

## **ABSTRACT**

Name of Student: SK Nasim Akhtar

Roll no. 19103083

Degree for which submitted: M.Tech

Department: Civil Engineering

Thesis Title: Analysing influence of vehicle appearance characteristics on its detection performance

Name(s) of Thesis Supervisor(s)

1. Prof. Partha Chakroborty (Supervisor)
2. Prof. Pranamesh Chakraborty (Co-Supervisor)

Month and year of thesis submission: November 2021

State-of-the-art deep learning based vehicle detection model usually works as a ‘black box’ system as we have access to only the inputs and the outputs of the model. So in order to understand the latent influence of vehicle appearance characteristics on detection model’s performance, an attempt has been made in this study by analyzing these characteristics using quantitative data obtained from a benchmark vehicle detection dataset. Occlusion is usually considered to be one of the primary factors influencing vehicle detection. On the other hand, previous research have used vehicle parts for handling occlusion and improving detection accuracies. Therefore, in this study, we analysed the influence of occlusion level along with vehicle parts visible, vehicle height (ground truth height) and aspect ratio as observed in image in state-of-the-art object detection performance.

We first segmented vehicle into three parts: front, side and back and then trained a deep learning based model to detect the visible parts. Since the trained model didn’t achieve decent accuracy due to limited annotated data, we used the information extracted from annotations regarding visible parts along with the other appearance characteristics to study their influence on vehicle detection. A logistic regression model has been used to study the influencing factors which showed that occlusion level, parts visible, and vehicle height influence object detection accuracies. On the other hand, there was no evidence of aspect ratio to have significant influence on the accuracy. Such insights can help traffic management centers to place cameras such that vehicle detection accuracy can be maximised and thereby camera based traffic management can be handled to extract maximum benefits out of it.