WNIVERSITY OF MARYLAND

National Transportation Center

ANNUAL REPORT

National Center for Strategic Transportation Policies, Investments and Decisions











THE UNIVERSITY of NEW ORLEANS









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DIRECTOR'S MESSAGE

Dear colleagues, sponsors, students and friends,

On behalf of all Center staff from our seven consortium universities, I present you with the first annual report of our National Center for Strategic Transportation Policies, Investments and Decisions.

Our National Transportation Center (NTC@Maryland) was established in October 2013 as one of the five National Centers funded by the U.S. Department of Transportation University Transportation Center Program. Building on a successful Tier 1 University Transportation Center at the University of Maryland, our NTC@Maryland also benefits from great support from several State Departments of Transportation, especially the Maryland State Highway Administration and many local government and private-sector partners.



In 2014, more than 100 faculty, researchers, and students engaged in more than 30 research, education, outreach, and technology transfer projects at NTC@Maryland. Our most important asset is our people, who are addressing some of the most critical issues in economic development and multimodal transportation systems. For example, several collaborative research projects that involve all seven consortium universities developed innovative solutions to improve freight mobility and reliability, to support national-level transportation investment decision-making, and to leverage private-sector funding resources in a fiscally constrained environment. It is also an exciting time at NTC@Maryland in regards to education and workforce development. Our faculty members are establishing the first online Master's Program in Transportation Engineering and are expanding a successful crosscutting Transportation Engineering and Public Policy Graduate Program. Our Summer and Year-long Internship Programs have attracted a diversified group of future transportation engineering professionals. In 2014, NTC@Maryland organized and sponsored a series of training academies, workshops, conferences, and seminars consistent with our three Center themes of freight efficiency and reliability, congestion management with multimodal solutions, and national-level policy decision-support. These programs include the Freight Academy, Traffic Operations Academy, TRB Conference on Innovation in Travel Modeling, TRB Conference on Transportation and Economic Development, and the Gulf Coast Maritime Transportation Summit.

Our vision for the coming year is for our center to grow and become more impactful. We aspire to the highest level of performance for our stakeholders and constituents with impactful practice-ready products. Through a multi-university collaborative approach, we have set our sights on major opportunities to bring NTC@Maryland to new heights in 2015. I would like to thank you for all your support to our Center and ask for your continuous support — we will not be able to achieve our goals without it.

Best Regards,

Lei Zhang, Director of NTC@Maryland

OVERVIEW & THEME

The theme of NTC@Maryland is **"Strategic Transportation Policies, Investments** and Decisions for Economic Competitiveness."

The National Transportation Center at the University of Maryland, College Park (NTC@Maryland), conducts research and provides education and technology transfer related to this theme, and directly supports the U.S. Department of Transportation's (DOT) strategic goal of economic competitiveness. **The University of Maryland** leads the consortium that includes six partner universities:

Arizona State University (ASU)

Louisiana State University (LSU)

Morgan State University (MSU)

North Carolina State University (NCSU)

Old Dominion University (ODU)

University of New Orleans (UNO)

To focus the research on economic competitiveness, the NTC@Maryland has defined the following three primary research areas:

Freight efficiency and reliability

Congestion mitigation with multimodal strategies

National-level multimodal transportation investment analysis and decision-support

In addition to research activities, the NTC@Maryland is also involved in promoting education, workforce development, technology transfer, and diversity. During this reporting period, the members of the NTC@Maryland have built on their impressive track record of sharing expertise and relevant research findings with a multitude of audiences including academic professionals, government representatives, and private practitioners. Our members have also made significant contributions to educate and diversify the next generation of transportation professionals. On this front, UMD is officially recognized as an Asian-Pacific Islander Minority Serving Institution. In a similar fashion, ASU is a Hispanic Minority Serving Institution, while MSU is a historically black college. An overview of the education, workforce development, technology transfer, and diversity efforts during this reporting period are discussed in later sections of this report.

PARTNER UNIVERSITIES

UNIVERSITY OF MARYLAND

The Transportation Engineering Program (TEP) at the University of Maryland provides students with in-depth knowledge of a range of topics integral to the field, from traditional areas of transportation planning, travel behavior, traffic operations, safety and design, to system optimization, transportation economics and



policy, infrastructure vulnerability and protection, emissions estimation and sustainability analysis.

With expertise in all transport modes, our students are trained to tackle problems involving both passengers and freight that arise in our roadways, airways, railways and waterways, as well as in their intermodal components. The problems that arise in the interdisciplinary field of transportation are complex and continue to change alongside changes in society, technology and the environment. TEP recognizes that to develop professionals capable of analyzing and solving these difficult problems, our students must master material in many disciplines, including mathematics, computer science, architecture and urban planning, operations research and management science, logistics, economics, and psychology.

With extensive training and an emphasis on both academic education and professional development, our graduates are now professors and researchers at universities and research institutes in the U.S. and abroad; industry experts in local, national and international firms; and government officials in local, state and federal positions.

NTC@Maryland collaborates with the following groups: (1) the Center for Advanced Transportation Technology (CATT) that was originally established in 2002 as an academic applied research and development lab to support national, state and local efforts to solve important transportation, safety and security problems; (2) Consortium for ITS Training and Education (CITE) that aims to create an integrated advanced transportation training and education program; and (3) Maryland Transportation Technology Transfer Center (MD T2 Center) that targets to foster a safe, efficient and environmentally sound surface transportation system by improving skills and increasing knowledge of the transportation workforce and decision-makers.

ARIZONA STATE UNIVERSITY

The ASU Transportation Engineering program has two general themes: Transportation Systems and Pavements and



Materials. First, the Transportation Systems program addresses a broad range of education and research focus areas. Faculty in the transportation systems program focuses on traffic operations and simulation, intelligent transportation technologies, traveler safety and risk, travel behavior, transportation systems simulation, and transportation planning applications. Second, the Pavements and Materials program addresses pavement analysis and design, pavement performance and management, material testing and characterization, and consideration of developing new and more efficient construction materials, such as asphalt and concrete, that are applicable to transportation needs.

Recent graduates have been hired by organizations and companies both in the private and in public sector. Job opportunities include tenure-track and research faculty positions in academia, small and large consulting firms that deal with transportation systems and pavements, federal agencies such as the Federal Highway Administration (FHWA), state agencies such as the Arizona Department of Transportation (ADOT), county and city engineering offices, and large companies like Tetra Tech. Students typically encounter valuable employment and career opportunities that span the spectrum and fulfill the needs and desires of our graduates.

LOUISIANA STATE UNIVERSITY

The LSU Civil Engineering Department is housed in Patrick F. Taylor Hall. This facility incorporates eleven laboratories, which covers 23,600 square feet of floor area. Among the laboratories used for graduate studies and research are geotechnical, environmental, structural, mechanics of materials, water



resources, and computer laboratories. Graduate civil engineering students use the TEM/SEM microscopy mineralogical analysis laboratory of the Department of Mechanical Engineering and the remote sensing and image processing facilities of the Division of Engineering Research Units. The civil and mechanical engineering departments also share a new Wind Tunnel Laboratory. Laboratories for state-of-the-art materials testing may become available for use at the nearby Louisiana Transportation Research Center (LTRC). The department also shares the Geosynthetic Engineering Research Laboratory with LTRC. The department maintains an array of more than thirty microcomputers for word processing, data acquisition, plotting, and research functions. A general use I/O room with terminals and PCs is also located in CEBA.

University Computing Services maintains a high-performance UNIX cluster with 48 IBM RS/6000 servers for research

PARTNER UNIVERSITIES

needs. LSU's College of Engineering has a new acquisition that stimulates research amongst various departments across campus and proves enticing for federal funding a virtual driving simulator developed by Realtime Technologies, Inc. The simulator provides both undergraduate and graduate students an opportunity to participate in studies that could impact driving safety. The simulator, a full-body Ford Fusion with technologically advanced computer programming, is housed on campus in the civil engineering department and uses a combination of cameras, projectors and screens to provide a realistic virtual environment.

MORGAN STATE UNIVERSITY

Morgan State University's National Transportation Center has supported research on traffic models to improve mobility and accessibility. Completed research simulated vehicle infrastructure integration impact on incident management, congestion and disaster evacuation, and



trip generation impacts of town center and senior housing developments. NTC has conducted research on driver behavior, impairment, and engineering features' effects on vehicle crashes and safety.Research has included understanding effects of social networks on alcohol-impaired drivers and road engineering influences on motorcycle crashes. Research has focused on causes and effects and developing interventions to improve safety. Research continues on economics, life cycle costing, and optimization transportation analyses of traffic flows, highway infrastructure, freight, and urban public transit systems.

The transportation education program on the graduate level consists of the Doctor and Master of Engineering degrees and interdisciplinary Master of Science in Transportation program. On the undergraduate level the Bachelors of Science in Civil, Electrical and Industrial Engineering and in Transportation Systems have courses that are related to economic competitiveness. In addition the Department of Transportation and Urban Infrastructure Studies has implemented a PhD. In Transportation Systems that enrolled students in fall 2013. MSU provides opportunities for graduate and undergraduate students to work with faculty principal investigators on funded research projects in cooperation with graduate and undergraduate recruitment and financial aid. As a minority serving institution, MSU is uniquely qualified to work toward the goal of diversity in the transportation professional workforce. MSU has a diverse group of faculty, staff and students involved in its research, education, and outreach activities. NTC staff and MSU faculty serve on

committees and participate in conferences of minority and women's transportation professional associations to increase members' awareness of transportation-related degree programs at MSU.

NTC's Teacher Transportation Institute, (TTI) shows high school STEM educators how hands-on, transportation-related projects can complement and apply math and science concepts. The TTI has focused on roundabouts because they are designed to make intersections safer and more efficient for drivers, pedestrians and cyclists and clearly apply STEM-related tools and techniques. Teachers receive continuing education credits.

NORTH CAROLINA STATE UNIVERSITY

The Transportation Materials and Systems group researches the planning, analysis, design, construction, and management of transport facilities and the materials from which they are built. Our research group focuses on two main sub-areas related to transportation: (1) Transportation



materials, including pavement design, mix design, and materials characterization; (2) Transportation systems, including planning, design, operations and safety.

The Institute for Transportation Research and Education (ITRE) is an inter-institutional research center administered by North Carolina State University. Located within the University's visionary Centennial Campus, ITRE conducts surface, water, and air transportation research while providing professional training and educational opportunities. The Institute serves all 16 statewide campuses in the University of North Carolina system and partners with transportation professionals around the globe. It is a university-based institute committed to leadership in the study of surface and air transportation issues through fostering analytical thinking, integrating technology in education and research, serving as a catalyst for problem solving, and cultivating professionals and students dedicated to excellence in transportation.

The Center for Transportation and the Environment (CTE) is frequently sought after by transportation agencies and their stakeholders for quality research, training, and information exchange related to improving transportation infrastructure while preserving the integrity of the natural and built environment. Since its establishment in 1991, CTE has helped decision-makers and practitioners of diverse interests collaborate successfully on some of the most challenging technical and policy issues facing the profession. Within the academic community, CTE has developed new opportunities for research among multi-disciplinary teams of faculty and graduate students, and has helped to cultivate the next generation of transportation and environmental professionals. CTE, a national university transportation center, is funded in part by the U.S. Department of Transportation and the North Carolina Department of Transportation.

OLD DOMINION UNIVERSITY

The Transportation Research Institute (TRI) and the Center for Innovative Transportation Solutions (CITS)at ODU work collaboratively on both basic and applied research centered on modeling and simulation of transportation systems. With six faculty members across the



campus, the transportation engineering program at ODU provides students unique interdisciplinary opportunities to study multimodal transportation networks, human behavior, traffic operations, transportation planning, network modeling and optimization, intelligent and connected transportation systems, sustainable transportation, and transportation policy and economics.

TRI and CITS researchers work closely with Virginia Modeling, Analysis and Simulation Center (VMASC), taking advantage of the state-of-the-art facilities that include a 74-seat virtual reality theater, a five-wall Cave Automated Virtual Environment, and specialized labs for visualization, human factors, behavioral analysis, driving simulator, and general modeling and simulation research. ODU is a global leader inmodeling and simulation techniques and the world's onlyuniversity offering Modeling and Simulation degrees at the bachelor's, master's, and doctoral levels. ODU is also a leader in the defense industry's pursuit of interoperability for simulations and the adoption of universal simulation standards, and is pursuing similar efforts within the transportation field. ODU's transportation laboratory includes workstations and high speed computers with agent-based modeling software, planning software (TransCad, Cube®, Dynasmart), and operations software (e.g., TransModeler, VISSIM, Synchro, and Paramics). Since being established in 2006, the transportation program at ODU has grown significantly and provided services to local, state, and federal government agencies. TRI and CITS researchers have been developing large-scale network simulation models to assist policy makers with challenging infrastructure investments decisions. System Sciences.

UNIVERSITY OF NEW ORLEANS

The Merritt C. Becker, Jr. University of New Orleans Transportation Institute (UNOTI) combines applied research, education, and outreach initiatives incorporating both THE UNIVERSITY of passenger and freight systems to positively NEW ORLEANS impact the transportation field from local to



international spheres. The Institute promotes innovative policies and practices for the users and providers of transportation as well as strategic partnerships with both the public and private sectors. Faculty and staff associated with the Institute are recognized for their expertise in: Transportation Policy for Sustainability, Livability, Resiliancy and Disaster Recovery, Freight-based Economic Development, Maritime and Port Planning, Bicycle and Pedestrian Planning and Safety, Transit Oriented Development, Megaregion Research and Development and Globalization Planning and Policy.

As a member of three USDOT funded University Transportation Centers (UTC), UNOTI enjoys a robust research partnership with 14 universities throughout nine states , \$3,675,800 in active research projects and over \$5,000,000 in pending proposals, ongoing research partnerships with local, national and international institutions, and is co-founder of the National Evacuation Conference with partners at LSU (2010, 2012, 2014). UNOTI is also a participant in the Southwest Region University Transportation Consortium's Megaregion Symposium 2014. Research outcomes are integrated into local and state policy, and UNOTI faculty and staff effectively bridge research findings with academia, government and private industry through education and service.

UNOTI offers an executive program Master of Science in Transportation, transportation concentrations within the Bachelor of Science in Urban Studies and Planning, Master of Urban and Regional Planning, and a Ph.D. program in Urban Studies. UNOTI provided tuition and living stipend support for six graduate students in school year 2013-2014, and provided more than \$150,000 in student support from 2011-2014. Fiftysix pervent of those funds support female students.

UNOTI's Division of Planning supports various service efforts, including offering technical services to assist communities on a variety of applied planning issues, supporting the Sustainable Transportation Advisory Committee (New Orleans City Council), serving on transportation professional association boards at the local, state and national levels, supporting the Women's Transportation Seminar (WTS) and participating in "On the Move" K-12 outreach and Maritime Workforce Summit.

FUNDING & EXPENDITURES // PEOPLE

FUNDING & EXPENDITURES

In 2014, the NTC@Maryland generated \$5.6 million in revenue, with half of those sources coming from the U.S. DOT, and the other half from non-federal matching funds. The sources of the non-federal matching funds included university resources, State DOTs, and other entities.

The figures below show expenditures by activity and the breakdown of the matching funds.

In the figure below, labeled Matching Fund Scores, the breakdown of matching funds is displayed. The category "subcontracts" includes all funds from partner universities, including support from state DOTs or other parties.



The NTC@Maryland uses funding resources to support research activities of the consortium while promoting education and technology transfer. The following figure presents NTC@Maryland expenditures by activity.



FACUTLY, STAFF AND RESEARCHERS

KEY PERSONNEL

Lei Zhang, Ph.D., Director

Mark Franz, Assistant Director of Outreach and Technology Transfer *Xiqun (Michael) Chen, Ph.D.,* Assistant Director of Research and Education *Christina Nobleman,* Assistant Director of Finance

EXECUTIVE COMMITTEE

Lei Zhang, Ph.D., Director, University of Maryland
Kamil Kaloush, Ph.D., Associate Director, Arizona State University
Brian Wolshon, Ph.D., Associate Director, Louisiana State
University
Andrew Farkas, Ph.D., Associate Director, Morgan State University
Nagui Rouphail, Ph.D., Associate Director, North Carolina State
University
Mecit Cetin, Ph.D., Associate Director, Old Dominion University
Bethany Stich, Ph.D., Associate Director, University of New Orleans

RESEARCHERS

Ahmet H. Aydilek, Ph.D., University of Maryland Ali Haghani, Ph.D., University of Maryland Cinzia Cirillo, Ph.D., University of Maryland Elise Miller-Hooks, Ph.D., University of Maryland Gang-Len Chang, Ph.D., University of Maryland Lei Zhang, Ph.D., University of Maryland Paul Schonfeld, Ph.D., University of Maryland Qingbin Cui, Ph.D., University of Maryland Kamil Kaloush, Ph.D., Arizona State University Mikhail Chester, Ph.D., Arizona State University Mounir El Asmar, Ph.D., Arizona State University Shane Underwood, Ph.D., Arizona State University *Xuesong Zhou, Ph.D., Arizona State University* Yingyan Lou, Ph.D., Arizona State University Brian Wolshon, Ph.D., Louisiana State University Sherif Ishak, Ph.D., Louisiana State University Hyeon-Shic Shin, Ph.D., Morgan State University Billy M. Williams, Ph.D., North Carolina State University George F. List, Ph.D., North Carolina State University Nagui Rouphail, Ph.D., North Carolina State University James Martin, P.E., North Carolina State University Mecit Cetin, Ph.D., Old Dominion University Mike Robinson, Ph.D., Old Dominion University Bethany M. Stich, Ph.D., University of New Orleans

ALI HAGHANI, Ph.D.



Ali Haghani holds a Bachelor of Science degree in civil engineering from Pahlavi (Shiraz) U n i v e r s i t y in Iran and a

Master's and a Ph.D. degree in civil engineering with a concentration in transportation from Northwestern University. He was a Post Doctoral fellow and a Research Scientist at Northwestern University for one year, and he taught at the University of Pittsburgh as an Assistant Professor for three years prior to joining the University of Maryland, College Park, in August 1990. He was the Department Chairman from Fall 2003 through Fall 2013. He assumed the position of the Director of Center for Integrated Transportation Systems Management (CITSM) at the University of Maryland in 2010.

Dr. Haghani is an expert in Intelligent Transportation Systems, freight transportation and logistics, emergency response, dynamic fleet management, mass transit operations, and traffic data collection, analysis, and evaluation. He has more than 200 publications in archival journals, refereed conference proceedings and research reports. His work in Intelligent Transportation Systems is mainly focused on traffic surveillance. detection, data collection and data processing. He has made numerous presentations in various conferences and professional venues, and has been a keynote speaker in a number of professional conferences.

Dr. Haghani has more than thirty years of experience in research and

education, as well as vast experience in managing research programs and administrative expertise. Hehas managed numerous research contracts totaling over \$25 million, and he has completed many research projects for several sponsors, including the Maryland State Highway Administration, the Maryland Mass Transit Administration, and the Federal Highway Administration. One of his earliest research projects funded by the Federal Highway Administration was the development of additional prototype strategies for inclusion in Real-Time Traffic Adaptive Control System (RT-TRACS). The FHWA funded development of five of these prototypes, and Dr. Haghani's prototype was one of the two selected for further analysis and inclusion in RT-TRACS. Later in his career, he designed and developed a sophisticated software and hardware system for parking garage management for the Maryland Mass Transit Administration (MTA). Dr. Haghani's system was implemented in two of the MTA's parking garages. More recently, his research group was selected to evaluate the cellular probe data for the Baltimore Multimodal Traveler Information System (MMTIS).

In 2008, he led a successful effort for establishing a Tier-I university transportation center, named the Center for Integrated Transportation Systems Management, at the University of Maryland. He later assumed its directorship in 2010. Because of his work on the MMTIS project, he was asked to lead the I-95 Corridor Coalition Vehicle Probe Project Travel Time Data Validation. This is a very high visibility project in which the I-95 Corridor Coalition buys real-time travel time and speed data from a third-party vendor and makes that information available to its member states. Dr. Haghani's group is in charge of assessing

the quality of, and validating, the data provided by the third-party vendor. Dr. Haghani was the pioneer in using Bluetooth technology-based sensors for collecting ground truth traveltime information in the Vehicle Probe Project travel time data validation process.

As part of his Intelligent Transportation Systems research, Dr. Haghani has in recent years focused on developing new and innovative green technologies for traffic data collection. His research group has developed new wireless traffic sensors that harvest energy from the environment and are capable of collecting and disseminating traffic information via wireless communication. These sensors are also capable of communicating with each other to increase the efficiency of data collection and dissemination. Two types of these sensors have been developed to date. One type is for use in freeways and arterials and prototypes of these sensors have been deployed in the Maryland Inter County Connector. The other type is for use in freeway rest areas to collect parking status information. The prototypes of these sensors have also been deployed in a rest area off of Interstate 95 in Maryland.

Dr. Haghani has served as the chairman of the TRB Committee on Transportation Network Modeling. He is a member of ASCE, the Institute of Transportation Engineers, ITS America, and the Institute for Operations Research and the Management Sciences. Dr. Haghani has also served as a member of the Editorial Advisory Board of Transportation Research and is currently Associate Editor of the Journal of Intelligent Transportation Systems.

MOUNIR EL ASMAR, Ph.D.



Dr. Mounir El Asmar works on innovative project delivery s y s t e m s , i n c l u d i n g integrated project delivery (IPD), public-private

partnerships (PPP), and designbuild (DB), as well as evaluating the sustainable performance of built facilities.

Dr. El Asmar has been studying projects that use alternative delivery methods to compare their performance in terms of costs, quality, and time, to traditional project performance. He also studies the life cycles of facilities in an effort to develop a framework for sustainable performance. Dr. El Asmar has been involved in use-inspired research related to innovative delivery systems, specifically for highway projects. His involvement with highways and infrastructure led to a development of research interests in cost engineering, which culminated to him developing new costestimating tools currently mandated by the Wisconsin Department of Transportation.

Dr. El Asmar continues to work on advances in innovative delivery systems, coupling it with sustainable performance of the built environment. He has developed 5D models that evaluate project performance based on contractual terms, the social tone of project participants, and the technology and tools used in the process. The models visually demonstrate how integrated delivery systems are superior in performance to traditional systems.

Dr. El Asmar has presented his research in several venues, most notably at the annual Transportation Research Board meetings, the International Council for Research and Innovation in Building and Construction, and the Construction Research Congress. His work is published in several ASCE journals and was recognized regionally by the Wisconsin Transportation Builders Association, nationally through the 2010 Best Paper Award of the ASCE Journal of Construction Engineering and Management, and internationally by the Association for the Advancement of Cost Engineering. Most recently, Dr. El Asmar was the recipient of the Construction Industry Institute's (CII) Distinguished Professor Award.

BRIAN WOLSHON, Ph.D.



Dr. Brian Wolshon began his employment in the Department of Civil and Environmental Engineering at Louisiana State University as non-tenureа track Instructor

in January 1997. After completing all of the requirements for his Doctoral Degree, he was appointed to a tenuretrack Assistant Professor position in August 1997, was promoted with tenure to Associate Professor in August of 2003, then promoted to Professor in August of 2009, and awarded the Edward A. and Karen Wax Schmitt Distinguished Professorship in August 2010. During the summer of 2006, Dr. Wolshon was also appointed as an Affiliate Researcher in the Energy & Infrastructure Analysis Laboratory at the Los Alamos National Laboratory (LANL) in New Mexico. From August 2005 to July 2007, he served as the Department of Civil Engineering's Coordinator of Undergraduate Programs.

During his sabbatical term from January to May 2008, Dr. Wolshon was appointed as a visiting research professor in the Radiological Consequence Management and Response Technologies Department at the Sandia National Laboratories Albuquerque, New Mexico. in In October 2008, Dr. Wolshon became the Director of the federally funded University Transportation Center for Evacuation and Resilient Transportation. In 2008-2009. Dr. Wolshon was the holder of the Roy Paul Daniels Distinguished Professorship of Engineering.

Prior to his arrival at Louisiana State University, Dr. Wolshon was a Project Engineer for the firm of JCK & Associates in Novi, Michigan. In this capacity, he directed transportation engineering staff on projects involving highway design, traffic engineering and control, municipal storm and floodwater management, wetland mitigation design, and pavement rehabilitation and management. Concurrent with his employment at JCK & Associates, he completed most of the coursework and research requirements for his Doctoral Degree at Michigan State University. His area of doctoral research involved the development and application of a first-of-a-kind modeling approach to evaluate the efficiency of the nation's first largescale field deployment of a real-time adaptive traffic signal control system. Prior to these positions, Dr. Wolshon also worked for the consulting firm of Barton-Aschman Associates (now Parson's Transportation Group) in

Southfield, Michigan, from 1990 to 1991 and as an engineering intern at the firm of Linscott, Law, and Greenspan Inc. in Pasadena, California, in 1989. Following his M.S. graduation in 1988, Dr. Wolshon was awarded a United States Department of Transportation Eisenhower Fellowship. Under this fellowship, Dr. Wolshon initiated his doctoral research program at the Federal Highway Administration's Turner-Fairbank Highway Research Laboratories in McLean, Virginia.

Dr. Wolshon is currently employed tenure-track professor as а in the Department of Civil and Environmental Engineering at Louisiana State University. His current position involves 50 percent teaching and 50 percent research effort distribution. He is also a licensed Professional Engineer (PE) in the States of Louisiana, Florida, and Michigan, as well as a nationally licensed Professional Traffic Operations Engineer (PTOE).

HYEON-SHIC SHIN, Ph.D.



Dr. Hyeon-Shic Shin, acting director of the National Transportation Center and an assistant professor in the Graduate City and Regional Planning Program at the School of Architecture and Planning at Morgan State University, joined a panel for a transportation symposium sponsored by Eastern Michigan University and the Conference of Minority Transportation Officials (COMTO). He discussed long-term transportation planning and policy issues, emphasizing setting priorities based on the public's preferences for vehicle technologies and effectively educating students by bridging theory and practice.

GEORGE LIST, Ph.D.



George List, Ph.D., P.E., is working on a UMD NTC research project focused on freight reliability and efficiency and d e v e l o p m e n t of educational materials for a

short course on high-speed rail. Dr. List is a recognized scholar for his work in reliability assessment, network operations modeling and control, and freight network planning. He recently completed his role as the PI on SHRP 2 project L02, a project that focused on creating a national guidebook for travel-time reliability monitoring systems. In addition to his NTCsponsored research, he is the PI on a project to better understand the impact of trucks on highway performance and capacity. Dr. List is chair of the TRB Joint Traffic Simulation Subcommittee (SimSub), a member of the TRB Traffic Flow Theory Committee, and a former member of the Highway Capacity and Quality of Service Committee. In 2007 he was a co-recipient of the ITS-America "Best of ITS" award in the area of Research and Innovation; prior to this, he was a recipient of the project of the year award from ITS-New York three times. In 1999, he was a Finalist in the Edelman Prize Competition (INFORMS). Dr. List is a Fellow of ASCE and a member of TRB, IEEE, ITE, and INFORMS.

ANDREW COLLINS, Ph.D.



Andrew Collins, Ph.D., is a research assistant professor at the Virginia M o d e l i n g, Analysis and S i m u l a t i o n C e n t e r (VMASC) at Old

Dominion University. He holds a Ph.D. (2009) and an MSc (2001) from the University of Southampton in Operations Research, and a bachelor's degree in Mathematics from the University of Oxford. Dr. Collins has spent the last fifteen years applying game theory to variety of practical operations research problems, and for a time served as an analyst for the UK's Ministry of Defense,. These applications come from a variety of different areas: auction tolling for connected vehicles, modeling competition to airline pricing, and analyzing mortgage modification behaviors of banks. Dr. Collins' other work in the transportation domain includes looking at creating a generic traffic incident model for use in emergency evacuations, and the construction of an agent-based pedestrian simulation that incorporates group dynamics. Dr. Collins' passion is on the development application Agentand of based Modeling and Simulation (ABMS). He has developed several research simulations, including an award-winning investigation into the foreclosure ontagion that incorporated social networks. Many of the problems faced by the world today are Complex Adaptive Systems (CAS), and ABMS provides a means to analyze them. The black-box

nature of ABMS makes it difficult to be accepted by both academic and the general population. Thus, Dr. Collins believes there is much to be done to ensure that ABMS become a main-stream activity, and that this research challenge can be tackled by developing, improving, promoting, and applying technical tools that enable the practical use of ABMS in a robust way to help understand real-world problems and systems. Dr. Collins' work and profile can be found at the academic social media site Research Gate.

BETHANY STICH, Ph.D.

Dr. Bethany Stich is an Associate Professor of Transportation Studies and the Associate Director of the Merritt C. Becker Transportation



Institute (UNOTI) at the University of New Orleans. Dr. Stich serves as the Co-Principal Investigator of UNOTI's two University Transportation Centers, the National Center for Strategic Transportation Policies, Investments and Decision, which is housed at the University of Maryland, and the Maritime Transportation Research & Education Center at the University of Arkansas. Additionally, Dr. Stich serves as the Principal Investigator for the Department of Homeland Security Center of Excellence for Maritime Resiliency at Louisiana State University.

Dr. Stich has conducted research and published extensively on topics surrounding transportation, such as the importance of retaining and revitalizing rail, inland waterway infrastructure, airports as economic drivers, globalization and international trade, freight-based economic development, intermodal development and planning, community development, industry recruitment and retention, sprawl, and citizen involvement. Additionally, She has published and presented on topics such as refounding Public Administration, new public philosophy of public administration, and defined benefit packages. Dr. Stich received her Ph.D. from Virginia Tech's Center for Public Administration and Policy. She teaches Transportation, Economic Development, and Public Policy courses . Her international work includes presentations in England, Korea, China, Panama, and Canada.

Dr. Stich serves on the Transportation

Research Board's Intermodal Freight Committee as the Subcommittee Chair and the Committee on Logistics of Disaster Relief and Business Continuity. She serves on the American Society for Public Administration's Section for Public Administration research and is the Past President of the Section on Transportation Planning and Administration. Locally, she serves on the boards for the Louisiana Center for Women in Government and Business and on the selection committee for New Orleans' Nine Most Endangered Places.

Previously, Stich was employed as the Associate Director of Transportation Policy at the John C. Stennis Institute of Government, an Assistant Professor of Public Policy and Administration in the Department of Political Science and Public Administration, and as a Research Fellow at the Geosystems Research Institute at Mississippi State University. She previously served as the Assistant Director of the Virginia Tech Transportation Institute's Center for Transportation Policy. Stich has also worked for the Georgia Department of Transportation as an Environmental Compliance Planner.



FEATURED STUDENTS

EIRINI KASTROUNI

Ms. Eirini Kastrouni is a 2nd year Ph.D. c a n d i d a t e working with Dr. Lei Zhang with research funding support from the NTC@ M a r y l a n d. Originally from



Athens, Greece, Ms. Kastrouni received her Diploma in Civil Engineering from the National Technical University of Athens, Greece in 2010, as well as a Master of Science in Civil Engineering and a Minor in Statistics from Iowa State University in 2012.

For her Master's thesis work, Ms. Kastrouni received the prestigious Charley V. Wootan Memorial Award by the Council of University Transportation Centers.

In her research, Ms. Kastrouni works closely with federal and state governments in an effort to quantify the broader economic impacts stemming from transportation infrastructure investment in terms of productivity, job growth or landuse changes, while accounting for spatial correlation between neighboring regions. Her ultimate goal is to design a user-friendly tool that federal, state, and local agencies will use while performing Benefit-Cost Analysis of different project alternatives. Ms. Kastrouni is also working on developing progressive and equitable mileagebased user fee schemes to substitute the current fuel tax in an effort to alleviate the financial. transportation-related burden

of lower-income households while ensuring that enough revenue is generated to maintain the surface transportation system in the current conditions of the Highway Trust Fund insolvency. Ms. Kastrouni has presented her research work in various conferences, including the Transportation Research Board Annual Meeting.

Ms. Kastrouni is currently serving as the President for the ITS/ITE Maryland Student Chapter for the academic year 2014-2015. In 2013-2014, she also served as Vice President for the same organization. During her appointments, Ms. Kastrouni has been dedicated in organizing the chapter's weekly activities, which include numerous outreach events promoting the mission of the association, speaker seminars, tour visits, and social events.

Ms. Kastrouni's leadership skills have been acknowledged by various professional organizations in the transportation field. In June 2014, Ms. Kastrouni was selected as an Eno Fellow to attend the 2014 Development Future Leaders Conference held in Washington, D.C. In September 2014, Ms. Kastrouni won ARTBA's Women Leaders in Transportation Design & Construction Council's Future Industry Spotlight Award for her outstanding effort and contribution to the transportation construction industry, for having thus far achieved an outstanding academic record and having demonstrated extraordinary leadership skills within and outside of the academic environment.

Ms. Kastrouni was also selected to be a 2012 International Road Federation (IRF) Road Scholar, where she was

elected Vice President for the 2012 IRF Class by the (nternational Road Educational Foundation (IREF) Board of Directors. Within the same organization, Ms. Kastrouni serves as the Area Coordinator for Southern Europe for IRF Fellows Alumni Association (FAA). Ms. Kastrouni is a young member of the TRB Committee on Transportation and Economic Development (ADD10) and also served as a member of the Planning Committee for the International Transportation Economic Development Conference, held in Dallas, Texas, in April 2014.

Ms. Kastrouni is a member of various professional organizations, including the American Society of CivilEngineers (ASCE), the Institute of Transportation Engineers (ITE), Women in Transportation (WTS), the Technical Chamber of Greece (TEE-TCG), and the Hellenic Institute of Transportation Engineers (SES-HITE).

DAVID RAMSEY



David Ramsey is a Ph.D. student in Construction Engineering at ASU, with an expected graduation date of December 2015. His research focuses on quantifying the cost and schedule performance of Public-Private Partnerships in the U.S. transportation sector.

Formerly, Mr. Ramsey received his

FEATURED STUDENTS

Master of Science in Engineering in Civil, Environmental, and Sustainable Engineering from ASU in 2012. Before that, he earned his Bachelor of Science in Civil Engineering, also at ASU, in 2010.

Ramsey has won numerous awards for his work, including the First Place Best Poster Award from the Construction Industry Institute (CII), in 2014, and second place in the SSEBE Best Poster Award at the ASU Graduate Student Research Symposium, out of more than 50 research posters. In 2014, Ramsey was awarded the ASU Dean's Fellowship award.

JOSE RODRIGUEZ

Jose M. Rodriguez completed a Bachelor of Science degree in civil engineering at Los Andes University and Escuela Colombiana de Ingenieria in Bogota in 2006. Before that, he entered RHEMA Colombia Biblical Training Center in January 2005 and received a certification as a theology instructor. Mr. Rodriguez entered graduate school in December 2009 under the direction of Dr. Guillermo Scaglia, and he earned a Master of Science in the School of Animal Sciences at Louisiana State University in 2012. During that time, Jose worked for the LSU AgCenter as a Research Associate for two vears. Jose continued his graduate studies at Louisiana State University, but this time in a different area. In the fall of 2012, he started a master's program in civil engineering under the direction of Dr. Sherif Ishak. Jose has now graduated with a Master of Science degree in the Civil and Environmental Engineering Department at Louisiana State University and works in Baton Rouge, Louisiana, as a constant for Acadis Engineering.

LAURA BIANCA-PRUETT

Laura Bianca-Pruett is a research assistant for Dr. Hyeon-Shic Shin. She is pursuing her Master of City and Regional Planning in the School of Architecture and Planning. She began her studies in August 2012 and anticipates graduating in May 2016 from the program. Through her research, Ms. Bianca-Pruett is addressing the last-mile issues of freight delivery in urban areas, with the objective to identify and assess

alternatives for ensuring efficient and reliable freight movement by trucks in large urban areas while minimizing the negative impacts of freight deliveries. She is looking at urban goods trends, issues, and alternatives that include freight villages and urban distribution centers. By conducting a literature review of the goals, successes, and shortcomings of current and former freight villages and urban distribution centers in Europe, Japan, and the United States, she is determining whether these strategies will be effective regionally and nationwide. She is also addressing the unique challenges that would occur with freight villages and urban distribution centers regionally and nationwide.

GULSEVI BASAR

Ms. Gulsevi Basar is currently a Ph.D. student at Old Dominion University, Norfolk, in the department of Modeling, Simulation, and Visualization Engineering. She received her Bachelor of Science in Industrial Engineering from Bogazici University, Turkey, where she



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worked on healthcare and disease modeling applications, and her Master of Science degree in Industrial and Systems Engineering at Colorado State University, Pueblo. Her master's focused on emission thesis modeling applications. She is currently working on the model development of dynamic toll pricing strategies for toll roads in a connected vehicle environment in order to explore and analyze the various design options. Her research interests include microscopic traffic simulation, economic investment and policy applications, and intelligent transportation systems.

KYLE GRIFFITH

Kyle Griffith is currently pursuing his doctorate degree in urban studies with a focus on freight transportation planning and economic development at the University of New Orleans. A California native with cultural roots in the Caribbean, Kyle attended the University of Miami College of Engineering where he earned his Bachelor of Science in architectural engineering. He holds a Master of Science degree in civil engineering from Drexel University in Philadelphia where he worked extensively with local middle school students to improve reading and mathematics competency. Kyle's professional career includes engineering design of commercial structures in Southern California. He has conducted research at both public and private institutions around the United States, including the National Institute of Standards and Technology (NIST), a U.S. federal

research institution.

As a researcher with the Merritt C. Becker UNO Transportation Institute (UNOTI), Kyle investigated the feasibility of Liquefied Natural Gas as a marine fuel in partnership with the Port of New Orleans. He also coauthored a paper for publication in the journal of Public Works Management & Policy. This past August, he was selected to attend the 2014 Pan-American Advanced Studies Institute on Sustainable Urban Freight Systems (PASI-SUFS) in Colombia. This two week workshop, organized by Rensselaer Polytechnic Institute (RPI), included lectures from senior researchers from around the world, presentations of ongoing research, and discussions of research needs in increasing UFS sustainability.

This semester, Kyle is co-teaching a course on Globalization and Mobility in addition to preparing for his Ph.D. comprehensive exams.

JOHN WAGNER



John A. Wagner is a first-year master's student at North Carolina State University, working with Dr. Billy Williams and Dr. Nagui Rouphail on an NTC-sponsored project titled "Validation of Travel Time Reliability Prediction from Probe Data." Over the next year, he will be working to test travel-time predictors (like FREEVAL-RL) and identify improvement opportunities for the recent developments in travel-time reliability that have been recently incorporated into the HCM.

As an undergraduate, he assisted with research at NCSU's Institute for Transportation Research and Education (ITRE), including other travel-time-related projects like Smartlink, a project funded by the North Carolina Department of Transportation. In this project, he worked with Dr. Williams to map congestion problem areas and analyze raw data sets from freeway sensors. In addition to his academic activities, John remains active among departmental and university organizations at NC State. He continues to be an active participant in NC State's chapter of the Institute of Transportation Engineers (ITE), as well as the NC-Alpha chapter of Tau Beta Pi, the Engineering Honor Society, where he previously served as President.

John is a Tau Beta Pi Fellow for 2014-2015, an honor awarded to only 25 students across the country. In addition to graduating as a valedictorian from NC State in May 2014, he was honored with the 2014 Civil, Construction, and Environmental Engineering departmental award for leadership, as well as the 2013 Mulkey/ General Hugh Shelton Leadership Award and Scholarship. Upon earning his Master's degree, John plans to pursue full-time employment in the transportation engineering industry, preferably working with intelligent transportation systems (ITS).

RESEARCH

COLLABORATIVE RESEARCH ON TRANSPORTATION AND ECONOMIC COMPETITIVENESS: MAKING REAL-WORLD IMPACT

• he NTC@ Maryland promotes collaboration within the consortium and with other stakeholders. In fact, the following entities have contributed to the NTC non-federal matching funds:

- I-95 Corridor Coalition
- Idmec, Technical University of Lisbon
- Institute for Transportation Research and Education (ITRE), NCSU, Raleigh, NC
- International Freight Forwarders & Customs Brokers Association of New Orleans
- *iTds*, *Lisbon*, *Portugal*
- Los Angeles Metro

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- Maryland State Highway Administration, MDSHA
- Maryland Department of Transportation, MDOT
- North Carolina Department of Transportation, NCDOT
- Port of New Orleans
- Virginia Department of Transportation, VDOT
- San Francisco County Transportation Authority
- Transportation Engineering Program, UMD
- University of New Orleans Transportation Institute
- Valley Metro in Phoenix

With the consortium, researchers often collaborate to tackle the challenging problems of transportation planning and operations. Such efforts are evident in the two research paths, National-Level Travel and Transportation Investment Analysis.

Collaborative research at UMD and ASU is investigating intercity passenger travel demand at the national level and the economic impacts of high-speed rail. UMD researchers, led by NTC@Maryland Director, Lei Zhang, Ph.D., have developed quantitative models for inter-regional and national passenger travel demand analysis. These models are implemented in a microsimulation platform to provide decision-makers with information to strategically invest in nationally significant corridors, the national highway system, passenger rail, and airports. Trips from Washington, D.C., by car, train, and air are shown below:







RESEARCH

FREIGHT EFFICIENCY AND RELIABILITY THROUGH RESEARCH AND TECHNOLOGY TRANSFER

everal universities within the NTC@Maryland consortium are studying the economic impacts of freight movement in the United States and are developing innovative strategies for enhancing the efficiency and reliability of freight transportation systems. Paul Schonfeld, Ph.D. (UMD), George List, Ph.D. (NCSU), and Hyeon-Shic Shin, Ph.D. (MSU), are collaborating on the development of a general modeling framework for freight system optimization. The focus of this multi-university collaborative project is to increase the efficiency and reliability of freight operations at intermodal transfer terminals. In addition, Hyeon-Shic Shin, Ph.D. (MSU), analyzes freight stakeholders' preferences for various policy alternatives on managing the last mile of goods delivery in congested urban areas. Qingbin Cui, Ph.D. (UMD), and Shane Underwood, Ph.D. (ASU), are both analyzing critical issues with regard to the provision and maintenance of freight transportation infrastructure. Dr. Cui has created an analysis framework for delivering freight transportation infrastructure through Public Private Partnerships (P3), comparing the P3 approach to traditional project delivery methods. Results from his analysis will provide direct policy recommendations on the use of P3 investment for all modes of transportation, including freight. Dr. Underwood evaluates the impacts of freight travel trends, demand, loads, and composition on pavement infrastructure. This NTC@

Maryland research project will identify for decision-makers the critical corridors where freight movement is negatively affecting the Nation's transportation infrastructure. In addition, NTC@Maryland researchers have also engaged in technology transfer activities to freight transportation professionals, including collaboration with the I-95 Corridor Coalition's Freight Academy and sponsorship of first annual Port of New Orleans Maritime Workforce Summit.

Other ongoing collaborative research projects at the NTC@ Maryland include:

- Open Toll Lanes in a Connected Vehicle Environment, which is currently conducted at ODU as a collaborative effort between faculty from Civil Engineering and Modeling, Simulation, and Visualization Engineering (MSVE) Department
- Behavioral Study for Managed Lane Pricing with Refund Option, which is conducted by ASU School of Sustainable Engineering and The Built Environment and ASU Parking and Transit Service
- Evaluating and Calibrating Emission Impacts of Traffic Management Strategies, a collaborative effort of ASU, ITRE at NCSU.



THE NATIONAL CENTER FOR STRATEGIC TRANSPORTATION POLICIES, INVESTMENTS AND DECISIONS

ADVANCED DILEMMA ZONE PROTECTION SYSTEM

P.I. GANG-LEN CHANG, PH.D.

UMD researchers, led by NTC@ Maryland Director Dr. Gang-Len Chang, are designing an advanced dilemma zone protection system in the state of Maryland. The first step of this study was to select an intersection that experienced a high frequency of crashes susceptible to correction by a dilemma zone protection system. Upon selecting the target intersection, a dynamic dilemma zone protection system was designed by using three microwave sensors to track vehicles approaching the intersection on the major approach. The data collected by these sensors are then used in real-time to control the signal logic, providing green extensions and all red extensions when pre-defined parameters of the detected vehicles are met. To evaluate the performance of the system design and the appropriateness of the associated parameters, a field test was conducted. The data analysis included the identification of falsely called red extensions (related to efficiency) and missed red extensions (related to safety) to assess the overall performance of the newly installed dynamic dilemma zone protection system. During the analysis period, the system performed as designed. In fact, in the single case in which the all red extension was called, the need to do so was verified by identifying a vehicle traveling above the threshold speed during the detection period. Here, the system called for an all red extension and allowed the target vehicle to safely cross the intersection before the intersecting road traffic was released.

QUANTIFYING PUBLIC-PRIVATE PARTNERSHIP (PPP) TRANSPORTATION PROJECTS

P.I. MOUNIR EL ASMAR PH.D.

The use of public-private-partnerships (PPP or P3) to deliver major U.S. transportation projects has steadfastly increased since the early 1990s. At the same time, a large portion of design and construction projects has seen significant variations in costs and schedules. This first phase of the UTC research study attempted to quantify the cost and schedule performance of recently completed PPP projects in the U.S. transportation sector. The authors collected and verified data through professional databases, publicly available sources, and structured interviews with key projects constituents. The preliminary results have been summarized in a technical paper submitted to the TRB. The paper presents results stemming from 25 completed PPP transportation projects. All projects in the database were completed between year 1995 and 2013, with project costs ranging from \$18 million to \$2.1 billion and totaling about \$14 billion. Results of the PPP projects analysis show an average cost growth of 3.22 percent and an average schedule growth of 1.2 percent, which highlights superior performance when compared to traditional design-bid-build delivery. This project fills a gap of knowledge on PPP project performance in the U.S. transportation sector and compares the results to those of previous research efforts studying the international PPP market. The work in this project is the first step in a benchmark study that will provide a comprehensive quantitative performance assessment of cost and schedule growth for PPP transportation projects in the U.S. In fact, ongoing

work on this topic includes increasing the database of projects to target all completed U.S. PPP projects and comparing the results to those of the international market to help the industry improve PPP project practices.



The figure above shows PPP projects by state for the projects included in the database. Projects by state are highlighted in green. One interesting finding is that several of the central states have not initiated PPP projects. Moreover, PPP projects seem to be heavily prevalent in the Southwest region except for Arizona, which might approve its first PPP project in the near future. Furthermore, a PPP project has been initiated in nearly every state on the east coast.

TEST BED FOR CONNECTED VEHICLES USING THE LSU DRIVING SIMULATOR

P.I. SHERIF ISHAK, PH.D.

The primary goal of this study is to develop a driving simulator-based test bed for connected vehicles research in the areas of operation and safety. This includes testing real-time data capture applications, as well as the integration and interoperability of connected vehicles and highway infrastructure. To accomplish this goal, the following specific objectives or tasks will be achieved: (1) searching for studies in published reports and journal manuscripts with the purpose



of gaining the state of the art knowledge on the subject matter; (2) developing a simplistic yet realistic network using the flexible scenario creation interface of the driving simulator; (3) using the SimCreator proprietary software to manipulate the properties of the ambient traffic, create a new vehicle type to represent connected vehicles, and identify the traffic parameters that can be transmitted from the connected vehicles; (4) exploring the means to gather data from the connected vehicles in the ambient traffic, and synthesize information to be relayed to the driver of the driving simulator. The first part of this task, which relates to retrieving data, will address what information can be derived from the connected vehicles data. The second part, which relates to presentation of information, will involve producing a simple sketch of the graphical layout of the information that could be presented to the driver.

MULTI-LAYERED INTEGRATED URBAN FREIGHT DELIVERY NETWORK

P.I. HYEON-SHIC SHIN, PH.D., MICHAEL CALLOW, PH.D.

Building on an ongoing study conducted by Dr. Hyeon-Shic Shin in collaboration with the University of Maryland and West Virginia University, this study conducts a large-scale survey of freight-related businesses and analyzes the survey using choice-based conjoint analysis technique. This study is envisioned as a multi-stage effort. The first phase of the study establishes a conceptual framework, conducts outreach and surveys of industries, and identifies preferred strategies. The second phase formulates a model for the chosen strategy and evaluates potential benefits and costs. The third phase will conduct a pilot implementation of the concept. The fourth phase will be a real-world implementation. The study area of interest is the Baltimore metropolitan area.

The authors' motivation of this study is based on a series of discussions with freight transportation professionals in Maryland and their concerns about efficient freight flow in, out of, and around the Port of Baltimore.

The goal of the study is to analyze freight sector stakeholders' preferences for various policy alternatives on managing last-mile delivery. Specific objectives are to (1) conduct in-depth interviews with leaders of the freight sector to guide the development of a survey to measure stakeholder opinion; (2) carry out a large-scale survey of the industry; (3) conduct conjoint analysis to identify freight stakeholder's preferences for alternative freight transportation policies; (4) develop a guide for the next stage of the study involving the development of an evaluation model for the chosen alternative policy.

The team has conducted an extensive review of case studies on alternative freight demand management strategies either planned or implemented in European countries. Based on the typologies created by Dr. Shin's two previous studies, the current review focuses on the types of facilities and benefits. We had in-depth interviews with a Baltimore County planner involved in a vision plan for redeveloping Sparrows Point, a former still mill site, into a complex of freight logistics facilities. In addition, we conducted an in-depth interview with a logistics manager of an Asian grocery chain that has a national network to identify the characteristics of the company's unique supply chain from Asia to the United States. Further meetings are scheduled to obtain further information and, potentially, delivery schedule data.

The next step is to identify a broader group of businesses and conduct a stated preference survey of alternative freight delivery strategies. The survey will be designed on the basis of the conjoint analysis framework that is a widely used marketing analysis methodology. The study team, led by Dr. Shin, has also successfully conducted conjoint analysis-based preference surveys to identify drivers' preferences on new vehicle technologies. This experience will help design and conduct the freight sector survey. The conjoint analysis will yield businesses preferences by analyzing their decision-making behavior based on trade-offs among alternatives. The outcome from this study is expected to give us more accurate preference structures of businesses than previous studies that used a simple Likert-scalebased survey or multi-criteria analysis.

VEHICLE TRAJECTORY TOOL

P.I. NAGUI M. ROUPHAIL, PH.D.

The project intends to pilot-test a new in-vehicle high-resolution device (i2d for Intelligence to Drive) that collects and disseminates in near real time tripbased information second by second. The project includes two primary tests that are essential for successful AMS

FEATURED RESEARCH PROJECTS



test-bed applications: a traffic shock wave characterization using a controlled sample of equipped vehicles approaching a bottleneck; and an upstream queue warning and speed advisory system using VIV communications (Vehicle-Infrastructure-Vehicle) to be compatible with connected vehicle implementation.

The off-line testing is expected to be completed by December 2014, to be followed with the VIV test in early 2015. Initial findings on the use of in-vehicle data in an off-line mode included uncovering correlations between high resolution deceleration rates from the i2d device, and long term (4-year basis) rear end crash rates for a freeway network traversed by a fleet of approximately 20 roaming, equipped vehicles in a naturalistic driving environment.

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The initial findings of the study are promising. First, the crash data revealed hotspot locations starting at the on-ramp gore and extending 2,000 feet upstream. Over 85 percent of all rear end crashes occurred at those 30 hotspots on internal Traffic Management Channels (TMC's). Secondly, on those TMC's with high crash rates, we have detected a higher propensity of drivers decelerating at high rates (4 m/sec2 or more). The TMC-based measure of that propensity is the fraction of time drivers decelerate at those rates. We have also tested and confirmed that the sharp deceleration

phenomenon is not confined to a few drivers, but appears to be common for the high-crash TMC's, using trip-based analyses.





The first photo shows the i2d device components, including the box, the OBD connector, and the GPS antenna. The second photo shows an installed unit in a vehicle, with the unit circled in red.

OPEN TOLL LANES IN A CONNECTED VEHICLE ENVIRONMENT

P.I.MECIT CETIN, PH.D.

The impetus for fully connected vehicles is strong and growing,

which is accelerated further by the U.S. Department of Transportation's (DOT) National Highway Traffic Safety Administration (NHTSA) announcement in February 2014 that USDOT will begin taking steps to enable vehicle-to-vehicle (V2V) communication technology for light vehicles.

Future vehicles are expected to have full connectivity and awareness of their environment with access to the essential system-state information in real-time.

A large and growing body of research on understanding the safety and mobility implications of connected vehicles already exists. However, there is not much significant work on investigating new pricing/ tolling options in a connected vehicles world. Congestion pricing is an effective method to address the growing congestion problems on freeways. In the current state of practice, toll lanes are typically separated from the regular lanes with physical barriers, and toll rates are either fixed or vary either by time-of-day or traffic congestion.

Information from vehicles that sense their own locations, including the lanes they are in, and can sense exchange information about their positions and speeds can be used to develop and support an open tolling system with the number of designated "toll lanes" on a highway varying over time to maximize the throughput. Vehicle displays could inform drivers about the prevailing toll rates and the designated toll lanes.

The number of lanes dedicated to toll lanes can be dynamically optimized to promote the best use for the given conditions. This flexibility to allocate and manage the scarce road capacity, and the differential pricing options enabled by the connected vehicles can ultimately translate into a more efficient and economically sustainable transportation network.

ODU researchers, Drs. Mecit Cetin, Mike Robinson, and Andy Collins, aim to build various models (e.g., agent-based models) to investigate the best toll policies and traffic control options in a connected vehicles environment. They will develop a framework for an open tolling system in a connected vehicles environment, algorithms to optimize tolls and the number of toll lanes dynamically under different traffic conditions, and evaluate how such a system will perform in a simulation model.

The results will help toll agencies determine optimal toll policies under different traffic conditions.

PORT CITY CHALLENGES

P.I. BETHANY STICH, PH.D.

The University of New Orleans Transportation Institute (UNOTI), working with the Port and the maritime industry, is analyzing the progress made from 2006 to date on the establishment of e-Navigation regulations, the implementation of e-Navigation architecture, data structures, and IHO S-100 standards, by Maritime Industry Partners including the International Maritime Organization (IMO), the International Hydrographic Organization (IHO), the Corps of Engineers, the United States Coast Guard, the National Oceanic and Atmospheric Administration, the National Weather Service, State DOTs, and the Radio Technical Commission for the Maritimes (RTCM). The research includes, but is not limited to:

•The definition and scope of the concept of e-Navigation in terms of

its purpose, components and limita tions;

•The identification of the key issues and priorities that need to be addressed in a strategic vision, and a policy framework on e-Navigation and how CRS&SI technologies can be integrated into this strategic vision;

•The identification of both benefits and obstacles that may arise in the further development of the strategic vision and policy framework;

•The identification of the roles of the IMO, its Member States, other bodies and industry in such development.

Stich attended TRB's 15th Biennial Harbor Safety Committee and Area Maritime Security Committee Conference: Partnering for Safe, Secure and Resilient Port Operations in Philadelphia, Pennsylvania, and the Innovative Technologies for a Resilient Marine Transportation System 3rd Biennial Research and Development Conference in Washington, DC.



LIST OF MAJOR RESEARCH, EDUCATION AND TECHNOLOGY TRANSFER PROJECTS FUNDED BY NTC@MARYLAND IN 2014

Lead University	Principle Investigator	Category	Funded Project Titles
	Paul Schonfeld	Applied Research	Efficiency and reliability in freight transportation systems
	Ali Haghani	Applied Research	HOV lane performance monitoring system
	Gang-Len Chang	Applied Research	Design and Implementation of a Detection, Control, and Warning System (DCWS) for dilemma
	Elise Miller-Hooks	Advanced/Applied Research	Objective decision-making tools for infrastructure investments to combat sea level rise
	Cinzia Cirillo	Applied Research	Revenue management and operations optimization for high speed rail
UMD	Mark Franz	Technology Transfer	Freight academy
	Tom Jacobs	Technology Transfer	Operations academy and regional traffic operations workshop series
	Xiqun Chen	Education	Summer and year-long student internship program
	Ali Haghani	Education	Online master's degree program in transportation engineering and planning: Phase one
	Lei Zhang	Advanced Research	U.S. national and inter-regional travel demand analysis: person-level microsimulation model and application to high-speed rail demand forecasting
	Yingyan Lou	Basic Research	Behavioral study for managed lane pricing with refund option
	Mikhail V. Chester	Basic Research	Long-distance transportation infrastructure in a climate-constrained future: reliable HSR service for economic growth
VCII	Ram M. Pendyala	Research	Congestion mitigation potential of autonomous (driverless) vehicles: A Scenario-Based Approach
DOC	Mounir El Asmar	Research	Quantifying and benchmarking the delivery performance of U.S. Public-Private-Partnership (PPP) transportation projects
	Xuesong Zhou	Research	Evaluating and calibrating emission impacts of traffic management strategies through simplified emission estimation model and mesoscopic dynamic traffic simulators
	Shane Underwood	Advanced Research	Impact of freight movement trends on highway pavement infrastructure
	Brian Wolshon	Basic Research	Quantifying the effects of manual traffic control on evacuation corridors
L30	Sherif Ishak	Basic Research	Development of a simulation test bed for connected vehicles using the LSU driving simulator
MSU	Hyeonshic Shin	Applied Research	Multi-layered integrated urban freight delivery network – Phase i: identification of policy preferences based on qualitative and conjoint analyses
	James Martin	Technology Transfer	Moving transportation research to practice: TPID webinar series
	George List	Applied Research	Efficiency and reliability in freight transportation
NCSU	George List	Education	High Speed Rail Short Course
	Billy M. Williams	Applied Research	Validation of travel time reliability prediction from probe data
	Nagui M. Rouphail	Advanced, Applied Research	Vehicle trajectory tool (VTT): Application pilot for AMS test bed
	Mecit Cetin	Advanced Research	Combining different data sources to predict origin-destinations and flow patterns for trucks in large networks
20	Mecit Cetin	Basic Research	Open toll lanes in a connected vehicle environment: development of new pricing strategies for a highly dynamic and distributed system
UNO	Bethany Stich	Applied Research	Port city challenges

FEATURED EDUCATION PROJECT

FIRST-EVER ONLINE MASTER'S DEGREE IN TRANSPORTATION SYSTEMS AND ENGINEERING

The NTC consortium universities are collaborating to create the first ever online Master of Engineering Program in Transportation Systems Engineering and Planning. Led by Dr. Ali Haghani, the purpose of this groundbreaking program is to offer the renowned onsite course offerings within the NTC consortium to students outside the region or to those students with other commitments that prevent them from enrolling in a traditional Master's program. In doing so, the online Master's Degree Program will promote the expertise of the NTC faculty to students across the globe.

The program will utilize state-of-the-art online teaching tools to expose enrolled students to renowned transportation instruction and will allow them to access the course material on their own schedule.

Course offering will include but is not limited to:

- Highway Traffic Characteristics and Measurement
- Regional Transportation Planning
- Urban Transportation Planning
- OR Models for Transportation Systems Analysis
- Transportation Systems Modeling
- Discrete Choice Analysis

The program will launch at UMD in the fall of 2015 with four course offerings. Additional courses will be developed and offered in subsequent semesters.

COURSES AND STUDENT SUPPORT

A primary goal of the NTC@Maryland and its partner universities is to attract and educate the best and brightest students in transportation-related studies. To meet this goal, the faculty of our consortium integrates cutting edge research into course curriculum and offer research opportunities at both the undergraduate and graduate levels. The result of this effort has created diversified course offerings at each partner university. The figures below summarize the course offerings and student support within the consortium.







STUDENT INTERNSHIP PROGRAMS

At UMD, faculty collaborated with the Maryland State Highway Administration (SHA) to offer summer internships for 12 University of Maryland Students in various divisions of SHA.

Division	Intern		
Plants and Surveys Division	Nick Jackson		
Structures Inspection and	Brianna Kovacs		
Division	Valerie Andrews		
	Michael Itzlas		
	Kostas Protopapas		
Pavement and	Rachel Berman		
Geotechnical Division	Shardul Pendharkar		
Community Design	Sean Tracey		
Division	Chinoy Khandelwal		
Highway Hydraulics Division	Meredith Wilson		
	Nicole Huang		
	Daniel Pedraza		

SHA Intern Mr. Michael Itzla stated, "This summer I interned with the Office of Structures in the Structures I n s p e c t i o n and Remedial E n g i n e e r i n g



Division (SIRED). Our division was responsible for monitoring and maintaining the states bridges and culverts that pass over a state highway. This included doing routine inspections of structures, as well as emergency inspections and flood inspections on certain bridges. These experiences working at SHA have encouraged me pursue jobs related to highway structures in the state of Maryland. After working at SHA I have become much more familiar with the State standards and procedures when dealing with remedial engineering work. This should allow me to easily transition into a job in MD as opposed to other states. Also, working at SHA has exposed me to several different types of bridges that are commonly used. As a result, I am more familiar with bridges as opposed to any other type of structure and am planning on going down a career path that deals heavily with bridges."

Ms. Nicole Huang, another SHA intern, said, "This internship was truly amazing, and I learned so much and I am hoping to be able to go back to SHA after



I graduate. It gave me the perfect amount of hands on and office work. I was really able to apply my skills that I learned throughout my school semesters to calculate and make an impact on the world. I brought my skills to life and it wasn't just on paper anymore. After interning there this past summer, I am confident that I chose the right major."

Ms. Meredith Willson reflected, "As an intern in the Highway Hydraulics Division, I got to go on a lot of drainage investigations, which meant I was

out in the field at least once a week. I loved the mix of being both out in the field and in the office every week. I also loved seeing the different phases of projects, from the initial site visit to the meetings with MDE to the final presentation of the plans to the contractor. I was lucky enough to be in charge of a project at Mount Saint Mary's from start to finish and present the plans that I created on Microstation to the contractor myself."

SHA intern Mr. Chinoy Khandelwal worked on redesigning curbs and sidewalks as well as design features on MD180. He stated that, "Apart



from the technical knowledge, I learnt how to work in a team, about team management and also about time management. I am a Structures major student but this work experience helped me find a new interest in highway engineering jobs. I discovered about myself that I have interest in highway design and management. This job helped me a lot about how to interact with people in corporate world and develop contacts and references. Overall, the internship was very beneficial for me."

Finally, Ms. Kovacs Brianna "Before noted. this internship, T had only completed one year of college, so I had not taken many Civil Engineering courses yet.



was thinking about pursuing the structural track of Civil Engineering, and this internship confirmed that! I absolutely love bridges and I can see myself working on them in the future."

UNDERGRADUATE RESEARCH

In addition to the SHA internship program, UMD also funded two undergraduate students to work with faculty on cutting-edge transportation research projects. Dr. Elise Miller-Hooks mentored UMD undergraduate student Mr. Kevin Denny on the project titled "Objective decision-making tools for transportation infrastructure investment to combat the impacts of sea level rise and climate change." Meanwhile, Dr. Elise Miller-Hooks and Dr. Paul Schonfeld mentored Mr. Dan Tobias (below) on, "Taxis as a Recourse Option for Ridesharing Services."



Mr. Tobias said the following about his research experience: "I learned quite a bit from this experience about both ridesharing services and writing research papers. I really enjoyed coding in MATLAB to simulate real world transportation conditions. I have always enjoyed computer programming, and this was a great opportunity to go more in depth with transportation simulations than I did in any of my classes. The work was challenging at times, which made it that much more rewarding when I managed to successfully model the DARP. Additionally I was introduced to writing research papers, an opportunity that doesn't always exist for undergraduate students. I learned how to properly write and present

data in a TRB paper, and was given the opportunity to read past papers that had been published.

This experience was a great introduction to what graduate research would consist of if I chose to get a Master's Degree in civil engineering. I have not made my decision yet as to whether or not I want to go to graduate school, but I am glad to have had this opportunity to do significant research with my professors and fellow graduate students."

STUDENT AWARDS

The outstanding research and academic performance of the students of the NTC@Maryland has earned them several awards, such as:

- TRB Fred Burggraf Young Research Award
- ARTBA Future Leader Award
- ITSA Scholarship and Best Paper Awards
- IRF Outstanding Student Achievement Award
- TRF Best Student Paper Award
- NSF Graduate Student Fellowship Award
- Eisenhower Graduate Fellowship Award
- Best MS Thesis and PhD Dissertation Awards from various Professional Organizations

In January 2014, Mark Franz of UMD was awarded a Council of University



Transportation Centers (CUTC) Outstanding Student of the Year Award. Since then, Mr. Franz (above) has become the NTC@Maryland Assistant Director of Outreach and Technology Transfer.

OTHER EDUCATION ACTIVITIES

At ASU, a Transportation seminar series started early this semester to engage researchers from other UTC universities and government officials. At ASU, a Transportation seminar series started early this semester to engage researchers from other UTC universities and government officials. We have developed a Transportation Seminar to engage with researchers at other universities and local government officials. Each week, the seminar hosts a speaker from the UTC, local government (DOT, MPO), or other disciplines at ASU, such as Planning. Speakers scheduled for the Fall 2014 included: ASU CIDSEC and Planning, University of Maryland, The Arizona Department of Transportation, Valley Metro, North Carolina State University, Northern Arizona University and the University of Arizona. The email list and invitees include 275 undergraduate and graduate students enrolled in the various programs, 58 faculty, post docs, and industry members.

At LSU, there are two graduate faculty

members supported by this grant. There were two courses taught by these professors, which incorporated the research results within their classes. There was one outreach activity supported by the research funds: Recruiting into Engineering High Achieving Multi-Cultural Students (REHAMS) - June 19, 2014.

The first REHAMS program was held at LSU in 1977, and it was one of the first programs in the country to target minorities and recruit and retain them in STEM disciplines. Since then, REHAMS has provided pre-college students an opportunity to explore CoE disciplines through a holistic overview of the field by presenting both the academic structure and career possibilities.

"The most valuable part was seeing how hard works pays off," said George Tullock-Harris, an 11th grade student from Chicago, Illinois. "No matter how big of a challenge the students and professors knew engineering was going to be, they all went the extra mile and succeeded. Everyone has a passion for what they're doing. Throughout the program, they sugar-coated nothing, and I liked that. They made sure I knew everything about engineering, even the things I thought I wouldn't need to know. Overall, it was fantastic."

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The Gulf Coast Center for Evacuation and Transportation Resiliency, a United States Department of Transportationsponsored University Transportation Center and part of the University of Maryland Natation University Transportation Center, hosted the 2014 REHAMS Summer Camp. Recruiting into Engineering High Ability Multi-Cultural Students (REHAMS) gives multi-cultural students an opportunity to explore the various disciplines offered by the College of Engineering



(CoE), including biological, chemical, petroleum, industrial, civil, electrical and computer engineering, computer science, and construction management.

MSU sponsored eight graduate students to work as interns for the Maryland Department of Transportation. These internships exposed the next generation of transportation professionals to realworld transportation issues.

NCSU hosted two outreach activities to attract the best and brightest students to their transportation engineering program. In addition, NCSU has hosted several seminars and symposia to expose their students, faculty, and staff to leading experts in transportation research.

At UNO, NTC@Maryland Associate Director Dr. Bethany Stich is currently working with the Port of New Orleans to develop K-12 curriculum at the New Orleans Charter Science and Mathematics High School (SciHigh). The club focuses on understanding communities and cities to be the confluence of numerous forces and learning how every subject the students study in school matters when understanding and working in cities. In addition, Ms. Carol Short at UNO has created an outreach program titled "On the Move," which is a youth outreach initiative to introduce New Orleans school-aged students to the field of urban planning and transportation studies. The interactive workshops, which engage students in creating a solution or vision for change in their own neighborhoods, are designed to give a better understanding of the diverse higher education and career opportunities in the transportation and urban planning fields.

TECHNOLOGY TRANSFER AND WORKFORCE DEVELOPMENT

FEATURED TECHNOLOGY TRANSFER PROJECT

NO co-sponsored the first Annual Maritime Workforce Summit at the Port of New Orleans, moderated by Mark Romig, president and CEO of the New Orleans Tourism and Marketing Corporation. Summit participants include state and local education officials, maritime industry leaders, and workforce development professionals. Summit sponsors include UNO, Youth Rebuilding New Orleans, NTC@Maryland, Merrit C. Becker Jr. UNO Transportation Institute, Associated Terminals, Turn Services, The New Orleans Board of Trade, Crescent River Port Pilots' Association, Big River Coalition, Louisiana Maritime Association, the Propeller Club of the United States - Port of New Orleans, LMICC, and International Freight Forwarders Customs Brokers Association of New Orleans. The World Trade Center of New Orleans served as a promotional partner.

"The goal of this summit is to inform the Greater New Orleans community stakeholders of maritime job opportunities, engage industry leaders to identify maritime workforce needs, and leverage regional economic efforts to strengthen multimodal transportation at the Port of New Orleans," said Gary LaGrange, Port president and CEO. "I want to thank all of our partners and sponsors for their efforts supporting this worthwhile event."

The summit featured opening remarks from UNO President Peter Fos and U.S. Rep. Cedric Richmond. Port Purchasing and Contract Administration Manager Terry Martin will provide



a presentation for small businesses wishing to do business at the Port. Several panel discussions are scheduled to focus on trade and transportation logistics, career education, and economic and workforce development. Below is the link to the Highlight Video of the Port of New Orleans Maritime Workforce Summit: http://youtu.be/ FWInkY8xv1s.

TECHNOLOGY TRANSFER ACTIVITIES

A primary goal of the NTC@Maryland is to communicate the cutting-edge research conducted at the NTC to the people who can use it to improve the performance of our transportation network. On this front, the NTC@Maryland supported the following outreach and technology transfer activities:

1. The course of Revenue Management and Operations Optimization for High Speed Rail was provided in Italy at the Doctoral school Politecnico di Torino in May 2014.

2.Based on the study of the Efficiency and Reliability in Freight Transportation Systems, problems, analysis methods and results have been presented in existing undergraduate and graduate courses at UMD.

3. The results of Quantifying and Benchmarking the Delivery Performance of U.S. PPP Transportation Projects will be included in the graduate course (CON551) on Alternative Project Delivery Methods. The course was recently added as a required course for all online master's students in construction at UMD.

TECHNOLOGY TRANSFER AND WORKFORCE DEVELOPMENT

SEMINARS

The NTC@Maryland sponsors and organizes seminars and colloquia to allow for students, faculty, and staff to interact and exchange ideas with top • researchers from around the globe. The following seminars were hosted by the NTC@Maryland:

- Routing and Scheduling for Restoration of Road Network Connectivity after a Disaster: Speaker Dr. Sibel Salman, College of Engineering, Koç University, Istanbul, November 21st, 2013.
- Avoiding bus bunching: Real-time control of buses, from research to the streets. Speaker Dr. Ricardo Giesen, Department of Transport Engineering and Logistics at Pontificia Universidad Católica de Chile, January 17, 2014.
- Introduction to Highway Safety Fundamentals, Implementation of HSM in the IHSDM software. Speaker Dr. Mohamadreza Banihashemi, Senior Transportation Research Engineer of the Geometric Design Lab, TFHRC, FHWA, McLean, VA. April 4, 2014.

- Agent-based microsimulation of urban activity and travel. Speaker Prof. Eric J. Miller, Department of Civil Engineering, University of Toronto, April 30, 2014.
- Effectiveness of variable speed limits. Speaker Prof. Yafeng Yin, Department of Civil and Coastal Engineering, University of Florida, May 8, 2014
- Rational queueing. Speaker Prof. Refael Hassin. Department of Statistics and Operations Research, Tel Aviv University, June 4, 2014.
- From roadway networks to social networks: safety-oriented driver behavioral modeling and evacuation traveler departure time choice. Speaker Dr. Samer H. Hamdar, Department of Civil and Environmental Engineering, The George Washington University. July 2, 2014.
- Investigating the damaging impacts of the 2011 Great East Japan Earthquake and evaluating the restoration and reconstruction performance. Speaker Prof. Tatsuo Oyama, National Graduate Institute for Policy Studies, Japan, August 6,



2014.

• Importance of integrating land use policies with transportation modeling. Speaker Prof. Tom van Vuren, University of Leeds, England, September 10, 2014.

In addition to hosting seminars, the NTC@Maryland was actively involved in sponsoring, exhibiting, and organizing several conferences. Such efforts include:

- Sponsor at the International Transportation Economic Development Conference
- Exhibitor Maryland Quality Initiative Conference
- Patron, exhibitor and event organizer at the Innovations in Travel Modeling Conference

The NTC consortium works together to disseminate research findings to other researchers, transportation practitioners, and the general public. At the NTC@ Maryland, several technology transfer and workforce development programs have been pursued. Dr. Paul Schonfeld and Mr. Mark Franz has collaborated with the I-95 Corridor Coalition Freight Academy to assist in recruiting underrepresented freight professionals. Dr. Schonfeld and Mr. Franz also served as a mentors and reviewers of the Capstone projects of the participants.

OUTREACH

Dr. Lei Zhang and Mark Franz participated in the StateStat roundtable discussion with Maryland Gov. Martin O'Malley. The event invited state experts on workforce development, education, and transportation to share input on the state of Maryland's online data sharing and reporting system.

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In addition, the staff at the NTC@ Maryland worked with UMD Clark School of Engineering to host two technology transfer and promotional events. First, the A. James Clark School of Engineering hosted its first-ever Advanced Transportation Technologies Day event, during which nearly 40 representatives from government, industry, academe and media toured the University of Maryland's transportation engineering laboratories. The event promoted the expertise of the NTC@ Maryland and created an environment for initiating collaborations with potential research sponsors and with media professionals.

Second, the NTC@Maryland worked again with the Clark School of Engineering in organizing Mpact week. This weeklong event invited experts in Disaster Resilience to present research and share ideas on how to make our nation better prepared for dealing with both natural and man-made disasters. The event included a panel discussion on the Intersection of Research and Policy at the U.S. Capitol Visitor's Center in Washington, D.C.

Next, Dr. Paul Schonfeld organized a site visit to the Washington Metropolitan Area Transit Authority (WMATA) rail yard in Greenbelt, Maryland. This visit allowed students to experience the behind the scenes operational activities at one of the nation's largest urban rail systems.

Mr. Mark Franz volunteered as a judge at the Science Technology Engineering and Mathematics (STEM) Science Fair on Thursday, March 3, 2014. The event was hosted at the Imagine Andrews Public Charter School on Andrews Air Force Base in Maryland. Mr. Franz judged 3rd-5th grade science experiments to assist in determining the top three students in each grade who would represent Imagine Andrews in the Prince George's County STEM Science Fair.

Finally, the faculty and staff at the NTC@ Maryland has integrated their research findings into educational curriculum such as:

- 1. The course of Revenue Management and Operations Optimization for High Speed Rail was provided in Italy at the the Doctoral school Politecnico di Torino in May 2014.
- 2. Based on the study of the Efficiency and Reliability in Freight Transportation Systems, problems, analysis methods and results have been presented in existing undergraduate and graduate courses at UMD.
- 3. The results of Quantifying and Benchmarking the Delivery Performance PPP of U.S. Transportation Projects will be included in the graduate course (CON551) on Alternative Project Delivery Methods. The course was recently added as a required course for all online master's students in construction at UMD.

published a few media stories highlighting the transportation faculty and their effort within this consortium. Current efforts are underway to establish a website that will be dedicated to highlighting the accomplishments of the research team.

Dr. Xuesong Zhou from Arizona State University has worked closely with Dr. Nagui Rouphail and Dr. Chris Frey from North Carolina State University. They used a multi-scale agent-based dynamic traffic assignment methodology to simulate time-varying traffic flow patterns within a Triangle Regional Model, NC network in order to accurately estimate the individual and total system cost in the transportation network.

The researchers incorporated and tested the emission calculation module in our open-source package DTALite/NEXTA (above), which is available at https:// code.google.com/p/nexta/. This project directly responds to the key theme for the NTC@Maryland. The final research product will allow state DOT and metropolitan planning agencies to quickly test the emission impact of a full suite of innovative traffic management strategies at both the corridor and network levels. The proposed methodology will ultimately serve as the recognized approach used by a state or





From left to right, NTC@Maryland's Dr. Lei Zhang, Stephanie Peters, Mark Franz, Lydia Elena Mercado, Dawn Tucker-Thomas, Caesar Singh, Denise Dunn, Takeia Bradley, Dr. Ali Haghani

TECHNOLOGY TRANSFER AND WORKFORCE DEVELOPMENT

local transportation agency to evaluate the emission reduction of those new concepts in their jurisdiction.

At LSU, Dr. Brian Wolshon participated in several general public information dissemination activities. He was:

- Interviewed as an expert on evacuation for "Is contraflow the best hurricane evacuation strategy?" WBRP, 107.3FM, Baton Rouge, Louisiana. Broadcast date: August 25, 2014.
- Interviewed for and quoted as an expert on evacuations, for "LSU researchers work to make evacuation easier this hurricane season," WVLA-TV, Channel 33, Baton Rouge, Louisiana., Broadcast date: June 6, 2014.
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- Interviewed for and quoted as an expert on evacuation for "The Future of Evacuations in the Climate Change Era," The Atlantic, May 27, 2014.
- Interviewed for and quoted as expert on evacuation for "Leadership failures left Atlanta in chaos," Atlanta Journal-Constitution, February 1, 2014.
- Interviewed for and quoted as an expert on evacuation for "Other cities have planned for, and survived, worse," Atlanta Journal-Constitution, February 1, 2014.

Next, in the summer of 2014, MSU hosted and organized the Summer Transportation Institute. In addition, the National Transportation Center at Morgan State University hosts some 50 to 60 managers in the Maryland Department of Transportation's leadership program. The managers will visit Morgan State University's Center for Built Environment and Infrastructure Studies (CBEIS) on Sept. 24, 2014.

The visitors will hear presentations about Morgan's academic programs, degrees, and certificates related to transportation planning, policy and engineering from the faculty of transportation, city & regional planning, and civil engineering programs. They will visit the Travelers Behavior and Simulation Lab where two state-of-the-art driving simulators are housed. A recent study will be demonstrated, and the visitors may experience driving on the simulators. The visitors will also see the biaxial earthquake simulator - one of only two of this magnitude on the East Coast, capable of producing an "earthquake" of up to 9.0 on the Richter scale - and materials labs, where materials used to construct roads and bridges, such as corrosion-resistant rebar, are tested.

The research efforts at NCSU have produced seven technical research reports. The media has sited the research at NCSU on multiple occasions. Dr. George List is developing materials for a short course focused on the technological and operational aspects of high-speed rail. The intent is to make the course available via the web for professional development and for use in other instructional environments. The course will cover the basics of high-speed rail: its major characteristics, its design, operation, and maintenance. In addition, Mr. James Martin is developing an online webinar series titled "Moving Transportation Research to Practice," which is expected to be released in the upcoming months.

UNO, in conjunction with the Partnership for Youth Development, is developing content for the Port of New



US DOT Secretary Anthony Foxx (left) and Dr. John Rene from UNO.

Orleans website (http://portno.com) related to K-12 education. The project includes the research and design of material that is age-appropriate and matched to Common Core standards at each grade, as well as a small evaluation conducted to access the attitudes of a sample group of both children and teachers to the material.

Finally, Dr. John Renee of UNO participated in a roundtable to commemorate the 50th anniversary of the Civil Rights Bill. Other participants included US Secretary of Transportation Anthony Foxx and New Orleans Mayor Mitch Landrieu. During the discussion, Dr. Renee noted, "Transportation in America still has a long way to go in promoting equality. We still do a poor job in connecting affordable housing to jobs, shopping and services. We are a car dependent nation, which has disparate impacts to African Americans in many communities. While solving these problems can sometimes be controversial, we owe gratitude to the generations before us that sacrificed so much to enable us to move towards a more inclusive society where we can have an open debate across race, gender and culture."



In 2014, the National Transportation Center offered more than 55 undergraduate and graduate courses at the University of Maryland and consortium member universities on transportation-related issues, taught by faculty and teachings assistants associated with the Center. More than 35 students, both graduate and undergraduate, were given the opportunity to participate in transportation research projects funded by a grant from the U.S. Department of Transportation. Twenty-five advanced degrees focusing on transportationrelated studies, including nine masters-level programs and 16 doctoral-level programs, were supported by the NTC@Maryland. Almost 60 students studying transportation-related issues benefitted from the grant money from the U.S. Department of Transportation, 12 of whom in 2014 earned a degree in the field. The NTC@ Maryland and consortium member universities conducted 12 applied research projects and 10 advanced research projects in total using UTC grant funds.

A full list of program-wide indicators broken down by university can be found below.

Performance Indicators	Total	UMD	ASU	LSU	MSU	NCSU	ODU	UNO	
Number of transportation-related courses offered during the reporting period that were taught by faculty and/or teaching assistants who are associated with the UTC.									
Undergraduate	27	2	8	2	4	2	1	8	
Graduate	29	5	10	0	1	4	3	6	
Number of students participating in transportation research projects funded by this grant.									
Undergraduate	6	1	1	2	2	0	0	0	
Graduate	32	3	8	6	6	4	2	3	
Number of transportation-related advanced degree programs that utilize grant funds to support graduate students.									
Masters-level programs	9	0	5	1	1	2	0	0	
Doctoral-level programs	16	7	3	1	1	1	2	3	
Number of students supported by this grant.									
Undergraduate	15	12	1	2	0	0	0	0	
Graduate	18	5	5	2	4	2	0	0	
Doctoral	26	10	3	4	4	2	2	1	
Number of students supported by this grant who received degrees.									
Undergraduate	3	0	1	0	0	2	0	0	
Graduate	6	4	1	1	0	0	0	0	
Doctoral	3	2	0	0	1	0	0	0	

PUBLICATIONS AND PRESENTATIONS

After just one year of collaborative effort, the NTC@Maryland has made significant impacts in the realms of transportation and economic competitiveness research, technology transfer, and education. In terms of journal publications, the researchers at the NTC@Maryland produced the following select products:

- Asadabadi, A., Miller-Hooks, E. 2014. An optimizationbased approach to reducing the impacts of sea level rise on freight transport. In preparation for submission.
- 2. He, X., Kastrouni, E., and Zhang, L., Impact of highway investment on the economy and employment across U.S. industrial sectors: A simultaneous equations analysis at the metropolitan level, Journal of the Transportation Research Board (Accepted for Publication).
- Hetrakul, P., Cirillo, C. 2014. A latent class choice based model system for railway optimal pricing and seat allocation. Transportation Research Part E, 61(1), pp.68-83.
- 4. Hetrakul, P., Cirillo, C. 2014. Customer heterogeneity in revenue management for railways services" Journal of Pricing and Revenue Management. In press.
- 5. Mollanejad, M. , Vemulapati, S.V. , and Zhang, L. (2014). Supporting sustainable megaregion development through optimizing the impacts of transportation investments, ASCE Journal of Urban Planning

and Development (Sep. 2014): 1-10.

- Nasri, A. , and Zhang, L. (2014). The analysis of transit-oriented development (TOD) in Washington, D.C. and Baltimore metropolitan areas, Transport Policy 32: 172-179.
- 7. Osama Osman, Julius Codjoe and Sherif Ishak. 2014. Impact of timeto-collision information on driving behavior in connected vehicles environments using a driving simulator test bed. Submitted for consideration for publication and presentation at the 94th Annual Meeting of TRB. Under review.
- 8. Ramsey, D.W., El Asmar, M. 2015. An analysis of project cost and schedule performance of the entire population of PPP transportation projects in the U.S. ASCE Journal of Construction Engineering and Management. In preparation for submission.
- Ramsey, D.W., El Asmar, M. 2015. Cost and schedule performance benchmarks of U.S. transportation Public-Private-Partnerships (PPP) projects: Preliminary results. Submitted for consideration for publication and presentation at the 94th Annual Meeting of TRB. Under review.
- Song, T., S. Kim, N. Rouphail, B. Aghdashi, A. Amaro and G. Goncalves. 2014. Exploring the association of crash propensity and micro-scale driver behavior. Submitted for consideration for publication and presentation at the 94th Annual Meeting of TRB. Under review.
- 11. Stich, B. 2014. Intermodal transportation disruption and

reroute simulation framework: lesson for freight planning", Transportation Research Record, 2014.

- Stich, B., Griffith, K. 2014. Federalism and transportation finance. Public Works, Management & Policy. Forthcoming.
- 13. Stich, B., Platt, J. 2014. The Evolution of the Section of Transportation Policy & Administration. Forthcoming.
- 14. Xiong, C., Zhu, Z., He, X., Chen, X., Zhu, S., Mahapatra, S., Chang, G.L., Zhang, L., Developing a 24-hour large-scale microscopic traffic simulation model for the before-and-after study of a new tolled freeway in the Washington DC-Baltimore region, ASCE Journal of Transportation Engineering (Accepted for publication).
- 15. Zamir, R., Nasri, A., Baghaei, B., Mahapatra, S., and Zhang, L., Comparative analysis of the effect of transit-oriented development on trip generation, distribution, and mode share in the Washington, D.C. and Baltimore metropolitan areas, Journal of the Transportation Research Board (Accepted for Publication).
- 16. In addition to accepted papers in journals, the NTC@Maryland has also had several select research papers accepted in professional conferences, which are listed below:
- Asadabadi, A., Miller-Hooks,
 E. 2014. Objective decisionmaking tools for infrastructure

investments to combat impacts of sea level rise. To be presented at INFORMS, San Francisco, November 2014.

- Chen, X., Yin, M., Song, M., Zhang, L., and Li, M. (2014). Social Welfare Maximization of Multimodal Urban Transportation Systems Using Metamodels: Theory, Model, and Application to the Tianjin Eco-City in China, Paper presented at the 93rd Transportation Research Board Annual Meeting, January 12~16, Washington, DC.
- Chris Frey. 2014. Evaluating and calibrating emission impacts of traffic management strategies through simplified emission estimation model and mesoscopic dynamic traffic simulators. Presented in a meeting hosted by the U.S. Environmental Protection Agency, Ann Arbor, MI on March 05, 2014.
- Collins, A. J., Frydenlund, E., Robinson, R. M., Cetin, M. 2015. xploring a toll auction mechanic enabled by vehicleto-infrastructure technology. The 94th Transportation Research Board Annual Meeting, Washington, D.C., 15-2825. Under review.
- 21. Kastrouni, E., He, X., and Zhang, L. (2014). Transportation Infrastructure Investment and Economic Growth at MSA Level: Accounting for Spillover Effects, Paper presented at the 93rd Transportation Research Board Annual Meeting, January 12~16, Washington, DC.
- 22. Lu, Y., Chen, X., Zhang, L.

2014. A national travel demand model for the U.S.: A personbased microsimulation approach. Accepted for presentation at the 94th Transportation Research Board Annual Meeting, Washington, D.C.

- 23. Lu, Y., Zhang, L., and Kastrouni, E. (2014). Statewide Congestion Pricing and Distance-Based User Charges with Differentiated Car and Truck Fees: Case Study in Maryland, Paper presented at the 93rd Transportation Research Board Annual Meeting, January 12~16, Washington, DC.
- 24. Masoud Hamedi, Ali Haghani, Yanru Zhang. 2014. Methodology for measuring performance of high occupancy vehicle lanes. The 20th Conference of the International Federation of Operational Research Societies (IFORS 2014), Barcelona, Spain, July 2014.
- Mollanejad, M., and Zhang, L. (2014). Optimal Population Distribution in Sustainable Regional Development, Paper presented at the 93rd Transportation Research Board Annual Meeting, January 12~16, Washington, DC.
- 26. Nasri, A., Zhu, Z., Zamir, K., Xiong, C., and Zhang, L. (2014). Simulation-Based Approach for Analyzing the Regional and Local Impact of Transit-Oriented Development on Congestion and Emissions, Paper presented at the 93rd Transportation Research Board Annual Meeting, January 12~16, Washington, DC.
- 27. Nichols, A.P., Cetin, M. 2015. Evaluation of differential calibration accuracy between WIM stations using re-identified vehicles. The 94th

Transportation Research Board Annual Meeting, Washington, D.C., 15-2825. Under review.

- Nichols, A.P., Cetin, M., Chou, C.S. 2014. Enhancing a vehicle reidentification methodology based on WIM data to minimize the need for ground truth data. NATMEC: Improving Traffic Data Collection, Analysis, and Use, Chicago, IL, June 29– July 2, 2014.
- 29. Ramsey, D.W., El Asmar, M. 2014. Project cost and schedule performance of transportation public-private-partnerships. Poster in Preparation for the School of Sustainable Engineering and the Built Environment (SSEBE) Graduate Research Symposium, Arizona State University.
- 30. Ramsey, D.W., El Asmar, M. 2014. Project cost and schedule performance of transportation public-private-partnerships. Presentation at the Construction Graduate Seminar, Del E. Webb School of Construction, Arizona State University.
- 31. Tang, L., Xiong, C., and Zhang, L. (2014). Artificial Intelligence Approach to Modeling Travel Mode Switching in a Dynamic Behavioral Process, Paper presented at the 93rd Transportation Research Board Annual Meeting, January 12~16, Washington, DC.
- 32. Tanvir, S., Zhou, X., Rouphail, N.M., Frey, H.C. 2014. Asssesing emissions impacts of transportation management strategies for large scale

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regional networks. The 94th Transportation Research Board Annual Meeting, Washington, DC. Under review.

- 33. Xiong, C., and Zhang, L. (2014). Dynamic Travel Mode Searching and Switching Analysis Considering Hidden Modal Preference and Behavioral Decision Processes, Paper presented at the 93rd Transportation Research Board Annual Meeting, January 12~16, Washington, DC.
- 34. Xiong, C., Hetrakul, P., and Zhang, L. (2014). On Ride-Sharing: A Departure Time Choice Analysis with Latent Carpooling Preference, Paper presented at the 93rd Transportation Research Board Annual Meeting, January 12~16, Washington, DC.
- 35. Zhang, L., and He, X. (2014). Quantifying the Self-Selection Effects in Residential Location Choice with a Structural Equation Model, Paper presented at the 93rd Transportation Research Board Annual Meeting, January 12~16, Washington, DC.
- 36. Zhou, X. 2014. Evaluating emission impact of intelligent transportation management strategies through simplified emission estimation and mesoscopic dynamic traffic simulation models. Presented in the 2014 Transportation Planning/Land Use/Air Quality Workshop, Charlotte, North Carolina.
- 37. Zhou, X., Pendyala, R. 2014. Minimum number of cars a city

needs in a fully coordinated vehicle sharing system. To be presented in the Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting. San Francisco, CA, November 2014.

 Zhu, S., Du, L., Li, M., and Zhang, L. (2014). Rationing and Pricing Strategies for Congestion Mitigation under Heterogeneous Users and Vehicle, Paper presented at the 93rd Transportation Research Board Annual Meeting, January 12~16, Washington, DC.

NTC researchers (1) integrated the research-produced algorithms into the graduate courses in transportation (e.g., the collected per-vehicle data were used in class projects to analyze traffic flow behavior); (2) helped educate undergraduate and graduate students in transportation engineering, including women and underrepresented minorities, and thus prepare them for careers in transportation fields; (3) taught graduate courses in which students obtained the skills necessary to engage in the transportation community and workforce, especially in the area of Modeling and Simulation; (4) updated a training manual and hosted workshops for training police officers on how to direct traffic more safely and efficiently; (5) intended to acquire units for use in classroom instruction, as the trajectory-based data are the most detailed mobility data and will be essential to be understood and analyzed by the next generation of transportation engineers and planners; (6) implemented findings from the research as a module in several graduate courses to help train the next generation workforce that how transportation infrastructure are susceptible to climate change

and strategies for reducing the vulnerabilities; (7) developed and disseminated new findings and provided exposure to transportation delivery for practitioners and students in the engineering and construction disciplines.

OTHER IMPACTS

Finally, the NTC@Maryland consortium shares their expertise with practitioners by collaborating with public, private, and academic entities such as:

- Maryland State Highway Administration, MDSHA
- Maryland Department of Transportation, MDOT
- North Carolina Department of Transportation, NCDOT
- I-95 Corridor Coalition
- Cal-Trans
- Texas DOT
- Port Authority of NY/NJ
- Tri Met
 - International Freight Forwarders & Customs Brokers Association of New Orleans
- iTds, Lisbon, Portugal
- And many others...

These collaborations allow the NTC@Maryland researchers to interact with individuals who can put their cutting-edge research into practice. In addition, these collaborative relationships have created a platform to share ideas on research needs. As a result, the research conducted at the NTC@ Maryland has real-world impact on the safe, efficient, and sustainable movement of people and goods within the U.S.



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