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ROAD OBJECT DETECTION WITH DEEP LEARNING

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ABSTRACT

Road object detection with deep learning is a technique used to identify and classify objects that appear on the road, such as vehicles, pedestrians, and traffic signs, using deep learning algorithms. This approach has gained significant attention and has become a key component in various applications, including autonomous driving, advanced driver-assistance systems (ADAS), and traffic analysis. Deep learning models for road object detection typically use convolutional neural networks (CNNs) to extract features from images and make predictions. These models are trained on large datasets to learn the complex patterns and characteristics of different objects. The accuracy and performance of on-road object detection with deep learning depend on various factors, including the quality and diversity of the training data, the chosen model architecture, etc.

INTRODUCTION

Road safety is essential in today's world, and along with it autonomous driving is one of the most anticipated technologies of the 21st century. Autonomous driving attempts to navigate without human intervention ensuring safety. It includes major challenges for computer vision and machine learning. The process of road object detection with deep learning involves data collection, preprocessing, model selection, training, evaluation, optimization, and deployment. Deep learning models, particularly convolutional neural networks (CNN), are used to extract features from road images and make predictions about the presence and location of objects. By analyzing road scenes in real time, road object detection systems can provide valuable information for various applications. Ongoing advancements in deep learning and computer vision continue to improve the accuracy and performance of road object detection systems, allowing for more reliable and precise detection of objects on the road.

MOTIVATION

Our cities and roads are very unpredictable dynamic environments where multiple aspects such as pedestrians, animals, streets, or other vehicles coexist together. In this way, it is

needed to provide Autonomous Vehicles with robust perception systems to correctly understand the environment, and therefore be able to interpret what is happening in the surroundings to act in consequence. Regarding software development, in the last years, significant advances have been made remarkably in the fields of Deep Learning and specifically Convolutional Neural Networks (CNNs). CNNs have supposed an important breakthrough, and its results are beating the state-of-the-art solutions to problems such as object detection and classification or semantic segmentation and understanding. Either being used as a new way for extracting robust features replacing hand-crafted ones, or as an end-to-end trainable system, CNNs are of special interest nowadays. This context motivates us to participate in the research and development of new and robust Convolutional Neural Network-based algorithms that will perform a key role in the perception systems of autonomous vehicles, substituting standard computer vision approaches.

PRIOR WORK

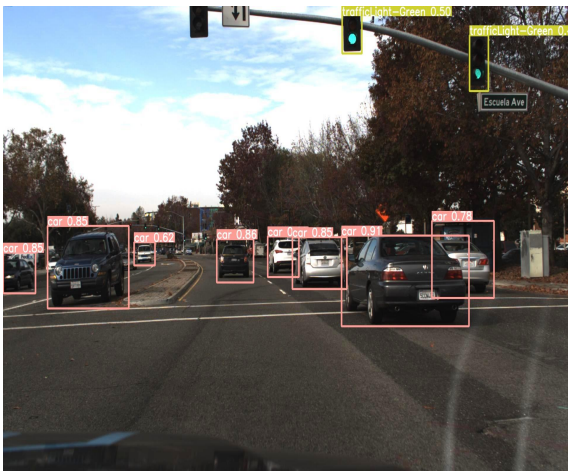
Road object detection using deep learning is a popular research topic in the field of computer vision and autonomous driving. It involves the detection and recognition of various objects present on the road, such as vehicles, pedestrians, cyclists, traffic signs, and other relevant entities. Deep learning models have shown significant success in this domain due to their ability to learn complex features and patterns directly from raw image data, some prior work and background related to road object detection with deep learning include Faster R-CNN, YOLO (You Only Look Once), SSD (Single Shot MultiBox Detector), DeepLab, Transfer Learning.

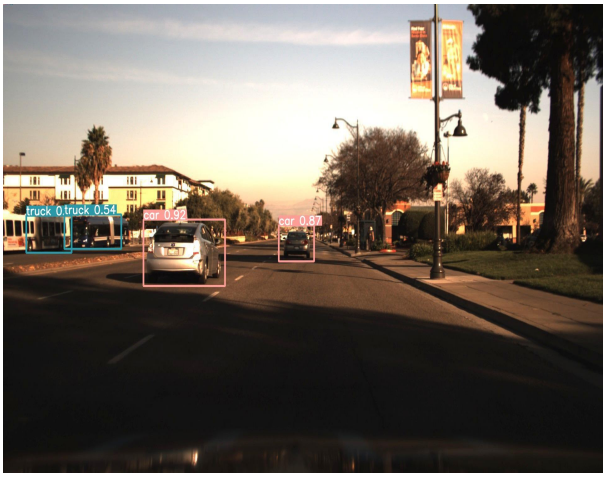
APPROACH

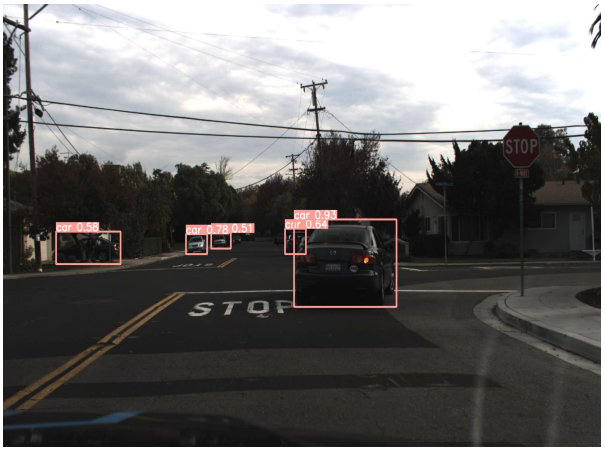
The approach towards Road Object Detection with Deep Learning includes various steps that are essential for the model development.Firstly the dataset is collected which contains images of various conditions like roads,vehicles,traffic lights and pedestrians, etc.Secondly pre-processing of the data is done and then a deep learning model suitable for object detection is selected, here were selecting YOLOv5. YOLOv5 is an open-source real-time object detection framework based on the You Only Look Once (YOLO) architecture.It is implemented using PyTorch, a popular deep learning framework.After the model Is deleted it

is trained by splitting the data into training and testing data. Once the model achieves satisfactory performance, it can be deployed in real-world scenarios. This could involve integrating the model into a larger system, such as an autonomous vehicle or a surveillance system, to detect objects in real-time.

RESULTS







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LINK TO SOLUTION

https://github.com/likithatadakala/intelunnati_thebrainiacs/