



Webinar #1 Monday, June 8, 1-2pm

Ontologies & Platforms – 2 presentations

1. The iCity Ontology: Towards a Data Standard for Transportation Planning - Megan Katsumi

The iCity Transportation Planning Suite of Ontologies addresses the benefits of using ontologies to support transportation planning activities and explains how the iCity-ORF work has led to a series of ISO standardization efforts for city services' data. Directions for future work on this key outcome, including the collaborative approach that will be pursued for the continued development of the ISO standards will also be discussed.

2. iCity ITSoS Platform and ATIS Applications - Ahmed Aqra, Hasan Bayanouni, Mohammed El-Darieby

Next generation smart city applications will comprise complex workflows of services processing a heterogeneous multitude of voluminous datasets. Services and datasets are heterogeneous as they are provided by diverse public and private institutions using different technologies. The ITSoS platform uses Artificial Intelligence and contemporary software engineering technologies to facilitate seamless integration of these heterogeneous services and datasets into application workflows. The capabilities and services include an Open Trip Planner for the GTHA and a Trip Reservation-based Traffic Control System. These capabilities and services can be scaled for application to a mega city using Big Data techniques.

Webinar #2 Wednesday, June 10, 1-2pm

Visualization – 2 presentations

1. Understanding Urban Planning & Transportation Visualization Needs: Compara and Vizland - Jeremy Bowes, Sara Diamond

The OCAD Visual Analytics Laboratory (VAL) has developed a taxonomy of end users, software systems, data types, tasks and interactivity within the domain of smart city transportation planning. This work contributes to a taxonomy by creating Compara, an intuitive, interactive and searchable index that visualizes the attributes of software from a wide-range of applications and technologies. The taxonomy began as a spreadsheet that we transformed into a custom interactive data visualization that helps users find and understand existing tools and their attributes. We then built Vizland which related specific visualization strategies to tasks that Compara tool users would undertake.

2. 2D and 3D tools for Urban Analytics - Betaville and GraphTrails - A Case Study - Jeremy Bowes, Sara Diamond

Existing technologies for transportation planning, urban design, and decision-making must keep pace with rapid urbanization. Visualization and analysis tools can help by providing 2D and 3D perspectives. Our research teams developed technologies – Betaville and StoryFacets (which includes GraphTrails, as means of recording and revisiting analytics tasks) –and explored ways that these could be integrated as a presentation system. These tools were applied within StudentMoveTO, a large-scale data analytics project which gathered and analyzed students' transportation strategies for four universities in the Greater Toronto Area. The Visual Analytics Lab continues to apply the results of this research to develop visualization strategies for the second phase of this project.



Webinar #3 Friday, June 12, 1:00-2:30pm

Foundations for Planning and Operations – 3 presentations

1. Geo Semantics Exchange: Connecting Content and Providing Context - Hasan Bayanouni, Megan Katsumi, Anastassios Dardas

An increasing dilemma for geospatial analytics is the disconnect between datasets. How does a computer know that a road segment in one dataset passes through a neighbourhood in another and is close to five points of interest in a third? Moreover, how does it know if/how the neighbourhood and points of interest should be treated differently, or what the spatial relationships between them represent? While such facts can be determined with standard geoprocessing tools (e.g., intersect) and human input, the task becomes increasingly complex as the size and variety of the data increase. Our vision is to address this by enabling semantic querying within the ArcGIS Enterprise platform. Toward this, we developed the GeoSemantic Exchange (GSX), a hybrid full-stack prototype that uses data from Esri Canada's GeoFoundation Exchange, is operated by ArcGIS Enterprise and Python, and powered by the iCity Ontologies.

2. Customizing ArcGIS for Visualization of Origin/Destination Model Outputs - Michael Leahy, Eric Miller

UTTRI's Travel Modelling Group uses activity-based travel demand models based on the Transportation Tomorrow Survey to simulate metrics of travel between 2375 zones in the **GTAH**. Visualizations of the OD flows provide insight into travel demand patterns, but it is a challenge to process and visualize the origin-destination data outputs of these simulations using conventional GIS software. This presentation will discuss two custom prototypes developed by the Education and Research group at Esri Canada to enable the origin-destination travel modelling outputs to be processed and visualized efficiently and effectively in ArcGIS Pro desktop software, and on the Web browser using the ArcGIS API for JavaScript.

3. Bus Bridging Assessment Tool and Visualization Dashboard - Alaa Itani, Olufunbi Disu-Sule

Transit agencies use "bus bridging" to provide service in the event of unforeseen disruptions to rail services in many cities. A majority of agencies use improvised strategies to withdraw buses from regular routes to service the disrupted rail segment. Riders on routes from which buses are diverted may experience travel delays; the disruption may end before diverted buses are effectively deployed. The iCity Bus Bridging Dashboard, is an assessment tool agencies can use to minimize the total user delay associated with specific bus bridging plans. Researchers at the Visual Analytics Lab were tasked with creating a visualization prototype for the iCity Bus Bridging Dashboard. Using ArcGIS Operations Dashboard, the processing and handling of geospatial data and statistics is fluid. The prototype takes advantage of the ArcGIS workflow through ArcGIS Pro, ArcGIS Online and the functionality of ArcGIS Operations Dashboard.

Webinar #4 Monday, June 15, 1:00-3:00pm

Elements of the Street and its Users – 4 presentations

1. A 'Gamification' Survey Approach to Assessing Parking Behaviour - Mehdi Nourinejad, Bo Wang

iCity Park investigates on-street parking choices made by drivers. Deciding where to park involves complicated trade-offs between cost of parking, cost of fines for illegal parking, parking availability, probability of a ticket, information availability, and distance from destination. Given the challenge of assessing these trade-offs by



Research Day Webinar Series, June 8-17, 2020

drivers we use a novel ‘gamification’ approach to develop a survey about parking behaviour. This presentation outlines the survey and the results of a behavioural model of parking choices based on the data we collected. The model assesses the impact of parking information systems, and other policies such as parking price, illegal parking fine, and enforcement levels.

2. Capturing Pedestrian Tours and Activities through Smartphone Data: Lessons Learned - Ming Xiaomeng Xu

To improve the representation of the behavioral demand for travel, travel forecasting models have shifted from being trip-based to activity-based. Pedestrian tours both link pedestrian activities and related trips and reflect the access mode, sequence, frequency, and duration of scheduled pedestrian activities. Process-oriented experiences learned throughout the data collection and analysis will be discussed. From designing and generating the travel diary, assessing the value of GPS travel data, to extracting pedestrian activities and tours from smartphone data, linking the pedestrian tours to locational attributes and urban forms.

3. A Dashboard Tool for Mapping and Evaluation of Complete Streets in Toronto - Greice Mariano, Matthew Roorda

The iCity Complete Streets Dashboard, developed by iCity researchers at the Visual Analytics Lab from OCAD University and UTTRI, is an interactive web-based dashboard visualization tool designed to help urban planners and engineers design, assess and visualize the features and benefits of Complete Streets. This work builds on literature surveys on “best practices” in Complete Street design conducted in 2015 and a novel 3D animated survey conducted in 2016, in which iCity researchers identified priorities and competing interests that must inform the design. The iCity Complete Streets Dashboard will soon be implemented within the Esri product suite.

4. KidScore: Child-Friendly Cities Assessment Tool - Josh Fullan, Susie Saliola

The KidScore is an engagement tool and metric for evaluating the child-friendliness of urban places. It measures and scores what matters to kids and youth in cities and towns, and provides decision makers with actionable data to improve quality of life at the neighborhood level.

Webinar #5 Wednesday, June 17, 1:00-2:00pm

The Long View and Next Steps – 2 presentations

1. Multi-Decade Longitudinal Analysis of Urban Growth and Transport Network Expansion in the GTHA - Eric J. Miller

This study explored the dynamic relationship between transportation infrastructure investment and urban growth in the GTHA. A comprehensive database of urban growth indicators, population socio-economic attributes and transportation networks and accessibilities was constructed for the time period 1971-2016 from a variety of sources. Econometric models were then constructed to explore the role of road and transit accessibility in urban development, the effects of urban form on travel demand and factors influencing housing prices.

2. Next Steps and iCity 2.0 - Eric Miller, Sara Diamond, Steve Farber, Amer Shalaby, Judy Farvolden

iCity 2.0 builds on the successful collaborations established in iCity and is an outcome of a series of workshops



Research Day Webinar Series, June 8-17, 2020

held with key stakeholders over the summer of 2019. The research will address three issues key to equitable, healthy, wealthy and sustainable development: How do we manage the risks and reap the benefits of emerging mobility services? How can we create complete communities in both existing neighbourhoods and new developments? How can we allocate surface transportation capacity to move more people safely, efficiently, and reliably on existing roads? A multidisciplinary research team from the University of Toronto and OCAD-U will be complemented by partnerships with mobility start-ups, technology firms, engineering, data and analytics firms, property developers, not-for-profits, and municipal and regional governments, creating an urban innovation ecosystem of next-stage recipients and end-users that ensures iCity 2.0 will achieve research impact.

iCity 2.0:Urban Data Science for Future Mobility was submitted to the Ontario Research Fund, Research Excellence Round 10.

Speakers

Ahmed Aqra is a PhD candidate working towards his PhD in Intelligent Transportation Systems at the University of Toronto. Ahmed is a multi-dynamic ITS expert and self-motivated certified project manager (PMP). His research focuses on developing trip level and link level traffic assignment that will pave the road for a network-wide trip-level in-advance reservations platform in our transportation system. Ahmed received his BSc in Computer Engineering from Ajman University in 2006, and he obtained his Master of Engineering Management from University of Wollongong in 2013. In 2016, he received his Master of Applied Science in Software Systems Engineering from University of Regina. From 2006 to 2015, Ahmed worked in the industry as a software engineer, web developer, chief analyst, and ITS subject matter expert serving several international organizations. During his PhD journey, Ahmed led the “Big Data” team for traffic applications in ITS lab at University of Toronto to develop various applications and services. Ahmed is passionate about incubating new ideas and solving real life problems using state-of-art software technologies.

Hasan Bayanouni has 13 years of experience in the ICT industry. He received his BSc in Computer Engineering from Ajman University in 2003. In 2017, he received his PhD from University of Salford, UK. He is a postdoctoral fellow in the Department of Civil and Mineral Engineering at the University of Toronto and the team leader of ITSoS (iCity-ITSoS) project which is part of the iCity-ORF project. He is working with the Smart Freight Centre on the Freight Data Warehouse and Data Analytics Solutions. Dr. Bayanouni worked in the industry as IT infrastructure engineer and solution architect. He led mega projects in the ICT infrastructure. He also led mega projects in the Smart Cities domain. He is focusing on the big data, data analytics, IoT Solutions and Smart Cities Solutions.

Jeremy Bowes is a tenured Professor in Design at OCAD University, and teaches in the Environmental Design program, and the Strategic Foresight and innovation graduate program. He has 35 years of experience as an interior, and architectural designer. He has operated his own design office since 1987, and has pursued a variety of design work from film and television studios, interior and architectural design, to exhibit and furniture design. His current practice encompasses residential design; small urban infill, cottage and rural residential projects, with a focus on new sustainable methods, constructional systems and materials. Jeremy has served in numerous administrative capacities, most recently as an assistant dean in the faculty of design, and as a chair of the Environmental Design program. He is also a course leader in the Strategic Foresight and innovation Masters of design graduate program, and an advisor to Slab. His research centres around sustainable living design approaches for habitat dwellings, building on past architectural housing experience, and systems design background. Key areas of research are minimal residential habitat design, sustainable prefabrication, material constructional system methods, and integrated living systems within architectural, urban and rural ecologies.

Anastassios (Tasos) Dardas is a Higher Education Developer/Analyst in the Education & Research Group at Esri Canada. He received his PhD in Geography (Health & Transport) from McMaster University and M.S. in GISciences from Clark University (USA). Before Esri Canada, Tasos worked with Hasan as a team co-lead in the ITSoS project. Now with the ontology project, his role is to conduct R&D on semantic technologies and create an application within the ArcGIS ecosystem. Aside from semantic research, Tasos is working on “big” data, data science, automated pipelines, and GeoAI related content.

Dr. **Sara Diamond** is the President of OCAD University, Canada’s “university of the imagination.” She holds a PhD in Computer Science and degrees in new media theory and practice, social history and communications. She is an appointee of the Order of Ontario and the Royal Canadian Society of Artists. While retaining OCAD University’s traditional strengths in art and design, Diamond has guided the university in becoming a leader in digital media, design research and curriculum through the Digital Futures Initiative, new research in Inclusive Design,



Research Day Webinar Series, June 8-17, 2020

health and design, as well as in sustainable technologies and design. She also played a leading role in OCAD University's establishment of the unique Aboriginal Visual Culture Program. These initiatives have built strong partnerships for OCAD University with science, business and communities, in Ontario and abroad. Currently, she serves on the Ontario Ministry of Culture's Advisory Council on Arts & Culture, ORION (Ontario's high-speed network), SHARCNET, IO (Interactive Ontario), Canadian Women in Communications; i-Canada; is Chair of the Scotiabank Nuit Blanche Toronto Advisory Committee. Diamond serves the larger university community through her membership on the Standing Advisory Committee on University Research (SACUR) of the Association of Universities and Colleges and as Chair of the Standing Committee on Relationships with Other Postsecondary Institutions for the Council of Ontario Universities. Diamond is a member of the Council of the Canadian Academies' expert panel on the State of Science & Technology in Canada.

Olufunbi Disu-Sule is an undergraduate at Fanshawe College where he is enrolled in his fourth year of Environmental Design and Planning. He is currently a Research Assistant at OCAD-U's Visual Analytics Lab. His research is focused on the implementation and utilization of Esri software to solve urban visualization problems.

Mohamed El-Darieby is a Professor of Software Engineering, Faculty of Engineering, University of Regina. He received his BSc and MSc from Egypt and PhD in Systems and Computer Engineering at Carleton University, Ottawa, Canada. He has more than 25 years of experience in software development. His research interests are in the areas of software and networking systems with applications to Smart Infrastructure and City Dynamics with over 22 competitive industrial, national and industrial funding grants from agencies such as NSERC (DG, DDG and Engage), Transport Canada, CANARIE, CFI, GEOIDE, Sask. Highways, NRC, WestGrid, PTRC, and WED. Dr. EL-Darieby has more than 60 publications in technical conferences and journals. Dr. El-Darieby is a member of the Association of Professional Engineers and Geoscientists of Saskatchewan (APEGS).

Professor **Steven Farber** is a quantitative transportation geographer and spatial analyst. His research investigates how land use and transportation systems affect social and economic outcomes in urban areas. His work is aimed at better understanding this link in an effort to improve the sustainability of transportation and land use planning. Steve's interdisciplinary approach draws from and contributes to the theories of activity and travel behaviour modelling, urban-, transportation-, and time-geography, spatial analysis, and geographic information science (GIS).

As the founding executive director of UTTRI, Dr. **Judy Farvolden** has helped create a leading transportation research centre, leveraging the cross-disciplinary knowledge of University of Toronto researchers to address real-world challenges. Judy works collaboratively with industry and government partners to identify opportunities that can be addressed by UofT's broad and deep transportation research expertise. Through an extensive network of stakeholders, UTTRI has successfully created numerous collaborations with partners locally, nationally and internationally. Her own interests are in harnessing the disruption created by emerging transportation technology and services to realize a future of seamless, integrated mobility that enhances access and equity, and mitigates climate impacts.

Josh Fullan brings over 15 years' experience of delivering successful projects for governments, communities, and private enterprise in public consultation, community facilitation, education and engagement. In 2019, Josh acted as Project Lead for the City of Toronto's KidScore Pilot, the City of Vaughan's Traffic Management Strategy Communications and Engagement program, and the Halton District School Board's Stakeholder Engagement Plan for its next Multi-Year Plan. He also acted as Strategic Advisor for the City of Toronto Children's Services' Strategic Plan, facilitating community workshops and discussions in diverse Toronto neighbourhoods. He is currently leading a national study on the impact of COVID-19 social and physical distancing on Canadian children and youth, and acting as a stakeholder and community relations advisor on a number of development and infrastructure projects.

Alaa Itani is a PhD student in the Department of Civil and Mineral Engineering at University of Toronto and she is currently an executive committee member of the UT-ITE student chapter. Her research interest is in planning and modelling on-demand transit in the era of new mobility and automation. Alaa holds an MASc degree from the University of Toronto where her research focused on developing a decision support toolkit for managing unplanned subway disruptions.

Megan Katsumi is a postdoctoral fellow with the University of Toronto Enterprise Integration Lab, and the Transportation Research Institute (UTTRI) Group. She has a BAsC in Industrial Engineering (Toronto), and completed her MASc and PhD with the Semantic Technologies Group at the University of Toronto where her research focused on foundations for ontology development. Currently, Megan's research is concerned with the development of a set of ontologies and reasoning services to support city services.

Michael Leahy is a Higher Education Developer/Analyst in the Education and Research group at Esri Canada. He manages the Esri Canada GIS Centres of Excellence program, and contributes to a variety of research and development projects using Esri technologies in collaboration with researchers at universities and colleges across Canada. Michael has a PhD in Geography from Wilfrid Laurier University, and Masters of Environmental Studies from University of Waterloo.



Research Day Webinar Series, June 8-17, 2020

Dr. **Greice C. Mariano** is a postdoctoral research fellow in Data Visualization at the Visual Analytics Lab (VAL), OCAD University. She earned her MASC and PhD in Computer Science in 2018 and 2013, respectively, at the Institute of Computing (IC) from University of Campinas (UNICAMP), São Paulo State, Brazil. In 2009, she graduated in Information Technology at the Faculty of Technology, University of Campinas (UNICAMP), Brazil. Her experience and main research interest is related to the investigation and use of visualization techniques to explore multidimensional and multivariate temporal data. She also has experience in software development, as well as information system with emphasis in corporate web applications. As a Post-Doctoral Research Fellow with the Visual Analytics Lab, she has been working on iCity-ORF project, collaborating with the development of user-centred visualization tools.

UTTRI Director Professor **Eric J. Miller** is Past Chair of the U.S. Transportation Research Board (TRB) Committee on Travel Behavior and Values, Member Emeritus of the TRB Transportation Demand Forecasting Committee and Past Chair of the International Association for Travel Behaviour Research (IATBR). He served on the US National Academy of Sciences Committee for Determination of the State of the Practice in Metropolitan Area Travel Forecasting. He has chaired or been a member of numerous travel demand modelling peer review panels throughout North America. He is the recipient of the 2009 Wilbur S. Smith Distinguished Educator Award from the Institute of Transportation Engineers, the inaugural winner of the University of British Columbia Margoese National Design for Living Award (2012) and recipient of the 2018 IATBR Lifetime Achievement Award. He is the developer of GTAModel, an advanced regional travel demand modeling system used by municipalities in the Greater Toronto Area (GTA) to forecast travel demand that is based on TASHA, a state-of-the-art agent-based microsimulation model of activity and travel, and ILUTE, an integrated land use-transportation model system for the GTA.

Dr. **Mehdi Nourinejad** is an assistant professor at the Civil Engineering Department of York University. He received his PhD from the University of Toronto and worked for two years as a post-doctoral fellow at the Rotman School of Management. Mehdi's research focuses on optimal planning and control of transportation systems in smart cities with autonomous vehicles. He has published his research in several peer-reviewed journals and he is on the editorial board of "Transportation Research Part E: Logistics and Transportation Review." His research on autonomous vehicles has received media coverage and is published in outlets including Forbes, University of Toronto Engineering News, Popular Science, Design Quarterly, Global News, Gizmag, Science Daily, and Tech Xplore.

Matthew Roorda is a Professor of Civil and Mineral Engineering and has been faculty at the University of Toronto since 2005. Dr. Roorda obtained his P.Eng. in 1999. He completed his BEng at McMaster University, and his MASC and PhD degrees at the University of Toronto. Dr. Roorda has extensive experience in the development of new models of urban systems (freight and passenger), the use of those models for forecasting and analysis, and in supporting data collection initiatives. Dr. Roorda's research interests include urban freight transportation, freight planning and operations, freight and passenger travel survey methods, city logistics, agent-based simulation, parking and curbside management, emissions analysis, activity-based travel demand modelling, and firm behaviour. Dr. Roorda is an experienced teacher at both the graduate and undergraduate levels. Dr. Roorda is a Canada Research Chair in Freight Transportation and Logistics. Dr. Roorda is also co-chair of the University of Toronto Infrastructure Engineering Program, and he is the Chair of the Smart Freight Centre, a three-university research centre focused on freight research and implementation projects across the Greater Toronto and Hamilton Area.

Susie Saliola is an Education and Research GIS Analyst at Esri Canada's Toronto office where she provides support for various teaching, learning, and research projects, facilitates workshops for both entry level and experienced GIS users, and works with different partner organizations to create meaningful maps and apps. Susie has a special interest in using GIS for community research, engagement, and development. Susie's background includes doing GIS work for municipal planning, public health, and international non-profit organizations. She has an M.Sc. in Physical Geography with a specialty in GIS and Remote Sensing from the University of Toronto and a Bachelor of Environmental Studies from York University.

Dr. **Amer Shalaby** is a Professor in the Department of Civil and Mineral Engineering at University of Toronto, Director of the Transit Analytics Lab and Associate Director of the iCity Centre for Automated and Transformative Transportation Systems (iCity-CATTS). He is specialized in transit planning and operations, intelligent transportation systems, and transportation planning for large-scale events and mega cities. His research program has been sponsored by many organizations from both the public and private sectors. In addition to research, Dr. Shalaby has delivered consulting services to various transportation organizations in Canada and internationally, and he has offered annual short courses on public transit planning and modelling to the professional community since 2008.

Bo Wang completed his BASC and MASC at University of Toronto, supervised by Professor Matthew Roorda, with a research focus on parking behaviour investigation, including survey design, and multiple logit models development.

Ming Xiaomeng Xu is a PhD candidate working with the Waterloo Public Transportation Initiative (WPTI) led by Dr. Jeff Casello, University of Waterloo. She has a BE in Software Engineering and a Master of Community and Regional Planning (MCRP) from Iowa State University. Her research uses automatically-collected trip data to study pedestrians' travel behavior for use in planning studies. Ming's interests lie in active transportation and their impacts on healthy and environmentally-friendly neighborhoods and communities.