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## **Real-Time Traffic Monitoring and Adaptive Control Withyolov11 for Emergency Vehicles**

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Abstract: The project provides a real-time traffic adaptive control and monitoring system based on the sophisticated YOLOv11 object detection algorithm to enable the safe and unobstructed passage of emergency vehicles. Through the use of real-time video feeds from traffic cameras, the system identifies ambulances, fire engines, and police cars accurately. Once identified, it adjusts traffic signals in real time to establish a green corridor, reducing delays and enhancing emergency response times. Integration of YOLOv11 guarantees high-speed, high-accuracy object detection even in dense and complicated cityscapes. This smart traffic control technology serves to improve public security, ease traffic flow, and maximize urban mobility through AI-based automation.

In contemporary urban settings, free and unobstructed flow of emergency vehicles is essential for providing timely response to life-critical situations. Yet, traditional traffic management systems tend not to dynamically respond to such critical situations, leading to avoidable delays and heightened risk. This project overcomes this limitation by designing a real-time traffic monitoring and adaptive signal control system based on the YOLOv11 deep learning algorithm.

The system to be implemented utilizes real-time video feeds from traffic monitoring cameras to constantly observe traffic movement and identify the presence of emergency vehicles like ambulances, fire trucks, and police vehicles. YOLOv11, which is renowned for its improved speed and accuracy in object detection, is utilized to detect emergency vehicles even in heavy traffic. After detection, the system examines their location and direction of travel to give priority to their route through intersections.

To enable the smooth run of these vehicles, the system initiates adaptive traffic signal control. Traffic lights are dynamically adjusted in real-time to form a "green corridor" that makes way, thus decreasing delays considerably as well as enhancing emergency response effectiveness. This solution not only enhances safety and mobility for emergency responders but also decreases secondary accidents due to panic or incoordinated driver action..

**Keywords:** Real-Time Traffic Monitoring, YOLOv11, Emergency Vehicle Detection, Adaptive Traffic Signal Control, Intelligent Transportation System, Object Detection, Deep Learning, Smart City, Traffic Management, Computer Vision

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