School of
Computer Science

MSC.CS Defence

Wednesday, August 12, 2020 at 10:00 am on Teams
(If you would like to view the defense please contact Mark Wineberg at mwineber@uoguelph.ca)

MACHINE LEARNING TECHNIQUES TO IDENTIFY MIND-WANDERING AND PREDICT HAZARD RESPONSE TIME IN FULLY IMMERSIVE DRIVING SIMULATION

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Abstract

This work presents machine learning based techniques for detecting mind-wandering and predicting hazard response time in driving using only easily measurable driving performance data (speed, horizontal and frontal acceleration, lane gap, and brake pressure). Such predictors are relevant as research tools in the driving simulation community. We present a simple method, and a feature extraction based method, of representing time-series driving performance data that both support machine learning based predictions. We use the two types of representations to compare the effectiveness of support vector machines, random forest, and multi-layer perceptrons on data from 117 drives performed by 39 participants during a previous study in the high-fidelity driving simulator at the University of Guelph. Classification of mind-wandering and prediction of hazard response time was successful when compared to baseline measures. Specially, random forest methods were most effective in both types of prediction and feature extraction supported the strongest random forest prediction of hazard response time. A discussion of the reasoning for this is included. To our knowledge this is the first driving pattern based classification of mind-wandering in a fully immersive driving simulator.