MIE498H1: Research Thesis 2024-2025

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Number of Positions   1
Open to   Undergraduate Industrial Engineering Students
Term Offered   Fall (F)
Research Area   Human Factors
Research Topic   Machine Learning Applications to Detect Driver
                                   Cognitive Load Levels

Project Description

Driving tasks require cognitive resources and requires sufficient allocation of attention to driving tasks. High levels of cognitive load due to distractions or long periods of lack of cognitive load (e.g., boredom, monotonous driving) can both lead to collisions. Systems that can detect these high-risk states can warn the driver. These systems are now becoming mandatory for vehicle manufacturers to incorporate in their vehicles; however, more research is needed for developing driver cognitive load detection systems. A driving simulator study was conducted to understand the effects of cognitive load levels on driving performance (e.g., speed, lane position), and driver physiology (e.g., heart rate, sweat response) and behavioural data (e.g., yawning). The goal of this study is to use machine learning (ML) for classifying cognitive load levels and evaluate the performance of different ML models, preprocessing methods, and features. The thesis student will use the driving simulator data to build ML models and employ explainable AI methodologies to inform the design of driver state detection systems.

Additional Information   This project requires machine learning/deep learning
                                   applications (Python or R).

Application Instructions   Please send your CV/resume and transcript to
                                   donmez@mie.utoronto.ca and sayas@mie.utoronto.ca.
                                   Briefly describe your experience with machine learning
                                   applications (courses, projects, internships etc.).

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