

## **ABSTRACT**

*Traffic accidents are one of the leading causes of death worldwide, including in Indonesia. The high number of road accidents necessitates a more accurate approach to detect the severity of accidents. This study aims to develop a vehicle accident severity detection model using the YOLOv9 algorithm. The model is designed to classify accidents into three main categories: No Accident, Moderate, and Severe. The dataset used in this research was obtained from Kaggle and includes various accident images captured by traffic surveillance cameras (CCTV). By focusing on image analysis from CCTV recordings, this study is designed to represent real-world road conditions. The training and validation processes were conducted using a combination of hyperparameters such as batch size, learning rate, number of epochs, and the YOLOv9e model as the initial weight. Performance evaluation was carried out using key metrics such as mAP@0.5, Precision, Recall, and F1 Score. The results showed that the best configuration was achieved using the SGD optimizer with a learning rate of 0.0005, resulting in the highest mAP@0.5 score of 0.989. The developed model demonstrated high accuracy in detecting accidents across the three categories, highlighting its significant potential to support larger systems for traffic accident analysis. Although this study focuses solely on developing the detection model, the findings are expected to serve as a foundation for future research in enhancing accident management systems effectively.*

**Keywords:** *accident detection, YOLOv9, severity classification, artificial intelligence, CCTV recordings.*