SMARTER Center Research Thrusts and Faculty Expertise

To better facilitate cooperation among researchers at the SMARTER Center's constituent universities across the region, this document provides a preview of the Center's research thrusts and the expertise of its faculty. Researchers are encouraged to use this document as a reference as they seek partners for competitive proposals and generate research topics.

Research Thrust 1 – Equity

The Mid-Atlantic is home to many diverse, congested urban areas with low-income communities that experience a spatial disconnect between their residents and the affordable housing, jobs, food, and healthcare they need. It also includes rural and suburban areas without well-integrated public transportation networks. Moreover, most of the population lives in coastal areas that are directly impacted by the effects of climate change, especially rising sea levels and extreme weather events, which disproportionally affect disadvantaged communities.

Consortium members will conduct community-based research to increase the mobility and accessibility of disadvantaged populations. Building a safe, affordable, and accessible transit system requires transportation planners to build the capacity of the region's disconnected communities. This research thrust conceives of transportation as a key driver of economic dynamism, connecting underserved communities with the critical services and opportunities needed for social mobility. It also acknowledges that any meaningful investment in accessible transportation must consider how this infrastructure can be made more resilient to climate change.

Research Thrust 2 – Mobility Innovations/CAVs/EVs

A large portion of urban households in the region do not own an automobile. Philadelphia (30.3%) and Baltimore (29.8%) are among the top ten cities with zero-car households in the US, while Pittsburg (23.6%) and Richmond (17.2%) also have a very high number zero-car households. This is not because mass transit service in the region is exceptional, however. On the contrary, transportation options in these cities remain limited, and public transit networks across major metropolitan areas are often not fully integrated with one another. These problems are most acute in poor, minority-dominated communities, but residents in rural areas also suffer from poor public transit access.

Bottlenecks also have negative consequences for the Mid-Atlantic's commercial activity for passenger vehicles and freight. Freight movement is of critical importance in the Mid-Atlantic region due to the region's large port facilities, critical trucking routes, extensive rail network and inland waterways. With trucks moving 72% of American freight, the nationwide truck driver shortage has impeded the movement of goods in the US while escalating recent supply chain issues. Truck drivers now experience a job turnover rate of 90%, with poor working conditions and parking shortages along crowded interstates being important factors among those leaving the profession.

Emerging technologies have the potential to address these issues and others across the region, with mobility innovations like CAVs and EVs promising to increase safety, mobility, and accessibility while reducing pollution and congestion. Smart cities and shared autonomous vehicles can provide viable transportation for people with mobility challenges, while autonomous trucks and other innovations can address labor shortages in freight transport. SMARTER Center will serve as a nexus for regional technological studies in transportation, using simulations and pilot studies to drive developments in smart cities, data management, EVs, and CAVs.

Research Thrust 3 – Multimodal Policy and Planning

A large portion of travelers in the Mid-Atlantic are captive riders with little choice regarding their mode of travel. Rural areas suffer from a lack of transit options, and transit systems in urban and suburban areas are often not fully integrated with one another. Multimodal transportation, safe and equitable complete streets, transit-oriented developments, and emerging technologies could provide viable transportation modes for underserved communities in the region.

Policies made based on the Infrastructure Investment and Jobs Act (IIJA) should be executed in a way that does not have adverse effects on minority communities, especially Black communities, as urban renewal policies based on 1949 Housing Act and the 1956 Interstate Highway Act did. The highways built under these programs tore apart communities and brought pollution and noise to many neighborhoods. Efforts could be made to redevelop failed projects like the highway to nowhere in Baltimore.

Research Thrust 4 – Urban and Rural Accessibility

The socioeconomic vitality of a community depends on a transportation system which facilitates access to human activities and necessities. Inadequate access to transportation should be deemed a public health problem as it adversely affects access to jobs, education, medical care, and healthy food while increasing possible exposure to adverse environments. Given the spatial sprawl endemic to current city design in North America, it is very difficult to design efficient, integrated, and connected transit systems. Developing transformative, efficient public transportation systems which integrate multiple modes of transportation and address the first- and last-mile problem could enhance the system.

Many low-income rural communities in the region are not supported by public transportation, which negatively impacts their economic prosperity and compromises their quality of life. SMARTER will propose innovative solutions to provide viable transportation modes for these underserved rural communities.

SMARTER Faculty Expertise

Faculty	Expertise	Equity	Multimodal Planning & Policy	Mobility Innovation / CAV/ EV	Urban & Rural Access
Morgan State University					
Jeihani	Traveler Behavior, CAV, Equity, Simulation, Safety, Multimodal Transportation, Planning & Modeling, AI/ML, Big Data	*	*	*	*
Lee	Public Transport, Urban Transport, ITS, CAV, Logistics, Safety		*	*	*
Chavis	Equity, Multimodal Transportation, Data Analysis, GIS	*	*	*	*
Saka	Traffic Operations, Planning		*		
Vaziri	Equity, Safety, Data Analysis	*		*	
Shin	Safety, EV, Planning and Policy		*	*	
Yang	CAV, Human Factor, ITS, Safety		*	*	
Howard University					
Arhin	Traffic Operations, Safety of Pedestrians and Bicyclists, Transportation Infrastructure Operations				
Hasnine	Modeling Individuals' Travel Behavior, Econometrics andMachine Learning Modeling				
Marin	Assessing Transportation Infrastructure Health, Bridges Loads Analysis				
University of Delaware					
Faghri	Transportation Engineering, Simulation, Equity, Environmental Justice	*	*	*	
Barnes	Transportation policy and planning, electric vehicles, climate change and resiliency, policy analysis, equity, community engagement, qualitative research methods	*	*		*
Pierce	Planning & Policy, Sustainability, Equity	*	*		*
Saxe	Environmental Science & Engineering, Sustainability, Equity, Policy	*	*		*
University of Maryland					
Cirillo	Travel Behavior, Discrete Choice Analysis, Survey Methodologies including national household travel surveys andstated preference data, Activity-Based Modeling	*	*		
Haghani	ITS, Freight Transportation and Logistics, Emergency Response, Dynamic Fleet Management, Real-time NetworkOptimization, Mass Transit Operations, and Traffic Data Collection, Analysis and Evaluation		*	*	
Schonfeld	Transportation Engineering, Urban Public Transportation Systems, Freight Logistics, Infrastructure Location and Design,Air Transportation, Inland Waterways, Maintenance Planning and Scheduling, Transportation Network Development, Infrastructure Maintenance Mgmt		*	*	*
Chang	Traffic system controls and operations, Network traffic flow theory and simulation, Intelligent Transportation Systems Design and Implementation, Traffic safety design and analysis,Advanced traffic demand, AI in transportation networks			*	
Yang	Traffic Safety & Operations, Connected Automated Vehicles, Machine Learning for Smart Mobility, Transportation Equity				
University of Pittsburg					
Khazanovich	Pavement Performance Modeling, Pavement Design, Pavement Management, Non-destructive Testing	*			*
Vandenbossche	Pavement performance modeling, pavement design, pavement management, non-destructive testing	*			*
Stevanovic	ITS, Adaptive traffic control, Traffic signal systems, CAV, Traffic modeling and simulation		*	*	
University of Virginia					
Park	ITS, CV, Simulation, Optimization, AI/ML applications		*	*	

Chen	CAV, EV vehicle adoption and infrastructure planning, Share Mobility, Travel Behavior, Pedestrian and bicyclist safety, Virtual reality, and augmented reality simulation		*	*	
Smith	Infrastructure Applications - CAVs			*	
Harris	Work force development, Technology Transfer	*			
Mondschein	transportation systems, travel behavior, urban planning and policy, sustainable accessibility				
Virginia Tech					
Rakha	large-scale transportation system optimization, modeling, and assessment	*	*	*	*
Du	Driving behavior, CV, Traffic modeling and simulation, ITS, Advanced traffic signal control systems, GIS, Transportation safety modeling	*	*	*	*
Farag	ITS, Information retrieval, Machine learning, Large-scale data analysis, Big data			*	
Ahn	ITS, Vehicle energy consumption modeling, Vehicle emission modeling, Multi-modal traffic modeling		*	*	
Chen	Vehicle control, Vehicle automation implementation and testing			*	
Fadhloun	Traffic flow theory, Modeling of bicyclists and pedestrians	*	*		
West Virginia University					
Pyrialakou	Comprehensive transportation planning, Accessibility planning, Multimodal transportation, Public transportation	*	*		*
Martinelli	Transportation activity modeling, Transportation safety, Transportation economics	*	*		*