Dickinson

Real-Time Vehicle Detection in Traffic Monitoring

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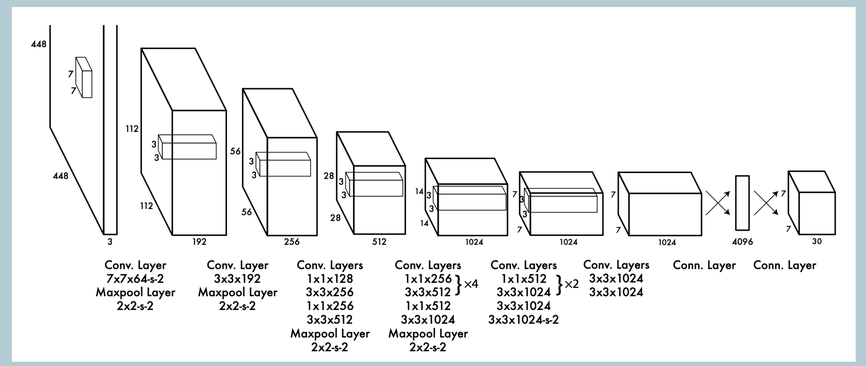
Introduction

Utilizing YOLOv8 model to analyze real-time surveillance cameras and detect vehicles on the road.



YOLO's architecture - 2016

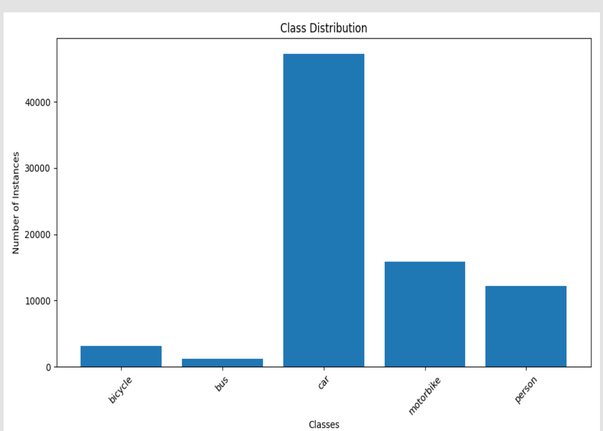
YOLO treats object detection as a regression problem — predicting bounding boxes and class probabilities directly from full images in one evaluation

It is ideal for real-time detection because it uses a single neural network to predict objects, allowing high speed and efficiency with high FPS (30-150 FPS)

By processing streaming video from traffic cameras, the system counts the number of vehicles and determines how busy the road is based on predefined thresholds.

The goal is to monitor traffic conditions, which can be used for smart city applications and traffic management/ notification.

Data



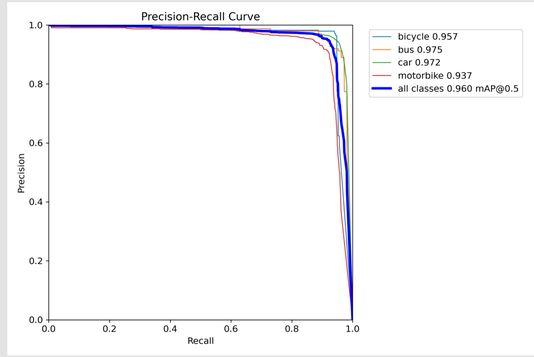
7566 train images, 805 valid images, 322 test images

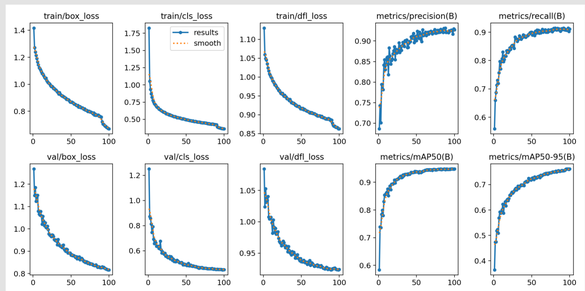
Data is classified into 6 classes representing 6 types of vehicles: bicycle, bus, car, motorbike, person, and truck.

Augmentations:

- Flip - Horizontal
- Saturation - Between -61% and +61%
- Brightness - Between -25% and +25%
- Noise - Up to 2% of pixels

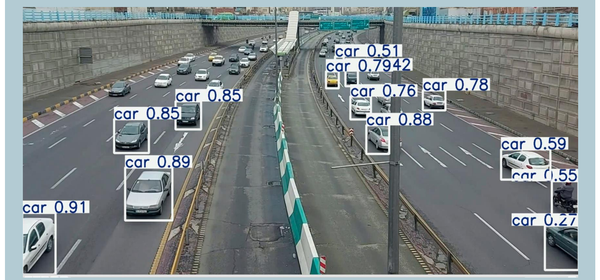
Model Performance



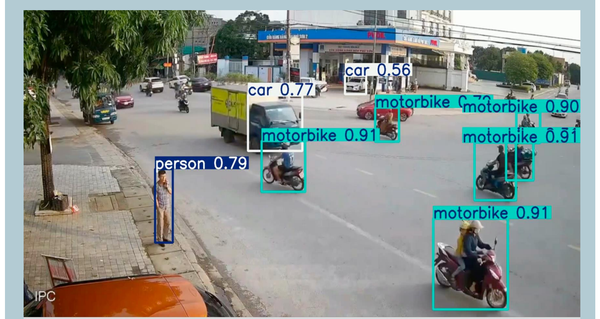


Result

Class	Images	Instances	Box(P	R	mAP50	mAP50-95):
all	549	5438	0.935	0.94	0.96	0.824
bicycle	189	250	0.963	0.946	0.957	0.856
bus	81	108	0.92	0.952	0.975	0.916
car	520	3842	0.933	0.959	0.972	0.843
motorbike	331	1238	0.926	0.902	0.937	0.682



2-way road



Different vehicles

Low light condition