

Object Detection with Real-Time Example

1. Introduction

This project demonstrates the design and training of an object detection model with real-time application. Object detection is a computer vision task that involves identifying and locating objects within an image or video.

2. Objective

To build and train a deep learning model capable of detecting multiple objects in real-time from a webcam feed or video stream. The system should draw bounding boxes and labels on detected objects.

3. Model Architecture

The model used for object detection can be YOLO (You Only Look Once), SSD (Single Shot Detector), or Faster R-CNN. For real-time performance, YOLOv5 is preferred due to its balance between speed and accuracy.

The model uses convolutional layers to extract features from images, followed by detection heads that predict bounding boxes and class probabilities.

4. Dataset and Training

Popular datasets for object detection include COCO, Pascal VOC, and custom datasets. The model is trained on annotated images using tools like LabelImg. Training is performed using frameworks like PyTorch or TensorFlow with suitable loss functions for classification and localization.

5. Real-Time Example

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After training, the model is deployed for real-time detection using OpenCV. A webcam feed is passed through the model, and the output is displayed with bounding boxes and class labels on detected objects. This is suitable for surveillance, autonomous driving, and smart robotics applications.

6. Conclusion

This project demonstrates how deep learning can be effectively used for object detection in real-time environments. By using models like YOLO, fast and accurate detection is possible, making it suitable for a wide range of practical applications.