UTC Project Information	
Project Title	Driving Risk Assessment based on High-frequency, High-resolution Telematics Data
University	Virginia Tech Transportation Institute
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Funding Source(s) and Amounts Provided (by each agency or organization)	Federal: $75, 000 Non-Federal/Match: 75,000
Total Project Cost	$150,000
Agency ID or Contract Number	Grant No: 69A3551747115 Project: VTTI-00-028
Start and End Dates	12/15/2019-5/15/2021
Brief Description of Research Project	The emerging connected vehicle and Automated Driving System (ADS) as well as widely available advanced in-vehicle telematics data collection/transmitting systems produce gigantic amount of high-frequency, high-resolution driving data. These telematics data provide comprehensive information on driving style, driving environment, road condition, and vehicle condition. The telematics data has been used for a number of safety areas such as insurance pricing, teenage driving risk evaluation, and fleet safety management. The surge of ride-hailing service in the last decade provides a novel alternative mode for travelers. The ride-hailing drivers are a unique driver population with substantial operational responsibilities and the safety management is critical for the drivers. The smartphone ride-hailing app can conveniently collect kinematic information from sensors on smartphones, thus make the telematics data available for the entire driver population. Parallel to this proposed study, the research team has evaluated telematics feature in prediction crash risk for millions of ride-hailing drivers. This project will address the following main safety research questions using high-frequency, high resolution telematics data: 1) characterize the high-frequency kinematic signatures for safety critical events as well as during normal operations; 2) develop models to predict high risk drivers based on the kinematics signatures. 3) develop models to distinguish and predict crashes from normal driving scenarios based on the high frequency data. The project will contribute to connected vehicles and ADS real-time

	safety monitoring, NDS data analysis, hail-driving driver safety prediction, as well as fleet and driver safety management programs.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	1. The findings of this project will be summarized in a final report and the data will be shared with proper authorization from TRB (SHRP2 NDS). 2. The project will benefit both education and workforce development. 3. Planned Learning Modules The methods developed in this project will be covered in the two courses: STAT5374, "Statistical Epidemiology and Observational Studies" (Graduate level), and STAT 5504G/4504, "Multivariate Statistics" (crossed listed, both graduate and graduate level) The training materials will provide the state-of-the-art modeling technique and domain knowledge to both graduate and undergraduate students. 4. Student Funding The project will partially fund two Ph.D. graduate students from the department of statistics, Qian Chen and Liang Shi. The research conducted in this project will be part of their Ph.D. dissertations. 5. Technology Transfer Plan The findings of this project will be submitted to peer reviewed journal for publishing and be presented at conferences and a webinar. The results can benefit fleet safety management, insurance industries, as well as car industry. 6. Planned Stakeholder Involvement The project is parallel with Xiaoju Technology Co. who sponsored a parallel project on risk prediction for ride-hailing drivers using high frequency kinematic data collected through cellphone apps as well as operational characteristics. The project team will brief Xiaoju quarterly on the project progress and discussing potential applications of the method developed. Liheng Tuo from Xiaoju Technology Co. will be the project champion. 7. Planned T2 Activities and Products The research team will disseminate the results of the project and conduct technology transfer through several approaches including presentation at professional conferences, presentation to industry groups via webinars, and publication in peer reviewed journals. The research team will also develop an open-source R package so industry and other researchers can easily use the developed methods to analyze their data. A details list of the activities is listed in the table below. 1. Presentation at Professional Conferences, e.g., TRB and JSM 2. Conduct webinar to present project findings to industry group. 3. Journal Article (Expected journals include: AAP, IEEE-ITS, Technometrics etc.) 4. R package development

Impacts/Benefits of Implementation (actual, not anticipated)	The project will benefit several areas: 1. Provide a tool for identify safety critical events from high frequency driving data. 2. Benefit driver risk prediction for both fleet safe management and insurance industry; 3. Support real time risk prediction and detection for automated and connected vehicles.
Web Links • Reports • Project website	https://www.vtti.vt.edu/utc/safe-d/index.php/projects/driving-risk-assessment-based-on-high-frequency-high-resolution-telematics-data/