**ABSTRACT**

* TOPIC: Artificial Intelligence & Machine Learning

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Abstract: Traffic Signal Violation Detection System

Traffic signal violations, especially red light jumping, are a major cause of road accidents and traffic congestion. Traditional enforcement methods rely on manual monitoring or basic CCTV cameras, which are inefficient and prone to human error. To address this issue, our **Traffic Signal Violation Detection System** uses advanced **computer vision and artificial intelligence** to automatically detect vehicles that cross the stop line when the signal is red.

The system is built using **YOLOv8 (You Only Look Once)** for real-time object detection and **OpenCV** for video processing. It processes **pre-recorded traffic footage** or can be adapted for live video surveillance. A **manual stop line selection** feature allows flexibility in different environments. Once a vehicle crosses the designated stop line, it is flagged as a violator for **one second**, ensuring accurate detection while reducing false positives. The system then logs the event, capturing key details such as **timestamp and location**, which can be used for further analysis by traffic authorities.

**Key Features:**

* **Real-time object detection** using YOLOv8
* **Manual stop line selection** for flexible deployment
* **Short-term violation marking (1 second)** to prevent continuous flagging
* **Automated tracking** without manual intervention
* **Cost-effective solution** eliminating the need for physical sensors
* **Scalable and adaptable** to existing traffic surveillance infrastructure

By implementing this **AI-driven solution**, traffic enforcement agencies can **reduce road accidents, improve traffic discipline, and enhance urban mobility**. Future enhancements may include **automatic license plate recognition (ALPR)**, **cloud-based storage**, and **real-time alerts** for better enforcement. This project provides a **scalable, cost-efficient, and high-accuracy** approach to traffic violation detection, contributing to safer roads for everyone.

🚦 **Keywords:** YOLOv8, OpenCV, AI-based Traffic Monitoring, Road Safety, Real-time Detection