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# Object Detection Using Deep Learning

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**ABSTRACT-** Due to object detection's close relationship with video analysis and image understanding, it has attracted much research attention in recent years. Traditional object detection methods are built on handcrafted features and shallow trainable architectures. Their performance easily stagnates by constructing complex ensembles which combine multiple low-level image features with high-level context from object detectors and scene classifiers. With the rapid development in deep learning, more powerful tools, which are able to learn semantic, high-level, deeper features, are introduced to address the problems existing in traditional architectures. These models behave differently in network architecture, training strategy and optimization function, etc. In this project, we provide a review on deep learning based object detection frameworks. Our review begins with a brief introduction on the history of deep learning and its representative tool, namely Convolutional Neural Network (CNN). Then we focus on typical generic object detection architectures along with some modifications and useful tricks to improve detection performance further. As distinct specific detection tasks exhibit different characteristics, we also briefly survey several specific tasks, including salient object detection, face detection and pedestrian detection. Experimental analyses are also provided to compare various methods and draw some meaningful conclusions. Finally, several promising directions and tasks are provided to serve as guidelines for future work in both object detection and relevant neural network based learning systems.

**Keywords:** Objects, Deep Learning, CNN and image Processing .

## I. INTRODUCTION

**Background**

Object detection, one of the foremost basic and difficult issues in laptop vision, seeks to find object instances from an outsized range of predefined classes in natural pictures. Deep learning techniques have emerged as a robust strategy for learning feature representations directly from information and have LED to exceptional breakthroughs within the field of generic object detection. As a long, basic and difficult drawback in laptop vision, object detection has been a full of life space of analysis for many decades. The goal of object detection is to detect all instances of objects from a famous category, like individuals, cars or faces in a picture. The main objective of the item detection is it permits a North American nation to spot and find objects in a picture or video by victimisation may be a laptop vision technique. With this sort of identification and localization, object detection is wont to count objects in a very scene and confirm and track their precise locations, all whereas accurately labeling them..

**Research Objective**

The **goal of object detection** is to **detect** all instances of **objects** from a known class, such as people, cars or faces in an image.

**Research Question**

This research addresses the problem faced in achieving higher accuracy for identifying objects which will help for better decision making.

**Research Question:** How well can objects be classified from a dataset using deep learning techniques and classification algorithms with limited computation power for achieving higher

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accuracy?

**Problem Statement: Problem**- Object detection is typically thought-about to be tougher than image classification, notably attributable to these with high accuracy by applying deep learning techniques.

## II. METHODOLOGY

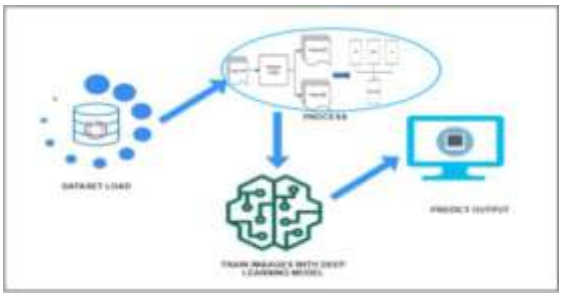

**Fig1: Methodology**

Download and explore the dataset-

- Importing (or installing) Keras, Tensorflow , OpenCV and other packages on system
- Load dataset from disk
- Create training and testing splits
- Create model
- Compile and save the model
- Train the model on training data (split)
- Evaluate the model on test data (split)
- Prediction on new data using trained model

## III. TECHNOLOGY DECISIONS

In this section, we can see the details of the technologies that are used for this project.

Python: Python is a high level interpreted language used for general purpose programming. It is widely used for scientific computing and can be used for a wide variety of general tasks from data mining to software development. Python is the main language used for this project.

Numpy: Numpy is a library in Python that allows for efficient numerical computing in Python. This library is highly optimized to do mathematical tasks. In the project workflow Numpy is heavily used in data pre-processing and preparation. One of the main features about Numpy is it's highly efficient n-dimensional array (ndarray). Compared to a list in Python a Numpy array can be n-dimensions and has more features associated with the ndarray. Numpy can also perform more efficient mathematical operations compared to the math library in Python.

Pandas: Pandas is also a library in Python, like numpy is also used for data pre-processing and preparation. One of the main features about pandas is the DataFrame and Series data structure. These data structures are optimized and contain fancy indexing that allow a variety of features such as reshaping, slicing, merging, joining etc to be available. Pandas and Numpy are extremely powerful when used together for manipulating data.

Matplotlib: Matplotlib is a Python plotting library that allows programmers to create a wide variety of graphs and visualizations with ease of use. The great feature about Matplotlib is that it integrates very well with Jupyter Notebook and creating visualizations is simplified. Matplotlib also works very well with pandas and numpy.

OpenCV: OpenCV (Open Source Computer Vision) is a well established computer vision library which is written in

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C/C++ and has been abstracted to interface with C++, Python and Java. This is a powerful tool when working with images and has a myriad of tools regarding image data manipulation, feature extraction, etc.

Tensorflow: Tensorflow is an open source deep learning library by Google. It was originally developed by Google's engineers who were working on Google Brain and has been used for research on machine learning and deep learning. Tensorflow at its core is about computations of multidimensional arrays called tensors but what makes Tensorflow great is its ability to be flexible to deploy computations on different devices such as CPU's and GPU's.

Keras: Keras is also a Deep Learning Framework that abstracts much of the code in the other Frameworks like Tensorflow and Theano. Compared to the other frameworks Keras is more minimalist.

Jupyter Notebook IDE: Jupyter Notebook is an open source software IDE that allows developers to create and share documents that contain live code and more.

## IV. SYSTEM ARCHITECTURE

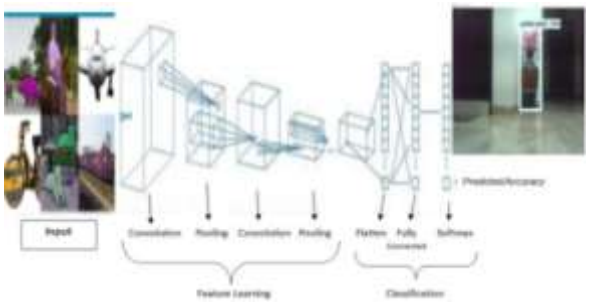

**Fig 2 : System Architecture**

In the proposed procedure, CNNs are applied to detect and classify objects from dataset Convolution Neural Networks is a sort of deep learning paradigm applied for processing data which has a grid pattern like images; it is all about using Deep Learning with Computer Vision. A good way to gain foreknowledge about this technique is to imagine a Neural Network Architecture also how it is practiced to visual tasks i.e. Video and Images. Furthermore, the Convolution Neural Networks is an important technique used for Object Recognition; create Facial Recognition, Self-Driving Cars. A Convolution Neural Network is a Deep Learning algorithm that can take in an image as input, with assigning important learnable weights and biases to various objects inside this image and be capable of differentiating one from the other. In addition, the preprocessing required for this technique is much lower if compared with other classification algorithms. The role of the CNN is for reducing the images without losing features that are important for getting a good prediction. A typical CNN consists of three types of operation layers: the convolution layer (CONV), the pooling layer (POOL), and finally the classifier layer (FC), as exemplified in the figure.

## V. RESULTS


**Fig 3: Potted Plant**

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**Fig 4: Cell Phone**

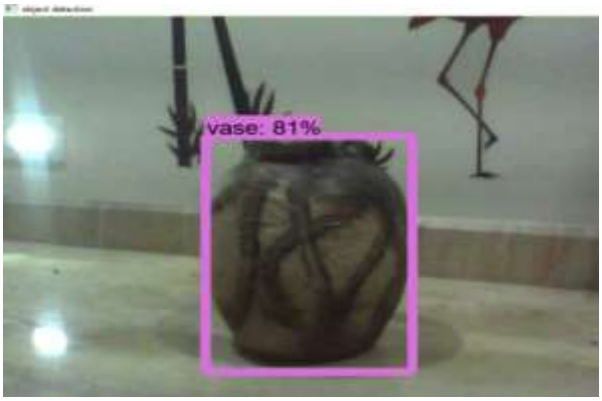


**Fig 4: Vase**

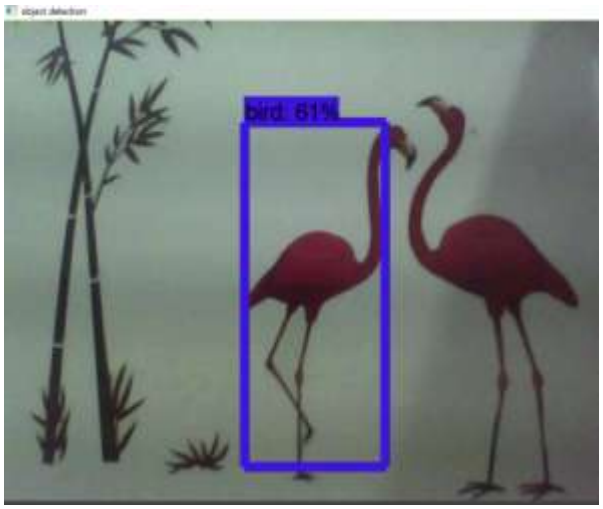


**Fig 3: Bird**

## VI. CONCLUSION

Considering all the related work mentioned above it can be Observed that building an efficient and effective classification system two different machine learning algorithms have been studied to achieve optimum results and high accuracy rate.Object detection models have different approaches based on the relevant and the size of the data. It can be seen that deep learning models such as CNN need to have data in large volume to perform well whereas models like ANN. The Deep learning methods used for classification where the system is trained with large datasets to identify the type of cancer with its size and shape. This Project goal is to improve a CNN deep learning model to classify lung cancer nodules successfully with high accuracy. By applying deep learning techniques such as Convolutional Neural Network (CNN), In the future, develop innovative tools that can detect Objects with high risk of sensitivity and specificity. To enhance the performance of the proposed model by raising the number of images in the used datasets, increasing the training epochs and using other deep learning techniques.

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