

Call for papers: "Modelling complex urban environments" specialist conference
Sponsored by the Waterloo Institute for Complexity & Innovation (WICI)

June 21-22, 2018, St. Jerome's College, University of Waterloo, Waterloo, Ontario, Canada

We invite submissions for conference presentations and session proposals for the 2018 WICI sponsored conference on "Modelling complex urban environments". The intent of this small, informal conference is to bring together scholars from multiple disciplines who have activity and interests in modelling the processes that create and shape complex urban environments. Full details are available at the conference website <https://uwaterloo.ca/complexity-innovation/events/wici-conference-modelling-complex-urban-environments> .

Paper proposals should include a short but descriptive title, a list of all contributing authors and their affiliations, an abstract of no more than 250 words, a list of 3-5 keywords, and an identification of the theme to which the proposal is submitted, if applicable.

Session proposals should include a short but descriptive title, a session abstract of no more than 250 words, a list of organizers and their affiliations, 3-5 keywords, and a list of potential paper contributions, following the format from above. *Paper proposals as part of a proposed organized session should be submitted with the session proposal. If we are not able to accommodate the proposed session, paper proposals may be accepted individually.* Alternative formal session proposals, such as panel discussion, learning sessions, workshops, and other participatory activities are highly welcomed.

All submissions should be directed to Noelle Hakim (noelle.valeriot-hakim@uwaterloo.ca), with a subject header WICI UCC <paper|session> submission, Yourlastname **BY MARCH 1, 2018**. For example: subject: WICI UCC Session 5 Parker (for a paper submitted to the ABM land market session). OR subject: WICI UCC Session Proposal Parker (for a session proposal).

We specifically invite proposals around the following themes:

- 1. Integrating "big data" and "smart cities" data with urban modelling**
Organizer: Alison Heppenstall (A.J.Heppenstall@leeds.ac.uk)

New forms of data about people and cities, often termed 'Big', are disrupting many traditional fields of research. This is true in geography, and especially in those more technical branches of the discipline such as computational geography / geocomputation, spatial analytics and statistics, geographical data science, etc. These new forms of micro-level data have fostered new methodological approaches in order to better understand how urban systems behave, giving rise to a new research area

termed urban analytics. Increasingly, these approaches and data are being used to ask questions about how cities can be made more sustainable and efficient in the future.

This session will bring together the latest methodological research focused on urban analytics, with the goal of production of a special journal issue. We are particularly interested in papers that engage with the following domains:

- Integrating urban analytics and agent/individual-based modelling;
- Machine learning for urban analytics;
- Innovations in consumer data analytics for understanding urban systems;
- Real-time model calibration and data assimilation;
- Spatio-temporal data analysis;
- New data, case studies, demonstrators, and tools for urban analytics;
- Geographic data mining and visualisation;
- Frequentist and Bayesian approaches to modelling cities.

2. **Social-ecological networks in the city** *Organizer: Jeremy Pittman*
(jpittman@uwaterloo.ca)

This theme focuses on conceptual and empirical models of three interrelated patterns that characterize cities as complex social-ecological systems: (1) social interactions that occur across cityscapes; (2) ecological interactions across cityscapes, and (3) social-ecological interactions, or how people relate to key features of their urban environments. These various aspects, individually and collectively, have demonstrated impacts on sustainability of a broad range of rural/non-urban systems. Our intent is to bring together diverse urban scholars working on one or all of these different components, with the hopes of fostering meaningful dialogue and integration towards understanding the role of social-ecological networks in urban sustainability.

3. **Modelling and the planning process** *Organizer: Jeremy Pittman*
(jpittman@uwaterloo.ca)

We solicit presentations that demonstrate the application of modelling within planning processes, including (but not limited to): (1) the use of simulation models to inform decision-making under uncertainty and (2) participatory modelling to guide public engagement and planning efforts. Presentations may cover a diversity of topics or applications (e.g., transportation, energy, sustainability), but must align with the general theme of demonstrating model application in real-world planning processes.

4. **Artificial Intelligence & Optimization Models in Urban Environments**
Organizer: Jorge Garcia (ja4garci@uwaterloo.ca)

Artificial Intelligence (AI) may provide decision-makers with tools to combine, interpret, and extract rules from data generated by different information systems. Detecting lifestyle patterns, anticipating problems, identifying areas of risk, analyzing collective real-time data, and classifying populations are some of its potential

benefits. These techniques can potentially provide decision support for cities striving to efficiently allocate scarce resources. More and more companies opt for using AI in their operations, so it is likely we will see more AI applications for urban environments.

Optimization techniques are excellent decision-making tools for well-defined linear deterministic problems; however, when we have uncertainties in parameters, nonlinear relations, multiple agents, or multiple relations we may opt for either using a more sophisticated model (or set of models) or simplifying the real problem. In the context of urban environments, there are many problems that need proper planning and efficient allocation, and here optimization may play an important role. We invite presentation of novel optimization applications for complex urban environments.

This session is devoted to the application of AI or Optimization models applied to urban problems including:

- urban planning
- transportation
- healthcare
- waste management
- resource allocation
- population dynamics
- public services

5. **Agent-Based Modelling of Urban Markets** *Organizer: Yu Huang*
(yu.huang@uwaterloo.ca)

This session will highlight cutting-edge research in the field of agent-based modelling of urban markets. It will also provide a forum for discussion and reflection on potential implications of model findings for current urban issues, such as housing market dynamics, labour market transitions, and urban growth and change. A special journal issue will be organized around the session, comprising contributions of leading agent-based modelling scholars in the field of urban economics, urban and regional planning and development, and geography.

Suitable topics for the session presentations include any theoretical or empirical agent-based modelling on

- land/housing markets (land development; housing market mechanisms and policies);
- residential mobility, home search and location choices;
- labour markets and wages (job search and mobility);
- rental markets (rent control policies);
- land-use/transport interaction;
- and other markets nested in complex land-use change models

6. Measuring and Modeling the Role of Citizen Agency in the Evolution of Cities as Embedded in Multi-Scale Governance Structures and Global Networks *Organizer: Milton Friesen (ingenuityarts@gmail.com)*

One of the cornerstones of liberal democracy is citizen responsibility, which in turn implies agency – an ability to act meaningfully in the dynamics of freedom and responsibility at various scales. Technological development affects human agency, both directly and indirectly, through changes in access to resources including information, communication, and the development of products and services. Data generation, ensuing measurement, and analytic techniques such as modeling affect policy in ways we are only beginning to understand. How are digitally intensive urban contexts affecting citizen agency?

Potential Topics:

- Effect of smart cities on citizen agency, with possible comparison to low digital function contexts;
- Distribution of global digital networks (social media, banking, and information, etc.) and potential effects on citizen agency;
- How the scale of networks from the local to the global affects optimum benefits for human agency;
- Effects of algorithms embedded in large corporate and government structures (including city-to-city and business-to-business networks) on human political freedom;
- Useful vs. distorting simplifications in urban modeling including examination of various forms of persistent inequality;
- Comparison of very large computational models with agent numbers approaching human global populations vs. smaller, more contextual models such as city scales;
- Comparison of effects of digital infrastructure on social infrastructure.

7. Measuring, modelling and interpreting scaling/power laws in urban systems *Organizer: Fatemeh Jahanmiri (fatemeh.jahanmiri@uwaterloo.ca)*

Technological advancements in the collection and analysis of “big data” have led to the identification of scaling and power law models in urban systems, including the distribution of population, size of buildings and parcels, length and structure of infrastructure, firm size and income among many more. Interpretations of these models are dispersed coming from frameworks of multiple disciplines including physics, economics, sociology and geography. This session aims to highlight the latest findings in this area and distill to converge to a unified theory that is comprehensible and useful for generalist city scientists. Session goals include exploration of advancements in models that link patterns to processes based on the universal scaling laws. We also invite novel application ideas that use scaling concepts to advance urban planning policy and practice.

Potential topics include:

- Review, comparison and classification of power law models in urban systems;

- Latest techniques in measuring and analyzing scaling pattern in various data types and the resulting urban metrics;
- Hypotheses/ models of the origin of scaling in urban systems and their resulting theoretical frameworks;
- Challenges in interpretation of power law models and the effects of multidisciplinary contexts;
- The latest applications of power law models in urban policy and practice, including gaps and obstacles;
- The application of fractal theory in urban scholarship and planning;
- Comparison between the effects of different organizational models and the fractal structure in human agglomerations;
- Scaling process in urban systems and the effects of digital infrastructure and globalization on such processes.

We also invite **proposals related to any other aspect of modelling urban complexity**. Proposals for transdisciplinary and participatory activities are particularly welcomed. Qualitative, quantitative, and mixed methods approaches welcome.

Conference registration fees are anticipated to be \$200 for faculty members and other professionals, \$100 for post-doctoral fellows, and \$50 for students. Fees will include a reception, two lunches, and coffee breaks. Accommodation options include a block of rooms at the Delta Hotel: (<http://www.marriott.com/hotels/travel/ykfdw-delta-hotels-waterloo/>) at \$169.00 per night, or in campus residence: (<https://uwaterloo.ca/summer-accommodations/accommodation-information>) at \$60.00 per night. Full conference information and links to registration will be available at <https://uwaterloo.ca/complexity-innovation/events/wici-conference-modelling-complex-urban-environments>.

A small amount of funding is available for travel for presentations by junior scholars and/or scholars from underrepresented groups (including geographical location). Details to follow. Please indicate on your proposal if you are seeking travel support.

Waterloo, Ontario is part of a vibrant and growing urban area, the Region of Waterloo, which is a growing hub for technical innovation and start-ups. Located less than 100km from the vibrant international city of Toronto, the Region is well served by international airport connections via Pearson International Airport. Southern Ontario also offers many recreational and tourism opportunities, including local agriculture, four great lakes, wineries, and the world famous Niagara Escarpment. In addition to the University of Waterloo, Southern Ontario is home to eight research universities and many highly ranked technical colleges.

Organizers:

Dawn Parker, Professor, School of Planning, University of Waterloo
(deparker@uwaterloo.ca)

Alison Heppenstall, Professor, Department of Geography, University of Leeds
(A.J.Heppenstall@leeds.ac.uk)

Additional faculty program committee members:

Jeremy Pittman, Assistant Professor, School of Planning, University of Waterloo
Kathleen Rybczynski, Associate Professor, Department of Economics, University of Waterloo

Student organizers:

Yu Huang, PhD candidate, University of Waterloo School of Planning
Milton Friesen, Senior Fellow and Program Director, Social Cities, CARDUS; PhD candidate, University of Waterloo School of Planning
Jorge Garcia, PhD student, Systems Design Engineering
Fatemeh Jahanmiri, PhD student, University of Waterloo School of Planning
Neluka Leanlage, PhD student, School of Planning

For further details on conference organization, contact Dawn Parker (dcparker@uwaterloo.ca) or Noelle Hakim-Valeriotte (noelle.valeriotte-hakim@uwaterloo.ca).