INITIAL PLAN

LEARNING TO DETECT AND RECOGNISE ROAD SIGNS

MODULE CODE – CM3203
MODULE TITLLE – ONE SEMESTER INDIVIDUAL PROJECT
MODULE CREDITS – 40

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PROJECT DESCRIPTION AND BACKGROUND INFORMATION

Road Sign Detection and Recognition system are one of the most important parts of Autonomous Driving. Why? On average there are 60 road accidents occur every day in the UK. Therefore, for the development of self-driving cars, detection and recognition of road signs is a crucial part as it will help the car to understand roadways and surrounding environment and adapt accordingly for example if a car in self-driving mode is entering the city from the highway then it will automatically decrease the speed by detecting and recognizing speed limit signpost on the road as the traffic congestion is more in the city. This is important from the perspective of safety and unwanted accidents. (Bachute and Subhedar, 2021) [2]

Development of these systems has been possible with the help of Computer Vision and Deep Learning which is a subdomain of Machine Learning. Computer Vision helps computers to obtain knowledge and meaningful sense from digital images and videos. It allows the computer to see, observe and understand. Computer Vision requires a lot of data in order to learn and finally recognize images. For example, In this case, if we want to develop a prototype that recognizes the road sign then we have to feed it with a vast quantity of data in the form of images of the road signs. As Computer Vision allows the computer to see, Machine Learning more specifically Deep Learning allows the computer to think as it uses algorithms to teach computers about the context of visual data. If we fed enough images to the computer then it will look through all those images and will teach itself to identify and differentiate one image from another. Therefore, with the help of algorithms computers can learn by themselves as opposed to programming it to identify the image. (Gupta et al., 2021) [3]

In Deep Learning, Convolution Neural Network is a class of deep neural networks that uses a special technique called Convolution to analyze visual images. The CNN Algorithm takes the image as an input and breaks down the image into pixels and then performs mathematical operations to predict what it is seeing. The CNN runs multiple iterations so that it can make improvements in the machine learning model to classify an image. The pre-processing required in CNN is much lower as compared to other classification algorithms. Hence with the help of Computer Vision and Deep Learning which is a subdomain of Machine Learning, we can develop prototype systems that can detect and recognize road signs in real-time camera footage and thus act as an

essential component for making autonomous driving vehicles. (Arcos-García, Álvarez-García and Soria-Morillo, 2018) [1]

ETHICS

There is no ethical approval required for this research as we will be using images and real-time camera footage of road signs and there would be no insertion or input of personal data from the user. The dataset of images would be from different opensource platforms links to which has been given in the References section.

QUINYX
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PROJECT AIMS AND OBJECTIVES

1. To develop a prototype that can detect and recognize road signs from real-world camera footage. This should be accomplished by implementing core understanding, concepts and technologies of Computer Vision and Machine Learning.
2. To gain a deep understanding of Computer Vision and Machine Learning concepts and use the technologies in the area above for example OpenCV which is a Computer Visions Library and TensorFlow which is an open-source library for machine learning which particularly focus on training deep neural networks.
3. To explore, summarize and visualize the data set
4. To design, develop, train, validate and test the most suitable Neural Network Architecture so that the highest possible accuracy can be achieved in the detection and recognition of the road signs.
5. To further optimize the performance of the Neural Network Model by making necessary alterations in different metrics and to compare and study the results obtained.
6. Summarize the whole research and the obtained results with a proper written report.

WORK PLAN

Week	*Date*	*Milestones and Deliverables*	*Scheduled Review Meetings*	*Status*
1	31/01/22 – 06/02/22	Understand the dissertation topic. Gather necessary materials and resources. Start working on the initial project plan.		Achieved
2	07/02/22 – 13/02/22	Submit initial report. Gain deep understanding of core concepts like Computer Vision, Machine Learning, Deep Learning, different types of neural networks and their architecture.	Review meeting with the supervisor.	In-progress
3	14/02/22 – 20/02/22	Learn using OpenCV for the Computer Vision and TensorFlow for training deep neural networks.		Will be started soon

4	21/02/22 – 27/02/22	Gathering and Processing the dataset. Compare and finalise the most suitable CNN algorithm for training the model. Start working on the final report.	Review meeting with the supervisor.	Will be started soon
5	28/02/22 – 06/03/22	Train the Machine Learning Model. Continue making progress in the final report.		Will be started soon
6	07/03/22 – 13/03/22	Perform validation and rigorous testing of the Machine Learning Model. Continue adding and making enhancements in the final report.	Review meeting with the supervisor.	Will be started soon
7	14/03/22 – 20/03/22	Evaluate and Optimize the performance of the Machine Learning Model. Explore the concepts of Augmentation to further boost the performance of the model.		Will be started soon
8	21/03/22 – 27/03/22	Carry out detailed analysis of the results obtained from the work of week 6 and week 7. Find out the most optimum model having highest accuracy in detecting and recognising the road signs.	Review meeting with the supervisor	Will be started soon
9	28/03/22 – 03/04/22	Take final report to the professional standards. Provide background of all the terminologies used. Do research on the future work in this field.		Will be started soon
10	04/04/22 – 10/04/22	Draw final conclusions and reflect on the knowledge and understanding gained by undertaking this project. Complete the final report as well as the coding part.	Review meeting with the supervisor.	Will be started soon
11	11/04/22 – 17/04/22	Perform final checks on the report and the coding part. Go through the complete work and rectify any errors if spotted.	Review meeting with the supervisor.	Will be started soon
12	18/04/22 – 24/04/22	Submit the project and prepare for the project demonstration in the front of the panel.	Review meeting with the supervisor.	Will be started soon

REFERANCES

[1] Arcos-García, Á., Álvarez-García, J.A. and Soria-Morillo, L.M. (2018). Evaluation of deep neural networks for traffic sign detection systems. *Neurocomputing*, [online] 316, pp.332–344. Available at: https://www.sciencedirect.com/science/article/pii/S092523121830924X.

[2] Bachute, M.R. and Subhedar, J.M. (2021). Autonomous Driving Architectures: Insights of Machine Learning and Deep Learning Algorithms. *Machine Learning with Applications*, p.100164.

[3] Gupta, A., Anpalagan, A., Guan, L. and Khwaja, A.S. (2021). Deep learning for object detection and scene perception in self-driving cars: Survey, challenges, and open issues. *Array*, 10, p.100057.