

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.



Results

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



Tested On

- - OS: Windows 11
- - Python: 3.10.11
- - GPU: NVIDIA GeForce GTX 1650 with Max-Q Design
- - CUDA Version: 12.5 (system), using PyTorch with CUDA 11.8 build
- - PyTorch: 2.1.2 with CUDA 11.8 build
- - Ultralytics: 8.1.23
- - OpenCV: 4.9.0.80

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

- - Low FPS initially → Fixed by resizing frame to 640x480
- - Irrelevant detections → Validated actual object presence
- - `pip` and CUDA compatibility issues → Installed correct PyTorch build with cu118 support

Future Improvements

- - Add object tracking to follow objects across frames
- - Log confidence scores for analysis
- - Use TensorRT/ONNX version for even higher FPS
- - Display FPS and class confidence in real-time UI