

# Developing a Crash Risk Index and Detecting Driver's Engagement in Secondary Tasks from Driving Behavior Attributes and Socioeconomic Characteristics: A Naturalistic Driving Study

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Distracted driving has long been acknowledged as one of the leading causes of death or injury in roadway crashes. The focus of past research has been mainly on the impact of different causes of distraction on driving behavior. However, only a few studies attempted to detect distracted driving from driving behavior attributes. This study takes advantage of the rich SHRP 2 Naturalistic Driving Study (NDS) database to develop a model for detecting the likelihood of a driver's involvement in secondary tasks from distinctive attributes of driving behavior. Five performance attributes, namely speed, longitudinal acceleration, lateral acceleration, yaw rate, and throttle position were used to describe the driving behavior. A model was developed for each of three selected secondary tasks: calling, texting, and passenger interaction. The models were developed using a supervised feed-forward Artificial Neural Network (ANN) architecture to account for the effect of inherent nonlinearity in the relationships between driving behavior and secondary tasks. The study also proposed a Crash Risk Index (CRI) to estimate the crash risk associated with the socioeconomic characteristics of drivers and their tendency to experience distracted driving. The proposed CRI was developed based on the crash risk associated with performing secondary tasks during driving and the effect of socioeconomic attributes on the likelihood of engagement in secondary tasks. Logistic Regression analysis was conducted to identify the significant secondary tasks with high crash risk and the socioeconomic characteristics with significant effect on drivers' engagement in secondary tasks. The developed CRI indicates the relative crash risk associated with the socioeconomic characteristics of drivers, given the likelihood of engagement in secondary tasks.