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Transfer Learning Based Neural Network for Object Detection

[1]Dr.N.R.Gayathri, [2] Mr.T.B.Dharmaraj, [3]Mrs.K.Sona, [4] Mrs.S.Vasumathikannaki, [5]Dr. A.Kodieswari

[1]AssociateProfessor, Department of Artificial Intelligence and data science, Christ The King Engineering College, Karamadai, Coimbatore.

[2]AssociateProfessor, Department of Computer Science and Engineering, Christ The King Engineering College, Karamadai, Coimbatore.

[3]AssistantProfessor, Department of Computer Science and Engineering, Christ The King Engineering College, Karamadai, Coimbatore.

[4]AssistantProfessor, Department of Computer Science and Engineering, Christ The King Engineering College, Karamadai, Coimbatore.

[5]Associate Professor, Department of Artificial Intelligence and Machine Learning, Bannari Amman Institute of Technology, Sathyamangalam.

Abstract

Computer vision is a field of study that focuses on how computers can interpret and analyze visual information from the world around us. This includes tasks such as image and video recognition, object detection, facialrecognition and scene reconstruction.Therefore, video analysis and understandingthe images has become necessary and challenging issue. This study aimed at presenting the model based on benchmark MSCOCO datasetof image data. Highly accurate object detection-algorithms and architectures such asFaster R-CNN, Mask R-CNN with backbone architectures Resnet, Inception and ResNeXt are fast yet highly accurate ones like YOLOv3 and YOLOv4 captures both low-level and high-level features. These models exhibit different behaviors in terms of network architecture, training methods, and optimization techniques, etc. Each and every object in an image is identified by the area object in a highlighted rectangular boxes and tag is assigned to each and every object.The accuracy in detecting theobjects is checked by different parameters such as accuracy, frames per second(FPS) and mean average precision (mAP). Also, the performance of the presented model with YOLOv4 andDarknet-53as a backbone architecture for transfer learningor fine-tuned for specific computer vision taskachieves 49.2% mAP, which outperforms the baseline by 3.8%.

Keywords: R-CNN, YOLOv3, YOLOv4, ResNeXt, CNN, SVM, HMMs, DarkNet, EfficientNet.

Introduction

In computer vision, pattern recognition techniques are often used to analyze visual data and extract useful features that can be used for tasks such as object detection and image classification. These techniques include machine learning algorithms such as neural networks, decision trees, and support vectormachines [1].While vision focuses specifically on visual data, pattern recognition techniques can be applied to a wide range of data types.

The goal of computer vision is to enable computers to understand and interpret the visual world in the same way that humans do [2]. This involves developing algorithms and techniques that can identify and classify objects in images and videos, recognize patterns, and perform other visual tasks.It is used in a wide range of applications, including medical imaging, robotics, autonomous vehicles [3], surveillance and entertainment. For example, computer vision is used in self-driving cars to detect and identify objectssuch as pedestrians, traffic signsand other vehicles.

The development of computer vision has been made possible by advancements in artificial intelligence and machine learning which enable computers to learn from large amounts of data and improve their performance over time. Computer vision also draws on techniques from other fields, such as mathematics, statistics and computer science to develop algorithms and models that can analyze and interpret visual data.Computer vision works by using algorithms