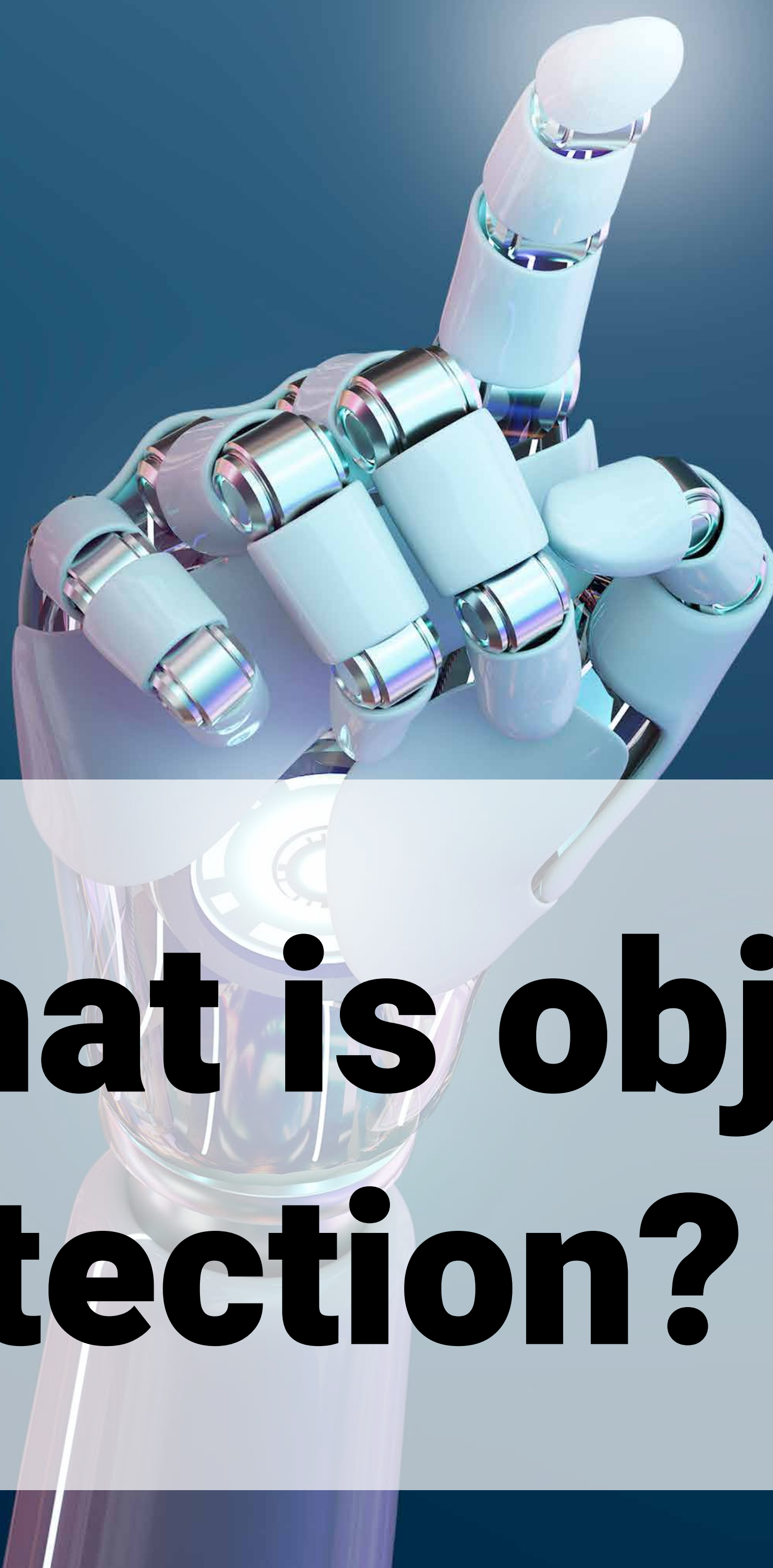# What is object detection?

What is object detection?

Over the past decade, deep learning has drawn much greater attention, and become an imperious technology in the Artificial intelligence area. Object detection is considered one of the noteworthy areas in deep learning and Computer vision. Object detection has been determined by numerous applications in computer vision such as object tracking, retrieval, video surveillance, image captioning, Image segmentation, Medical Imagine and several other applications as well. In this article, we are going to be understanding all the fundamental things about object detection. So, Let's get started.

1. What is Object Detection?

Object Detection is a technology of deep learning where things, human, building and cars can be detected as objects in image and videos.
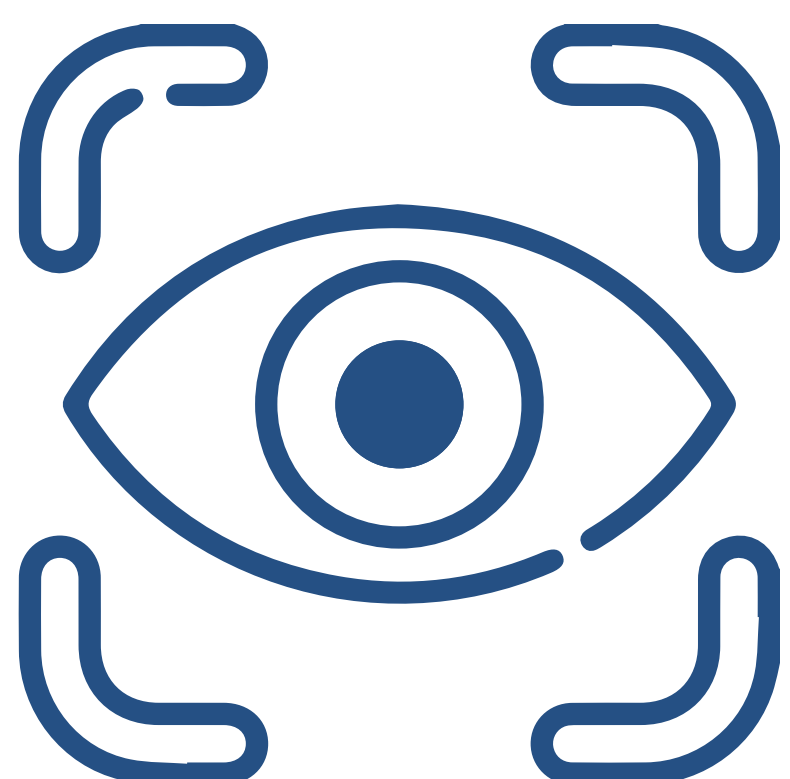

Fig 2. Classification, Object Detection and Segmentation Representation

Object detection is merely to recognize the object with a bounding box in the image, where in image classification, we can simply categorize(classify) that is an object in the image or not in terms of the likelihood(Probability).

2. Machine learning and Deep learning base object Detection.

Machine learning based object detection method has to extract the feature manually by using the Image based feature extraction technique such as Histogram of oriented gradients(HOG), Speeded-up robust features(SURF), Local binary patterns (LBP), Haar wavelets, Color histograms, etc.

3. How it works?

Before exploring object detection, we need to know the image classification. Image Classification is provided with a lot of material to study, and you may have implemented it all through a tutorial at least once. When an image is an input to the CNN, the problem of classifying the class corresponding to the image is known as image classification, and as shown in the figure below, probability values for all targeted classes are output.

You can think of Object Detection as a problem in which an image classification task has a regression task that predicts the position of an object using a bounding box. Problem of Object detection has assumed that multiple classes of objects may exist in an image at same time. We can also visualize this like two types of problems: one is multi label classification (multiple class in one image)
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Bounding Box (Regression Problem) in which we have to predict the coordinates values of the bounding box in terms of x,y,w,h.
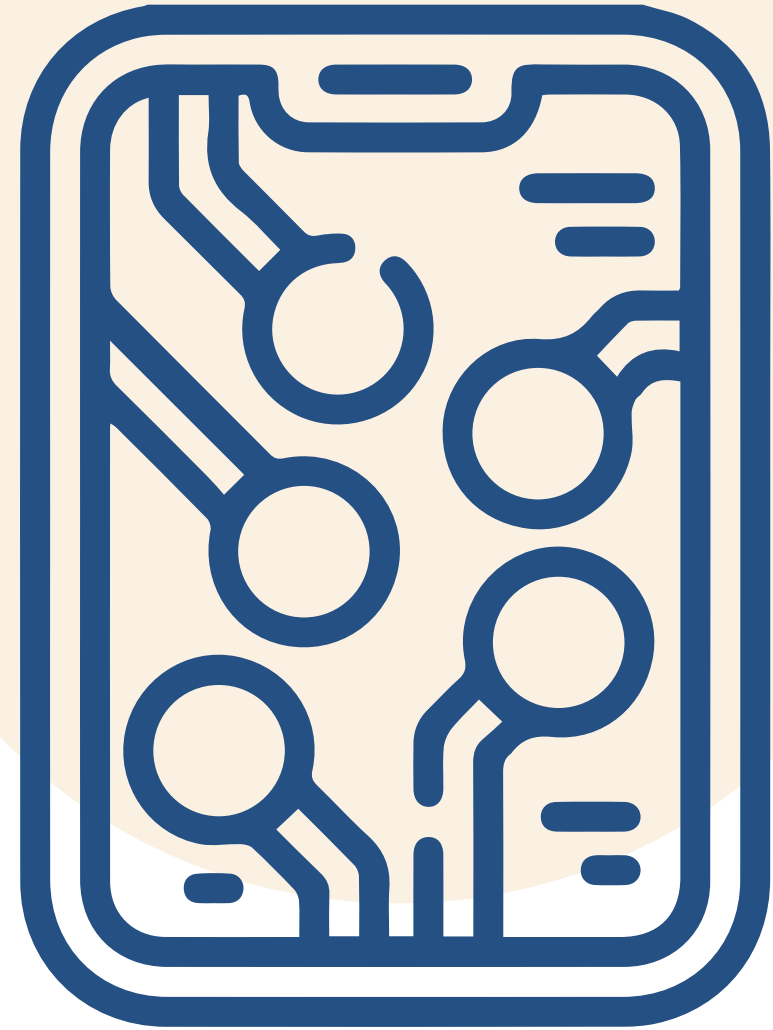
4. Object Localization

The task of object localization is to predict the object in an image as well as its boundaries. The difference between object localization and object detection is subtle. Simply, object localization aims to locate the main (or most visible) object in an image while object detection tries to find out all the objects and their boundaries.

An image classification or image recognition model simply detects the probability of an object in an image. In contrast to this, object localization refers to identifying the location of an object in the image. An object localization algorithm will output the coordinates of the location of an object with respect to the image. In computer vision, the most popular way to localize an object in an image is to represent its location with the help of bounding boxes.