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MAX PLANCK INSTITUTE FOR INTELLIGENT SYSTEMS

EBERHARD KARLS UNIVERSITÄT TÜBINGEN

Renz K. Chitta K. Mercea O.B.
Koepke A.S. Akata Z. Geiger A.

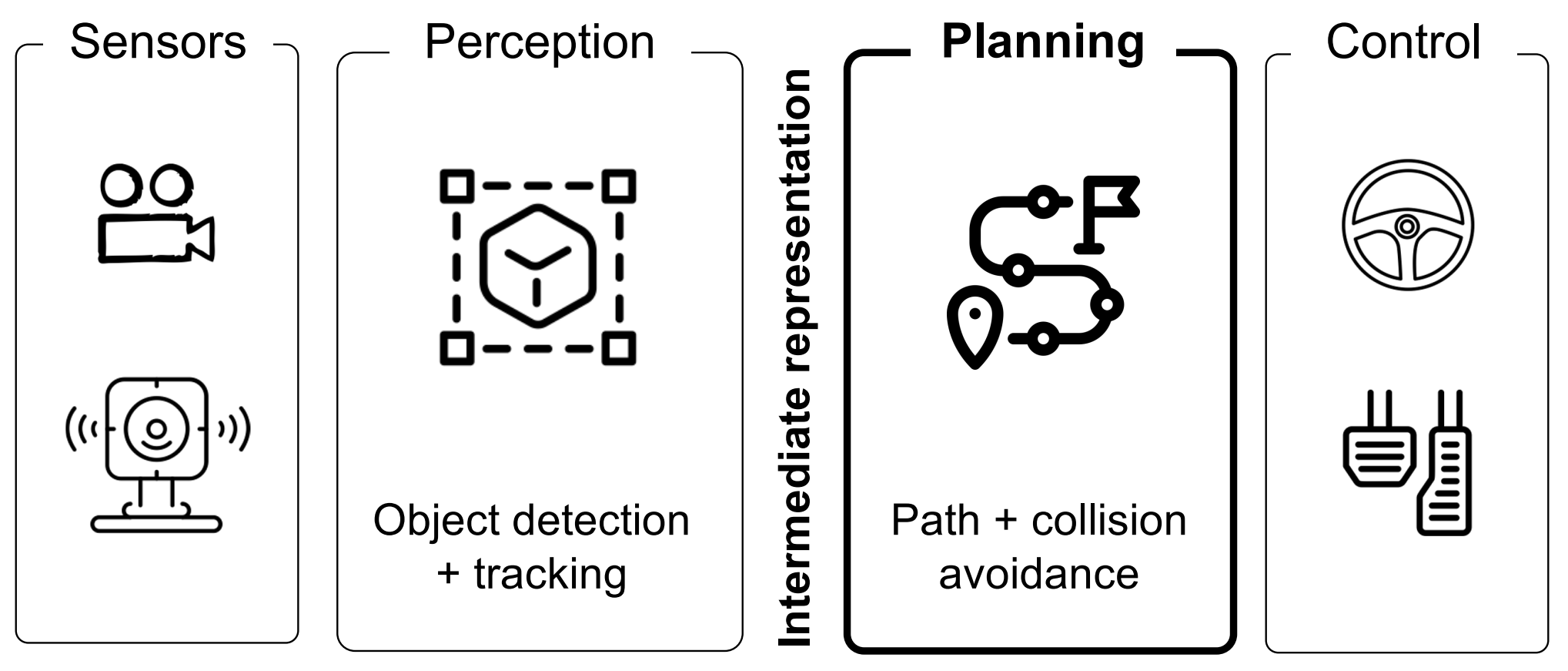
PLANT:

EXPLAINABLE **PLANNING** **TRANSFORMERS** VIA OBJECT-LEVEL REPRESENTATIONS

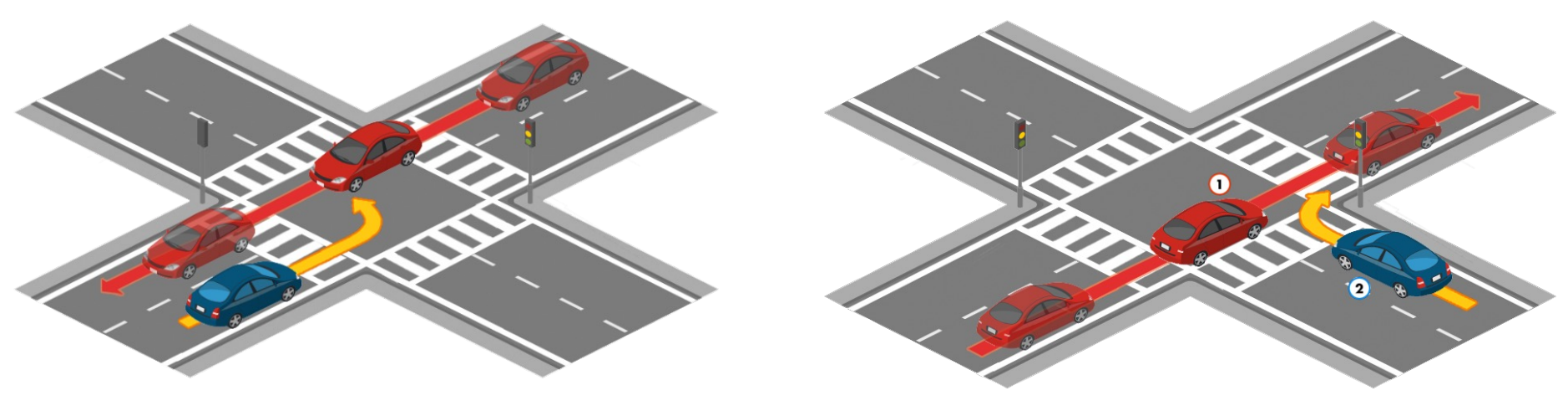
Abstract

Planning an optimal route in a complex environment requires efficient reasoning about the surrounding scene. In this paper, we propose PlanT, a novel approach for that uses a standard transformer architecture. PlanT is based on imitation learning with a compact object-level input representation. Combining PlanT with an off-the-shelf perception module provides a sensor-based driving system that is more than 10 points better in terms of driving score than the existing state of the art.

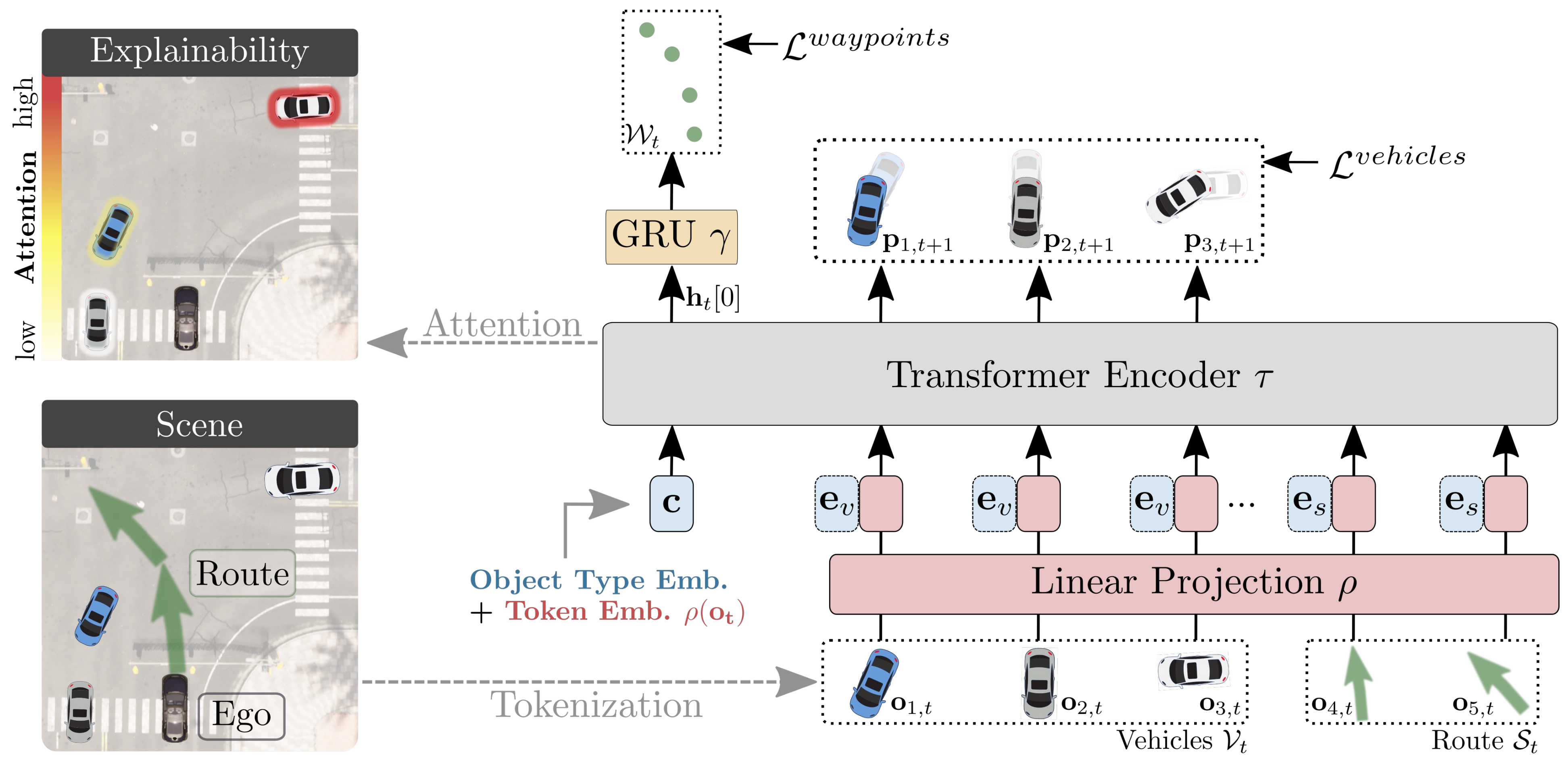
Task


Sensors
Perception
Object detection + tracking
Intermediate representation
Planning
Path + collision avoidance
Control

CARLA scenarios

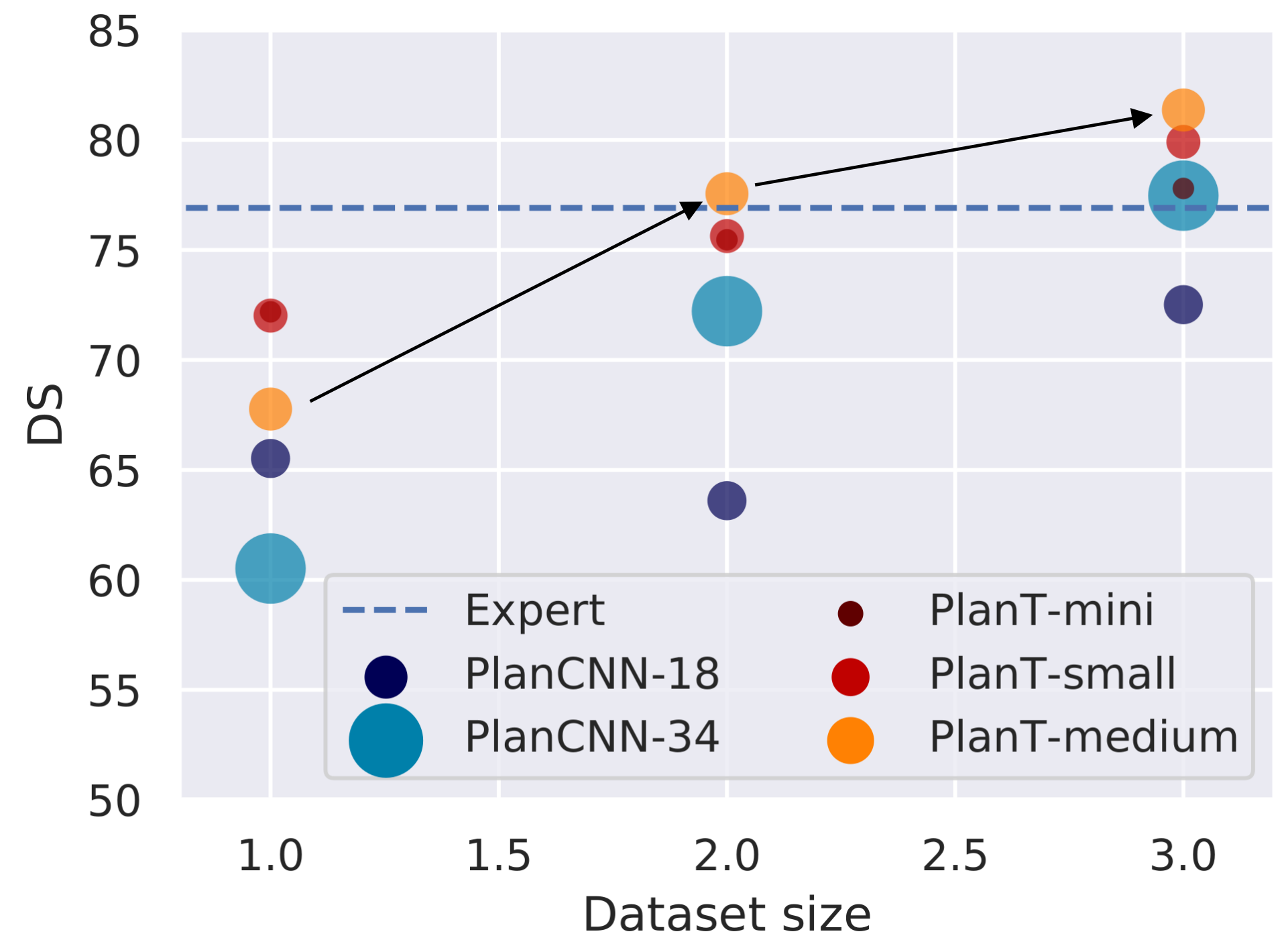


Architecture



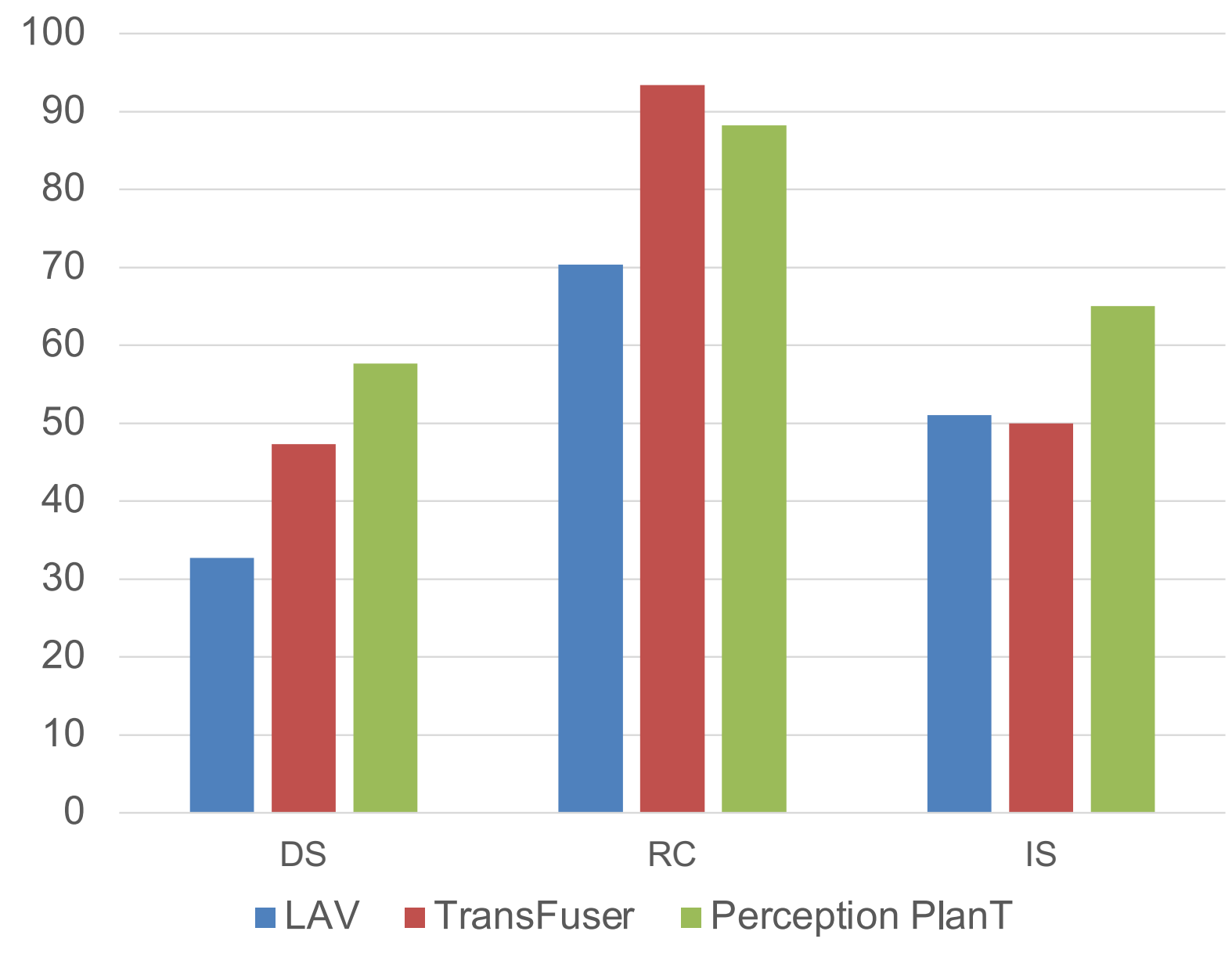
- Train **a standard transformer encoder** from scratch
- Loss on **future positions** of ego vehicle and the other vehicles

Results



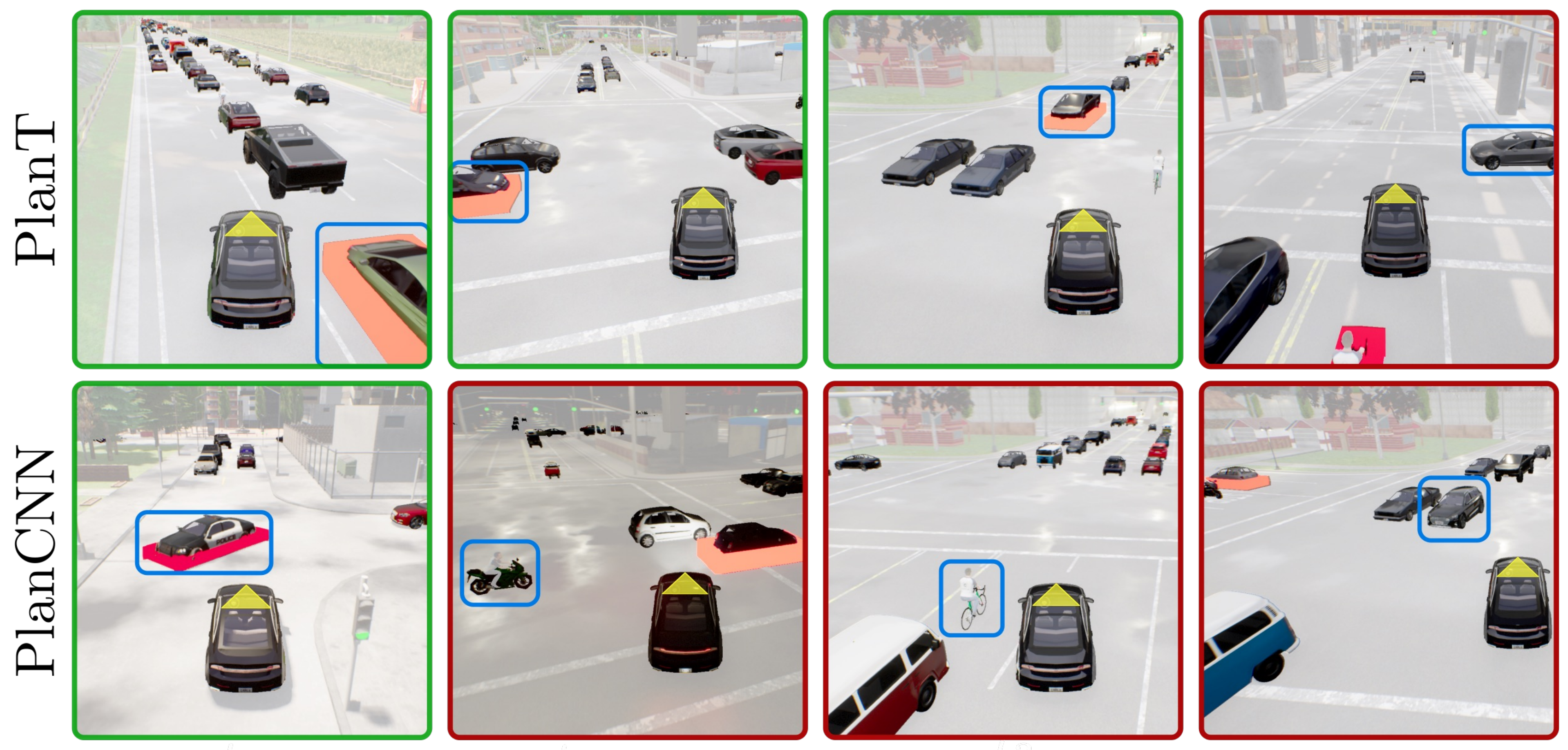
- **Scaling** dataset and model improves performance
- **Expert level performance**

Perception PlanT



- Adding a perception module
- State of the art on longest 6 benchmark

Explainability



- Visualization of **attention weights** to show the **most important object**
- **Temporarily** more **consistent** than the CNN-based method + also takes **geometrically distant** objects into account