

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

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Project Title

University Transportation Centers Program – Region 1

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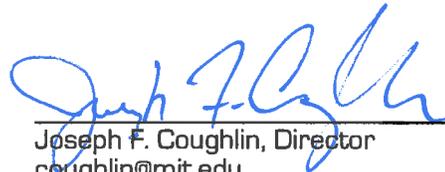
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REPORTING CATEGORIES

1. Accomplishments

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

Accomplishments under this goal

Following is the list of the 34 research projects under this grant, and their current status:

| Project No. | PI | Project Title | Current Status |
|-------------|----------------------------------|---|----------------|
| MITR24-1 | Ben-Akiva Abou-Zeid Zegras | Capturing the Relationship between Motility, Mobility and Well-Being Using Smart Phones | active |
| MITR24-2 | Coughlin | Transportation Wellbeing, Age and Safety | active |
| MITR24-3 | D'Ambrosio | Assessing Alternative Transportation Options for Older Users | active |
| MITR24-4 | Glass Mehler | Spoken Dialog Planning to Reduce User Distraction in Mobile Environments | active |
| MITR24-5 | Gonzalez | Transportation Model in the Boston Metropolitan Area from Origin Destination Matrices Generated with Big Data | active |
| MITR24-6 | Murga Salvucci | Kendall Square: Lessons Drawn from Its Past Development to Guide Its Future | active |

| | | | |
|-----------|----------------------|---|--------|
| MITR24-7 | Osorio | Urban Transportation Optimization: A Multi-Modal Simulation-Based Approach | active |
| MITR24-8 | Reimer | Technology Adoption and Use Across the Lifespan | active |
| MITR24-9 | Salvucci Murga | Development of a "Universal" Residential Public Transportation Pass, as Part of a Comprehensive Multi-Modal Approach to Urban Parking | active |
| MITR24-10 | Sheffi Goentzel | Big Data During Crisis: Lessons from Hurricane Irene | active |
| MITR24-11 | Sussman | Determining Performance Measures to Evaluate the Effect of High Speed Rail on Communities' Livability | active |
| HVDR24-12 | Howitt Giles | Disaster Recovery for Transportation: China's Wenchuan Earthquake of 2008 and Japan's Tohoku Earthquake and Tsunami of 2011 | active |
| HVDR24-13 | Gomez-Ibanez | The Challenges of Growth and Motorization: Transportation Policy in Rapidly Developing Cities | active |
| HVDR24-14 | Muehlegger Shoag | Cell Phones and Vehicle Safety | active |
| UMAR24-15 | Christofa Collura | A Person-based Comparison of Transit Preferential Treatments on Signalized Arterial Corridors | active |
| UMAR24-16 | Collura Burleson Gao | A Decision Support System to Assess Disruptive Impacts of Alternative Transportation Financing Approaches | active |
| UMAR24-17 | Fisher Romoser | Moving Map Displays: Using CTIL and Eye Tracking Technologies to Measure Distraction in Locomotive Cabs | active |
| UMAR24-18 | Ganz Collura | Hybrid NFC and Vision Based Navigation System in Subways for the Blind and Visually Impaired | active |

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|-----------|----------------------------------|--|--------|
| UMAR24-19 | Gao | A Spatial Learning Model for the Micro-Simulation of Travel Dynamics | active |
| UMAR24-20 | Gao | Cognitive Maps for Route Choice Modeling | active |
| UMAR24-21 | Gartner Jones Statmatiadis | Robust Performance of Transportation Networks Using Quantile Metrics | active |
| UMAR24-22 | Knodler Romoser Fisher | Evaluating the Effects of Integrated Training on Minimizing Driver Distraction | active |
| UMAR24-23 | Ni Gao | Making More Value out of Transportation Data | active |
| UMAR24-24 | Ni | Modeling Drivers' Lateral Motion Control | active |
| UMAR24-25 | Romoser Knodler Fisher | Reducing Older Driver Crashes: Technology, Training and Livable Communities | active |
| UMAR24-26 | Stamatiadis Gartner Xie | ITS Equipment Placement for Safety and Mobility | active |
| UMAR24-27 | Zarillo Collura Burleson | Security & Privacy Breaches in ETPS: Problem Survey & Case Study of I-90 | active |
| UCNR24-28 | Garrick Atkinson- Palombo | The Impact of Parking Policies on the Long-term Vitality of American Cities | active |
| UCNR24-29 | Gokhale Lownes | Automated Congestion Prediction with Smart Phones | active |
| UCNR24-30 | Ivan Ravishanker | Investigation of Road and Roadside Design Elements Associated with Elderly Pedestrian Safety | active |
| UCNR24-31 | Konduri Lownes | Transportation System Modeling in the Information Era | active |
| UCNR24-32 | Lownes | t-HUB: Connecticut Public Transport Data Hub | active |

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|-----------|--------|--|--------|
| UMER24-33 | Garder | Elderly Pedestrian Safety and Driver Distractions | active |
| UMER24-34 | Rubin | Regional Credit Trading: Economic and GHG Impacts of a National Low Carbon Fuel Standard | active |

**MIT Industrial Liaison Program profiles Dr. Reimer
March 18, 2013**

New England Center associate director Dr. Bryan Reimer was featured by MIT's Industrial Liaison Program in the ILP Insider. The profile overviews his work in optimizing driver-vehicle interface, including recent findings in typeface and driver distraction. Read the article [here](#).

**Age-Proofing the City: MIT's Michal Isaacson & Hilde Waerstad featured in The Atlantic
June 16, 2013**

The New England Center's research on livable communities and development of the USDOT-funded MALL or Massachusetts Avenue Living Laboratory project was featured in The Atlantic. Urban Geographer and MIT Post-doc Michal Issacson described her work using GPS to track mobility patterns of older adults along with MIT's Hilde Waerstad, a geriatric physical therapist who discussed the next version of [AGNES](#) (Age Gain Now Empathy System) to help students and researchers understand the daily friction faced by older adults navigating the urban landscape. Read the article [here](#).

**Reimer speaks with USA Today about challenges to driverless cars
June 11, 2013**

New England Center associate director Dr. Bryan Reimer spoke with [USA Today](#) about the challenges he believes developers will face on the road towards the driverless car. Read the article [here](#).

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.

Accomplishments under this goal

Following is the list of the 5 education projects under this grant, and their current status:

| Project No. | PI | Project Title | Current Status |
|--------------------|------------------------|---|-----------------------|
| MITE24-35 | Coughlin | Massachusetts Avenue Area Living Laboratory (MALL) | active |
| MITE24-36 | Jarzombek Hendricks | Engaging emerging minority youth in real-time, community-based transportation research and modeling | active |
| UMAE24-37 | Knodler | Creating an Education ASSET | active |
| UCNE24-38 | Lownes | Senior Design | active |
| UCNE24-39 | Lownes | Graduate Course | active |

Bertolaccini named 2012 Outstanding Student

January 10, 2013

Ms. Kelly Bertolaccini received the UTC Outstanding Student Award of 2012 from the New England University Transportation Center. She earned dual undergraduate degrees in Civil Engineering (B.S.) and English (B.A.) from the University of Connecticut (UConn) in 2010. After graduating, she entered UConn's Transportation Engineering and Urban Planning graduate program. Ms. Bertolaccini recently defended her Master's thesis on the equitable distribution of transit services and will continue her graduate studies as a PhD student in UConn's transportation program. She will participate in a graduate exchange program with the University of New South Wales, Australia this spring semester.

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 | Current Status |
|-------------|----------|---|----------------|
| MITT24-45 | Coughlin | MIT Technology Transfer Initiative | active |
| UCNT24-46 | Shea | LTAP/TTAP Core Competency Development and Pilot | active |

Accomplishments under this goal

Project UMAR24-18 Hybrid NFC and Vision Based Navigation System in Subways for the Blind and Visually Impaired

We have written and submitted a conference paper concerning the PERCEPT system, using hybrid tags for the MBTA system, which we designed and implemented.

Project UMAE4-25 Reducing Older Driver Crashes: Technology, Training and Livable

A mobile capable training system for older drivers has been created for use in our study.

Project UMAR24-15 Project UMAR24-15 A Person-based Comparison of Transit Preferential Treatments on Signalized Arterial Corridors

A poster presentation was given at the ITE Northeastern District Annual Meeting, Northampton, MA on May 23, 2013.

Plans during the next reporting period to accomplish the goals

Project UCNR24-31 Transportation System Modeling in the Information Era

The research team is currently in the process of testing different analytical tools for the dynamic traffic assignment. The team will soon select a tool best applicable for the proposed effort and then proceed with next steps including integrated model development, and scenario analysis using the integrated modeling tool. The team will be presenting preliminary results at the Conference on Agent-Based Modeling in Transportation Planning and Operations scheduled to run from September 30 through October 2, 2013 in Blacksburg, Virginia.

Project UCNR24-32 t-HUB: Connecticut Public Transport Data Hub

At the completion of this project we will have a public transit database and a prototype of NetWare designed to access the database through an intuitive GIS-based graphical user interface.

Project UMAR24-16 A Decision Support System to Assess Disruptive Impacts of Alternative Transportation Financing Approaches

A paper will be presented at the January 2014 Transportation Research Board Annual Meeting in Washington DC.

2. Products

Journal publications

Archilla, Andrés. Intercity Passenger Rail Productivity in the Northeast Corridor: Implications for the Future of High-Speed Rail. [<http://cee.mit.edu/graduates/mst/theses>].

C.M. Schneider, V. Belik, T. Couronne, Z. Smoreda and M.C. González, "Unraveling Daily Human Mobility Motifs", *J R Soc Interface* 20130246 (2013).

Coughlin, J.F., Mehler, B. & Reimer, B. (2013). Population Aging and The Evolution of High-performance Environments: Implications for a New Social Intelligence. *IQT Quarterly*, 4(3), pp. 25-29.

Dong, H., J. Schafer, A. Ganz, Visual Tag Detection for Visually Impaired Users using an Android Smartphone", International Conference on Bioinformatics, Computational Biology, Biomedical Engineering, Oslo, Norway, July 2013.

NEC FUTURE Tier I Scoping Process: Public Comment (.pdf ESD-WP-2012-27).

MIT MCP thesis titled "Understanding Patterns of Growth at Kendall Square Using a System Dynamics Approach" by Laura Beatriz Vina-Arias. [forthcoming Spring 2014].

MIT MST thesis titled "Exploring the Relationship Between Destination Accessibility, Cluster Formation and Employment Growth in Kendall Square" by Tatiana Peralta-Quiros. [forthcoming Spring 2014].

Osorio, C. and Selvam, K.K. (2013), Solving Urban Transportation Problems by Combing the use of Multiple Traffic Simulation Models. MIT Working Paper, Department of Civil and Environmental Engineering, Massachusetts Institute of Technology.

Plotnikov, Michael, J. Collura, S. Gao and W. Burleson - "A Decision Support System to Assess the Impacts of Placing Tolls along Interstate Highways." In the proceedings of the TRB 92nd Annual Meeting. Washington, D.C., 2013.

Reimer, B., Fried, R., Mehler, B., Joshi, G., Bolfek, A., Godfrey, K.M., Zhao, N., Goldin, R. & Biederman, J. (in press). Examining Driving Behavior in Young Adults with High Functioning Autism Spectrum Disorders: A Pilot Study using a Driving Simulation Paradigm. *Journal of Autism and Developmental Disorders*.

Reimer, B., Donmez, B., Lavallière, M., Mehler, B., Coughlin, J.F. & Teasdale, N. (2013). Impact of Age and Cognitive Demand on Lane Choice and Changing Under Actual Highway Conditions. *Accident Analysis and Prevention*, 52, pp. 125-2132.

Stein, Naomi. Spatial Dimensions of High-Speed Rail: Intermediate Cities, Inter-jurisdictional Planning, and the Implications for High-Speed Rail in Portugal. [<http://cee.mit.edu/graduates/mst/theses>].

Zhao, N., Reimer, B., Mehler, B., D'Ambrosio, L.A. & Coughlin, J.F. (in press). Self-Reported and Observed Risky Driving Behaviors among Frequent and Infrequent Cell Phone Users. *Accident Analysis and Prevention*.

Other publications, conference papers and presentations

Dobres, J., Potter, A., Reimer, B., Mehler, B., Mehler, A. & Coughlin, J.F. (2013). Assessing the Impact of “Brain Training” on Changes in Driving Performance, Visual Behavior, and Neuropsychology. Proceedings of *the 7th International Driving Symposium on Human Factors in Driver Assessment, Training, and Vehicle Design*. Bolton Landing, NY. 50-56.

Howitt, A., “Perspectives on Disaster Recovery,” Canon Institute for Global Studies, Tokyo, Japan, February 18, 2013.

Howitt, A., “Getting Ready for Crisis,” at a conference, “Crisis Management for the 21st Century,” National Graduate Institute for Policy Studies, Tokyo, Japan, February 19, 2013.

Howitt, A., “A Web-based GIS for Measuring Equity in A Public Transportation System”, American Association of Geographers, April 13, 2013: Los Angeles, CA.

Giles, D. “The Tohoku Disaster: Emergency Response to the Great East Japan Earthquake and Tsunami,” at a conference “Crisis Management for the 21st Century,” National Graduate Institute for Policy Studies, Tokyo, Japan, February 19, 2013.

Jiang, S., G. Fiore, Y. Yang, J. Ferreira Jr., E. Frazzoli, and M.C. González, “A Review of Urban Computing for Mobile Phone Traces: Current Methods, Challenges and Opportunities” UrbComp '13: Proceedings of the ACM SIGKDD (accepted).

Leden, L., Per Gårder, Anna Schirokoff, Hector Monterde-i-Bort, Charlotta Johansson and Socrates Basbas, “Is ITS the solution to creating a safe city environment for children?” Road Safety on Four Continents, 16th International Conference, Beijing, China, 15-17 May 2013.

Mehler, B. & Reimer, B. (2013). An Initial Assessment of the Significance of Task Pacing on Self-Report and Physiological Measures of Workload While Driving. Proceedings of *the 7th International Driving Symposium on Human Factors in Driver Assessment, Training, and Vehicle Design*. Bolton Landing, NY. 170-176.

Reimer (2013) Keynote, Implications of Autonomous Driving: Could “We” be a Near Term Threat? Japan International Transport Institute Safer Vehicle Seminar, Washington, DC. March 20, 2013.

Reimer (2013) Disconnects in the driver distraction equation: It’s more than the technology! Lifesavers, Denver, CO. April 15, 2013.

Reimer (2013) Technological advances in the driver-vehicle interface: implications for older adult mobility and safety. MIT Tech Reunions 6th Annual Cardinal and Gray Academy, Cambridge, MA. June 7, 2013.

Reimer (2013) Keynote, The Future is Autonomous Driving - But Are “We” on a Near Term Collision Course? AUVSI Driverless Car Summit, Detroit, MI. June 11, 2013.

Reimer, B., Mehler, B., McAnulty, H., Munger, D., Mehler, A., Garcia Perez, E.A., Manhardt, T. & Coughlin, J.F. (2013). A Preliminary Assessment of Perceived and Objectively Scaled Workload of a Voice-Based Driver Interface. Proceedings of *the 7th International Driving Symposium on Human Factors in Driver Assessment, Training, and Vehicle Design*. Bolton Landing, NY. 537-543.

Schneider, C.M., C. Rudloff, D. Bauer, and M.C. González, “Daily travel behavior: Lessons from a week-long survey for the extraction of human mobility motifs related information” UrbComp

'13: Proceedings of the ACM SIGKDD [accepted].

Yang, Y., Reimer, B., Mehler, B. & Dobres, J. (2013). A Field Study Assessing Driving Performance, Visual Attention, Heart Rate and Subjective Ratings in Response to Two Types of Cognitive Workload. Proceedings of *the 7th International Driving Symposium on Human Factors in Driver Assessment, Training, and Vehicle Design*. Bolton Landing, NY. 397-403.

Yang, Y., Reimer, B., Mehler, B., Wong, A., McDonald, M. & Coughlin, J.F. (2013). Distraction, Experience and Drivers' Coping Strategy. Proceedings of *The Transportation Research Board 92nd Annual Meeting*, Washington, DC.

Websites or other Internet sites

Self-driving cars could have long road to acceptance. USA Today, June 14, 2013

Driverless Car Summit Starts With Focus on Implementation. Robotics Tomorrow, June 11, 2013

Driverless cars should slow down, some say. USA Today, June 10, 2013

The driverless car: where is it taking us?. Future Tense - ABC Radio National (Australian Broadcasting Corporation), June 2, 2013

Building a Better "Smarter" Car. The Weather Channel, May 15, 2013

Semiautonomous Cadillacs Hit the Road for Testing. The New York Times, April 30, 2013

Proceed with Caution toward the Self-Driving Car. MIT Technology Review, April 16, 2013

As Workload Overwhelms, Cars Are Set to Intervene. The New York Times, April 5, 2013

Driving concerns. Simons Foundation Autism Research Initiative (SFARI), March 8, 2013

Can You Be Trusted With a Driverless Car? Next Avenue, January 16, 2013

Future Cars Will Monitor Driver's Health. WBZ CBS News, January 16, 2013

The Right Type: How humanist fonts could improve driver safety. MIT Technology Review, January 2, 2013

Vital Signs. Vision Zero International, January, 2013

<http://web.mit.edu/newsoffice/2013/people-organize-daily-travel-efficiently-0508.html>

Technologies or techniques

Project MITR24-5 Transportation Model in the Boston Metropolitan Area from Origin Destination Matrices Generated with Big Data

Using travel survey and cellphone usage data for Paris, Boston and Chicago, we found that with each increase in the number of locations a person visits in a day, the possible configurations of those trips (home to work to home to store to restaurant to home etc.) grows exponentially. However, only four of these travel configurations are used. For instance, if the number of locations visited is five, the number of possible trip configurations is 5,406. If the number of locations visited is six, there are 1,047,008 configurations. But only four configurations are used by 90 percent of the populations in each case. With such a finding we developed a Markov Chain model that allows building daily mobility chains in urban populations and relating survey data with mobile phone data.

Project MITR24-9 Development of a Universal Residential Public Transportation Pass

Tatiana Peralta's thesis (forthcoming) combines economic cluster creation and location theory with an accessibility approach, while acknowledging the impact of new trends among young professionals regarding housing location and commuting trends which differ from those associated to other main job centers in Boston.

Laura Vina's thesis (forthcoming) has adopted a System Dynamics approach to explore not only current trends but policy measures like housing development in close proximity to Kendall Square to compensate for the transport capacity issues faced by the Red Line.

Project MITR24-7 Urban Transportation Optimization: A Multi-Modal Simulation-Based Approach

The overall goal of this project was to allow transportation agencies to use multiple traffic simulation models to derive traffic management strategies. We focused on using traffic micro simulation models of varying scales in a simulation based optimization framework. When completed, this framework will allow efficient allocation of computational budget that will enable transportation agencies to solve problems at a local level using regional and local models simultaneously.

Project UCNR24-31 Transportation System Modeling in the Information Era

The study team utilized open-source platforms and commercial transportation planning software packages. The transportation demand component of the transportation system was modeled using OpenAMOS - Open-source Activity Mobility Simulator which is an open-source activity-based travel demand modeling tool available for use under GPL licensing agreements. The traffic component of the transportation system was modeled using either open-source packages such as DTALite, DynusT or a commercial solution such as Cube Avenue.

Project UCNR24-32 t-HUB: Connecticut Public Transport Data Hub

A prototype database architecture and initial software prototype are completed and have been demonstrated to Connecticut DOT and presented at the University of Queensland, Monash University and the University of New South Wales.

Project UMAR24-25 Reducing Older Driver Crashes: Technology, Training and Livable Communities

A "table top" mobile simulation training system has been created for this project.

Audio or video products

Project UCNR24-29 Automated Congested Prediction with Smart Phones

We have developed a smartphone application to collect driver location information and a database server to store this statistical information so that it can be used to develop new traffic prediction models. We have applied to our university's Institutional Review Board and received approval to share the app with students. These experiments will test the application and provide information for data sets, which will be shared with the broader research community. In the future, we plan to share the app through the universities app store. We will also share the smartphone application source code and database scripts available to interested researchers.

Project MITR24-12 Disaster Recovery for Transportation

Preliminary results of "Disaster Recovery for Transportation" were presented at a seminar sponsored by the Harvard University Asia Center on October 26, 2013. A video of this presentation, "Assessing Emergency Response to the 3.11 Earthquake/Tsunami/Nuclear Accident in Japan," made by Arnold Howitt, appears at <http://vimeo.com/52488882>

Other Products

Project MITR24-1 Capturing the Relationship between Motility, Mobility and Well-Being Using Smart Phones

We have developed a conceptual approach to a first and second phase implementation of happiness evaluations within a survey platform that we call the Future Mobility Survey (FMS). The FMS consists of a mobile app 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 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 MITR24-9 Development of a Universal Residential Public Transportation Pass

Models that we have developed:

- Transport accessibility models for the work commute
- Demand Models for Greater Boston describing 1990, 2000 and 2010 conditions
- Regression models between accessibility and job density per transport mode
- System Dynamic model of Kendall Square Development

We have also created a database of commuting patterns for the major job centers in Boston.

Project UCNR24-29 Automated Congested Prediction with Smart Phones

A database and software have been developed. The database stores information, including the time and location information of vehicles. A smartphone app collects this information and transmits it to the database through the internet by automatically interacting with a data entry webpage. The smartphone app and database have been successfully integrated and tested.

Project UCNR24-31 Transportation System Modeling in the Information Era

All project material and products including reports, software, and results will be disseminated for public use. However, data for the project was obtained from Capital Region Council of Governments (CROG) which is the metropolitan planning organization for the Hartford metropolitan area. Therefore, data utilized in the effort may be made available to interested individuals after consultation with CROG.

Project UMAR24-15 A Person-based Comparison of Transit Preferential Treatments on Signalized Arterial Corridors

The outcomes from studying the impact of geometric preferential treatments (e.g., bus lanes, queue jump lanes) on person-based measures of effectiveness (e.g., person delay) were presented by Yashar Farid at the student poster session during the ITE Northeastern District Annual Meeting, in Northampton, MA on May 23, 2013

3. Participants & Other Collaborating Organizations

Organizations that have been involved as partners

New York City Office of Emergency Management, Brooklyn, NY - in-kind support (consultation)

Idibon, San Francisco - in-kind support (tools and consultation time)

Gnip, Boulder, CO - Partial in-kind support (We began negotiating terms to acquire Twitter data from Gnip. MIT Contracts Office continues to work with the company in agreeing to terms for data sharing. Gnip will charge for this service, recovering their direct cost but potentially providing partial in-kind support.

BMW (Munich, Germany) - provides financial support and expertise

Mobile Reward Platform, USA.

IST, Lisbon, Portugal - Provides facilities, collaborative research is performed and personnel exchange is carried out

Graduate School of Global Environmental Studies, Kyoto University, Kyoto, Japan – academic institution. Host of Howitt, Giles, and Akiyama during stay in Japan: May 21-July 13, 2013. Provided office space for all three and, in addition, local living and travel expenses for Howitt during this period. Prof. Rajib Shaw and researcher Shohei Matsuura are facilitating research contacts in the earthquake/tsunami area and participating in some project interviews.

The Capital Region Council of Governments (Hartford, CT) - provides research effort by providing data for their regional travel demand model. No financial support was provided and the support was provided in-kind.

Other collaborators or contacts that have been involved

New England Members of the Workforce Development Summit Planning Committee.

Center for Transportation and Livable Systems, Storrs, CT - Financial support; facilities.

Connecticut Department of Transportation, Newington, CT - Financial support.

New England Representatives from UTC's and LTAP Centers on the Workforce Development Summit Planning Committee.

4. Impact

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

Project MITR24-5 Transportation Model in the Boston Metropolitan Area from Origin Destination Matrices Generated with Big Data

The prevalence of the 17 trip configurations indicates that they represent “motifs,” which in network theory are patterns that occur with a frequency much larger than by random chances. The presence of motifs indicates that the study has uncovered a basic principle that can be used in predictive models for daily intracity travel, allowing trip chains to be based on a relatively simple mathematical formula and considerably reducing the complexity of algorithms that simulate behavior.

Project MITR24-1 Capturing the Relationship between Motility, Mobility and Well-Being Using Smart Phones

The conceptual approaches that we are working on for the measurement of happiness are expected to have an impact on the state of the art in transportation planning surveys and modeling methodologies. In previous research on happiness, we have proposed and collected (in Denver, through DRCOG) measures of overall activity pattern happiness, which we are using to extend activity pattern generation models by adding happiness indicators to them. The current research goes a step further by collecting measures of happiness with every activity conducted in a day as well as by testing real-time measures as opposed to purely retrospective measures.

Project MITR24-9 Development of a Universal Residential Public Transportation Pass

This research has resulted in a good explanation on the recent socio-economic development of Kendall Square, Cambridge, based on the forces and circumstances that played a critical role, together with the policies recommended to sustain its current patterns of development.

Project MITR24-7 Urban Transportation Optimization: A Multi-Modal Simulation-Based Approach

The methodologies developed build upon state of the art simulation based optimization techniques. By combining traditional traffic assignment with a queuing theory based model to account for congestion and blocking, this work attempts to take advantage of the detail in large scale models and the low computational overhead associated with small scale models.

Project MITR24-12 Disaster Recovery for Transportation

When completed, this project will provide information in the transportation field about how Japan has managed emergency response and recovery from the Great East Japan Earthquake of 2011. This will provide insight into methods of restoring transportation services in the face of catastrophic disaster, potentially helping transportation planners and operators better prepare for future catastrophic events.

Project UCNR24-29 Automated Congested Prediction with Smart Phones

It is expected that the data collection techniques under development will provide significantly richer data for transportation modeling and simulation. For example, these modeling and simulation techniques will be useful for predicting congestion in existing networks as well as simulating the performance of proposed networks.

Project UCNR24-32 t-HUB: Connecticut Public Transport Data Hub

The results of this research will have profound impacts on the management of transit data and the usage of data in public transit planning and operations. In particular, the t-HUB database and webtool will create a centralized repository of the network, demographic and

socio-economic data necessary to perform equity and environmental justice analysis by transit planners and operators. Furthermore, the repository will create a valuable resource for students and researchers looking for living laboratory opportunities – that is, opportunities to test their methods, techniques and technologies on real data from real transit systems.

Project UMAR24-15 A Person-based Comparison of Transit Preferential Treatments on Signalized Arterial Corridors

The research offers guidance on choosing transit preferential treatments for various traffic and transit operating conditions in urban multi-modal transportation systems; allows us to determine the best preferential treatment to be implemented that will improve person mobility and the reliability of transit service without compromising the performance of cars too much. More reliable transit operations improve its economic competitiveness, which along with improved efficiency of traffic and transit operations can lead to enhanced air quality and more livable urban areas

Project UMAR24-19 A Spatial Learning Model for the Micro-Simulation of Travel Dynamics

This research will result in more accurate user performance prediction models.

Project UMAR24-20 Cognitive Maps for Route Choice Modeling

This research will result in more accurate user performance prediction models.

Project UMAR24-23 Making More Value out of Transportation Data

This research will allow better understanding of highway traffic flow, especially tools that help analyze dynamics of traffic flow and its safety at a very fine level of detail.

Project UMAR24-24 Modeling Drivers' Lateral Motion Control

This research will add to our existing knowledge base regarding traffic data processing and traffic information.

Project UMAR24-25 Reducing Older Driver Crashes: Technology, Training and Livable Communities

The development of mobile-capable training for older drivers will allow for much wider and cost-effective dissemination. In the past, simulator-based training for older drivers has been shown to be highly effective in improving older drivers' scanning for hazards – especially in intersections where they are most at risk. The primary research question is whether this same training, delivered on a smaller, more compact and lower cost interface is as effective as simulator-based training.

[The impact on other disciplines](#)

Project MITR24-1 Capturing the Relationship between Motility, Mobility and Well-Being Using Smart Phones

The techniques developed in this research are likely to be of use to other researchers working in the field of subjective well-being measurement (covering a broad range of application areas).

Project MITR24-9 Development of a Universal Residential Public Transportation Pass

The two MIT Master's theses this project produces should be of interest to transport planners, urban planners and those focused on economic development projects.

Project UCNR24-29 Automated Congested Prediction with Smart Phones

It is expected that the contributions will impact the field of intelligent transportation by

providing models that can be used by algorithms used to plan vehicle routes as well as deliver timely safety alerts to drivers.

Project UCNR24-32 t-HUB: Connecticut Public Transport Data Hub

Both computer science and geography stand to benefit from this project, as it will serve as an example of a successful collaboration between civil engineering, computer science & engineering and geography.

Project UMAR24-23 Making More Value out of Transportation Data

Outcomes of this research will lend a useful perspective to address problems in other disciplines such as granular flow, flocks of birds, and active particles.

Project UMAR24-24 Modeling Drivers' Lateral Motion Control

Outcomes of this research are useful for other systems that involve flows and sensors such as the Internet, commodity flow, and manufacturing.

Project UMAR24-25 Reducing Older Driver Crashes: Technology, Training and Livable Communities

The training developed for this program has implications for driver training in other at risk groups including teenage drivers and drivers recovering from brain injury as well as driving for professional services such as police, fire fighters, EMTs and commercial drivers.

The impact on the development of transportation workforce development

Project MITR24-5 Transportation Model in the Boston Metropolitan Area from Origin Destination Matrices Generated with Big Data

This work connects passive information gathered from big data sources such as mobile phone data, with travel surveys and transportation models.

Project MITR24-1 Capturing the Relationship between Motility, Mobility and Well-Being Using Smart Phones

This research project involves several graduate students who are receiving training in transportation research methods.

Project MITR24-9 Development of a Universal Residential Public Transportation Pass

The research experience may be extrapolated to different contexts both nationally and internationally.

Project UMAR24-23 Making More Value out of Transportation Data

Outcomes of this research can be integrated into classroom teaching and help prepare a qualified transportation workforce in the future.

Project UMAR24-24 Modeling Drivers' Lateral Motion Control

Outcomes of this research can be integrated into classroom teaching and help prepare a qualified transportation workforce in the future.

The impact on physical, institutional, and information resources

Project MITR24-5 Transportation Model in the Boston Metropolitan Area from Origin Destination Matrices Generated with Big Data

Our findings represent very low cost alternatives to travel surveys. Using phone data, we

created a very simple mathematical model called the “Perturbation Model” (people who make one additional trip beyond going to work are in a perturbed state and are likely to add yet another location to their day), this allows to make predictions and model of trips from passive sources such as GPS and mobile phone data.

Project MITR24-9 Development of a Universal Residential Public Transportation Pass

This research will demonstrate an excellent example of public-private collaboration.

Project MITR24-11 Determining Performance Measures to Evaluate the Effect of High Speed Rail on Communities’ Livability

This research provided opportunities for research and teaching in transportation and related disciplines. Also, graduate students working on the project, all soon to enter professional practice, have benefitted from the research experience.

Project MITR24-12 Disaster Recovery for Transportation

The project will increase Harvard’s knowledge of Japan, in particular about its transportation response to disaster.

Project UCNR24-29 Automated Congested Prediction with Smart Phones

The database of transportation statistics will serve as a repository of information for researchers in the field of transportation modeling. Several of the initial trips recorded have been prepared in multiple formats for ease of sharing, including comma separated values and excel spreadsheets containing the sequence of geo coordinates. A database query tool that allows a user to select a subset of the data based on the time and location of interest is planned.

Project UMAR24-15 A Person-based Comparison of Transit Preferential Treatments on Signalized Arterial Corridors

A ten-intersection signalized arterial of San Pablo Avenue in Berkeley, CA has been built in the simulation software Aimsun and can become available to other researchers in the University. Several modifications of the existing arterial have been coded, namely: additional exclusive bus lane, replacement of an existing lane with an exclusive bus lane and insertion of queue jump lanes.

Project UMAR24-23 Making More Value out of Transportation Data

Publications and presentations resulted from this research will contribute to the success of the university.

Project UMAR24-24 Modeling Drivers’ Lateral Motion Control

Experiments of this research can add to existing facility at the University, the Regional Traveler Information Center, and allow it to be more functional.

[The impact on technology transfer](#)

Project MITR24-5 Transportation Model in the Boston Metropolitan Area from Origin Destination Matrices Generated with Big Data

This research will result in a transfer to industry: new research agreements with Ford and Accenture based on the current findings.

Project MITR24-7 Urban Transportation Optimization: A Multi-Modal Simulation-Based Approach

When fully implemented, the methods that result from this project could potentially be integrated into software that is used for traffic micro-simulation.

Project UCNR24-29 Automated Congested Prediction with Smart Phones

The transportation models resulting from the research are expected to assist individuals at highway operations centers predict congestion more accurately. This should simplify their task overseeing traffic conditions.

Project UCNR24-32 t-HUB: Connecticut Public Transport Data Hub

A second workshop for transit operators and regional planners was held February 7, 2013. This workshop, funded through the Connecticut DOT was affiliated with t-HUB and dealt with Title VI reporting requirements to FTA.

[The impact on society beyond science and technology](#)

Project MITR24-1 Capturing the Relationship between Motility, Mobility and Well-Being Using Smart Phones

In future phases of the project, we will study how providing information to travelers about their travel and activity patterns (via the Smartphone app or the survey website) and how they compare to others may influence their travel behavior. For instance, feedback may be offered to make their travel patterns more efficient or more sustainable.

Project MITR24-9 Development of a Universal Residential Public Transportation Pass

Both the results from the regression analyses as well as from the System Dynamic approach show the non intuitive nature of the recommended policies.

Project MITR24-7 Urban Transportation Optimization: A Multi-Modal Simulation-Based Approach

The efficient traffic management strategies resulting from this approach will mitigate congestion in urban areas by enabling us to derive more benefits from existing transportation infrastructure. The same strategy could also be used to identify energy-efficient traffic management strategies that will improve the livability of urban communities.

**Project MITR24-12 Disaster Recovery for Transportation
Disaster Recovery in Transportation**

Potentially, this will help society better prepare for catastrophic disasters.

Project UCNR24-29 Automated Congested Prediction with Smart Phones

The data collection and modeling research are expected to lead to more accurate transportation simulation and design studies, which should improve the efficiency of future transportation networks. Improved transportation network efficiency conserves fuel, money, and the environment.

Project UMAR24-15 A Person-based Comparison of Transit Preferential Treatments on Signalized Arterial Corridors

Designing efficient transit preferential treatments that improve transit operations and person mobility in congested urban areas is expected to improve the reliability of transit service. This could potentially encourage more travelers to use the transit service, which would lead to reduced congestion, time spent traveling, and air pollution. In general, it is expected to improve the livability of large metropolitan areas.

Project UMAR24-25 Reducing Older Driver Crashes: Technology, Training and Livable Communities

Driving instructors and occupational therapists who work directly with older drivers would

primarily be primary target audience for such training. Therapists could prescribe training programs for those drivers they believe would benefit from additional remediation of driving skills.

5. Changes/Problems

Changes in approach

Project UCNT24-46 LTAP/TTAP Core Competency Development and Pilot

The research scope will now include work on the New England Workforce Development Summit planning committee and participation in the Workforce Development Summit as a way to bring statewide representatives together to begin the work of developing the set of core competencies, the projects ultimate goal.

Project UMAR24-15 A Person-based Comparison of Transit Preferential Treatments on Signalized Arterial Corridors

We have decided to focus the simulation tests on a four-intersection segment of the signalized arterial of San Pablo Avenue instead of the ten-intersection one that was originally planned. The reason for this change is that the ten-intersection segment included links that were not long enough to allow for introduction of queue jump lanes of sufficient length. Therefore, in order to make comparisons of equivalent scenarios, for example a scenario where all intersections have queue jump lanes vs a scenario where all intersections have exclusive bus lanes, we chose a four-intersection segment of the arterial

Project UMAR24-19 A Spatial Learning Model for the Micro-Simulation of Travel Dynamics

Due to budget and time limitations, no new data will be collected from the field and simulated data will be used. As a result, Task 3—Data Collection using Smartphone App—will be revised.

Project UMAR24-20 Cognitive Maps for Route Choice Modeling

Due to budget and time limitations, data will not be collected from the field (i.e. with human subjects as initially planned) but rather simulated for the purpose of demonstrating the methodology of route choice modeling with cognitive map. As a result, Task 2—Survey Design and Data Collection—will be revised.

Actual or anticipated problems/delays

Project UCNR24-31 Transportation System Modeling in the Information Era

The project schedule has been pushed back due to problems resulting from a delay in obtaining the data and effort involved in exploring the traffic modeling software. However, all the issues have since been overcome and the research team is back on track to complete all project tasks. Additionally, the scheduling issues mentioned above do not alter the scope of the project.

Significant changes in use of human subjects

Project UMAR24-20 Cognitive Maps for Route Choice Modeling

Human subjects will no longer be utilized (see above: Changes in Approach).

Additional information regarding Products and Impacts

Outputs

Project UCNR24-31 Transportation System Modeling in the Information Era

The focus of this research is to address the potential limitations of existing transport model systems for accurately modeling real-time traveler information services:

- First, existing travel diary datasets will be explored to characterize the dimensions of pre-trip and en-route scheduling and rescheduling dynamics displayed by individuals and understand motivations behind the exhibited behavior. Further, the findings from the exploration of existing travel diary datasets will be incorporated into an existing open-source integrated transport modeling software prototype dubbed SimTRAVEL (Pendyala 2012) in an effort build a system modeling tool that can be readily utilized evaluate traveler information system applications.
- Second, the enhanced open-source prototype will be applied to Hartford metropolitan region to evaluate a subscription based traveler information system providing real-time traffic information. Further, the subscription system will be evaluated under varying levels of participation to understand implications on individual activity-travel behaviors and network operations. The test application will demonstrate the applicability of an integrated transport modeling framework for accurately modeling the impacts of real-time traveler information services on activity-travel patterns.

Outcomes

Nothing to report.

Impacts

Project MITR24-5 Transportation Model in the Boston Metropolitan Area from Origin Destination Matrices Generated with Big Data

- Reduce Costs from Travel Surveys by integrating their information with Mobile Phone data.
- Education of students and postdocs in developing techniques to statistically analyze big data to develop transportation and urban applications. These are required for the current transportation workforce.

6. Special Reporting Requirements

Nothing to report