



COLLEGE of ENGINEERING AND PHYSICAL SCIENCES

SCHOOL OF COMPUTER SCIENCE

MSc Seminar

Thursday August 1, 2019 at 3:30PM in Reynolds, Room 1103

Machine Learning Techniques to Predict Important Measures in Simulated Driving

John Beninger

Advisor: Dr. Andrew Hamilton-Wright

Advisory Committee: Dr. David Calvert

ABSTRACT:

Driving simulations are of great practical importance within the driving psychology and safety communities. They allow precise control of the conditions that drivers are subject to within studies and facilitate replication of highly dangerous driving situations without risk of harm. Because driving simulation data is typically sampled at a high rate (10-100Hz) and can be highly multi-dimensional machine learning techniques are particularly useful as a supplement to traditional analytical methods.

This seminar presents machine learning based techniques for detecting mind-wandering (a form of driver inattention) and hazard response time in driving using only commonly measurable driving performance data (speed, horizontal and frontal acceleration, lane gap, and brake pressure). Two methods of representing time-series driving pattern will be presented. These representations were used to compare the effectiveness of several predictive algorithms on data from a prior study of 40 participants in a high-fidelity driving simulator. Significant results were found for the identification of mind-wandering and the prediction of hazard response time when compared to baseline measures. Specifically, random forest methods were most effective in both types of prediction and a representation based on descriptive signal statistics supported the strongest random forest prediction of hazard response time.