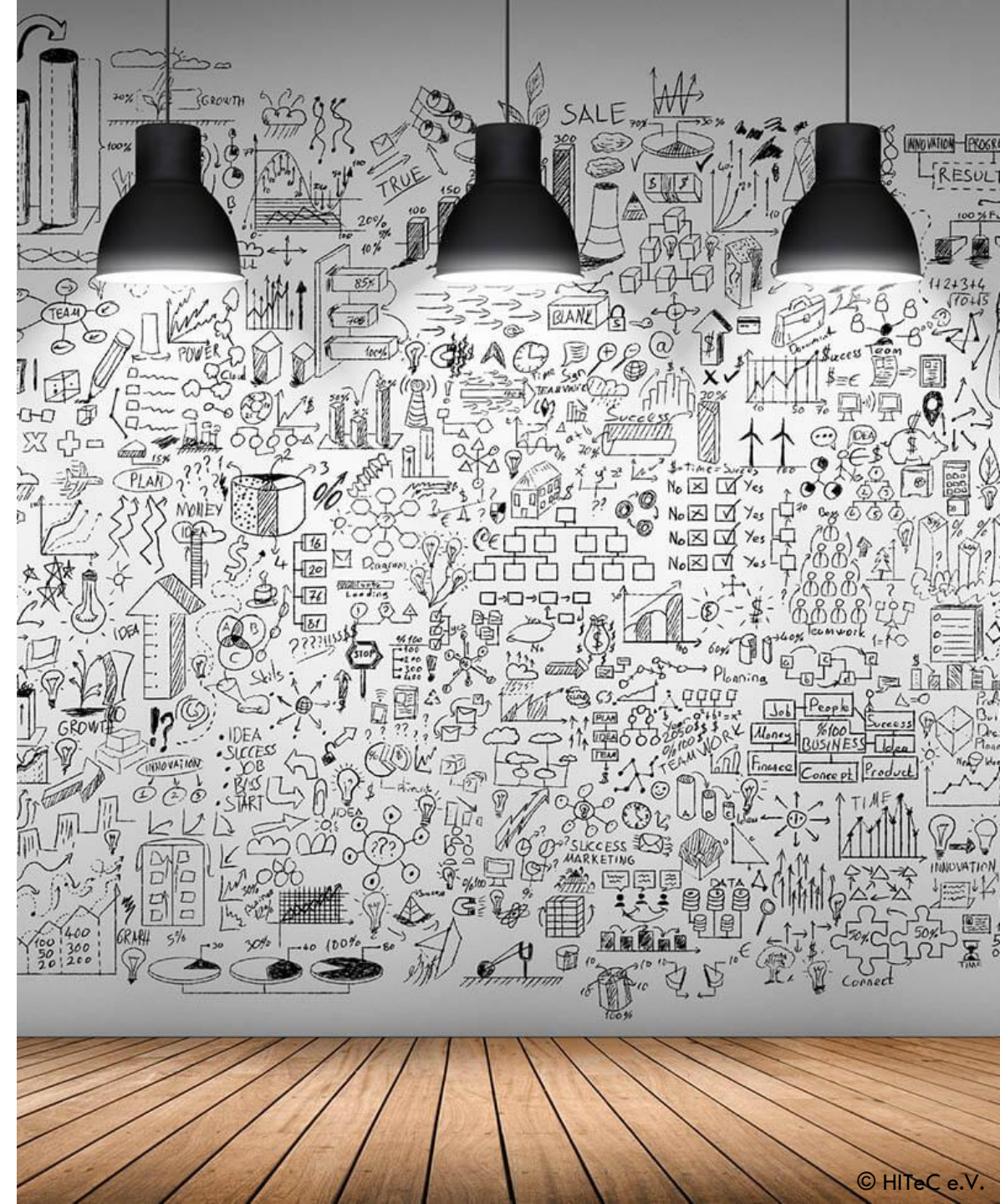
SCENE INTERPRETATION OF ROAD TRAFFIC

SmartWalk

Protection of vulnerable road users with intelligent traffic infrastructure:

- smart crosswalk
- privacy-compliant camera system
- Scenior

Funded by the German Federal Ministry of Traffic an intelligent Infrastructure (BMVI) by mFund

[Source: AS Bercman Technologies]

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THANK YOU FOR YOUR ATTENTION!

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