# ABSTRACT

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Degree for which submitted: **Master of Technology**

Department: **Civil Engineering**

Thesis title: **Identifying and classifying turning movements using Naturalistic Driving Study Data**

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Studying turning behavior enables us to identify potential safety issues and develop strategies to reduce the risk of collisions. It is important to study the dynamics of turning, and various types of turns that can be executed at an intersection, using a large scale (Navigation Data Standard) NDS dataset. Furthermore, it is also important to examine the influences of external factors, such as oncoming traffic, presence of leading vehicles, pedestrians, and other variables, on turning behavior. Such an analysis facilitates a comprehensive understanding of how vehicles navigate turns, enabling traffic engineers and urban planners to optimize traffic flow, enhance safety, and strategically plan efficient infrastructure.

The dataset we chose for our study is the (Berkeley Deep Drive) BDD100K dataset. It is an open source large scale NDS dataset, that contains driving in diverse scenarios, incorporating many complex driving maneuvers. In the first part of this study, we have experimented the use of semi-supervised machine learning algorithms in the task of turn identification, using features created from IMU-GPS data. Semi-supervised models enable us to utilize readily available unlabeled datasets by incorporating a small number of labeled data. From the IMU-GPS data, we derived and used several features depending upon their usefulness. Even with only

20 labeled samples (equally distributed among the 3 classes), the Random Forest model in the supervised setting showed a comparable accuracy of 80% to the semi-supervised models with the same number of labeled samples. This emphasizes the efficacy of the feature creation task undertaken in this study.

The second part of this study, is to classify turning behaviour into separate classes depending on the external factors faced by the turning vehicles, such as following a lead vehicle, presence of oncoming traffic, presence of pedestrian and so on. In this study we have chosen two classes of turning, namely unobstructed turns and car-following turns. Object detection and tracking was done on video data coming from dashcam perspective while driving. The vehicles were then classified into various bins depending on the number of frames they appeared in during the turn. We then defined extracted variables from the bounding box data, such as average area, radial distances, etc to help characterize each bin of vehicles. Finally, we were able to obtain an accuracy of 85% using supervised random forest model. Thereby, this study is a basic attempt aiming to classify turning behaviour at intersections making use of dashcam video data.