

## Research Statement

My research integrates social demographics into transportation system design and leverages cutting-edge technology to enhance mobility, accessibility, and resilience for vulnerable populations, including aging individuals, people with disabilities, and underserved communities. By addressing transportation barriers and improving equity, my work contributes to safer, more inclusive, and sustainable mobility systems.

As the PI of the NSF-funded project “Collaborative Vehicle-and-Robot Delivery to Improve Food Access in Underserved Communities,” I explore an innovative hybrid delivery paradigm that coordinates traditional vehicles and autonomous robots to improve food access in underserved areas. This research integrates machine learning and integer programming to optimize scheduling, routing, and cost-effectiveness, ultimately advancing last-mile delivery solutions for vulnerable populations.

My USDOT-funded project, “Investigating Driving Behavior in Rural Areas through Integrated Driving Simulators and Virtual Reality,” examines how adverse weather conditions impact driving behavior, particularly for vulnerable populations such as older adults. By leveraging virtual reality and simulation technologies, this study provides insights into decision-making processes and the role of Advanced Driver Assistance Systems (ADAS) in improving safety for aging drivers in rural settings.

Additionally, my FSU-funded FYAP project, “Enhancing Urban Emergency Evacuation Through Optimization of Autonomous Vehicle Ridesharing Services under Uncertainty,” focuses on optimizing Shared Autonomous Vehicles (SAVs) for pre-disaster evacuations. Using Sumter County, Florida, as a case study, this research develops a mathematical programming and simulation-based decision-making framework to improve evacuation strategies in transportation-insecure regions.

In the realm of education accessibility, I lead the NSF-funded project “Building a Digital Twin-Based Virtual Engineering Laboratory for Students with Disabilities.” This initiative develops an immersive virtual engineering environment designed to accommodate students with disabilities, offering an inclusive and transformative learning experience. By incorporating digital twin models and extended reality (XR) technologies, this research bridges the gap between traditional teaching methods and student needs, enhancing accessibility, engagement, and equity in engineering education.

Furthermore, my UTC-funded project, “Equitable Restoration Strategies for Bridge and Road Infrastructure Networks after Hurricanes in Coastal Communities,” focuses on developing data-driven methodologies to assess and enhance the resilience of transportation infrastructure in hurricane-prone regions. This research integrates community needs with optimization models to prioritize restoration efforts, ensuring equitable access to transportation networks post-disaster. By incorporating stakeholder feedback and systemic risk assessments, this project aims to create adaptive recovery strategies that minimize disruptions and support long-term resilience in coastal communities.

I am also a Site PI with Advancing Community-Centric Equitable Systems and Solutions in Mobility (ACCESS-M), a USDOT-funded Mobility Equity Research Center, which focuses on designing and improving public transit services to better serve aging populations. My work in this center explores how to optimize demand-responsive services, such as paratransit, to enhance accessibility and mobility for older adults. By leveraging data-driven optimization models and user-centered design, we aim to develop operational strategies that improve service efficiency, reduce wait times, and enhance the overall user experience of transit-dependent aging communities.

Overall, my research bridges the gap between technology and human-centered solutions, ensuring that emerging innovations in transportation, disaster resilience, and education effectively serve underrepresented and vulnerable communities. Through data-driven methodologies, optimization models, and immersive simulations, I strive to enhance accessibility, mobility, and resilience, aligning with the broader goals of the Institute for Successful Longevity.