Pedestrian Detection using Transfer Learning

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Abstract

This project aims to develop a real-time pedestrian detection system using pre-trained deep learning models. The system provides live pedestrian detection on a video feed, utilizing popular pre-trained models such as VGG19, ResNet101, and InceptionV3. This report details the methodology, model selection, model loading, real-time detection, and the outcomes of the project.

1. Introduction

1.1 Problem Statement

The project addresses the need for an efficient pedestrian detection system for real-time applications, such as video surveillance and traffic management. Accurate pedestrian detection is a fundamental task in these domains.

1.2 Motivation

The motivation for this project lies in enhancing safety and automation by leveraging the power of deep learning models. Real-time pedestrian detection can contribute to various fields, including autonomous vehicles and security systems.

2. Methodology

2.1 Model Loading

- The project offers three pre-trained model choices: VGG19, ResNet101, and InceptionV3.

- The selected model's architecture is loaded from a JSON file, and the model's weights are loaded from an H5 file, based on the user's choice.

2.2 Real-time Detection

- The project captures a video feed, which can be from a webcam or a specified video file.

- A Haar Cascade Classifier (`haarcascade_fullbody.xml`) is employed for the initial detection of pedestrians within each frame.

- The captured frame is converted to RGB format for further processing.

- The `detectMultiScale` method identifies pedestrians within the frame.

- Each detected pedestrian is enclosed with a green bounding box, and a region of interest (ROI) is created.

- The ROI is resized to 200x200 pixels and passed to the selected pre-trained model for pedestrian detection.

3. Results

3.1 Real-time Detection

- The system displays real-time pedestrian detection on the video feed.

- Detected pedestrians are indicated with green bounding boxes.

- Above each pedestrian, the system displays whether a pedestrian is detected or not ("Pedestrian" or "None").

4 Model Choice

- The project allows flexibility in choosing from three pre-trained models (VGG19, ResNet101, InceptionV3).

- The choice of model can be tailored to specific use cases based on factors like accuracy and computational efficiency.

4.2 Real-time Performance

- The system achieves real-time pedestrian detection by combining the Haar Cascade Classifier with deep learning models.

- The frame processing is efficient, ensuring minimal latency in the detection process.

4.3 Applications

- The project has applications in real-time surveillance, autonomous vehicles, and pedestrian safety.

- The system's flexibility in model choice allows it to be adapted for various scenarios.

5. Conclusion

The project successfully demonstrates real-time pedestrian detection using pre-trained deep learning models. It combines the strengths of Haar Cascade and deep learning for efficient and accurate pedestrian detection. The system can be a valuable addition to applications that require real-time monitoring and pedestrian safety.