yolov8m_finetuned_1 Final Training Report

System Information

OS	Linux 6.6.105+
Python Version	3.12.12
PyTorch Version	2.9.0+cu126
CUDA Available	True
Device	cuda
RAM (GB)	89.63

Dataset Information

Property	Value
Dataset	bdd100k_yolo_limited
Number of Classes	10
Train Images	29959
Val Images	10000
Test Images	20000
Data YAML	data.yaml

Classes:
person, rider, car, truck, bus, train, motor, bike, traffic light, traffic sign

Optimization Summary

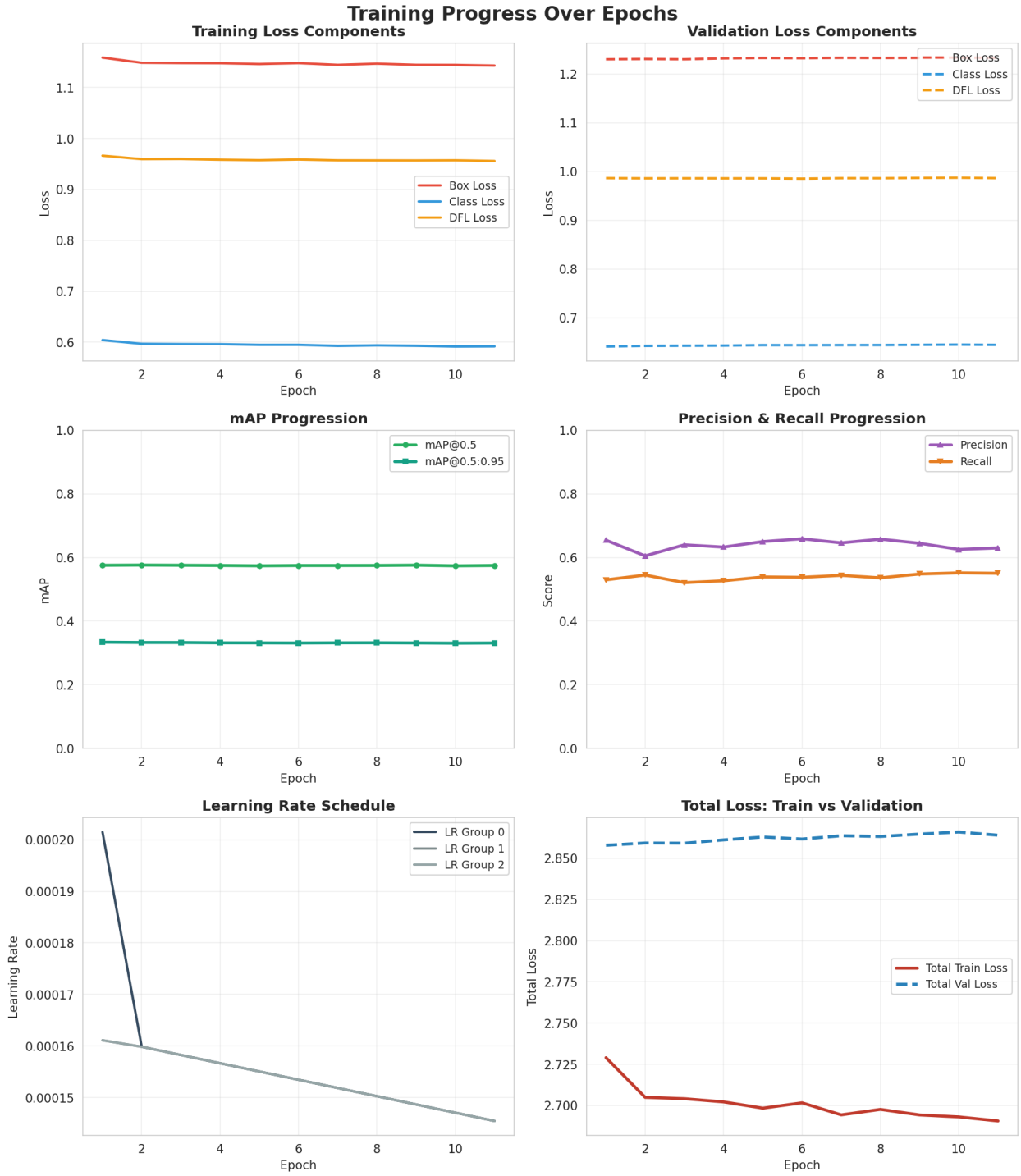
Metric	Value
Tuning Run	yolov8m_finetuned_1_tune_20251127_230340
Total Trials	N/A
Completed Trials	N/A
Best Trial Number	N/A
Best Trial mAP@0.5	N/A
Final Training Epochs	100

Optimized Hyperparameters Used

Parameter	Value
imgsz	768
optimizer	SGD
lr0	0.000161
momentum	0.909850
weight_decay	0.000428
warmup_epochs	1
warmup_momentum	0.514931
warmup_bias_lr	0.018938
mosaic	0.820538
mixup	0.023789

Training Process Analysis

Epoch-by-Epoch Training Metrics



Detailed Epoch Metrics

Epoch	Train Loss	Val Loss	mAP@0.5	mAP@0.5:0.95	Precision	Recall
1	2.7290	2.8579	0.5756	0.3335	0.6545	0.5296
2	2.7049	2.8593	0.5763	0.3326	0.6050	0.5447
3	2.7041	2.8592	0.5757	0.3325	0.6399	0.5208
4	2.7022	2.8612	0.5750	0.3315	0.6328	0.5266
5	2.6984	2.8629	0.5739	0.3313	0.6501	0.5388
6	2.7016	2.8617	0.5748	0.3309	0.6590	0.5376
7	2.6943	2.8637	0.5748	0.3315	0.6460	0.5437
8	2.6976	2.8633	0.5750	0.3317	0.6578	0.5360
9	2.6943	2.8647	0.5760	0.3311	0.6448	0.5480
10	2.6931	2.8659	0.5738	0.3304	0.6254	0.5516
11	2.6906	2.8640	0.5749	0.3310	0.6300	0.5503

Training Statistics Summary

Metric	Initial	Final	Best	Change
mAP@0.5	0.5756	0.5749	0.5763	+-0.0007
mAP@0.5:0.95	0.3335	0.3310	0.3335	+-0.0025
Precision	0.6545	0.6300	0.6590	+-0.0245
Recall	0.5296	0.5503	0.5516	+0.0206

Final Model Performance

Metric	Value
mAP@0.5	0.5769
mAP@0.5:0.95	0.3347
Precision	0.6530
Recall	0.5310

Test Set Validation Results

Model Architecture & Performance

Metric	Value
Model Name	yolov8m_finetuned_1_finetuned_20251128
Parameters (M)	25.86
Model Size (MB)	49.61
FLOPs (G)	79.09
Layers	169
Inference Speed (FPS)	329.52
IoU Threshold	0.50

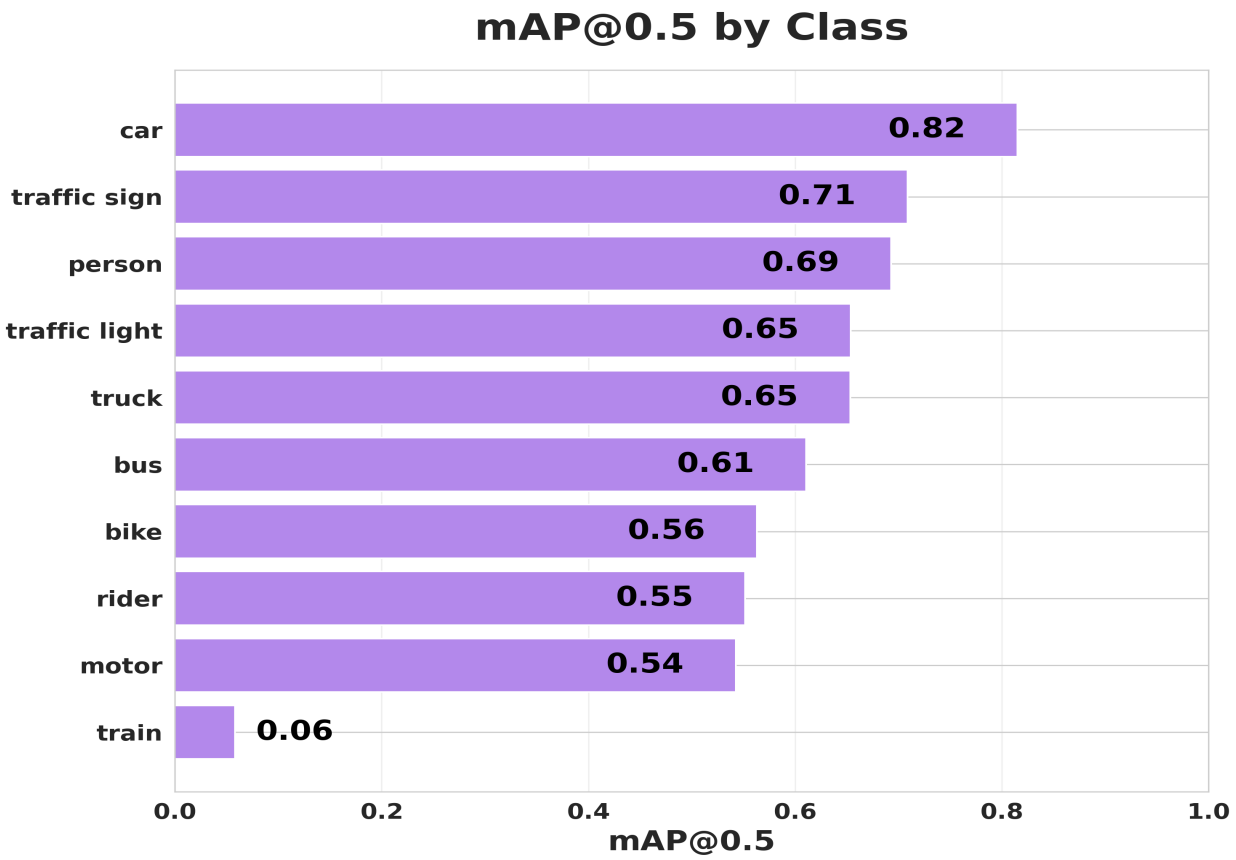
Overall Performance Metrics on Test Set

Metric	Confusion Matrix	YOLO Validation
Precision	0.7246	0.6371
Recall	0.7859	0.5496
F1-Score	0.7540	N/A
mAP@0.5 (Overall)	N/A	0.5850
mAP@0.5:0.95 (Overall)	N/A	0.3338

Per-Class Performance Metrics

Class	Precision	Recall	F1-Score	mAP@0.5	TP	FP	FN
person	0.6401	0.7632	0.6962	0.6930	15778	8872	4896
rider	0.5402	0.6057	0.5711	0.5518	699	595	455
car	0.7761	0.8335	0.8038	0.8151	159214	45935	31801
truck	0.6042	0.5887	0.5964	0.6532	5259	3445	3674
bus	0.5804	0.5683	0.5743	0.6106	1867	1350	1418
train	0.0714	0.1176	0.0889	0.0580	2	26	15
motor	0.5410	0.5556	0.5482	0.5425	455	386	364
bike	0.5896	0.6129	0.6010	0.5631	1178	820	744
traffic light	0.6558	0.7615	0.7047	0.6539	34653	18187	10854
traffic sign	0.6861	0.7203	0.7028	0.7087	47347	21659	18386

mAP@0.5 Distribution by Class



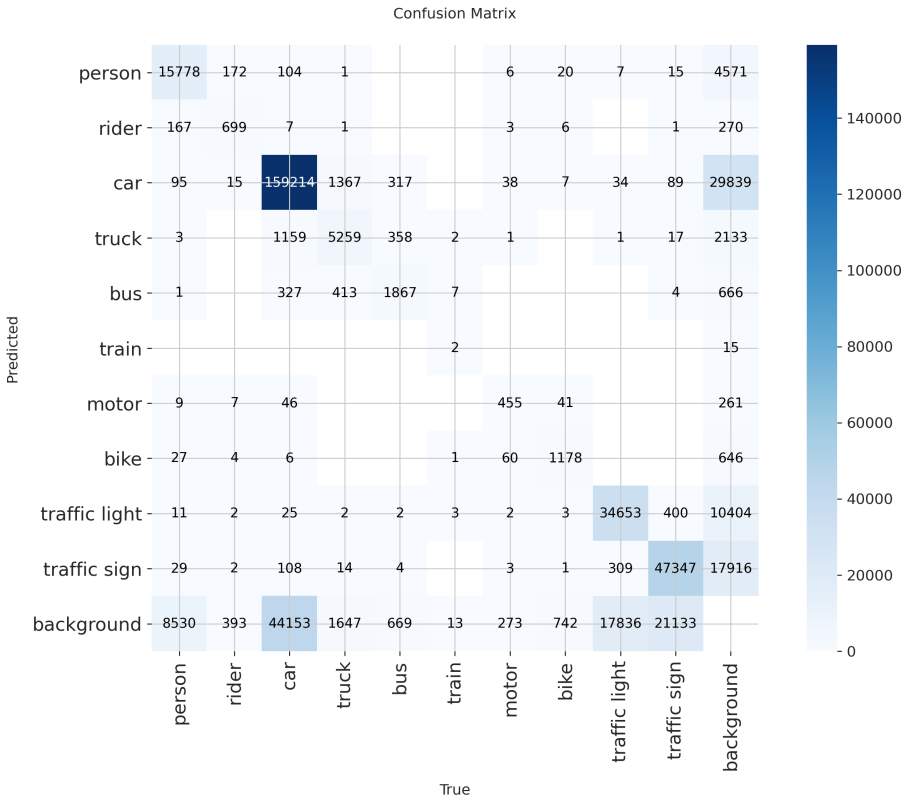
Intersection over Union (IoU) Analysis

IoU Threshold Used: 0.50

IoU (Intersection over Union) measures the overlap between predicted and ground truth bounding boxes. A prediction is considered correct (True Positive) when IoU ≥ 0.50.

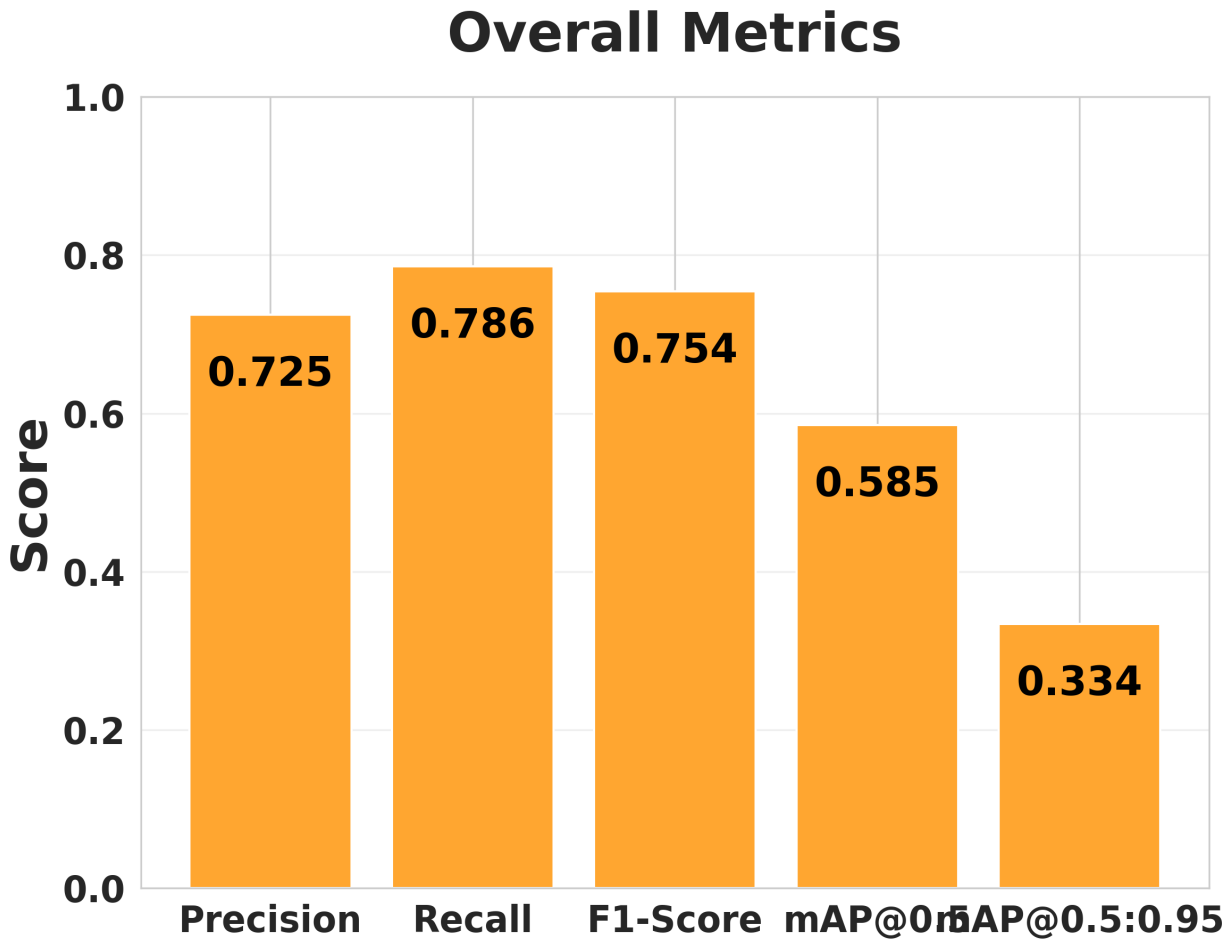
Per-Class IoU Performance:
The confusion matrix and per-class metrics above show detection accuracy at IoU=0.50 threshold. Each class's True Positives (TP) represent detections with IoU ≥ 0.50.

Confusion Matrix (Test Set)



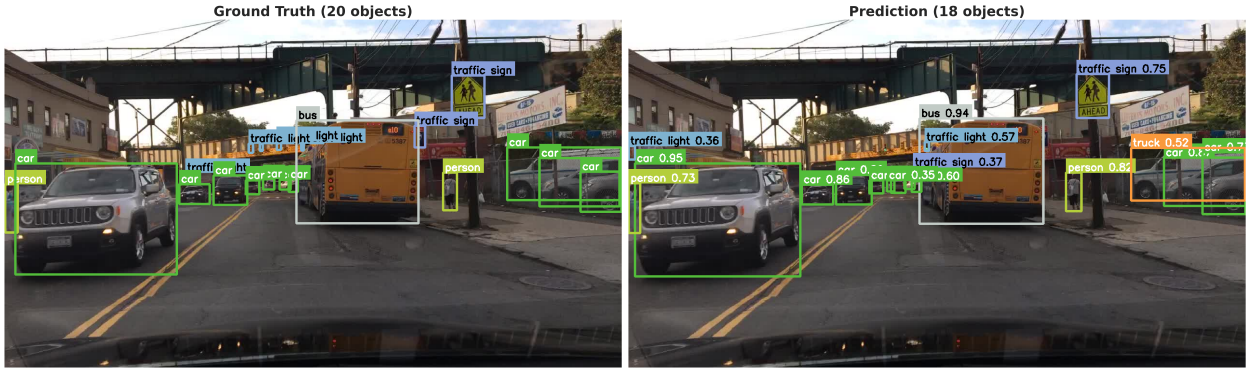
Test Set Performance Curves

Overall Metrics Visualization



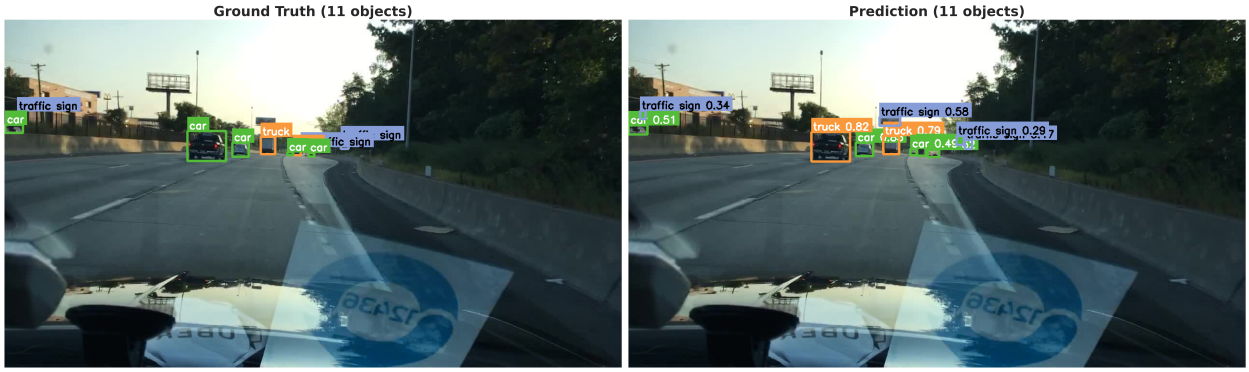
Sample Predictions: Ground Truth vs Model Output

Sample 1 - Weather: partly cloudy, Scene: city street, Time: daytime



Ground Truth: 20 objects | Predictions: 18 objects

Sample 2 - Weather: clear, Scene: city street, Time: dawn/dusk

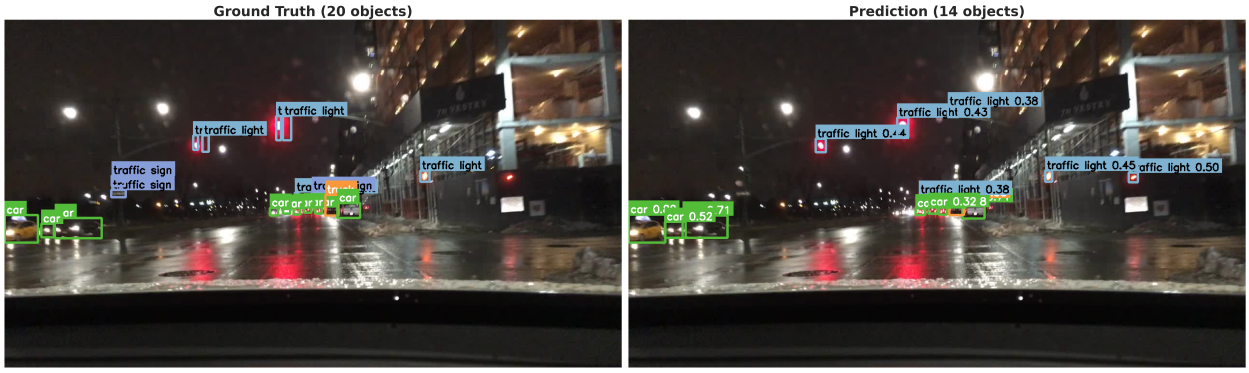


Ground Truth: 11 objects | Predictions: 11 objects

Sample 3 - Weather: clear, Scene: highway, Time: night

Ground Truth: 10 objects | Predictions: 12 objects

Sample 4 - Weather: rainy, Scene: city street, Time: night



Ground Truth: 20 objects | Predictions: 14 objects

Sample 5 - Weather: clear, Scene: highway, Time: daytime

Ground Truth: 35 objects | Predictions: 20 objects

Sample 6 - Weather: clear, Scene: city street, Time: night

Ground Truth: 22 objects | Predictions: 21 objects