# TopoPoint: Enhance Topology Reasoning via Endpoint Detection in Autonomous Driving

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Motivation

1. **Previous pipeline:** Lanes are predicted independently, which leads to obvious endpoint deviation.

2. **Proposed pipeline:** Lane endpoints are explicitly modeled, and lanes with overlapping endpoints are obtained through **point-lane geometry matching**.


(a) The previous pipeline

(b) Our proposed pipeline
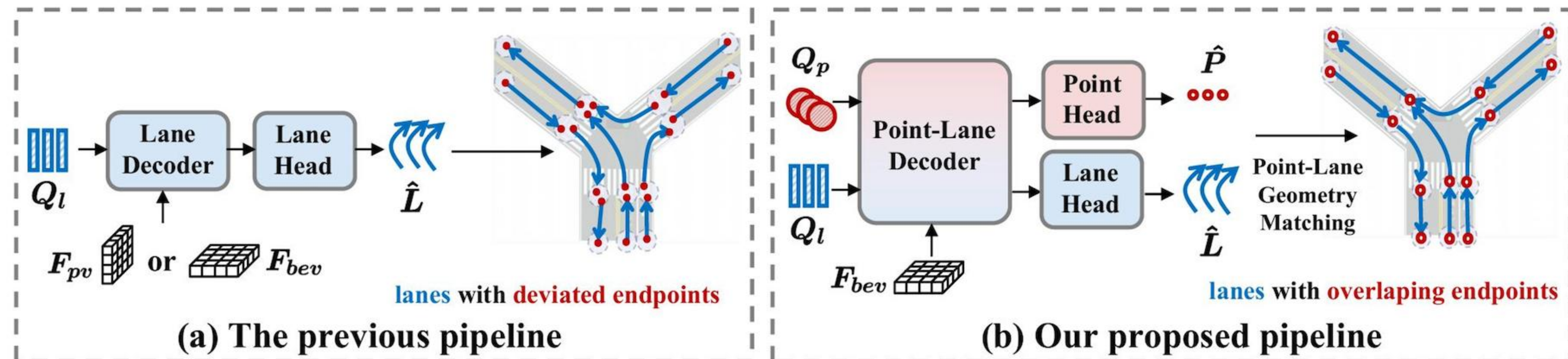
FrameWork

3. **Detecor:** Traffic elements, lanes and endpoints are explicitly perceived.

4. **Geometric attention bias:** Incorporated into the point-lane merge self attention module to **exchange information**.

5. **Topology Head:** Traffic query, lane query and point query are used to predict point-lane topology, lane-lane topology and lane-traffic topology.

6. **Inference:** Point-lane fusion is applied to **eliminate endpoint deviation.**

(a) Traffic Detector & Point-Lane Detector

(b) Geometric Attention Bias

(c) Topology Head

(d) Point-Lane Result Fusion
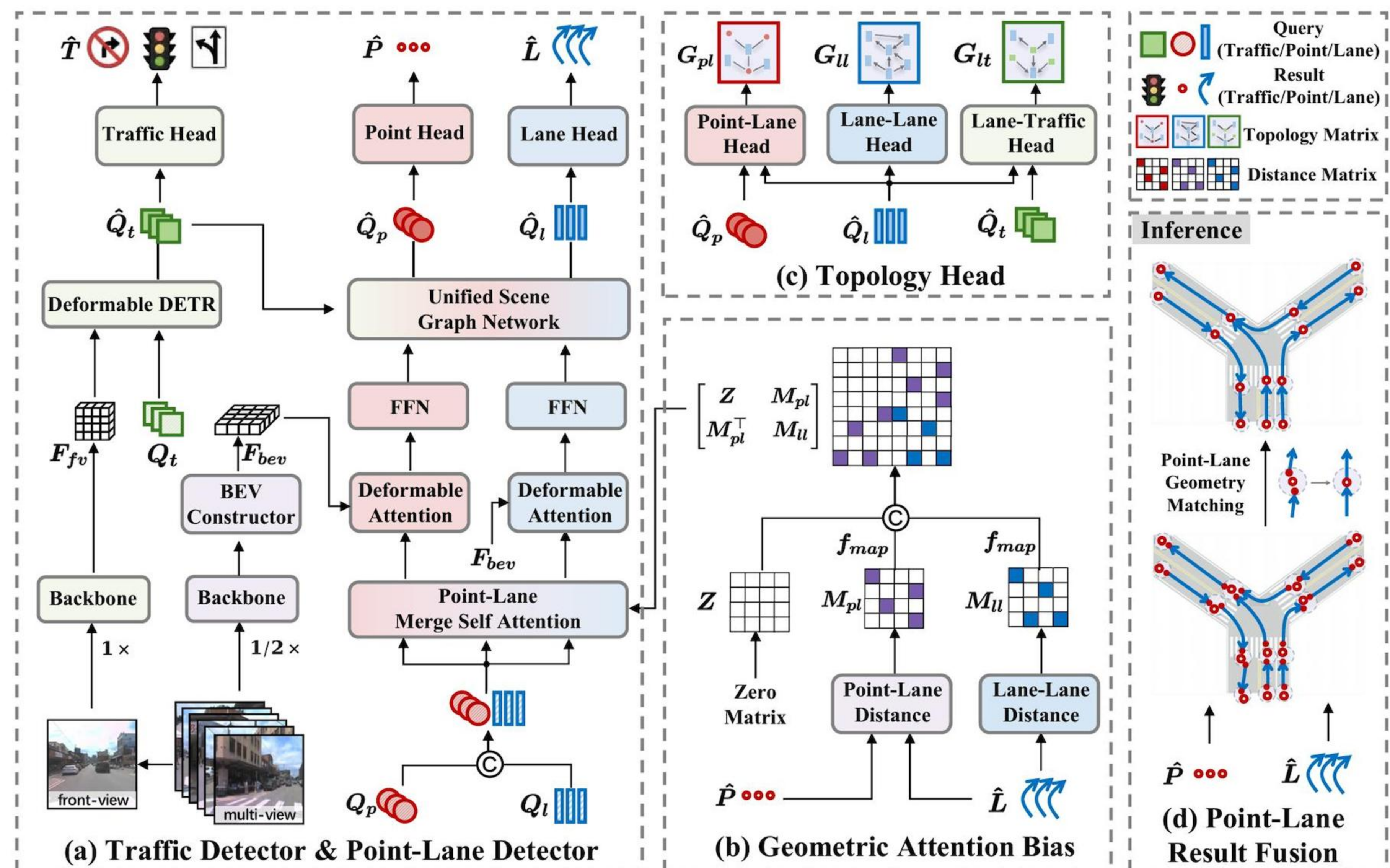
Unified Scene Graph Network

7. Lane and point query are enhanced from traffic elements, lanes and points with **geometric attention bias** by Graph Neural Network .

(a) Unified Scene Graph Network

(b) PLGCN
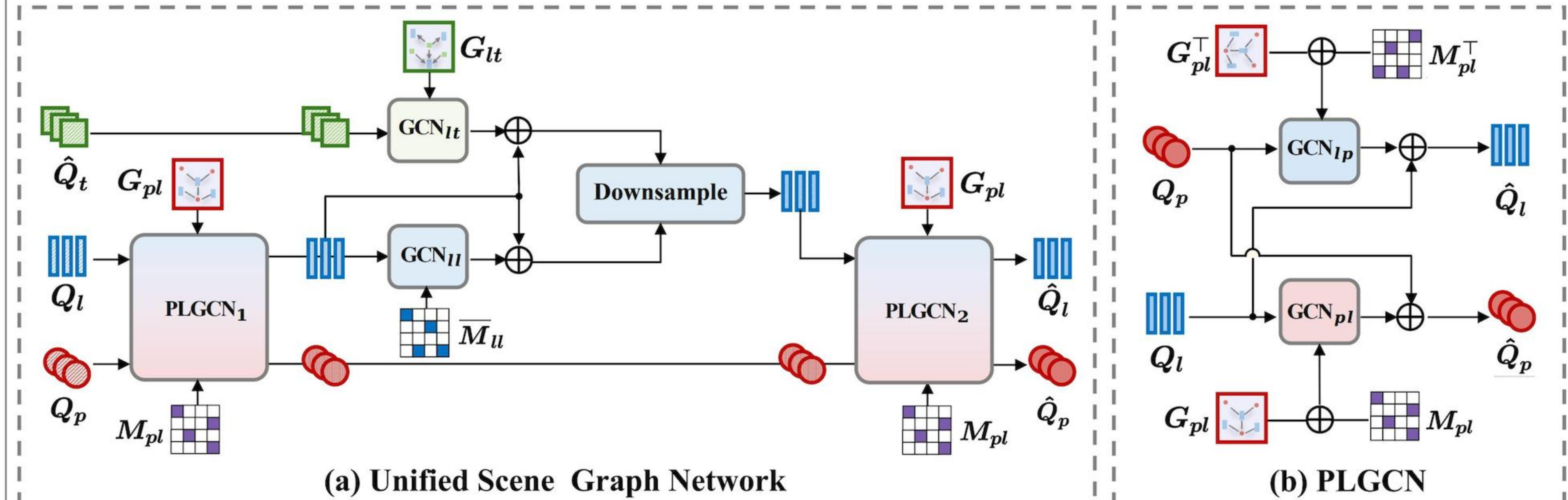
Experiment on OpenLane-V2

Data	Method	Conference	DET$_l$↑	DET$_t$↑	TOP$_{ll}$↑	TOP$_{lt}$↑	OLS↑	DET$_p$↑
subset_A	STSU	*ICCV2021*	12.7	43.0	2.9	19.8	29.3	-
	VectorMapNet	*ICML2023*	11.1	41.7	2.7	9.2	24.9	-
	MapTR	*ICLR2023*	17.7	43.5	5.9	15.1	31.0	-
	TopoNet	*Arxiv2023*	28.6	48.6	10.9	23.8	39.8	43.8
	TopoMLP	*ICLR2024*	28.3	49.5	21.6	26.9	44.1	43.4
	TopoLogic	*NeurIPS2024*	29.9	47.2	23.9	25.4	44.1	45.2
	TopoFormer*	*CVPR2025*	**34.7**	48.2	24.1	29.5	46.3	-
	TopoPoint	-	31.4	**55.3**	**28.7**	**30.0**	**48.8**	**52.6**

Qualitative Results

Multi-view Input

GT · TopoLogic · TopoPoint

Lane Topology

● Correct Node → Correct Topology ● Missed Node → Missed Topology ● Wrong Node → Wrong Topology