

**Program Progress Performance Report
for the
New England University Transportation Center
Massachusetts Institute of Technology**

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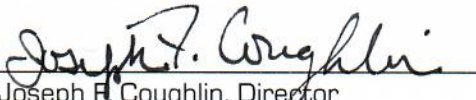
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REPORTING CATEGORIES

1. Accomplishments

1A. Research Projects

Major goals as stated in New England UTC Prospectus

Research Goal

- To conduct research in technology applications and systems integration with related work in policy, planning and human factors that improve transportation safety as well as further our understanding and realization of livable communities to support mobility across the lifespan.
- To support peer-reviewed investigations that address safety and livability by exploring and furthering research, policy, and practice in the application of ubiquitous intelligence, use of big data, and improved human performance

Following is the list of the 37 research projects under this grant, and their current status:

Project No.	PI	Project Title	Status
MITR25-1	Abou-Zeid Ben-Akiva	Capturing the Relationship between Social Interaction and Travel Behavior Using Smart Phones	active
MITR25-2	Caplice Caballero	High-Resolution Urban Freight Modeling in Cambridge, MA	completed
MITR25-3	Coughlin	Assessing Navigatability and Livability of Public Transportation Systems	active
MITR25-4	Ellis Lavalliere	Transportation Workforce Health and Wellbeing	active
MITR25-5	D'Ambrosio	Understanding the Adoption of and Education about New Auto Technologies among Older Adults	active
MITR25-6	Frazzoli	Modeling the Impact of One-Way Car Sharing: An integrated data- and optimization-driven approach	completed

MITR25-7	Goentzel	Fusing Structured and Unstructured Transportation Data for Decision-Making in Crisis	active
MITR25-8	Gonzalez	Coupled Mobility Networks: A Data Driven Approach	active
MITR25-9	Isaacson	Out and About in New England: Maintaining Active Life styles in Later Life	completed
MITR25-10	Lee	Effectiveness of Various Information Channels on User Training and Learning in Automobiles	completed
MITR25-11	Osorio	Optimal Road Traffic Operations for an Increasingly Autonomous and Connected Vehicle Fleet	active
MITR25-12	Pentland Shmueli	Incentivizing Safer Driving Using Peer-Pressure	active
MITR25-13	Reimer Dobres	Assessing the Effect of Typography on In-Vehicle Glance-Like Reading Across the Lifespan	active
MITR25-14	Salvucci Murga	MALL Transit and Wider Economic Benefit Assessment	completed
MITR25-15	Sussman	Hub Stations As Catalysts for Regional Growth: The Case of New York Penn Station	active
MITR25-16	Trancik	From Trip Data to the Energy Requirements of Personal Vehicle Travel	active
MITR25-17	Zegras Pereira	Scenario Discovery for Resilient Urban Systems (or, The Future is "Big Data")	completed
MITR25-18	Zhao	Humanizing Travel: How E-hail Apps Transform Stakeholder Relationships in Taxi Services	active
HVDR25-19	Glaeser	Transportation Stimulus Spending and Long Term Unemployment	active

HVDR25-20	Gomez-Ibanez Fagan	The Experience with Managed Toll Lanes	active
HVDR25-21	Howitt	Recreating Livable Communities after Catastrophe: Managing the Recovery from Japan's Earthquake, Tsunami, and Nuclear Disaster of 2011	active
HVDR25-22	Mayne	The Politics of Transport Policy in the Greater Copenhagen Region, Part 2	active
HVDR25-23	Shoag	The Local Effects of the American Recovery and Reinvestment Act on Economic Activity and Traffic Safety	active
UMAR25-24	Christofa Knodler	Operational and Emission Analyses of Roundabouts under Varied Vehicle and Pedestrian Demands	active
UMAR25-25	Fisher Knodler Zafian	Evaluating the Effect of Google Glass on Driver Distraction	active
UMAR25-26	Gao	Routing Policy Choice Models in Stochastic Time-Dependent Networks: The Stockholm Case Study	active
UMAR25-27	Gonzales	Route Choice in Congested Grid Networks	active
UMAR25-28	Knodler Fisher	A Driving Simulator Evaluation of Driver Distraction and Traffic Control Device Comprehension for At-Grade Railroad Crossings	active
UMAR25-29	Krishnamurty	An Innovative Design to Retrofit Seatbelts in Motorcoaches	active
UMAR25-30	Ni Wang	Supplementary Vehicle Positioning to Connected Vehicles	active
UCNR25-31	Atkinson- Palombo Garrick	A Multi-Scalar Model to Identify the Causes of Decreased Vehicle Miles Traveled (VMT) in the United States	active
UCNR25-32	Garrick Atkinson- Palombo	Factors Contributing to the Decrease in Traffic Fatality Rates for Young People in America	active

UCNR25-33	Ivan Ravishanker Townsend	Social Network Effects on Attitudes about Pedestrian Street Crossing Behavior	active
UCNR25-34	Konduri Dalal	Exploration of Human Psychological Factors Underlying Mobile Phone Usage Behaviors while Driving	active
UCNR25-35	Lownes	Clustering Algorithms for Transit Network Design	active
UMER25-36	Garder	Deficient Bridges and Safety Information	active
UMER25-37	Rubin Garder	Automated Vehicles: Economic Incentives for Environmental Benefits and Safety	active

Accomplishments under the New England UTC's research goal

New England UTC Study Featured in Wired Article on Dealership Presentation of Safety January 10, 2017

Advance driver assistance systems are more commonly being advertised and implemented in vehicles. The New England University Transportation Consortium founded the [Advanced Vehicle Technology \(AVT\)](#) consortium to investigate how drivers use and learn to use these new potentially life-saving technologies. Last year, the New England UTC and New England Motor Press deployed a survey that found most drivers are learning to use vehicle technologies through trial and error, but they would prefer to learn these technologies using other sources, such as dealerships as part of the sales process. But how much do dealership salespeople know about the details of these new safety technologies?

As part of the AVT consortium, UTC researchers visited 18 dealerships in the Greater Boston Area to find out. The good news is that some vehicle brands are motivated to educate their customers on vehicle safety, and are teaching customers how to use new vehicle systems in a variety of formats. Unfortunately, some brands are not as well equipped. This research was featured on [Wired.com](#), and the results were presented at the 2017 Annual Meeting of the Transportation Research Board.

New England UTC Research Profiled in Globe and Mail Article February 14, 2017

The Globe and Mail—a Canadian newspaper—printed a NE UTC research article: "Will driverless cars change retirement? Only if wary seniors embrace them." This research on driver preferences toward autonomous vehicle technologies is about the potential of self-driving cars to improve mobility for seniors. At the NE UTC, researchers are diving into research on seniors and driving technology alternatives: whether they trust it. UTC researchers found relatively low interest in self-driving cars across all ages, but that drivers

45 years and older are “less comfortable with partial or full autonomy” than younger drivers. Figuring out how to educate consumers, particularly older ones, will be a crucial step in encouraging drivers to accept greater levels of vehicle automation. “If we’re not educating older adults, it’s unrealistic to expect they’ll end up using it,” Ms. Abraham, the study’s lead author and UTC research, is quoted in the article. Read the full story [here](#).

Project MITR25-1

Capturing the Relationship between Social Interaction and Travel Behavior Using Smart Phones

In the past six months, we continued to implement changes to the Future Mobility Sensing (FMS) platform to capture the additional information needed for this study. These include passive data collection through smartphones, on-phone real-time surveys, and additional questions to be posed in the web-based prompted recall. In addition, we have developed an interface to collect user’s social media information if the user authorizes FMS to access his Facebook account. A new website is being setup to conduct a pilot survey for this study.

Project MITR25-15

Hub Stations As Catalysts for Regional Growth: Various Urban Cases

The Regional Transportation Planning and High-Speed Rail Research Group has continued to research Penn Station in Manhattan as part of its broader study of the Northeast Corridor. Further, St Pancras, London and Las Vegas, NV are being studied. This research examines the existing regional transportation governance structure in all three locations. The research explores multi-scale governance, and the relationships within and between urban, metropolitan and mega-regional transportation governance structures. The study of Penn Station considers the history that has led to the current structure of the governance system and explores the long-, medium- and short-term changes that can help improve regional rail integration and decision-making. The current governance system impacts service at Penn Station, from way-finding to train scheduling, often creating conflicts among the rail operators and inefficiencies in service. This understanding of the governance system serves as a foundation for ideas to integrate operators’ services and improve passengers’ experience and rail efficiency. Achieving these goals is essential to the development of an effective Moynihan Station adjacent to Penn Station.

Project UMAR25-24

Operational and Emission Analyses of Roundabouts under Varied Vehicle and Pedestrian Demands

We finalized the microsimulation model for the roundabout at N. Pleasant and Governors Dr. at the University of Massachusetts campus in Amherst, MA and performed the microsimulation tests for a variety of pedestrian and vehicle demand levels. The results of this effort will be presented at the 5th International Conference on Roundabouts, which will take place on May 8-10, 2017, in Green Bay, Wisconsin. We also finalized the driving simulator experimental design and coded the scenarios and are currently in the process of recruiting subjects for this study. Finally, we improved our field data collection at the same roundabout by combining an INTERSECTOR motion and presence radar sensor, which can track 2-dimensional trajectories of up to 32 vehicles within 600 feet of the radar, with cameras and a NOx monitor.

Project UMAR25-25

Evaluating the Effect of Google Glass on Driver Distraction

The research team has conducted a simulator study: Does the Presentation of Traffic Sign Information on Head-Mounted Displays Improve Latent Hazard Anticipation? Two experiments comprise the project. The first experiment (now completed) determined whether warnings of an impending latent hazard, delivered on Google Glass, can improve both young and middle-aged drivers' latent hazard anticipation ability. The results showed that the latent hazard anticipation performance of young drivers was significantly affected by Google Glass, and that for middle aged drivers, their performance was not significantly affected by the warnings from Google Glass. It is concluded that head mounted displays like Google Glass offer a promising platform for the delivery of traffic warnings to help young drivers better detect hazards on the road.

Project UMAR25-26

Routing Policy Choice Models in Stochastic Time-Dependent Networks: The Stockholm Case Study

Experimentations with the discrete choice models were carried out for the case study in a sub-network of Stockholm, Sweden, based on GPS data from hired taxis. The experimentations included various ways to account for travel time variability and travelers' risk attitudes and both the structural and non-structural heterogeneity across travelers. The refined models confirm the previous conclusions that travelers are heterogeneous in terms of their ability and willingness to plan ahead and utilize real-time information, and an appropriate route choice model for uncertain networks should consider the underlying stochastic travel times and traveler heterogeneity in terms of real-time information utilization.

Project UMAR25-28

A Driving Simulator Evaluation of Driver Distraction and Traffic Control Device Comprehension for At-Grade Railroad Crossings

A first-of-its-kind rail simulation model has been fully constructed in a virtual driving environment. The precisely constructed scenarios carefully sequence the movement and placement of virtual objects in the presence of railroad crossings to test driver attention, visual detection and the effect of distraction. Forty-six participants have been recruited for this simulator experiment.

Project UCNR25-31

A Multi-Scalar Model to Identify the Causes of Decreased Vehicle Miles Traveled (VMT) in the United States

The work has been impactful in identifying that the downward trend in VMT in the US is not a recent phenomenon. In fact, when VMT data are analyzed at the state level, it is evident that VMT decreases date back as far as twenty years, beginning with the state of Washington. This is very important because policy-makers have been interpreting this phenomenon as something that happened recently. VMT is an important determinant of many policy-oriented issues, most importantly funding. Presentations at the Transportation Research Board in January and the news article written by the Washington Post about the research garnered a great deal of attention. The data associated with the project have been made publicly available via the Washington Post website to extend discussion and analysis of this phenomenon.

Project UCNR25-33

Social Network Effects on Attitudes about Pedestrian Street Crossing Behavior

The research team has extracted and analyzed the cascading online survey response data

pertaining to the different social groups. This consisted of numerical data reflecting crossing behavior before and after one of four interventions, numerical data on participant demographics, and text data on discussions between participants in two intervention groups. The team checked the data for consistency, and correctly merged the data from in-person surveys with the data from the online (Intellectics) survey. The project team used SAS and R to carry out an analysis to understand the nature of the crossing behavior of participants, as well as possible changes in behavior as a result of interventions. The team also carried out qualitative analyses of the discussions from previously conducted in-person surveys and did preliminary work that will lead to text mining using R software in the next phase of the project

Project UMER25-37

Automated Vehicles: Economic Incentives for Environmental Benefits and Safety

A mail survey vehicle has been developed which has been administered to 3000 homes in the Northeast (NY, MA, VT, NH, ME). In the surveys, respondents are asked to respond to several questions aimed at measuring their knowledge, attitudes, beliefs, norms and behaviors surrounding current personal vehicle and autonomous vehicles, where current ride sharing will be used as a proxy for future AV travel. We have received 400 completed surveys to date and are sending out a second wave of reminder surveys to increase our response rate. We are in the process of entering the survey responses into a database for analysis.

How the New England UTC's research results have been disseminated

Project MITR25-16

From Trip Data to the Energy Requirements of Personal Vehicle Travel

Posters summarizing the research activities were presented at MIT Energy Night held October 14, 2017 at the MIT Museum. Energy Night celebrates and showcases the best of MIT energy innovation and entrepreneurship. This popular event is an annual student-run activity featuring over 70 interactive poster presentations that present new research and start-ups in energy renewability, storage, and efficiency.

Project HVDR25-19

Transportation Stimulus Spending and Long Term Unemployment

Our manuscript entitled, "A Clearer Picture of How Highway Construction Supports Jobs," has been submitted to an academic journal for peer review and publication. The Taubman Center at the Harvard Kennedy School of Government has posted the manuscript as a working paper for public comment on its website. Once we receive feedback from academic colleagues, we intend to summarize our findings in a white paper report for policy officials. The paper can be accessed at <https://www.hks.harvard.edu/centers/taubman/publications/working-papers>

Project HVDR25-21

Recreating Livable Communities after Catastrophe: Managing the Recovery from Japan's Earthquake, Tsunami, and Nuclear Disaster of 2011

We have taught material from the project in a graduate-level course *Disaster Relief and Recovery* that Dr. Howitt teaches at Harvard Extension School; and similar presentations are scheduled in April for two executive education programs at Harvard Kennedy School, *Leadership in Crises* (aimed at senior managers of public safety and humanitarian assistance organizations) and *The General and Flag Officer Homeland Security Executive Seminar* (for

generals in the US National Guard and admirals in the US Coast Guard).

Project UMAR25-27

Route Choice in Congested Grid Networks

Findings of the research has been presented in two presentations at the 96th Annual Meeting of the Transportation Research Board. These presentation reached an audience of transportation researchers and representatives from industry and public agencies. A paper on an analytical formulation of the equilibrium for the morning commute problem with heterogeneous traveler characteristics has been accepted to appear in the journal *Transportmetrica B*. Another paper is currently under review in *Economics of Transportation*. These publications will reach a broader academic audience in the engineering and economics fields.

Project UMAR25-28

A Driving Simulator Evaluation of Driver Distraction and Traffic Control Device Comprehension for At-Grade Railroad Crossings

The research team made a poster presentation at the Commercial Vehicle Safety Research Summit held in Northampton, MA on November 9-10, 2016. The poster was entitled, "Retrofit seatbelt system for Inter-city Buses." The summit was on "Best Practices for Advancing Safety through Partnerships with Universities." This theme proposed a variety of ways in which universities can support the work of law enforcement and drivers licensing agencies. At the summit, those groups shared best practices, practical know how, and funding strategies.

Project UMAR25-29

An Innovative Design to Retrofit Seatbelts in Motorcoaches

A conference paper was published and presented at an SAE International symposium in Pune, India in January 2017. 3D printed miniature samples were produced to demonstrate the product at the event. A coauthor presented the solution there to The Central Institute of Road Transport (CIRT), a leading organization for implementing an accreditation system for Bus Body Builders in India. Also, a presentation was given to the National Highway Traffic Safety Administration (NHTSA) in December 2016 to address all concerns they expressed about our solution in a recent Report to Congress. In response, NHTSA began a promotion for seatbelt use on motorcoaches found at <https://twitter.com/NHTSAgov/status/808370846746152960>.

Project UCNR25-33

Social Network Effects on Attitudes about Pedestrian Street Crossing Behavior

Project findings were presented at a Communication Association Conference and were discussed as part of a talk by Rebecca Townsend at the Annual Convention of the Eastern Communication Association.

Plans during the next reporting period to accomplish the New England UTC's research goal

No change on our major goals contained within our approved Application.

1B. Education Projects

Education & Workforce Goal

- To introduce transportation to all levels of education: K-12, undergraduate, graduate and continuing education.
- To place graduates into transportation fields.
- To provide current and developing methods, tools and insights to today's transportation workforce to support their capacity to build, operate and manage a safe and efficient transportation system.

Following is the list of the 2 education projects under this grant, and their current status:

Project No.	PI	Project Title	Status
HVDE25-38	Howitt	Teaching Case Study on Korea Ferry Disaster of April 2014	active
HVDE25-39	Davis Altshuler	Transforming Urban Transport: a Set of Case Studies	active

Accomplishments under the New England UTC's education goal

Parker Sorenson named 2016 Outstanding Student of the Year November 8, 2016

Parker Sorenson has been awarded the 2016 UTC Outstanding Student of the Year Award by the New England University Transportation Center at MIT. Parker is a second year graduate student pursuing his master's degree in Transportation and Urban Engineering at the University of Connecticut. He will receive \$1,000 plus the cost of attendance to the 2017 96th Annual TRB Meeting taking place in Washington, DC January 8-12, 2017.

All of the national UTC award winners will be honored at the 26th Annual Outstanding Student of the Year Awards ceremony, which is scheduled to take place as part of the CUTC annual banquet on Saturday, January 7, 2017.

Opportunity to Study Abroad in Amsterdam For Summer of 2017 December 20, 2016

Two New England UTC research faculty from the University of Connecticut will be teaching a sustainable urban and transportation planning course in Amsterdam this summer. The course will provide students with an opportunity to do field-based research into various topics relating to sustainable urban and transportation planning. Methods will include standard

qualitative approaches such as structured and unstructured interviews and direct observation. Research findings will be documented in a short film which the students will design, shoot, edit and produce during their time in the field. The course is open to all students in our consortium. The deadline for application is March 15, 2017.

Project HVDE25-38

Teaching Case Study on Korea Ferry Disaster of April 2014

This case study is in a complete draft, awaiting publication by the Harvard Kennedy School case program, once reviewed by knowledgeable Korean experts on this subject matter have provided comments on the draft. In the meantime, the case has been used in a graduate-level course *Crisis Management and Emergency Preparedness* that Dr. Howitt teaches at the Harvard Extension School. It was also previously featured in an issue of the UTC Spotlight newsletter that the US Department of Transportation publishes.

Project HVDE25-39

Transforming Urban Transport: a Set of Case Studies

We continue to pilot the case materials for teaching purposes. Senior Project Associate Lily Song has used draft versions of the cases as course material while teaching a course this Spring 2017 semester at the Harvard Graduate School of Design. Her course is entitled "Urban Infrastructure, Environment, and Sustainability" and has incorporated several of the TUT-POL cases as course reading and case-based discussion. Our Project Director, Diane Davis, and Senior Researcher, Lily Song, created various in-depth case analysis and analytical writing so as to offer a more systematic comparative lens for producing robust findings about how, when, and why political leadership advances positive transportation outcomes. This included various blog articles that have been written and distributed with outlets such as ITDP, Medium Planetizen, and Next City. We have also created 2-page case study briefs for each of the 8 case studies summarizing each transport initiative and political story, as well as political strategies and tactics that were used to make the transportation initiatives possible, and have held various workshops and seminars to further discuss and compare our findings. These handouts have become extremely useful for dissemination at events as well as in conceptualizing our findings.

1C. Technology Transfer Projects

Technology Transfer Goal

- To increase the awareness and level of information concerning transportation issues facing New England.
- To further our well-established technology transfer and outreach activities.
- To engage the public and private transportation sectors throughout the New England Region and the nation.

Following is the list of the 2 technology transfer projects under this grant, and their current status:

Project No.	PI	Project Title	Status
MITT25-43	Coughlin	MIT Centralized Technology Transfer Initiatives	active
UMAT25-44	Collura	UMass Centralized Technology Transfer Initiatives	active

Accomplishments under the New England UTC's technology transfer goal

Former Secretary of Transportation Rodney Slater speaks at New England UTC conference on Societal Element of Self-Driving Cars October 5, 2016

On October 5, 2016, the New England UTC held a day-long executive forum entitled “New Vehicle Technology & the Mature Driver: Examining the Societal, Business & Policy Implications of Autonomous Systems.” This conference explored the social, infrastructure, business, safety and policy implications of the development of autonomous vehicle technologies. Sponsored by The Hartford, the conference featured representatives from organizations including UPS, IBM, Lyft, the American Insurance Association, the MBTA, Ford, and the Highway Data Loss Institute.

Former US Secretary of Transportation Rodney E. Slater spoke at the event, commenting on the recently published federal policies from USDOT and NHTSA concerning the testing and deployment of autonomous vehicles. He encouraged business leaders to work with the USDOT in mapping policy prescriptions for a transportation landscape that will soon be populated, if not defined, by autonomous vehicles.

The New England UTC unveils its newly redesigned website, improving navigation and performance January 2017

Today, there are more people accessing the Internet from mobile devices than from desktops or laptops—thus, our redesign takes a mobile-first design approach. The website is now optimized for mobile devices to ensure the best user experience. The major improvement is the user interface which is easier to navigate and access materials one is looking for, resulting in a faster and more streamlined user experience.

Our content is better organized, and there is new material including short, engaging videos, capturing the work of each of our member schools. Also, the redesign is more aesthetically pleasing and we've made the user experience as elegant and easy to use as possible. We consider the UTC website as an entire platform for engaging our stakeholders and enhancing our value to the transportation community.

Understanding current and emerging trends, as well as the long-term implications of autonomous vehicles on the personal auto business and mature customer base, will help

ensure that the industry continues to meet customers' evolving needs. The question is whether drivers trust the technology: are they willing to take the risk of ceding control of their vehicle to realize a potentially enormous gain in safety?

Project UMAT25-44

UMass Centralized Technology Transfer Initiatives

The focus of this initiative is on workforce development and technology transfer. During the Fall semester 2016 the University of Massachusetts, Amherst offered its first course in transportation aviation, "Air Transportation Systems". In January, a total of 36 UMass/Amherst students, faculty and staff attended the Transportation Research Board (TRB) 96th Annual Meeting. During the TRB meeting, 25 UMass/Amherst attendees participated in various sessions. In March, we participated in the Massachusetts Department of Transportation (MassDOT) Innovation & Tech Transfer Exchange, which attracted over 800 participants. UMass/Amherst faculty, staff and students were instrumental in organizing the conference for MassDOT.

2. Products

Journal publications

Abraham, H., McNulty, H., Mehler, B. & Reimer, B. (2017). A Case Study of Today's Automotive Dealerships: The Introduction and Delivery of Advanced Driver Assistance Systems. *Transportation Research Record*. 2660. DOI: 10.3141/2660-02. Also appeared in (2017) Proceedings of *The Transportation Research Board 96th Annual Meeting*, Washington, DC.

Ahangari, H., Atkinson-Palombo, C., Garrick, N.W., "Is Building Bicycling Infrastructure a Path Towards Zero Vision for Traffic Fatality?", *Journal of Transport and Health* 3 (2), September 2016.

Ahangari, H., Atkinson-Palombo, C., Garrick, N.W., "Progress Towards Zero, An International Comparison: Improvements in Traffic Fatality from 1990 to 2010 for Different Age Groups in the USA and 15 of its Peers", *Journal of Safety Research*, April 2016.

Amirgholy, M., Gonzales, E.J. (2017). Analytical equilibrium of bicriterion choices with heterogeneous user preferences: Application to the morning commute problem. *Transportmetrica B*,

Amirgholy, M., Gonzales, E.J. (2017). Efficient frontier of route choice for modelling the equilibrium under travel time variability with heterogeneous traveler preferences. *Economics of Transportation*.

Bertolaccini, K. and N. Lownes (2017) Developing and Solving an Equitable Transit Network Design Model with a Genetic Algorithm Solution Approach, Proceedings of the 96th Annual Meeting of the Transportation Research Board, Paper #17-06547.

Buehler, Ralph, John Pucher, and Alan Altshuler. (Oct 2016). "Vienna's Path to Sustainable Transport." *International Journal of Sustainable Transportation*.

Dobres, J., Chahine, N. & Reimer, B. (2017). Effects of Ambient Illumination, Contrast Polarity, and Letter Size on Text Legibility Under Glance-like Reading. [*Applied Ergonomics*](#), 60(C), pp. 68-73.

Dobres, J., Chrysler, S.T., Wolfe, B., Chahine, N. & Reimer, B. (2017). Empirical Assessment of the Legibility of the Highway Gothic and Clearview Signage Fonts. [*Transportation Research Record*](#). 2624, pp. 1-8. DOI: 10.3141/2624-01. Also appeared as Signs of the Times: Empirical Assessment of the Legibility of the Highway Gothic and Clearview Signage Fonts in (2017) Proceedings of [*The Transportation Research Board 96th Annual Meeting*](#), Washington, DC. [2016 Best Paper Award - TRB Traffic Control Devices Committee].

Floberg, K., Atkinson-Palombo, C., and Garrick, N., An Assessment of How Land is Used in Cities at Different Levels of Automobility, Transportation Research Board Annual Meeting, 1st August 2016.

Floberg, K., Atkinson-Palombo, C., and Garrick, N., Walkability Lessons from the Past, Congress for New Urbanism. Submitted for presentation at the CNU Conference in Seattle, May 2017, and for publication on the CNU website. Accepted 3/23/17.

Garceau, T., Atkinson-Palombo, C., and Garrick, N., Peak Car Travel in the United States: A Two-Decade Long Phenomenon at the State Level Transportation Research Record, [Accepted 03/15].

Garceau, T., Atkinson-Palombo, C., and Garrick, N., Peak Travel and the Decoupling of Vehicle Miles Travelled and Gross Domestic Product: A Synthesis of the Literature, Transportation Research Record: Travel Behavior (2014), 1, 2412, 41-48.

Garceau, T., Atkinson-Palombo, C., Garrick, N. and Ahangari, H., Decreasing Vehicle Miles Traveled (VMT) per capita in the United States: The Role of the Back-to-City Movement, Smart Growth Policy, Demographic Changes and Increased Poverty, Transportation Research Board, 2016 Annual Meeting (submitted 8/1/2016). (being revised for resubmission to the Journal of Transport Geography)

Garceau, T., Atkinson-Palombo, C., Garrick, N. and Ahangari, H., The State of Driving in the United States: A Study of Travel Behavior Factors at the State-Level, Under Revision for submission to the Journal of Transport Geography.

Lee, J., Mehler, B., Reimer, B., Ebe, K. & Coughlin, J.F. (in press). Relationships between older drivers' cognitive abilities as assessed on the MoCA and glance patterns during visual-manual radio tuning while driving. [*The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*](#).

Lee, J., Roberts, S.C., Reimer, B. & Mehler, B. (2017). Does Order Matter? Investigating the Effect of Sequence on Glance Duration During On-road Driving. [*PLoS ONE*](#), 12(2).

Lee, J., Sawyer, B.D., Mehler, B., Angell, L., Seppelt, B.D., Seaman, S., Fridman, L. & Reimer, B. (2017). Linking the Detection Response Task and the AttenD Algorithm through the Assessment of Human-Machine Interface Workload. [*Transportation Research Record*](#). 2663. DOI: 10.3141/2663-11. Also appeared in (2017) Proceedings of [*The Transportation Research Board 96th Annual Meeting*](#), Washington, DC.

Muñoz, M., Reimer, B., Lee, J., Mehler, B. & Fridman, L. (2016). Distinguishing Patterns in Drivers' Visual Attention Allocation Using Hidden Markov Models. [*Transportation Research Part F: Traffic Psychology and Behaviour*](#)

Wolfe, B., Dobres, J., Kosovicheva, A., Rosenholtz, R. & Reimer, B. (2016). Age-related Differences in the Legibility of Degraded Text. [*Cognitive Research: Principles and Implications*](#), 1(22), pp. 1-13.

Books, dissertations, or one-time publication

Bertolaccini, K. L. (2015). Designing Transit Networks for Equity and Accessibility, Doctoral Dissertation.

Davis, Diane E. (Dec 2016). "Sense and the City." Modus, Royal Institute of Chartered Surveyors.

Floberg, K, MSc Thesis: Walkability Lessons from the Past. Defended: December 2016.

Garceau, T. PhD Dissertation on "Vehicle Miles Travelled: An Analysis of Trends and Implications", August 2015.

Hamed Ahangari. PhD Dissertation on "A Comprehensive Comparative Assessment of Road Safety in Developed Countries", August 2015. PhD Conferred.

Other publications, conference papers and presentations

"Response to NHTSA on March 2016 Report to Congress on: (Lap/Shoulder Belts) Retrofit Assessment for Existing Motorcoaches", submitted to National Highway Traffic Safety Administration (NHTSA)

Abdić, I., Fridman, L., Marchi, E., Brown, D.E., Angell, W. Reimer, B. & Schuller, B. (2016). Detecting Road Surface Wetness from Audio: A Deep Learning Approach. In *the Proceedings 23rd International Conference on Pattern Recognition (ICPR)*. Cancun, Mexico. pp. 3447-3452.

Abraham, H., Lee, C., Brady, S., Fitzgerald, C., Mehler, B., Reimer, B. & Coughlin, J.F. (2017). Autonomous Vehicles and Alternatives to Driving: Trust, Preferences, and Effects of Age. Proceedings of [*The Transportation Research Board 96th Annual Meeting*](#), Washington, DC.

Amirgholy, M., Golshani, N., Schneider, C., Gonzales, E.J. (2017). Advanced traveler navigation system adapted to route choice preferences of individual users. Paper Number 17-05826. Transportation Research Board 96th Annual Meeting, 8–12 January, Washington, D.C.

Amirgholy, M., Gonzales, E.J. (2017). Efficient frontier of the trip schedules in the morning commute problem: User equilibrium, system optimum, and dynamic pricing. Paper Number 17-05891. Transportation Research Board 96th Annual Meeting, 8–12 January, Washington, D.C.

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Technologies or techniques

Project MITR25-1

Capturing the Relationship between Social Interaction and Travel Behavior Using Smart Phones

We have developed a conceptual approach to the collection of social interaction information within the framework of a travel survey platform that we call the Future Mobility Sensing (FMS). FMS is a smartphone-based system that tracks users' trips and activities and detects certain trip attributes such as the mode. Users can visualize their travel and activities as an activity diary on a website where they also have the option to validate their trips and answer

further questions (prompted recall survey). The FMS has initially been developed as part of the Future Urban Mobility project of the MIT-Singapore Alliance for Research and Technology (SMART) and is under continuous development as part of other projects as well including this UTC project.

Project UMAR25-29

An Innovative Design to Retrofit Seatbelts in Motorcoaches

The technologies and techniques that result from this research project focus on those that provide the most effective guidelines to the safe and economical implementation of seatbelts on motorcoaches. Discussion with individuals who would be directly involved in seatbelt retrofit installations at DATTCO and American Seating were an important step toward actual implementation of the developed technology and installation techniques.

Project UCNR25-35

Clustering Algorithms for Transit Network Design

This project uses a novel form of Genetic Algorithm (GA) to solve instances of the transit network design problem. The GA uses new initial solution generation, crossover and mutation functions to address complexities introduced by the use of equity as an objective as opposed to cost minimization.

Inventions, patent applications, and licenses

Project UMAR25-29

An Innovative Design to Retrofit Seatbelts in Motorcoaches

A US patent for “Retrofit Seat Belt System” was filed as patent application PCT/US/1532218 in May of 2015 and is published as WO2015179784 A1 in January 2016. UMA 17-040 provisional patent application Ref. No.: 42740-38PROV, “Retrofit Seatbelt System”.

Other products

Project MITR25-1

Capturing the Relationship between Social Interaction and Travel Behavior Using Smart Phones

We have incorporated some changes into the FMS Android and iOS apps as well as the web-application. The apps have undergone significant improvements over the past six months, in terms of to user-friendliness, compatibility with latest mobile OS versions etc. In addition, we have developed an interface to collect social media information from users. A Facebook app has been developed such that when an FMS user gives his authorization, we will be able to collect information such as number of friends, public pages that the user has liked as well as characteristics of the pages. This information can help us better understand the impact of social media on people’s activity and travel decisions.

3. Participants & Other Collaborating Organizations

Organizations that have been involved as partners

Charles and Anne Schewe, Sara's Wish Foundation (SWF), Amherst, MA
Metro North Railroad
MTA Capital Construction
New Jersey Transit, Amtrak
New York City Transit
Northeast Corridor Commission
NY City Department of Transportation
Port Authority of New York and New Jersey
Regional Planning Association
Tel-Aviv University, Israel
Transit Center, North Jersey Transportation Planning Authority
Tsinghua University, China, Collaborative research
United States Department of Transportation

Other collaborators or contacts that have been involved

Dave McLaughlin, Vice President of American Seating Corporation
East Japan Railway Company, Tokyo, Japan
Empire State Development Corporation
John Cieplik, General Manager of the Coach Builders Facility at Peter Pan Bus Lines
London School of Economics
Masdar Institute of Science and Technology, Abu Dhabi, UAE
Metropoline (bus company), Israel
Municipal Arts Society
Prof. Katsumi Matsuoka, Iwate University, Japan
Prof. Rajib Shaw, Keio University, Japan
Prof. Shoji Tsuchida, Kansai University, Japan
Rutgers University

4. Impact

The impact on the development of the principal disciplines of the program

Project MITR25-1

Capturing the Relationship between Social Interaction and Travel Behavior Using Smart Phones

Overall, the FMS technology has been recognized as state-of-the-art for smartphone based travel surveys, and are being applied and/or extended for data collection in several transportation related research projects. These include context-specific stated preferences

survey for new transport modes or services (in collaboration with Ford and University College of London), happy traveller survey, truck drivers' survey (with Singapore Urban Redevelopment Authority), and event-driven on-phone transit satisfaction survey (with Singapore Land Transport Authority and Massachusetts Bay Transportations Authority).

Project UCNR25-35

Clustering Algorithms for Transit Network Design

This research project has made advances in transit network design modeling and solution methods, most significantly with respect to the inclusion of equity as a priority in reconfiguring transit networks. This work has enhanced the ability of public transportation systems researchers to consider aspects such as equity in service provision as well as allowed them to leverage the increasing amount of data and test beds openly available to researchers.

The impact on other disciplines

Project UCNR25-33

Social Network Effects on Attitudes about Pedestrian Street Crossing Behavior

The Urban Communication Foundation, which invited Rebecca Townsend to deliver a presentation at their spotlight panel during the Eastern Communication Association convention in Boston in March/April 2017, is interested in future work in this area. The Communication discipline is growing interested in understanding how behavior and messages about pedestrian safety can be improved to bring results for people's safety.

The impact on the development of transportation workforce development

Nothing to report.

The impact on physical, institutional, and information resources at your university or other partner institutions

Project UMAR25-24

Operational and Emission Analyses of Roundabouts under Varied Vehicle and Pedestrian Demands

The field trajectory data collected alongside with NOx emission levels can be used to relate traffic operations at roundabouts with air quality metrics that can be very useful not only for the transportation discipline but also for air quality and public health. In addition, the comparison between microsimulation and driving simulation results with field data can inform the disciplines of human factors and calibration processes for microsimulation.

Project UMAR25-25

Evaluating the Effect of Google Glass on Driver Distraction

A major upgrade is scheduled for the driving simulator later this spring. The research helps provide the evidence that we need to continue to pursue improvements to our research lab infrastructure. These improvements include adding two screens, adding new visual channels for side mirrors, installing an in-vehicle component to make it easier to conduct research related to different in-vehicle displays, and increasing the field of view from 150 degrees

horizontally to greater than 220 degrees horizontally. We have added SimDriver to the suite of software available to researchers, and will be installing the newest version of SimDriver after the larger system upgrade. SimDriver makes it possible to provide the driver with the various levels of automation that vehicles of the future will include and study how drivers behave with the different levels of automation, especially when the automated driving suite requests or requires a transfer of control.

Project UMAR25-27
Route Choice in Congested Grid Networks

The research addresses problems that fall at the intersection of transportation engineering, economics, management science, and finance. With applications to traveler information systems, there are also connections to the fields of computer science and psychology, which are important for transferring the research results into practice.

The impact on technology transfer

Project MITR25-16
From Trip Data to the Energy Requirements of Personal Vehicle Travel

A successful application to ARPA-E built off of the results of this project, with the TripEnergy tool providing crucial functionality towards a metropolitan area-wide transportation simulation and optimization framework that is intended to become a working commercial product. This project will optimally allocate monetary rewards to travelers in the Boston metro area to reduce system-wide energy consumption and improve transportation network performance. We are continuing to leverage synergies between the two projects to improve both outcomes.

The impact on society beyond science and technology

Nothing to report.

5. CHANGES/PROBLEMS

Project UCNR25-34
Exploration of Human Psychological Factors Underlying Mobile Phone Usage Behaviors while Driving

During this reporting period, the progress has been slow owing to personnel limitations, but the research team has since addressed this issue. Over the upcoming summer and fall semesters, the research team is bringing additional personnel onboard to complete the tasks as outlined in the original proposal and in the continuation efforts. The personnel issue experienced during the last reporting period and subsequent measures implemented do not alter the scope, budget, or schedule of the project. The team is on track to pursue and complete the proposed research in a timely manner within the budget requested.

Additional information regarding Products and Impacts

Project UMAR25-25

Evaluating the Effect of Google Glass on Driver Distraction

The Arbella Human Performance Laboratory at the University of Massachusetts/Amherst (HPL) and the University of Massachusetts Transportation Center (UMTC) continue to grow in numbers and visibility. The Human Performance Laboratory now has four different driving simulator setups, including a full-sized car with a Realtime Technology Inc. (RTI) simulator, and often runs more than 1,000 participant sessions per year. We publish the results of our simulator and field research regularly. Research funded through these entities is now used to support one postdoctoral research associate, one research assistant professor, and new tenure-track faculty

Outputs

Nothing to report.

Outcomes

Nothing to report.

Impacts

Nothing to report