UrbanIng-V2X: A Large-Scale Multi-Vehicle, Multi-Infrastructure Dataset Across Multiple Intersections for Cooperative Perception

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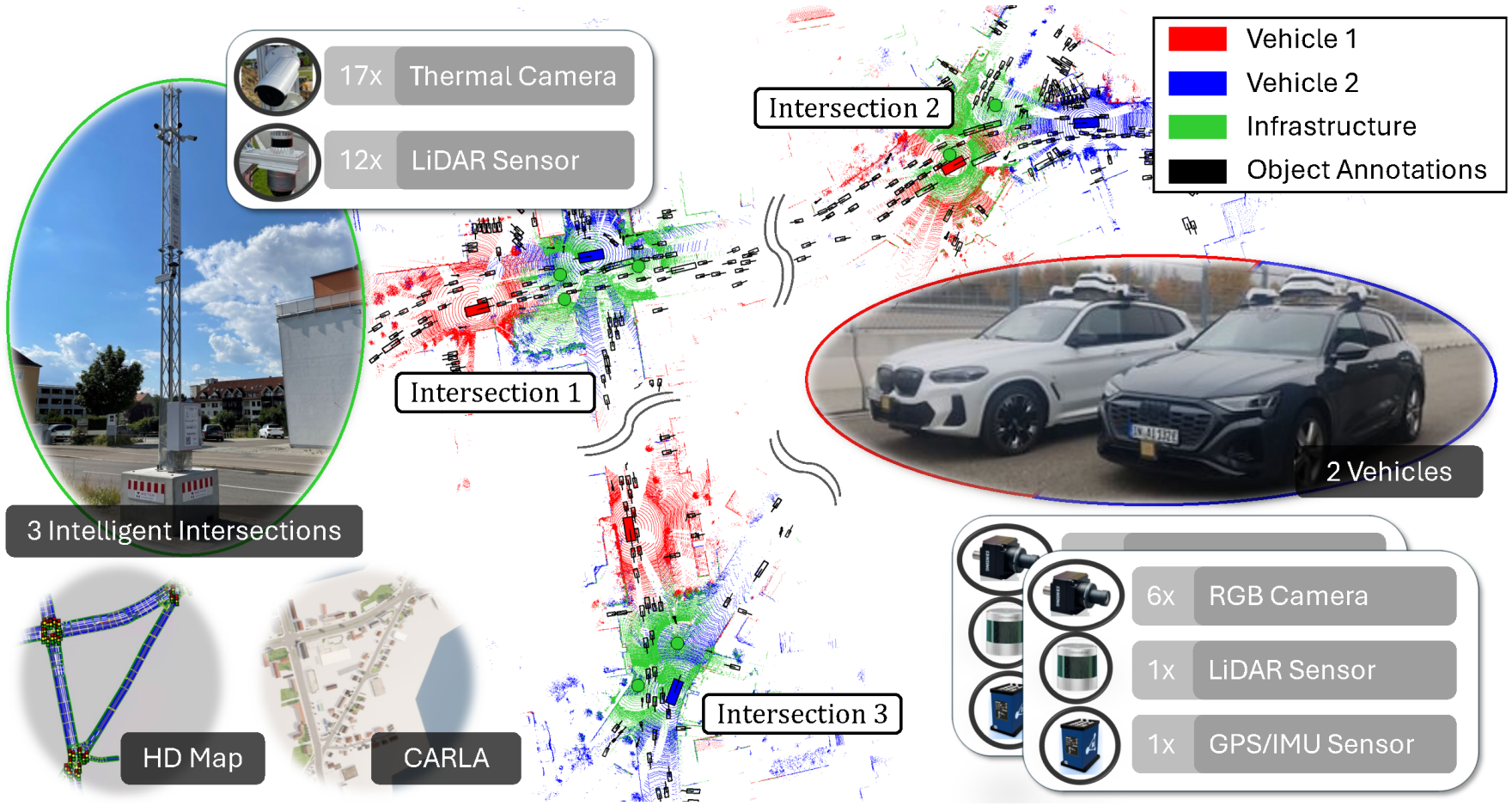
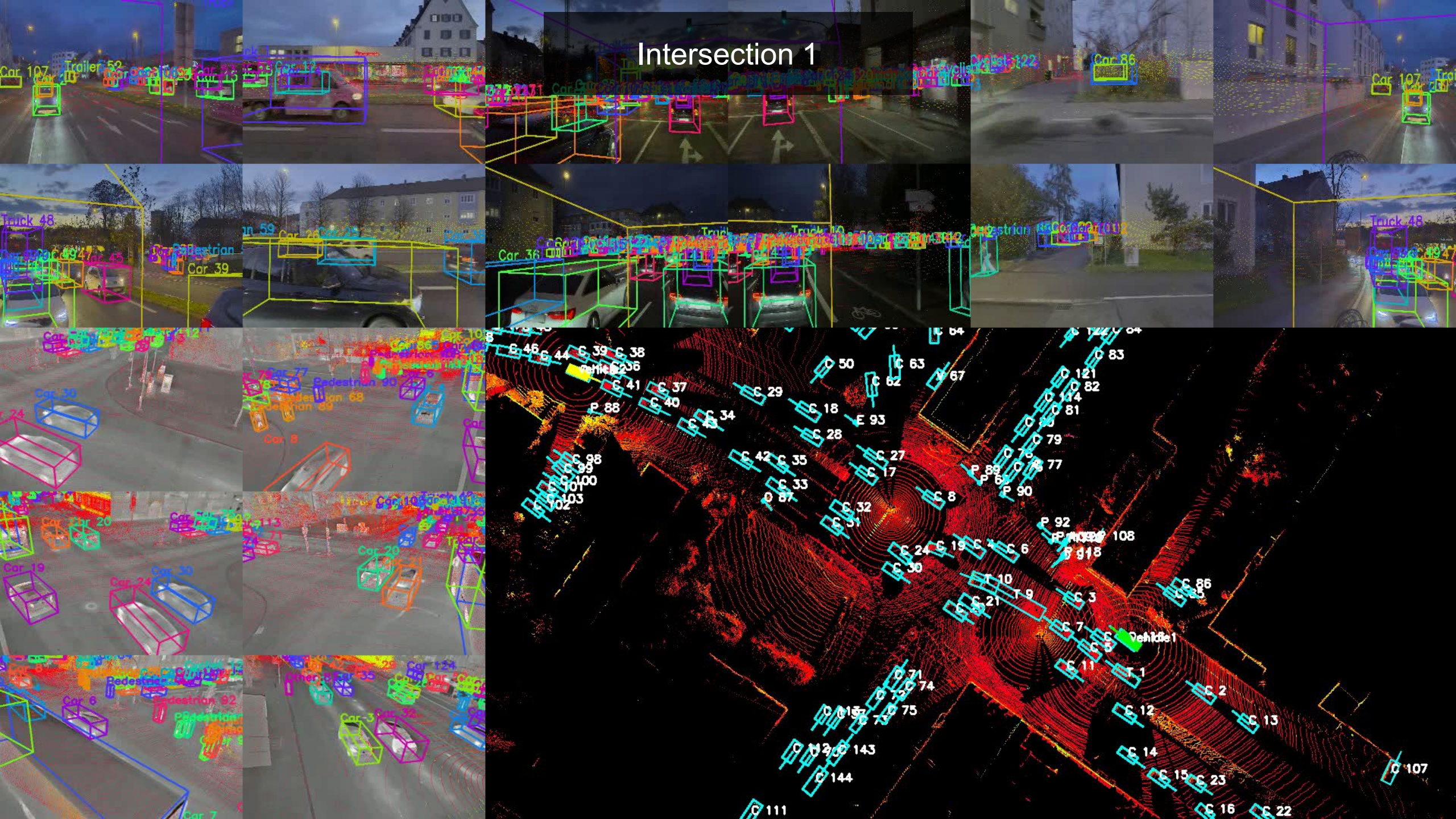
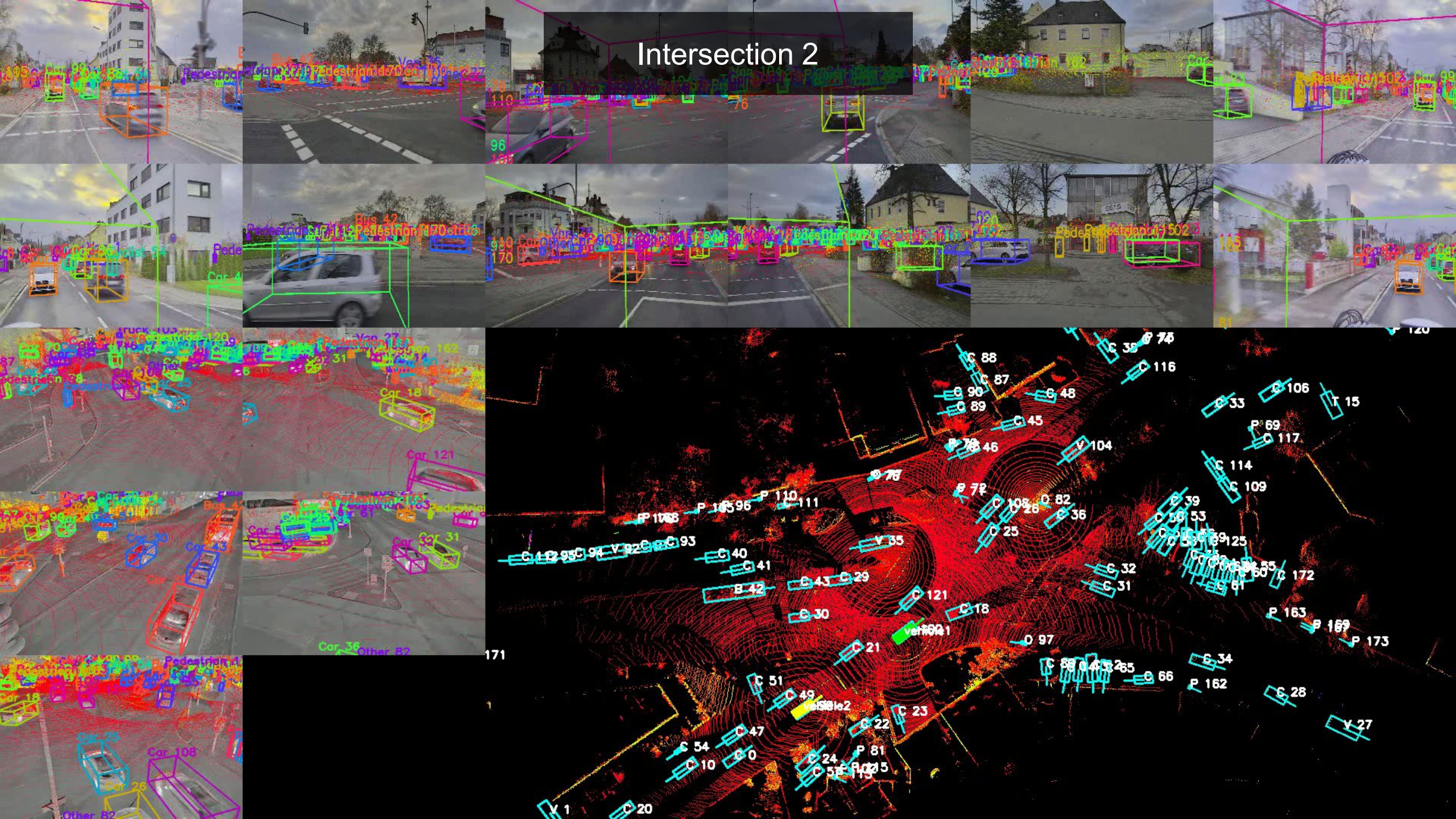
UrbanIng-V2X

A Large-Scale Multi-Vehicle, Multi-Infrastructure Dataset Across Multiple Intersections for Cooperative Perception

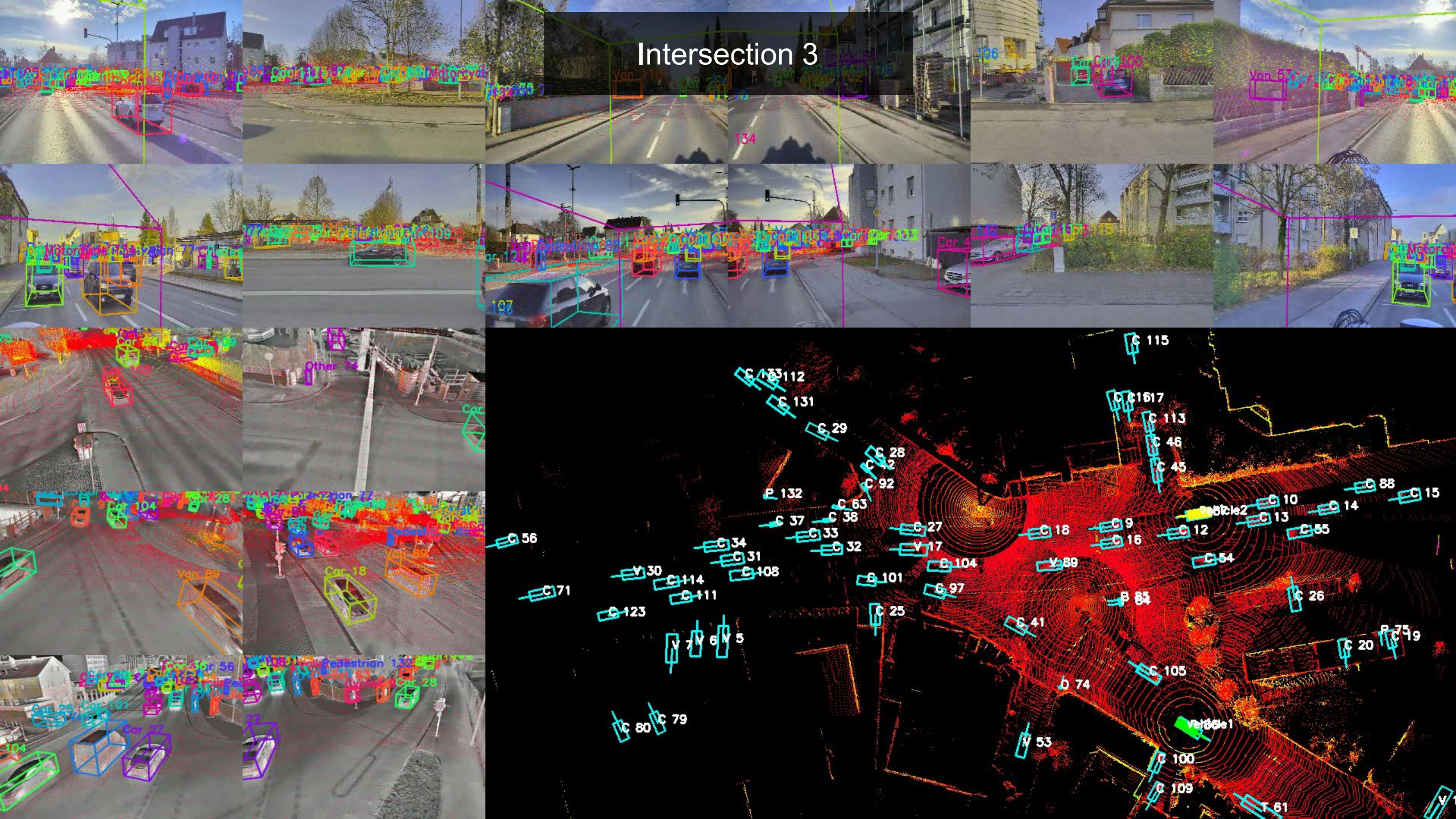


Property	UrbanIng-V2X
V2X	V2V&I
Intersections	3
Vehicles	2
RGB Images	81.6k
IR Images	38.8k
LiDAR Frames	27.2k
3D Boxes	712k
Classes	13
Digital Twin	Yes
Av. Worldwide	Yes
HD Maps	Yes
Attributes	Yes
Track Ids	Yes
Traffic Light	Yes
Sensors (I | V)	10 | 16
City	Ingolstadt
Country	Germany


Intersection 1

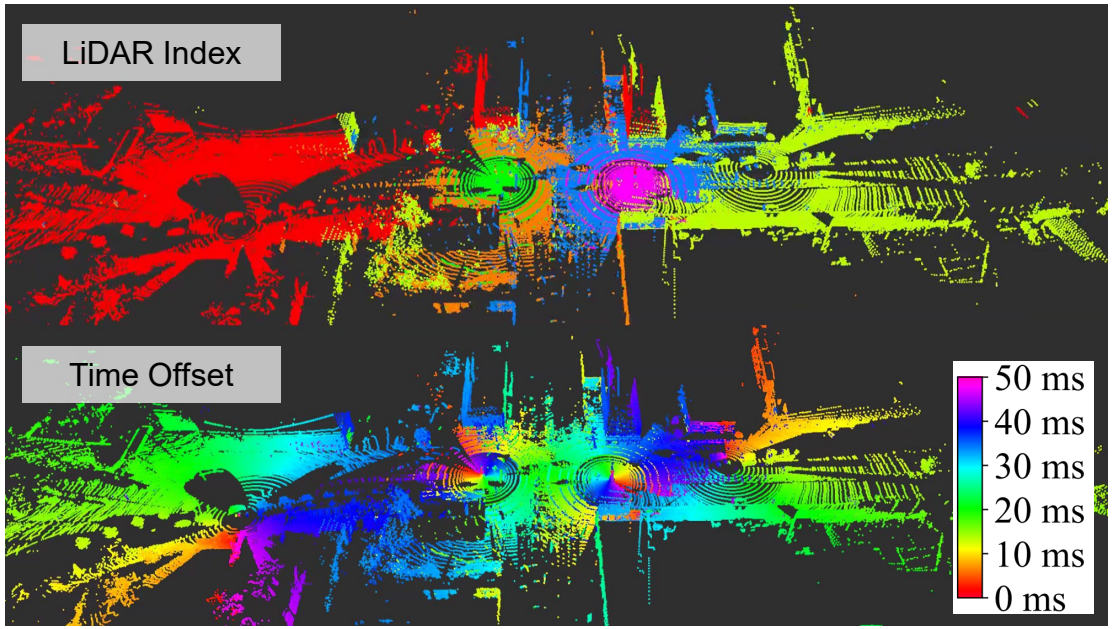

Intersection 2

Intersection 3

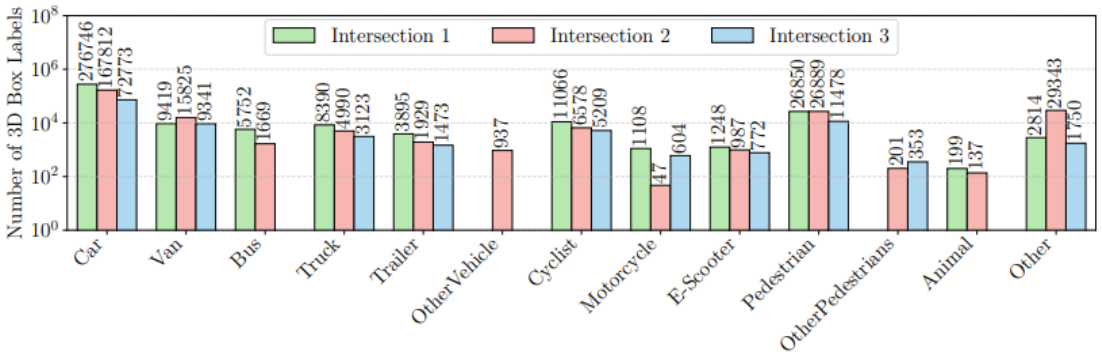


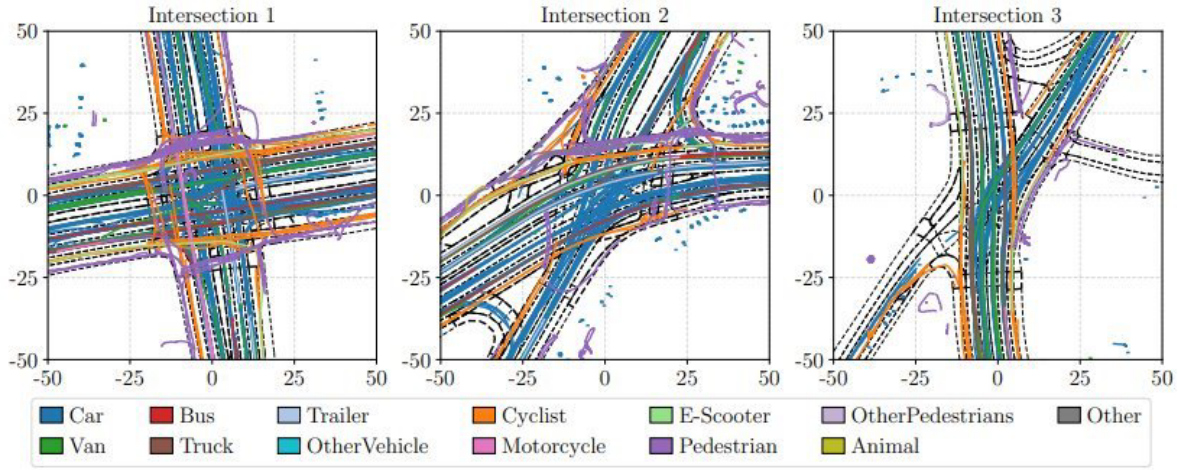
Dataset insights

Space time synchronization; Dataset highlights



Space Time Synchronization

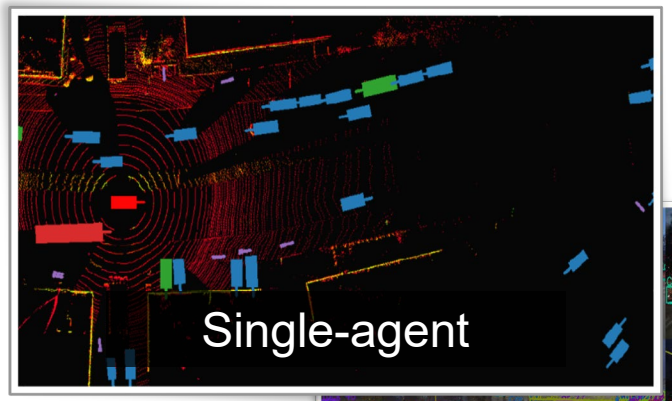


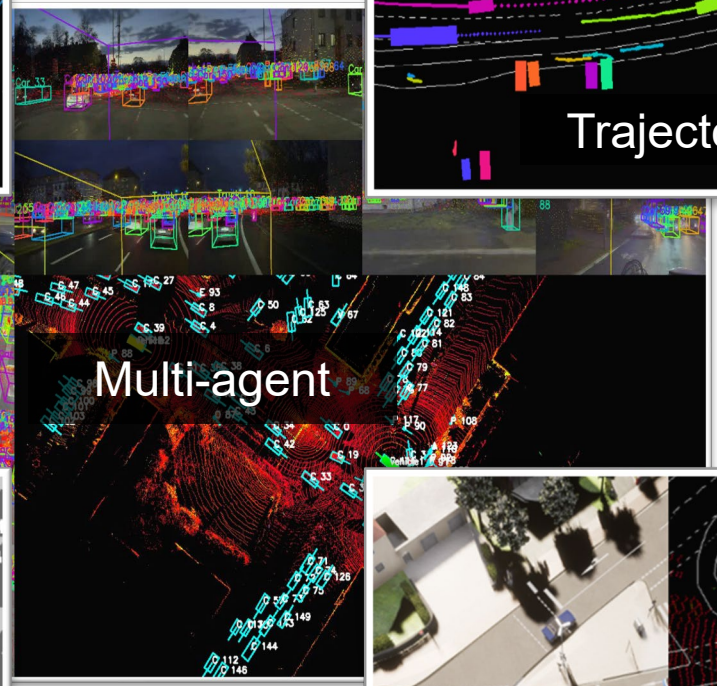


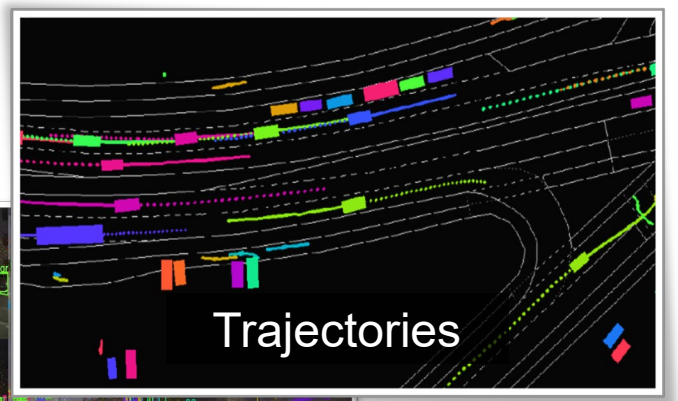
Dataset Statistics

Benchmark tasks

Possible tasks and setups







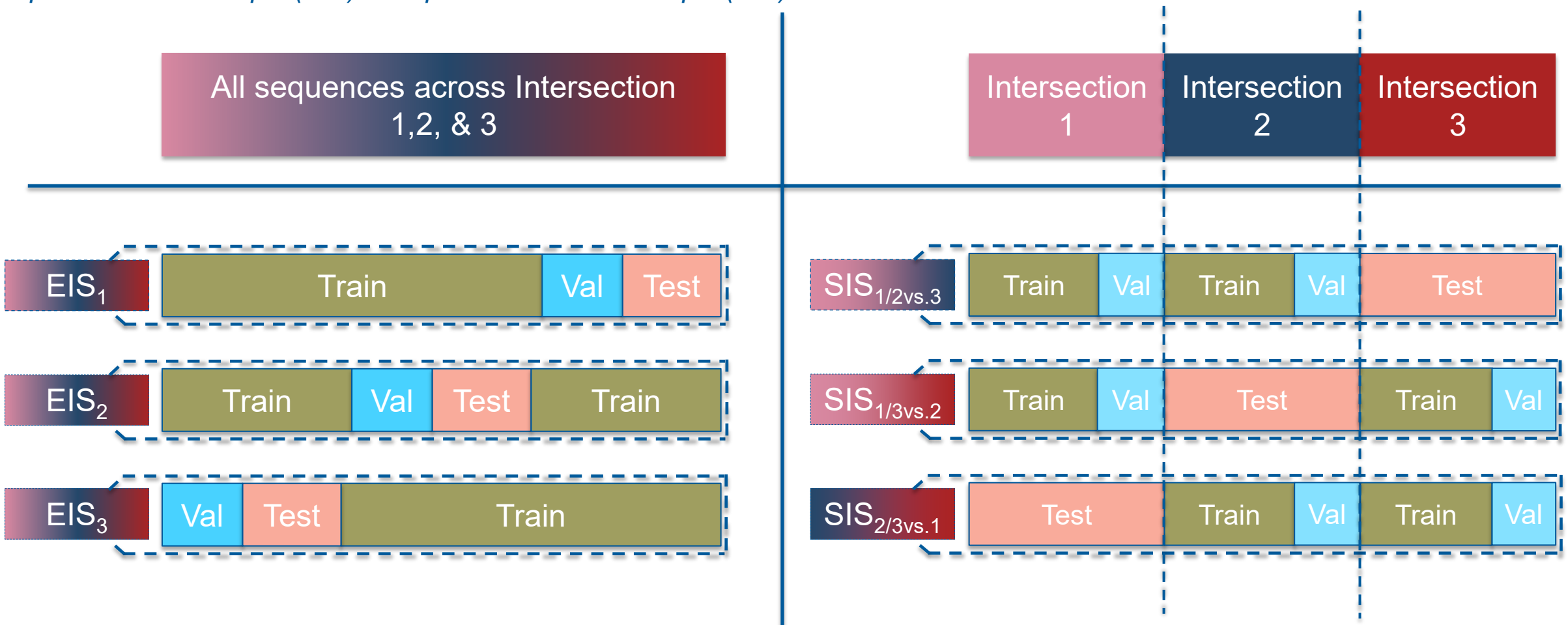
- 3D Multi Object Detection and Tracking
- Trajectory Prediction
- BEV Prediction
- Sim-to-Real Tasks
- HD-Map Tasks

- Single/ Multi Sensor
- Single/ Multi Agent
- With / Without/ Only Infrastructure

… across 3 intersections in one unified dataset

Benchmark results

Equal Intersection Split (EIS) & Separate Intersection Split (SIS)



Non-overlapping validation and test data.
21 training sequences, 6 validation sequences and 7 test sequences.

Training and validation data are from two intersections.
Test split contains the remaining full intersection data.

Benchmark results

Cooperative perception evaluation

Method	AP_{Veh}		AP_{HVeh}		AP_{Ped}		AP_{TWheel}		mAP	
IoU	0.3	0.5	0.3	0.5	0.3	0.5	0.3	0.5	0.3	0.5
No Fusion	49.1	40.9	19.2	17.6	2.0	0.7	18.0	13.8	22.1	18.3
Early Fusion	46.1	41.1	26.8	24.8	6.0	3.5	24.1	21.6	25.8	22.8
Late Fusion	28.7	24.6	9.8	6.9	1.9	0.8	16.7	12.1	14.3	11.1
F-Cooper [1]	52.6	46.7	33.1	24.0	4.6	3.1	25.1	23.2	28.9	24.2
AttFuse [2]	52.7	47.6	34.1	27.8	7.1	4.6	23.7	22.1	29.4	25.5
V2X-ViT [3]	52.0	46.2	32.5	22.2	5.8	3.5	19.7	18.0	27.5	22.5
Where2Comm [4]	50.4	45.8	28.4	25.3	5.1	3.1	23.2	20.9	26.7	23.8
CoBEVT [5]	53.2	46.0	33.8	29.6	5.7	3.3	22.5	20.5	28.8	24.9

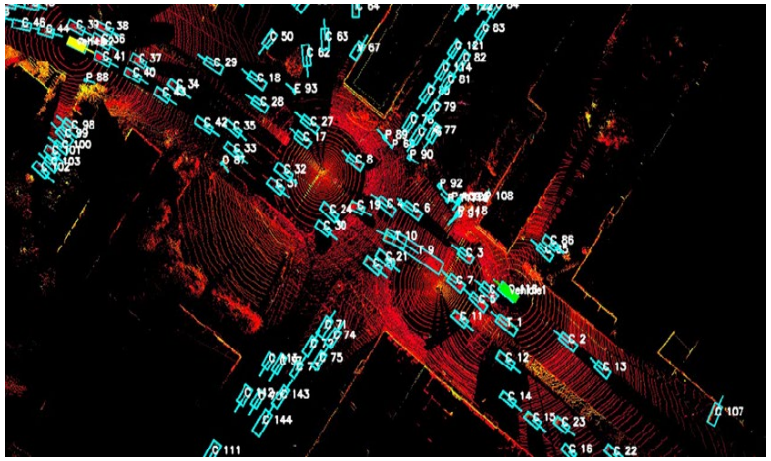
All models were trained and evaluated on the $SIS_{1/2vs.3}$ split.

Data split	AP_{Veh}		AP_{HVeh}		AP_{Ped}		AP_{TWheel}		mAP	
IoU	0.3	0.5	0.3	0.5	0.3	0.5	0.3	0.5	0.3	0.5
EIS_{avg}	74.6	68.7	44.7	37.3	21.8	13.1	38.7	33.0	45.0	38.2
$SIS_{1/2vs.3}$	53.2	46.0	33.8	29.6	5.7	3.3	22.6	20.5	28.8	24.6
$SIS_{1/3vs.2}$	45.1	40.2	14.9	11.3	10.2	6.0	22.0	18.7	23.0	19.1
$SIS_{2/3vs.1}$	64.8	59.1	41.5	31.1	10.8	7.4	22.6	18.2	34.9	28.9

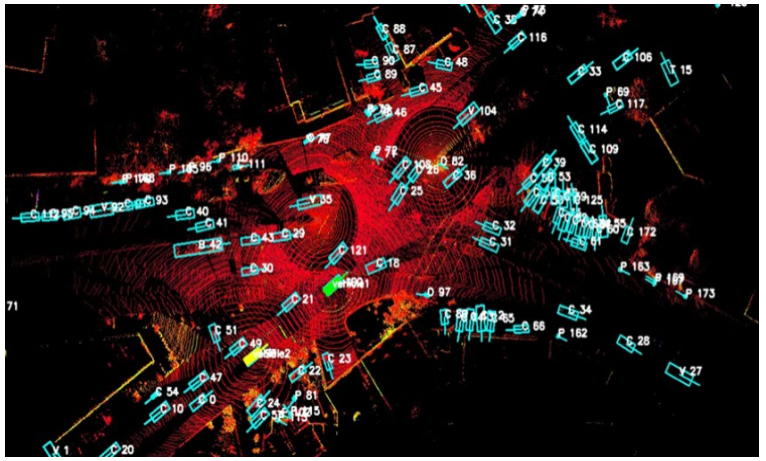
All data splits trained and evaluated on CoBEVT [5].

Check out our dataset

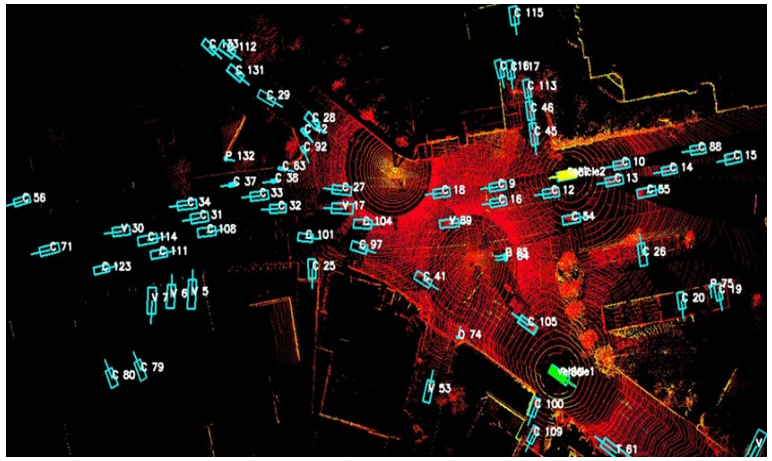
Intersection 1



Intersection 2



Intersection 3



Check out our GitHub repository

GitHub

Check out our website

Website

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