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

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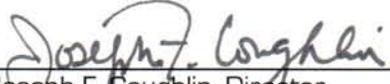
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1. Accomplishments

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 46 research projects under this grant, which now have all been completed:

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	completed
MITR24-2	Coughlin	Transportation Wellbeing, Age and Safety	completed
MITR24-3	D'Ambrosio	Assessing Alternative Transporation Options for Older Users	completed
MITR24-4	Glass Mehler	Spoken Dialog Planning to Reduce User Distraction in Mobile Environments	completed
MITR24-5	Gonzalez	Transportation Model in the Boston Metropolitan Area from Origin Destination Matrices Generated with Big Data	completed
MITR24-6	Murga Salvucci	Kendall Square: Lessons Drawn from Its Past Development to Guide Its Future	completed
MITR24-7	Osorio	Simulation-Based Energy-Efficient Transit Signal Priority Strategie	completed
MITR24-8	Reimer	Technology Adoption and Use Across the Lifespan	completed

MITR24-9	Salvucci Murga	Development of a "Universal" Residential Public Transportation Pass, as Part of a Comprehensive Multi-Modal Approach to Urban Parking	completed
MITR24-10	Sheffi Goentzel	Big Data During Crisis: Lessons from Hurricane Irene	completed
MITR24-11	Sussman	Determining Performance Measures to Evaluate the Effect of High Speed Rail on Communities' Livability	completed
MITR24-11A	Trancik	Time Dependent Environmental Impact of Transportation	completed
HVDR24-12	Howitt Giles	Disaster Recovery for Transportation: China's Wenchuan Earthquake of 2008 and Japan's Tohoku Earthquake and Tsunami of 2011	completed
HVDR24-13A	Mayne	The Politics of Transport Policy in the Greater Copenhagen Region	completed
HVDR24-14	Shoag	Cell Phones and Vehicle Safety	completed
HVDR24-14A	Shoag	Land-Use Regulation and Commuting Patterns	completed
UMAR24-14B	Christofa	Signal Timing Optimization for Improved Person Mobility and Air	completed
UMAR24-15	Christofa Collura	A Person-based Comparison of Transit Preferential Treatments on Signalized Arterial Corridors	completed
UMAR24-16	Collura Burleson Gao	A Decision Support System to Assess Disruptive Impacts of Alternative Transportation Financing Approaches	completed
UMAR24-16A	Fisher	ADHD Teen Driver Evaluation and Training Tool Development	completed
UMAR24-17	Fisher Romoser	Moving Map Displays: Using CTIL and Eye Tracking Technologies to Measure Distraction in Locomotive Cabs	completed

UMAR24-18	Ganz Collura	Hybrid NFC and Vision Based Navigation System in Subways for the Blind and Visually Impaired	completed
UMAR24-19	Gao	A Spatial Learning Model for the Micro-Simulation of Travel Dynamics	completed
UMAR24-19A	Gao	An Optimal Adaptive Routing Algorithm for Large-Scale Stochastic Time-Dependent Networks	completed
UMAR24-20	Gao	Cognitive Maps for Route Choice Modeling	completed
UMAR24-21	Gartner Jones Statmatiadis	Robust Performance of Transportation Networks Using Quantile Metrics	completed
UMAR24-21A	Knodler	An Observational Evaluation of Safety and Operations Resulting...	completed
UMAR24-22	Knodler Romoser Fisher	Evaluating the Effects of Integrated Training on Minimizing Driver Distraction	completed
UMAR24-22A	Ni	Efficient Methodology for Traffic Flow Model Calibration	completed
UMAR24-23	Ni Gao	Making More Value out of Transportation Data	completed
UMAR24-24	Ni	Modeling Drivers' Lateral Motion Control	completed
UMAR24-25	Romoser Knodler Fisher	Reducing Older Driver Crashes: Technology, Training and Livable Communities	completed
UMAR24-26	Stamatiadis Gartner Xie	ITS Equipment Placement for Safety and Mobility	completed
UMAR24-27	Zarillo Collura Burleson	Security & Privacy Breaches in ETPS: Problem Survey & Case Study of I-90	completed

UCNR24-28	Garrick Atkinson- Palombo	The Impact of Parking Policies on the Long-term Vitality of American Cities	completed
UCNR24-28A	Garrick Atkinson- Palombo	Assessing the Full Cost of Parking Provision from the Perspective of the Municipality	completed
UCNR24-29	Gokhale Lownes	Automated Congestion Prediction with Smart Phones	completed
UCNR24-30	Ivan Ravishanker	Investigation of Road and Roadside Design Elements Associated with Elderly Pedestrian Safety	completed
UCNR24-30A	Ivan Ravishanker	Effectiveness of Interventions at Midblock Crossings for Improving Senior and Other Pedestrian Safety	completed
UCNR24-31	Konduri Lownes	Transportation System Modeling in the Information Era	completed
UCNR24-31A	Konduri Lownes	Crowdsourcing Real-Time Traveler Information Services: Issues, Challenges and Recommendations	completed
UCNR24-32	Lownes	t-HUB: Connecticut Public Transport Data Hub	completed
UCNR24-32A	Lownes	Spring 2014 Pilot Project Competition	completed
UMER24-33	Garder	Elderly Pedestrian Safety and Driver Distractions	completed
UMER24-34	Rubin	Regional Credit Trading: Economic and GHG Impacts of a National Low Carbon Fuel Standard	completed

Accomplishments under the New England UTC's research goal

UConn Pilot Research Project Competition Leads to a Fall 2015 Transportation Film Festival
September 11, 2015
A UTC spring 2014 Pilot Project Competition at UConn has resulted in a UTC-supported spring 2015 class taught by Prof. Carol Atkinson-Palombo and Prof. Norman Garrick. The course subject was

motivated by the rationale that transportation students need to learn a variety of communication strategies to interact with a wide range of stakeholders. As such, the challenge to students was to create a short film that would communicate effectively complex ideas about transportation and land use planning. "The idea was to instill in the students the importance of being able to communicate their ideas in a way that is accessible to the general public," Garrick said. The film festival on September 23 at UConn in Storrs, CT. highlighted films about urban and transportation. It included award-winning films from the New Urban Film Festival in Los Angeles, a selection from Streetfilms, and three student films from the 2015 UConn class.

Mapping the Community of the Future: a Guided Tour through Gerontopia
September 21, 2015

While the utopia for retirement living remains elusive, there are key characteristics of what your personal *Gerontopia* might include. In Dr. Joseph Coughlin's research at the New England UTC, he developed a framework to help planners, policymakers, and developers assess the age-readiness of a community. This framework is, in effect, a fun interactive map about the community of the future. A piece on this work was published online at The Atlantic. Comprehensive retirement planning is about more than health and wealth; it is about planning to live longer and better. Communities that support living well in old age with an intensity and density of activities that are exciting, engaging, and easily accessible may in fact be *Gerontopias*—but they may turn out to be utopian not only for the aging but for people at any age.

Creation of a Unique Database for Transport Policy in Copenhagen
September 25, 2015

Research on Project HVDR24-13A (The Politics of Transport Policy in the Greater Copenhagen Region) has resulted in the creation of a unique database that contains a highly detailed timeline of national and local government policy and programs that helped and hindered the emergence and development of sustainable transportation in the Greater Copenhagen region over a fifty-year period. The database of events covers a wide range of phenomena: from the election of governments and cabinets and the appointment of particular individuals to public office, to parliamentary and council debates, and the passing and enactment of specific policies and programs. Eeach and every event included in the project's timeline was categorized by the one area of sustainable transportation to which it related. Given the multi-dimensional nature of sustainable transportation, this meant that it was possible to track change and continuity in a variety of policy sectors as well as the connections between different policy sectors; this includes housing, roads, trains, trams, buses, and cycling, as well as environmental policy and policy related to central-local and intermunicipal governing arrangements.

Research Offers Guidance for Establishing Parking Standards
October 1, 2015

A majority of American cities specify minimum parking requirements in local zoning codes, even in areas served by a variety of travel options. Little work has been done to understand how aggregate parking supplies compare to requirements in urban areas or to evaluate the potential impacts of meeting parking requirements in these places. Research project UCNR24-28 (The Impact of Parking Policies on the Long-term Vitality of American Cities) tracks changes in parking supplies and the built environment in six urban business districts between 1960 and 2000. It also offers a summary of parking requirements in each city and compares those requirements to actual supplies. The research performed demonstrates that parking requirements can only be met through a combination of costly parking infrastructure and considerable commitments of land. By quantifying existing parking supplies in urban areas and evaluating the potential impacts of increasing those supplies, this work offers guidance and justification for establishing parking standards that conform to long-term transportation and development goals.

Study Illustrates How Parking Supply Changes Affect Tax Revenues
October 1, 2015

Parking serves as the terminal facility for automobile-oriented transportation systems, but the impacts of its provision are often left unstudied. Providing too much parking in cities can undermine long-term transportation and development goals by creating a sparse or fragmented built environment. Project UCNR24-28A (Assessing the Full Cost of Parking Provision from the

Perspective of the Municipality) examines the changes in parking supplies, development characteristics, and travel mode shares over the past sixty years in six medium sized cities. In three of these cities, parking supply increased significantly over the study period, while in the other three cities parking supply increased only slightly. The main objective of project is to illustrate how these changes in parking supplies have affected the tax revenues in each city. A GIS-based analysis was used to calculate the tax revenue of all properties in the study area of each city. Tax revenues generated from parking were quantified and compared to tax revenues from non-parking uses on a proportional basis. Across the six cities, land occupied by surface parking contributes between 5% and 17% of the tax revenue that land occupied by taxable non-parking uses contributes. The study analysis characterizes an important concession involved in devoting large areas of land in the center of a city to surface parking.

Pedestrian-Vehicle Interaction Severity Found to be Good Surrogate for Crash Counts under Specific Road Conditions
October 15, 2015
Under Project UCNR24-30A (Effectiveness of Interventions at Midblock Crossings for Improving Senior and Other Pedestrian Safety) researchers have used an innovative statistical analysis technique, the Tau-path method, to assess the association between the severity of interactions between pedestrians and motor vehicles and the predicted crash count at the same intersections. Data collected for this project and another previously funded by the NEUTC program (Project UCNR24-30: Investigation of Road and Roadside Design Elements Associated with Elderly Pedestrian Safety) were used for this analysis. Locations with high association between conflicts and crashes are more likely to have exclusive pedestrian phasing and on-street parking. Among these locations, those with high conflict and crash counts are more likely to have on-street parking and be in non-residential areas.

Prototype Developed to Assess Impacts of Real-Time Services
October 10, 2015
Under Project UCNR24-31 (Transportation System Modeling in the Information Era) a comprehensive modeling framework and prototype of an integrated model system that can be utilized to systematically assess the direct and cascading impacts of real-time services such as Real-time Information Systems (RTIS) has been implemented. openAMOS was the implementation of choice for the activity-based travel demand model component of the integrated model. DTALite was the dynamic traffic assignment model implementation choice for this research. The openAMOS and DTALite implementations were extended to be able to realistically model the impacts of RTIS solutions. While the primary objective of the prototype for this research effort was to model the impacts of RTIS, the prototype was also being developed to achieve a number of other applications in the realm of Active Transportation and Demand Management (ATDM) and Dynamic Mobility Applications (DMA) as part of other research efforts. To this end, enhancements to the prototype were broken down into four phases.

Crowdsourced Real-Time Traveler Information Prediction System Prototype Developed
October 16, 2015
The primary research objective of Project UCNR24-31A (Crowdsourcing Real-Time Traveler Information Services: Issues, Challenges and Recommendations) was to evaluate the feasibility and applicability of crowdsourcing as a solution for providing real-time traveler information. To this end, researchers have developed a prototype of a RTIS solution called RETTINA to assess and evaluate the feasibility of providing real-time traveler information based on crowdsourced data. RETTINA stands for Real-time Transit Traveler Information. It is a prototype of a crowdsourced real-time traveler information prediction system which utilizes mobility traces shared by users to provide real-time traveler information. The system features an Android smartphone application which is used by the users to access arrival information of buses and availability of seats. Additionally, the smartphone application will allow users to contribute information about the location of the buses as they pursue trips and also provide feedback about the seat availability, and general experience pursuing the transit trip. The system also includes associated web infrastructure including software to process and archive the information that is contributed by users of the smartphone application and algorithms that utilize the archived information to predict real-time traveler information regarding the shuttle buses. While the RETTINA prototype has been fully developed, it hasn't been field tested; the

researchers will build on this effort to field test the RETTINA solution as part of future research efforts.

Project MITR24-3
Assessing Alternative Transportation Options for Older Users
This study has grown to encompass another set of older users; data collection has shifted to focus on the fastest growing group in the US population: the oldest old—those ages 85 and older. Data collection from this group was completed in November 2015. We also completed a questionnaire and discussion group study of these older users about their transportation preferences and practices. We are analyzing these data with the future plan of writing and publishing in 2016.

Project MITR24-11A
Time Dependent Environmental Impact of Transportation
Technology portfolios to mitigate methane emissions from energy technologies over time support greater energy consumption while meeting climate goals. We have shown that dynamic emissions metrics allow for technology planning to transition away from methane emitting fuels, or abate methane leakage. This approach supports energy consumption while also meeting climate change mitigation goals. These metrics can be used by distributed decision makers to plan for technology transitions and invest optimally in technology development.

Project HVDR24-12
Disaster Recovery for Transportation: China's Wenchuan Earthquake of 2008 and Japan's Tohoku Earthquake and Tsunami of 2011
The Principal Investigators conducted additional field research in Japan with government officials and community leaders involved in disaster recovery following the 2011 earthquake and tsunami. During this trip, they also made several presentations in which they presented on their findings. These included presentations made at Temple University (Tokyo campus) and at Iwate University in Morioka, Japan.

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

Project UMAR24-21A
Data-based Model for Regional Freight Demand
The findings from this research project are being disseminated in a number of ways. The first way constitutes part of the dissertation work of a PhD student who will continue to work on the general topic of demand responsive transportation systems for people and goods following the termination of this project. The specific models for regional distribution are being developed into a journal paper. The second way is the main contribution of a Master's thesis, which is being finalized in the early part of 2016. The findings related to quantifying the capacity and delay impacts of freight deliveries on individual streets are particularly relevant for suggesting improvements to the Highway Capacity Manual (HCM). The findings are written in a paper that has been accepted for presentation in the midyear meeting of TRB's Highway Capacity and Quality of Service Committee, which will include participation from the body of experts who can make changes to the HCM.

Project UCNR24-31
Transportation system modeling in the information era
Findings from the application of earlier versions of the integrated model prototype developed under this research project were presented at three conferences including the Conference on Agent-Based Modeling in Transportation Planning and Operations in Blacksburg, Virginia held from September 30 – October 2, 2013, the Innovations in Travel Demand Forecasting conference that was held in Baltimore, Maryland from April 27-30, 2014, and the 14th International Conference on Travel Behavior Research in Windsor, United Kingdom held from July 19-23, 2015. The study team is also preparing to present latest results at the upcoming Innovations in Travel Demand Forecasting conference that will be held in Denver, Colorado from May 1-4, 2016.

Project UCNR24-31A
Crowdsourcing real-time traveler information services: issues, challenges and recommendations
Preliminary findings from this research study were presented at the Innovations in Travel Demand Forecasting conference that was held in Baltimore, Maryland from October 27-30, 2015. The study team will also be presenting latest findings at the upcoming Innovations in Travel Demand Forecasting Conference to be held in Denver, Colorado from May 1-4, 2016.

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 transporttation workforce to support their capacity to build, operate and manage a safe and efficient transportation system.

Following is the list of 6 education projects under this grant, which now have all been completed:

Project No.	PI	Project Title	Current Status
MITE24-35	Coughlin	Massachusetts Avenue Area Living Laboratory (MALL)	completed
MITE24-36	Jarzombek Hendricks	Engaging emerging minority youth in real-time, community-based transportation research and modeling	completed
HVDE24-36A	Gomez-Ibanez	Transportation Cases throughout the Curriculum	completed
UMAE24-37	Knodler	Creating an Education ASSET	completed
UCNE24-38	Lownes	Senior Design	completed
UCNE24-39	Lownes	Graduate Course	completed

Accomplishments under the New England UTC's education goal

Project HVDE24-36A
Transportation Cases throughout the Curriculum
It was reported in the prior PPPR, that four of the five transportation cases were test taught at Harvard University's Kennedy School of Government and were revised on the basis of that experience. During this reporting period, the last few transportation cases were revised based on teaching experience and submitted to the Kennedy School Case Program for formatting and inclusion in the case catalogue.

Cole Fitzpatrick named 2015 UTC Student of the Year
November 25, 2015
Cole Fitzpatrick is a Ph.D. candidate at The University of Massachusetts, Amherst where his work focuses on roadway safety and human factors. He was awarded the 2015 UTC Outstanding Student of the Year Award by the New England University Transportation Center at MIT for several reasons. He combines research, academic performance, professional contributions both within and outside of academia, and leadership characteristics. His work on driver behavior spans several topics of interest to the transportation and policy communities, including the maintenance of roadways and their surrounds, driver distraction, and individual safety. His research, academic record, professional experience and student leadership in the field of transportation studies all contributed to him receiving this award.

In 2014, Mr. Fitzpatrick was awarded, an NSF Innovation Corps grant. This led to him receiving a fellowship in 2015 from the UMass Isenberg School of Business to continue this work. He also served as the UMass Institute of Transportation Engineers (ITE) Student Chapter President during 2014-15. In addition to receiving the Outstanding Student Paper Award from the ITE Northeastern District, UMass was named ITE Student Chapter of the Year in the Northeastern District. Mr. Fitzpatrick's leadership extended beyond ITE as he also served on the Graduate Student Senate in the Civil and Environmental Engineering Department. This leadership experience led to him being selected as an Eno Fellow, and attend the Eno Future Leaders Development Conference where he had the opportunity to learn about the top transportation issues facing Capitol Hill, and meet Secretary Anthony Foxx.

Project UCNE24-39
Graduate Course
This education project resulted in a new online graduate course, delivered for the first time in Fall 2015. It supported an internal UConn competition for the development or transition of a graduate transportation course to online delivery—with resources provided for the development and implementation of online materials and coordination with external partners. The course selected for this transition was the joint graduate/undergraduate Transportation Planning Course that provides an in-depth treatment of the theory and principles behind urban transportation planning as practiced in the US. In particular, the course focuses on the role of transport modeling in supporting transportation planning. Emphasis is placed on the four step approach to transportation modeling: trip generation, trip distribution, mode choice and traffic assignment are discussed. Further, the course highlights limitations of the four step approach and provides a brief introduction to the state of research and practice in transportation modeling; activity-based travel demand modeling and dynamic traffic assignment. The course was delivered in Fall 2015, concurrently with students at the University of Central Florida (UCF). Thirty-five graduate and undergraduate students worked collaboratively and competitively within the online course delivery framework.

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 3 technology transfer projects under this grant, which now have all been completed:

Project No.	PI	Project Title	Current Status
MITT24-45	Coughlin	MIT Technology Transfer Initiative	completed
UCNT24-46	Shea	LTAP/TTAP Core Competency Development and Pilot	completed
UMAT24-46A	Collura	UMass Technology Transfer Initiative	completed

Accomplishments under the New England UTC's technology transfer goal

HVDR24-13A
The Politics of Transport Policy in the Greater Copenhagen Region
Dr. Howitt is in the process of writing a paper based on the research of this project that he will submit to a peer-reviewed journal. He also plans on producing a short-form version of the research to be disseminated via the website of Harvard Kennedy School's Ash Center for Democratic Governance and Innovation. Finally, Dr. Howitt plans on making public—via his personal website—the database of policy events, which lies at the very heart of this research.

2. Products

Journal publications

Colak S., Lima A., Gonzalez MC, Understanding congested travel in urban areas, Nature Communications (forthcoming 2016)

Daniel Shoag and Erich Muehlegger "Cell Phones and Motor Vehicle Fatalities" Procedia Engineering 78, p. 173-177, September 2014

Daniel Shoag and Erich Muehlegger "Commuting Times and Land Use Regulations", Procedia Engineering (2015) .488-493

Dube, Christina M., Fitzpatrick, Cole D., and Michael A. Knodler Jr. An Observational Evaluation of Safety Resulting from Driver Distraction. Road Safety and Simulation. Orlando, FL. October, 2015

Farid, Y.Z., Christofa, E., and Collura, J. An Analytical Model to Conduct a Person-based Evaluation of Transit Preferential Treatments on Signalized Arterials. [to be submitted for journal publication].

Farid, Y.Z., Christofa, E., and Collura, J. 2015. Person-Based Evaluation of Dedicated Bus Lanes and Queue Jumper Lanes at Signalized Intersections with Nearside Bus Stops. Transportation Research Record, 2484, 182—192

Jia, C.; Wang, J.; and Ni, D. An Efficient Methodology for Calibrating Traffic Flow Models Based on Bisection Analysis. Journal of Applied Mathematics. Volume 2014, Article ID 949723. Hindawi Publishing Corporation. 2014.

Khalighi, F., and Christofa, E. 2015. Emission-based Signal Timing Optimization for Isolated Intersections. Transportation Research Record, 2487:1–14
Khalighi, F, Amirgholy, M., and Christofa, E. A Real-Time Signal Control System for Improved Mobility and Air Quality. [to be submitted for journal publication]

Klemun, M. M. and Trancik, J. E., 'Hidden effects of carbon-focused energy policies call for accelerated methane mitigation', in review.

L Alexander, S Jiang, M Murga, MC González, Origin–destination trips by purpose and time of day inferred from mobile phone data, Transportation Research Part C: Emerging Technologies, 58, 240–250 (2015)

P Widhalm, Y Yang, M Ulm, S Athavale, MC González
Discovering urban activity patterns in cell phone data,*Transportation*, July 2015, Volume 42, Issue 4, pp 597-623 (2015)

Roy, M., Edwards, M. R. and Trancik, J. E., 'Methane mitigation timelines to inform energy technology evaluation'. Environmental Research Letters, 2015, Vol. 10, pp. 114024.

Toole JL, Colak S., Sturt B., Alexander LP, Evsukoff A., González MC, The path most traveled: Travel demand estimation using big data resources, Transportation Research Part C: Emerging Technologies, 58, Part B, September 2015, 162–177, (2015)

Rahimi, M., Gonzales, E.J. Continuous approximation models for optimizing urban deliveries of diverse types of goods. (under preparation)

Zhang, Yaohua; Ravishanker, Nalini; Ivan, John; Mamun, Sha. "A Semiparametric Statistical Approach to Evaluate Conflict Severity as a Surrogate for Crashes in the Context of Pedestrian Safety", submitted for publication in *Accident Analysis & Prevention,* 2015.

Zhang, Yaohua; Mamun, Sha; Flannery, Eamon; Ivan, John; Ravishanker, Nalini. "Effectiveness of Treatments at Midblock Crossings for Improving Pedestrian Safety in Connecticut", submitted for publication in *Journal of Transportation Safety and Security*, 2015.

Yumani, Y., Samuel, S., Knodler, M., and Fisher, D. Evaluation of the Effectiveness of a Multi-Skill Program for Training Younger Drivers on Higher Cognitive Skills. Applied Ergonomics.

Books, dissertations, or one-time publications

Berthaume, A.L. Microscopic Modeling of Driver Behavior Based on Modifying Field Theory for Work Zone. PhD Dissertation, Department of Civil and Environmental Engineering, University of Massachusetts Amherst. 2014.

Other publications, conference papers and presentations

Arnold M. Howitt, David W. Giles, and Hiromi Akiyama, "Emergency Disaster Response Capacity: Perspectives on the 3.11 Disasters," presentation at Iwate University, Morioka, Japan, July 16, 2015.

Arnold M. Howitt, David W. Giles, and Hiromi Akiyama, "Greater Centralization or Decentralization for More Effective Disaster Response? The Great East Japan Earthquake and Tsunami in Perspective," presentation made at the symposium *Disaster Discourses, Public Policy and the Politics of 3.11* at Temple University, Tokyo, Japan, July 17, 2015.

Berthaume, A. L.; Ni, D.; Collura, J., and Romoser, M. The 3rd Annual International Conference and Workshop on Agent-based Mobility, Traffic and Transportation Models, Methodologies and Applications, Hasselt, Belgium. 2014.

Ding-Mastera, J., Gao, S., Jenelius, E., Rahmani, M., Pereira, F. C. and Ben-Akiva, M. E. A Latent-Class Routing Policy Choice Model in Stochastic Time-Dependent Networks. The Annual Meeting of the Institute for Operations Research and Management Science, Philadelphia, PA, Nov. 1-4, 2015

Dube, Christina M., Fitzpatrick, Cole D., Gazzillo, J. and Michael A. Knodler Jr. (Submitted) Improved Identification of Distraction-Related Crashes and the Impact of Distraction-Free Driving Laws. Transportation Research Record, Washington DC

Guler, S.I., and Christofa, E. 2015. Bus Lanes and Pre-signals with Transit Signal Priority: Domains of Application, 2015 MASITE Annual Meeting, 4–5 October, King of Prussia, PA.

Jia, C.; Wang, J.; and Ni, D. An Efficient Methodology for Calibrating Traffic Flow Models Based on Bisection Analysis. The Mid-year meeting of TRB Committee on Traffic Flow Theory and Characteristics, Fort Lauderdale, FL. 2012

Keegan, A.J., Gonzales, E.J. (2016). Evaluating capacity and delay for signalized arterials with freight deliveries. International Symposium on Enhancing Highway Performance (ISEHP), 14 – 16 June, Berlin, Germany. (Paper accepted for Presentation)

McCahill, Chris, Garrick, Norman W, Atkinson-Palombo, Carol, Polinski, Adam, " Effects of Parking Provision on Automobile Use in Cities: Inferring Causality", Transportation Research Board Annual Meeting 2016, Washington, DC

Monterde-i-Bort, Hector; Charlotta Johansson, Lars Leden, Socrates Basbas, Per Gårder, " A Safe and Efficient Traffic Environment for the Elderly," 28th ICTCT [International Co-operation on Theories and Concepts in Traffic Safety] workshop at the Shamoon College of Engineering (SCE) in Ashdod, Israel 2015/10/29 - 2015/10/30

Rehan, A., and Konduri, K.C. Trajectory-based Regression Approach to Predict Real-Time Traveler Information Using Crowdsourced Location Traces. Accepted for Presentation at the 2016 Conference on Innovations in Travel Demand Forecasting, Denver, CO, May 1-4, 2016.

Roy, M., Edwards, M. R., Trancik, J. E., 'Technology portfolios to mitigate methane emissions from energy technologies', poster presentation, International Society of Industrial Ecology Conference 2015, University of Surrey, UK. July 7-10, 2015.

Rubin, Jonathan, "Connected Automated Vehicles: AVs: Relationship to Travel Behavior & Energy Use," Automated Vehicles Symposium 2015, sponsored by the Association for Unmanned Vehicle Systems International and Transportation Research Board of the National Academics, Ann Arbor, Michigan July 21-23.

S Çolak, LP Alexander, BG Alvim, SR Mehndiretta, MC González,
Analyzing Cell Phone Location Data for Urban Travel: Current Methods, Limitations and Opportunities, Transportation Research Board 94th Annual Meeting (2014).

Tian Zhou, Lixin Gao, and Daiheng Ni, Road Traffic Prediction by Incorporating Online Information. Workshop on Connecting Online & Offline Life (COOL). Seoul, Korea. 2014

T Trancik, J. E., Edwards, M. R., Klemun, M. M., Roy, M., 'Emissions metrics and evaluating methane-emitting natural gas as a bridge fuel', poster presentation, Our Common Future Under Climate Change (CFUC), Paris, July 7-10, 2015

rancik, J. E., Edwards, M. R., Klemun, M. M., 'Evaluating the time-dependent greenhouse gas emissions intensity of natural gas', International Society of Industrial Ecology Conference 2015, University of Surrey, UK. July 7-10, 2015.

You, D., Garikapati, V., Konduri, K.C., Pendyala, R.M., and Zhou, X. A Continuous-Time Integrated Transport Model System for Simulating Impacts of Dynamic and Active Mobility Management Strategies. Accepted for presentation at the 2016 Conference on Innovations in Travel Demand Forecasting, Denver, CO, May 1-4, 2014.

Websites or other Internet sites

http://karthikkonduri.weebly.com/projects.html serves as the main portal for disseminating results from Project UCNR24-31 (Transportation System Modeling in the Information Era). The codebase for OpenAMOS can now be accessed both from GitHub repository located at https://github.com/foss-transportationmodeling/simtravel. DTALite codebase can be accessed by visiting the GitHub repository located at https://github.com/xzhou99.

http://karthikkonduri.weebly.com also serves as the main portal for disseminating the results from Project UCNR24-31A (Crowdsourcing Real-Time Traveler Information Services: Issues, Challenges and Recommendations). Additionally, the codebase for the smartphone application being developed is hosted on GitHub and can be accessed by visiting https://github.com/foss-transportationmodeling/rettina. The codebase for the web server that is being developed to powers the app is also hosted on GitHub and can be accessed by visiting https://github.com/foss-transportationmodeling/rettina-server.

https://thub-web.engr.uconn.edu/ Project UCNR24-32 (t-HUB: Connecticut Public Transport Data

Hub) is now complete and accomplished its stated goals. The t-HUB web interface has been publicly launched and is now available for access.

http://trancik.scripts.mit.edu/home/evaluating-the-dynamic-environmental-impacts-of-technologies/

Media

http://grist.org/people/this-cleantech-expert-lays-down-the-facts-on-solar-and-natural-gas/
Grist, 10 July 2015: "This cleantech expert lays down the facts on solar and natural gas,"

Technologies or techniques

Project UCNR24-32
t-HUB: Connecticut Public Transport Data Hub
This research study has resulted in several tools for the processing of General Transit Feed Specification (GTFS) and the integration with public transportation analysis techniques. This technology has been integrated with the web application product.

Inventions, patent applications, and licenses

Nothing to report

Other products

The following cases are published by the Case Program at the Harvard Kennedy School:

"Airlines and Antitrust: Scrutinizing the American Airlines-US Airways Merger" HKS case no. 2044.0, sequel 2044.1 and teaching note 2044.2

"Hubway: Bicycle Sharing in Boston" HKS case no. 2048.0, teaching note 2048.2

"Queuing at Logan Airport," HKS case number pending

"The Quest for Sustainable Public Transit Funding: SEPTA's 2013 Capital Budget Crisis" HKS case no. 2047.0, sequel HKS 2047.1, teaching note 2047.2

3. Participants & Other Collaborating Organizations

Organizations that have been involved as partners

The Hartford Center for Mature Market Excellence (formerly The Advance50 Team at The Hartford), Simsbury, CT: Financial support contributed to the project

National Cooperative Highway Research Program (NCHRP).

Tsinghua University, China, Dr. Jianqiang Wang.

The Department of Electrical and Computer Engineering (ECE), UMass Amherst, Dr. Lixin Gao and her student, Tian Zhou

Other collaborators or contacts that have been involved

Aristotle University of Thessaloniki, Socrates Basbas, Thessaloniki, Greece

Arizona State University, Dr. Xuesong Zhou

Georgia Institute of Technology, Dr. Ram Pendyala

Iwate University, in Morioka Japan

Luleå University of Technology, Charlotta Johansson, Luleå, Sweden

Penn State University, Sukran Ilgin Guler

Temple University (Tokyo campus)

University of Valencia, Hector Monterde-i-Bort Valencia, Spain

VTT, Finland, Lars Leden,

4. Impact

Project HVDR24-14
Cell Phones and Vehicle Safety
These findings were presented at a major conference in front of an audience of academics, policy-makers, and NGOs. The conference was HumTech 2014: Humanitarian Technology: Science, Systems and Global Impact 2014, May 13–15, 2014 in Boston, MA.

Project HVDR24-14A
Land-Use Regulation and Commuting Patterns
These findings were presented at a major conference in front of an audience of academics, policy-makers, and NGOs. The conference was HumTech 2015: Humanitarian Technology: Science, Systems and Global Impact 2015, May12–14, 2015 in Boston, MA.

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

Project MITR24-11A
Time Dependent Environmental Impact of Transportation
The climate impacts of technology adoption scenarios are frequently studied using integrated assessment models. However, to be applied to technology evaluation, these insights must be translated from the level of the scenario modeled to the level of per-unit technology impact. In recognition of the importance of simple tools to perform comparisons of emissions impacts of various technologies, we contribute to the literature by formulating a model to investigate optimal technology choice under a constraint on radiative forcing, identifying the corresponding metric, and showing the benefits of applying this method to technology evaluation.

Project UMAR24-14B
Signal Timing Optimization for Improved Person Mobility and Air
The updated emission estimation and optimization models developed during this reporting period can be used by others in the transportation community to obtain more accurate emission estimates for cars and buses. These estimates can be useful for design of traffic signal control and other traffic management strategies. In addition, the methodology used to obtain weighting factors for the two objectives of the proposed optimization, under the assumption of elastic demand, can be used as an example of how to treat multi-objective signal control optimization problems. Overall, the proposed optimization can guide transportation firms and governmental agencies to improve signal timing design with the goal of achieving transit reliability with fewer pollutant emissions

The impact on other disciplines

Project MITR24-5
Transportation Model in the Boston Metropolitan Area from Origin Destination Matrices Generated with Big Data
Urban computing refers to the process of applying computational methods to explore human activity across public urban landscapes. It is an interdisciplinary endeavor that brings together engineers, planners, physicists and computer scientists. This research intersects these domains: it combines data mining and statistical physics methods in space and time to extract useful features and models from massive and passive data sets. These results impact transportation and engineering models that traditionally rely on survey information manually collected.

Project MITR24-11A
Time Dependent Environmental Impact of Transportation

By demonstrating the use of dynamic equivalency metrics in a technology choice model that can be used to make policy and investment decisions, we contribute to the literature on metrics for climate impact evaluation, as well as to the larger body of literature on climate policy analysis and technology R&D and investment planning.

Project HVDR24-12
Disaster recovery for transportation: China's Wenchuan earthquake of 2008 and Japan's Tohoku earthquake and tsunami of 2011
During this reporting period, research conducted under this grant informed presentations made by Howitt and his research team in summer 2015 to audiences in Japan representing a diverse mix of professional and academic backgrounds, including law, political science, business, and journalism. These presentations provided audience members with a greater understanding of the policy and implementation challenges of organizing response and recovery in the transportation sector, as well as recovery in a larger context, following complex, disruptive natural disasters.

Project UMAR24-23
Making More Value out of Transportation Data,
Though this research used transportation to provide domain knowledge, the proposed methodology (such as big data processing technology and hierarchical Bayesian network) is domain-independent and lends a useful perspective to address problems in other disciplines, such as Internet traffic management and manufacturing systems.

Project UMAR24-24
Modeling Drivers' Lateral Motion Control
In this research, we have formulated a field-based theory to model drivers' operational control of road vehicles. More specifically, we have represented the driving environment as a "field" in a driver's mind and the resultant vehicle motion in the longitudinal and lateral directions is a combined effect of "field force" perceived by the driver. Mathematically, the field force is obtained by taking partial derivative of the "field" with respect to the direction under consideration. By introducing "field" and "force" to traffic flow modeling, we have seamlessly integrated knowledge from physical and psychological sciences into transportation science. Also, we conducted this research in collaboration with expertise from Human Factors.

The impact on the development of transportation workforce development

Project HVDR24-12
Disaster recovery for transportation: China's Wenchuan earthquake of 2008 and Japan's Tohoku earthquake and tsunami of 2011
Through their presentations at Morioka and Temple Universities in summer 2015, Howitt and colleagues exposed university-level students and members of the public to the complex challenges of disaster response and recovery involving the transportation sector in Japan. In particular, the presentations highlighted the work of one transportation-focused agency in Japan – the Tohoku Regional Bureau (TRB) of the national government's ministry of Land, Infrastructure, Transport, and Tourism, whose actions in the post-disaster environment were critical for facilitating relief and recovery. The lessons from TRB's efforts are broadly applicable to non-transportation-focused organizations as well.

Project UMAR24-14B
Signal Timing Optimization for Improved Person Mobility and Air
The graduate student working on this project is female: Ms. Farnoush Khalighi. This assists in the effort of increasing the diversity of the transportation workforce. In addition, this research was disseminated to transportation practitioners, faculty, young people, and the public through journal publications during this reporting period.

Project UMAR24-21A
Data-based Model for Regional Freight Demand
This project funds Mahour Rahimi, who is a female Ph.D. student in transportation engineering. She is actively engaged in the student community and will be joining the transportation workforce upon graduation. Her involvement broadens the diversity of the students and researchers working on transportation engineering problems. This project also funds Aaron Keegan, who is a M.S. student in transportation engineering. He comes to this project from experience working on demand modeling for a consulting firm, and he is planning to return to practice in industry following this degree.

Project UCNR24-32
t-HUB: Connecticut Public Transport Data Hub
This project has had a significant impact on transportation workforce development by providing students, workshop participants and users of the t-HUB application experience and training in public transit data anlysis, Geographic Information Systems, and software development. Given the thematic focus on equity in transit service provision, the project has also provided new analytical tools for many underrepresented groups in Connecticut, including minorities, low-income households and limited English proficiency households.

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

Project MITR24-11A
Time Dependent Environmental Impact of Transportation
Professional education summer course: MIT Short Program on 'Understanding and Predicting Technological Innovation: New Data and Theory', J. Trancik, July 13-17, 2015. Also: the online equivalency metrics tool, http://trancik.scripts.mit.edu/home/data/

Project UMAR24-15
A Person-based Comparison of Transit Preferential Treatments on Signalized Arterial Corridors
The C++ code that has been created through Aimsun's Advanced Programming Interface can be used to provide green extension at signalized arterials when a transit vehicle is detected. As well, the Matlab code of the analytical model can be utilized with minor modifications for any network and will become available to other researchers within the NEUTC.

Project UMAR24-21A
Data-based Model for Regional Freight Demand
Video data was gathered for observations of freight deliveries at sites in New York City and Boston. The traffic characteristics and freight delivery details have been logged electronically, so detailed counts of vehicle movements, traffic signal timings, and delivery locations have been recorded. This data is now available to other researchers within the NEUTC for further research into the details of traffic operations in the vicinity of freight deliveries.

The impact on technology transfer

Project UCNR24-32
t-HUB: Connecticut Public Transport Data Hub
The t-HUB application helps make transit system and demographic data much easier to access for transit planners. The simple, yet robust system will also serve as a straightforward means of transferring technology to users immediately. An early example will be the inclusion of the Transit Opportunity Index (TOI), which will be integrated into the initial toolset. The TOI was developed through a related prior research grant through CTDOT.

The impact on society beyond science and technology

Project UMAR24-14B
Signal Timing Optimization for Improved Person Mobility and Air
Improved traffic management systems, such as advanced traffic signal control strategies that improve transit operations and air quality are essential for achieving livable urban areas. The performed research provides ways of utilizing existing infrastructure more efficiently, improving person mobility and the reliability of transit service while minimizing pollutant emissions; therefore, assisting cities reach their sustainability goals

5. CHANGES/PROBLEMS

No change.

Additional information regarding Products and Impacts

Project UCNR24-31A
Crowdsourcing Real-Time Traveler Information Services: Issues, Challenges and Recommendations
First, the smartphone application and associated web infrastructure will be released under open-source licensing agreements. Interested users can then borrow codebase to implement a crowdsourcing-based traveler information system for transit services in a different study area. Also, other researchers can extend and deploy the RETTINA application to systematically study issues of quality and validity of crowdsourced data; algorithms and approaches for synthesizing structured and unstructured crowdsourced data; and understanding participant behaviors as they relate to motivations for participation, and incentives for continued involvement. Secondly, the research conducted in the study will provide interesting insights into the feasibility and applicability of crowdsourcing as a paradigm for providing traveler information.

Outputs

Nothing to report

Outcomes

Project UMAR24-21A
Data-based Model for Regional Freight Demand
The models developed through this research project improve the body of knowledge in the field of urban freight. The analysis has highlighted shortcomings of conventional approaches and shown how concepts from traffic flow theory can be used to develop analytical models that are not computationally complex, and which could be implemented in future versions of the Highway Capacity Manual or in software packages for traffic analysis.

Project UCNE24-39
t-HUB: Connecticut Public Transport Data Hub
In addition to offering a distance-learning alternative to the traditional delivery mechanism of the Transportation Planning course at UConn, the course created instructional resources, data, and software related to transportation modeling that will benefit the transportation community at large. The web portal builds on philosophies and practices from successful web education initiatives (e.g. code.org in the computer science arena) to build a publicly accessible transportation planning educational resource. All of the software will be distributed under open-source licensing agreements. Lastly, a partnership with UCF was established and innovative collaborative course delivery techniques implemented and evaluated for refinement in subsequent offerings of the course.

Impacts

Nothing to report