Safe Local Motion Planning with Self-Supervised Freespace Forecasting
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Representations that Support Local Planning

Standard: object-centric representations
- Pros: provide detailed object properties
- Cons: forecasting requires extensive labels

Proposed: freespace-centric representations
- Cons: no semantic, no instance, only geometry
- Pros: forecasting can be self-supervised

Self-Supervised Freespace Forecasting

Past frames
A stream of localized LiDAR data
Future frames

Freespace Forecasting Network
(Where learning happens)

Spatial-temporal 4D
Historical Freespace

Spatial-temporal 4D
Future Freespace

Forecasting Residuals

Direct Forecasting
0.752
0.364
0.773

Residual Forecasting
0.83

Train
Test

Planning with Forecasted Freespace

CARLA NoCrash [1]
LBC [2]

Post-processing LBC[2] on CARLA NoCrash [1]

Learning to Plan with Future Freespace

Vanilla NMP [3]
+freespace supervision

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[1] Exploring the Limitations of Behavior Cloning for Autonomous Driving, Codevilla et al.
[2] Learning by Cheating, Chen et al.
[3] End-to-end Interpretable Neural Motion Planner, Zeng et al.