ABSTRACT

The lack of vehicle detection systems in Indonesia hinders the development of smart cities, particularly in traffic management and intelligent transportation. Adaptive traffic light systems, as noted by Suhartono (2022), can reduce vehicle queues by up to 28%, while autonomous vehicle development is projected to decrease congestion by up to 30% in major cities like Jakarta (Indonesian Ministry of Transportation, 2022). This research aims to implement vehicle detection using the YOLOv11 architecture, fine-tuned to support smart city realization and further applications in other industries. YOLOv11, the latest version released in 2024, offers enhanced feature extraction that improved performance compared to previous versions (Ultralytics, 2025). The approach involves training the model on a dataset of Indonesian highway and toll road images containing daily vehicles such as motorcycles, cars, and heavy vehicles, with YOLOv11 parameters optimized to detect the single class "vehicle" (four-wheeled or larger) under diverse environmental conditions. Evaluation results show the model achieves an mAP@50 of 98.1%, with high accuracy in vehicle detection, serving as a foundation for advancements in other industries and contributing significantly to intelligent traffic monitoring and sustainable urban ecosystems.

Keywords : Object Detection, YOLOv11, Car