

**VISION-BASED FORWARD COLLISION WARNING  
APPLICATION FOR VEHICLES**

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Thesis submitted in partial fulfillment of the requirements for the degree

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I, as the supervisor of the above-mentioned candidate, confirm that the student has conducted research for their Masters dissertation under my guidance. I hereby validate the truthfulness and accuracy of the declaration made by the student as mentioned above.

Name of the supervisor: Dr. Charith Chitraranjan

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## **ACKNOWLEDGEMENT**

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## ABSTRACT

Driver Assistance Systems (DAS) have become an important part of vehicles, and there is a considerable amount of research in this area. Most accidents happen due to driver inattention caused by driver distraction and drowsiness. Driver Assistance Systems aim to minimize these conditions and increase road safety. Vision-based driver assistance plays a major role in DAS, where camera-based collision warning stands out as one of the most effective and accurate types. Our implementation is a collision warning system that utilizes a single monocular camera and performs 3D vehicle detection for better accuracy and performance. It is a low-cost, near real-time collision warning system that can be implemented on both new and old vehicles. For 2D vehicle detection, we employ YOLO, and then we estimate 3D bounding boxes based on the 2D bounding boxes. To track the vehicles, we use the Deep SORT algorithm. The application will generate a Birds Eye View (BEV) graph based on the 3D bounding box estimation. This BEV graph will represent a much more accurate position and orientation for vehicles in a 3D plane. Based on this data, the collision prediction algorithm will determine the possibility of a collision and output a warning signal. The collision prediction algorithm relies on the distance between the vehicle with the camera and other vehicles in each frame.

Keywords: collision warning, 3D object detection, YOLOv5, Deep SORT, based collision prediction

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## **LIST OF ABBREVIATIONS**

Abbreviation	Description
DAS	Driver Assistance System
SFM	Structure From Motion
YOLO	You Only Look Once
CNN	Convolutional Neural Network
DoF	Degree of Freedom
ABS	Anti-Lock Braking System
TBD	Tracking By Detection
DFT	Detection Free Tracking
SORT	Simple Online and Realtime Tracking
ESC	Electronic Stability Control
MOT	Multi-Object Tracking
BEV	Bird Eye View
GCP	Google Cloud Platform
TCS	Traction Control System