

ABSTRACT

Traffic accidents remain a serious global safety issue, causing over 1.19 million deaths annually, including 148,307 cases in Indonesia in 2023. Although many traffic surveillance systems have been implemented, most still rely on manual monitoring and lack the ability to detect and classify accidents automatically. This study aims to develop a YOLO11-based accident detection model capable of not only identifying incidents automatically but also classifying the types of vehicles involved: car_accident, car_motorbike_accident, and motorbike_accident. The model was trained and tested on 1,483 images collected from Kaggle, Roboflow, YouTube, and Google Images. Evaluations were conducted on the baseline model and the fine-tuned model using precision, recall, mAP@0.5, and mAP@0.5:0.95 metrics. The baseline model achieved a precision of 0,82, recall of 0,79, and mAP@0.5 of 0,84. After fine-tuning with strategies such as freezing the first 10 layers, data augmentation, and using the AdamW optimizer, the model showed improved stability with a precision of 0,81, recall of 0,72, and mAP@0.5 of 0,75. Class-wise performance became more balanced with no significant overfitting. This approach proves effective in enhancing accident detection and classification performance, and shows potential for supporting more intelligent and adaptive traffic surveillance systems.

Keywords: accident detection, YOLO11, classification, traffic, fine-tuning