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Journal of Current Studies in SDGs
Homepage : https://journal.i-ros.org/index.php/JOCSIS
Email : jocsis@i-ros.org

e-ISSN 3089-7564
Vol.2, No.1, March 2026

Real-Time Artificial Intelligence Traffic Counting for Volume of Translators of Surakarta City Roads

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DOI : https://doi.org/10.63230/jocsis.2.1.152

Sections Info

Article history:
Submitted: May 20, 2026
Final Revised: June 4, 2026
Accepted: June 5, 2026
Published: June 10, 2026

Keywords:
Artificial Intelligence;
Traffic Counting;
Urban Transportation;
Vehicle Detection;
YOLO.

ABSTRACT

Objective: *This study aims to develop and evaluate an artificial intelligence (AI)-based traffic counting system using the YOLO (You Only Look Once) deep learning algorithm to provide accurate and real-time traffic volume data for urban transportation management.* ***Method:*** *The study employed a deep learning approach by implementing the YOLO algorithm for vehicle detection and traffic counting. Traffic video data from road objects in Surakarta City were processed to identify and classify various vehicle types. The AI-generated traffic counting results were then compared with manual traffic survey data to assess the system's accuracy and effectiveness.* ***Results:*** *The findings indicate that the proposed AI-based traffic counting system can accurately detect and classify multiple vehicle categories, including cars, motorcycles, trucks, buses, bicycles, and bajaj. The traffic counting data produced by the system were highly readable and reliable. Comparison with manual traffic surveys showed that the AI-generated results were very similar while requiring significantly less time and human resources. The system achieved nearly 100% consistency with the available secondary traffic volume data, demonstrating its effectiveness in monitoring urban traffic conditions.* ***Novelty:*** *The novelty of this study lies in the application of the YOLO deep learning algorithm for automated traffic counting in the urban road environment of Surakarta City. The proposed system provides a practical and efficient alternative to conventional manual traffic surveys by delivering accurate, real-time traffic data with minimal human intervention, thereby supporting more effective urban transportation planning and management.*

INTRODUCTION

The problem of transportation, especially land transportation in Indonesia, is quite complex because transportation is an interrelated system. If one problem arises in one unit or one network, it will affect the system as a whole (Hendratmoko & Dewantoro, 2018). Traffic delays, accidents, and increased pollution are often the outcome of complex traffic problems that most urban regions face (Leroux et al., 2022). Transportation agencies are increasingly concerned about the high number of traffic fatalities and their rise in recent years, which makes researching intersection user safety crucial. A considerable amount of crash data is typically required to develop safety assessment analyses. Preparing crash data is subject to several restrictions, nevertheless, such as challenging data collection procedures, lengthy data collection periods, and underreporting problems (Patel et al., 2023).

One potential answer is using real-time data to build more dynamic routes and manage traffic. By maintaining a continuous traffic flow and directing cars away from impediments, a system that employs variable message signs, for instance, can lower emissions from motor vehicles and traffic bottlenecks (Unzilatirrizqi et al., 2019; Chatterjee & McDonald, 2004). Access to transportation-related data is a critical element in mitigating the issue of traffic accidents. This information covers things like facility usage, vehicle data, and traffic volume (Unzilatirrizqi et al., 2019). However, these methods depend on precise traffic statistics