International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Classification And Detections Using Yolov5

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Abstract
Object detection is a growing field of research in the field of computer vision. The ability to identify and classify objects, either in a single scene or in more than one frame, has gained huge importance in a variety of ways, as while operating a vehicle, the operator could even lack attention that could lead to disastrous collisions. In this article, we present the object detection application of YOLOv5, including the detection of people, vehicles, and animals in various environments. Test the performance of the method on the PASCAL VOC dataset and make it clearer and faster compared to YOLO's previous model. Our outcome shows that YOLOv5 achieves good modern performance for a variety of sensing applications, including surveillance, robotics, and autonomous driving. Overall, this article demonstrates the potential of YOLOv5 to be an excellent tool for object detection in real-world applications.

Keywords: Object detection, PASCAL VOC dataset, YOLOv5.

Introduction

Today's Technology has made our work easier and better. Advancement in Artificial Intelligence and computer vision has made our work simple. The Artificial Intelligence is employed in systems to make work run accurately. Object Recognition is a project constructed using ai technologies to make intelligent systems.

YOLO is a desired family of object detection technology that uses deep CNN algorithm to perform real-time detection. The You Only Look Once algorithm detects objects by using splitting the input photo into a grid and detecting bounding boxes and sophistication probabilities for each grid square. YOLO also utilizes novel loss function that unite localization and classification errors, allowing it to handle overlapping objects and improve the accuracy of detection.

The application here is designed with supervised learning concept which helps in achieving object detection in much faster way in real time. Here, we present an implementation of YOLOv5 an improvised version of yolo released by ultralytics company to perform object detection tasks. The YOLOv5 uses a novel architecture based on a hybrid backbone network that combines features from different levels of abstraction, allowing it to detect objects with high accuracy and efficiency. YOLOv5 also includes several optimizations, including a new anchor box design, feature pyramid network, and improved training techniques, which further improve its performance.

Architecture

Yolov5 internally is a single stage object detection model and the model is mainly composed of three components namely Backbone, Neck and Head. The Backbone performs feature extraction with spatial resolution, Neck performs Feature pyramid pooling and Head assigns class scores and final class probability. Here, we explain the modules to perform object Detection in real time.

Modules

1.Data Collection

The Dataset is a PASCAL VOC which is used here. This Dataset has been widely used in past research related to object detection. The PASCAL VOC has wide variety objects with good annotations.

2.Preprocessing

Preprocessing of data is labelling with class labels and splitting the data into training and testing phase.

3.Evaluation

Installing the necessary requirements and configuring the environment. The Yolov5 repository is cloned and it is trained with the pre-processed data.

4.Predictions

The Predictions are exported to the Web Application.

5.User Interface

The User Interface is designed to make real time predictions with the model.

Improvements

1. The Yolov5 involves FOCUS LAYER which reduces number of parameters internally helps in reducing memory and helps run application better compared to previous versions of Yolo. The map is improved.
2. The Grid Sensitivity problem is addressed in version v5 which is eliminating Grid Sensitivity by proposing new equation which address the problem of bounding box on image corners and also it addresses the height and width problem which is resulted when an image is scaled.
3. The running environment of Yolov5 is improved by using Pytorch while the previous darknet framework used c implementation which is an advantage in the present version.

Conclusion and Future Work

We implemented the yolov5 algorithm. Then, Designed web application for the same. Finally, the result displays the confidence score of the predicted image. The score has been improved compared to previous algorithms.

YOLOv5 represents a significant step forward in object detection technology. In addition to this yolov5 can be pipelined with existing environments of robotics or can be designed to be used in various applications such as contact less checkout, Agriculture, Inventory Management, Robotics and Smart Devices.

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