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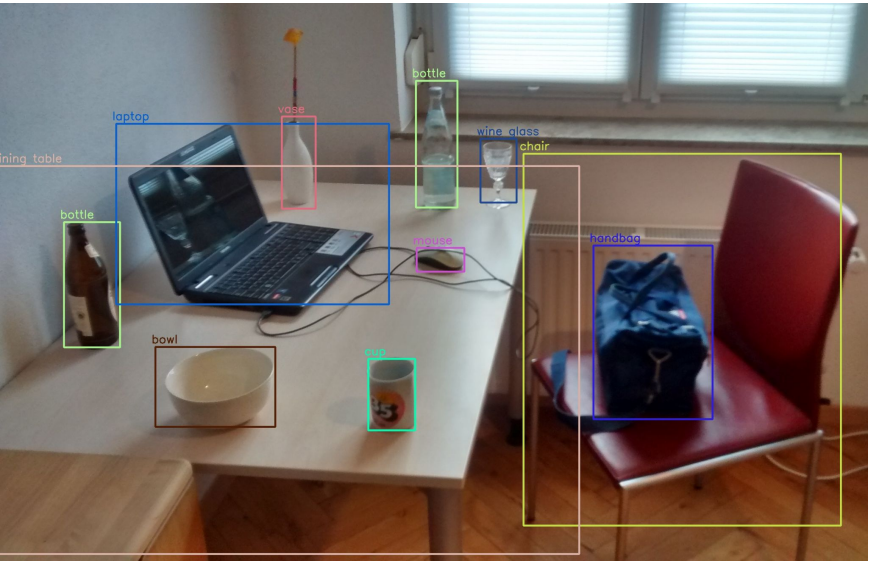
Agenda

- What is Object Detection?
- How does Object Detection work?
- Applications of Object Detection
- Challenges and Limitations
- Practical Demo of an Object Detection using YOLO v5

What is Object Detection?



Object detection is a computer vision task that involves identifying and localizing objects within an image or video. Unlike object recognition, which simply identifies the presence of an object, object detection also provides information about its location in the image.

Is this a dog?

Image Classification

What is there in image and where?

Object Detection

Which pixels belong to which object?

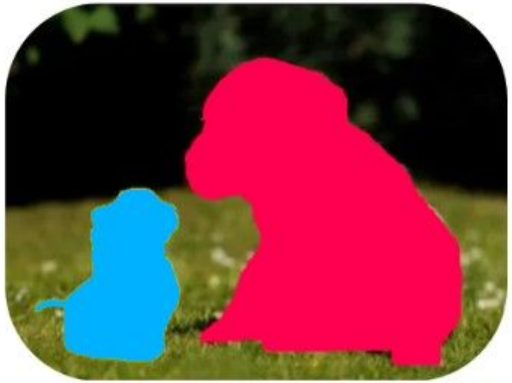


Image Segmentation

How does Object Detection work?

Object Detection: Deep learning algorithms and Feature-based methods.

Deep learning algorithms are a type of machine learning that use neural networks to learn from large datasets. These algorithms are capable of detecting objects in images with high accuracy, but require significant computational resources to train and run. Feature-based methods, on the other hand, rely on hand-crafted features such as edges, corners, and textures to identify objects. While less computationally intensive than deep learning algorithms, feature-based methods are often less accurate and require more manual tuning.

Some Object Detection Algorithms

- RCNN
- Fast RCNN
- Faster RCNN
- SSD
- YOLO

Some Object Detection Frameworks

- Ultralytics
- Detectron2
- Tensorflow 2.x Object Detection API

Applications of Object Detection

- Autonomous Vehicles
- Surveillance and Security
- Retail and E-commerce
- Healthcare
- Robotics and Industrial Automation
- Augmented Reality (AR)
- Sports Analytics

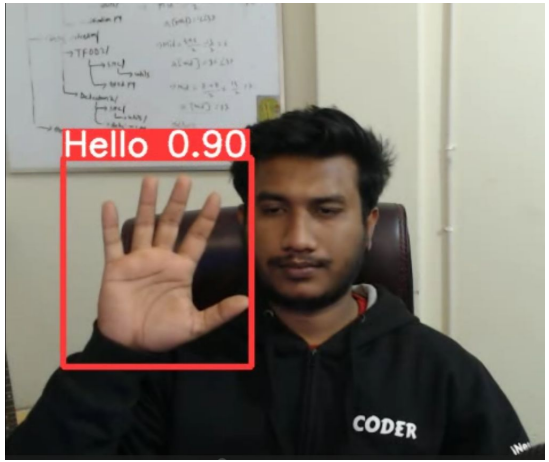
Challenges and Limitations

One of the biggest challenges in object detection is **achieving high accuracy while maintaining fast processing speeds.** This is especially important in real-time applications such as autonomous vehicles or surveillance systems where delays can have serious consequences. Researchers and developers are constantly working to improve algorithms and hardware to address these issues.

Another challenge is scalability, particularly when **dealing with large datasets or complex environments. As the number of objects to detect increases, so does the computational load required.** To address this, researchers are exploring distributed computing and parallel processing techniques to speed up detection times.

Practical Demo

Let’s build a **Sign Language Detection System** Using **Yolo v5**



American Sign Languages

Hello

I Love u

No

Please

Thank you

Yes