1. Introduction

Object detection is an important computer vision task used to detect instances of visual objects of certain classes (for example, humans, animals, cars, or buildings) in digital images such as photos or video frames.The goal of object detection is to predict a set of bounding boxes and category labels for each object of interest

Some application of object detection

Autonomous Vehicles: Object detection plays a critical role in enabling self-driving cars to perceive and understand their surroundings. It helps in detecting and tracking pedestrians, other vehicles, traffic signs, traffic lights, and obstacles to ensure safe navigation.



Surveillance and Security: Object detection is widely used in video surveillance systems for detecting and tracking suspicious activities, unauthorized objects, and intruders. It can be employed in airports, banks, public spaces, and other high-security areas.



Industrial Automation: Object detection is employed in industrial settings for quality control, object sorting, and robotic automation. It can identify defects in manufactured products, sort items based on specific criteria, and guide robots in picking and placing objects.



Object detection is general categorized into 2 type: Two-Stage and One-Stage



Two-Stage object detection:

In the first stage, the region proposal network (RPN) generates a set of candidate object bounding boxes, called region proposals, based on predefined anchor boxes and convolutional feature maps.

In the second stage, these proposed regions are refined and classified by a classifier to determine the object class and location more accurately.

Two-stage detectors tend to have higher accuracy but are generally slower in terms of inference time due to the two-stage process.

One-Stage object detection

These methods divide the input image into a grid of cells and generate a fixed number of bounding boxes (anchors) per cell with different scales and aspect ratios.

Each bounding box predicts the class probabilities and offsets for refining the box coordinates.

One-stage detectors are faster compared to two-stage .However, they might sacrifice some accuracy, especially for small objects or overlapping instances



2