

Vehicle Road Double-line Violation Detection and Severity Assessment Using Deep Learning

Baladurage Kavinda* and P. K. S. C Jayasinghe

Department of Information and Communication Technology, Faculty of Technology, University of Ruhuna

*dilshankavinda371@gmail.com

Abstract

Road accidents remain a significant public safety problem in Sri Lanka, and violation of road double white lines has been identified as a major reason. Conventional traffic monitoring systems based on CCTV cameras and manual observations fail to serve their purpose as they are ineffective in providing accurate and timely detection. Using the advanced features of YOLO V8 and Open CV, this study suggests a deep learning-based system that automates the detection and severity assessment of double-line violations to address these challenges. Model creation involved several steps data gathering, preprocessing, training, and testing. Data collection was performed at high-traffic road areas where double-line violations frequently happen. Six vehicle types were considered for model training and a total of over 2,500 images were annotated after extracting them from high-resolution video frames. The YOLO V8 was selected as the baseline model due to its strong performance in various traffic scenarios, various vehicle types, and environmental conditions, particularly when compared to other tested models, like DERT, and Faster R-CNN. Its robustness has been proven, achieving 90.2% precision and 87.0% recall on testing data. Also, the integration of Open CV enhances the system by marking road lanes and analyzing key regions of interest, which significantly improves detection accuracy. For severity assessment, the system will categorize violations as normal or serious based on calculating the ratio between the vehicle's width and the extent to which it has crossed the double line. Future directions include enhancing the model's capability to detect other types of vehicles and integrating a number plate recognition feature with an alerting system to identify violators and take immediate action. In conclusion, the study presents that the limitations of traditional monitoring systems can be effectively addressed with the use of approaches based on deep learning. This system represents a major advancement in leveraging artificial intelligence to improve traffic management and law enforcement in Sri Lanka.

Keywords: *Deep Learning, Real-Time Monitoring, Traffic Safety, YOLO V8, CNN*