



Advanced Perception: AI in Transport

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ATC
Moving Traffic

Improving Road Safety



5 - 29

year olds face road traffic injuries as the leading cause of death.

1.3 M

people die every year as a result of traffic accidents.

>50%

of all traffic fatalities in urban areas are vulnerable road users: pedestrians, cyclists and motorcyclists.

Challenge: Road Safety

Vulnerable road users (VRU) represent **70% of all road fatalities** mainly in urban areas.

Especially vulnerable groups, such as the mobility impaired, the elderly and the very young are **constantly at risk**.

Cities working towards ***Vision Zero*** aim to design and operate safer roads in more multimodal environments.

Key factors to address



Lack of adequate detection



Lack of visibility



Static traffic control



Malfunctioning & unreliable traffic equipment



Absence of traffic control



Inattentive & distracted users



Low situational awareness

Our solution approach

Smart intersection

Universal **AI-enabled detection**

Flexible & dynamic traffic control for all users

Smart central monitoring for high availability & reliability

Best-in-class equipment for intersections of any size

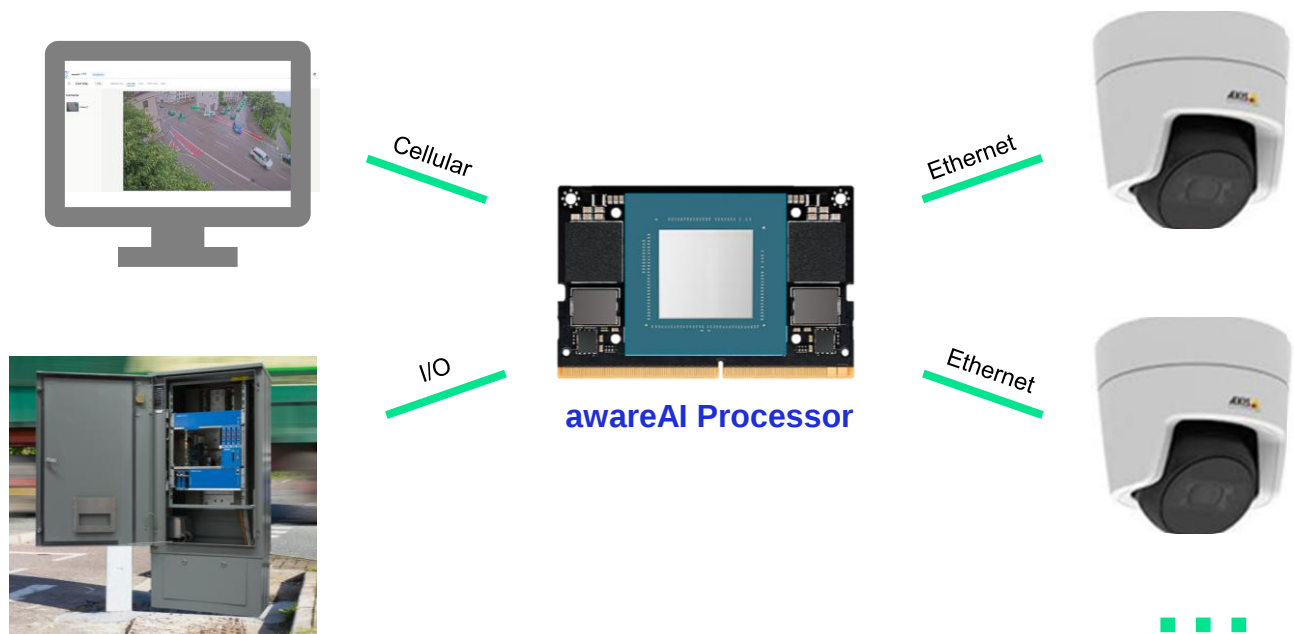
Connected mobility

Increased awareness via **connected devices**

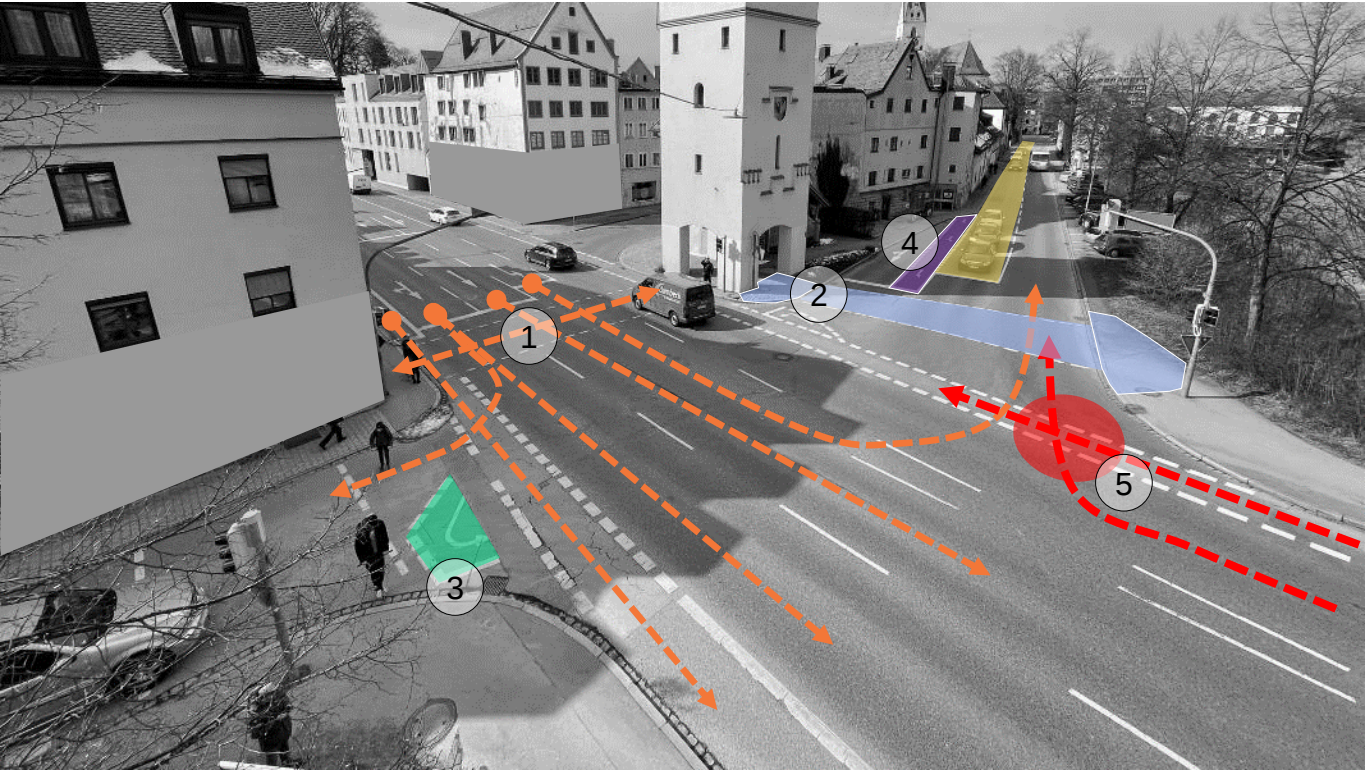
Our Solution: awareAI

The latest development from Yunex Traffic utilises advanced image processing for video detection and classification.

Cameras connect to the powerful processing core (via Ethernet) with I/O connection to the signal controller and a dedicated remote connection for user access.



A technical solution for a wide range of standard and advanced ITS applications



- 1

Traffic Flow Insights
for real-time motion analysis of all road users such as pedestrians, cyclists, vehicles in the entire intersection area

Traffic Optimization
- 2

Safe Pedestrian Crossing
for contactless request and adjustment of green time

VRU protection
- 3

Dynamic Spot Detector
for counting, speed measurement and occupancy of all road users for any zones

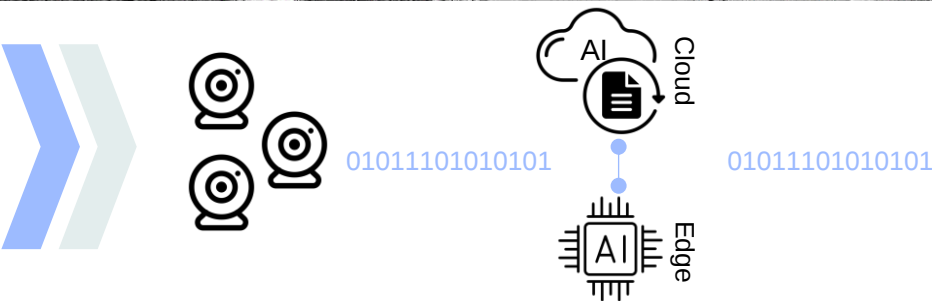
Traffic Optimization
- 4

Intelligent Priority
individually for all classes of road users

Traffic Optimization
- 5

VRU Conflict Awareness
To reduce accidents between non-motorized and motorized traffic.

VRU protection



Yunex Products

Symphony	
RSU	sX
OBU	...

Application – Traffic Flow Insights 1

The awareAI system allows for the easy configuration of virtual zones that can be placed at any position within an awareAI camera’s field of view.

The zones can then be associated with turning movements to provide an accurate account road user movements throughout an intersection.

Key Benefits

- Can utilise previously defined virtual zones, or newly configured dedicated zones to capture road user movements
- Fully automated data collection replacing the need for physical site surveys or data retrieval
- Filtering based on time, day and object class
- .CSV file data export for further evaluation or system input (modelling, predictive response plans).

Turning NW-NE NW all → NE all

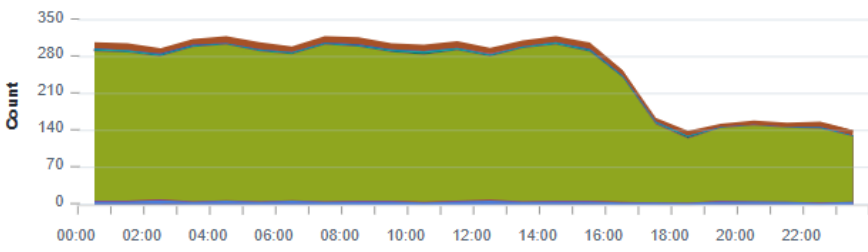
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Chronological

All classes ☐ Daily ☐ 11/06/2024 ☐

11/6/2024, 12:00 AM - 11/6/2024, 11:59 PM

Bicycles Buses Cars Car trailers Heavy trucks Light trucks Motorcycles
Pedestrians Scooters Trams Truck trailers Vans



Object name ☐	Count
Bicycles	59
Buses	21
Cars	5,753
Car trailers	2
Heavy trucks	0

Advanced Perception – awareAI

2

An innovative solution for pedestrian crossings

Key Benefits

1 Drive Forward with Effortless Digital Transformation: awareAI transforms analogue detection into digital detection.

2 Optimize Traffic Flow with Precision: awareAI detects pedestrians, cyclists and other non-motorized road users, integrating them into real-time planning for the first time ever.

3 Greater Performance and Flexibility at Equal or Lower Investment: awareAI replaces each individual detector with just one system. This reduces cost & less maintenance-intensive.

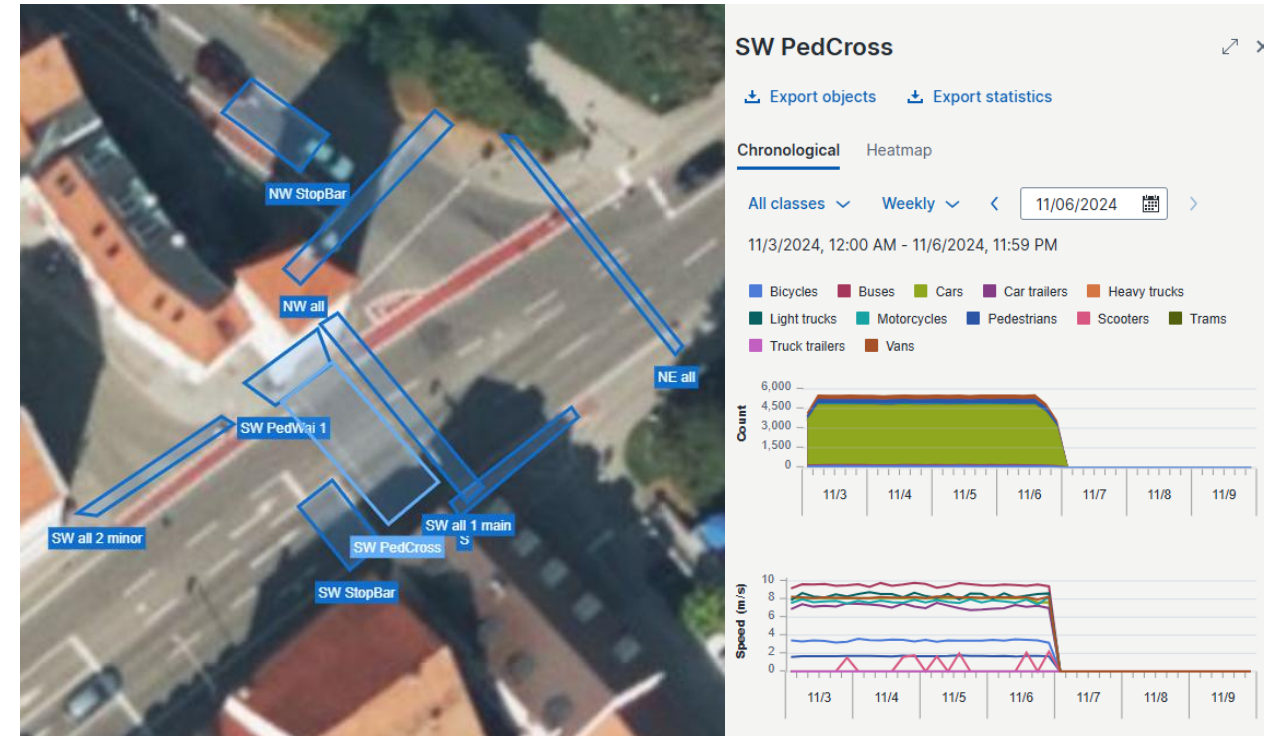
4 Set New Standards in Comprehensive Road Safety: awareAI is aware of every road user and can warn drivers of crossing cyclists or pedestrians using the turning assistant.



Application – Dynamic Spot Detector 3

Key Benefits

- Flexible configuration of zones supporting changing road network requirements
- Zone-based data capture of 12 road user classifications including non-motorised users
- Data capture includes counts, speed and occupancy
- .CSV file data export for further evaluation or system input
- Filtering based on time, day and object class
- Viewable as a heatmap for a quick visual overview of network conditions

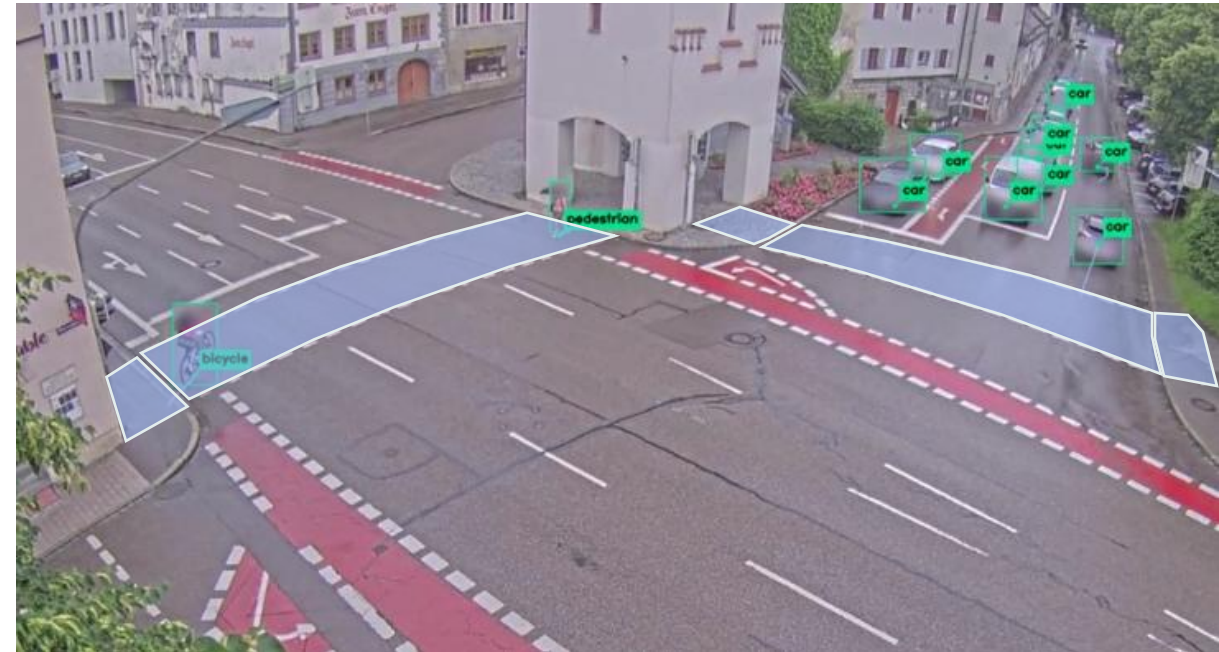


Application – Intelligent Priority 4

The flexible virtual zones can be further utilised for providing enriched local signal control via configurable rules and triggers to provide an input to the traffic signal controller.

Key Benefits

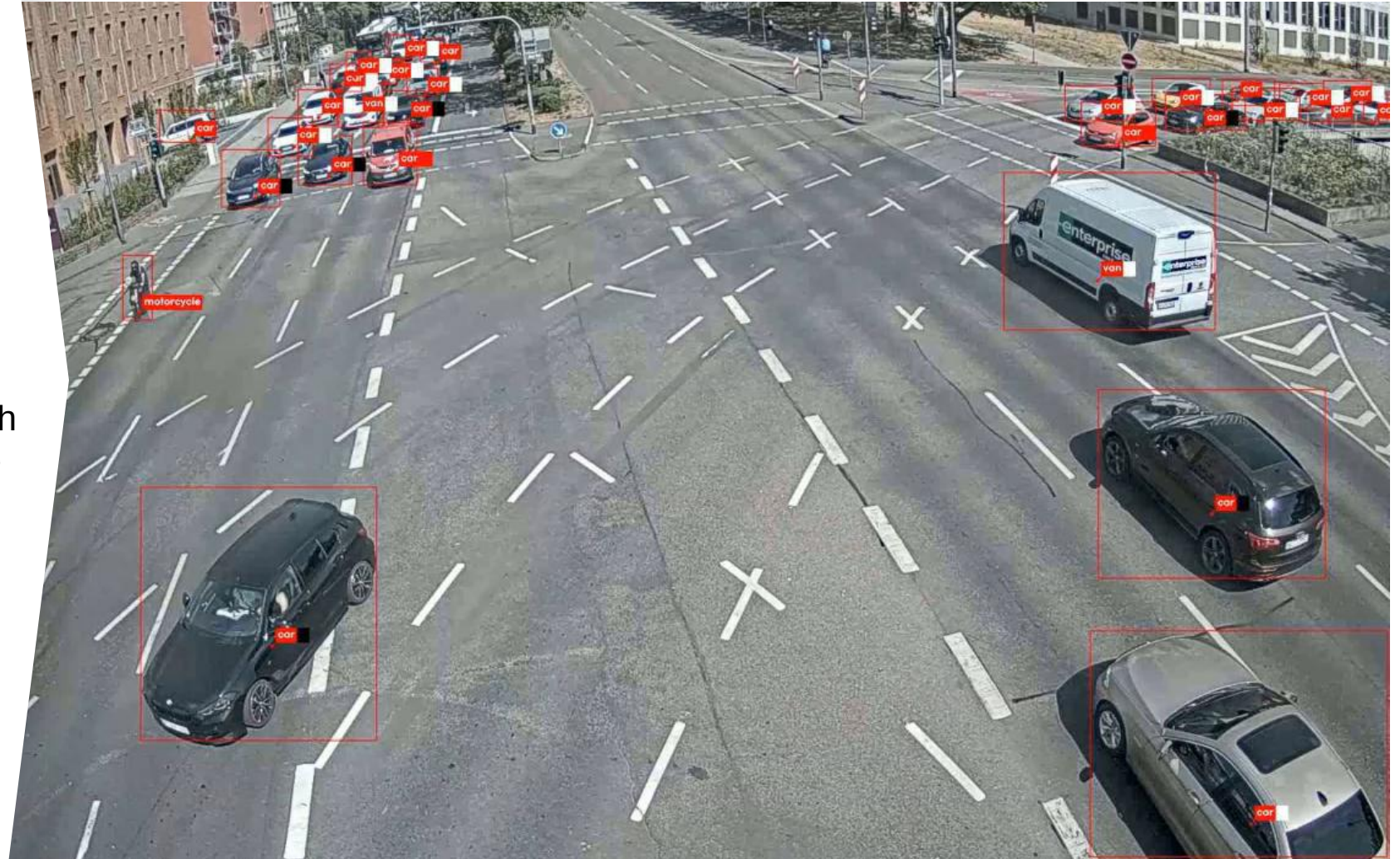
- Utilise existing configured data capture zones as harmonious traditional traffic detector zones
- Advanced local signal control based on count and classification of road users
- Easily configurable rules and triggers for traffic signal I/O.
- Reduces the need for dedicated physical induction loops or above ground detectors (i.e. Kerbside / On-crossing)
- Rules can be defined based on counts, classes and dwell times for dynamic control



Our technology awareAI

AI-enabled Advanced Perception

Virtual speed tracking is used to **recognize slow pedestrians or class groups and extend the green phases as required**, which not only increases comfort for the weakest road users but also ensures greater safety.



Application – VRU Conflict Awareness 5

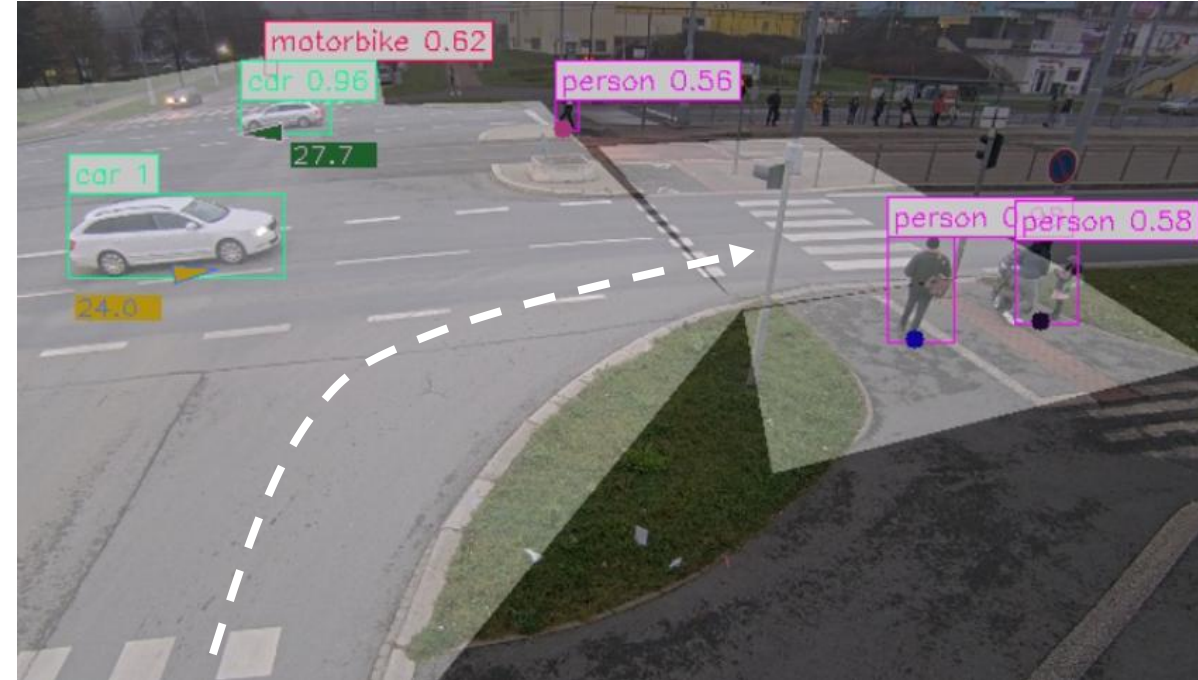
Future Application

The awareAI system also can warn road users of potential collisions through trajectory analysis and configuration.

This warning can be providing using V2X technology directly to Connected Vehicles or to a physical actuated sign.

Key Benefits

- Communication using a V2X ETSI DENM via the Yunex Traffic RSU2X
- Support of vehicles, cyclists and pedestrians
- Configurable based on road classes, speed intervals and lane selection
- Potential to reduce accidents between vehicles and vulnerable road users



Note:

VRU Conflict Awareness is a safety advisory application only and should only be used for providing additional information to support better road awareness.

Advanced Perception Applied: VRU Collision Prediction and Warning

Safety Application Layer Predicts Potential Crashes

Safety warning for crash prediction

- **Detection** of all road participants and prediction of movements
- **Prediction** of Points of conflict and real-time evaluation on a criticality factor for crash
- **Reduction of potential collisions**
- **Optimization of time-to-collision KPI**

Runs on New AI-based Platform

- **Aware-AI-Core** edge-based solution - new options for local control
- **Aware-AI Cloud** – video-based traffic analytics connected to Central-Traffic-Management System



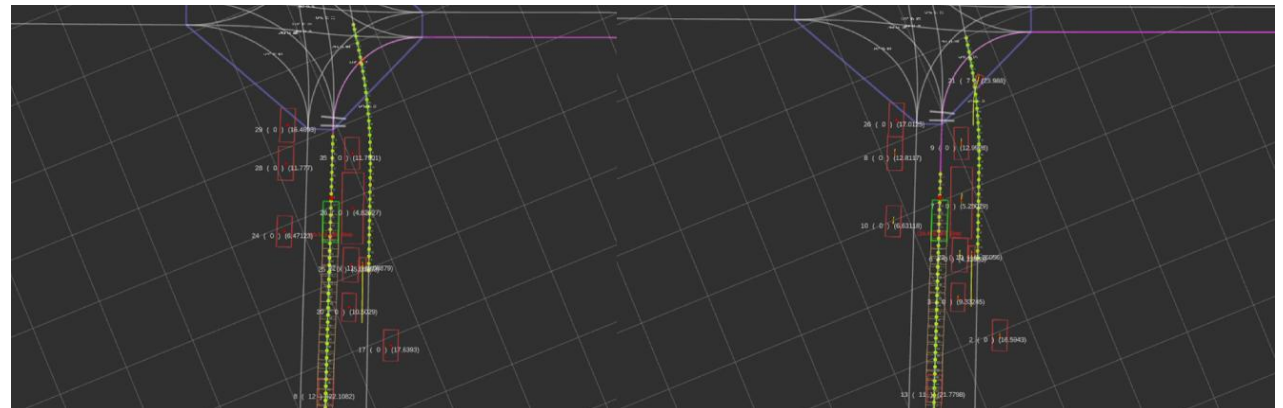
Without infrastructure data



With infrastructure data



Intersection in Munich; Arcisstraße



Real-time digital representation



Thank You!

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