Deep Learning Project

Object Detection

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Objective

The objective of this project is to implement and compare the performance of two popular object detection algorithms, YOLO V3 (You Only Look Once) and Faster RCNN (Region-based Convolutional Neural Network). We aim to fine-tune pre-trained models on a specific dataset and evaluate their accuracy and speed in detecting objects in images.

Problem Statement

Object detection is a crucial task in computer vision with applications in autonomous driving, surveillance, and image retrieval. However, achieving real-time detection with high accuracy remains a challenge. By leveraging the capabilities of YOLO V3 and Faster RCNN, we aim to address this challenge and explore the trade-offs between accuracy and speed in object detection.

Methodology

Data Collection and Preparation

We will use the COCO dataset, a widely used benchmark for object detection. The dataset consists of images with multiple object categories and corresponding bounding box annotations.

Model Selection and Pre-trained Models

We will utilize pre-trained models for YOLO V3 and Faster RCNN, available in TensorFlow's model zoo. These models are trained on large-scale datasets like COCO and ImageNet, providing a strong foundation for our task.

Fine-tuning

The pre-trained models will be fine-tuned on our dataset to adapt them to our specific domain or dataset characteristics. This step helps the models learn features relevant to our object detection task.

Evaluation

We will evaluate the fine-tuned models on a separate validation set using standard metrics such as mean Average Precision (mAP). This metric measures the accuracy of object detection algorithms by considering the precision and recall of detected objects.

Results

Detection Accuracy

We will compare the mAP scores of YOLO V3 and Faster RCNN to assess their performance in detecting objects of interest. A higher mAP indicates better accuracy in object detection.

Processing Speed

We will measure the processing speed of both models on a test dataset to evaluate their real-time performance. Faster processing speed is crucial for applications requiring quick object detection.

Qualitative Analysis

We will visually inspect the detection results to understand the strengths and weaknesses of each algorithm. This analysis will provide insights into the types of objects each model excels at detecting and any common failure cases.

Comparative Analysis

A comprehensive comparison between YOLO V3 and Faster RCNN will be presented, highlighting their respective strengths and weaknesses in terms of accuracy and speed. This analysis will help in choosing the most suitable algorithm for different applications and scenarios.

References

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