Project Information Sheet

Project Title: Data Simulation to Support Interdependence Modeling of a Multimodal Transportation Network
Project Abstract (Brief Description): Access to data on the design and operation of interdependent critical infrastructures (ICIs) is now recognized as essential for fostering new data analytics, design, and decision-support tools. This project has created and made available synthetic and simulated data on ICIs by developing new data creation techniques and model-based approaches to simulating ICIs and human cognition and behavior with ICIs. It provides research communities with a free simulation tool for modeling, collecting, and generating data on complex ICIs involving human activities and decisions. The research investigates a methodology for developing hybrid data-driven statistical models and simulation tools that help decision-makers, researchers, and other stakeholders acquire a good understanding of multimodal freight movement processes based on different data sources. This study has developed a spatiotemporal statistical model capable of capturing extreme weather-related natural events causing disruptions in inland waterways and of predicting such events in the future with high accuracy to facilitate commodity flow planning. Decision-makers can optimize their logistic policy to respond to natural disruptions for the best economic outcome. Moreover, an open-source simulation tool has been built to capture the effect of inland waterways disruptions on the commodity flow through other ICIs. This tool allows for custom and flexible parameterization of a wide array of scenarios. The integration of ports, locks, and dams, and ground transportation systems is a crucial feature. A case study based on the Mississippi River and the McClellan–Kerr Arkansas River Navigation System (MKARNS) along with the related highways has been used to illustrate the use of the simulation tool for operation simulation and interdependence modeling of the multimodal transportation network.
Web Links: https://martrec.uark.edu/data/index.php
Project Start and End Dates: September 2017-August 2020
Principal Investigator(s) and Contact Information: Haitao Liao, Ph.D. and Heather Nachtmann, Ph.D.
Principal Investigator Institution (University): University of Arkansas, Industrial Engineering