NULLCLASS INTERNSHIP REPORT

TASK 2

Submitted by,

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PROBLEM STATEMENT

Create a model to predict the car colour in the traffic as well as the count of car in the traffic signal. This model should mark red colour car as blue and blue colour car as red. If the traffic signal has people, we should predict the number of males and females in the traffic signal. If the traffic signal has other vehicles apart from car, we should predict how many other vehicles are there.

INTRODUCTION

This report outlines the second task of my data science internship, which involves creating a model to predict the car colour in traffic and count the number of cars at a traffic signal. Specific requirements include marking red cars as blue and blue cars as red. Additionally, if there are people at the traffic signal, the model should predict the number of males and females present. If there are other vehicles, the model should count them.

BACKGROUND

In urban environments, understanding traffic patterns and demographics at traffic signals can provide valuable insights for traffic management and urban planning. This task aims to develop a comprehensive model that can analyse traffic scenes, identify car colours, count vehicles, and predict the gender of people present at traffic signals. The task uses the VCOR dataset for car colour prediction.

LEARNING OBJECTIVES

The primary learning objectives for this task include:

- Understanding and implementing object detection and classification models.
- Handling special conditions in image processing.
- Enhancing skills in computer vision, deep learning, and relevant libraries such as OpenCV and TensorFlow.

ACTIVITIES AND TASKS

- Data Collection and Preparation: Used the VCOR dataset for car colour prediction and pre-processed images for the gender classification model.
- Model Development: Developed and trained models for car colour detection and gender classification.
- Special Condition Implementation: Implemented logic to swap red and blue car colours and to count other vehicles and people.
- Validation and Testing: Tested the model using various traffic images to ensure all conditions were handled correctly.
- Interactive Visualization: Used OpenCV to draw bounding boxes and labels on the images for visual validation.

SKILLS AND COMPETENCIES

- Programming: Proficiency in Python, including libraries such as TensorFlow for model development and OpenCV for image processing and Streamlit for creating interactive web applications.
- Deep Learning: Skills in developing and fine-tuning convolutional neural networks (CNNs) for object detection and classification.
- Computer Vision: Experience in using pre-trained models like YOLO for object detection.
- Data Representation: Understanding the benefits of image data for rich visual information versus text data for simplicity and clarity.

FEEDBACK AND EVIDENCE

Since I did not have a supervisor during this internship, the feedback and evidence were based on self-assessment and peer reviews. Key points include:

- Ensuring the models accurately predicted car colours and handled the special condition of colour swapping.
- Effectively counting cars, people, and other vehicles in various traffic scenarios.
- Justifying the choice of image data for this task, considering the rich visual information it provides for object detection and classification.

Evidence of my work includes:

- The Python code for generating synthetic data, applying rules, and displaying results.
- Screenshots and logs from OpenCV visualizations and Streamlit application demonstrating the feature's functionality under different conditions.

CHALLENGES AND SOLUTIONS

Challenge 1: Accurately detecting and classifying multiple objects in a traffic scene.

Solution: Used the YOLO (You Only Look Once) model for robust object detection and a custom car colour classification model trained on the VCOR dataset.

Challenge 2: Implementing the special conditions for colour swapping and counting other vehicles and people.

Solution: Incorporated logic within the object detection loop to handle colour swapping and used separate counters for cars, people, and other vehicles.

Challenge 3: Ensuring the gender classifier accurately predicted the gender of people in various poses and lighting conditions.

Solution: Used a pre-trained MobileNetV2 model for feature extraction and fine-tuned it for gender classification, achieving satisfactory accuracy.

OUTCOMES AND IMPACT

The developed model successfully predicted car colours, counted cars, and handled the special conditions of colour swapping. It also accurately predicted the number of males and females at traffic signals and counted other vehicles. This tool can provide valuable insights for traffic management and urban planning by analyzing traffic scenes in real-time. The decision to use image data was justified by the need for rich visual information for object detection and classification.

CONCLUSION

This task provided valuable experience in computer vision, deep learning, and object detection. The model developed not only met the specified requirements but also demonstrated the practical application of these techniques in real-world scenarios. The choice of image data ensured the model could effectively analyze and visualize traffic scenes.