LEAD: Minimizing Learner-Expert Asymmetry in End-to-End Driving
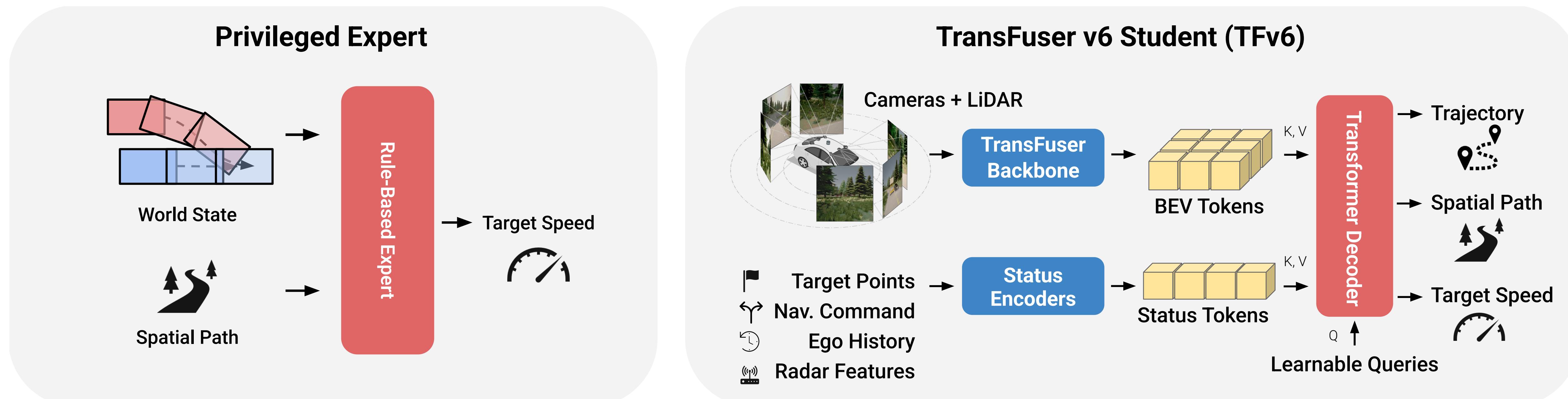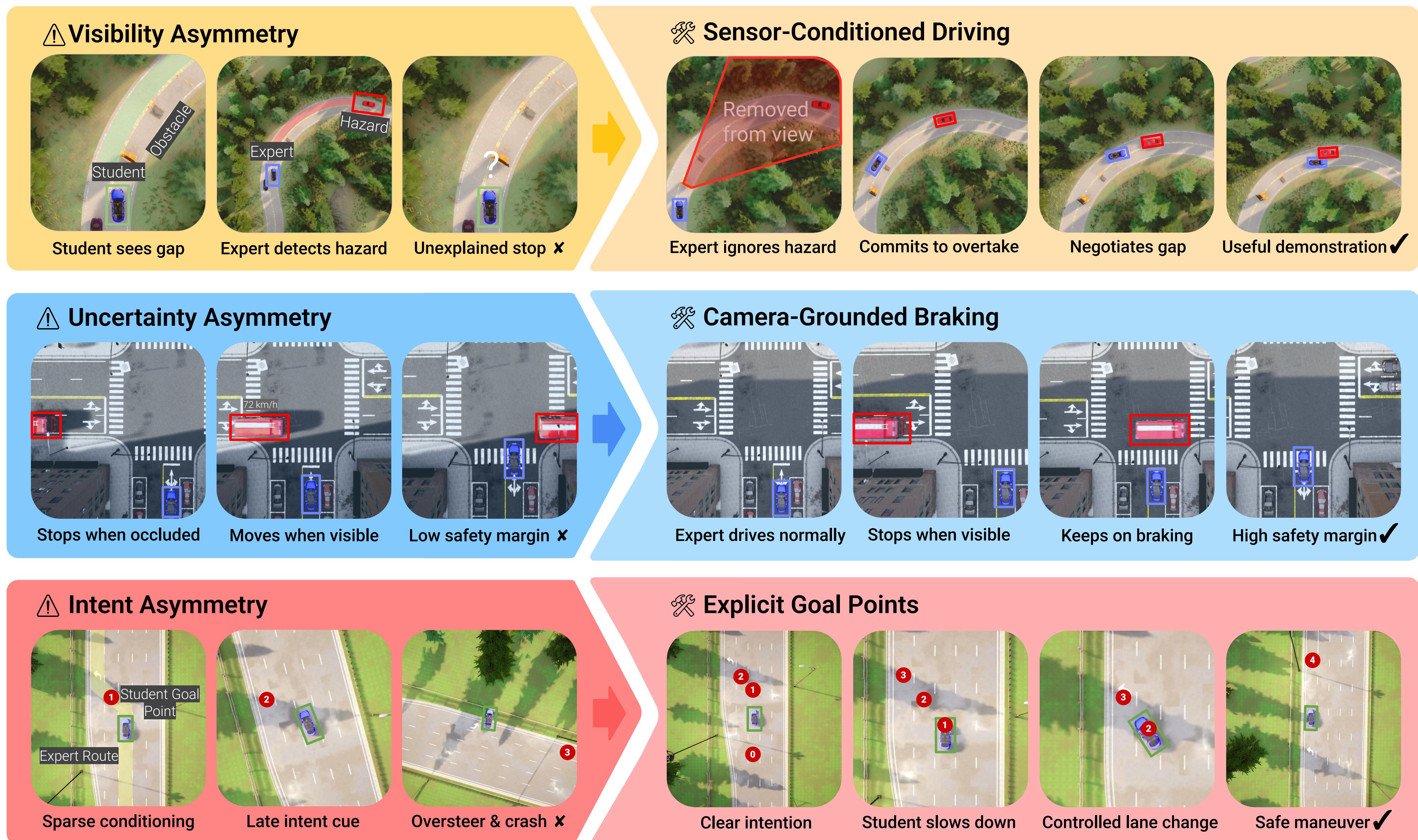
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"Learning by Cheating" distills a privileged expert into a sensor-based student.

Privileged Expert

World State

Rule-Based Expert

Spatial Path → → Target Speed

TransFuser v6 Student (TFv6)

Cameras + LiDAR → TransFuser Backbone → BEV Tokens → K, V

Target Points / Nav. Command / Ego History / Radar Features → Status Encoders → Status Tokens → K, V

Transformer Decoder → Trajectory / Spatial Path / Target Speed

Q ← Learnable Queries

However, this can underperform due to misalignments between experts and students.

⚠ Visibility Asymmetry

Student sees gap | Expert detects hazard | Unexplained stop ✗

🔧 Sensor-Conditioned Driving

Expert ignores hazard | Commits to overtake | Negotiates gap | Useful demonstration ✓

(Removed from view)

⚠ Uncertainty Asymmetry

Stops when occluded | Moves when visible | Low safety margin ✗

🔧 Camera-Grounded Braking

Expert drives normally | Stops when visible | Keeps on braking | High safety margin ✓

⚠ Intent Asymmetry

Sparse conditioning | Late intent cue | Oversteer & crash ✗

Student Goal Point | Expert Route

🔧 Explicit Goal Points

Clear intention | Student slows down | Controlled lane change | Safe maneuver ✓

Improved alignment between our LEAD expert and TransFuser v6 (TFv6) student significantly reduces infractions and shifts the performance frontier for this domain.

Infractions / 100 km

Legend: TFv5 | + State Alignment | + Intent Alignment

Categories: Veh, Block, Red, Stat, OL, Dev, Ped, Stop

Bench2Drive Driving Score

TCP-traj | ThinkTwice | TFv5 | SimLingo | HiP-AD | BridgeDrive | TFv6

2022-07, 2023-01, 2023-07, 2024-01, 2024-07, 2025-01, 2025-07, 2026-01