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Vehicle Counting for Traffic Management

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Abstract: *The rapid growth of urban traffic has created significant challenges in monitoring and managing vehicle flow. Traditional approaches to vehicle counting, such as manual surveys and sensor-based systems, are often expensive, labour-intensive, and lack real-time adaptability. To address these issues, this research presents an automated vehicle detection and counting system based on the YOLOv8 deep learning model. The system processes video streams by applying preprocessing techniques, including frame resizing, grayscale conversion, and noise reduction, to enhance detection accuracy. YOLOv8 is then utilized to identify and track multiple vehicle categories, such as cars, trucks, buses, and motorbikes, while ensuring unique identifiers to avoid duplication across frames. A user-friendly Streamlit-based interface allows for seamless video upload, real-time visualization with bounding boxes, and the generation of structured detection logs containing object IDs, timestamps, and vehicle counts. Experimental results demonstrate that the proposed system achieves high accuracy and real-time performance, making it suitable for applications in traffic monitoring, congestion analysis, toll collection, and smart city development. The integration of deep learning, computer vision, and interactive deployment provides a scalable and cost-effective solution to modern traffic management challenges.*

Keywords: Vehicle Detection, Vehicle Counting, YOLOv8, Deep Learning, Object Tracking, Intelligent Transportation Systems, Smart Cities, Real-Time Traffic Monitoring.

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