**Project Title:-Road object detection with deep learning**

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**Date:**

**Abstract:**

This report presents a study on road object detection using deep learning. The goal was to develop an accurate and efficient system for detecting objects on the road. The project employed the YOLOv4 algorithm and OpenCV library, trained on the COCO dataset. The system achieved high detection accuracy and real-time performance, demonstrating its suitability for real-world road object detection applications. The report discusses limitations, future improvements, and the system's contributions to autonomous vehicles and road safety.

**Introduction:**

Object detection is a crucial task in the field of computer vision, enabling machines to identify and locate objects within images or video frames. In the context of road safety and autonomous driving, accurate detection of objects on the road is of paramount importance. This report presents a study on road object detection using deep learning techniques, with the aim of developing an efficient system capable of detecting various objects on the road, such as vehicles, pedestrians, and traffic signs.

To achieve this objective, we leveraged the YOLOv4 algorithm, a cutting-edge object detection model known for its real-time performance and high accuracy. By integrating YOLOv4 with the OpenCV library, we sought to implement a robust and effective solution for road object detection.

The COCO dataset, a widely used benchmark in the computer vision community, was utilized for training and evaluating the YOLOv4 model. This dataset provides a diverse collection of images with annotated object bounding boxes and class labels.

**Prior work:**

In the field of autonomous driving and road safety, researchers have made significant progress in using deep learning for road object detection. One notable contribution is the YOLO (You Only Look Once) algorithm, which achieved real-time object detection with high accuracy. Later versions like YOLOv2 and YOLOv3 improved upon this by introducing features like anchor boxes and multi-scale detection.

The YOLOv4 algorithm, introduced in 2020, represents a significant advancement in road object detection. It combines a modified backbone network and advanced training techniques to achieve state-of-the-art accuracy while maintaining real-time performance. Many studies have explored integrating YOLOv4 with OpenCV, enabling real-time object detection in applications like autonomous vehicles and traffic monitoring.

This project builds upon prior work by implementing a road object detection system using YOLOv4 and OpenCV. The focus is on developing an accurate and efficient solution for detecting objects on the road, contributing to the advancement of autonomous driving and road safety technologies.

**Our approach:**

Our project aimed to develop an efficient and reliable system for real-time object detection on the road using deep learning. We employed the YOLOv4 algorithm integrated with OpenCV, training it on the COCO dataset to accurately detect objects like vehicles, pedestrians, and traffic signs. The system was tested in diverse road scenarios, evaluating its performance and contributing to advancements in autonomous driving and road safety technologies.

In summary, our approach involved integrating the YOLOv4 algorithm with OpenCV to develop a robust road object detection system. By training on the COCO dataset, we achieved accurate detection of various objects in real-time. Through testing in different road scenarios.

**Results:**

The developed road object detection system exhibited high accuracy and real-time performance in detecting vehicles, pedestrians, and traffic signs. Quantitative metrics such as precision, recall, and F1 score indicated impressive performance, striking a balance between accurate object detection and low missed detection rates. The system's real-time capabilities enable quick processing of video frames or images, making it suitable for applications like autonomous driving and traffic monitoring. Overall, the results demonstrate the effectiveness of the deep learning approach in advancing road safety technologies.



**References:**

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2) YOLOv4: Optimal Speed and Accuracy of Object Detection. arXiv preprint arXiv:2004.10934.

3) Microsoft COCO: Common objects in context. In the European Conference on Computer Vision (ECCV).

4)OpenCV: Open Source Computer Vision Library. Retrieved from: <https://opencv.org/>

**Github link:** <https://github.com/lavanyagola08/intelunnati_team-innovate>