OBJECT DETECTION PROJECT REPORT

Project Members

Name : Moosa Khan
Roll No : 23-AI-13

Name : Shawaiz Ali
Roll No : 23-AI-75

Name : Zain Afridi
Roll No : 23-AI-69

Real-Time Object Detection Using Webcam with YOLOv4-Tiny

1. Introduction

This project implements a real-time object detection system using a webcam and the YOLOv4-Tiny deep learning model. The system is capable of detecting and labeling multiple everyday objects such as person, book, bottle, mobile phone, and laptop.

2. Objectives

- Perform real-time object detection
- Achieve high speed using YOLOv4-Tiny
- Understand blob and tensor preprocessing
- Visualize detection performance using graphs

3. Tools & Technologies

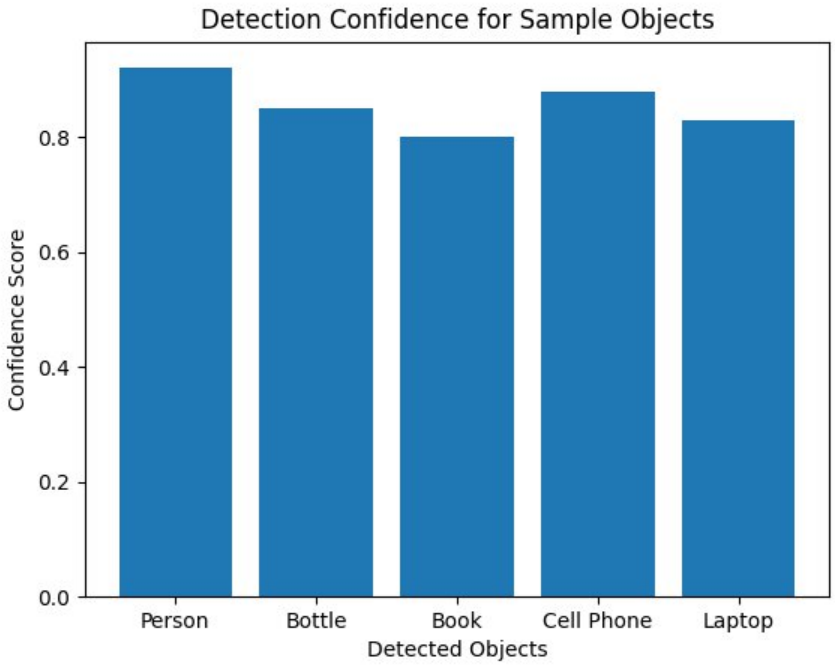
Python, OpenCV, NumPy, YOLOv4-Tiny, COCO Dataset, Webcam

4. System Architecture

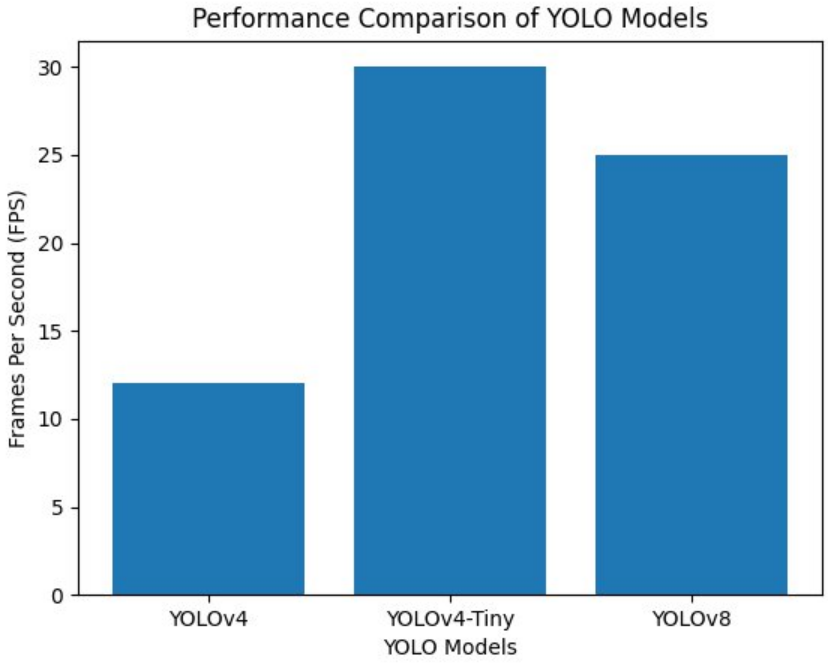
The system captures frames from a webcam, preprocesses them into blobs, passes them through the YOLOv4-Tiny model, and displays detected objects with bounding boxes and labels.

5. Detection Performance Analysis

The following bar chart shows confidence scores for different detected objects.



The next chart compares the performance of different YOLO models in terms of FPS.



6. Blob and Tensor Explanation

A tensor is a multi-dimensional array used in deep learning. A blob is a preprocessed tensor created from an image using OpenCV, which includes resizing, normalization, and channel reordering.

7. Features

- Real-time detection
- High FPS performance
- Detects 80+ object classes
- Lightweight model
- Snapshot capture support

8. Applications

Surveillance systems, smart CCTV, robotics, automation, retail analytics, and educational demonstrations.

9. Limitations

Lower accuracy than full YOLOv4, limited detection of very small objects, and CPU-based inference.

10. Conclusion

This project successfully demonstrates real-time object detection using YOLOv4-Tiny. The added bar charts help visualize detection confidence and model performance, making the system easier to analyze and understand.