

## Introduction

- Detection of vehicles in cities like Dhaka is very challenging due to diversity of vehicles (in terms of speed, size, and patterns) & traffic irregularities.
- *DhakaAI challenge* [1] addresses this issue for better future.
- We explored AI-based scheme based on YOLOv5 [2] models & we achieved promising results.

## Datasets

**DhakaAI** [1]: 21 classes (3003 train images with annotation, 500 & 450 test images w/o annotation).

**Dhaka-Traffic** [3]: 21 classes, 272 images with annotation (by us).

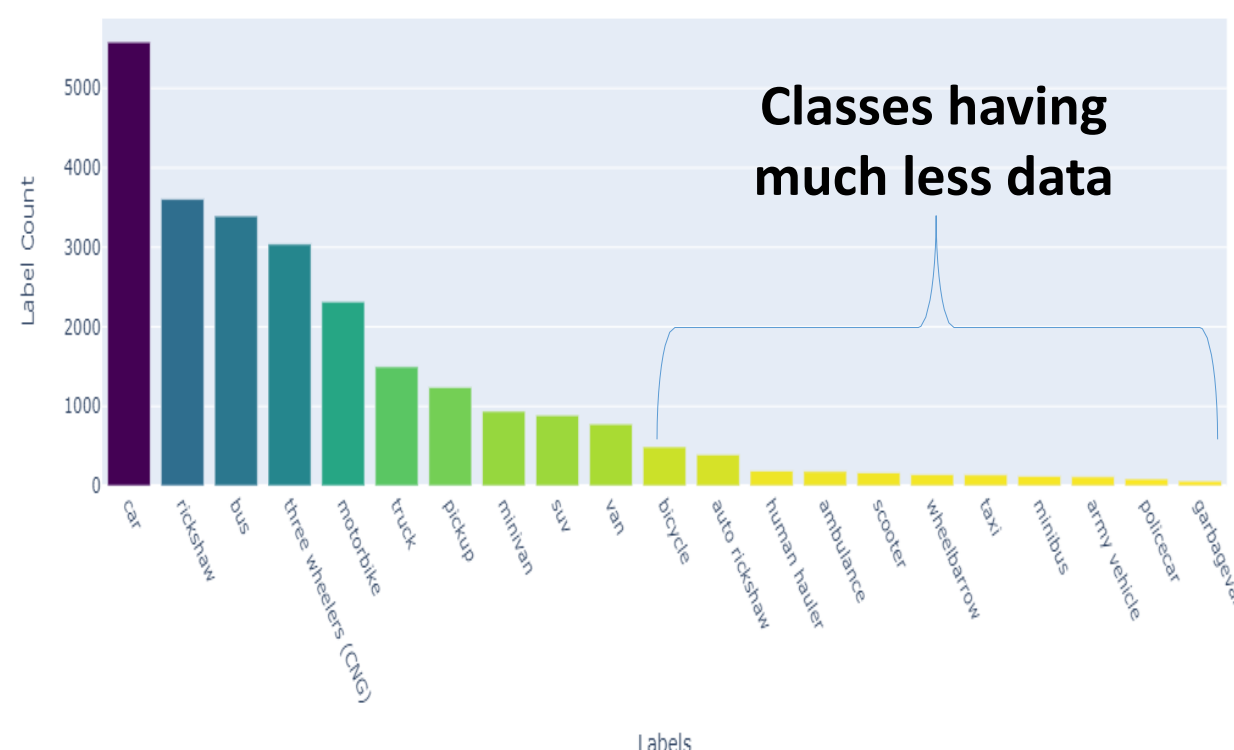


Fig. 1: Class distributions after combining the 2 datasets

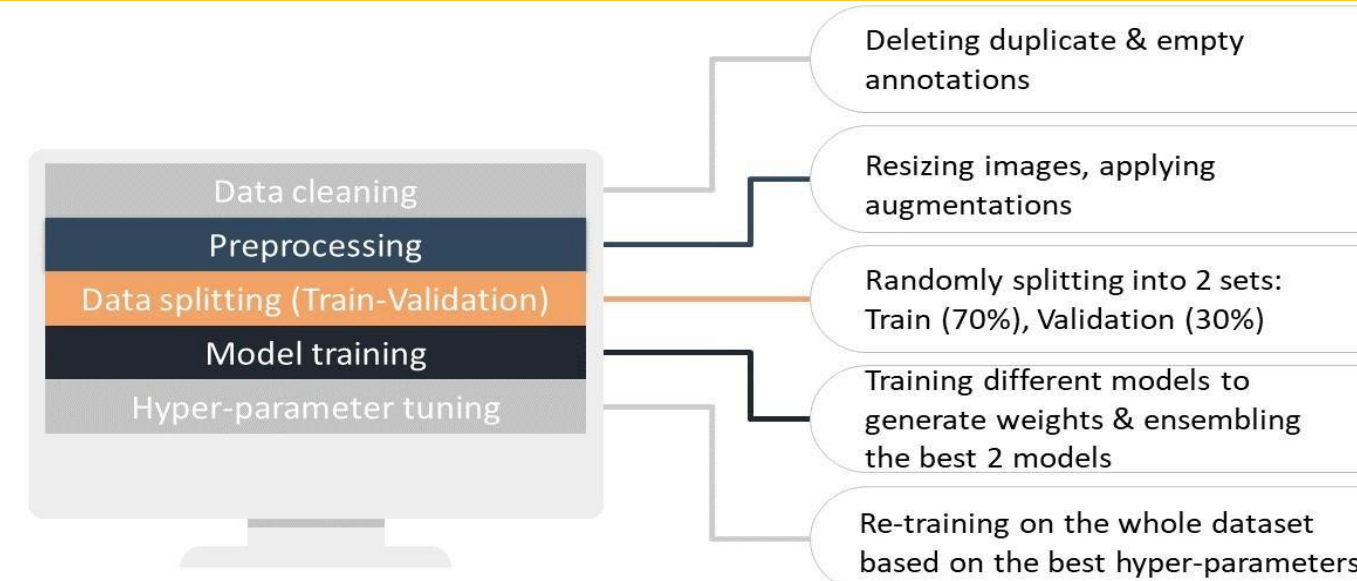


Fig. 2: Training workflow

## Methodology

- To avoid class-imbalance problem (F.1), augmentations (shear, horizontal flip, translate, scale, rotate, & random HSV) are done for minor 11 classes. Augmentations (dark & blur effect) are applied to generalize for night and blurry images.
- Explored models: YOLOv5s, YOLOv5m, YOLOv5l, YOLOv5x, EfficientDet0, EfficientDet1, EfficientDet2.
- After tuning the hyper-parameters for the model using the validation set, the model has been re-trained on the full dataset (F.3).

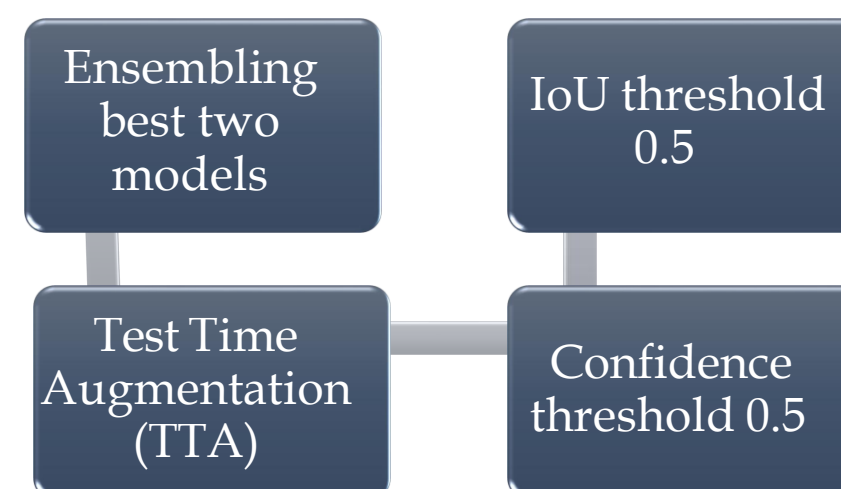


Fig. 3: Inference parameters

## Results

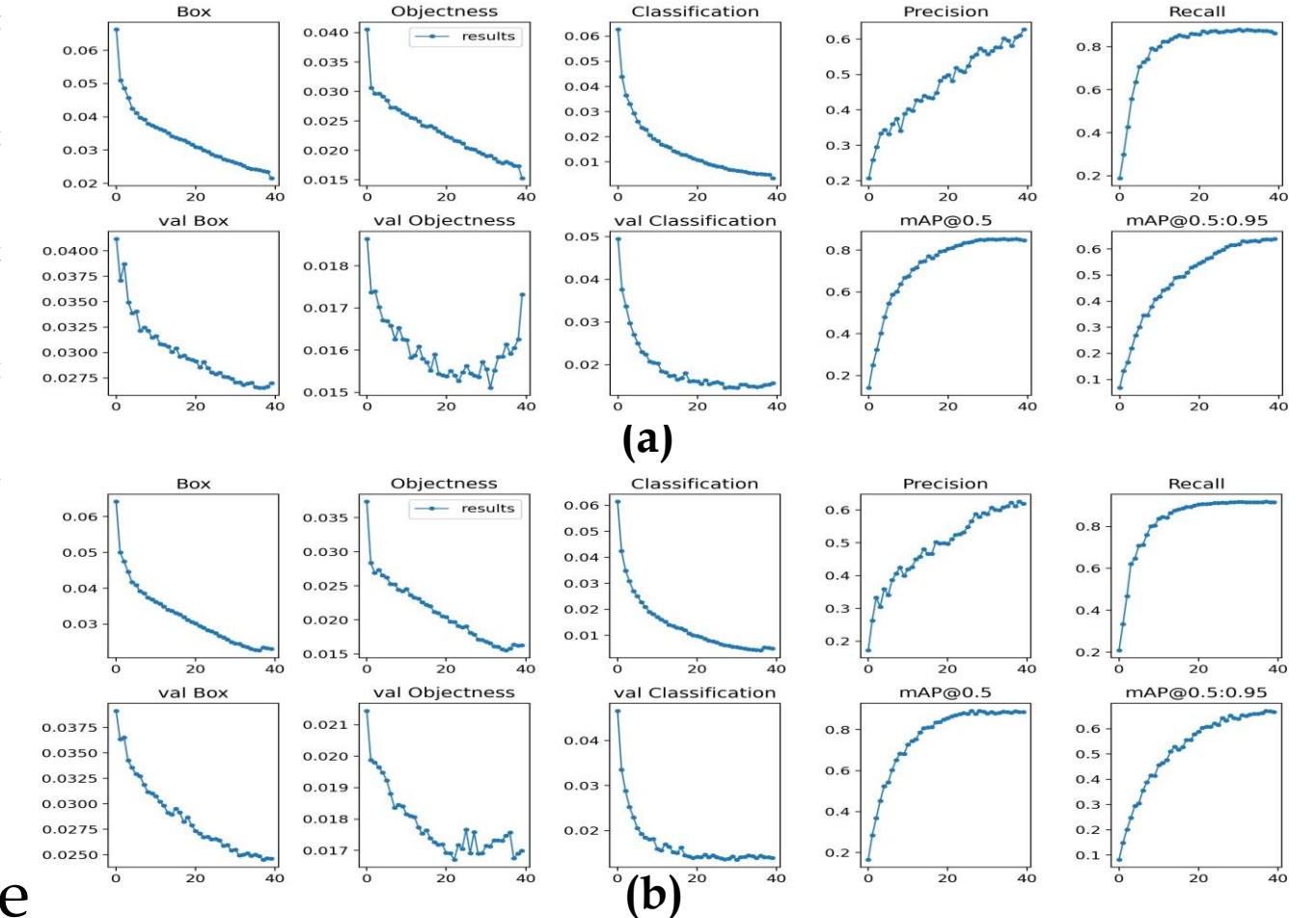


Fig. 4: Training & validation results from the best 2 YOLOv5x models

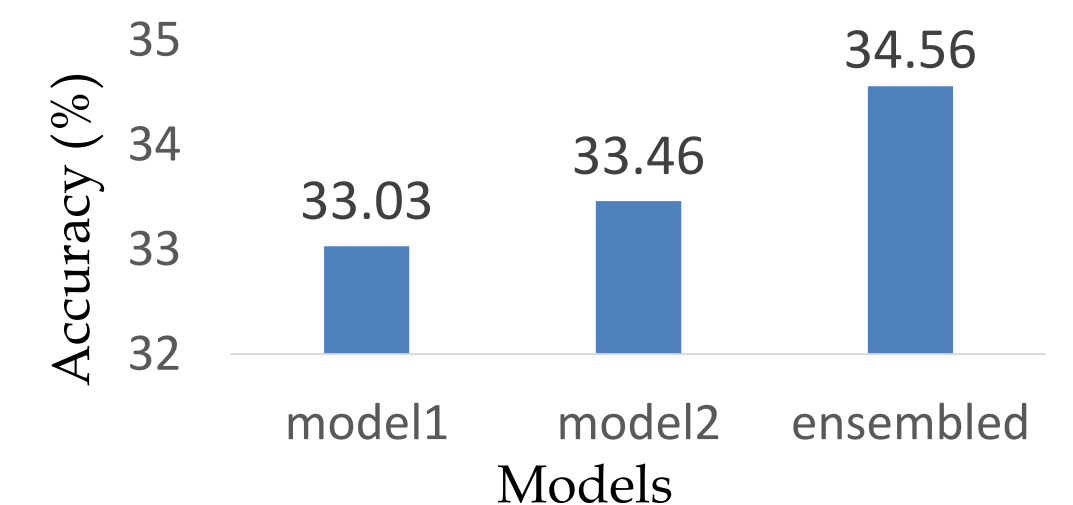


Fig. 5: Accuracies on test set 2

The best 2 models have been re-trained on the entire dataset. Ensembling them, the highest accuracy of 34.56% has been achieved on the test dataset (F.5).

## References

- [1] ASM Shihavuddin and M Rashid, "DhakaAI", Harvard Dataverse, <https://doi.org/10.7910/DVN/POREXF>, 2020.
- [2] <https://github.com/ultralytics/yolov5>, accessed on 2020.
- [3] <https://github.com/Morshed-Alam/Dhaka-Traffic>, accessed on 2020.