CVPR 2023

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Visual Trajectory Prediction via 3D Agent Queries

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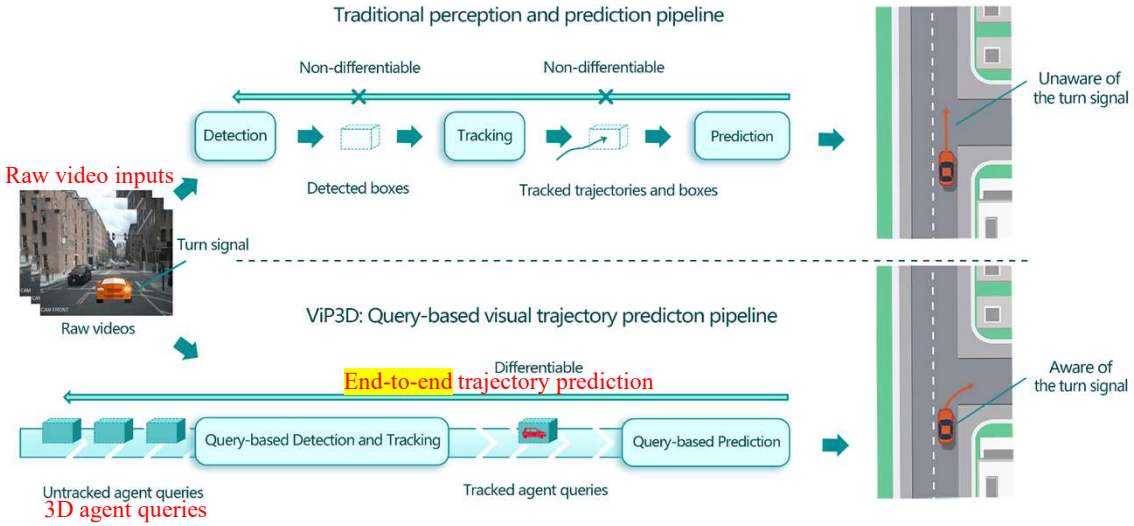
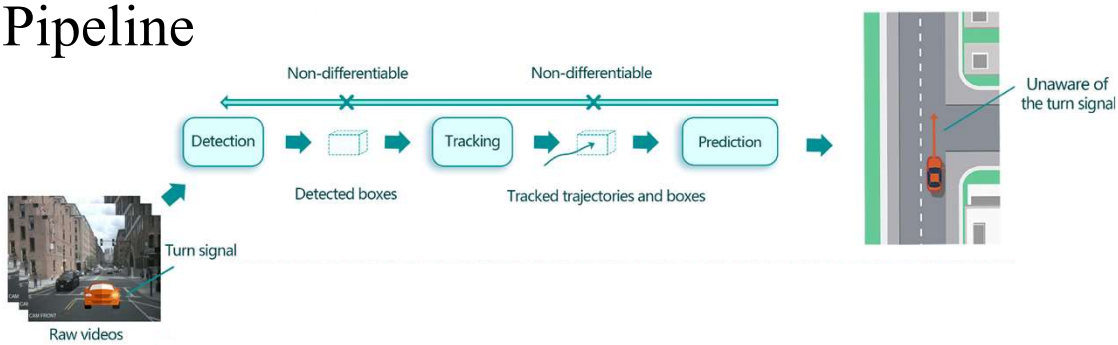
https://tsinghua-mars-lab.github.io/ViP3D/

nuScenes



Traditional Perception and Prediction Pipeline



- Perceive agents and predict their behaviors.
- Separate modules
  - Lost useful information
  - Error accumulation

End-to-end models

LiDAR-based: IntenNet / FaF / PnPNet

Drawbacks:
(1) no rich information from cameras
(2) convolutional feature map, suffering from non-differentiable operations (ex: NMS in detection, object association in tracking)

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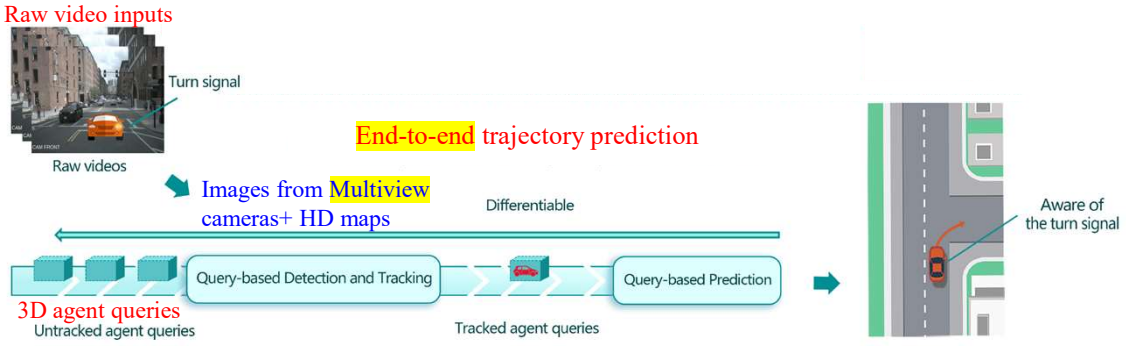


- Vision-based, fully differentiable
- Interpretable and High performance

nuScenes

Related Work: Trajectory Prediction

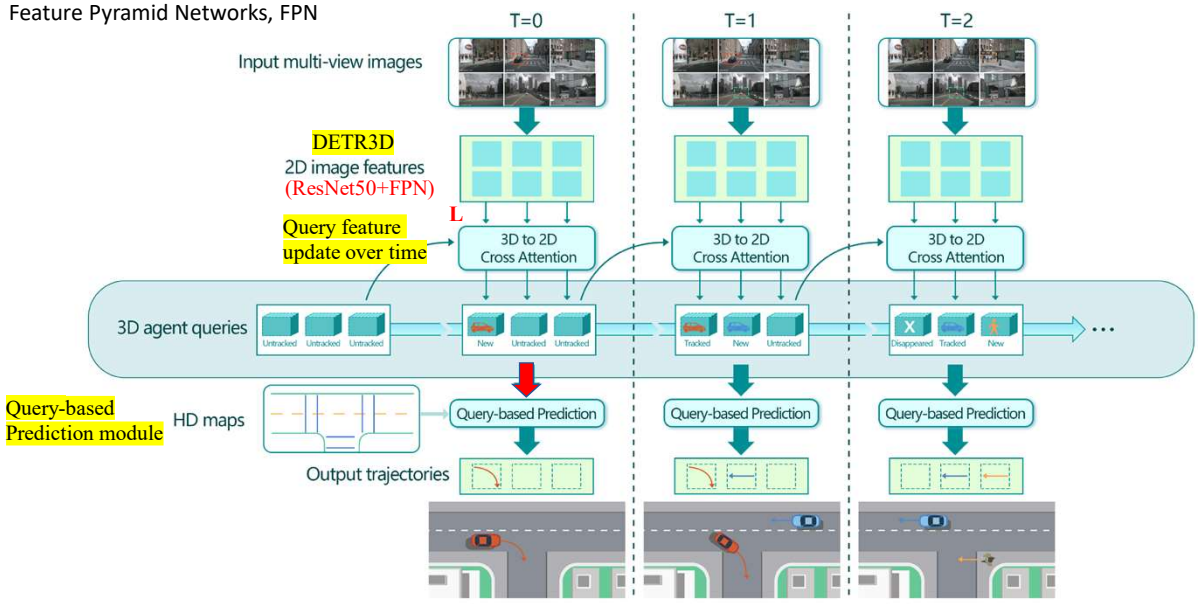
- GNNs
- Transformers
- Modeling uncertainty using latent variables
- Goal-based methods: predicting the intention first
  - Predict trajectory conditioning on these goals.

End-to-End Perception and Prediction

- Jointly optimizing detection, tracking, and prediction
- FaF, IntentNet, PnPNet
- Rely on BEV feature maps or heatmaps, leading to unavoidable non-differentiable operation

Tracked agent queries

Feature Pyramid Networks, FPN



3DETR: An End-to-End Transformer Model for 3D Object Detection

DETR3D: 3D Object Detection from Multi-view Images via 3D-to-2D Queries

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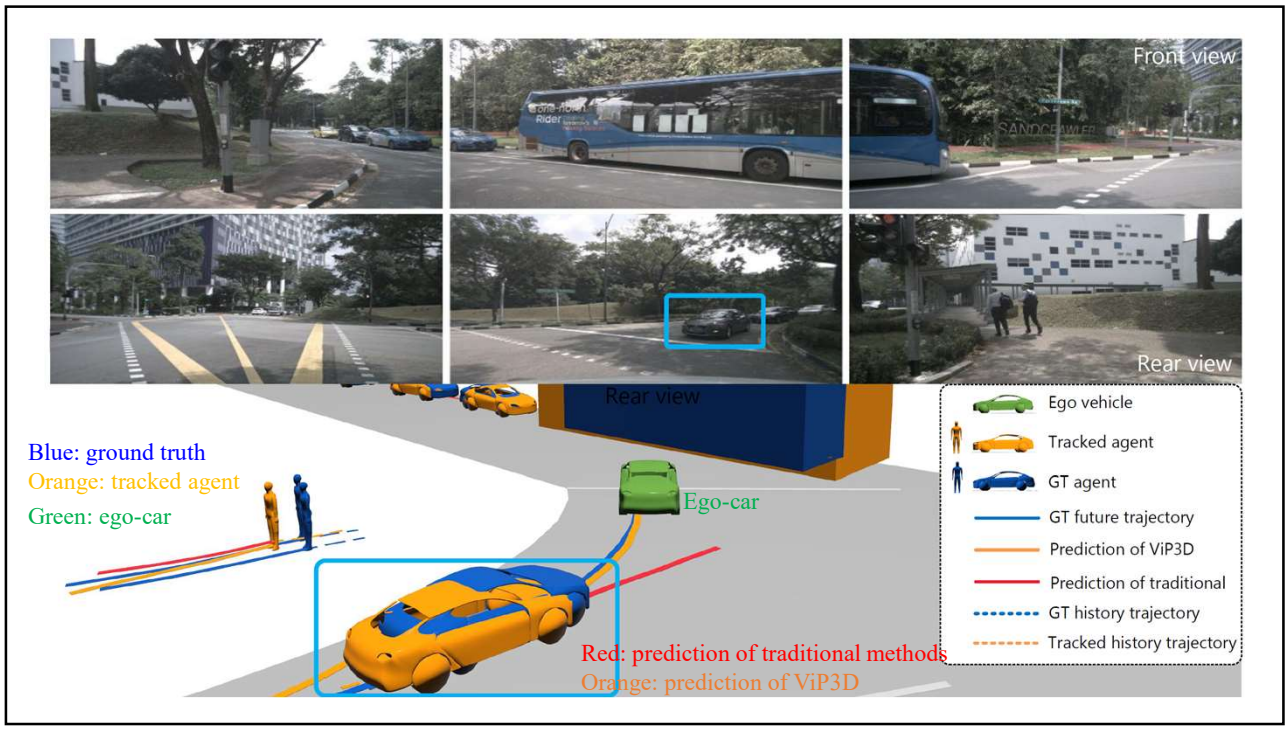
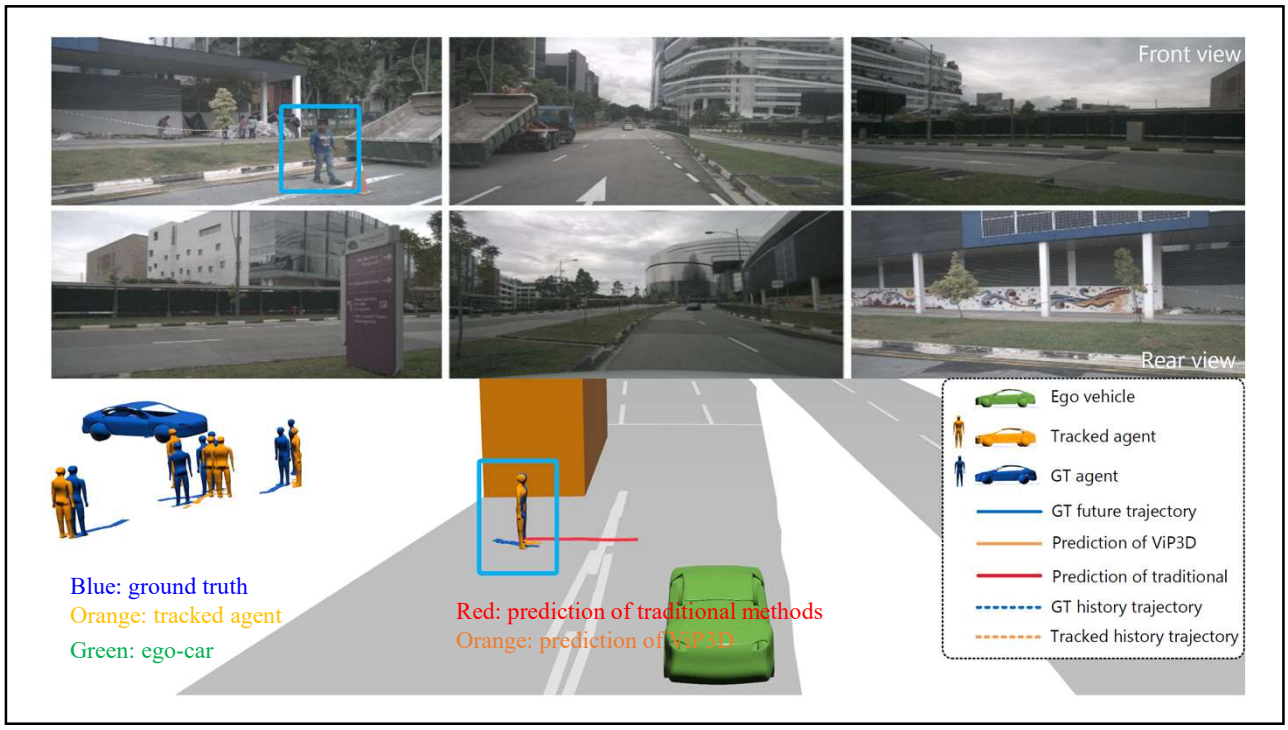
https://github.com/WangYueFt/detr3d


Front view
Rear view
Rear view
Ego-car
Blue: ground truth
Orange: tracked agent
Green: ego-car
Red: prediction of traditional methods
Orange: prediction of ViP3D
Ego vehicle
Tracked agent
GT agent
GT future trajectory
Prediction of ViP3D
Prediction of traditional
GT history trajectory
Tracked history trajectory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Prediction of ViP3D
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