Chapter 12
A Similarity-Based Object Classification Using Deep Neural Networks

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ABSTRACT

This chapter proposes a hybrid method for classification of the objects based on deep neural network and a similarity-based search algorithm. The objects are pre-processed with external conditions. After pre-processing and training different deep learning networks with the object dataset, the authors compare the results to find the best model to improve the accuracy of the results based on the features of object images extracted from the feature vector layer of a neural network. RPFOREST (random projection forest) model is used to predict the approximate nearest images. ResNet50, InceptionV3, InceptionV4, and DenseNet169 models are trained with this dataset. A proposal for adaptive finetuning of the deep learning models by determining the number of layers required for finetuning with the help of the RPForest model is given, and this experiment is conducted using the Xception model.

1. INTRODUCTION

Machine Learning has a specialized branch called Deep learning. In machine learning features which are relevant are extracted manually from the images. From the extracted features, various objects in an image is to be classified by creating a model. In different to machine learning process,deep learning automatically extracts relevant features from the images and also it achieves "end-to-end learning" in which network is trained and then learned to do classification automatically by giving raw data. Machine learning support two types of learning paradigms i) Supervised Learning and ii) Unsupervised Learning (Agrawal, Carreira, & Malik, 2015). Supervised Learning is categorized into Classification and Regression. Support Vector Machine, Discriminant Analysis,Naïve Bayes, Nearest Neighbor and Neural Networks

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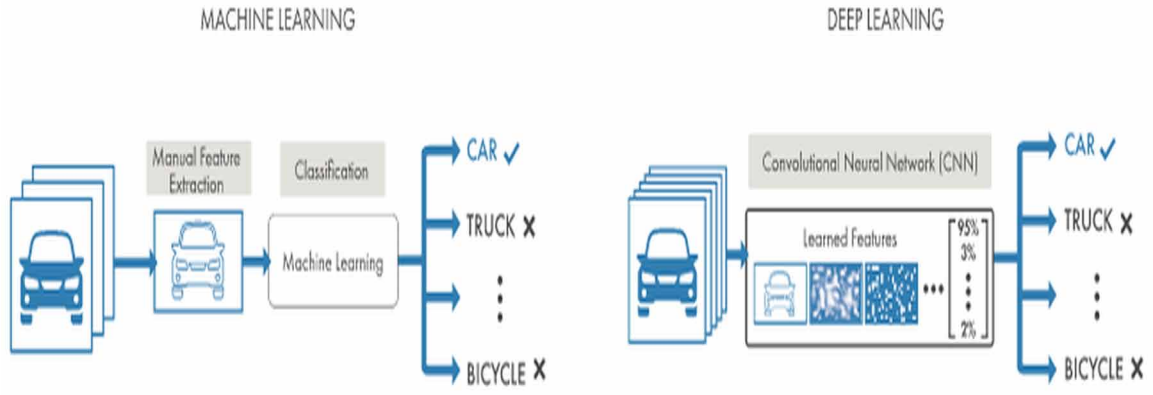
Figure 1. Difference between machine learning and deep learning



are the major classification algorithms in machine learning. Under Regression Model, Linear Regression, Generalized Linear Models, Support Vector Regressor, Ensembling methods, and Decision Tree are known methods. Similarly, Kmeans, Kmediods, Fuzzy C- means, Hierarchical, Gaussian Mixture, Hidden Markov Model are the famous clustering algorithms. Another key contrast appeared in Figure 1. is a profound learning calculations scale with information, though shallow learning coverages. Shallow learning alludes to machine learning strategies that level at a specific level of execution when clients include more illustrations and training data to the system. The major pro of deep learning networks is it's directly proportional to the size of data i.e networks endure to expand as the size of data rises.

Python and the Keras library of deep learning is used to pre-train the dataset by which1000 various catagories of objects and other objects in real time environment can be recognized with high accuracy. This chapter consists of 8 sections. Section 2 describes about the various deep learning image classifiers, Section 3 elaborates various search techniques, Section 4 explains the Approximate Nearest Neighbor Search with Random Projection Forest Building an ANN Search Tree. Section 5 deals with Fitness-Scaled Chaotic Artificial Bee Colony (FSCABC) algorithm, Section 6 gives about Classification of Objects Using Multiclass Support Vector Machine and Computer Vision, Section 7 explains the Automatic Object classification using random forest algorithm and Section 8 is the Conclusion

2. DEEP LEARNING IMAGE CLASSIFIERS

ImageNet

Different types of research are being carried out for object classification, especially computer vision uses this ImageNet which has the collection of 23,000 separate object categories discussed by He, K., Zhang (2015). In the context of deep learning and Convolutional Neural Networks, it can be called as Imagenet Large Visual Recognition Challenge (ILSVRC). The Objective of this task is to prepare a prototype which accurately arrange the picture into 1000 different object categories. About 1.2 million of pictures are considered as training phase and 50,000 pictures are taken for approval and 100,000 pictures utilized for testing. The full rundown of questionable classifications is given in Imagenet Large Visual Recognition Challenge(ILSVRC). The cutting edge pre-trained networks incorporated into the Keras

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