

yolov8m 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

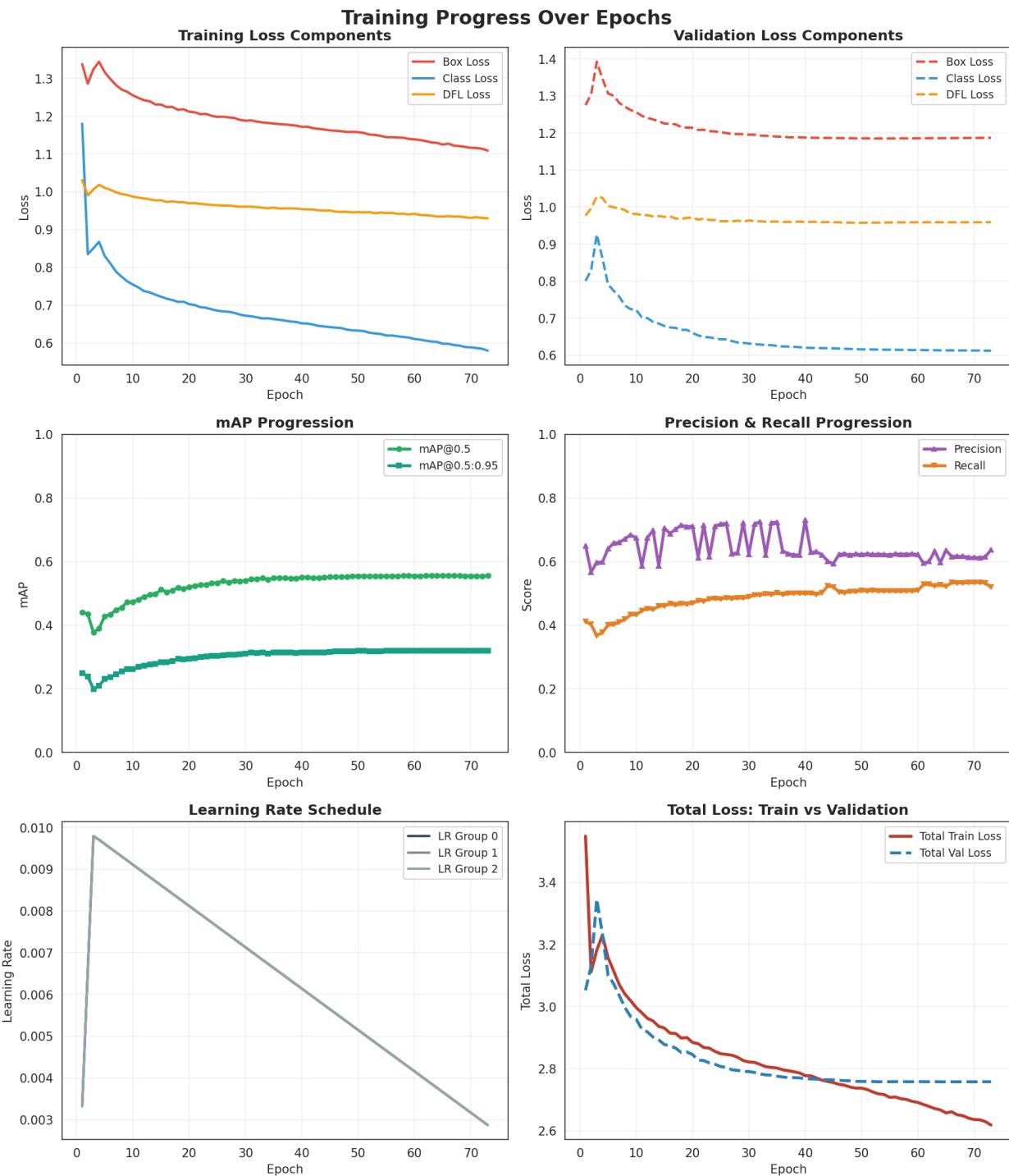
Metric	Value
Tuning Run	
Total Trials	N/A
Completed Trials	N/A
Best Trial Number	N/A
Best Trial mAP@0.5	N/A
Final Training Epochs	100

Optimized Hyperparameters Used

Parameter	Value
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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	3.5490	3.0524	0.4411	0.2500	0.6506	0.4114
2	3.1117	3.1307	0.4356	0.2390	0.5672	0.4020
3	3.1817	3.3458	0.3766	0.1995	0.5976	0.3674
4	3.2303	3.2335	0.3895	0.2091	0.5987	0.3770
5	3.1575	3.1012	0.4285	0.2311	0.6404	0.4002
6	3.1146	3.0733	0.4339	0.2358	0.6584	0.4018
7	3.0703	3.0355	0.4470	0.2452	0.6606	0.4097
8	3.0402	2.9968	0.4558	0.2542	0.6715	0.4180
9	3.0192	2.9681	0.4726	0.2620	0.6840	0.4329
10	2.9970	2.9594	0.4728	0.2616	0.6745	0.4332
35	2.8020	2.7758	0.5487	0.3139	0.7246	0.5015
36	2.7965	2.7732	0.5493	0.3151	0.6333	0.4962
37	2.7933	2.7713	0.5479	0.3146	0.6250	0.4992
38	2.7900	2.7712	0.5472	0.3136	0.6210	0.5008
39	2.7862	2.7702	0.5474	0.3131	0.6213	0.5005
64	2.6673	2.7578	0.5558	0.3195	0.5971	0.5268
65	2.6575	2.7576	0.5559	0.3196	0.6359	0.5218
66	2.6613	2.7577	0.5555	0.3191	0.6161	0.5342
67	2.6513	2.7578	0.5556	0.3192	0.6167	0.5328
68	2.6486	2.7577	0.5554	0.3191	0.6169	0.5326
69	2.6406	2.7578	0.5551	0.3190	0.6133	0.5337
70	2.6361	2.7578	0.5546	0.3190	0.6132	0.5339
71	2.6355	2.7580	0.5547	0.3188	0.6123	0.5343
72	2.6295	2.7580	0.5546	0.3189	0.6153	0.5322
73	2.6184	2.7580	0.5552	0.3193	0.6371	0.5194

Training Statistics Summary

Metric	Initial	Final	Best	Change
mAP@0.5	0.4411	0.5552	0.5559	+0.1141
mAP@0.5:0.95	0.2500	0.3193	0.3199	+0.0693
Precision	0.6506	0.6371	0.7312	+-0.0135
Recall	0.4114	0.5194	0.5343	+0.1079

Final Model Performance

Metric	Value
mAP@0.5	0.5564
mAP@0.5:0.95	0.3204
Precision	0.6335
Recall	0.5234

Test Set Validation Results

Model Architecture & Performance

Metric	Value
Model Name	yolov8m_finetuned_20251127
Parameters (M)	25.86
Model Size (MB)	49.61
FLOPs (G)	79.09
Layers	169
Inference Speed (FPS)	424.67
IoU Threshold	0.50

Overall Performance Metrics on Test Set

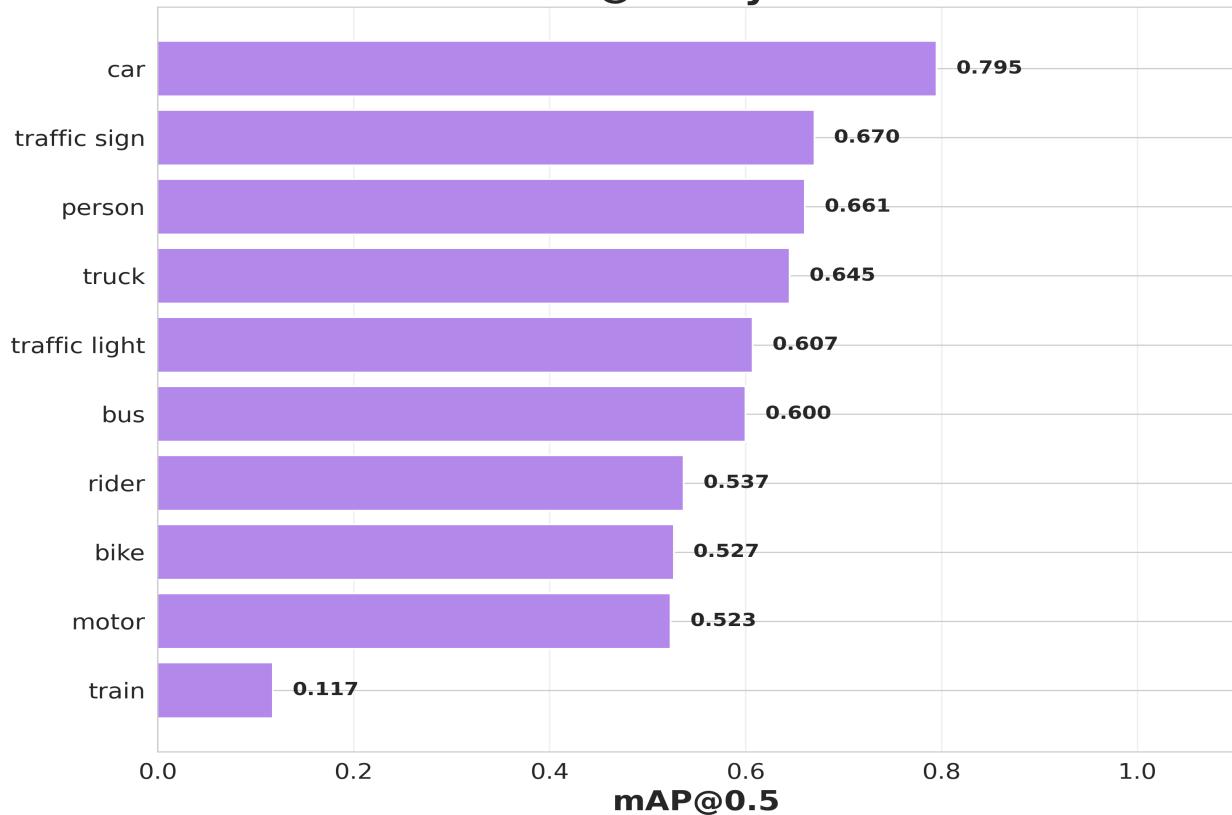
Metric	Confusion Matrix	YOLO Validation
Precision	0.6972	0.6329
Recall	0.7814	0.5445
F1-Score	0.7369	N/A
mAP@0.5 (Overall)	N/A	0.5683
mAP@0.5:0.95 (Overall)	N/A	0.3236

Per-Class Performance Metrics

Class	Precision	Recall	F1-Score	mAP@0.5	TP	FP	FN
person	0.6161	0.7497	0.6764	0.6605	15187	9463	5071
rider	0.5170	0.5684	0.5415	0.5368	669	625	508
car	0.7601	0.8287	0.7929	0.7951	155933	49216	32234
truck	0.5925	0.5921	0.5923	0.6452	5157	3547	3553
bus	0.5598	0.5628	0.5613	0.5998	1801	1416	1399
train	0.1071	0.3000	0.1579	0.1174	3	25	7
motor	0.5220	0.5515	0.5363	0.5235	439	402	357
bike	0.5726	0.5694	0.5710	0.5267	1144	854	865
traffic light	0.5954	0.7621	0.6685	0.6072	31460	21380	9822
traffic sign	0.6462	0.7135	0.6782	0.6702	44589	24417	17900

mAP@0.5 Distribution by Class

mAP@0.5 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 $\text{IoU} \geq 0.50$.

Per-Class IoU Performance:

The confusion matrix and per-class metrics above show detection accuracy at $\text{IoU}=0.50$ threshold. Each class's True Positives (TP) represent detections with $\text{IoU} \geq 0.50$.

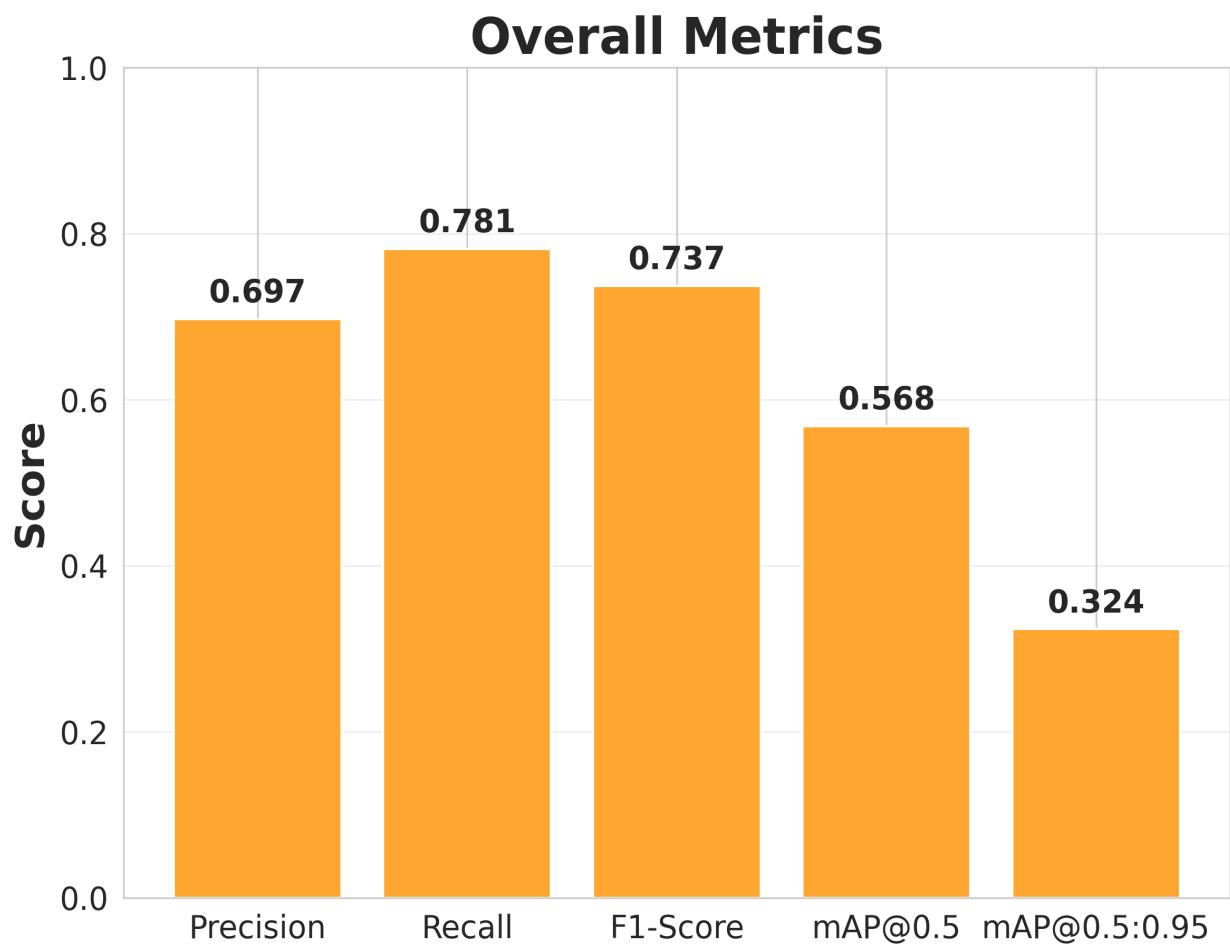
Confusion Matrix (Test Set)

Confusion Matrix (yolov8m_finetuned_20251127 validation)

	Predicted Class										
True Class	person	rider	car	truck	bus	train	motor	bike	traffic light	traffic sign	
person	15187	156	104	2			7	24	6	12	
rider	215	669	9				7	8			
car	114	13	155933	1373	321		38	10	29	91	
truck	2		993	5157	386	1			1	30	
bus			286	427	1801	7					3
train						3					
motor	11	4	38				439	34			1
bike	30	6	4			1	61	1144			
traffic light	9	1	23	2	2	3	1	2	31460	394	
traffic sign	29	1	89	14	5		2	1	281	44589	

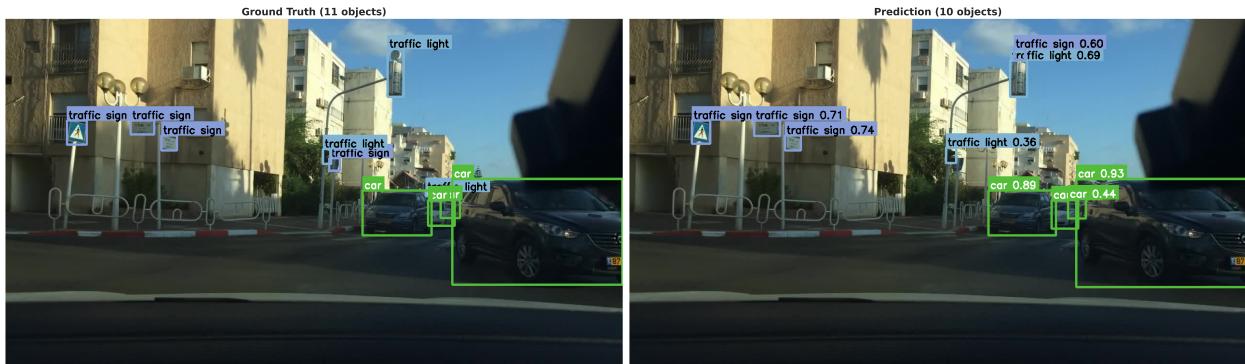
Test Set Performance Curves

Overall Metrics Visualization



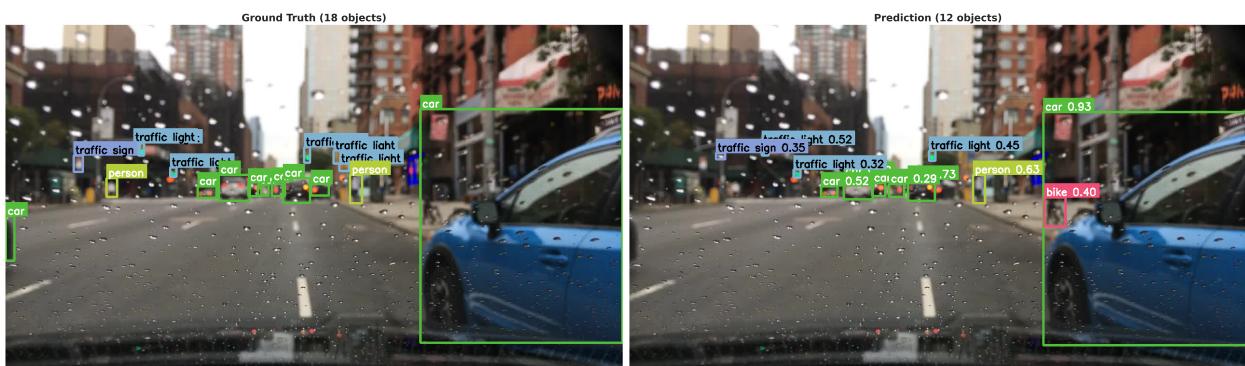
Sample Predictions: Ground Truth vs Model Output

Sample 1 - Weather: unknown, Scene: unknown, Time: unknown



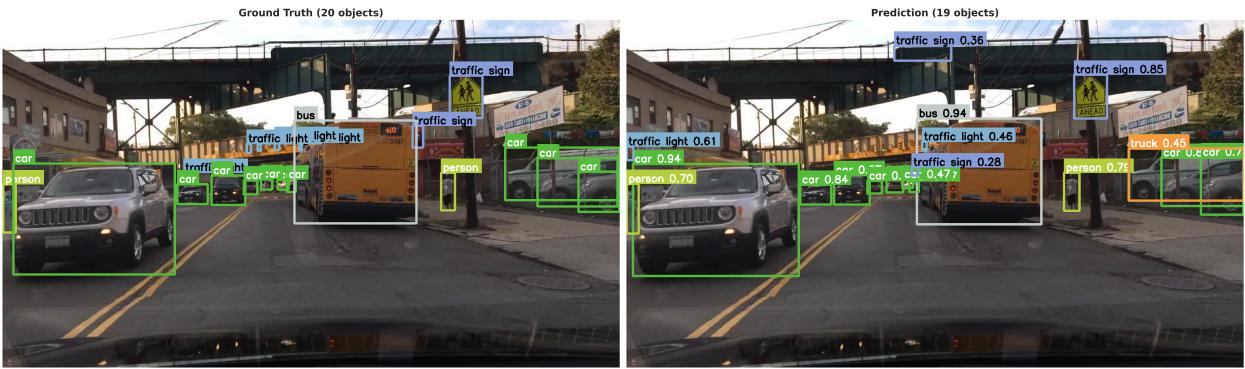
Ground Truth: 11 objects | Predictions: 10 objects

Sample 2 - Weather: unknown, Scene: unknown, Time: unknown



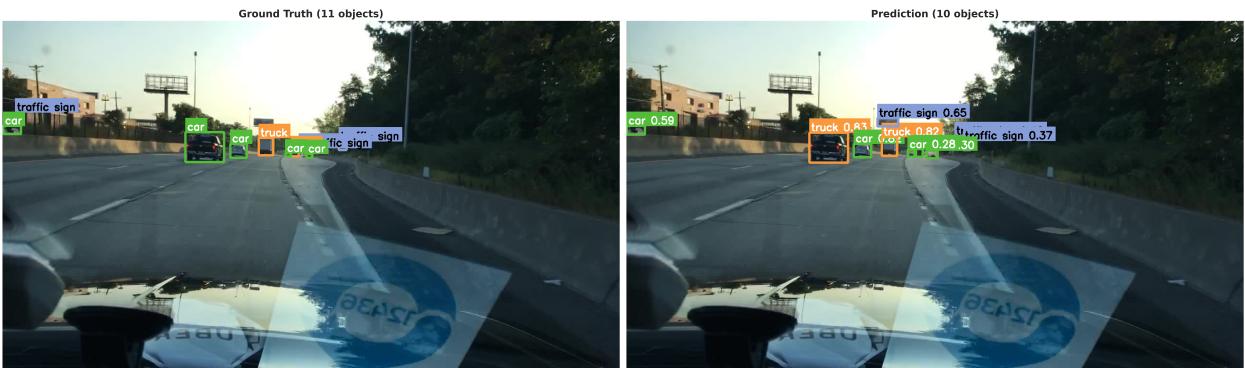
Ground Truth: 18 objects | Predictions: 12 objects

Sample 3 - Weather: unknown, Scene: unknown, Time: unknown



Ground Truth: 20 objects | Predictions: 19 objects

Sample 4 - Weather: unknown, Scene: unknown, Time: unknown



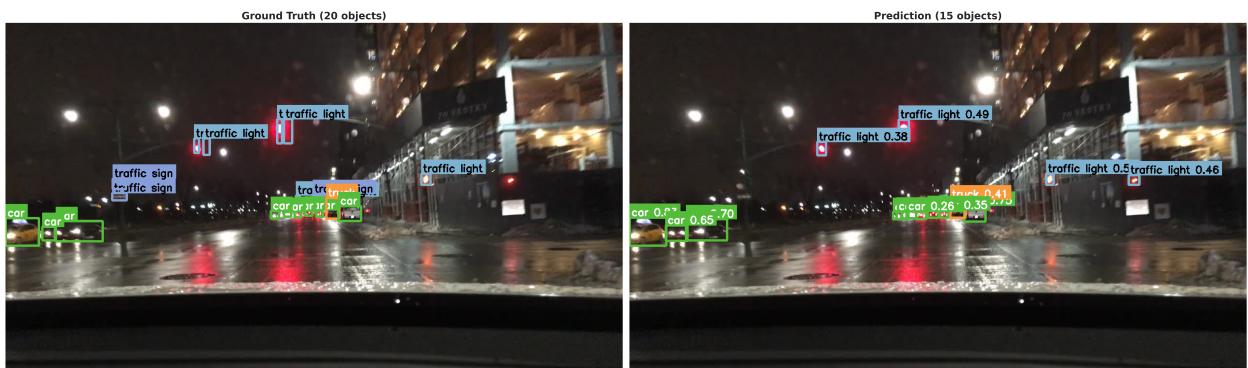
Ground Truth: 11 objects | Predictions: 10 objects

Sample 5 - Weather: unknown, Scene: unknown, Time: unknown



Ground Truth: 10 objects | Predictions: 11 objects

Sample 6 - Weather: unknown, Scene: unknown, Time: unknown



Ground Truth: 20 objects | Predictions: 15 objects

Generated by YOLO Training Notebook
BDD100K Dataset - Computer Vision Project