# Car speed detection use YOLOv10 model

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## Abstract

This project explores the development of a real-time vehicle speed detection and traffic flow analysis system utilizing the YOLOv10 object detection framework. Leveraging the speed and precision of YOLOv10, the system accurately detects vehicles in video streams and estimates their speeds through motion tracking techniques. The integration of lightweight yet robust algorithms enables deployment on edge devices with limited computational power. This work demonstrates the potential of combining deep learning with intelligent transportation technologies to improve traffic monitoring, optimize urban mobility, and contribute to the advancement of smart city infrastructure.

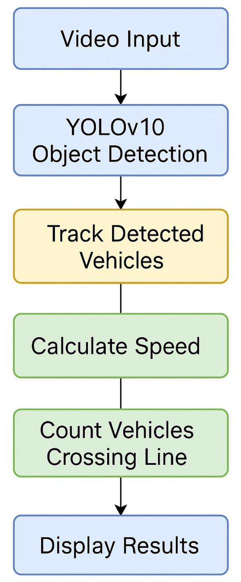
## Introduction

In recent years, intelligent transportation systems have become a critical area of research, aiming to enhance road safety, traffic monitoring, and urban mobility. This project presents a real-time vehicle speed detection and traffic flow analysis system based on the YOLOv10 object detection algorithm. By integrating advanced object detection with motion tracking and speed estimation techniques, the proposed system offers a foundation for further development of smart city traffic solutions. The use of YOLOv10 ensures a high level of accuracy and performance, even on low-resource devices, making the approach suitable for real-world deployment.

## Methodology

This flowchart outlines the main steps of a real-time vehicle speed detection and traffic flow analysis system using YOLOv10. The process starts by reading video frames and detecting vehicles using YOLOv10. Only relevant classes (cars, trucks, buses, motorcycles) are tracked. For each vehicle, the system calculates movement between frames and estimates speed if the object is moving.

Fig. 1. Flow chart model of the work.

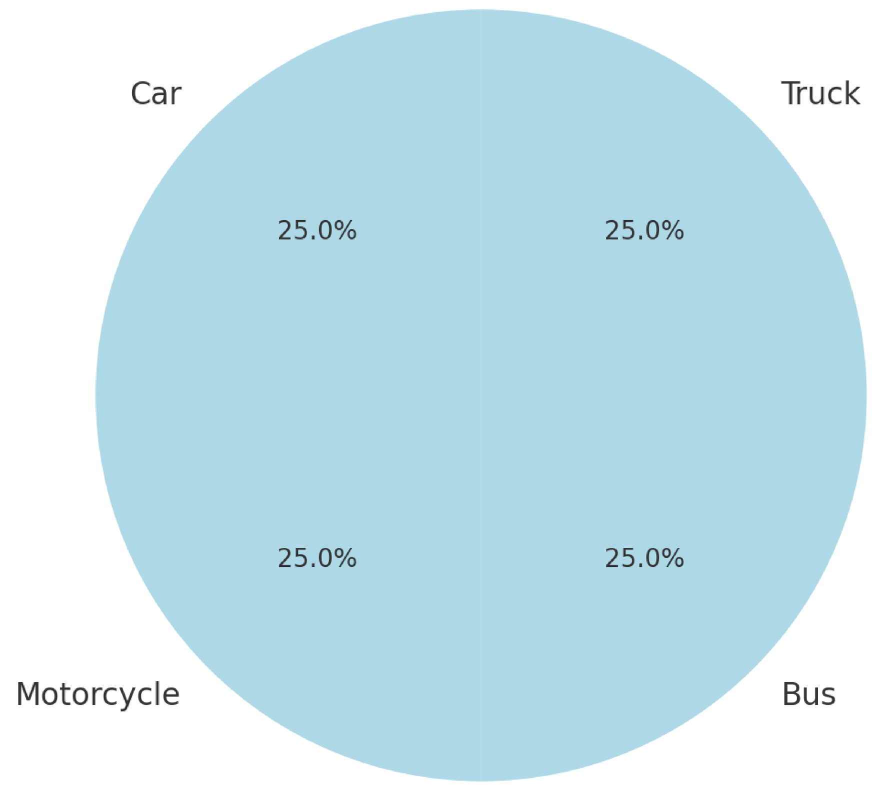



## Methodology (cont.)

The project for vehicle detection, tracking, and speed estimation can be applied in several key areas. Firstly, in smart cities for automatic traffic monitoring and improving road safety. Secondly, in traffic cameras for automated vehicle counting and detecting violations, such as speeding. The project can also be integrated into Intelligent Transport Systems (ITS) to enhance traffic regulation and optimize traffic light control.

In logistics, the system allows for tracking vehicles, improving routes and delivery times. It can also be used in safety systems to prevent accidents. Overall, the project can be adapted for various needs, including police investigations and research on traffic analysis.

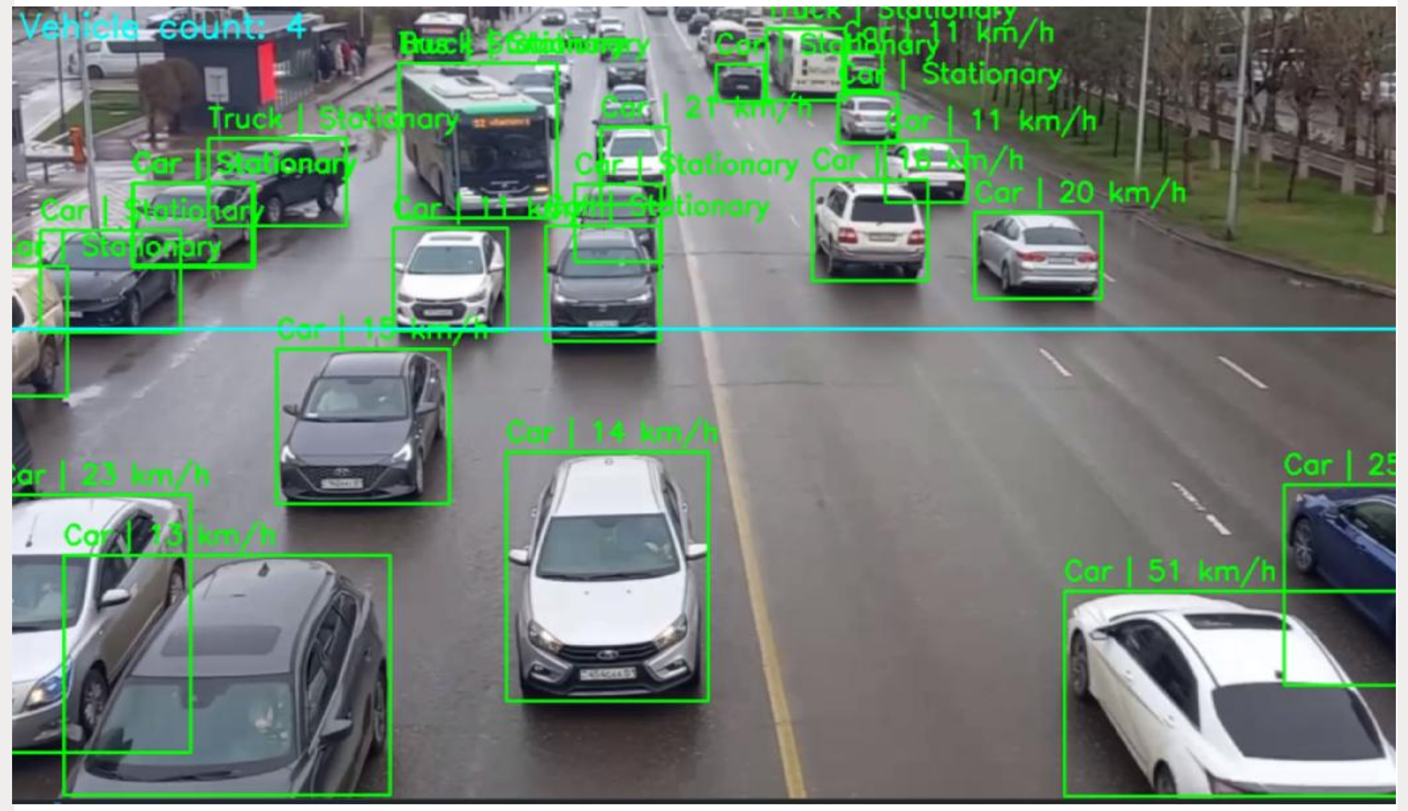
Fig 2. Vehicle distribution




## Results

The system is capable of identifying various types of vehicles, such as cars, buses, trucks, and motorcycles, tracking their movements across video frames, and calculating their approximate speed. Additionally, it counts the number of vehicles passing through a predefined virtual line, enabling basic traffic analysis.
The company from the UAE, Presight AI, will replace the Sergek surveillance system in Astana. In 2025, the company signed an agreement with the city's Akimat worth 190 million USD for the implementation of a "smart city" project, including traffic optimization and modernization of public services.

Fig 3. Example of a take a photo

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## Conclusion

The project developed a system for automatic detection, counting and measuring the speed of vehicles on video using the YOLOv10n model and the OpenCV library. Processing of frames with the counting of four types of objects was implemented: cars, motorcycles, buses and trucks. To estimate the speed, tracking of the center of the object between frames and conversion to kilometers per hour was used, taking into account the specified scale.

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Presentation

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