Spring 2019

The UMEC Report

The newsletter for the Urban Mobility & Equity Center, a Tier 1 University Transportation Center led by Morgan State University

Research spotlight

‘Food desert’ metrics are first step toward solutions

The link between diet and health is well established, and residents of poorer communities who lack access to cars suffer from a lack of healthy food options in their neighborhoods. In Baltimore these areas are termed healthy food priority areas, often called “food deserts.”

But just what does that mean? And how do people living in disadvantaged communities shop for food? What determines if a neighborhood is a healthy food priority area? The UMEC project, “Understanding Access to Grocery Stores in Food Deserts in Baltimore City” examined those questions.

“This project was looking at how people get to and from the grocery store,” Dr. Celeste Chavis, one of the study’s authors, said. “In the past, definitions of food deserts were based on income, vehicle access and distance. But different income levels were used, and different distances were used as well – from ¼ of a mile from a store to 1 mile, which is a huge range. Can we determine what the threshold should be – can we tell from the data where the drop off in access occurs?”

The project surveyed shoppers and interviewed drivers of unlicensed vehicles for hire, known as “hacks,” who traditionally operate in healthy food priority areas.

No Boundaries Coalition operates a food stall in West Baltimore once a week to provid healthy food options.

Researchers quickly learned that people don’t shop at the nearest grocery store.

“That was one interesting thing we saw, and yet the definitions of a food desert are based on distance to the nearest store,” Dr. Chavis said.

Not surprisingly, people didn’t use public transit to shop, since lugging bags would be difficult. Instead they

Continued on p. 2

Director's Message

Dr. Andrew Farkas

All of us desire good health, a good job, and good quality of life.

Our research faculty, students and staff have accomplished much over this year to gain understanding of access to healthy foods, safe commuting, access by transit to employment and how internships and research prepare students for work.

This issue of the newsletter gives numerous examples, but three milestones are particularly impressive: (1) At a recent conference on mobility, grant managers and researchers expressed interest in our two food desert research projects; final reports are finishing up soon. (2) A recent Traveler's Insurance outreach event featured our research, using our driving simulator and eye tracking device, on distracted driving in Maryland. (3) Several of our graduate students exhibited posters and made presentations at the TRB Annual Meeting in January; also, we are currently going through the selection cycle for the Maryland Department of Transportation/Morgan State University Graduate Internship Program.

All of these milestones have involved dedicated students, faculty and staff, and I am grateful to all for the visibility that we've achieved.

Discovering food desert metrics, from page 1

either got a ride from friends or family or used a hack or taxi.

Hack drivers were not worried about competition from transportation network companies such as Lyft and Uber.

"They provided service," Dr. Chavis noted. "With their regular customers, they would help them take their bags in the house, and they actually shopped for elderly customers, taking their list and going to the store for them. That the hack drivers were not concerned about transportation network companies was surprising to me, and I was surprised they were so customer-oriented in terms of service."

Their prices were competitive, too, costing around $5 to $10 one way.

Now that the data has been collected, Dr. Chavis and her co-authors are developing metrics to establish just what constitutes a healthy food priority area, moving away from the old standard of distance to the nearest grocery store.

"We will do the analyses and see what the metrics should be," she said. "This type of work could influence transportation solutions."

Ongoing UMEC Research Projects

Core projects

Managing the Impacts of Different CV/ AV Penetration Rates on Recurrent Freeway Congestion from the Perspective of Traffic Management
Dr. Gang-Len Chang, University of Maryland

Traffic State Prediction: A Traveler Equity and Multi-model Perspective
Dr. Hesham Rakha, Dr. Kyoungho Ahn, Virginia Tech

Drivers' Interactions with Advanced Vehicles in Various Traffic Mixes and Flows (autonomous and connected vehicles (ACVs) electric vehicles (EVs), V2X, trucks, bicycles, and pedestrians) – Phase I: Driver Behavior Study and Parameter Estimation
Dr. Mansoureh Jeihani, Morgan State University

Hands on Wheel, Eyes on Road
Dr. Mansoureh Jeihani, Morgan State University

Optimized Development of Urban Transportation Developments
Dr. Paul Schonfeld, University of Maryland

Understanding Access to Grocery Stores in Food Deserts in Baltimore City
Dr. Celeste Chavis, Anita Jones, M.S., Morgan State University

Development of Multimodal Traffic Signal Control
Dr. Hesham Rakha, Dr. Kyoungho Ahn

For detailed information on UMEC research projects, visit www.morgan.edu/UMEC

Collaborative projects

Developing an Eco-Cooperative Adaptive Cruise Control System for Electric Vehicles
Dr. Hao Chen, Dr. Hesham Rakha, Virginia Tech; Dr. Cinzia Cirillo, University of Maryland

Shared Bus/Bike Lane Safety Analysis: Accessing Multimodal Access and Conflicts
Dr. Celeste Chavis, Morgan State University; Dr. Cinzia Cirillo, University of Maryland

E3: Equity in Evacuation: A Practical Tool and Two Case Studies
Dr. Cinzia Cirillo, University of Maryland; Dr. Celeste Chavis, Morgan State University

Improving Public School Bus Operations: Boston Case Study
Dr. Youssef Bichiou, Dr. Hesham Rakha, Virginia Tech; Dr. Young-Jae Lee, Morgan State University, William Eger, Boston Public Schools

Innovative Methods for Delivering Fresh Foods to Underserved Populations
Dr. Hyeon-Shic Shin, Dr. Young-Jae Lee, Morgan State University; Dr. Paul Schonfeld, University of Maryland

Developing a Connected Vehicle Transit Signal Priority System
Dr. Kyoungho Ahn, Dr. Hesham Rakha, Virginia Tech; Dr. Young-Jae Lee, Morgan State University

Developing and Testing an ECO-Cooperative Adaptive Cruise Control System for Buses
Dr. Hesham Rakha, Dr. Hao Chen, Virginia Tech; Dr. Mansoureh Jeihani, Morgan State University

The UMEC Report is published annually.

Completed research projects

Dynamic (Time Dependent) Green Vehicle Routing Problem
Dr. Ali Haghani, Gonush Masghati Amoli, Moschoula Pternea, University of Maryland

Optimal Automated Demand Responsive Feeder Transit Operation and Its Impact
Dr. Young-Jae Lee, Amirreza Nickkar, Morgan State University

Sustainable Design of Concrete Bus Pads to Improve Mobility in Baltimore City
Dr. Aslan, Dr. Mehdi Shokouhian, Morgan State University

Click or tap to read these reports

Optimization of Emergency Traffic Patrols (ETP) Operations (This project is completed but not yet posted; it is undergoing a technology transfer review)
Dr. Ali Haghani, University of Maryland; Dr. Mansoureh Jeihani, Morgan State University

Evaluating Equity Issues for Managed Lanes: Methods for Analysis and Empirical Results
Dr. Cinzia Cirillo, Dr. Javier Bas Vicente, University of Maryland

Studying distractions safely is still scary in video

How do you study distracted driving without getting someone hurt?

How do you determine exactly how long a distracted driver's eyes are off the road, when they lose control of the car, and which activities are the most dangerous – is talking on a hands-free cell phone the same as talking to a passenger in the car?

The answer, of course, is a driving simulator. The UMEC project "Hands on the Wheel, Eyes on the Road," funded in part by the Maryland Highway Safety Office, put drivers of various ages and backgrounds in the simulator and asked them to do the things that 80 percent of us admit to doing on the road – texting, talking, removing clothing, eating, drinking, and using a GPS app. A sophisticated eye-tracking system recorded their eye movements while the simulator documented adverse events, everything from decreasing speed and hard braking to swerving or crashing.

"This project will help us better educate the public about the dangers of distracted driving," Dr. Mansoureh Jeihani, the principal investigator, said. "By understanding just what happens we can craft a more effective message about how to avoid it."

The result is not only interesting data about the mechanism of distraction, but a five-minute video, available for public use, that illustrates just how a driver is imperiled.

https://www.youtube.com/watch?v=cxBP177W06o&t=42s

Incidentally, even with a hands-free device, talking on the phone is more dangerous than talking with a passenger. Why? Because the passenger is seeing the same road conditions as the driver sees – a tricky merge, congestion, an upcoming intersection – and instinctively stops talking or even alerts the driver. Someone on the other end of the phone doesn't see those things and keeps on talking. ■

Noted

UMEC researchers do much more than just work on UMEC projects, and their breadth of experience contributes to the high-quality innovative research that is a hallmark of our center. Read about the accomplishments of a sampling of a few of our researchers.

Amirreza Nickkar - graduate student

- Second Place award for best paper at the 23rd National Conference on Rural Public & Intercity Bus Transportation

- 2019 Lifesavers Conference Scholarship winner

Presentations at the January 2019 annual meeting of the Transportation Research Board in Washington, D.C.

• Nickkar, A., and Lee, Y. An Evaluation of Dedicated Lanes for Automated Vehicles at Roundabouts with Various Flow Patterns

• Shin, H., Farkas, A., and Nickkar, A. A Spatial Analysis of Commuting Trips of Electric Vehicle Drivers: The Case of Maryland.

• Bhuyan, I., Chavis, C., Barns, P., & Nickkar, .A. (2019). An Equity Gap Planning Analysis of the Baltimore Bike Share System.

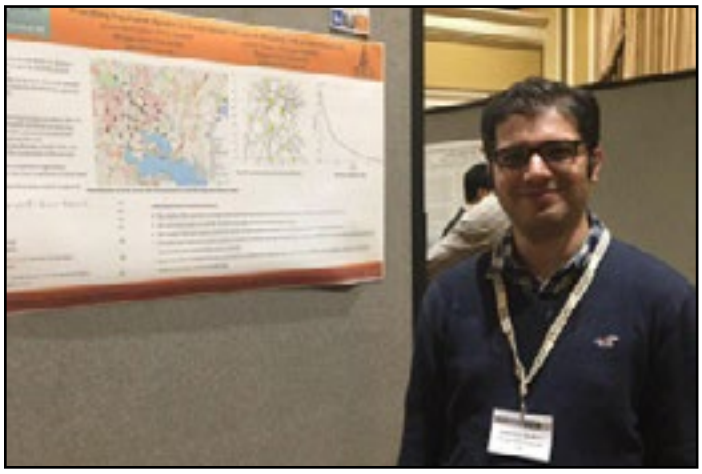
• Lee, L., Nickkar, A., and Meskar, M. Impact of Individual Passenger Degree of Circuity on Optimal Transit Network Design.

• Nickkar, A., and Dadvar, S. Developing an Optimal Traffic Signal Control Algorithm with Pedestrian Priority at Signalized Intersections Under Connected Vehicles Environment.

• Nickkar, A., and Chavis, C. Providing equitable accessibility in food desert areas; A missing link in Baltimore city, Active Living Research Conference 2019, February, Charleston, South Carolina.

Presentations

• Lee, Y.-J., & Nickkar, A. (2019). Comparison between Demand Responsive Feeder Transit Networks with Door-to-Door and with Temporary Stops. Paper presented at the International Conference on Demand Responsive and Innovative Transportation Services, April 2019, Baltimore, Maryland.



Amirreza Nickkar

• Lee, Y.-J., & Nickkar, A. (2019). Optimal Automated Demand Responsive Feeder Transit Operation and Its Impact. Presented at University Transportation Centers (UTC) Spotlight Conference, Washington D.C.

• Nickkar., A., and Lee, Y. Phased Development of the Automated Demand Response Feeder Transit System in Rural Areas, The National Rural ITS and ITS Arizona Annual Conference, Arizona, October 2018.

• Nickkar, A., & Lee, Y.-J. (2019). Comparison between Demand Responsive Feeder Transit Networks with Door-to-Door and with Temporary Stops. Paper presented at the International Conference on Demand Responsive and Innovative Transportation Services, Baltimore, Maryland 2019.

Nickkar, A., and Chavis, C. Providing equitable accessibility in food desert areas; A missing link in Baltimore city, Active Living Research Conference 2019, February, Charleston, South Carolina.

Publications

• Shin. H., Bapna. S., Farkas. A., and Nickkar. A., 2019, *Providing an Accurate Performance Measure of the*

Continued on p. 6

Continued from p. 5

Economic Contribution of the Freight Industry: An Input-Output Analysis. International Journal of Applied Logistics (IJAL) ,9(1), P16

• Nickkar, A., and Jeihani, 2019, M., *Analysis of Driving Simulator Sickness Symptoms: A Zero-Inflated Ordered Probit Approach*. Transportation Research Record, 0(0), 1-13.

• Shin, H., Farkas, A., and Nickkar, A. *An Analysis of Attributes of Electric Vehicle Owners' Travel and Purchasing Behavior: The Case of Maryland.* 2019 International Conference on Transportation & Development, Alexandria, VA 2019 (Presentation and accepted for publication).

Snehanshu Banerjee - graduate student

- Presented two papers in Stockholm, Sweden
- Presented two papers at TRB
- Two accepted papers at the ASCE International Conference on Transportation & Development
- Patent application in progress

Publications

• Banerjee, S., Jeihani, M., Khadem, N. K., & Brown, D. D. (2019). *Units of information on dynamic message signs: a speed pattern analysis*. European Transport Research Review, 11(1), 15.

• Banerjee, S., Jeihani, M., & Khadem, N. K. (2019). *Influence of work zone signage on driver speeding behavior*. Journal of Modern Transportation, 1-9.

• Moghaddam, Z. R., Jeihani, M., Peeta, S., & Banerjee, S. (2019). *Comprehending the roles of traveler perception of travel time reliability on route choice behavior*. Travel Behaviour and Society, 16, 13-22.

Danny Brown - graduate student

- Recipient, 2018 Conference of Minority Transportation Officials (COMTO)/Infrastructure Engineering National Scholarship

Publications

• *Units of Information on Dynamic Message Signs: A Speed Pattern Analysis*. Published January 2019, European Transportation Research Review.

Conference Papers

• *Speed Pattern Analysis based on Units of Information in Proximity of Dynamic Message Signs: A Driving Simulator Study*. Published January 2019, Transportation Research Board 98th Annual meeting 2019.

• *Impact of Level of Service (LOS) on the Driver's Behavior on Arterial*. Published January 2018, Transportation Research Board 97th Annual meeting 2018.

Technical Papers

• P*otential Effects of Composition and Structure of Dynamic Message Sign (DMS) Messages on Driver Behavior and Their Decision to Use Freeway Traffic Incident Management (FTIM) Routes*. Published, August 2018, Maryland Department of Transportation State Highway Administration.

Samira Ahangari - graduate student

Presentations

• Ahangari S., Jeihani M., Sheykholmolook M., The effect of cellphone usage on driving performance of young drivers using eye tracking in a driving simulator, In Lifesavers National Conference on Highway Safety

Continued on p. 7

Congrats to students and staff who will be serving on the following committees:

2019-2022 AFP50, Standing Committee on Seasonal Climatic Effects on Transportation Infrastructure, Oludare Owolabi

2019-2022 AP060, Standing Committee on Paratransit, Celeste Chavis

2019-2022 AP060, Standing Committee on Paratransit, Snehanshu Banerjee

2019-2022 AND30, Standing Committee on Simulation and Measurement of Vehicle and Operator Performance, Snehanshu Banerjee

2019-2022 AP045, Standing Committee on Passenger Intermodal Facilities, Kristen Franklin

Continued from p. 6
Priorities, Loiusville, Kentucky, March 31-April 2, 2019.

• Ahangari S., Lee Y., GIS Approach to Identify the Potential Service Areas and Feasibility for Demand Response Feeder Transit Service: US metropolitan Suburban Areas, in International Conference on Demand Responsive and Innovative Transportation Services, Baltimore, Maryland, April 15-17, 2019.

• Ahangari S., Chavis C., Olowokande G. Bhuyan I. Understanding Access to Grocery Stores in Baltimore City, in International Conference on Transportation & Development (ICTD 2019), Alexandria, Virginia, June 9-12, 2019.

• Ahangari S., Chavis C., Nickkar, A. Analyzing Grocery-Shopping Travel Behavior by Women in Baltimore Using Zero-Inflated Negative Binomial Models, in 6th International Conference on Women's Issues in Transportation, Irvine, California, September 10-13, 2019.

Istiak Bhuyan - graduate student

- Received "National Traffic Safety Scholar – 2019" award at the 37th annual Lifesavers National Conference on Highway Safety Priorities. Highlight of the conference was meeting the U.S. Secretary of Transportation Elaine L. Chao and Heidi K. King, Deputy Administrator, NHTSA.

Presentations

• Ahangari, Samira; Bhuyan, Istiak A; Lee, Young-Jae; 2019. GIS Approach to Identify the Potential Service Areas and Feasibility for Demand Response Feeder Transit Service: US metropolitan Suburban Areas, International Conference on Demand Responsive and Innovative Transportation Services.

• Bhuyan, Istiak A; Chavis, Celeste; 2019. Shared Bus-Bike Lane Safety Analysis: Assessing Multimodal Access and Conflicts Using Computer Vision Tools, Transportation & Development Institute (T&DI) of ASCE.

• Bhuyan, Istiak A; Chavis, Celeste; Barnes, Phillip; Nickkar, Amirreza; 2018. Equity Gap Analysis of Baltimore Bike Share System, Transportation Research Board, Transportation Research Board 98th Annual Meeting.

Publications

• Bhuyan, Istiak A.; Chavis, Celeste; Barnes, Phillip; Nickkar, Amirreza; 2019. *GIS-Based Equity Gap Analysis Case Study of Baltimore Bike Share Program*. Urban Science.

• Nickkar, Amirreza; Bhuyan, Istiak A.; Chavis, Celeste; Barnes, Phillip; Banerjee, Snehanshu 2018. *A Spatial-Temporal Gender and Land Use Analysis of Bikeshare Ridership: The Case Study of Baltimore City*. City, Culture and Society (under peer review).

• Banerjee, Snehanshu; Bhuyan, Istiak A.; 2019. *Correlation of Crime Rate with Transit Connectivity and Transit Demand at Census Block Group Level*. Transportation & Development Institute (T&DI) of ASCE.

• Ahangari, Samira; Chavis, Celeste; Olowokande, Gbenga; Bhuyan, Istiak A.; Jones, Anita; 2019. *Understanding Access to Grocery Stores in Food Deserts in Baltimore City*. Transportation & Development Institute (T&DI) of ASCE.

Dr. Mansoureh Jeihani, Professor, Morgan State University

- A provisional patent has been filed.

Publications

• Rashidi Moghaddam, Z., Jeihani, M., Peeta, S., and Banerjee, S., *Comprehending the roles of traveler perception of travel time reliability on route choice behavior*. Travel Behavior and Society, 16, 13-22, 2019.

• Banerjee, S., Jeihani, M. and Khadem, N. K., *Influence of Work Zone Signage on Driver Speeding Behavior*. Journal of Modern Transportation, 1-9, 2019.

• Jeihani, M. and Banerjee, S., *Drivers' Behavior Analysis under Reduced Visibility Conditions using a Driving Simulator*. Journal of Traffic and Logistics Engineering, 6(2), 48-52, 2018.

• Banerjee, S., Jeihani, M., and Rashidi Moghaddam, Z., *Impact of Mobile Work Zone Barriers on Driving Behavior on Arterial Roads*. Journal of Traffic and Logistics Engineering, 6(2), 37-42, 2018.

• Danapour, M., Nickkar, A., Jeihani, M., and Khaksar, H., *Competition between High-speed rail and Air Tranport in Iran: The Case of Tehran-Isfahan*. Case Studies on Trans-

Continued on p. 8

Continued from p. 7
port Policy, 6(4), 456-461, 2018.

• Nickkar, A., Jeihani, M., and Sahebi, S. *Analysis of Driving Simulator Sickness Symptoms: A Zero-Inflated Ordered Probit Approach*. Transportation Research Record - Journal of Transportation Research Board, In press.

Presentations at the January 2019 annual meeting of the Transportation Research Board, Washington, D.C.

• Banerjee, S., Jeihani, M., Khadem, N. K., Brown, D.D. Speed Pattern Analysis Based on Units of Information in the Proximity of Dynamic Message Signs: A Driving Simulator Study.

•Banerjee, S., Jeihani, M., Morris, D. Impact of Work Zone Signage on Driver Speeding Behavior: A Driving Simulator Study.

•Nickkar, A., Jeihani, M., and Sahebi, S. Analysis of Driving Simulator Sickness Symptoms: A Zero-Inflated Ordered Probit Approach.

•Ahangari, A., Rashidi Moghaddam, Z., Jeihani, M., Chavis, C., Chen, H., Rakha, H., and Kang. K., Investigating the Effectiveness of an Eco-Speed Control System in the Vicinity of Signalized Intersections Using a Driving Simulator.

•Karmakar, N., Aghdashi, S., Babich, J., Chavis, C., Jeihani, M., The Impact of Arterial Level of Service on Driver Behavior Using High Resolution Trajectory Data.

Grant

•Jeihani, M., Investigating the Impact of Distracted Driving among Different Socio-Demographic Groups. Maryland Department of Transportation (MDOT), October 2018-September 2019, $50,000.

Dr. Paul Schonfeld, Professor, University of Maryland

- Recipient of ASCE's 2018 James Laurie Prize for career achievements in Transportation Engineering.

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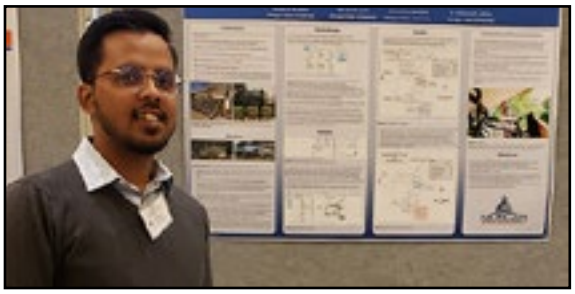
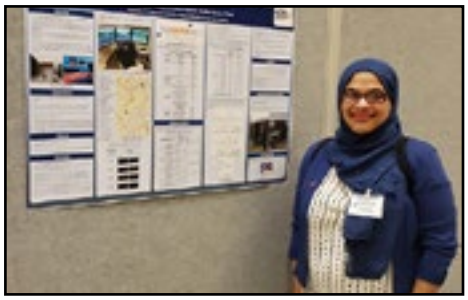


Md Muhib Kabir (left) and Nashid Khadem (right) presented research posters at a competition here in April.



UMEC was represented at the 2019 Lifesavers Conference by (from left) recent graduate Dr. Seyedehsan Dadvar and graduate students Amirreza Nickkar, Istiak Bhuyan and Samira Ahangari.

Dr. Young-Jae Lee made two presentations at the International Conference on Demand Responsive and Innovate Transportation Services in April.

Continued from p. 8

- Recently completed a study funded by the National Science Foundation entitled Optimization with Data Acquisition in Transportation Engineering.

Presentations at the January 2019 annual meeting of the Transportation Research Board, Washington, D.C.

• Yu, L., Sun, Y. and Schonfeld, P. Nonlinear Complementarity Problem Formulation for Bus Transit Assignment under General Stochastic Equilibrium Conditions.

• Choi, Y., Schonfeld, P., Lee, Y. and Shin, H. Innovative Methods for Delivering Fresh Food to Underserved Populations.

• Shayanfar, E. Schonfeld, P. and Wang, J. J. Prioritizing Highway Development Projects Based on Market Access in Appalachia.

Recent Conference Papers

• Guo, Q., Chen, S., Schonfeld, P. and Li, Z. *How Time-Inconsistent Preferences Affect Investment Timing for Rail Transit*, accepted for Transportation Research Part B: Methodolgical, October 2018.

• Li, W., Pu, H. Schonfeld, P. Song, Z. Zhang, H. Wang, L., Wang, J. Peng, X. and Peng, J. *A Method for Automatically Re-creating the Horizontal Alignment Geometry of Existing Railways*. Computer-Aided Civil and Infrastructure Engineering, June 2018.

• Huang, H., Li, K. and Schonfeld, P. *Metro Timetabling for Time-varying Passenger Demand and Congestion at Stations*. Journal of Advanced Transportation, March 2018.

• Kim, M., Schonfeld, P. and Kim, E. *Switching Service Types for Multi-region Bus Systems. Transportation Planning and Technology,* March 2018.

Dr. Mehdi Shokouhian, Assistant Professor, Morgan State University

- In January 2019, Dr. Mehdi Shokouhian was promoted to tenure-track Assistant Professor in the Department of Civil Engineering.

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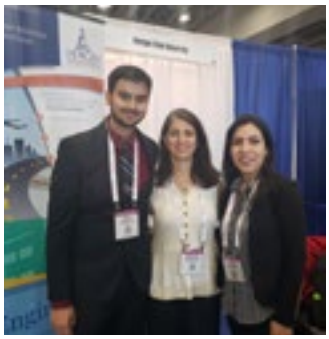
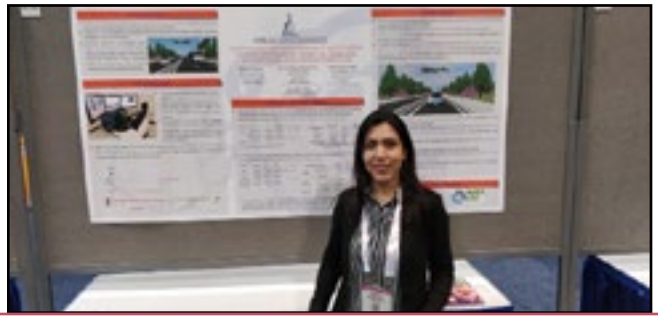
UMEC was well represented at TRB

Congrats to the UMEC students and faculty, who had numerous poster and paper presentations at the 2019 TRB.





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Publications

• Seo, J. Schaffer, W., Head, M. Shokouhian, M., *Integrated FEM and CFD Simulation for Offshore Wind Turbine Structural Response*. Springer, International Journal of Steel Structures, August 2018, p1-13 https://doi.org/10.1007/s13296-018-0191-y

Presentations

• Dr. Mehdi Shokouhian and his doctoral student, Muritala Adegoke presented research entitled: Experimental investigation of residual compressive strength of partially confined column retrofitted using CFRP wrap, in Structures Congress 2019, April 24-27, Orlando, Florida.

• Dr. Mehdi Shokouhian and his doctoral student, Muritala Adegoke presented research entitled: Toward a Sustainable Design: Performance Evaluation of AFRP RC Column with Energy Dissipaters" in Engineering Sustainability 2019, April 7-9, Pittsburgh, Pennsylvania.

Recently funded projects

• The project Highway Geometrics and Noise Abatement Decision has been funded in January 2019 by the Maryland State Highway Administration.
Investigators: Dr. Owolabi, Dr. Shokouhian and Dr. Efe.

UMEC research in the spotlight

From left, UMEC Director Dr. Andrew Farkas, Dr. Young-Jae Lee and grad student Amirreza Nickkar presented research at the University Transportation Centers Spotlight conference in the House and Senate office buildings in Washington, D.C., on May 14, 2019.

A look back at last summer's programs

Summer Transportation Institute

High school students learned about career opportunities in transportation through a variety of field trips and hands-on activities.

Middle School Summer Transportation Initiative

Middle School students learned about bridges and bridge construction. Informing students about STEM careers at an earlier age helps them make decisions later on about what classes to take to gain the necessary math and science skills.

Teacher Transportation Institute

Helping teachers incorporate STEM concepts into their classroom is the most effective way to ensure future students will be well versed in STEM skills.

The Urban Mobility & Equity Center is a federally funded Tier 1 University Transportation Center led by Morgan State University in partnership with the University of Maryland and Virginia Tech. UMEC focuses on research to improve the mobility of people and goods in an environmentally sustainable and equitable manner.

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