University of Peradeniya

Vision Based Road Traffic Violation Detection

G.L.C. Aponsu[1], I.D. Weerasinghe[1], H.M.B.S.B Herath [1]
Supervised by: W.M.M.T.S. Weerakoon[1], L.T. Samaranayake[1], W.A.N.I. Harischandra[1],
[1]*DEEE, Faculty of Engineering, University of Peradeniya*

Abstract - In response to rising traffic challenges, we introduce an advanced approach using YOLOv8 Instance Segmentation and ByteTrack to efficiently detect pedestrian crossing violations. Achieving accuracies: Random Forest Classifier (98.08%), SVM (74.60%), and XGBoost model (99.20%), we have enhanced accuracy by training a 2D feature matrix with relevant pedestrian and vehicle features, ensuring safer pedestrian crossings.

Introduction

- Annual road fatalities in Sri Lanka exceed 2500.
- Building infrastructure and promoting discipline reduces traffic accidents.
- Bringing discipline by detecting traffic violations.
- Conventional methods of violation detection not being scalable with growing traffic.
- Need for an efficient, reliable, scalable, consistent violation detection method.

Approach

- YOLOv8 for vehicle and pedestrian Instance Segmentation
- ByteTrack algorithm for tracking
- Violation detection
  - **Random Forest**
  - **SVM**
  - **XGBoost**

Feature Extraction

- Centers of Pedestrian and Vehicle
- Displacements of the Pedestrian and Vehicle between subsequent frames
- IOU of Pedestrian/Vehicle with Crossing
- Used the feature matrix as the key input for machine learning models.

Methodology

Surveillance Video of pedestrian crossing

YOLOv8

Instance Segmentation → ByteTrack Tracking

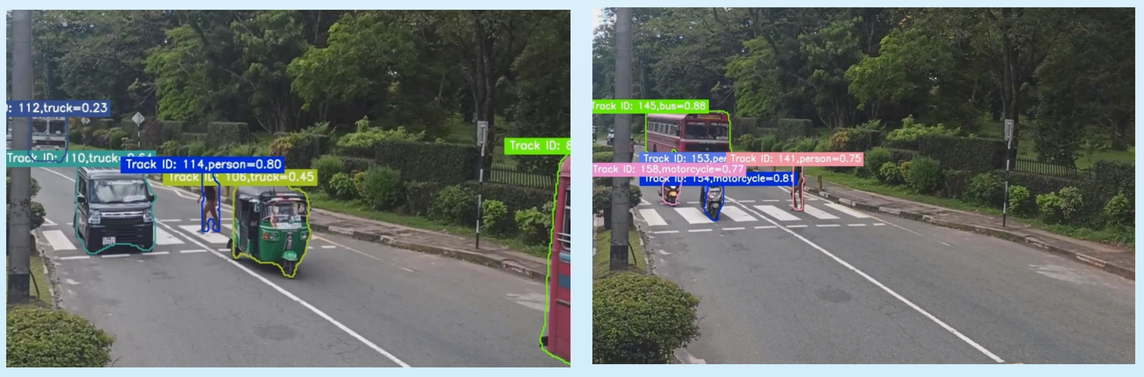
1. Pedestrian
2. Vehicles

*Crossing is marked when camera setup on location

Feature Extraction → Violation Detection Model

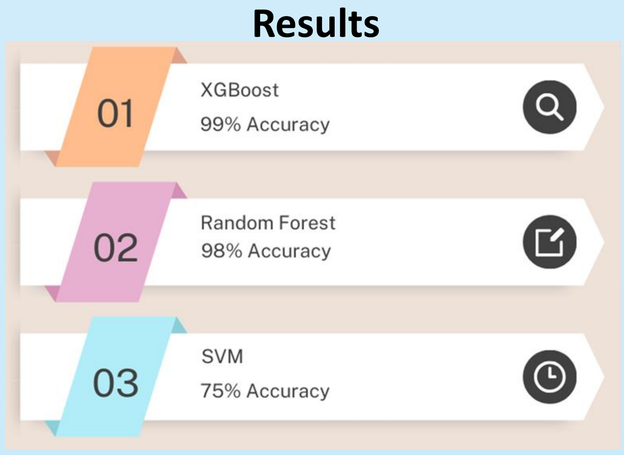
Mathematical Algorithms

1. Pedestrians, Vehicles Center Points
2. Pedestrian, Vehicle & Crossing IOU
3. Pedestrians, Vehicles Displacement



Detected Violation Frames are Saved for reporting purposes

Results



Conclusion

- In Sri Lanka, we combat vehicle violations at pedestrian crossings using YOLOv8, ByteTrack, and ML model SVM, Random Forest, and XGBoost for precise detection.
- Improved accuracy is achieved through algorithms and feature matrix training
- Our approach combines feature extraction, object detection, object tracking, and machine-learning training models.
- By saving violation frames for reporting purposes, we aim to create a system that contributes to the reduction of traffic violations

Contact details

Name : Dr. Tharindu Weerakoon
Tel. No.: +9478041793
Email : tharinduw@eng.pdn.ac.lk

Multidisciplinary AI Research Centre (MARC)
University Research Council
University of Peradeniya
Peradeniya, 20400, Sri Lanka