**MEMORANDUM OF AGREEMENT**

TO: ENBAL SHACHAM, PHD, MED, DIRECTOR OF SAINT LOUIS UNIVERSITY COLLEGE FOR PUBLIC HEALTH AND SOCIAL JUSTICE DOCTORAL STUDIES PROGRAM

FROM: MIAO CAI, MS, DISSERTATION COMMITTEE: STEVEN E. RIGDON, PHD, HONG XIAN, PHD, FADEL MEGAHED, PHD

SUBJECT: TRADITIONAL DISSERTATION

DATE: Sep 11, 2019

I have chosen the *traditional format* for my dissertation thesis. I will begin initial work on my dissertation in October 2019 and I plan to complete the work and defend by the spring of 2020. Approval for my dissertation, titled, *Modeling Truck Safety Critical Events: Efficient Bayesian Hierarchical Statistical and Reliability,* has been obtained from the St. Louis University Review Board, who have confirmed that this research project is not deemed Human Subjects Research and a waiver from the institutional review board has been issued. I have completed SLU's (CITI) human subjects research certification courses.

The theme for my dissertation will be understanding risky truck driving behavior and associated risk factors using a high-resolution naturalistic driving study (NDS) dataset. The purpose of my research is to quantify the association between various risk factors including driver, fatigue, weather, road geometry and safety critical events among truck drivers. Specifically, my three research aims are;

(1) To examine the association between truck crashes and safety critical events using a Bayesian Gamma-Poisson regression,

(2) To construct three scalable Bayesian hierarchical models to identify potential risk factors for safety critical events,

(3) To propose an innovative reliability model that accounts for both within shift cumulative driving time and between-trip rest time.

The results of this study will help illustrate the effects of driver, fatigue, weather, and road features on safety critical events among truck drivers and further shed light on truck routing and scheduling. Besides, the analysis framework, as well as an associated R package to be developed, will serve as a pattern and toolkit to analyze NDS datasets from other studies.

Traditional traffic safety studies primarily focus on using retrospective reports from police, drivers, and survivors. However, these retrospective datasets are limited due to potential selection, recall, and information bias. Considering these limitations, a growing number of naturalistic driving studies have been initiated worldwide to identify crash causation and improve traffic safety. NDS use unobtrusive devices, sensors, and cameras installed on vehicles to proactively collect frequent naturalistic driving behavior and performance data under real-world driving conditions.

The high-resolution driver behavior and performance data from NDS enable researcher to access data shortly prior to the occurrence of crashes or SCE without information or selection bias. NDS datasets are relatively new and therefore less studied. The sheer volume of NDS datasets create challenges to data management and existing statistical and reliability models. To date, there is no large-scale studies that specifically target on truck drivers using NDS datasets. A truck naturalistic driving dataset with more than 1.4 billion real-time location, speed, vehicle and driver characteristics will be provided by a large commercial truck company to facilitate this research. Dates included will be 5/1/2015 to 4/31/2016.

Dr. Steven E. Rigdon will serve as my Dissertation Committee Chairperson.

Drs. Hong Xian and Fadel Megahed have agreed to serve as Committee members.

Miao Cai, MS Date Steven E. Rigdon, PhD Date

Doctoral Student Dissertation Committee Chairperson

Hong Xian, PHD Date Fadel Megahed, PhD Date

Dissertation Committee Member Dissertation Committee Member