

# The UMEC Report

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

## Research spotlight

### Rerouting on the fly could transform delivery systems



*Dr. Ali Haghani*

Delivery companies plan routes that maximize efficiency while responding to both requests to pick up packages and orders to deliver ones already on the truck.

But one incident – a broken-down car, an accident or a work zone – can snarl traffic, imprisoning the delivery truck in a backup or forcing the driver to change routes.

“What if the control center could get real-time traffic information?” asks Dr. Ali

Haghani, a professor of civil and environmental engineering at the University of Maryland and the principle investigator of the UMEC project Dynamic Vehicle Routing with Route Guidance for Urban Pickup and Delivery. “They already know the positions of their vehicles because they’re equipped with GPS. So what

if on the fly they could reroute them and avoid those hotspots? It requires the rerouting to be done in real time.”

That rerouting could also take into account packages that need to be collected along the new route, and could direct the truck back once the incident is over to deliver packages in the vicinity.

“This is the optimization model,” Dr. Haghani says.

But getting there requires tackling what’s known in research circles as the time-dependent vehicle routing problem, “and we have to solve it,” Dr. Haghani says. “It requires developing algorithms.”

He’s spent the past year developing the necessary algorithms and soon will begin testing them in simulated traffic situations.

Such improved routing would reduce emissions caused by vehicles stuck in traffic and increase urban mobility. The algorithms also could be used for other applications, such as ride sharing services and mass transit. •

## Director's Message



### Dr. Andrew Farkas

Welcome to the UMEC newsletter. As you'll read, there is much going on here. I recently attended two events that also showcased our center.



On April 3, the University of Maryland launched its Maryland Transportation Institute at the House of Delegates office building in Annapolis, Maryland. MTI brings research resources within the university and from university partners, such as Morgan State, to bear upon transportation challenges throughout society. We're pleased to participate in that effort.

I also attended the first annual National Mobility Summit of U.S. Department of Transportation University Transportation Centers devoted to mobility of people and goods. Led by Carnegie Mellon University, the national center with that theme, the summit brought university partner, government, and industry representatives together to discuss areas of cooperation, best practices and continuing challenges. Both of these events show that transportation and mobility are exciting areas for research, education and technology transfer. The technologies and human factors involved in mobility are really fascinating, and UMEC's students and affiliated faculty are immersed in them.



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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## Core research 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

### Sustainable Design of Concrete Bus Pads to Improve Mobility in Baltimore City

Dr. Monique Head, Morgan State University; Dr. Mehdi Shokouhian, Morgan State University

### Evaluating Equity Issue for Managed Lanes: Methods for Analysis and Empirical Results

Dr. Cinzia Cirillo, University of Maryland

### Traffic State Prediction: A Traveler Equity and Multi-model Perspective

Dr. Hesham Rakha, Virginia Tech; Dr. Kyounggho 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 Jaihani

### Hands on Wheel, Eyes on Road

Dr. Mansoureh Jaihani, Morgan State University

### Development of Multimodal Traffic Signal Control

Dr. Hesham Rakha, Virginia Tech; Dr. Kyounggho Ahn, Virginia Tech

### Dynamic Vehicle Routing with Route Guidance for Urban Pickup and Delivery

Dr. Ali Haghani, University of Maryland

### Optimizing Small-Sized Automated Transit Operations and Its Applications

Dr. Young-Jae Lee, 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, Morgan State University; Anita Jones, M.S., Morgan State University

## Competitively awarded projects

### Innovative Methods for Delivering Fresh Foods to Underserved Populations

Dr. Hyeon-Shic Shin, Morgan State University; Dr. Young-Jae Lee, Morgan State University; Dr. Paul Schonfeld, University of Maryland

### Developing a Connected Vehicle Transit Signal Priority System

Dr. Kyounggho Ahn, Virginia Tech; 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, Virginia Tech; Dr. Hao Chen, Virginia Tech; Dr. Mansoureh Jaihani, Morgan State University

### Optimization of Emergency Traffic Patrols (ETP) Operations

Dr. Ali Haghani, University of Maryland; Dr. Mansoureh Jaihani, Morgan State University

For more information on any of these projects, visit our website at [www.morgan.edu/umec](http://www.morgan.edu/umec)

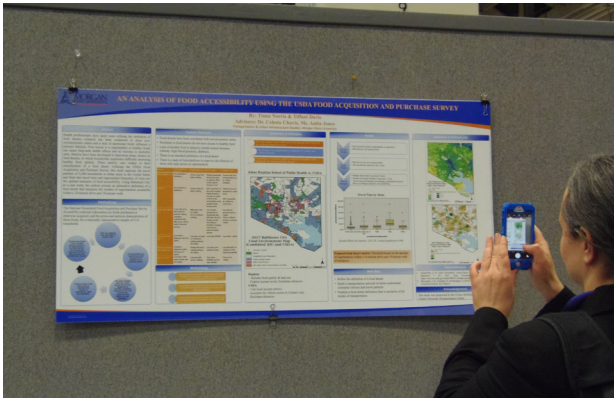
The UMEC Report is published annually.

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Dr. Andrew Farkas, left, UMEC director, gave an overview of research, education and technology transfer at the First Annual National Mobility Summit in April. In the photo on the right are Caesar Singh, director, University Transportation Centers Grants Program; the Honorable Finch Fulton, Deputy Assistant Secretary for Transportation Policy, U.S. Department of Transportation; and Raj Rajkumar, Director, Mobility 21 National UTC, Carnegie Mellon University. •



A poster presentation that was part of the project Understanding Access to Grocery Stores in Food Deserts in Baltimore City garnered interest at the Transportation Research Board's annual meeting. •

Samira Abangari, a Ph.D. student at Morgan, presented Developing and Testing an ECO-Cooperative Adaptive Cruise Control System for Buses (Collaborative Project) at the 2018 ITE Mid-Colonial District Annual Conference in April. •



Optimized Development of Urban Transportation Networks was presented at the January 2018 annual Transportation Review Board meeting (Jovanovic, U., Shayanfar, E. and Schonfeld, P. "Selecting and Scheduling Link and Intersection Improvements in Urban Networks," Annual TRB Meeting, Jan. 2018 (18-05088)), and it was published in the peer-reviewed Transportation Research Record in October 2017. •

The Second Annual Transportation Summit was held at Morgan State University on April 18. •



Jeremy Weiss, a master's degree student in City & Regional Planning at Morgan State University, was a University Transportation Center Outstanding Student of the Year for 2017. He recently earned an Excellence in Community Planning Certificate for his entry in the Sustainable Growth Challenge, a collegiate competition hosted by the Maryland Sustainable Growth Commission that engages students in planning, sustainability and reinvestment issues. Weiss, who graduates in May, also has a master's degree in public administration with a focus on nonprofit management from Clark University. His background includes work in building inspection, community organization, and weatherization programs; he came to Baltimore six years ago to work for AmeriCorps. He has an undergraduate degree from Clark University in sociology and environmental studies.

"The program at Morgan seemed like a great way to combine a lot of disparate interests," he said. "It was a good conduit to pull together everything I've done - how can I use all these skills to create better opportunities in Baltimore? The Morgan program really treats Baltimore as its living laboratory ... you do need to go out into the communities and learn and interact." •



## School Day proves smart day at VTTI



Robert McCall, research associate at VTTI, discussed motorcycle safety research with high school students. (Photo by Carri Edmiston)

Earning a driver's license is a rite of passage for teenagers, and while it's an exhilarating time for young drivers, it's also a dangerous one. Motor vehicle crashes are the leading cause of death for U.S. teens, according to the Center for Disease Control and Prevention.

During its School Day program on April 19, Virginia Tech Transportation Institute (VTTI) experts spoke with high school students about teen driving risks and demonstrated ways to become safe drivers.

"From a public health standpoint, we should always include and communicate directly with the people we are trying to help," said Gayatri Ankem, a research associate for VTTI's Center for Vulnerable Road User Safety. "VTTI is doing the research, and we know how bad things are, but we are also working on solutions to help young drivers make safer choices."

Classes from three counties visited VTTI and toured the Virginia Smart Road testing facility. Students from second to 10th grade interacted with researchers and experienced firsthand the transportation safety research and technology being developed. VTTI co-hosts the event with the Virginia Department of Transportation.

When Carol Kroeger heard about School Day, she thought it would be a great opportunity for her driver's education class at Dayspring Christian Academy.

"The students are close to holding their driving permits, if they don't have them already. Our administration felt it was important for them to see this research and engage with experts, not only to make them aware of the risks, but also on the tools they can use to become safe, alert, and responsible drivers. VTTI gives us

a face in the community to rely on for these resources," said Kroeger.

During their visit, Kroeger's class met with Ankem to explore teen driving safety data and best practices based on the transportation institute's research. Ankem works for VTTI's Teen Risk and Injury Prevention Group, which studies the hazards facing young drivers and identifies safety measures. The group also collaborates with local school districts on outreach programs.

Ankem began her interactive presentation by quizzing the class on their knowledge of teen driving statistics. For example, one out of every five young drivers in the country is involved in a collision within the first six months of driving. If the teenage driver is texting, the crash risk quadruples, according to VTTI's research for the National Highway Traffic Safety Administration. This statistic surprised sophomore Makayla Carr.

"You hear all that time that you should be careful and not to let yourself be distracted by your phone while driving. But it is so hard to do that in today's culture considering that everybody is always using their phones," said Carr. "I've always heard that there are a lot of deaths with teens, but I never realized how many there actually are."

Ankem and the students also discussed the key risks facing teen drivers. Based on VTTI's research, some of these risks include texting, speeding, night driving, traveling with teenage passengers, and not wearing seat belts. Being inattentive while driving is particularly hazardous, which Ankem put into perspective like this: If someone is driving at 55 miles per hour, that person will drive the length of one football field in only four seconds.

Students can become safe drivers by practicing consistently with their parents and guardians. An additional option is for teenagers and their parents to develop a mutual system of tracking and rewarding improved driving performance over time. A recent VTTI study for the National Surface Transportation Safety Center for Excellence found that consistent parental involvement greatly reduces precarious driving behaviors by their teenagers.

Following the annual School Day, VTTI and VDOT hosted an open house of the Virginia Smart Road for the general public. •