

# OBJECT DETECTION IN AN IMAGE USING CONVOLUTIONAL NEURAL NETWORK

Roshini. M<sup>1</sup>, Sathyapriya. S<sup>2</sup>, Deepa. K<sup>3</sup>

<sup>1,2</sup>Student, Dept. of Information Technology, Sri Ramakrishna Engineering College, Tamilnadu, India

<sup>3</sup>Assistant Professor (Sr. Grade), Dept. of Information Technology, Sri Ramakrishna Engineering College, Tamilnadu, India

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**Abstract** - Nowadays, computer vision plays the major role for identifying the objects in the real world scenarios such as face detection, face recognition and video object co-segmentation. It is also used in tracking objects, for example tracking a ball during a football match, tracking movement of a cricket bat, tracking a person in a video. This project deals with the object detection in an image. The system detects the people, vehicle, and some other objects. This is done by the OpenCV python library and imageAI python library. Since the system uses the training set containing different images of people and vehicles, it is used in many use cases such as detecting person's face and monitoring traffic and thefts in roads accurately.

**Keywords:** computer vision, object detection, ImageAI

## 1. INTRODUCTION

One of the important fields of Artificial Intelligence is Computer Vision. Computer Vision is the science of computers and software systems that can recognize and understand images and scenes. Computer Vision is also composed of various aspects such as image recognition, object detection, image generation, image super-resolution and more. Object detection is probably the most profound aspect of computer vision due to the number of practical use cases.

Object detection refers to the capability of computer and software systems to locate objects in an image/scene and identify each object. In this project, object detection is used for face detection, vehicle detection, pedestrian counting and security systems.

## 2. PROBLEM DEFINITION

Early implementations of object detection involved the use of classical algorithms, like the ones supported in OpenCV, the popular computer vision library. However, these algorithms could not achieve enough performance to work under different conditions.

Using these methods and algorithms, based on deep learning which is also based on machine learning require lots of mathematical and deep learning frameworks understanding. Computer programmers and software developers needs to integrate and create new

products that uses object detection. But this technology is kept out of their reach due to the extra and complicated path to understanding and making practical use of it.

Therefore, the new python library called ImageAI along with the R-CNN is used to solve this problem. The R-CNN refers to the Convolutional Neural Network which is used for feature extraction from the image in which R standing for Region, is for object detection..

## 3. RELATED TECHNOLOGY

### 3.1. ImageAI

A python library built to empower developers to build applications and systems with self-contained Deep Learning and Computer Vision capabilities using simple and few lines of code. ImageAI supports a list of state-of-the-art Machine Learning algorithms for image prediction, custom image prediction, object detection, video detection, video object tracking and image predictions trainings. ImageAI currently supports image prediction and training using 4 different Machine Learning algorithms trained on the ImageNet-1000 dataset. ImageAI will provide support for a wider and more specialized aspects of Computer Vision including and not limited to image recognition in special environments and special fields.

### 3.2 OpenCV:

OpenCV (Open source computer vision) is a library of programming functions mainly aimed at real time computer vision. It supports deep learning frameworks TensorFlow, Torch or PyTorch and Caffe. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products. OpenCV-Python makes use of Numpy, which is a highly optimized library for numerical operations with a MATLAB-style syntax. All the OpenCV array structures are converted to and from Numpy arrays.

### 3.3 Tensorflow

Tensorflow is an open source artificial intelligence library, using data flow graphs to build

models. It allows developers to create large-scale neural networks with many layers. TensorFlow is mainly used for Classification, Perception, Understanding, Discovering, Prediction and Creation. It is a Python library for fast numerical computing created and released by Google. It is a foundation library that can be used to create Deep Learning models directly or by using wrapper libraries that simplify the process built on top of TensorFlow.

#### 4. METHODOLOGY

The dependencies such as Numpy, Tensorflow, Keras, Pillow and ImageAI library are downloaded. The pre-trained keras model file is downloaded. This model file is composed of the parameters and relationships between the image and the labels extracted during the training phase. During testing phase, these parameters are used to map the labels to the objects or features extracted from the input image. Then, the ImageAI object detection class library is imported. Then, the python `os` class is imported and defined a variable to hold the path to the folder for the python file, keras model file and images.

Object detection class is defined and the model type is set to RetinaNet. The model path is set to the path of the RetinaNet model, and the model is loaded into the object detection class. The detection function is called and parsed in the input image path and the output image path.

The system iterates over all the results returned by the `detector.detectObjectsFromImage` function. Then print out the name and percentage probability of the model on each object detected in image.

ImageAI supports many powerful customization of the object detection process. One of it is the ability to extract the image of each object detected in the image. By simply parsing the extra parameter `extract_detected_objects=True` into the `detectObjectsFromImage` function. The object detection class will create a folder for the image objects, extract each image, save each to the new folder created and return an extra array that contains the path to each of the images.

#### 5. SCREENSHOTS



Fig-1 Original Image

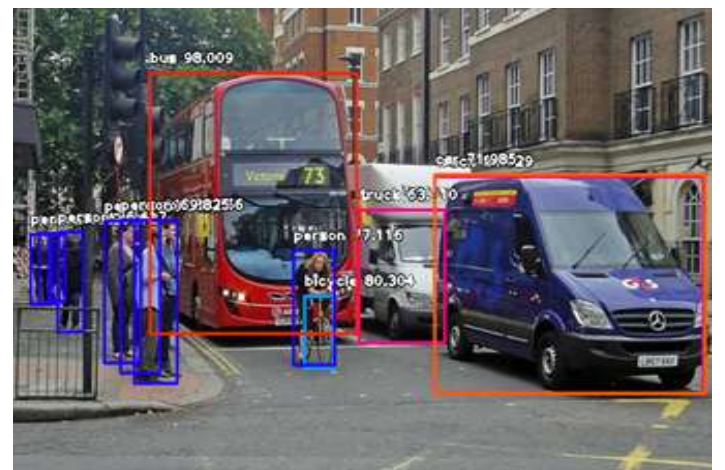


Fig-2 Object Detected Image

#### ADVANTAGES AND DISADVANTAGES

##### ADVANTAGES

- Since the training dataset is high, it accurately predicts the objects in the images.
- The user need not train for every input image, since it matches the features with already available parameters in the model file.

##### DISADVANTAGES

- Since the large dataset is required for achieving high accuracy, training takes long time.

**CONCLUSION**

Thus the system detects the objects in the real world more accurately and fastly using the ImageAI and OpenCV python library. This system can be used for face detection, vehicle detection, pedestrian counting and security systems

**REFERENCES**

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