**Object Detection Using**

**Artificial Intelligence**

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**INTRODUCTION**

We have chosen the topic “Object Detection system” and we would like to implement a tool which detects the different objects present in image and classifies them (as dog or human etc.) with a bounding box around them. And this system detection can play a major role in our daily life and makes our work simple and reduces human effort.

Our main motivation to select this topic is in present era with the rapidly growing importance in military and security applications visual surveillance has become a necessary area of research for improvement . It is very hard for human operators to monitor for long durations to identify the important events in real-time .But using this system we can detect the objects in the images of the video continuously in the military area to detect any suspicious activity. And it can be also used in many other areas. This gives us the interest to select this project.

We humans mostly can detect the objects we see in an image but for computer vision it is difficult to detect the object. Computer vision involves working with digital images and videos to deduce some understanding of contents within these images and videos. Computer vision cannot perform complex tasks like identifying multiple objects and detect obstacles. But now-a-days with the availability of large amounts of data, faster GPUs, and better algorithms, we can now train computers to detect and classify multiple objects within an image with high accuracy. Object detection is associated with Computer Vision.

The main aim of object detection is to determine where objects are located in a given image (object localization) and which category each object belongs to (object classification). Object localization refers to identifying the location of one or more objects in an image and drawing the box around their extent. Object classification involves identifying the class of one object in an image. Object detection combines these two tasks and identifies and classifies one or more objects in an image. With this kind of identification and localization, object detection can be used to count objects in a scene and determine and track their precise locations, all while accurately labeling them.

As one of the fundamental computer vision problems, object detection is able to provide valuable information for good understanding of images and videos, and is related to many applications, including image classification, human behavior analysis, face recognition, autonomous driving, video surveillance, and healthcare.

**Literature Survey**

We have taken the research paper “Object Detection with Deep Learning” for our project.

The first object detector came out in 2001 and was called the Viola Jones Object Detector .Although, it was technically classified as an object detector, it was primary used for facial detection. It provided a real time solution and was taken by many computer vision libraries at the time. Deep Learning

Research moving forward at a fast pace, new discoveries and

Algorithms have led to disruption of numerous fields. Object detection has been affected by Deep Learning in a Substantial way .The first Deep Learning object detector model was called the Over feat Network which used Convolutional Neural Networks (CNNs) along with a sliding window approach. It classified each part of the image as an object/non object and subsequently combined the result to generate the final set of predictions. This method of using CNNs to solve detection led to new networks being introduced which pushed the state of the art even further.

There are currently two methods of constructing object

Detectors- the single step approach and the two-step approach. The two step approach has achieved a better accuracy than the former whereas the single step approach has been faster and shown higher memory efficiency. The single step approach classifies objects in images along with their locations in a single step. The two step approach on the other hand divides this process into two steps. The first step generates a set of regions in the image that have a high probability of being an object. The second step then performs the final detection and classification of objects by taking these regions as input. These two steps are named the Region Proposal Step and the Object Detection Step respectively.

In these years some methods are developed for object detection. But currently the most popular methods are Faster RCNN and YOLO .Faster R-CNN is a two-step approach which is used for object detection. Faster R-CNN is one of the state-of-art object detection methods, approaches real time application. Moreover, computational impends on model and image crop size, yet accuracy is like-wise influenced.

YOLO (you only look once) is a simple single convolutional network which works is that we take an image and split it into an SxS grid, within each of the grid we take m bounding boxes. For each of the bounding box, the network outputs a class probability and offset values for the bounding box. Yolo trains on full images and directly optimizes detection performance. This unified model has several benefits over traditional methods of object detection. Yolo is extremely fast. Since we frame detection as a regression problem we don’t need a complex pipeline. We simply run our neural network on a new image at test time to predict detections.

With these methods we train system with different datasets to detect objects. And we will explore more about this and create a system which detects object in an image by bounding around them and classifies to which class it belongs to.

**Advantages**:

It has broad application prospects in many areas .It can accurately identify and track multiple instances of a given object in a scene, this helps to automating video surveillance systems. This models are capable of tracking multiple people at once, in real-time, as they move through a given scene or across video frames.

Crowd counting is another valuable application of object detection. For densely populated areas like theme parks, malls, and city squares. Real-time car detection models are to the success of autonomous vehicle systems.

In future with much more development .we can use in many more fields. Agriculture, for instance, a custom object detection model could accurately identify and locate potential instances of plant disease, allowing farmers to detect threats to their crop yields that would otherwise not be visible to the naked human eye.

**References:**

1. Object Detection with Deep Learning by Zhong-Qiu Zhao, Peng Zheng (research paper) .
2. A Survey of Modern Object Detection Literature using Deep Learning by karanbir Chahal and Kuntal Dey