2015 ANNUAL REPORT

NATIONAL CENTER FOR TRANSPORTATION
SYSTEMS PRODUCTIVITY AND MANAGEMENT

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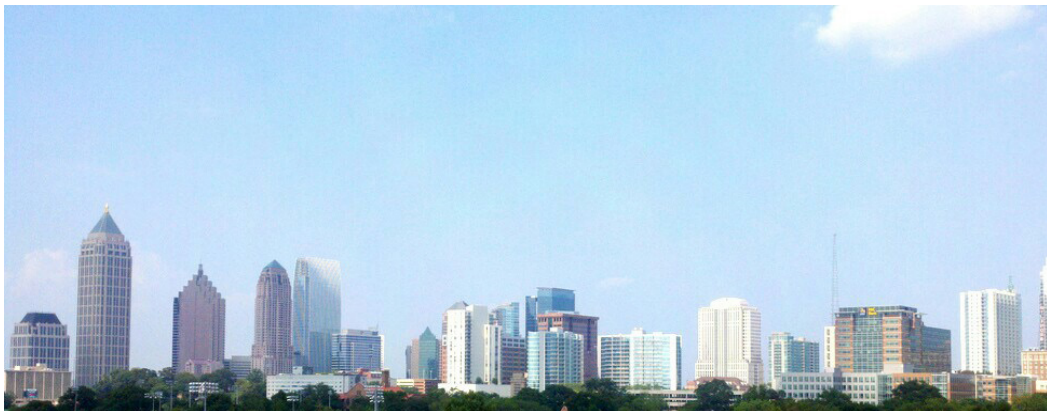
GEORGIA INSTITUTE OF TECHNOLOGY
FLORIDA INTERNATIONAL UNIVERSITY
THE UNIVERSITY OF ALABAMA AT BIRMINGHAM
UNIVERSITY OF CENTRAL FLORIDA

NCTSPM



The National Center for Transportation Systems Productivity and Management (NCTSPM) is a 2012 Tier 1 University Transportation Center (UTC) sponsored by the U.S. Department of Transportation's Office of the Assistant Secretary for Research and Technology (OST-R) and the states of Georgia, Florida, and Alabama.

CONSORTIUM PARTNERS
Georgia Institute of Technology
Florida International University
Georgia Transportation Institute
The University of Alabama at Birmingham
University of Central Florida

This publication is a report of NCTSPM's transportation research, education, and technology transfer activities for January 1, 2015 – December 31, 2015.

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Back cover photos, clockwise from top left: Courtesy of FEMA, FEMA, Georgia Tech, Georgia Tech, Georgia Tech.

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ABOUT NCTSPM

NCTSPM

The National Center for Transportation Systems Productivity and Management (NCTSPM) is a National University Transportation Center (UTC) funded by the U.S. Department of Transportation's Office of the Assistant Secretary for Research and Technology (OST-R) in cooperation with the Departments of Transportation of Georgia, Florida, and Alabama.

The Center's program in research, education, and technology transfer is multi-modal, multi-disciplinary, multi-sector, and needs-driven. The theme of NCTSPM is transportation systems performance and management, and its focus is on addressing critical interactions between safety, state-of-good-repair, and economic competitiveness. NCTSPM supports transportation-related research, education, workforce development, and technology transfer. It disseminates research results and other products of the Center to the transportation community and actively explores international cooperative activities with research entities in selected countries where similar research interests exist.

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Georgia Institute of Technology
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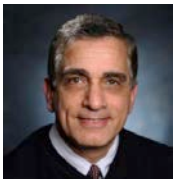

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MESSAGE FROM THE DIRECTOR

The foundation of the health, economy, and quality of life we have come to expect in our nation is our transportation infrastructure. Transportation professionals must anticipate future demands and needs in tailoring a sustainable built environment that achieves these goals. It is the task of those involved in transportation to continue to innovate new and better transportation solutions, leveraging technological advances while understanding the needs and constraints of a largely fixed infrastructure.

As a leading center of transportation research, NCTSPM is in a unique position to facilitate inter-university and cross-disciplinary collaboration as well as training the next generation of transportation professionals. This year's Annual Report places special emphasis on the impact of that next generation — our students — on the transportation world. They are at the core of every university, and they represent the future of innovation and leadership in our field. From internships with major transportation engineering firms to conducting research, from leading professional society student groups to social events, students of all levels play an integral role in the success of NCTSPM.

That student efforts are at the core of the NCTSPM mission is a point of pride for our researchers. Their efforts have shaped the success of many of the individual projects and the center overall. For instance, students at UAB played key roles in "Evaluation of Anchor Bolt Clearance Discrepancies," helping develop new ways to calculate loading capacities of anchor bolts. FIU students were instrumental in "Examining the Value of Travel Time Reliability for Freight Transportation." Along with Dr. Xia Jin, they tackled issues critical to the future of freight investment and policy. Georgia Tech's effort in "Estimating the Monetary Benefits of Reducing Delays on Heavily Trafficked Truck Freight Corridors in Georgia" is a prime example of the value of mentoring and collaboration between established researchers and students. Denise Smith worked with Dr. Frank Southworth to advance the state-of-the-art in determining the dollar value of reducing travel time for different classes of trucks. Further, graduate students were essential in ensuring the success of "HOV to HOT Conversion Impacts on Carpooling," where students and researchers were able to develop new guidance and best practices for similar conversions in the future.

This has been an outstanding year for NCTSPM: our influence and impact continues to grow, thanks in no small measure to these students' efforts alongside our researchers. Our investment in them — and thus in the future — is paying off already. Meanwhile, our overarching goal is to contribute to the enhancement of the field of transportation, and from this report, I believe it is clear that we have done just that. I hope you will join with us in celebrating our entire team's achievements.

Dr. Michael P. Hunter
Director, NCTSPM

MESSAGE FROM THE CHAIRMAN

This has been an outstanding year for the Center as we move toward completion of many projects, thanks to the outstanding efforts of Dr. Hunter and all the other leaders of the Center and its endeavors. We look forward to the possibility of new federal transportation legislation and the opportunity to continue as a designated Center for research.

The thrust of almost all our efforts remains to move sophisticated university-centered research out into the practical world of transportation, and to couple that progress with a broad and active participation from many excellent students who will become the future leaders in the field of transportation. Our Center is multidisciplinary, producing research with a focus on real-world applications. This is particularly important at a time when there are continued constraints on funding transportation projects at the federal, state, and local levels. Each dollar spent on transportation must be spent wisely and in a way that shows the best investment return. Internally, with a mix of federal, state, and private funding and university resources, our Center is able to leverage both funding and work.

Each of the projects discussed in this report contributes to making transportation safer, more effective, and less expensive. The Center continues to develop methods and tools to allow departments of transportation at all levels to do more with less. Our Center is particularly effective in addressing this challenge because our researchers bring together strengths from a wide variety of fields and a broad base of participating universities to meet the real-world challenges faced by every transportation system today. NCTSPM helps lead the way in designing a better future for transportation.

Each member of our Board is proud to be associated with the Center and its professors, researchers, and students, through our university partners.

F. T. Davis, Jr.
Chairman, Board of Advisors

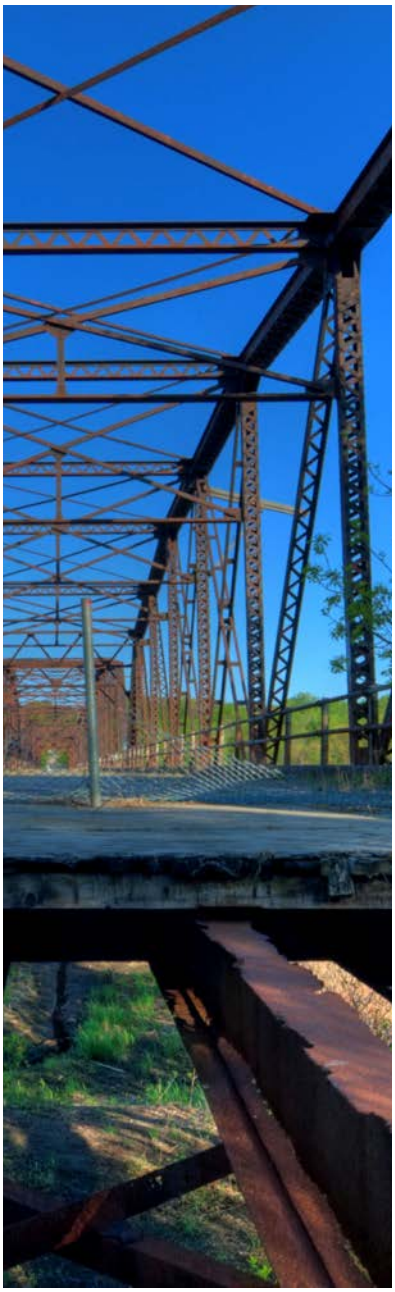

Photo courtesy of Flickr user landerholm.

PARTNER INSTITUTIONS

GEORGIA INSTITUTE OF TECHNOLOGY (Georgia Tech) is ranked seventh among U.S. News & World Report's top public universities and enrolls 23,000 students within its six colleges. Georgia Tech is the nation's leading producer of engineers, as well as a leading producer of female and minority engineering Ph.D. graduates; it ranks among the nation's top ten universities (without a medical school) in research expenditures. Georgia Tech is home to the Center for Quality Growth and Regional Development, an applied research center created to help society achieve a sustainable, equitable, superior quality of life through effective planning, policy, and design.

FLORIDA INTERNATIONAL UNIVERSITY (FIU) is a public research university in Miami, Florida. With a student body of nearly 55,000, FIU serves a large number of economically disadvantaged students. Nearly 50 percent of all undergraduate students at FIU receive financial aid, and nearly 60 percent of those recipients come from families with annual household incomes under $30,000. FIU is the largest producer of Hispanic engineers in the continental United States. It is also home to The Lehman Center for Transportation Research (LCTR) established in 1993 to meet the transportation research, education, and training needs of the South Florida region.

GEORGIA TRANSPORTATION INSTITUTE (GTI), a partnership between the Georgia Department of Transportation and participating Georgia universities, seeks to address today's real-world transportation challenges, focusing on issues critical to the state of Georgia. Active GTI universities currently include Georgia Tech, The University of Georgia, Mercer University, Georgia Southern University, Georgia State University, Kennesaw State University, Albany State University, and Savannah State University.

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM (UAB) offers an academic experience to nearly 18,000 students, fueled by innovative curricula, strong mentoring, and groundbreaking research and scholarship in a highly interdisciplinary environment. UAB is a member of the University Transportation Center for Alabama and is also home to the UAB Sustainable Smart Cities Research Center, which seeks to foster cross-disciplinary research and training, and to develop innovative solutions for sustainable smart cities and communities.

UNIVERSITY OF CENTRAL FLORIDA (UCF), situated in the prime location of Orlando, offers opportunities in many fields that benefit students while they are in school, helping them land a career upon graduation. More than 60,000 students attend classes on UCF's main campus and its ten regional campuses, which are located throughout Central Florida. UCF houses the Center for Advanced Transportation Systems Simulation (CATSS). CATSS has a theme consisting of four core research focuses: Advanced Intelligent Transportation Technologies and Communications, Traffic Safety, Simulation and Advanced Training for Transportation Applications, and Congestion Pricing.

STATE PARTNERS

Georgia Department of Transportation
Florida Department of Transportation
Alabama Department of Transportation

OTHER COLLABORATING UNIVERSITIES

Morehead State University
Saint Louis University
University of Memphis

Georgia Tech

FIU FLORIDA INTERNATIONAL UNIVERSITY

GEORGIA TRANSPORTATION INSTITUTE

UAB THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

UNIVERSITY OF CENTRAL FLORIDA

TECHNOLOGY TRANSFER
ECONOMIC COMPETITIVENESS
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NCTSPM
RESEARCH
STATE-OF-GOOD-REPAIR
EDUCATION

STUDENT RESEARCH SPOTLIGHTS

Student research is at the core of every successful research project. The following pages represent just a few of the many outstanding student researchers found across NCTSPM's member universities.

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

Doctoral candidate **Ahmed Ahmed** specializes in structural engineering and is working with Dr. Ian Hosch on "Evaluation of Anchor Bolt Clearance Discrepancies." The equations developed in this research will be included in the future AASHTO Standard Specifications for Structural Supports manual.

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

Emily Black, a master's student, is contributing to a collaborative effort between UAB, FIU, and UCF, which is attempting to determine if a new type of decking system for bridges can speed up repair times for failing bridges. She and other researchers are compiling all available literature on the topic and developing design guidelines to help future practitioners. Her work has been an integral part of the NCTSPM project, "Innovative Modular High Performance Lightweight Decks for Accelerated Bridge Construction."

UNIVERSITY OF CENTRAL FLORIDA

Kali Carroll is a master's student working as a graduate research assistant with Dr. Mohamed Abdel-Aty. She is working on toll plaza safety, determining what factors can affect driver behavior and safety.

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

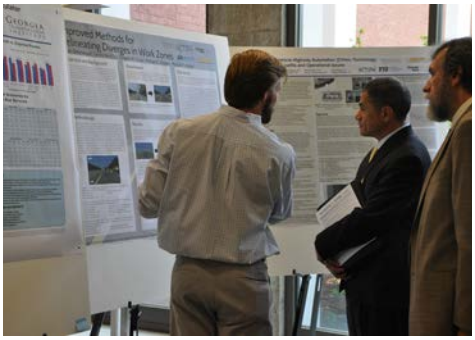
Doctoral student **Mohamed Gallow** is working with Dr. Fouad Fouad on fatigue design research, sponsored by the Alabama Department of Transportation to determine optimal designs for highway signs to minimize fatigue caused by wind gusts. Mohamed has also worked as a teaching and research assistant at UAB since 2012.

FIU FLORIDA INTERNATIONAL UNIVERSITY

Sahar Ghasemi, a doctoral candidate originally from Iran, is working with Dr. Amir Mirmiran on the project, "Innovative Modular High Performance Lightweight Decks for Accelerated Bridge Construction," which will develop materials to allow for heavier loads on existing bridges and extend the bridges' service lives. Sahar has been involved in two other bridge engineering research projects in the last two years.

Georgia Tech

Franklin Gbologah completed his doctoral degree in Fall 2015. His research focused on the impacts of illumination levels on nighttime safety at roundabouts. His research results were chosen as one of three best papers at the Transportation Research Board's (TRB) 4th International Roundabout Conference, and were subsequently presented on a TRB national webinar that commemorated 20 years of roundabout design and was the most attended TRB webinar to date. Franklin is currently working to expand the research to include stop-control and uncontrolled intersections. His awards include National Society of Black Engineers Board of Corporate Affiliates Scholar, the Georgia Tech Tower Award, and an Eisenhower Graduate Fellowship.



Georgia Tech

Aaron Greenwood, the 2015 NCTSPM student of the year, completed his doctoral degree in Fall 2015. Aaron investigated how drivers perceive traffic control devices in work zones. He is also involved in the projects "Cooperative Vehicle-Highway Automation (CVHA) Technology: Simulation of Benefits and Operational Issues" and "Factors Influencing Visual Search in Complex Driving Environments." Aaron is a recipient of a prestigious National Science Foundation Graduate Research Fellowship.

Photo courtesy of Flickr user leeco.


DR. FOUAD H. FOUAD
FAU

STUDENT RESEARCH SPOTLIGHTS

University of Central Florida

Juneyoung Park is a doctoral candidate with a focus in transportation engineering. His research focuses on improving traffic safety, a growing field within civil engineering. He has worked on the Florida Department of Transportation–funded project, "Validation and Application of Highway Safety Manual (Part D) in Florida," under the supervision of Dr. Mohamed Abdel-Aty.

UAB
THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

Ossama Ramadan, a doctoral candidate, has collaborated on three research projects since 2012, including the NCTSPM project, "Optimizing Emergency Medical Services (EMS) through the Use of Intelligent Transportation Systems (ITS) Technologies."

FIU | FLORIDA INTERNATIONAL UNIVERSITY

Kollol Shams, a third year doctoral candidate, is collaborating with Dr. Xia Jin on the project, "Examining the Value of Travel Time Reliability for Freight Transportation to Support Freight Planning and Decision-making." Kollol has also worked with Dr. Berrin Tansel and presented papers at the Transportation Research Board and University Transportation Center Conferences.

Georgia Tech

Atiyya Shaw is a doctoral student who dedicated herself to transportation engineering because she could see the tangible impacts it provides to improving communities. She is involved with several projects focusing on the measurement of transportation system users' performance. She is also the recipient of a prestigious National Science Foundation Graduate Research Fellowship and is President of the Georgia Tech Chapter of the Women's Transportation Seminar.

STUDENT RESEARCH SPOTLIGHTS

Georgia Tech

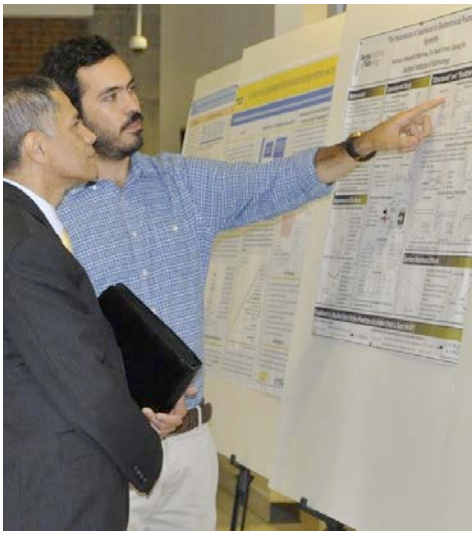
Denise Smith, a doctoral candidate and Albert Sloan Fellow originally from Landover, Maryland, is researching the "inevitable" impact of autonomous vehicles on our roadways to develop modeling and performance measurement tools, and to demonstrate how these tools can be applied to high-volume freight corridors in Georgia. She serves as chapter advisor for the Tri-Cities High School Chapter of the National Society of Black Engineers.

University of Central Florida

Jiawei Wu is a master's student advised by Dr. Essam Radwan. His research relates to analyzing and assessing the behavior and performance of taxicab drivers in large cities. Jiawei both designed and performed data extraction and analysis for the study. He is currently working on two other UCF research projects. Jiawei will continue as a doctoral student.

University of Central Florida

Ling Wang is a doctoral candidate working with Dr. Mohamed Abdel-Aty on the NCTSPM project, "A Comprehensive Investigation of Visibility Problems on Highways: Developing Real Time Monitoring and Prediction System for Reduced Visibility and Understanding Traffic and Human Factors Implications." Ling's research seeks to better understand the impacts of environmental and traffic conditions on the rate and severity of car crashes.



TRANSPORTATION INNOVATION STUDENT RESEARCH SPOTLIGHT

Deputy Secretary of Transportation Victor Mendez and student presenters at the NCTSPM *Student Research Spotlight*

On July 27, 2015 NCTSPM sponsored a *Student Research Spotlight* at Georgia Tech with a theme of transportation innovation. The event featured twenty-nine student led posters highlighting innovative transportation research. The Student Research Spotlight was attended by a range of dignitaries, most notably Deputy U.S. Secretary of Transportation Victor Mendez and GDOT Deputy Commissioner Todd Long.

2015 SCHOLARSHIPS AND AWARDS

Margaret-Avis Akofio-Sowah
Georgia Institute of Technology
Charley V. Wootan Award
(Transportation Research Board)

Meshal Almoshaogeh
University of Central Florida
2015 International Road Federation
Executive Fellowship

Stephanie Amoaning-Yankson
Georgia Institute of Technology
2015 American Association of University
Women International Fellowship;
2015 International Road Federation
Executive Fellowship

Stefanie Brodie
Georgia Institute of Technology
Marie Curie Experienced
Researcher Fellowship

Jack Cebe
Georgia Institute of Technology
US Department of Transportation
Eisenhower Transportation Fellowship

Somaye Fakharian Qom
Florida International University
ITS Florida Anne Brewer Scholarship

Jamie Montague Fischer
Georgia Institute of Technology
Charley V. Wootan Award
(Transportation Research Board)

Alice Grossman
Georgia Institute of Technology
Future Leaders Development Conference, Eno
Foundation; US Department of Transportation
Eisenhower Transportation Fellowship; Helene
M. Overly Memorial Scholarship, Atlanta Chapter
Women's Transportation Seminar; Leadership Leg-
acy Scholarship Women's Transportation Seminar

Samaneh Khazraeian
Florida International University
Helene M. Overly Memorial
Scholarship, South Florida Chapter
Women's Transportation Seminar

Carly Queen
Georgia Institute of Technology
US Department of Transportation
Eisenhower Transportation
Fellowship; Arcadis Scholarship,
Georgia Engineering Foundation

Atiyya Shaw
Georgia Institute of Technology
National Science Foundation Graduate
Research Fellowship

Denise Smith
Georgia Institute of Technology
Alfred P. Sloan Foundation Minority
Ph.D. Fellowship

Janille Smith-Colin, P.E.
Georgia Institute of Technology
US Department of Transportation
Eisenhower Transportation
Fellowship; Charley V. Wootan Award
(Transportation Research Board)

Emelyn Venturini
Florida International University
Sharon D. Banks Memorial
Undergraduate Scholarship,
South Florida Chapter Women's
Transportation Seminar

Ling Wang
University of Central Florida
ITS Florida Anne Brewer Scholarship

Jiawei Wu
University of Central Florida
ITS Florida Anne Brewer Scholarship

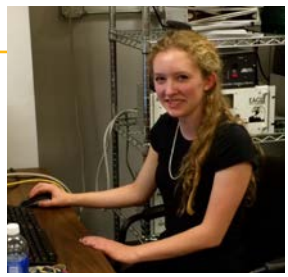
STUDENT INTERNSHIPS

Internships provide up-and-coming professionals with opportunities for growth and development within their chosen fields. A few examples from NCTSPM students are found below.

Dorielis Padron, an Information Technology major from FIU, interned with District Four of the Florida Department of Transportation (FDOT). She worked with intelligent transportation systems, aiding District traffic operators in monitoring roadway conditions.

"Interning at the FDOT, I learned that 'Luck is when preparedness meets opportunity'," Padron said. "I can honestly say I'm ready to face any future obstacles in intelligent transportation [thanks to my internship experience]."

Liana Lantigua Cuni is a civil engineering student at FIU who interned this summer as an undergraduate assistant with FDOT, working with District Six's Intelligent Transportation Systems (ITS) department. Through her internship, Cuni "proudly contributed to the continuity of the ITS program mission, [working to] 'enhance the safety, security, and efficiency of Florida's transportation system'."



Kathrine Udell, an entering freshman undergraduate at the Georgia Institute of Technology, interned with the Transportation Safety and Operations Lab (TSOL) as a part of her required Magnet Senior internship at Kennesaw Mountain High School. Georgia Tech doctoral student Atiyya Shaw supervised Udell's work in completing an ethical research certification course, collecting data from her high school, and drafting a full-length paper. This was the pilot internship for the TSOL, an initiative expected to continue in the future. Shaw used the experience to draft and publish an American Society for Engineering Education conference paper on "Designing an Engineering Research Experience for High School Students."

Ehsan Doustmohammadi, a doctoral student at UAB, has been interning with Birmingham's Regional Congestion Monitoring Project since March 2015. A joint venture between UAB and the Regional Planning Commission of Greater Birmingham, this research aims to monitor roadway performance and manage traffic congestion. Doustmohammadi said that his internship "is an opportunity to learn from everyone around me, ask questions, [and] improve skills. ... These people can be potential future colleagues or could be the connection [I will need] to achieve my first job."

Timothy Sanford, another UAB student, turned an internship with GHD (formerly Conestoga-Rovers & Associates) into a full-time job. As an intern, he worked on forensic investigations into failure analysis, something that he says was "unique and challenging."

"Every day was a new adventure," he said. Sanford is now an engineer in training with the company, thanks to an internship experience that he said gave him skills that he could not learn in school.

"I would not be in the job that I am now without ... [working] as an intern."

FEATURED PROJECTS

Photo courtesy of Flickr user Jason Weaver.

A COMPREHENSIVE INVESTIGATION OF VISIBILITY PROBLEMS ON HIGHWAYS: DEVELOPING A REAL TIME MONITORING AND PREDICTION SYSTEM FOR REDUCED VISIBILITY AND UNDERSTANDING TRAFFIC AND HUMAN FACTORS IMPLICATIONS

Principal Investigator: Mohamed Abdel-Aty, University of Central Florida

What do foggy highways, losing your glasses, and wildfires have in common?

All involve a major reduction in visibility. And while fog-obscured roads, for example, hardly seem as dangerous as wildfires, Mohamed Abdel-Aty, Ph.D., of the University of Central Florida (UCF) understands just how precarious they can be.

He and his team are working to create a tool capable of predicting fog and areas of reduced visibility on roadways based on meteorological data, and in the process, they will work toward a better understanding of drivers' reactions to a lack of visibility.

Inspired by a series of fatal collisions on Interstates 75 and 4 in Georgia and Florida, and spurred on by the Florida Department of Transportation's increasing emphasis on safety in bad weather, the project centers on detecting roadways with reduced visibility, predicting how long the fog will last, determining drivers' typical reactions, predicting what traffic conditions will form, and ascertaining the best way to notify authorities of those conditions.

The southeastern United States is not the only area facing this problem. It has become a worldwide issue, exemplified by the 100-car pileup near Incheon International Airport in South Korea in early 2015.

Also staggering is the amount of effort required to accomplish the task. The project is already 75 percent complete; Abdel-Aty's team has done everything from collecting lane counts to conducting driving simulations, with their final report anticipated to be released by the end of 2015. The team includes Essam Radwan, Ph.D. and Amr Oloufa, Ph.D. from UCF and Michael Rodgers, Ph.D. from the Georgia Institute of Technology, and two postdoctoral students.

Students working on the project include a Ph.D. student whose thesis relates to reduced visibility, and a student who transitioned from undergraduate research on the project to completing his master's thesis. The inclusion of more student researchers is planned as the project continues.

With regard to the impacts that his research has, Abdel-Aty says, "With any project, the most rewarding aspect is making a difference – if you save even one life, the implications are enormous."

DRIVER PERCEPTION OF COMPLEX ROADWAY ENVIRONMENTS

Principal Investigator: Michael P. Hunter, Georgia Institute of Technology

Drivers' perception and behavior is critical to the safety and functionality of transportation systems. However, many of the traffic devices and roadway configurations in use today were simply designed as they were needed, so those designs often fail to maximize human perception and performance. As our transportation systems become increasingly complex, designing roadways and traffic controls that drivers can readily comprehend will be even more important.

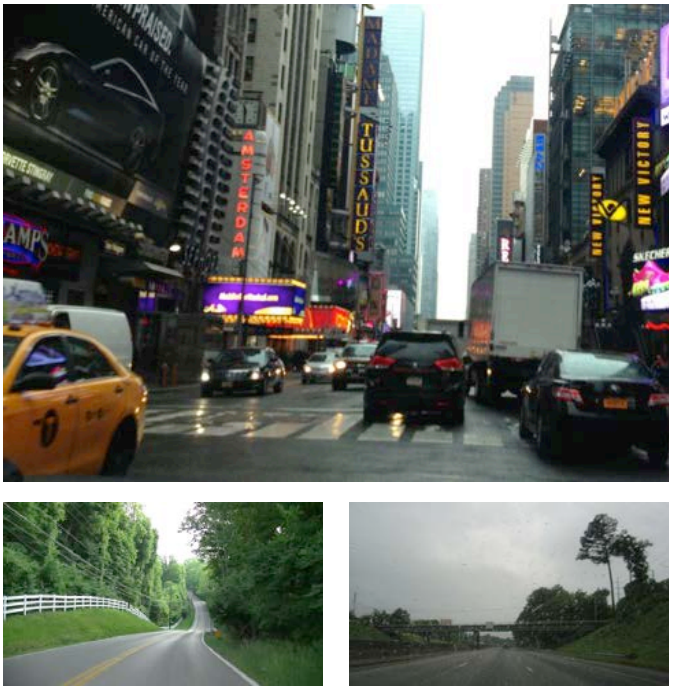
In an effort to begin bridging the gap, Michael Hunter, Ph.D., is now studying how drivers perceive complex roadway environments and how they are influenced by a wide array of roadway factors and configurations. This has led to a series of experiments where drivers rated the perceived complexity of images and videos showing real-life and simulated roadway environments.

The objective is to inform driving simulator experiments that will allow the team to study the relationships between driver perception, behavior, and performance in varied roadway environments. In a paper that will be presented at the 2016 TRB annual conference, *Drivers' Perceived Complexity of Simulated and On-Road Environments*, Hunter and his team detail results of a simulator validation study that examined differences in how drivers perceive complexity for simulated versus on-road environments. The research team found that, in general, participants rated the level of complexity of environments consistently, whether they viewed real-world examples or simulated ones, although drivers' responses to particular factors may vary across environments.

This work builds on recent work from Hunter and his team that highlights just how important driver perception is (*Improved Methods for Delineating Diverges in Work Zones*). The study found that the perceptual principles of continuity and closure (drawn from the Gestalt theory of visual perception) significantly impact the accuracy of driver detection and interpretation of work zone channelizing devices.

Hunter said he hopes one of the lasting contributions of this work ultimately will be improved roadway design and traffic guidance that enhances the ability of drivers to approach and process complex environments and then move safely through them.

Sample driving simulated roadway environment images used in experiment.



Sample on-road environment images used in experiment.

Sign base with anchor bolt clearance discrepancy.

Anchor bolt sign failure.

EVALUATION OF ANCHOR BOLT CLEARANCE DISCREPANCIES

Principal Investigator: Ian Hosch, The University of Alabama at Birmingham

When high winds prevail, highway signs may fail. This is especially true if the anchor bolts that secure them to their foundations are not properly placed.

These bolts were originally designed for an infinite lifespan of fatigue, but only if they are subjected to the specific stresses they were designed for — and not more.

Researchers have discovered that differences in clearance heights for the anchor bolts used to secure large signs can have massive effects, whether caused by bad physical geometry or simply operator error. And now Ian Hosch, Ph.D., and his team from the University of Alabama at Birmingham (UAB) are investigating exactly what these effects can be, and what that means for the signs' stability.

Hosch was inspired to investigate this topic after a cantilevered sign support fell onto an Interstate. His team replaced the sign with supports and anchor bolts that were up to code and placed monitors on the structures to see what kinds of strain the bolts were undergoing. He said the results proved shocking with the stress on the bolts varying wildly.

Hosch's work is almost complete — researchers have developed a new way to calculate the forces that a bolt could experience during its service life, and industry leaders are taking note.

"[I've] spoken with a member of the American Society of Civil Engineers 113 Substation Structure Design Guide committee, and they [were] very interested in the results of the project," Hosch said, adding that similar anchor bolt fatigue results have been seen on power grid substation structures, not just highway signs.

Hosch said this "showed significant implementation of [the project's] results" across industries and disciplines.

As with other projects, students have played a role in the success of this project. Ahmed Mohamed Abdelkhalek, a UAB Ph.D. student, and Lonny Traylor, a UAB master's student, have collaborated with Hosch.
Ahmed is analyzing the data gathered from the experiments. He will finish his dissertation in late 2015, based in large measure on this project.

EXAMINING THE VALUE OF TRAVEL TIME RELIABILITY

Principal Investigator: Xia Jin, Florida International University

When Xia Jin, Ph.D., first asked her colleagues' opinions on her latest research idea, they told her it was "mission impossible."

Impossible, because of disinterest from industries. Impossible, because of microscopic response rates to surveys. Impossible because of the difficulties of getting information from the private sector.

But none of this swayed Jin, an assistant professor in the Civil and Environmental Engineering Department at Florida International University (FIU). With the assistance of the Florida Chamber of Commerce and the Florida Department of Transportation, her team has been able to make this project a success.

Jin's work aims to put a dollar value on the reliability of the freight shipping industry.

Traditional reliability analysis has focused on delivering passengers from point A to point B, but it lacks information on the importance of timeliness to freight users, whose efficiency depends on the transportation system's reliability.

Jin's biggest challenge in this task has come from a major gap in the understanding of how freight industries value the accuracy of travel time data. Her team is seeking to understand "how users trade off between certain attributes, like travel time, cost, reliability," she says.

"If industries could provide a higher level of service, would consumers be willing to pay a higher cost?"

Once researchers understand the behavioral aspect of reliability, they can develop better tools to inform agencies in cost/benefit analyses, help them prioritize different strategies, or help them find alternate evaluation assessments. To do so, the team recruited individuals to take part in surveys with different focuses, including tradeoff between mode, cost, and reliability, though this proved a challenge in and of itself, as subjects were anxious as to whether their responses could be linked to their employers.

The role of students in Jin's research has been an essential one. "[They] worked very hard and performed several months of studying and reviewing all available literature, and studying statistical courses to create the surveys," she said. Jin said she is proud of these students.

"Even though there are obstacles, unknowns, and difficulties, if you're determined to do it the right way, you'll accomplish what you want to do. This is the joy we get from research projects — that you learn new things every day."

ACTIVE RESEARCH PROJECTS

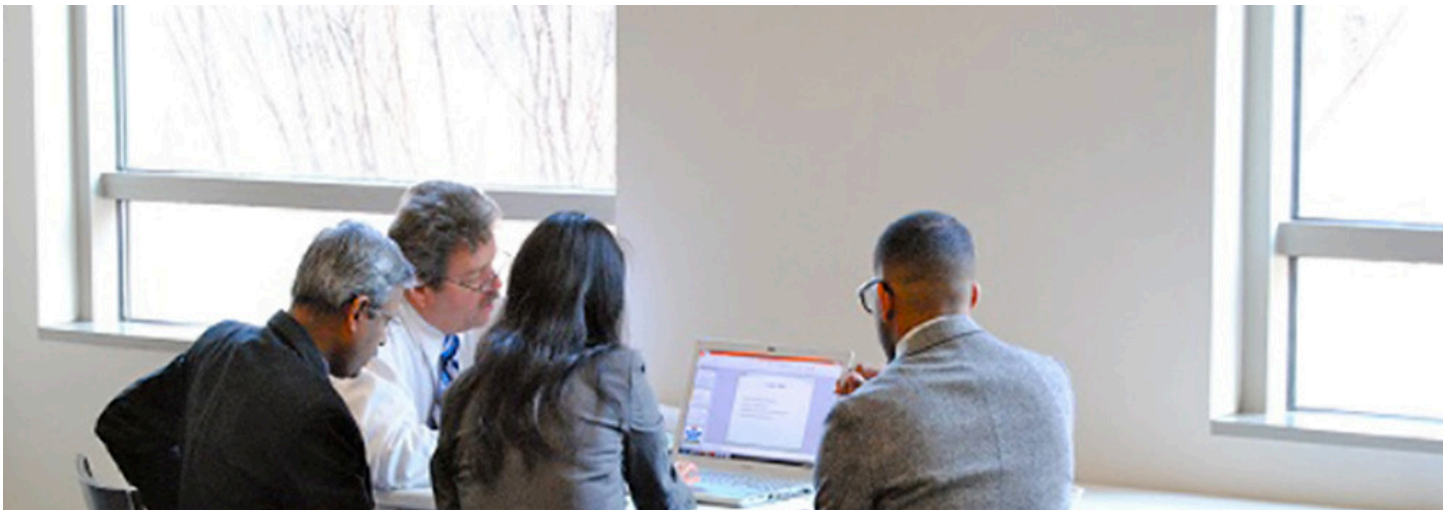


Photo courtesy of FEMA.

Photo courtesy of Flickr user brent_nashville.

A Comprehensive Investigation of Visibility Problems on Highways: Developing A Real Time Monitoring and Prediction System for Reduced Visibility and Understanding Traffic and Human Factors Implications (Georgia Tech, UCF)

Principal Investigator: Mohamed Abdel-Aty, UCF

Visibility, or the lack thereof, is one of the most important factors in determining a road's safety, and weather conditions, particularly fog, can have a negative impact on visibility. The southeastern United States is at the forefront of experiencing roadway visibility impairment as a result of foggy weather conditions, so this project will work to combat fog-related visibility impairment. It will do so using an alternative, low-cost approach, which, coupled with supplemental meteorological data, will attempt to pinpoint a "footprint" that can be used to identify areas and circumstances of probable fog formation. Computer algorithms will be used to allow for adaptation to local conditions.

A Data Driven Approach to State Transportation Investment Decision: A Transportation Project Investment and Evaluation Resource (T-PIER) (Georgia Tech, University of Memphis)

Principal Investigator: Timothy F. Welch, Georgia Tech

The primary objective of this research is to provide a data-driven resource that planners and engineers, policymakers, service providers, and researchers can use to determine how investments should be made in the future by balancing available resources to maximize return on investment (ROI). T-PIER is equipped to examine the performance of improvements to small- and medium-scale transportation networks with multiple interacting modes such as driving, biking, and walking. The tool will assist planners and engineers in determining the optimal allocation of projects for obtaining maximum benefits when resources are limited and scarce. The T-PIER framework combines a travel demand model with a resource allocation model, which allows for interactive communication to obtain an optimal set of projects for maximizing ROI.

Assessment of High Early Strength Limestone Blended Cement for Next Generation Transportation Structures

Principal Investigator: Kimberly Kurtis, Georgia Tech

Because of the popularity of concrete as a building material and the emissions associated with its manufacture, there is an increasing interest in the viability of "green" concrete made with more environmentally friendly ingredients. Specifically, the feasibility of the replacement of clinker with ground limestone is being investigated. Currently, AASHTO and ASTM specifications allow for up to 15 percent replacement, but the effects of this substitution on the strength and performance of concrete are not fully known. Some have documented accelerated cement hydration, particularly in concrete formed at higher temperatures. In this research, early hydration kinetics are observed for the first time in these limestone cements at higher temperatures, of the type that would be used in precast structural concrete elements.

Automated Data Collection for Origin/Destination Studies of Freight Movement

Principal Investigator: Amr A. Oloufa, UCF

The collection of reliable origin/destination data for freight has profound consequences for a large range of applications in both planning and operations. In an exploratory project, the principal investigator and his research team developed a novel approach for tracking trucks using their license plate numbers, allowing for speed and travel time measurements for each truck. This information can then be used in an origin/destination model. That project demonstrated the feasibility of the approach; however, more work needs to be done before a system can be adopted for wide application. In the proposed project, limitations in the previous effort will be addressed, and the field test will be expanded to three gantries covering a total of nine lanes.

Photo courtesy of FEMA.

WHERE DID THEY COME FROM, WHERE DO THEY GO?

Dr. Amr Oloufa of UCF has developed a new way to track where freight-carrying semi-trailers originate and where they wind up, using their license plate numbers. In the future, this information will be used on a larger scale across multiple locations.

Bridge Rail Design Procedures

Principal Investigator: Dean Sicking, UAB

With the recent production of the revised Manual for Assessing Safety Hardware (MASH), the existing procedures for designing bridge rails have become out of date. Sicking and Uddin's research is in the process of developing improved ways to design bridge rail and cantilever deck systems for variable impact loads. Currently, the design process results in over-engineered bridges with too-thick decks and oversized railings. Through the procedural update, bridges will be able to be better designed to meet their given design criteria while fulfilling the requirements of the new MASH.

Bringing Freight Components into Statewide and Regional Travel Demand Forecasting (Georgia Tech, UAB)

Principal Investigator: David Jung-Hwi Lee, Georgia Tech

A GPS-based database of truck travel may lower the hurdle of the lack of detail and disaggregation of existing data so that regional planning organizations can easily develop Freight Demand Models (FDMs) in conjunction with travel demand forecasting models. Incorporated with existing data, a set of GPS data will provide detailed O-D information, critical routes for goods movement, operating speeds of a large sample of trucks along major highways, travel times, flows for intercity truck traffic, significant truck corridors, etc. This study will explore various possible ways that GPS-based truck movement data can contribute to freight demand forecasting at the state and regional levels.

Consumer Response to Road Pricing: Macro and Micro Modeling Tools for Socioeconomic Evaluation and Pricing of Managed Lanes

Principal Investigator: Randall Guensler, Georgia Tech

Metropolitan Atlanta's I-85 express lanes were recently converted from high occupancy vehicle lanes to high occupancy toll (HOT) lanes. With this recent conversion, it is unknown what characteristics influence lane usage and what the optimal pricing for a HOT lane would be under the existing circumstances. Guensler's research will create a socioeconomic impact assessment tool that functions at both the regional and localized levels. GDOT will be able to use the tool to quantify drivers' usage response in regard to given toll pricing levels in decision-making capacities.

Cooperative Vehicle-Highway Automation (CVHA) Technology: Simulation of Benefits and Operational Issues (FIU, Georgia Tech)

Principal Investigator: Michael Rodgers, Georgia Tech

Major automobile manufacturers including Ford, BMW, Audi, GM, and others are developing cooperative vehicle-highway automation (CVHA) systems that control steering and acceleration/deceleration to help manage driving in congested freeway environments. While these systems are being developed and deployed with the intent of reducing driver stress and potentially improving vehicle flow, it is not clear how they will be operated on existing transportation infrastructure; how they will be regulated by state DOTs; and how much, if any, congestion mitigation they will produce. This study focuses on developing the information necessary for state DOTs to make data-driven decisions regarding management of their current and next-generation infrastructure, given the imminent introduction of CVHA technology; it also provides transparent analysis for state transportation officials to carefully evaluate the impacts of CVHA to their highway systems.

Development of a Prototype Evidence-Based Database and Planning Tool: Applying Performance Management Principles in Asset Management Program Development

Principal Investigator: Adjo Amekudzi-Kennedy, Georgia Tech

In this study, Amekudzi-Kennedy addressed uncertainties regarding transportation asset management (TAM) and discussed difficulties regarding quantifying benefits of TAM systems. Since TAM is a constantly evolving practice and is dynamic rather than static in nature, its benefits must be viewed in context. This research is purposed to develop an evidence-based planning tool and database to aid agencies in planning the development of their asset management programs, and will do so by applying an evidence-based design (EBD) framework. EBD designs or retrofits facilities with evidentially proven features to capitalize on observed benefits of these features. In the context of TAM, this involves evaluating the impacts of adopted tools on system performance.

Development of Risk Management Strategies for State DOTs to Effectively Deal with Volatile Prices of Transportation Construction Materials

Principal Investigator: Baabak Ashuri, Georgia Tech

Transportation agencies across the nation are facing rising costs for construction of new highways, as well as for the maintenance and modernization of existing infrastructure systems. Therefore, the purchasing power of transportation agencies has been declining due to construction cost inflation. The objective of this project is to enhance transportation agencies' understanding of the opportunities, challenges, and best practices for using risk management strategies for material price volatility in transportation projects. The final deliverable of this project is a comprehensive risk management guide that systematically addresses risk management for material price volatility in different types of highway projects at various phases of project development.

Development of a Web-based Decision Making Tool for the Highway Safety Manual Implementation

Principal Investigator: Priyanka Alluri, FIU

The objective of this project is to develop a web-based tool to assist agencies in deciding how to tailor the Highway Safety Manual (HSM) procedures to their needs. The tool will help agencies select the most suitable safety analysis methods among those discussed in the HSM. This research will first identify factors that influence the agency's selection of the existing methods. This information will, in turn, be used by the web-based tool to design and implement the selected procedures. Agencies will be able to use this tool to identify the most appropriate method to meet their particular needs, data, available statistical expertise, available software tools, etc.

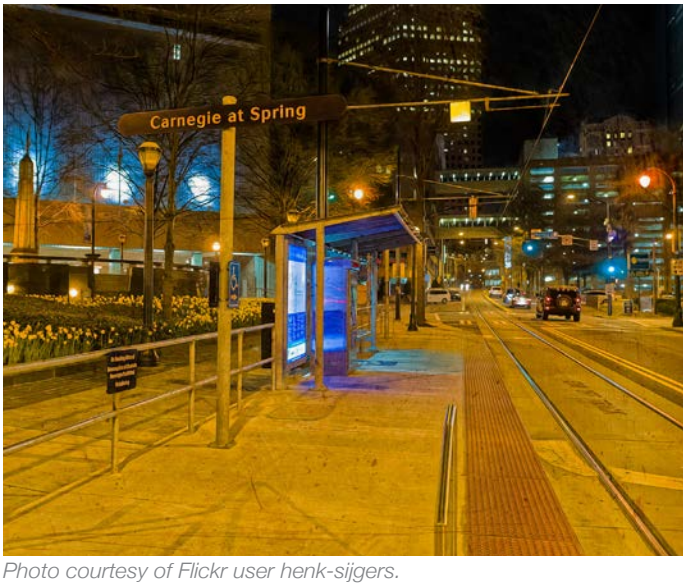


Photo courtesy of Flickr user henk-sijgers.

Digital Advertising Billboards and Driver Distractions (UAB, FIU)

Principal Investigator: Virginia Sisiopiku, UAB

In response to growing concern among the public regarding the potential distraction of digital billboards to motorists, Dr. Sisiopiku hopes to arrive at a firm conclusion as to whether these billboards do pose a distraction and safety risk to their viewers. There are significant data which suggest that distractions amounting to greater than two seconds cause the vast majority of traffic incidents; however, the controversy lies in whether digital billboards, which are lighted and feature bright colors and changing backgrounds, constitute a portion of this distraction interval. Building on the expertise of the project team, this study undertakes a comprehensive approach for establishing potential correlations between the presence of digital billboards and crash risk.

DRIVEN TO DISTRACTION

Dr. Virginia Sisiopiku of the University of Alabama at Birmingham is researching whether digital advertising billboards can contribute to distracted driving and car crashes.

Economic Development and Workforce Impacts of State DOT Expenditures

Principal Investigator: Thomas Boston, Georgia Tech

This research will measure the economic development impact of the Georgia DOT's highway expenditures on economic activity, income, employment, and workforce development and generalize these results to other state DOTs. The analysis will examine impacts in every prime contract and subcontract award made by the Georgia DOT over the past three years. A statewide input–output model will be used to estimate the multiplier effect of the award on economic activity, income, and employment throughout the state. Special attention will be given to economically disadvantaged communities and environmental justice areas.

Efficient Utilization of the Existing ITS System and the Viability of a Proactive Traffic Management System for the Orlando–Orange County Expressway Authority System

Principal Investigator: Mohamed Abdel-Aty, UCF

There is a wider range of vehicle detection devices in use on freeways and expressways than ever before, from the popular inductive loops and magnetometers to videos and radar-based detectors. The Central Florida Expressway System utilizes automatic vehicle identification (AVI) system for electronic toll collection (ETC) and for the provision of real-time information to motorists within the Advanced Traveler Information Systems (ATIS). Data are gathered using AVI tag readers that are installed for the purpose of toll collection and additional tag readers installed solely for the purpose of estimating travel times. The main objective of this research is to investigate the viability of using the AVI traffic data in the identification of freeway real-time "hot-spots" in a proactive traffic management framework. Guidelines will be provided to adapt the existing structure of the AVI system (e.g. locations, spacing, and archiving system) to provide more useful data.

Enhanced Role of Activity Center Transportation Organizations in Regional Mobility

Principal Investigator: Angshuman Guin, Georgia Tech

Major activity centers, with concentrations of employment, residential, and shopping activities, are an important part of the metropolitan form of today's urban areas. In many cases, these activity centers have formed transportation management associations (TMAs) to support the transportation needs of the employees working within the TMA boundary. In addition, many of these same areas have formed community improvement districts (CIDs), which allow for the commercial landowners in the districts to self-impose taxes to provide funds for transportation and other improvements. One of the areas that these organizations have not been actively involved in has been the real-time operations of the transportation system. This research will support the implementation of road operations strategies under the auspices of the Buckhead, Georgia, CID; assess the feasibility and effectiveness of activity center management associations in such strategies; and generalize the results of the research to other activity center contexts.

Photo courtesy of FEMA.

Photo courtesy of GDOT.

Estimating the Monetary Benefits of Reducing Delays on Heavily Trafficked Truck Freight Corridors in Georgia

Principal Investigator: Frank Southworth, Georgia Tech

To improve the information supplied to state planners, this project is assessing the state-of-the-art in value of travel time savings for different classes of truck and automobile travel, and developing a practical method that can be applied at the statewide, corridor level for the purposes of deriving the monetary benefits of limiting within-corridor travel delays. The method will be demonstrated using data collected for the heavily trafficked I-85 corridor within the state of Georgia. To this end, a multi-class combined trip distribution–origin constrained traffic assignment model is being used to track the travel paths associated with a set of 43 commodity class specific origin-destinaion (O-D) trip matrices. Prior to network assignment, these O-D flows are converted into trips by five different truck size classes. After experimenting with a number of truck freight flow disaggregation methods, a set of inter-county origin–destination–commodity truck flow matrices have been constructed within a six state region in the southeastern United States (including the states of AL, FL, GA, NC, SC, and TN). The preferred approach uses a mix of techniques that includes the use of inter-industry input-output tables. Once an acceptable set of corridor-based commodity-cum-truck flows has been settled upon, and taking advantage of the specific path-based assignment approach employed, experiments will be carried out to develop a set of travel congestion-induced travel cost matrices that capture the implications of both commodity mix and vehicle type mix for the costs of corridor delay, including the costs of on-time unreliability on corridor performance.

Evaluating the Impact of Real-time Transit Passenger Information on Ridership and Mode Share

Principal Investigator: Kari Watkins, Georgia Tech

Transit provides many mobility and congestion reduction benefits. However, from a customer perspective, a mobility choice must be fast, comfortable, and reliable. One inexpensive way to combat unreliability is to provide real-time transit information via mobile devices. In this study, the research team has developed, implemented, and assessed an integrated transit information platform in Atlanta by combining regional real-time and schedule information sources from Metropolitan Atlanta Rapid Transit Authority (MARTA), Georgia Tech, Cobb Community Transit (CCT), and other transit providers into a proven platform known as OneBusAway. Using this platform, the research team has created a novel approach to measure individual ridership change and rider behavior utilizing smartcard data.

Evaluation of Anchor Bolt Clearance Discrepancies

Principal Investigator: Ian E. Hosch, UAB

The objective of this project is to investigate the effect of non-uniform stand-off distances on the stress distribution of the anchor bolts. Analysis will focus on the stress distribution within the anchor bolt group as well as the area above the base plate-to-shaft weld. The stand-off distance is defined as the distance between the bottom of the base plate and the top of the concrete foundation. This discrepancy has produced non-uniform stress distribution within the anchor bolt group due to service loading. The main outcome of the project is to create limit-state design equations for this condition.

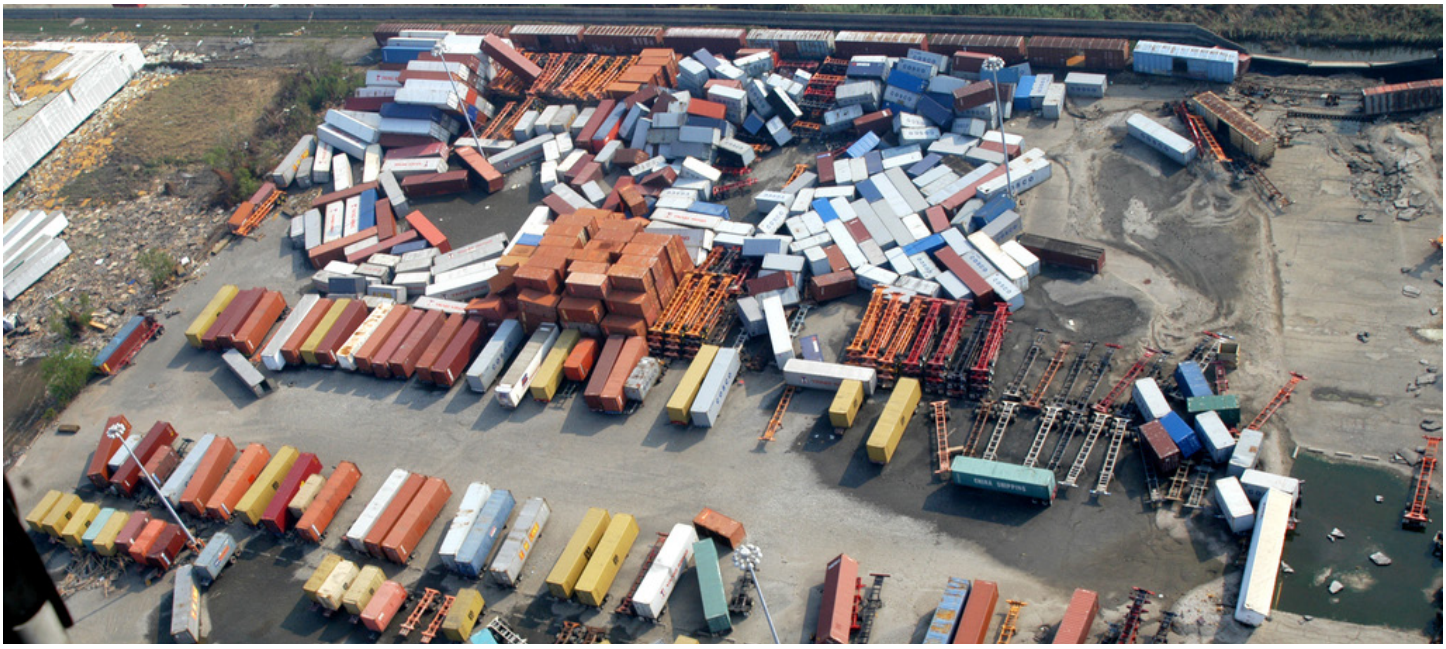


Photo courtesy of FEMA.

Evaluation of Signage Alternatives for Express Lane Facilities

Principal Investigator: Albert Gan, FIU

This project aims to determine the amount of information to display and the manner in which the information is communicated to drivers to ensure a safe and effective operation of express lane facilities. The research will help prioritize the types of information to include and how best to display the information, including sign layout, sign placement, and, in the case of multiple sequential signs, spacing and order of sign display. This research will produce specific recommendations on the prioritization of contents to be displayed and the proper design and placement of signs for safe and effective express lane operations.

Evaluation of the Cost Effectiveness of Illumination as a Safety Treatment at Rural Intersections (Georgia Tech, Middle Georgia State College)

Principal Investigator: Angshuman Guin, Georgia Tech

Late-night/early-morning driving has significantly higher fatality rates than that during other periods of the day. A proven safety countermeasure that can be used to help drivers under such driving conditions is intersection illumination. While these safety benefits are well documented, intersection illumination represents one of the principal contributors to electrical power consumption in roadway maintenance and operations. The objective of this study is to provide a tool that will give state DOTs better information for making decisions about when illumination, as well as what level of illumination, is justified in a rural setting from a safety and operations perspective. The tasks involved to attain this objective include identifying the relationship between illumination levels and observed crash rates and crash severities at rural intersections, analyzing the cost-effectiveness of different levels of illumination relative to current state DOT practices, and developing recommendations and guidelines that will inform decision makers as to the safety and cost implications of particular illumination policies and practices.

GETTING THE MESSAGE ACROSS

Dr. Albert Gan of Florida International University is working to help public officials understand how to best convey information to drivers via express lane signs in Florida. Right now, there is no standard on how to convey it most effectively.

Examining the Value of Travel Time Reliability for Freight Transportation to Support Freight Planning and Decision-Making

Principal Investigator: Xia Jin, FIU

The goal of this research is to advance the understanding on how the freight industry values transportation system performance in travel time reliability. As freight users constantly adapt to changes in the transportation system through mode shifts, temporal and route shifts, moving points of manufacture, shifting points of entry, etc., understanding of the pattern and sensitivity of the demand is critical to freight investment and policy decisions. This study will provide valuable insights on how the freight users value travel time reliability in their transportation choices. The project aims to contribute to a) better understanding of how the users (shippers and carriers) respond to system changes in productivity, reliability and capacity; and b) advanced methods and tools in evaluating the effectiveness of alternative freight management and operational strategies.

Extending HYRISK to Predict Scour Risk as a Function of Soil Erodibility Characteristics

Principal Investigator: Laurie Garrow, Georgia Tech

The majority of bridge failures in the United States are caused by foundation scour, but it is difficult to determine which bridges are most vulnerable. Because it is not financially feasible to inspect every single bridge in the state, a risk assessment tool called HYRISK was developed to calculate the probability of bridge failures because of scour. For the current project, HYRISK is being extended to include risk adjustment factors relating to probability of soil erosion. This will enable state agencies to use HYRISK to prioritize and identify a subset of at-risk bridges to perform scour screenings and evaluations on, thus saving time and money by identifying the most critical bridges in need of rehabilitation.

Factors Influencing Visual Search in Complex Driving Environments (Georgia Tech, UCF, Morehead State University)

Principal Investigator: Michael Hunter, Georgia Tech

Human factors engineering, which attempts to account for the capabilities and limitations of drivers, promises to provide ways to improve safety by designing more forgiving systems and environments. By understanding a driver's perception of the environment, engineers can make informed design changes to operational environments (such as temporary work zone areas and approaches) and reduce the potential for driver confusion, thus improving safety for both workers and drivers. The central focus of this research is to identify changes in the visual search patterns of drivers as environments become more complex. The overarching focus of the project is safety enhancement.

Field Validation of a Drive-By Bridge Inspection System with Wireless BWIM and NDE Devices (Georgia Tech, UAB)

Principal Investigator: Yang Wang, Georgia Tech

A proactive, automated drive-by inspection system is proposed to provide convenient evaluation of transportation infrastructure safety. The system incorporates a next-generation high-fidelity portable wireless BWIM+NDE (bridge weigh-in-motion and nondestructive evaluation) system, and compatible wireless sensing devices aboard a heavy drive-by inspection vehicle. As the inspection vehicle drives through a bridge, both wireless sensors aboard the vehicle and wireless BWIM+NDE devices on the bridge simultaneously trigger. This wireless sensing system measures both truck excitation and the corresponding bridge vibration and ultrasonic characteristics, providing an unprecedented mix of heterogeneous data for bridge safety management and maintenance planning.

Freight Impacts on Small Urban and Rural Areas

Principal Investigator: Catherine L. Ross, Georgia Tech

Intercity and interstate freight movement occurs primarily along major trucking corridors that support 75 percent of total commodity flows by value in the United States. Much of the freight movements traverse small and rural communities and roadways, and the impact of freight activity is significant. This study focuses on the impacts of freight activity on rural and small urban areas, using local data to analyze current and forecast future truck movements along rural corridors. The study improves upon existing research by integrating the use of real-time GPS truck activity data, growth in major economic sectors, detailed route information, and growth in port activity to analyze the flow of freight and its likely impact on smaller geographic areas.

Photo courtesy of FEMA.

Freight Movement and Economic Competitiveness from the Megaregion Perspective

Principal Investigator: Catherine L. Ross, Georgia Tech

Over the next thirty years, the majority of the population and economic growth in the United States will concentrate in the emerging networks of metropolitan centers and their areas of influence known as megaregions. Increasing international free trade in the global economy will place additional pressure on existing freight infrastructure within and between megaregions. This project will examine policy implications of the megaregional approach for freight planning in a global economy. The project will construct U.S. megaregion-level freight data, identify major region pairs of freight movement within and between megaregions, assess the characteristics of the identified major region pairs, and analyze the impacts of the identified freight movement on the regional economic growth in core and rural areas of megaregions.

Full-Scale Wall of Wind Testing of Variable Message Sign (VMS) Structures to Develop Drag Coefficients for AASHTO Supports Specifications (FIU, UAB)

Principal Investigator: Arindam Chowdhury, FIU

The use of ITS technologies on highways is an attractive option for traffic facility operators. VMS structures are the cornerstone of ITS infrastructure, as they relay messages to motorists warning of hazards ahead such as fog, traffic congestion, accidents, construction, and lane closings. VMS messages are of paramount importance in ensuring safety and avoiding fatal crashes. The objective of this project is to develop accurate drag coefficients for incorporation into AASHTO Supports Specifications to foster safer and more economic design of VMS structures.

Georgia SPLOST Database and Clearinghouse for Transportation Finance

Principal Investigator: Catherine L. Ross, Georgia Tech

This project developed a web-based tool and data repository of special-purpose local-option sales tax (SPLOSTs) for the state of Georgia to compare some of the variables that influence whether a SPLOST will pass or fail. These data are now available in a dynamic interactive format, which means that relationships between key factors in SPLOST approval, such as adjacencies and geographic patterns across the state, are now clearly visible. The accessibility of these data as well as the development of both the data repository and the interactive tool are critical. The results will provide a comprehensive data source that helps local, county, regional and metropolitan planning organizations, and other regional entities and state governments to better prepare for the consideration of financial and funding strategies for infrastructure for their constituencies.

GRTA/GDOT Real-Time Tracking and Choice Data

Principal Investigator: Randall Guensler, Georgia Tech

The primary goals of this project are: a) to demonstrate the capabilities of smartphone systems to provide more reliable freeway and arterial travel time data than currently provided by vehicle detection system (VDS) spot speed measurements, and b) to facilitate the monitoring and analysis of real-time performance data for high occupancy toll (HOT) corridors and the Georgia Regional Transportation Authority (GRTA) Xpress Bus service. The team is collecting second-by-second vehicle activity data from volunteers who use the HOT corridor and major arterials, and comparing these travel times with estimates derived from VDS spot speed data. The team will assess the potential benefits of more widespread deployment of the Commute Warrior App throughout the region. The team will also conduct focus groups to gather information regarding the potential impacts of real-time data on their use of HOT lane and express bus services.

HOV to HOT Conversion Impacts on Carpooling

Principal Investigator: Yanzhi "Ann" Xu, Georgia Tech

The carpool survey project investigates changes in carpooling activity before and after the I-85 HOV-to-HOT lane conversion project in Atlanta, Georgia, and examines potential reasons for this decline using data collected through a survey of about 2,000 frequent corridor commuters identified from license plate analysis and divided into specific markets based on a cluster analysis of their lane use. The researchers are also analyzing a sub-sample of GRTA Xpress bus users. Recruitment is based upon established markets and demographic parameters. The research team is implementing a unique large-format mail-out/mail-back survey. Followup survey work will include an online survey option. Analyses are designed to assess potentially important demographic and land use factors associated with noted changes in carpooling activities within each sample strata. The findings should have significant policy implications for future HOV/HOT conversion projects with regard to the retention and promotion of carpools. The carpooling survey method can also apply to the implementation of similar surveys in other regions.

Information Services in Social Networked Transportation

Principal Investigator: Hans Klein, Georgia Tech

Over the past twenty years, the transportation sector has experienced an information technology (IT) revolution, as the national program in ITS planned and launched a wide variety of IT-based systems. Today, the transportation sector is poised for a second IT-driven revolution, social networked transportation (SNT), which realizes the functionality of social networks in the transportation sector. SNT leverages preexisting IT investments to realize new services and functions that significantly enhance mobility. This project combines research in social networking and research in transportation to achieve useful insights into SNT. It seeks to understand the functions and the benefits of SNT, the processes that make SNT possible, and the institutional innovations needed to facilitate those processes.

Impact and Feasibility Study of Solutions for Doubling Heavy Vehicles (UAB, FIU, UCF)

Principal Investigator: Nasim Uddin, UAB

Many of the details used in older steel bridge girders are prone to fatigue failures directly related to truck weight. Repetitive loading may cause fatigue cracking in these steel members and limit the service life of a bridge. Truck weight frequency distributions by vehicle type (i.e., truck weight histograms) are needed to estimate the effects on remaining life and the costs caused by changes in legal and permit truck weights. Because carrying higher payloads can reduce the operating costs of truck operators, the possibility of a growing share of freight will be considered in estimating the future truck weight distribution and truck traffic. The goal of this project is to determine if allowing an increase in truck weight provides better or worse bridge durability and longevity when compared to increasing the number of trucks to meet freight demands.

Innovative Modular High Performance Lightweight Decks for Accelerated Bridge Construction (FIU, UAB, UCF)

Principal Investigator: Amir Mirmiran, FIU

This research aims at developing innovative, modular, high performance, lightweight deck options for accelerated bridge construction, replacement, or widening. Two configurations have been proposed that integrate ultra high-performance concrete (UHPC), high-strength steel (HSS), and fiber reinforced polymer (FRP): (1) UHPC waffle deck reinforced with HSS or carbon FRP, and (2) hybrid carbon/glass FRP deck with UHPC topping. After laboratory tests at FIU, the decks will go through dynamic wheel loading at FDOT's accelerated pavement testing facility in Gainesville. Successful alternatives will be offered to FHWA and state DOTs for possible implementation through the Innovative Bridge Research and Deployment (IBRD) Program.

Photo courtesy of Flickr user landerholm.

Integrating Safety in Developing a Variable Speed Limit System

Principal Investigator: Mohamed Abdel-Aty, UCF

Visibility is one of the most important impacts of weather on the road system; weather-related visibility reduction is most often due to fog. Florida is among the top-rated states in the United States with regard to traffic safety problems resulting from adverse visibility conditions caused by fog/smoke (FS). The reduced visibility also has a negative impact on traffic flow. This research attempts to identify the effect of reduced visibility on traffic flow and predict the reduced visibility events by using weather parameters including air temperature, wind speed, surface moisture, etc. This research will facilitate development of a fog detection algorithm and the corresponding software by using an array of low-cost environmental sensors, analysis of the effect of weather parameters on reduced visibility, analysis of the impact of reduced visibility on traffic flow characteristics, analysis of the distribution and influencing factors of fog duration, and determination of the drivers' reaction and behavior during reduced visibility events.

Managing Transportation System Health: Setting Performance Targets and Policies in Non-Uniform Regions and Jurisdictions to Achieve Uniform Statewide and National Objectives

Principal Investigator: Adjo Amekudzi-Kennedy, Georgia Tech

The 2012 national surface transportation legislation, Moving Ahead for Progress in the 21st Century (MAP-21), articulated a performance-based process for decision making. This study provides guidance for addressing a multi-scalar issue involved in performance-based planning at multiple levels of decision making: namely, how to achieve broader statewide (or national) objectives while formally taking into consideration different regional priorities and constraints. The study applies the concept of health to transportation systems to provide support for performance-based decision making, recognizing that achieving better health at multiple scales results in a more robust system.

HOW LONG 'TIL THE NEXT BUS?

Dr. Kari Watkins of the Georgia Institute of Technology is working to answer this question. Many transit riders are unaware of wait times for their bus or train, and while real-time info is available on mobile devices, not all riders have access. Her research investigates how transit information should be presented, so as to provide access to all.

Micro-Dynamics of Business Location and Growth and its Effects on the Transportation Network and Congestion in Georgia and the Southeast Region

Principal Investigator: Frank Southworth, Georgia Tech

The project will examine selected industries that are: a) economically important in Georgia/the broader Southeast region, and b) some of the important drivers of demand for transportation. Examining the link between the micro-dynamics of industrial location and growth and the demand for transportation is important for several reasons. A more efficient and less congested transportation system, for example, will mean lower costs for the industries. To truly understand the complexities of transportation and its impact, the contention is that one needs to focus on some of the core industries that generate demand for the various modes of transportation. The research is novel in its use of pooling new as well as existing data sources to explore the little understood links between the micro-foundation of industry dynamics and economic activity, and the macro-congestion aspects of freight transport.

Mobile Technology Usage among the Transit-Riding Populace

Principal Investigator: Kari Watkins, Georgia Tech

If transit agencies hope to retain choice riders and increase ridership, they need to allow riders to maintain some control over their trips by providing them with real-time information. Unknown wait times mean riders will stand at a corner scanning the horizon for an approaching bus, wondering when or if it will come. If riders can know when the bus will actually arrive, the entire picture changes. This project will analyze how transit information should be presented to the public in an equitable manner. This addresses the prevailing use of smartphones for real-time transit data, the market penetration of smartphones among transit riders, and other ways to make the data accessible to the public.

Next Generation Crack Sealing Planning Tool for Pavement Preservation (Georgia Tech, UCF)

Principal Investigator: James Tsai, Georgia Tech

Drivers in the southeastern United States know well the annoyance of cracked, potholed pavement. For transportation agencies, prioritizing and planning these repairs can be a complex task requiring great expense and effort. Tsai and his team are working to develop a data-driven approach to crack sealing planning in order to help departments of transportation better maintain roadways. This tool is especially important as many agencies reduce their budgets and face financial strain.

Next-Generation Wireless Bridge Weigh-in-Motion (WIM) System Incorporated with Nondestructive Evaluation (NDE) Capability for Transportation Infrastructure Safety (Georgia Tech, UAB)

Principal Investigator: Yang Wang, Georgia Tech

Overloaded commercial vehicles can endanger the safety of transportation infrastructure and cause expensive premature structural damage. Bridge WIM is a method through which an existing bridge is used as a weighing scale to identify the axles and gross weight of passing trucks. The system can provide information on overloading and potentially protect the bridge from sudden collapse. This project will develop rapidly deployable, portable wireless bridge WIM systems with enforcement and monitoring capability. The research will deliver a low-cost, easy-to-install-and-maintain, reliable monitoring system for long-term next-generation WIM and NDE deployment on bridges.

Optimizing Emergency Medical Services (EMS) Through the Use of Intelligent Transportation Systems (ITS) Technologies (UAB, FIU)

Principal Investigator: Andrew Sullivan, UAB

EMS operations can greatly benefit from the integration of ITS technologies into the transportation system's infrastructure and into the emergency vehicles themselves. The expected benefits from this synergy are tremendous for the healthcare sector, the transportation sector, and the public. This research project investigates needs and opportunities associated with the use of ITS as a tool for improving healthcare delivery practices during routine as well as emergency operations.

Performance Measurements of Transportation Systems Based on Fine-Grained Data Collected by Automatic Vehicle Identification (AVI) and Automatic Vehicle Location (AVL) Systems (UCF, FIU)

Principal Investigator: Mohammed Hadi, UCF

Performance measurement is an important component of planning and operating transportation systems. Increasingly, transportation agencies have been interested in using data collected from point traffic detectors installed for the estimation of transportation system performance measures and the use of these measures in the active management of transportation systems. Some agencies have utilized or are considering using AVL technologies for estimating travel time in real-time applications. This project investigates the opportunities for more detailed performance measurements of transportation systems based on AVI, AVL and automatic passenger counters (APC) data and the use of derived measures for active performance management of the transportation systems.

Reducing Service Interruptions in Linear Infrastructure Systems (Transportation and Water/Sewer) by Synchronizing Schedules for Selected Maintenance Activities

Principal Investigator: Berrin Tansel, FIU

Lifeline systems are facilities that provide the main utility or transportation services to a community (e.g., electric and portable water transmission and distribution, wastewater collection and treatment). The extent of interdependency of the lifeline system plays a significant role in the vulnerability of a community. Increasing population density and increased vulnerability of the coastal areas to hurricanes has created major challenges for communities, especially with increasing awareness after recent disasters. This research will demonstrate the infrastructure limitations (design and operation) of lifeline facilities for coastal communities, identify critical bottlenecks in service quality, and show how failure will propagate through the system. It also looks at how to develop coordinated maintenance schedules to minimize (or reduce) service interruptions and increase maintenance cost effectiveness.

Traffic Management Centers (TMCs): Challenges, Best Practices, and Future Plans

Principal Investigator: Xia Jin, FIU

This project aims at providing a nationwide scan on best practices in TMCs with a focus on ITS in terms of innovative tools, technologies, methods, and policies. A web-based survey was conducted focusing on current applications as well as new methods and tools in various aspects of TMC operations and services. The survey covers five major areas of interest: current tools and applications used in TMC operations, practices in data collection and information sharing, potential enhancements with new technologies, staffing and skill needs, and incident management performance measures. The web-based survey was conducted during March and April 2014. A total of forty-two responses from twenty-five different states were received and analyzed.

SEMINARS

Dr. Susan Handy, “Driving Less: Reducing Vehicle-Miles Traveled in the Land of Freeways” (Atlanta, Georgia, January 2015)

Dr. Samer Madanat, “Incorporating Environmental Sustainability Objectives in the Planning, Operations, and Maintenance of Transportation Systems” (Atlanta, Georgia, February 2015)

Dr. Ram M. Pendyala, “Applications of the Multiple Discrete-Continuous Choice Framework in Activity-Based Travel Models” (Miami, Florida, February 2015)

Muhammad Asif Khan, P.E., “An Introduction to Miami-Dade County’s Transportation Plan in CDMP” (Miami, Florida, March 2015)

K. K. Saxena, “How Miami-Dade County’s Advanced Transportation Management System is Improving Traffic Flow” (Miami, Florida, March 2015)

Rossi M. Gaudio, “Ramp Metering Considerations on I-95 – The Miami Experience” (Miami, Florida, March 2015)

Dr. Ken Laberteaux, “Tracking Transportation Trends: Gen Y, Suburbs, and Automated Driving” (Atlanta, Georgia, March 2015)

Charles J. Robbins, “95 Express Dynamic Pricing” (Miami, Florida, March 2015)

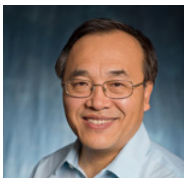
Zach Clark and Edward Myers, “Roundabout Triage – Improving Safety and Operations” (Miami, Florida, March 2015)

Dr. Geoffrey P. Whitfield, “Active Transportation: Understanding Surveillance and Measuring Health Impact” (Atlanta, Georgia, April 2015)

Dr. Daniel Piatkowski, “Carrots vs. Sticks: Strategies for Increasing Walking and Cycling in the U.S.” (Atlanta, Georgia, April 2015)

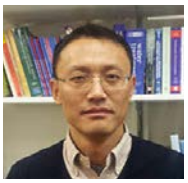
Dr. Omar Smadi, “Asset Management: A New Approach to Decision Making” (Atlanta, Georgia, April 2015)

Dr. Srinivas Geedipally, "4Es in Traffic Safety: What are their contributions?" (Miami, Florida, May 2015)



Dr. Yinhai Wang, "Big-Data-Driven Transportation Decision Making in the Smart Cities Context" (Atlanta, Georgia, August 2015)

Dr. Alex Karner, "The Convergence of Social Equity and Environmental Sustainability: Jobs-Housing Fit and Commute Distance" (Atlanta, Georgia, September 2015)



Dr. Jidong Yang, P.E., "Understanding the Varying Performance of Vehicle Detectors for Traffic Signal Control" (Atlanta, Georgia, September 2015)

Dr. Lucio Soibelman, "Design, Construction and Management for Data Rich Advanced Infrastructure Systems" (Atlanta, Georgia, September 2015)

Dr. Steve Dickerson, Sc.D., "A Comprehensive Urban Transportation App" (Atlanta, Georgia, October 2015)

Dr. Aaron Steinfeld, "Crowdsourcing for Public Transit Users of All Abilities" (Atlanta, Georgia, October 2015)

Dr. Srinivas Peeta, "Modeling the Information Flow Propagation Wave Under Vehicle-to-Vehicle Communications" (Atlanta, Georgia, October 2015)

Dr. Susan Tighe, P.E., "Incorporating Sustainability into Transportation Asset Management: Our Future Depends on It!" (Atlanta, Georgia, November 2015)

Dr. Christian Claudel, "Network Traffic State Estimation Using Hamilton-Jacobi Equations" (Atlanta, Georgia, November 2015)

2015 UNIVERSITY TRANSPORTATION CENTER CONFERENCE FOR THE SOUTHEASTERN REGION

On March 26 and 27 of 2015, the University of Alabama at Birmingham (UAB) and Mississippi State University (MSU) played host to the 2015 University Transportation Centers (UTC) Conference for the Southeastern Region. Held at the Hyatt Regency-Wynfrey Hotel in Birmingham, the event brought together transportation professionals from across the nation to discuss and disseminate information on research results, current activities and future plans.

Sponsored by the eight USDOT UTCs located in the Southeast (Region 4), the conference was co-chaired by UAB's Dr. Virginia P. Sisiopiku and MSU's Dr. John Usher with Michael Trentacoste, FHWA Associate Administrator for Research and Development and Director of the Turner Fairbank Highway Research Center, serving as the keynote speaker.

Twenty-two universities, numerous state and local transportation agencies, and other professionals participated. Attendees engaged in technical and breakout sessions, on topics ranging from freight and logistics, to state of good repair, traffic safety, and non-motorized and aging population issues. These technical sessions were each comprised of several 20 minute presentations by UTC research professionals discussing their ongoing research projects. Breakout sessions provided attendees with the opportunities to attend either student chapter meetings of Institute of Transportation Engineers (ITE) and Women's Transportation Seminar (WTS) or a panel discussing collaboration at the state and metropolitan planning organization levels.

Transportation Research Board Annual Meeting
(Washington, District of Columbia, January 2015)
NCTSPM and Georgia Tech opened the new year with a reception at the Transportation Research Board's 94th Annual Meeting in Washington, D.C. More than 200 students and researchers from various universities attended.

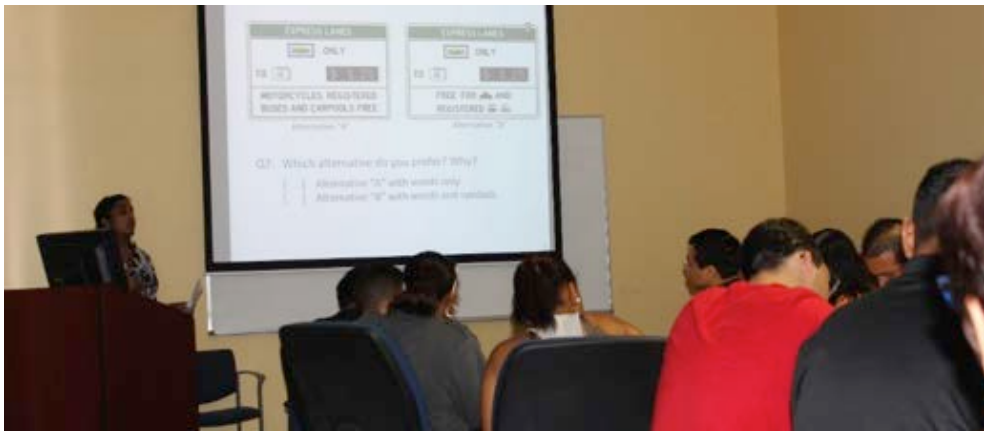
TransportationCamp South 2015 (Atlanta, Georgia, September 2015)
TransportationCamp South returned to Atlanta for the third time in September of 2015. The event was an "unconference" with participant-designed sessions and discussion, which brought together professionals, faculty and students, and laypersons with an interest in transportation. The camp provided a day of connection and creativity, facilitated by its novel approach, filled with discussions, demonstrations, and education related to transportation in the South.

GDOT Research Expo (Atlanta, Georgia, September 2015)
For the third year, the Georgia Department of Transportation, NCTSPM, and the Georgia Transportation Institute jointly hosted the GDOT Research Expo. The event, held at GDOT headquarters in Atlanta, featured over 70 posters highlighting research and results of NCTSPM and GDOT-sponsored research projects at Georgia Tech, Kennesaw State University, the University of Georgia, Georgia Southern University, and The University of Alabama at Birmingham.

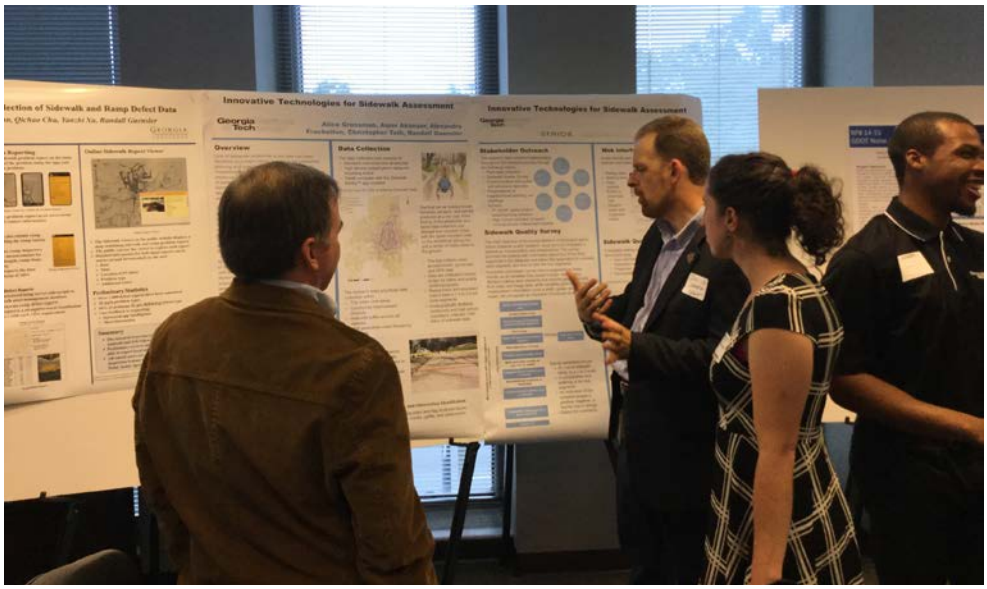
Road Safety and Simulation 2015 Conference (Orlando, Florida, October 2015)
The University of Central Florida, in conjunction with the University of Tennessee, hosted the RSS2015 Conference in Orlando, Florida. Spotlighting over 100 presentations and 85 posters, the conference also featured a special workshop on virtual and augmented reality for transportation research. The conference chair was Dr. Essam Radwan of UCF, and the co-chair was Dr. Mohamed Abdel-Aty, also of UCF. Keynote speakers for the conference included Dr. Peter A. Hancock, Sc.D., Ph.D., of UCF, Dr. C. Y. David Yang., of the Federal Highway Administration, and Jeff Greenberg, of the Ford Motor Company.

TRAINING AND OUTREACH

Dr. Priyanka Alluri, Assistant Professor of Civil Engineering at Florida International University, was invited to give a presentation on "Comprehensive Study to Reduce Pedestrian Crashes in Florida" to the Florida Senate Transportation Committee in Tallahassee, Florida on March 12, 2015. Dr. Alluri also fielded questions from the senators on specific pedestrian safety issues in Florida and the potential countermeasures.



As part of a NCTSPM project on evaluating signage alternatives for express lane facilities, researchers at Florida International University conducted six focus group sessions involving over 50 participants from the South Florida community. The sessions provided opportunities for the researchers to learn about drivers' understanding of, and preferences for, different sign design alternatives, as well as to educate the participants on the different signs used on express lane facilities. The participants also had a chance to learn about the research effort going into providing the best signage practice for the traveling public.



EDUCATIONAL INITIATIVES

Just as NCTSPM researchers are pioneering the future through their research projects, they are also helping to grow it, by planting the seeds of an interest in civil and transportation engineering in the next generation. Through educational initiatives undertaken at each of our member universities, students across the Southeast have been educated about and introduced to transportation science. These efforts are instrumental in cultivating future transportation professionals.

For the third year in a row, the University of Central Florida's (UCF) Transportation Systems Engineering program hosted Camp Connect. The week-long camp in July brought 8th through 10th graders to campus, where Dr. Mohamed Abdel-Aty presented the students with an overview of the engineering discipline, describing each field using real-world examples.

The students also learned about transportation through an interactive board game called Reservation Road Planner. The game was gifted to Camp Connect by the Federal Highway Administration two years ago through the efforts of Michelle Noch, and it remains a favorite year after year. In the game, students learned the stages of planning, designing, and funding a roadway. They had to complete a project through the five stages of development, project inventory inclusion, funding, preconstruction, and construction. The game also included a real-world feel – to represent the possible obstacles to a project, students were subject to fees, bankruptcy, and sudden changes in project guidelines. UCF students Alex Navarro, Kali Carroll, and Ryan Selby were instrumental in the success of the camp and the game.

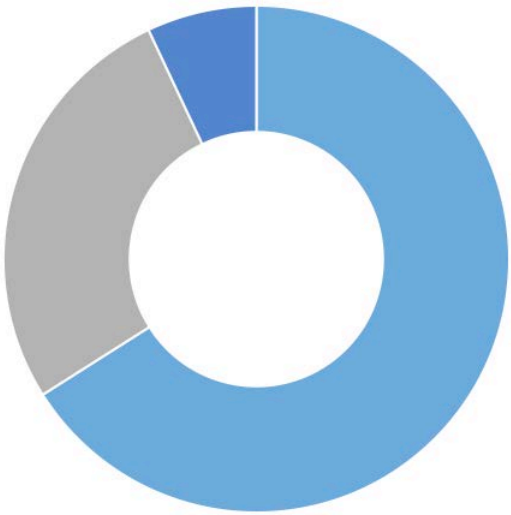
In July 2015, Florida International University (FIU) hosted 17 high school students at their Summer Transportation Camp. The two-week event was hosted by FIU's Lehman Center for Transportation Research and sponsored by NCTSPM, the U.S. Department of Transportation, and the Accelerated Bridge Construction University Transportation Center at FIU.

At the camp, students were introduced to transportation and bridge engineering through a novel, hands-on approach. They learned about various traffic management strategies, including intelligent transportation systems, and took field trips to the Florida Department of Transportation's District Traffic Management Center, Miami International Airport, and Miami Intermodal Center. The students also took part in a study on alternative interstate signage and driving simulation experiments at the FIU Driving Simulator Laboratory. They learned about different types of bridges, the elements of their design and construction, and possible loading scenarios. They also competed in a balsa wood bridge construction project and tested their knowledge through a Jeopardy!-style competition on the last day of camp.

BUDGET

The budget of the NCTSPM is more than $14 million, with approximately $6.9 million from the USDOT and more than $7 million in matching funds from participating state DOTs, universities, local government agencies, and foundations. The following charts indicate the relative allocations to research, programmatic activities (e.g., technology transfer, education, workforce development), and administration.

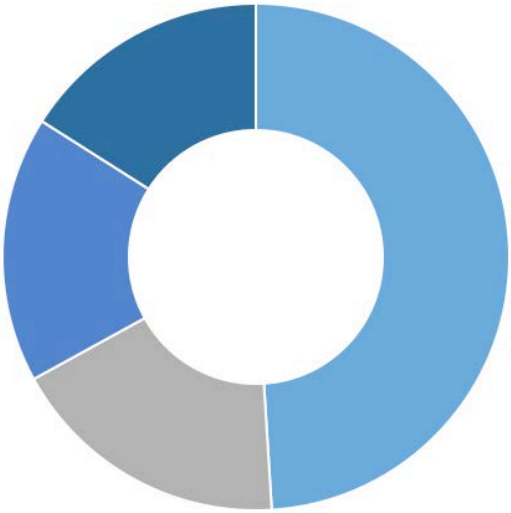
It is a primary goal of the NCTSPM, as a national university transportation center, to support high-quality, relevant research and critical national needs, as well as serve as the training ground for the next generation of transportation professionals. As such, many of the research allocations indicated below represent financial support for graduate and undergraduate students at each of the participating institutions.



ALLOCATION ACROSS FUNCTIONS

- Research: 66%
- Programs: 27%
- Administration: 7%

Note: Center programs include technology transfer, outreach, education, and workforce development.



ALLOCATION ACROSS UNIVERSITIES

- Georgia Tech/GTI: 49%
- University of Alabama at Birmingham: 18%
- Florida International University: 17%
- University of Central Florida: 16%

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