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Real-time vehicle counting using custom YOLOv8n and DeepSORT for resource-limited edge devices
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Abstract

Recently, there has been a significant increase in the use of deep learning and low-computing edge devices for analysis of video-based systems, particularly in the field of intelligent transportation systems (ITS). One promising application of computer vision techniques in ITS is in the development of low-computing and accurate vehicle counting systems that can be used to eliminate dependence on external cloud computing resources. This paper proposes a compact, reliable and real-time vehicle counting solution which can be deployed on low-computational requirement edge computing devices. The system makes use of a custom-built vehicle detection algorithm based on the you only look once version 8 nano (YOLOv8n), combined with a deep association metric (DeepSORT) object tracking algorithm and an efficient vehicle counting method for accurate counting of vehicles in highway scenes. The system is trained to detect, track and count four distinct vehicle classes, namely: car, motorcycle, bus, and truck. The proposed system was able to achieve an average vehicle detection mean average precision (mAP) score of 97.5%, a vehicle counting accuracy score of 96.8% and an average speed of 19.4 frames per second (FPS), all while being deployed on a compact Nvidia Jetson Nano edge-computing device. The proposed system outperforms other previously proposed tools in terms of both accuracy and speed. © (2024), (Universitas Ahmad Dahlan). All Rights Reserved.

Author Keywords

Edge computing; Vehicle counting; Vehicle detection; Vehicle tracking; You only look once version 8 nano

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