Real-Time Object Detection Report

Implementation Overview

This project implements a real-time object detection system using the YOLOv8s pre-trained model from Ultralytics. The system captures live video from a webcam, performs inference on each frame, and displays bounding boxes with labels and confidence scores. All detections are run using GPU acceleration via PyTorch.

📊 Performance Summary

- **Total Frames:** 752
- **Average FPS:** 19.10
- **Unique Objects Detected:** 19
- **Objects Actually Presented:**
  `book, bottle, cat, cell phone, cup, hair drier, keyboard, laptop, person, remote, spoon, toothbrush`

🧪 Tested On

- OS: Windows 11
- GPU: NVIDIA GTX 1650 (Max-Q)
- Python: 3.10

The detections were visually verified in real time and confirmed to be accurate. Bounding boxes remained stable during movement and lighting changes. False positives were minimal.

Challenges Faced

- Slight lag when using higher-resolution frames
- Occasional misclassification due to overlapping objects or occlusion

Future Improvements

- Record confidence scores for each object
- Add object tracking across frames
- Experiment with YOLOv8n-int8 (quantized model) for higher FPS