2023-2025

Technology Transfer Report

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Morgan State University (MSU) (Lead Institution),
Howard University (HU), University of Delaware (UDel) University of Maryland, College Park (UMD), University of Pittsburgh (Pitt), University of Virginia (UVA), Virginia Polytechnic Institute and State University (VT), and West Virginia University (WVU)

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Signature: 

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1 Introduction

As a U.S. Department of Transportation (USDOT) Regional University Transportation Center, the SMARTER Center is dedicated to addressing pressing mobility challenges in the Mid-Atlantic region through integrated research, technology transfer, and workforce development efforts. The Center focuses on developing and deploying innovative technological solutions and planning frameworks to enhance safety, improve system performance and connectivity, strengthen transportation network resilience, and address freight and logistics inefficiencies. Central to SMARTER's mission is the use of emerging technologies—such as connected and automated vehicles—and data-driven best practices that support decision-makers, planners, and transportation professionals.

To transform the region's transportation landscape, SMARTER leads a collaborative research program driven by expert faculty and actively engages students across all academic levels. The Center prioritizes actionable outcomes with real-world relevance and near-term impact. Through a robust portfolio of technology transfer activities, public outreach, education, and workforce development initiatives, SMARTER ensures that its innovations reach and benefit communities across the region—from major metropolitan areas to rural localities.

2 Implementation

From 2023 to 2025, the SMARTER Center has administered 36 projects, of which 14 have already been completed. Each project has an 18-month publication timeline, with the final six months dedicated specifically to technology transfer and implementation. This structure ensures that research outcomes are effectively translated from academia to the rest of the transportation sector. This emphasis on implementation allows us to effectively transfer of knowledge, tools, and solutions to the communities and agencies we serve.

2.1 The Autonomous wheelchair

The SMARTER Center's Autonomous Wheelchair represents a breakthrough in mobility technology for travelers with disabilities and senior citizens. Developed through five years of intensive research at Morgan State University, this innovative technology allows individuals with mobility challenges to navigate busy transportation hubs independently. Our team of researchers has transformed conventional powered wheelchairs into cutting-edge autonomous mobility devices. By retrofitting these wheelchairs with advanced sensing systems, including cameras and LiDAR sensors like those used in autonomous vehicles, we've created a reliable and safe mobility solution that provides flexibility and independence to those who need it most.

2.1.1 Key Features

- Autonomous Navigation: Advanced cameras and LiDAR sensors continuously map surroundings, allowing the wheelchair to safely navigate complex environments.
- Comfortable Travel Speeds: The wheelchair moves at natural walking speeds (2.5-4 miles per hour), ensuring a comfortable and safe experience for passengers.

- Dual Navigation Options: Available in both guided and trackless versions, the wheelchair can either follow predefined paths or navigate freely through open environments.
- Mobile App Integration: Users can call and control the wheelchair directly from their smartphones, enhancing convenience.
- Versatile Applications: Perfect for large facilities such as airports, hospitals, museums, and college campuses where navigation can be challenging for individuals with mobility limitations.

2.1.2 Real-World Implementation: BWI Airport Pilot Program

The Autonomous Wheelchair is currently undergoing comprehensive pilot testing at Baltimore-Washington Thurgood Marshall International Airport. The program tests the wheelchair's capabilities in a real-world, high-traffic environment, following a journey that takes passengers from the airport entrance, through security checkpoints, and on to their designated gates. Starting with a single prototype, the program has now expanded to include three operational wheelchairs, demonstrating the technology's reliability and growing adoption.

On July 30th, the SMARTER Center, in collaboration with CEAMLS, showcased the groundbreaking Urban Flow Autonomous Wheelchair pilot program at Baltimore-Washington International Thurgood Marshall Airport, drawing high-profile attendees including Maryland Lieutenant Governor Aruna Miller, Maryland Aviation Administrator and BWI CEO Shannetta Griffin, Maryland Department of Transportation (MDOT) Assistant Secretary Jawauna Greene, and Morgan State University President Dr. David K. Wilson.

The demonstration featured a test subject ordering a wheelchair to the airport entrance with a mobile app by scanning a QR code near the door. The wheelchair then transported the passenger to the American Airlines ticket counter for ticketing before proceeding through a TSA security checkpoint. Throughout the journey, the wheelchair utilized both guided and autonomous navigation capabilities to safely move the passenger through the facility.

The Urban Flow Autonomous Wheelchair represents is the culmination of a five-year research initiative that has expanded from a single prototype to three operational units. Led by SMARTER Director Dr. Mansoureh Jeihani and CEAMLS Director Dr. Kofi Nyarko, the team transformed conventional powered wheelchairs into autonomous navigation systems by installing advanced AI, LiDAR sensors, and computer vision technologies.

2.1.3 Development Journey

The current Autonomous Wheelchair represents the fourth iteration of this groundbreaking technology, culminating from more than five years of research and development. Our multidisciplinary team has continually refined the design, sensors, and navigation systems to create a solution that delivers both performance and practicality.

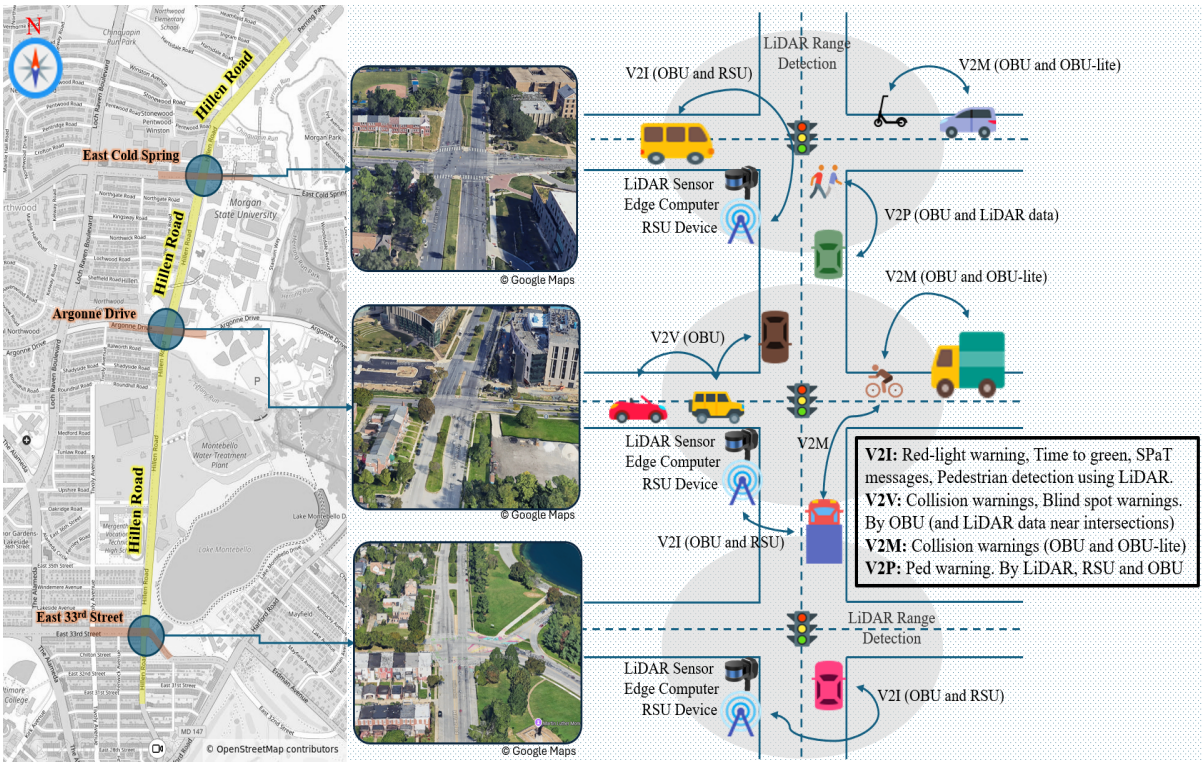
The SMARTER research project, “Advanced Mobility for People with Disabilities: Autonomous Wheelchair Pilot Deployment at the BWI Airport – Phase 3” focused on developing a custom-built mobile application with features such as QR code scanning for location-based wheelchair requests, real-time route display, and user verification systems. The app architecture is modular and scalable, supporting efficient navigation and integration with external wheelchair systems.

2.1.4 Future Directions

Efforts to further refine the Autonomous Wheelchair’s capabilities include improved obstacle detection and avoidance algorithms, extended battery life for longer operational periods, enhanced user interface options, and integration with existing transportation management systems. Moreover, SMARTER is actively soliciting partnerships from wheelchair manufacturers and the airline industry with the aim of expanding the pilot program and developing training protocols for wheelchair operators and maintenance technicians.

2.2 The SMART Intersection & SMART Corridor

The SMART Intersection and Vehicle-to-Everything (V2X) communication systems to enhance traffic safety and efficiency. SMART Corridors integrate these systems across multiple intersections. Developed by the SMARTER Center at Morgan State University, this technology creates real-time connections between vehicles, pedestrians, and infrastructure to prevent collisions and improve traffic flow.



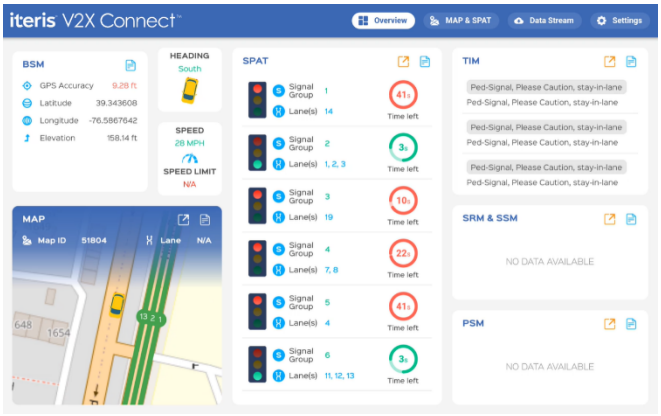
2.2.1 How SMART Corridors/Intersections Work

At the heart of each SMART Intersection is a sophisticated network of sensors, computers, roadside units, on-board units, and communications systems that continuously monitor traffic patterns and pedestrian movement. These sensors capture detailed, real-time data about all road users approaching and moving through the intersection. This information is then processed, interpreted, and communicated locally in real-time to vehicles and the surrounding infrastructure through V2X technology, enabling dynamic responses to changing traffic conditions.

The system's key components work together to create a comprehensive traffic management solution:

1. Advanced sensors (LiDARs and/or cameras) track and visualize movement patterns
2. Edge computers process data in real time and calculates safety factors to issue warning messages
3. V2X communication systems relay real-time information to vehicles and infrastructure and alert drivers and pedestrians of potential hazards
4. On-Board Units (OBUs) enable priority signaling for transit and emergency vehicles

5. Data Collection and Analysis tools provide insights for future improvements



2.2.2 West North Avenue Implementation

In partnership with the West North Avenue Development Authority (WNADA), the SMARTER Center has also begun deploying five “SMART Intersections” along Baltimore’s W. North Avenue corridor. Designed to benefit drivers, pedestrians, cyclists, and other travelers along one of Baltimore’s historic commercial corridors, this initiative exemplifies SMARTER’s commitment to implementing innovative, community-centered mobility solutions that align with USDOT priorities for smarter infrastructure and safer streets. In leveraging cutting-edge transportation technologies to protect travelers, this initiative exemplifies SMARTER’s commitment to implementing innovative, community-centered mobility solutions.

2.2.3 Portable Detection Kit

The SMARTER Center has partnered with the Baltimore City Department of Transportation to deploy portable LiDAR systems at nine intersections along three key traffic corridors throughout the city. These systems will collect critical data on traffic conflicts, red light violations, and pedestrian incidents outside designated crosswalks, enabling city officials to identify optimal traffic safety interventions and infrastructure improvements.

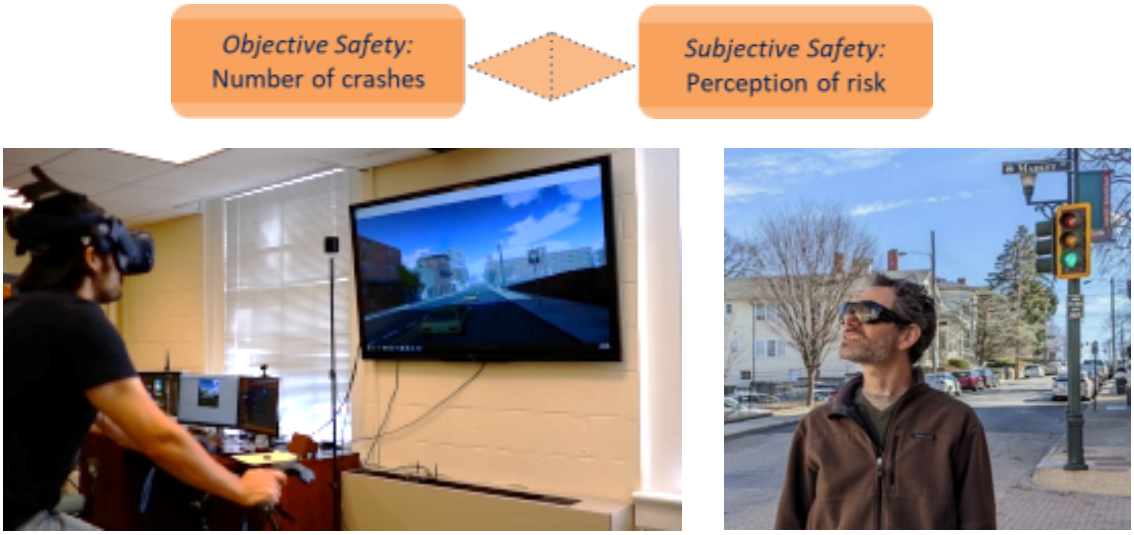
2.3 Measuring Pedestrian Psycho-Physiological Well-being in the Built Environment

To better inform the design of safer and more walkable urban environments, this research explores how pedestrian perception, comfort, and behavior differ between daytime and nighttime conditions. Using mobile eye-

tracking glasses and stated preference surveys, the study examined pedestrian attention along an urban corridor in Charlottesville, VA. By employing an urban typology framework, the analysis captured how participants directed their visual attention toward elements such as vehicles, infrastructure, lighting, people, and nature. Results showed that at night, pedestrians focused more on vehicles, lighted crossings, and lighting features, while attention to unlit infrastructure and nature declined. Notably, areas with the lowest lighting levels were consistently reported as feeling the most unsafe, underscoring the critical link between lighting and perceived safety. This work not only offers a quantitative model of attention and perception in urban settings, but also lays the groundwork for future research on how the design of streetscapes impacts pedestrian well-being and behavior.

2.3.1 Physiological Sensing to Better Understand Non-Motorized Roadway Users' Behavior

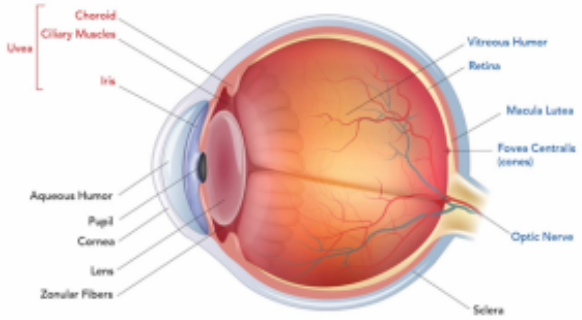
As part of efforts to improve traffic safety, education, and public outreach, researchers are increasingly turning to physiological sensing technologies to gain deeper insights into the behaviors and experiences for non-motorized roadway users, such as pedestrians, cyclists, and micromobility users. By measuring indicators like heart rate, skin conductance, and eye movements, these tools can capture real-time responses to environmental stimuli and roadway conditions. This data supports more accurate and nuanced behavioral studies, helping to identify moments of stress, distraction, or perceived danger. Insights from physiological sensing can inform targeted education campaigns, design improvements, and policy interventions aimed at protecting people and encouraging safer, more active modes of transportation.



2.3.1.1 Mobile Eye Tracking Technology

Mobile eye-tracking technology offers a powerful tool for studying human attention and perception in real-world environments. Eye movements function by directing the fovea—the part of the eye responsible for sharp central vision—toward stimuli of interest, enabling the brain to effectively process visual information. Fixations, or moments when the eye remains focused on a single point, allow researchers to make inferences about underlying cognitive processes and attentional focus. Modern mobile eye-tracking glasses are equipped with forward-facing point-of-view cameras, audio recording, pupil-tracking sensors, and inertial movement units (IMU), which collectively provide rich, multi-modal data on gaze direction, fixation duration, and head

movement. These features enable researchers to explore how individuals interact with complex environments, making eye-tracking a valuable method for transportation studies, behavioral analysis, and user experience research.



2.3.1.2 Virtual Reality for Public Involvement

Traditional public involvement methods in transportation planning often rely on 2D renderings, maps, and static visualizations, which can limit public understanding and engagement. In contrast, virtual reality (VR) provides a realistic, immersive, and interactive experience that allows both designers and community members to explore proposed projects in a more intuitive way. By virtually navigating the environment, the public can better understand the scale, layout, and impact of infrastructure changes. This enhanced understanding enables individuals to offer more detailed and meaningful feedback, ultimately leading to more informed decision-making. For transportation agencies and designers, VR becomes a powerful tool to clearly communicate design intent, build trust, and foster active participation in the planning process.

3 Stakeholder Engagement

3.1 Partners

Our collaborative efforts in technology transfer are made possible through the support and engagement of a wide range of partners across the nonprofit, government, and industry sectors. Among our nonprofit partners, we work closely with the West North Avenue Development Authority, Baltimore Metropolitan Council, Central Maryland Transportation Alliance, Metropolitan Washington Council of Governments, Council of University Transportation Centers, Institute of Transportation Engineers, Intelligent Transportation Society, Institute of Electrical and Electronics Engineers, American Society of Civil Engineers, and the American Road and Transportation Builders Association.

Our government partners include the Maryland Department of Transportation and its agencies—State Highway Administration, Motor Vehicle Administration, Maryland Aviation Administration, Maryland Transit Administration, and Maryland Transportation Authority—along with the U.S. Department of Transportation and its modal administrations such as the Federal Highway Administration, Federal Railroad Administration, Federal Transit Administration, and Federal Motor Carrier Safety Administration. We also collaborate with other state and regional transportation agencies, including DDOT, DelDOT, VDOT, PennDOT, WVDOT, Baltimore City, various counties such as Prince George's and Howard County, and the Washington Metropolitan Area Transit Authority.

In addition, our industry partners—including the Griffiss Institute, ARA, Kapsch, KCI, Dewberry, JMT, and Leidos—provide critical expertise and innovation to advance our shared mission. Together, these partnerships ensure that our research outcomes are effectively translated into practice, benefiting communities and transportation systems across the Mid-Atlantic region and beyond.

The table below illustrates some of the relationships developed and leveraged by SMARTER researchers through their UTC research projects.

Project	Organization name	Type of organization	Location of organization	Contribution (i.e, financial support, in-kind donation, collaboration, facilities, etc.)
Multimodal Planning and Asset Management of Transportation Systems in Small Urban and Rural Communities	The City of Morgantown, Engineering and Public Works Department	Local government (municipality)	Morgantown, WV	Collaboration (stakeholders, in-kind donation, and data-sharing)
	The Morgantown Monongalia Metropolitan Planning Organization (MMMPO)	Metropolitan planning organization	Monongalia County, WV	Collaboration (stakeholders)
	West Virginia Department of Transportation	Governmental	West Virginia	Collaboration (stakeholders)
	Shelly & Sands, Inc.	Contractor	Rayland, OH	Collaboration (i.e., donation: Asphalt Lab Testing Equipment)
Evaluating public engagement processes used in state transportation planning and design	Delaware Department of Transportation	State DOT	Dover, DE	Information/data sharing
	Maryland Department of Transportation	State DOT	Annapolis, MD	Information/data sharing
	West Virginia, Department of Transportation	State DOT	Charleston, WV	Information/data sharing
	Virginia, Department of Transportation	State DOT	Richmond, VA	Information/data sharing
Urbanization and Environmental Repercussions on Active Transport and	Delaware Department of Transportation (DelDOT)	State of Delaware Transportation Agency	Dover, Delaware	Financial support in the form of providing $200K match per year for the duration of the project

Project	Organization name	Type of organization	Location of organization	Contribution (i.e, financial support, in-kind donation, collaboration, facilities, etc.)
Micromodal Facilities	(DNREC) Delaware Department of Natural Resources & Environmental Control	State of Delaware Environmental Agency	New Castle, Delaware	Information sharing
Use of the Large Language Models to Improve Transportation Services	Southwestern Pennsylvania Commission	Government	Pittsburgh, PA	Shared database, provided inputs
	PennDOT	Government	Maplewood, MN	Advisory panel participation
	DelDOT	Government	Dover, DE	Advisory panel participation
	City of Pittsburgh	Government	Pittsburgh, PA	Advisory panel participation
Development of a CAV Testbed-enhanced Smart Campus at Morgan State University—Phase 2"	MDOT	Governmental	Maryland	Technology transportation, monthly meeting
	BCDOT	Governmental	Maryland	Technology collaboration, monthly meeting
	Iteris	Private	Maryland	Technical Support of RSUs, OBUs, and CCTVs
	Ouster	Private	Vancouver	Lidar equipment and preprocessing of the lidar data
	West North Avenue Development Authority (WNADA)	Economic development agency	Baltimore, MD	Information sharing
	Mead & Hunter	Private	Baltimore, MD	Information sharing

Project	Organization name	Type of organization	Location of organization	Contribution (i.e, financial support, in-kind donation, collaboration, facilities, etc.)
	TS&T	Private	Baltimore, MD	Information sharing
Implementation and Evaluation of Human-in-the-Loop Connected Cruise Control (hC3)	Virginia Common University	Academic Research/Education	Richmond, VA	Cost-share ($60K)
	Virginia State University	Academic Education/Research	Petersburg, Virginia	Collaborator
Advanced Mobility for People with Disabilities: Autonomous Wheelchair Pilot Deployment at the BWI Airport – Phase 3	Baltimore / Washington International Thurgood Marshall Airport	Public Airport	Baltimore, Maryland	Collaboration, facilities (access to airport spaces for testing the wheelchair system in real world conditions, including TSA areas)
	Maryland Department of Transportation (MDOT)	State Government	Maryland	In coordination for pilot deployment and planning
	CEAIMLS Center	Research Center	Baltimore, Maryland	Research Collaboration
	Morgan State's Office of Technology Transfer	Educational	Baltimore, Maryland	Collaboration
	Maryland Department of Disability	Governmental	Maryland	Collaboration
A Framework for Volunteer Integration in Rural and Small Urban Transit (WVU & MSU)	Maryland Department of Transportation	Governmental	Maryland	Collaboration (stakeholders)
	Transportation Association of Maryland	Transit association (non-profit)	Maryland	Collaboration (stakeholders)

Project	Organization name	Type of organization	Location of organization	Contribution (i.e, financial support, in-kind donation, collaboration, facilities, etc.)
	Virginia Transit Association (VTA)	Transit association (non-profit)	Virginia	Collaboration (stakeholders)
	Pennsylvania Department of Transportation	Governmental	Pennsylvania	Collaboration (stakeholders)
Implementing and Testing the Safety of Non-Motorized Road Users through Connected Everything and Traffic Signal Operations in Virtual Reality (Pitt & UVA)	Delaware Department of Transportation	State Government Agency	Delaware	Collaboration

3.2 Collaborators

Project	Collaborators/Contributor	ORCID # or Title
Urbanization and Environmental Repercussions on Active Transport and Micromodal Facilities	Wilmington Metropolitan Planning Organization	WILMAPCO

4 Research Outputs / Outcomes

With the support of USDOT, The SMARTER Center has produced a wide range of impactful research outcomes that contribute to advancing transportation innovation and safety in the Mid-Atlantic region. These outcomes include patents and copyrights reflecting novel technologies and tools, as well as informative multimedia projects like instructional videos and publicly accessible reports. In addition, SMARTER researchers have published numerous peer-reviewed journal articles and presented findings at national and international conferences, helping to disseminate cutting-edge knowledge to both academic and professional communities. Collectively, this research demonstrates SMARTER's commitment to translating research into actionable solutions and fostering broad knowledge transfer across the transportation sector.

4.1 Patent / Copyright

Issued Patents:

- System and Method for Driver Distraction Detection and Classification - Issued 11/19/2024, Mansoureh Jeihani, Samira Ahangari, Abdollah Dehzangi, Arsalan Hassan Pour, US00000012145597B220241119
- System and Method for Vehicle Routing - Issued 4/9/2024, Young-Jae Lee, Amirreza Nickkar, US00000011953334B220240409
- Systems and Methods for Generating Vehicle Speed Alerts, Patent **#11,565,711**

Pending Patents:

- 2023/0064211 Autonomous Mobility System Mansoureh Jeihani, Kofi Nyarko, Eazaz Sadeghvaziri, Anam Ardeshiri, Nile Walker **2023/0064211**
  - Mansoureh Jeihani, 2021/0334289 System and Method for Synchronization of Asynchronous Datasets, **2021/0334289**

Provisional Patents / Intellectual Property Disclosures

- Mansoureh Jeihani, A Multipurpose Adaptive Eco-Driving System Applicable to Driving Simulators, PPA# 62/959,215
- Mansoureh Jeihani, Distracted Driving Recognition Model Using Machine Learning, PPA# 62/959,576
- Mansoureh Jeihani, Method to Merge Datasets with Space and Time Variables, PPA# 63/013,640
- Mansoureh Jeihani, Safety Application for Work Zones, PPA#63/078,385
- Mansoureh Jeihani, Integrated Automated Wheelchair and Adapted Automated Vehicle System, PPA#63/231,379
- Mansoureh Jeihani, Systems and Methods for Generating Vehicle Speed Alerts, Patent #11,565,711
- Mansoureh Jeihani, Mixed Traffic Connected and Automated Vehicles (CAV) Testbed
- Mansoureh Jeihani, Kofi Nyarko, Nile Walker, Improved Integrated Automated Wheelchair and Adapted Automated Vehicle System
- Mansoureh Jeihani, Kofi Nyarko, Improved Automated Wheelchair System
- Mansoureh Jeihani, LIDAR-Based Traffic Mobility and Safety Data in Baltimore City
- Mansoureh Jeihani, Anam Ardeshiri, Safe Intersection for Vulnerable Road Users
- Di Yang, Mansoureh Jeihani, Blind Spot Warning with Hedging to Promote Defensive Driving Around Trucks
- Di Yang, Mansoureh Jeihani, Tianyu Shen, Online Algorithm of Extracting Time to Collision (TTC)
- Mansoureh Jeihani, Kofi Nyarko, Michael West, Automated Wheelchair Interface and Control System
- Mansoureh Jeihani, Di Yang, Ehsan Mehryaar, Wearable Ultralite Onboard Unit (OBU) for Road Users

- Young-Jae Lee, Amirreza Nickkar, Optimal Automated Demand Responsive Feeder Transit Operation Method.
- Young-Jae Lee, Amirreza Nickkar, Optimal Peer-to-Peer Ride-Matching Method
- Young-Jae Lee, Amirreza Nickkar, Optimal Integrated Single Framework for a Multi-Level School Bus Network

4.2 Open-Source Software

As part of SMARTER's commitment to advancing freight transportation research, Dr. Hesham Rakha and Dr. Ahmed Aredah have developed two innovative open-source simulation platforms. **ShipNetSim** is a large-scale, open-source ship simulator designed to model and analyze maritime freight movement with high spatial and temporal resolution. It supports realistic modeling of vessel operations and network dynamics, enabling researchers and practitioners to evaluate performance across various shipping scenarios. Additionally, **CargoNetSim** offers an integrated simulation framework for optimizing energy consumption, cost, and delay in multi-modal freight transport systems. This tool enables comprehensive assessment of freight logistics performance across rail, road, and maritime networks, supporting environmentally and economically efficient decision-making. Both platforms contribute to the broader goals of sustainability and efficiency in regional and national freight systems.

4.3 Startup Company / Entrepreneurship

One notable technology transfer success from the SMARTER Center is the creation of a startup company, TSP Solutions, founded by Nashid Khadem, a Morgan State's PhD candidate in Transportation Engineering. This startup is based on the Work Zone App patent developed through SMARTER research efforts. The Work Zone App aims to enhance safety and efficiency in work zones by providing innovative solutions for real-time communication and traffic management. This successful commercialization highlights the Center's impact in fostering entrepreneurship and translating research into practical, market-ready technologies that improve transportation operations.

4.4 Multimedia Products

Advanced Driver Assistance Systems (ADAS) Educational Video

As part of CAV Testbed Research, the researchers provided a video to educate the public about the existing technologies in vehicles to assist drivers and increase safety. The video was posted on the Maryland Department of Transportation website and YouTube channel too.

4.5 Journal Publications

Across the SMARTER Center projects, research teams have produced a robust body of scholarly work, with at least six peer-reviewed journal manuscripts currently in review or under preparation, alongside multiple technical reports nearing completion.

- Ansariyar, A., & Jeihani, M. (2023). Statistical analysis of jaywalking conflicts by a lidar sensor. *Zeszyty Naukowe. Transport/Politechnika Śląska*. (link).

- Ansariyar, A., Ardeshiri, A., & Jeihani, M. (2023). Investigating the collected vehicle-pedestrian conflicts by a LIDAR sensor based on a new Post Encroachment Time Threshold (PET) classification at signalized intersections. *Advances in transportation studies*, *61*. (link).
- Ansariyar, A., Taherpour, A., Yang, Di., Jeihani, M. (2023). Enhancing Pedestrian Safety by Providing a LiDAR-Based Analysis of Jaywalking Conflicts at Signalized Intersections, *Acta Scientiarum Polonorum Administratio Locorum* (link).
- Ansariyar, A., & Jeihani, M. (2024). Investigating the Vehicle-Bicyclists Conflicts using LIDAR sensor technology at signalized intersections, *International Journal of Transport and Vehicle Engineering*, Vol:18, No:3 (link).
- Swami, M., Pathak, C., Swami, S., and Jeihani, M., "Promoting Sustainable Mobility Analysis for S1chool Zone Safety", *Sustainability 16*(20), 9118; 2024, https://doi.org/10.3390/su16209118.
- Burra, L. T., Al-Khasawneh, M. B., & Cirillo, C. (2024). Impact of charging infrastructure on electric vehicle adoption: A synthetic population approach. *Travel Behaviour and Society*, *37*, 100834.
- Vaziri, E., Javid, R., and Jeihani, M., "Active Transportation for Underrepresented Populations in the United States: A Systematic Review of Literature", Transportation Research Records, 2678(6), 2024, DOI: https://doi.org/10.1177/03611981231197659.
- Teherpour, A., Massoumi, P., Ansariyar, A., Yang, D., Ahangari, S., and Jeihani, M., "Text and Voice Message Distraction Detection: A Machine Learning Approach Using Vehicles Trajectory Data", Transportation Research Records, 2678(12), 2024, DOI: https://doi.org/10.1177/03611981241253597.
- Shafik, A.K.; Rakha, H.A. Real-Time Turning Movement, Queue Length, and Traffic Density Estimation and Prediction Using Vehicle Trajectory and Stationary Sensor Data. *Sensors* **2025**, *25*, 830. https://doi.org/10.3390/s25030830
- Aredah, A., & Rakha, H. A. (2025). ShipNetSim: An Open-Source Simulator for Real-Time Energy Consumption and Emission Analysis in Large-Scale Maritime Networks. Journal of Marine Science and Engineering, 13(3), 518. https://doi.org/10.3390/jmse13030518
- Ansariyar, A. and Jeihani, M., "Investigating LiDAR Sensor Accuracy for V2V and V2P Conflict Detection at Signalized Intersections", *Future Transportation, 4*(3), 834-855, 2024, DOI: https://doi.org/10.3390/futuretransp4030040
- Shafik, A. and Rakha H., "Integrated Back of Queue Estimation and Vehicle Trajectory Op-timization Considering Uncertainty in Traffic Signal Timings," *IEEE Transactions on ITS Journal*, in press, accepted on September 11, 2024.
- Ansariyar, A. and Jeihani, M. Investigating LiDAR Sensor Accuracy for V2V and V2P Conflict Detection at Signalized Intersections. *Future Transportation* 2024, 4(3), 834-855; https://doi.org/10.3390/futuretransp4030040.

4.6 Conference Papers

- Aredah, A. and Rakha, H. 2024, "ShipNetSim: A Multi-Ship Simulator for Evaluating Longitudinal Motion, Energy Consumption, and Carbon Footprint." IEEE Smart Mobility Conference.
- Shafik, A. and Rakha, H. "Queue Length Estimation and Optimal Vehicle Trajectory Planning Considering Queue Effects at Actuated Traffic Signal Controlled Intersec-tions," TRB 2024 Annual Meeting.
- Vukojevic. M. "Methodology for "Implementing Multimodal Traffic Systems and CEIS for Vulnerable Road Users in a VR Environment, University of Pittsburgh." Intelligent Transportation Society of Pennsylvania conference (2024).

- Javid, R., Sadeghvaziri, E., Jeihani, M., "Transportation Analysis of Bikeshare Use Among Different Sociodemographic Groups," Poster Presentation with a Paper in the Conference Proceedings at the International Conference on Transportation and Development (ICTD 2024), Atlanta, GA, June 15-18, 2024.
- Javid, R., Sadeghvaziri, E., Kamyab Moghaddam, A., "Using the 2017 NHTS to Inves-tigate the Effect of Household Income on Biking Activities," Poster Presentation with a Paper in the Conference Proceedings at the International Conference on Transportation and Development (ICTD 2024), Atlanta, GA, June 15-18, 2024.
- Yang, D., Zhao, Z., Xie, K., Yang, H., Jeihani, M., Shen, T., "A New Piece-wise Multinomial Logit Model of Crash Severity with Accommodation of Unknown Inflection Points", In: Proceedings of the Road Safety & Simulation International Conference, Lexington, KY, 2024.
- Masumi, P., Taherpour, A., Jeihani, M., Ardeshiri, A., Ahangari, S., "Assessing the In-fluence of Various No-Right-Turn-on-Red Signs: A Driving Simulator Study," ASCE International Conference on Transportation and Development (ICTD), Atlanta, GA, June 2024, https://doi.org/10.1061/9780784485514.019.
- Masumi, P., Yang, D., Jeihani, M., Swami, M., "Demographic influences on Driving Behaviors: A Comprehensive Study using a Driving Simulator," poster presented at Seventh International TRB Women In Gender Conference, Irvine California, September, 2024.
- A.K. Shafik and H. A. Rakha, "Kalman Filter-based Real-Time Traffic State Estimation and Prediction using Vehicle Probe Data," *2024 IEEE International Conference on Smart Mobility (SM)*, Niagara Falls, ON, Canada, 2024, pp. 110-115, doi: 10.1109/SM63044.2024.10733394.
- A. K. Shafik and H. A. Rakha, "Enhancing and Evaluating a Decentralized Cycle-Free Game-Theoretic Adaptive Traffic Signal Controller on an Isolated Signalized Intersection," *2024 IEEE International Conference on Smart Mobility (SM)*, Niagara Falls, ON, Canada, 2024, pp. 216-221, doi: 10.1109/SM63044.2024.10733500.
- Ansariyar, A., Dankwa, C., Taherpour, A., Yang, D., Jeihani, M., Cook, D., "Analyzing Driver Behavior in Response to Traffic Safety Messages Broadcast by Roadside Units in Connected and Autonomous Environments", *104th Transportation Research Board Annual Meeting*, Washington, D.C., January 2025.
- Yang, D., Shen, T., Jeihani, M., Yang, X., Zhu, S., Baylor, B., "Bridge the Distance: Surveying a Path Forward Post the Francis Scott Key Bridge Collapse", *104th Transportation Research Board Annual Meeting*, Washington, D.C., January 2025.
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- Swami, M., Pathak, C., Swami, S., Jeihani, M., Multi-Faceted Walkability Analysis for School Zone Safety in Delhi, *104th Transportation Research Board Annual Meeting*, Washington, D.C., January 2025.
- Zhai, G., Xie, K., Yang, D., Yang, H., Do Electric Vehicles Lead to More Severe Crashes? A Study of Traffic Safety Trends, *104th Transportation Research Board Annual Meeting*, Washington, D.C., January 2025.
- Yan, Z., Yang, H., Wang, J., Yang, D., Xie, K., Development of a VR-Based Intervention Framework for Supporting Pedestrian Perception Behavior Study, *104th Transportation Research Board Annual Meeting*, Washington, D.C., January 2025.

4.7 Research Applications in Classrooms

1. As part of the project “Use of the Large Language Models to Improve Transportation Services,” Professors Lev Khazanovich and Julie Vandenbossche developed and integrated new AI/NLP content into CEE 1352/2325: Introduction to Generative Artificial Intelligence for Civil Engineers. This course introduces students to emerging AI techniques used in transportation planning and public feedback analysis.

2. In the "Regional Multimodal Planning in Small Urban and Rural Communities" project, led by Dr. Dimitra Pyrialakou, a new educational module was drafted and incorporated into Introduction to Transportation Engineering. This module focuses on regional multimodal transportation planning frameworks and rural infrastructure strategy.

3. Through the "CPTED for Public Transit Stations" project, Professor Jennie Saxe integrated Crime Prevention Through Environmental Design (CPTED) principles into undergraduate civil engineering

coursework. This content is being used in a spring 2025 course project that includes field assessments and class presentations focused on transit station safety.

4. In 2025, the SMARTER Center proudly participated in Exploration Day for Berman Academy, welcoming visiting students and teachers to Morgan State University. As part of the day's activities, the SMARTER team showcased a variety of interactive research demonstrations, introducing attendees to innovative projects in transportation safety, connected vehicle technology, and traffic simulation. The event offered students a hands-on look at how research is applied to solve real-world mobility challenges, while also sparking interest in STEM and transportation careers. It was a valuable opportunity to inspire the next generation of engineers, planners, and problem-solvers.

5. The Safety and Behavioral Analysis (SABA) Lab at Morgan State University is a state-of-the-art research facility advancing transportation safety through high-fidelity driving and cycling simulators, portable field units, and immersive VR-Design Studio software. Equipped with motion-sensing and standard driving simulators, a bicycle simulator, and eye-tracking systems, the lab enables controlled studies of driver and cyclist behavior, vehicle operation, visual attention, and responses to diverse traffic, environmental, and roadway conditions. Research applications include evaluating distraction impacts, testing advanced warning and safety systems, assessing cruise control, and optimizing roadway messaging and design. By generating data that would be unsafe or impossible to capture in real-world scenarios, the SABA Lab informs safer road designs, vehicle system innovations, driver training programs, traffic management strategies, and transportation policy. Through partnerships with government, industry, and academia, the lab serves as a critical resource for advancing safer transportation systems in the Mid-Atlantic region and beyond.

6. Through a cooperative effort with the National Science Foundation (NSF), the SMARTER PI, Dr. Di Yang develops innovative teaching platforms and tools that introduce undergraduate students to emerging transportation technologies. As part of this initiative, SMARTER has created a virtual connected vehicle learning platform that utilizes SUMO, an open-source microscopic traffic simulation software, and integrates several key connected vehicle applications along with driver reaction behavior models, offering students an interactive environment to engage with cutting-edge mobility solutions.

5 Events

From 2023 through 2025, the SMARTER Center actively organized and participated in a diverse series of events aimed at advancing transportation research, fostering collaboration, and promoting knowledge exchange. The Center also hosted and contributed to national and regional conferences, symposiums, and webinars, showcasing innovations of the latest research. These events underscore SMARTER's commitment to leadership in research, community engagement, and workforce development across the Mid-Atlantic region and beyond.

5.1 SMARTER Symposium

SMARTER held the 2025 SMARTER Transportation Symposium at Morgan State University on April 10-11, 2025. This premier event showcased cutting-edge research and technology from our constituent universities while creating valuable connections between researchers, practitioners, and future transportation professionals. The symposium featured expert panels, technology demonstrations, research presentations, and networking opportunities focused on advancing transportation innovation in the Mid-Atlantic region.

During the Symposium, **Lieutenant Governor Aruna Miller** visited the SMARTER team and delivered remarks highlighting the importance of innovation, safety, and collaboration in advancing transportation solutions across Maryland and the Mid-Atlantic region. Her visit underscored the state's support for university-led research initiatives and the vital role that the SMARTER Center plays in shaping the future of mobility.

The symposium also welcomed distinguished representatives from the U.S. Department of Transportation (USDOT), whose participation underscored the national significance of the discussions. Key attendees included Dr. Firas Ibrahim, Mr. Caesar Singh, Ms. Denise Dunn, Ms. Dawn C. Tucker, Ms. Amy Stearns, and Ms. Robin Kline. Their presence not only highlighted USDOT's commitment to advancing innovation and safety in transportation but also fostered meaningful dialogue between federal leaders, researchers, and practitioners, strengthening collaboration and alignment with national transportation priorities.

The SMARTER Center Symposium featured a dynamic student poster competition, showcasing cutting-edge research from undergraduate and graduate students across our partner institutions. The event also celebrated the awarding of student scholarships, recognizing academic excellence and commitment to transportation research. Attendees had the opportunity to engage directly with students and researchers through interactive demonstrations of SMARTER projects, highlighting innovations in connected vehicles, intelligent transportation systems, autonomous vehicles, and other mobility solutions. The symposium served as a platform for collaboration, knowledge exchange, and recognition of emerging talent in the field.

5.2 Presentations of SMARTER Research

2025 Great Baltimore Committee 70th Anniversary Innovation Gallery

On September 12th, the SMARTER Center participated in the event by presenting two technology demonstrations: (1) the autonomous wheelchair, developed in collaboration with CEAIMLS, which highlights advancements in accessible and inclusive mobility solutions; and (2) the SMART Intersection, which showcases innovative approaches to improving traffic safety and efficiency through intelligent transportation systems. These demonstrations not only illustrate the Center's research capabilities but also play a vital role in technology transfer activities by bridging academic innovation with real-world applications and fostering broader adoption of emerging mobility technologies.

2025 State University President's Cabinet

On September 2nd, The SMARTER Center hosted the Morgan State University President's Cabinet to showcase innovative transportation technologies currently being deployed at the National Transportation Center

(NTC), highlighting the Center's leadership in advancing research to real-world applications. They visited the SABA lab and research facilities and observed demonstrations of innovative transportation technologies being deployed at the National Transportation Center (NTC).

2025 National Summit on AV Leadership

The SMARTER Center proudly participated in the 2025 National Summit on AV Leadership, held on Capitol Hill, presenting our research through engaging posters and videos. This high-level national event brought together a wide spectrum of stakeholders—from AV developers and researchers to policymakers and community leaders—with the goal of fostering consensus and advancing U.S. leadership in autonomous vehicle technology. The Summit provided a timely platform for dialogue, set against the backdrop of the U.S. DOT's newly released AV Framework and ongoing Congressional preparations for the upcoming Transportation Reauthorization. Through keynote speeches, panel discussions, and interactive presentations, the event emphasized collaboration, innovation, and the responsible deployment of AV technologies.

Undergraduate Conference Presentations

On behalf of the University of Delaware and the SMARTER Center, undergraduate research assistant Sage Schiff presented two research posters highlighting her work on transportation innovation and data-driven planning. One poster was featured at the University of Delaware Undergraduate Research Symposium, while the

other was showcased at the City of Philadelphia Research Symposium. Sage's participation in these events reflects the SMARTER Center's commitment to engaging students in meaningful research experiences and supporting the dissemination of their work to academic and professional audiences.

National Institute of Standard and Technology (NIST)

On NIST's Assistive Tech. Demonstration Day, the researchers were to join the partners at CEAMLS to demonstrate our Autonomous Wheelchair project at NIST's Assistive Tech. Demonstration Day. This innovative, AI-powered solution highlights the meaningful role that technology can play in advancing accessibility for disabled travelers.

2025 World Bank Conference – Transforming Transportation

At the 2025 Transforming Transportation Conference, Mansoureh Jeihani, Kofi Nyarko, and their students showcased an inspiring innovation. They brought their AI-powered wheelchair to the World Bank's atrium, offering a glimpse into the future of accessible transportation. Designed to help people with disabilities navigate complex public spaces more easily, this wheelchair is currently being tested at BWI Airport and represents a truly groundbreaking advancement. During the event, we also highlighted our SMARTER intersections technology, demonstrating our commitment to improving mobility and safety for all.

Baltimore 2024 City for All Forum

SMART Intersection was featured prominently in the January 2024 City for All Forum: Envisioning Baltimore's Transportation Future event, spearheaded by Baltimore City Delegate Robbyn Lewis and held at Morgan State University. SMARTER researchers demonstrated the SMART Intersection. Most notably, through our demonstration, we made connections with local developers (Cross Street Partners and Beatty Development) and local representatives (Maryland Delegate Mark Edelson, who now serves on the SMARTER Advisory Board).

(Left) SMARTER Center graduate students and Dr. Jeihani at City for All forum; (Right)SMARTER Director Dr. Jeihani discusses the SMART Intersection with Maryland state delegate Mark Edelson.

ITS Maryland - 2024 Maryland Legislative Technology Fair

The SMART Intersection project was prominently featured at the 2024 Maryland Legislative Technology Fair held in March 2024. The live demonstration showcased how connected infrastructure and vehicle technology can improve traffic flow, safety, and efficiency at intersections. The demo attracted significant attention, drawing an audience that included six Maryland legislators, 54 legislative staff members, and 56 ITS Maryland attendees. This event provided an excellent platform for the SMARTER Center to engage directly with policymakers and industry professionals, highlighting the potential of smart infrastructure to shape the future of transportation in Maryland.

Arc Maryland

At Arc Maryland, we had the opportunity to showcase the Autonomous Wheelchair, giving attendees a hands-on look at how technology can enhance accessibility for people with mobility challenges. The demonstration highlighted the wheelchair's ability to navigate complex environments safely and efficiently, sparking discussions about the future of inclusive transportation. This event provided valuable feedback from users and stakeholders, reinforcing our commitment to practical, real-world implementation of SMARTER innovations.

2024 & 2025 Maryland Quality Initiative (MDQI)

SMARTER Center Director Dr. Mansoureh Jeihani presented "Exploring Maryland's Transportation Workforce: A Session for Morgan State Students" at Maryland Quality Initiative (MDQI) on February 7, 2024.

MSU students were given an opportunity to interact with distinguished transportation professions in a Q&A panel. Students received guidance and expertise from industry professionals, fostering a collaborative path forward for the next generation of transportation professionals.

At the 2025 MDQI conference, Dr. Jeihani and SMARTER researcher Dr. Di Yang presented their latest research on the impacts of the Francis Scott Key Bridge collapse. Their findings provided valuable insights into the regional transportation disruptions, emissions implications, and potential mitigation strategies. This important work highlights the critical role of data-driven analysis in responding to infrastructure emergencies and supporting resilient transportation planning across Maryland.

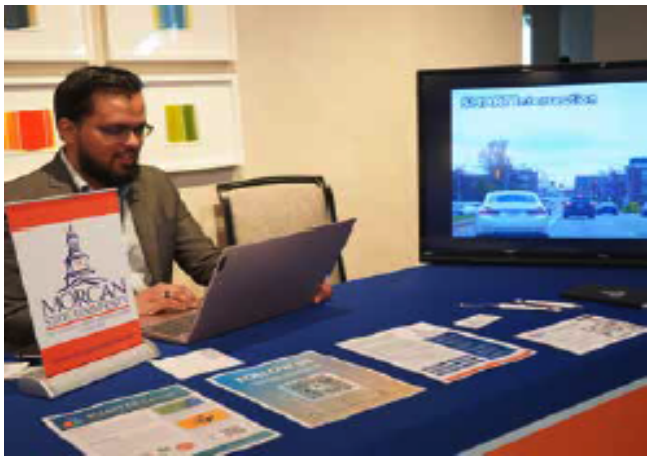
In addition to the presentations, the SMARTER Center hosted an interactive booth where attendees could explore our research firsthand. We showcased simulations, visualizations, and tools developed as part of our research projects, providing conference participants with a tangible experience of how SMARTER innovations are applied in real-world scenarios. The booth attracted considerable interest and facilitated discussions on the practical applications of our work in enhancing transportation safety, efficiency, and resilience.

2024 Making Connections Conference

In 2024, the SMARTER Center proudly sponsored and attended the Making Connections Conference, an event dedicated to strengthening the region's transit workforce through targeted workshops and training sessions. The conference featured a variety of interactive lecterns and skill-building activities aimed at enhancing the professional development of transit operators, planners, and support staff. By participating in this event, SMARTER reinforced its commitment to workforce development, knowledge sharing, and building capacity for a more efficient and innovative transportation system across the Mid-Atlantic region.

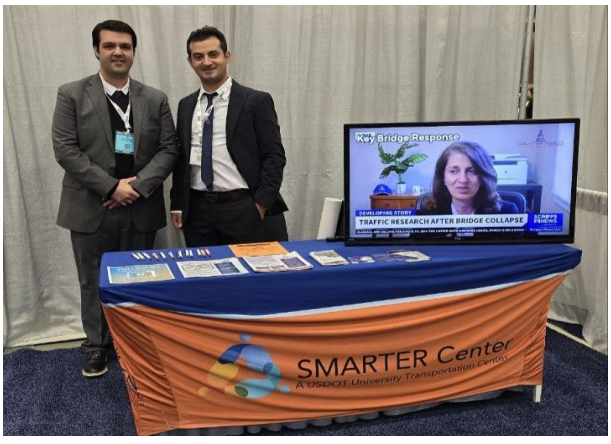
2024 TRB Second CATE Conference in Baltimore

The National Transportation Center, home of the SMARTER Center, was honored to sponsor the second annual CATE conference alongside the Transportation Research Board in July 2024, and to participate in three presentations. SMARTER Center Director, Dr. Mansoureh Jeihani, was a featured speaker in the welcome reception, highlighting the value of presence in Baltimore and the pressing need to analyze transportation research. Dr. Mansha Swami also made a presentation on the topic of Appraising the Ripple Effects of Transit-Oriented Development.

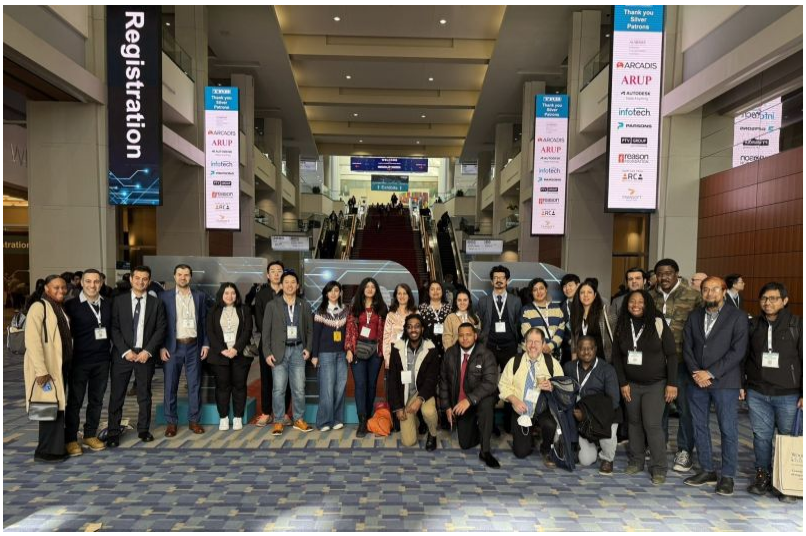


2024 & 2025 Transportation Research Board (TRB) Annual Meeting

SMARTER Center research was well-represented at the 103rd Transportation Research Board Meeting in January, 2024. At TRB 2024, faculty and researchers across partner universities collectively contributed an impressive **35 presentations**, including **28 posters and 7 papers**. In addition, Morgan State University graduate students and SMARTER researchers played a prominent role, leading workshops, lectern sessions, and presenting five posters on diverse topics ranging from transit survey data and funding challenges to driving simulator studies and mobility within low-income Black communities.



The SMARTER Center, in collaboration with the National Transportation Center (NTC), also had a strong presence at the Transportation Research Board (TRB) 2025 Annual Meeting in Washington, D.C. including research implementation demonstration at the TRB Exhibit Hall, SMARTER Collaboration Forum, and posters and presentations. Researchers presented multiple papers highlighting advancements in connected vehicle technologies, vehicle-to-infrastructure (V2I) safety communications, and driver behavior in connected environments. Several of these presentations were grounded in data from Morgan State University's Connected Vehicle testbed, demonstrating SMARTER's leadership in applied research and its contribution to advancing USDOT's vision for safer and more integrated transportation systems.



2024 ASCE Transportation Conference

The project titled "Development of a CAV Testbed-enhanced Smart Campus at Morgan State University: Phase 1" was presented at the 2024 ASCE Transportation Conference held in Atlanta, Georgia. This presentation highlighted the initial phase of establishing a Connected and Autonomous Vehicle (CAV) testbed on Morgan State's campus, aimed at supporting cutting-edge research, education, and real-world testing of emerging transportation technologies. The smart campus initiative is designed to serve as a living laboratory for mobility innovation, focusing on safety, connectivity, and transportation solutions.

Purdue University's Third Annual HBCU Conference

At Purdue University's Third Annual HBCU Conference, SMARTER undergraduate scholarship recipient Miles Davis and SMARTER Research Assistant Abolfazl Taherpourkomishani accompanied SMARTER PI Dr. Di Yang to present their poster, "Real-world and Virtual Testbeds for Emerging Transportation Technologies."

Baltimore Data Day 2024 Conference

The NTC team had the pleasure of participating in Baltimore Neighborhood Indicators Alliance-Jacob France Institute's Baltimore Data Day 2024 Conference. It served as a poignant reminder of the vibrant ecosystem of academics and policymakers devoted to empirical decision-making that improves people's lives. We're grateful to our colleagues at the Baltimore West North Avenue Development Authority and Cross Street Partners for the substantive panel discussion on how researchers and developers can leverage data to make public spaces safer and more inviting.

Baltimore 2025 City for All Forum

The SMARTER Center actively participated in the 2025 City for All Forum, engaging with local agencies, civic organizations, Baltimore City residents, and lawmakers. As part of the event, the Center staffed an interactive booth to showcase its ongoing research initiatives, with a particular focus on connected vehicle technologies. Attendees had the opportunity to learn about the SMART Intersection project and other intelligent transportation systems designed to enhance safety, mobility, and innovation in urban environments. This engagement reflects SMARTER's ongoing commitment to community outreach, public education, and collaborative innovation in support of more efficient transportation solutions.

2024 MDOT/Maryland Highway Safety Office Toxicology Meeting

In April 2024, Dr. Mansoureh Jeihani, Director of the SMARTER Center, participated in the MDOT/Maryland Highway Safety Office Toxicology Meeting. Her involvement highlighted ongoing efforts to integrate research insights into state-level transportation safety strategies.

2024 TraCR UTC Annual Conference

In May, Dr. Jeihani attended the TraCR UTC Annual Conference in Greenville, South Carolina, where she presented her research findings. Her presentation contributed to knowledge sharing and collaboration among transportation researchers and practitioners from across the country.

2024 CUTC Summer Meeting

In June, Dr. Jeihani participated in the Council of University Transportation Centers (CUTC) Summer Meeting in South Padre Island, Texas. Her engagement reflected a commitment to strengthening connections among university-based transportation research centers and advancing innovative solutions for regional and national transportation challenges.

2024 TRB Automated Road Transport Symposium

In July, Dr. Jeihani served as a panel moderator at the TRB Automated Road Transport Symposium in San Diego, California, leading the "Beyond Safety" discussion. Her leadership in this session underscored her role in shaping conversations on emerging transportation technologies, safety, and innovation.

Ramp Metering Workshop

Dr. Chang, PI for "Design and Evaluation of an Arterial-Friendly Local Ramp Metering System," has offered a workshop for state and county engineers to properly operate the innovative ramp metering system developed in his project.

BRTB Workshop

On May 15, 2025, the SMARTER Center participated in the Baltimore Regional Transportation Board (BRTB)'s Scenario Planning Workshop held at the Baltimore Metropolitan Council (BMC). The workshop brought together regional planners, transportation professionals, and researchers to explore the use of scenario planning as a strategic tool for shaping the future of mobility in the Baltimore region. Discussions focused on developing data-driven, resilient, and transportation strategies in the face of emerging challenges such as technological advancement and shifting demographics. The SMARTER Center was proud to contribute to these important conversations and support collaborative planning efforts across the region.

MASITE Annual Meeting Keynote Speech

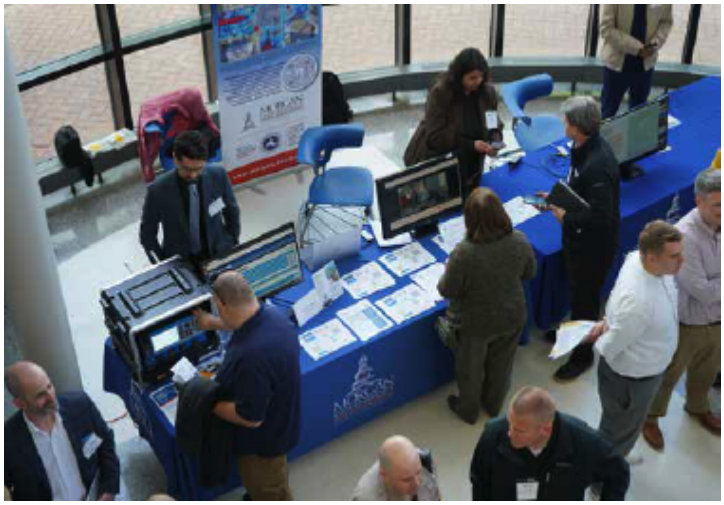
Results from the SMARTER project, "Multimodal Planning and Asset Management of Transportation Systems in Small Urban and Rural Communities," were presented in a keynote speech delivered by the research team at the Mid-Atlantic Region of the Institute of Transportation Engineers (MASITE) Annual Meeting.

hCCC Presentations

Dr. B Brian Park, lead researcher of the “Implementation and Evaluation of Human-in-the-Loop Connected Cruise Control (hCCC)” project, actively disseminated his research findings through invited talks and a keynote presentation. He delivered talks at Hyundai Motors in Hwaseng, South Korea on November 15, 2024, and at Brain Link X-Lab Day in Incheon, South Korea on November 14, 2024, discussing cooperative platooning in mixed traffic environments. Additionally, he presented a keynote address titled "What can be done when human-driven and connected automated vehicles co-exist?" at IEEE Day at James Madison University on October 1, 2024.

2024 & 2025 Maryland Connected and Automated Vehicles (MD CAV) Working Group Meetings

In 2024, Morgan State University was proud to host two professional development events in collaboration with the Maryland Connected and Automated Vehicle (MDCAV) Working Group. The first event, a meeting of the working group, was attended by 130 transportation professionals from across all sectors: state government, academic research, public safety, law enforcement, and private industry. The second event, USDOT Foundational V2X Interoperability Training, provided training from USDOT Intelligent Transportation Systems Joint Program Officers to 75 Maryland-area transportation professionals in September 2025. Both events were well attended by Morgan State students, who demonstrated research outputs and implementation (leading tours of the SMART Intersection and presenting the CAVe-in-a-Box) and benefitted from the V2X training.



In 2025, the SMARTER Center had the pleasure of once again hosting the Maryland Connected and Autonomous Vehicles (CAV) Working Group at Morgan State University. This annual gathering brings together a vibrant community of engineers, policymakers, researchers, and technologists dedicated to shaping the future of CAV technologies in Maryland and beyond. We are proud to contribute to these important discussions and to support ongoing collaboration aimed at advancing innovation and safety in transportation.

MDOT Connected Vehicle Pooled Fund Study Meeting

In 2025, Morgan State University played a key role in supporting the MDOT Connected Vehicle Pooled Fund Study Meeting, contributing to both the planning and execution of the event. As part of the meeting activities, the SMARTER Center hosted live demonstrations showcasing ongoing research and innovation in connected vehicle technology and automated mobility solutions, including a demonstration of an auto-wheelchair system designed to improve mobility for individuals with disabilities. These demonstrations highlighted the Center's commitment to technology-driven transportation research and its active collaboration with state and regional stakeholders to advance connected vehicle initiatives.

Baltimore Tech Hub Visit

Furthering our engagement with national, state, and local agency leaders, the SMARTER Center. welcomed Eric Smith, Director of the Tech Hubs Program, as part of his team's visit to the Baltimore Tech Hub. He was accompanied by representatives of the Greater Baltimore Committee (a non-governmental organization representing the private sector in the Baltimore region, "providing insightful economic and civic leadership to drive collective impact"), who have returned to the SMARTER Center for a more focused meeting in which researchers presented SMARTER research implementations and discussed collaboration opportunities.

2024 "Pizza & Patent" Meeting

The SMARTER Center hosted its inaugural "Pizza & Patent" meeting in November 2024 in collaboration with the National Transportation Center, YPT Baltimore, and the Institute of Transportation Engineers, offering guidance to students and researchers as to how they can effectively develop, patent, and deploy innovative transportation technologies.

Future of Transportation Summit

SMARTER Center staff and researchers joined colleagues from the UTC program and USDOT leadership at the inaugural Future of Transportation Summit in Washington, DC. The SMARTER Center was represented by students demonstrating the autonomous wheelchair. In addition to sitting on a workforce development panel, Dr. Jeihani debuted the SMARTER Center's year 2 collaborative research project in her presentation on Assessing the Aftermath: An In-Depth Analysis of the Regional Impact of the Francis Scott Key Bridge Collapse. The collapse of the Key Bridge in March 2024 was an event of tremendous regional impacts, particularly for transportation. The SMARTER Center will use its unique role as the Region 3 UTC (with lead institution Morgan State in the site's back-yard) to assess transportation impacts and define a path forward for mitigation, management, and rebuilding.

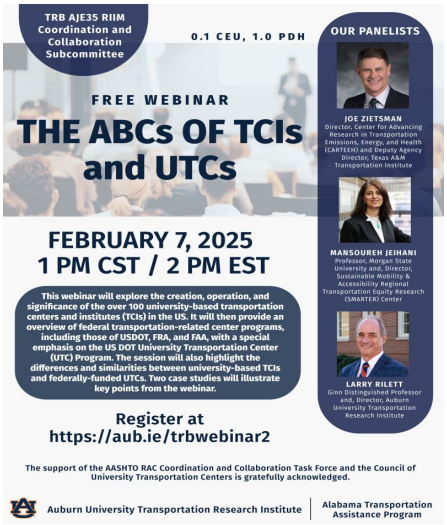
5.3 Webinars

CUTC- Transportation Safety – Vision Zero

On October 8 at 1:00 PM ET, the SMARTER Center participated in the joint Council of University Transportation Centers (CUTC) and Institute of Transportation Engineers (ITE) event on *Transportation Safety – Vision Zero*. SMARTER Center Director, Dr. Mansoureh Jeihani, presented applied research and real-world deployment of connected and automated vehicle (V2X) technologies, emphasizing their role in advancing transportation safety.

ABCs of UTCs

Dr. Jeihani participated in the ABCs of TCIs and UTCs webinar, providing a comprehensive overview of federal transportation research programs. Dr. Jeihani highlighted the strategic role and operational significance of University Transportation Centers (UTCs) in advancing national transportation goals. This engagement served as a platform to share SMARTER's research approaches, outcomes, and best practices with a nationwide audience of transportation professionals, policymakers, and academic leaders, further aligning the Center's work with the U.S. Department of Transportation's priorities for innovation and workforce development.



CUTC Workforce Development Webinar

Further emphasizing SMARTER's leadership role, Dr. Jeihani engaged in strategic dialogues on Webinar Workforce Development: Best Practices From University Transportation Centers (UTCS) with key stakeholders from various UTC programs, enhancing cross-institutional collaboration and reinforcing the Center's commitment to developing a skilled and diverse transportation workforce. These activities reflect a targeted dissemination strategy that effectively leverages conferences, webinars, and strategic partnerships to inform and impact transportation policy and practice relevant to USDOT priorities.

SMARTER Transportation Talks

SMARTER Transportation Talks is a podcast-style web series that features in-depth interviews with SMARTER researchers and leading transportation professionals, focusing on innovative approaches to mobility challenges and emerging technologies. The program explores diverse topics including urban versus rural transportation planning, connected and autonomous vehicles (CAVs), SMART city infrastructure, and disaster response methodologies. Each episode follows a structured format with extended interviews, and audience Q&A sessions, serving as a platform for knowledge transfer between academic researchers and transportation practitioners while addressing critical issues of safety, mobility, and technological innovation in transportation systems. Each episode is uploaded to the SMARTER Center's website and YouTube channel.

6 SMARTER Center's Media Presence

The SMARTER Center's new website hosts all of the institution's ongoing research projects with detailed descriptions related to the relevant investigators' aims and findings. The site also contains a wide array of information about the Center's staff, facilities, and workforce development initiatives. The website's media page shows an overview of the center's media presence and activities.

SMARTER social media ramped up in the reporting period, with the following follower metrics:

- LinkedIn: 892 followers
- Twitter (X): 126 followers
- Facebook: 32 followers
- YouTube: 59 subscribers

Some SMARTER researchers have built websites for their projects:

- Measuring Pedestrian Psycho-Physiological Well-Being in the Built Environment
- Design and evaluation of an Arterial-Friendly Local Ramp Metering System
- Crime Prevention through Environmental Design (CPTED) for Public Transit Station

Some SMARTER researchers are disseminating their work on GitHub, such as the repository for Connected Vehicle Identification System for Cooperative Control of Connected Automated Vehicles

Media appearances:

- Morgan State students test autonomous wheelchair that uses AI, WMAR, October 2024
- Cars and roads will soon get smarter. Morgan State students are paving the way with new tech, *Baltimore Banner*, 12/26/2023 (Ali Ansariyar, Dr. Mansoureh Jeihani, Abolfazl Taherpour)
- How long will it take to replace the Key Bridge? Engineers stress need to do it right, 3/27/2024 (Dr. Medhi Shokouhian)
- Pedestrian oasis or car nightmare? Harborplace plans could slow downtown traffic, 3/25/2024 (Dr. Gregory Newmark)
- "Commuting After Bridge Collapse," Scripps News Live, April 5, 2025.
- "Maryland transportation officials consider ramp metering Baltimore area to relieve traffic: State collaborating with National Transportation Center at Morgan State University to con-duct feasibility study," WBAL TV 11, July 25, 2025.
- "Morgan State students test autonomous wheelchair that uses AI," WMAR ABC 2, September 24, 2025.

Center Director Mansoureh. Jeihani promoted SMARTER research in two live interviews:

- Scripps News Interview
- Interviews with MDOT Social Media Team

6.1 Video Content

To document research outcomes, the SMARTER Center has spearheaded an "explainer" series, in which research projects, pilots, and implementations are documented in short, easy-to-digest videos. The SMARTER Explainer, "The Autonomous Wheelchair is Making Air Travel More Accessible Than Ever," went live in June

2024, and is currently available on YouTube. The autonomous wheelchair pilot at Baltimore/Washington International Thurgood Marshall Airport has been a pilot of considerable interest in the reporting period, receiving tremendous media interest and coverage. Another explainer video, "How the SMART Intersection Makes Streets Safer," details the technical specifications and benefits of the SMART Intersection system.

Public transit ridership faces a critical challenge: safety concerns that keep potential users away from buses and trains. Our latest research video examines how Crime Prevention Through Environmental Design (CPTED) offers a data-driven solution. University of Delaware researchers studied transit stations across the Mid-Atlantic, revealing how strategic design choices—improved lighting, clear sightlines, proper maintenance, and territorial boundaries—can significantly enhance rider safety without traditional security measures. For urban planners, transit professionals, and policy makers, this research demonstrates practical ways to make public transportation more accessible and appealing through evidence-based environmental design. Watch to learn how your community can implement these proven safety principles.

6.2 Awards

In January 2025, the SMARTER Center was honored with the Council of University Transportation Centers (CUTC) Technology Transfer Leadership Award. This national recognition reflects the Center's outstanding achievements in translating cutting-edge transportation research into practical applications that benefit both industry and the public sector. The award underscores SMARTER's commitment to advancing innovation through effective partnerships, real-world deployment, and measurable impact on transportation systems, aligning closely with the mission and strategic objectives of the U.S. Department of Transportation.

At the American Road & Transportation Builders Association (ARTBA) National Convention in September 2024, Dr. Mansoureh Jeihani, Director of the SMARTER Center, was honored with the prestigious 2024 ARTBA Women Leaders Excellence in Academia Award. This national recognition celebrates her outstanding contributions to transportation research, education, and leadership in academia, particularly her work at the SMARTER Center and her dedication to advancing safety and innovation in the transportation field.

In August 2024, Dr. Mansoureh Jeihani was honored with the Morgan State University Excellence in Research and Scholarship Award. This prestigious recognition highlights her outstanding contributions to transportation research, innovation, and academic leadership. Dr. Jeihani's work has significantly advanced the fields of connected and automated vehicles, traffic safety, and transportation innovation, while also fostering collaboration among researchers, policymakers, and industry leaders. The award reflects her commitment to impactful, data-driven research that addresses real-world mobility challenges and supports the development of sustainable transportation systems.

In 2025, Dr. Mansoureh Jeihani, has been awarded a fellowship by the Institute of Transportation Engineers, reflecting her significant contributions in mobility, intelligent transportation systems, computer science, and more.

7 Table of Tracking Tech Transfer Activities

2024-2025 Technology Transfer Activities

SMARTER Center			
Technology Transfer			
Note: any workshop, conference, demo, presentation, publication, ... is tech transfer.			
Types	**Items**	**Activities**	**Date**
USDOT	2024 TRB cost for students	Demonstration of SMARTER Research and Autonomous Wheelchair Technology	1/5-1/9, 2024
USDOT	2024 MD CAV lunch	Demonstration of SMARTER Research and Autonomous Wheelchair Technology	4/26/2024
USDOT	ADAS videos	Demonstration of SMARTER Research and Autonomous Wheelchair Technology	
USDOT	CATE Conference (Registrations)	Demonstration of SMARTER Research and Autonomous Wheelchair Technology	
USDOT	Atlanta Conference (ASCE)	Demonstration of SMARTER Research and Autonomous Wheelchair Technology	6/15-6/18,2024
USDOT	San Diego Conference (TRB Automated Ruled)	Dr. Jeihani presented in a panel	7/29-8/1, 2024
USDOT	Women Conference (Irvine, CA)	Presenting some SMARTER projects	9/9-9/11, 2024
USDOT	WNADA	Implementing our SMARTER intersection throughout city	
USDOT	2025 TRB Cost	presenting research, set up booth	1/5-1/9, 2025
USDOT	Booth at TRB	presenting research, set up booth	1/5-1/9, 2025
Matching	Patent filings/OTT expenses		
Matching	Wheelchair grant of OTT		
Matching	CAV/Wheelchair Task of MDOT matching		
USDOT	World Bank conference	Demo, automatic wheel and SMARTER research	3/11-3/12/2025

USDOT	2025 SMARTER Transportation Symposium	Expert panels, technology demonstrations, research presentations, and networking opportunities.	4/10/2025 -4/11/2025
USDOT	2025 SMARTER Student Poster Contest (With Symposium)	Student Poster Contest awards	4/10/2025
USDOT	NIST	Demonstration of SMARTER Research and Autonomous Wheelchair Technology	
USDOT	MDOT: Connected Vehicle Pooled Fund Study Meeting	Morgan State helped organize and had demonstration of SMARTER Research and Autonomous Wheelchair Technology	5/6-5/9/2025
USDOT	MD CAV Working Group (Maryland Connected &Automated Vehicles Working Group)	Providing Breakfast, Dr. Jeihani shared university updates, and demonstration of SMARTER Research and Autonomous Wheelchair Technology	5/21/2025
USDOT	BRTB's Scenario Planning workshop on May 15 at the Baltimore Metropolitan Council (BMC).	Dr. Jeihani participated in the BRTB's Scenario Planning workshop.	5/15/2025
USDOT	2025 Exploration Day for Berman Academy	Demonstration of SMARTER Research and Autonomous Wheelchair Technology	5/28/2025
USDOT	Peer-Mentoring Activity	Giving certificate to students (Dr. Owolabi's students) because of 2025 SMARTER symposium We mentored them into our projects, how to work with CAV and other technologies.	6/4/2025
USDOT	National Summit on AV Leadership	Demonstrated research projects through engaging videos and informative posters	6/5/2025
USDOT	BWI Wheel chair demo	Demonstration of SMARTER Research and Autonomous Wheelchair Technology, LG and government came	7/30/2025
Matching	Morgan's Office of Research Admin. visits SABA Lab	10 people from the ORA will visit us to see our research activities/equipment. We need to show CAV, Simulators, and some other research. A mini version of the symposium.	7/15/2025
Matching	Baltimore City's Visit to the SABA Lab/SMARTER Center	We show CAV, Simulators, and some other research.	7/17/2025

Matching	NIH Visit to MSU	We show CAV, Simulators, and some other research.	8/4/2025
	CAV Research Workshop at John Hopkins	We show CAV, Simulators, and some other research.	8/6/2025
Matching	Morgan President's Senior Cabinet Visiting	We show our projects, CAV, Simulators, and some other research.	9/2/2025
	Transportation Talks	Dr. Kofi and Dr. Chen	8/20, 9/3/2025
	Innovation Gallery powered by UpSurge for GBC's 70th Annual meeting	Demonstration of SMARTER CAV, Simulators and Autonomous Wheelchair	9/12/2025
Total Expenditures			

8 Appendixes

SMARTER Year One Core Projects-Completed

Univ.	Project Name	PI(s)	Completion Date
MSU	A Novel Driver Warning System with Hedging to Promote Defensive Driving	Di Yang	September 1, 2024
MSU	Development of a CAV Testbed-enhanced Smart Campus at Morgan State University: Phase 1	Mansoureh Jeihani, Di Yang, Anam Ardeshiri	September 1, 2024
MSU	Deriving Transit Performance Metrics from GTFS Data	Gregory Newmark	September 1, 2024
MSU	The Mass Transit Dilemma: Streamlining Regulatory Regimes to Address Climate Change And Poverty	Joseph Niehaus	September 1, 2024
UDel	Crime Prevention through Environmental Design (CPTED) for Public Transit Stations	Jennie Saxe	September 1, 2024
UDel	The Impacts of Climate Change and Urbanization on Non-Motorized Transportation Facilities and Negative Consequences on Lower Income Neighborhoods	Ardeshir Faghri	September 1, 2024
VT	Energy consumption modeling of ships: towards a Door-to-Door (D2D) freight optimization	Hesham A. Rakha, Ahmed Aredah	September 1, 2024
VT	Enabling GLOSA through Domain Knowledge Aware SPAT Prediction and Queue Length Aware Trajectory Optimization	Hesham A. Rakha, Amr Shafik, Seifeldeen Eteifa	September 1, 2024
Pitt	Socially Responsible Road Charging for Online Retailers to Support Disadvantaged Urban Communities	Aleksandar Stevanovic, Lev Khazanovich	September 1, 2024
Pitt	Assessing Pavement Rehabilitation Strategies	Lev Khazanovich, Julie Vandenbossche	September 1, 2024

Univ.	Project Name	PI(s)	Completion Date
UMD	Design and Evaluation of an Arterial-Friendly Local Ramp Metering System	Gang-Len Chang	September 1, 2024
UMD	A Comprehensive Analysis of EV Charging Demand Prediction, Infrastructure Planning, and Power Network Resilience in the Era of Electric Mobility	Xianfeng Yang	September 1, 2024
UVA	Connected Vehicle Identification System for Cooperative Control of Connected Automated Vehicles	B. Brian Park	September 1, 2024
UVA	Measuring Pedestrian Psycho-Physiological Well-Being in the Built Environment	T. Donna Chen, Andrew Mondschein	September 1, 2024
UVA	Smart Rideshare Matching – Feasibility of Utilizing Personalized Preferences	B. Brian Park, Afsaneh Doryab, T. Donna Chen, Andrew Mondschein	September 1, 2024
WVU	Automated vehicle-supported mobility services for rural areas	V. Dimitra Pyrialakou, David Martinelli	September 1, 2024

SMARTER Year Two Core Projects

Universities Involved	Project Name	PI(s)
Morgan State University	Advanced Mobility for People with Disabilities: Autonomous Wheelchair Pilot Deployment at the BWI Airport – Phase 3	Mansoureh Jeihani Kofi Nyarko
University of Delaware	Evaluating the Public Engagement Processes Used in State Transportation Planning and Design	Philip Barnes Andrea Pierce
University of Virginia	Virtual Reality as a Tool to Enhance Public Involvement Process	T. Donna Chen
University of Delaware	Crime Prevention through Environmental Design (CPTED) for Public Transit Stations: Year 2	Jennie Saxe

Virginia Tech	Integration of a Real-time Traffic State Estimation and a Decentralized Game-Theoretic Traffic Signal Controller	Hesham A. Rakha Amr Shafik
Virginia Tech	Agent-Based Approaches in Freight Systems: Towards A Door-To-Door (D2D) Freight Optimization	Hesham A. Rakha Amr Shafik
University of Pittsburgh	Use of Large Language Models to Improve Transportation Services	Lev Khazanovich Aleksandar Stevanovic
University of Virginia	Implementation and Evaluation of Human-in-the-Loop Connected Cruise Control (hCCC)	B. Brian Park
University of Maryland, College Park	Impact of Charging Infrastructure on Electric Vehicle Adoption: A Synthetic Population Approach	Cinzia Cirillo
Morgan State University	CAV Testbed Enhancement, Phase II	Di Yang Mansoureh Jeihani Ehasan Mehryaar Anam Ardeshiri
University of Maryland, College Park	Transportation Infrastructure Development Under Uncertainties	Paul Schonfeld
West Virginia University	Multimodal Planning and Asset Management of Transportation Systems in Small Urban and Rural Communities	V. Dimitra Pyrialakou
University of Delaware	Urbanization and Environmental Repercussions on Active Transport and Micromodal Facilities	Ardeshir Faghri

SMARTER Competitive-Collaborative Projects

Univ.	Project Name	PI(s)
Pitt & UVA	Implementing and Testing the Safety of Non-Motorized Road Users through Connected Everything and Traffic Signal Operations in Virtual Reality	Aleksandar Stevanovic B. Brian Park
UVA & MSU	Assessing Feasibility of Deploying Transit Signal Priority with Connected Vehicle Technology using MSU Testbed	B. Brian Park, Di Yang
MSU & UMD	Development of a Pedestrian Collision Avoidance System for Connected and Autonomous Vehicles with Cooperative Perception	Xianfeng Yang, Di Yang

Univ.	Project Name	PI(s)
WVU & MSU	A Framework for Volunteer Integration in Rural and Small Urban Transit	V. Dimitra Pyrialakou, Gregory Newmark
Univ.	Project Name	PI(s)
All	Assessing the Aftermath: An In-Depth Analysis of the Regional Impact of the Francis Scott Key Bridge Collapse	All