

Dhaka City Traffic Detection

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Introduction

- Object detection: One of the classic problems in computer vision.
- Convolutional Neural Networks (CNN): one of the most powerful tools now for Artificial Intelligence and Machine Learning problem.
- We used YOLO-based Convolutional Neural Network model (YOLOv5) to detect 21 different vehicles in Dhaka city. Those vehicles include car, truck, bus, motorcycle, bicycle, rickshaws, etc.

YOLOv5

Train the YOLOv5

- Train the network end-to-end by back-propagation and stochastic gradient descent.
- Use genetic algorithm to evolve and achieve optimum hyperparameters.
- Image augmentation
- Multi-scale training

YOLOv5 output: bounding box with confidence interval

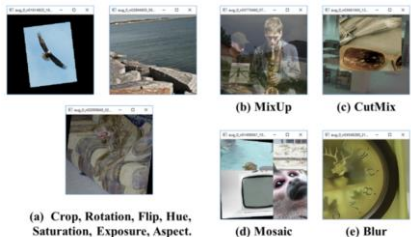


Image augmentation



Sample training image

Object Detection



Sample output image

Vehicle type	mAP@.5:.95
Ambulance	0
Auto rickshaw	0.8
Bicycle	0.6
Bus	0.7
Car	0.8
Garbage van	0
Human hauler	0.7
Minibus	0.5
Minivan	0.5
Motorbike	0.6
Pickup	0.7

Vehicle type	mAP@.5:.95
Army vehicle	0
Police car	0.6
Rickshaw	0.7
Scooter	0
SUV	0.6
Taxi	0.8
Three wheelers	0.7
Truck	0.7
Van	0.5
Wheelbarrow	0.4

Table: YOLOv5 performance over validation data (**N.B.** Ambulance, Garbage van, Scooter, etc. got mAP of 0 due to no such objects in validation data)

Improving Performance (mAP)

- Multi-scale training
 - Training with +/- 50% of actual image size
 - Fine tuning with image size of 1024
- Test Time Augmentation (TTA)
 - Augment test image and get average precision

References

1. Ultralytics (October 29, 2020) YOLOv5. doi: 10.5281/zenodo.4154370
2. Bochkovskiy, A., Wang, C. Y., & Liao, H. Y. M. (2020). YOLOv4: Optimal Speed and Accuracy of Object Detection. arXiv preprint arXiv:2004.10934