# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization Committee</td>
<td>4</td>
</tr>
<tr>
<td>Welcome Message</td>
<td>6-7</td>
</tr>
<tr>
<td>General Information</td>
<td>9-12</td>
</tr>
<tr>
<td>Keynotes Information</td>
<td>14-17</td>
</tr>
<tr>
<td>Tutorials Information</td>
<td>18</td>
</tr>
<tr>
<td>Mohawk College Map</td>
<td>19-20</td>
</tr>
<tr>
<td>Agenda at a Glance</td>
<td>21-23</td>
</tr>
<tr>
<td>Daily Agendas - Tuesday</td>
<td>25-28</td>
</tr>
<tr>
<td>Daily Agendas - Wednesday</td>
<td>29-32</td>
</tr>
<tr>
<td>Daily Agendas - Thursday</td>
<td>33-36</td>
</tr>
<tr>
<td>Daily Agendas - Friday</td>
<td>37-39</td>
</tr>
<tr>
<td>Things to do in the City of Hamilton</td>
<td>40-42</td>
</tr>
<tr>
<td>Conference Award Recipients</td>
<td>43-44</td>
</tr>
<tr>
<td>SCS Board of Directors Award Recipients</td>
<td>45-46</td>
</tr>
<tr>
<td>Sponsors</td>
<td>47</td>
</tr>
</tbody>
</table>
Organization Committee

General Chair: Hamdi Kavak

Vice-General Chair: Philippe Giabbanelli

Program Chair: Cristina Ruiz Martin

Proceedings Chair: Maria Julia Blas

Awards Chair: Mamadou Kaba Traore
Welcome
Welcome from the
ANNSIM ‘23 Conference Chairs

Welcome to Hamilton!

The organizing committee is delighted and honored to welcome you to the 2023 Annual Modeling and Simulation Conference (ANNSIM’23). Hosted by The Society for Modeling and Simulation International (SCS), ANNSIM is the flagship conference of SCS to cover state-of-the-art developments in Modeling & Simulation (M&S). SCS, the organizing committee, and the track chairs have worked hard to make these three-and-a-half days very exciting and to ensure that ANNSIM continues to establish itself as one of the leading events in the M&S community.

This year marks the second face-to-face meeting of ANNSIM to provide the most engaging experiences possible. In addition, SCS has been carefully selecting conference sites that minimize environmental impact to help build a sustainable future. Mohawk College was selected as the host of ANNSIM’23 because of its sustainability efforts. The 2022 AASHE Campus Sustainability Index lists Mohawk as “Top 3 Performer” among associate colleges in North America. During the conference, Mohawk College will share how it is rising in the ranks of the most sustainable academic campuses.

This year’s conference is a great opportunity to learn about the latest research in M&S and to network with other professionals in the field. The program of ANNSIM’23 includes a world-class selection of peer-reviewed original research papers, tutorials, work-in-progress presentations, Ph.D. Colloquium talks, and keynote speeches. Our first keynote will be delivered on the first day of the conference (May 23, 2023) by Prof. Kathleen M. Carley from Carnegie Mellon University, a world-renowned expert in social simulation. Prof. Dawn M. Tilbury from the University of Michigan is our second-day (May 24, 2023) keynote speaker, and she is an eminent expert in control systems. Participants will also have the opportunity to enjoy several social events and a rich environment that features vibrant arts and culture scenes in addition to the stunning natural beauty of the Niagara region.

ANNSIM’23 has technical co-sponsorships from both the Association of Computing Machinery (ACM) and the Institute of Electrical and Electronics Engineers (IEEE). ACM is the world’s largest educational and scientific computing society, delivering resources that advance computing as a science and a profession. IEEE is the world’s largest technical and professional organization dedicated to advancing technology for the benefit of humanity. SCS’ co-sponsorship agreements with both ACM and IEEE allow the ANNSIM’23 proceedings papers to be archived in both the ACM Digital Library and the IEEE Xplore digital library.

Our sincere appreciation goes to the track chairs, whose invaluable leadership in their respective areas was key to the success of the overall conference. This year’s tracks and chairs are:
Welcome from the
ANNSIM’23 Conference Chairs

- Annual Simulation Symposium (José Luis Risco Martín, Joachim Denil, and Román Cárdenas),
- Cyber Physical Systems (Claudio Gomes and Bentley Oakes),
- Emerging Topic - Digital Twins (Guodong (Gordon) Shao and Istvan David),
- Humans, Societies, and Artificial Agents (Taylor Anderson and Alison Heppenstall),
- Machine Learning and Simulation (Joon-Seok Kim and Andreas Züfle),
- Modeling and Simulation in Cyber Security (Sachin Shetty and Danda Rawat),
- Modeling and Simulation in Medicine (Jerzy W. Rozenblit and Michel Audette),
- Theory and Foundations for Modeling and Simulation (Hessam Sarjoughian and Eugene Syriani),
- Symposium on Simulation for Architecture and Urban Design (Nina M. Sharifi, Gabriel Wurzer, and Mohamed Aly Etman),
- Simulation Education and Simulation-Based Learning (Ashkan Negahban and Omar Ashour),
- Symposium on Performance Evaluation of Computer and Telecommunications Systems / Communications and Networking Simulation (Malamati Louta, George Karetsos, Abdolreza Abhari, and Ala’a Al-Habashna),
- Tutorials (Simon Gorecki and Scott Rosen),
- Work-in-Progress (Ali Kucukozyigit), and
- PhD Colloquium (Hoda Khalil)

We extend our appreciation to the technical program committee and reviewers in all tracks for their thorough work and diligence during the rigorous peer review process, which made it possible to set up a program of selected and high-quality presentations. We also express our gratitude to the authors for submitting their work to ANNSIM’23 from all over the world.

ANNSIM would not be possible without the dedication and tireless effort of several individuals, who have supported the organizing committee: Maria Julia Blas (Proceedings Chair), Mamadou Kaba Traore (Awards Chair), and John Richardson (Logistics Chair). Our final thanks go to SCS officers Oletha Darenburg and Carmen Ramirez, and SCS President Charles Macal, for the smooth running of conference coordination activities.

We hope you enjoy ANNSIM’23, and we look forward to your participation in future SCS events.

On behalf of the organizing committee,

Hamdi Kavak
Vice-General Chair
George Mason University
USA

Philippe Giabbanelli
Vice-General Chair
Miami University
USA

Cristina Ruiz Martin
Program Chair
Carleton University
Canada
This page left intentionally blank.
General Information
General Information

Registration

Your registration for SCS’s 2023 Annual Modeling and Simulation Conference (ANNSIM’23) includes morning and afternoon breaks each day, the Tuesday evening reception and access to all sessions, tutorials, posters, (unless otherwise noted).

ANNSIM’23 will take place in both the McKeil School of Business Building (i Wing) and the Joyce Centre for Partnership and Innovation Building (EA Wing).

- Registration Hours  (Joyce Gallery, EA Wing)
  - Tuesday, May 23, 2023  8:00 a.m.—5:00 p.m.
  - Wednesday, May 24, 2023  8:00 a.m.—5:00 p.m.
  - Thursday, May 25, 2023  8:00 a.m.—5:00 p.m.
  - Friday, May 26, 2023  8:00 a.m.—12:00 p.m.

  Please note that the Registration Desk will be closed for lunch from Tuesday through Thursday.

- Morning Coffee  (Joyce Gallery, EA Wing)
  - Tuesday, May 23, 2023  8:30 a.m.—9:00 a.m.
  - Wednesday, May 24, 2023  8:30 a.m.—9:00 a.m.
  - Thursday, May 25, 2023  8:30 a.m.—9:00 a.m.
  - Friday, May 26, 2023  8:30 a.m.—9:00 a.m.

- Coffee Breaks  (Joyce Gallery, EA Wing)
  - Tuesday, May 23, 2023  10:30 a.m.—11:00 a.m. | 3:30 p.m.—4:00 p.m.
  - Wednesday, May 24, 2023  10:00 a.m.—10:30 a.m. | 3:30 p.m.—4:00 p.m.
  - Thursday, May 25, 2023  10:30 a.m.—11:00 a.m. | 3:00 p.m.—3:30 p.m.
  - Friday, May 26, 2023  10:30 a.m.—11:00 a.m.

- Plenary Session with Keynotes  (EA Wing, EA011)
  - Tuesday  9:30 a.m.—10:30 a.m.—SCS Keynote: Dr. Kathleen M. Carley
  - Wednesday  9:00 a.m.—10:00 a.m.—SCS Keynote: Dr. Dawn M. Tilbury
Conference Meetings & Events Summary

• **Tuesday**  
  Welcome, Awards, and Plenary Session with Keynote  
  (9:00 a.m.—10:30 a.m.)  
  Technical Sessions (11:00 a.m.—5:30 p.m.)  
  Board of Directors Awards and Fellows Luncheon (By Invitation)  
  (12:30 p.m.—2:00 p.m.)  
  Tutorial I (4:00 p.m.—5:30 p.m.)  
  Welcome Reception (5:30 p.m.—7:00 p.m.); Joyce Gallery (EA Wing). All Conference Attendees Invited

• **Wednesday**  
  Plenary Session and Keynote Address; (9:00 a.m.—10:00 a.m.)  
  Technical Sessions (10:30 a.m.—5:30 p.m.)  
  Tutorial II (4:00 p.m.—5:30 p.m.)  
  Simulation Meeting (By Invitation) (5:30 p.m.—6:30 p.m.)

• **Thursday**  
  Technical Sessions (9:00 a.m.—5:00 p.m.)  
  Tutorial III (9:00 a.m.—10:30 a.m.)  
  Ph.D. Colloquium (11:00 a.m.—12:30 p.m.)  
  Ph.D. Colloquium Panel (Lite Lunch for panel participants only)  
  (12:30 p.m.—2:00 p.m.)  
  Ph.D. Colloquium Keynote Speaker (2:00 p.m.—3:00 p.m.)  
  Tutorial IV (3:30 p.m.—5:00 p.m.)

• **Friday**  
  Tutorial V (9:00 a.m.—10:30 a.m.)  
  Technical Sessions (9:00 a.m.—12:30 p.m.)
General Information

Best Paper Award
The Overall Best Paper Awards for ANNSIM’23 will be presented at Tuesday’s Plenary Session.

Posters
The posters will be on display throughout the week to be viewed. Posters will be presented during the morning and afternoon break on Thursday, May 25, 2023 and in the morning break on Friday, May 26, 2023.

Wi-Fi
Text (SMS) Keyword: wifievent
To Mobile Number: 18333387626
Only Valid On: May 23 – 26, 2023

Personal Belongings
SCS and Mohawk College is not responsible for any items left in the breakout rooms. We recommend that you make sure to take your things before the end of each day.

SCS Board of Directors Awards
The SCS Board of Directors will honor all recipients of the Board of Directors awards from 2019 to 2022 during the Tuesday welcome address.
This page left intentionally blank.
Keynotes
Simulating Societal Systems: Issues in Linking the Micro and the Macro

Author: Kathleen M. Carley
Location: EA Wing, EA011

Day | Time: May 23, 2023 | 9:30 am—10:30 a.m.

Abstract: Long, long ago in the land of simulation, the simulationist would make rules that controlled whether little squares on a giant piece of digital graph paper appeared to be dark or light. At issue was, could micro behavior by these “agents” effect large scale macro behavior for their “society.” Rules such as move to an unoccupied square if you are not near three others like you, resulted in behavior that was “human like” to the observers, that is the squares segregated on the basis of color. Success was declared. Now, fast forward to 2023, and the land of simulation looks very different. However, the foundational micro-macro congruence problem still exists and takes many forms. For example, does accurate micro behavior guarantee realistic macro behavior? Do micro-agents need to gain capabilities to generate more accurate social or macro-behavior? Do human observers believe the simulation macro results more as the micro-agents become more realistic? In this talk, questions regarding the micro-macro linkage in simulation models are addressed using a set of models and results associated with diverse applications. These applications include: threat assessment, pandemic interventions, and the growth of civil violence. It is argued that using simulation fruitfully at the micro and macro level is more impacted by human perception and the modeling of social cognition and emotional cognition than the exact level of realism used in creating congruence.

Biography: Kathleen M. Carley is a professor in the School of Computer Science in the department – of the Institute for Software Research – at Carnegie Mellon University. She also has courtesy appointments at Engineering and Public Policy Bio, Heinz School Bio, Electrical and Computer Engineering, and GSIA Bio.

She is the director of the Center for Computational Analysis of Social and Organizational Systems (CASOS), a university-wide interdisciplinary center that brings together network analysis, computer science, and organization science (www.casos.ece.cmu.edu). Kathleen M. Carley's research combines cognitive science, social networks, and computer science to address complex social and organizational problems. Her specific research areas are dynamic network analysis, computational social and organization theory, adaptation and evolution, text mining, and the impact of telecommunication technologies and policy on communication, information diffusion, disease contagion, and response within and among groups, particularly in disaster or crisis situations. She and her lab have developed infrastructure tools for analyzing large-scale dynamic networks and various multi-agent simulation systems.
The infrastructure tools include ORA, a statistical toolkit for analyzing and visualizing multi-dimensional networks. ORA results are organized into reports that meet various needs such as the management report, the mental model report, and the intelligence report.

Another tool is AutoMap, a text-mining system for extracting semantic networks from texts and then cross-classifying them using an organizational ontology into the underlying social, knowledge, resource, and task networks.

Her simulation models meld multi-agent technology with network dynamics and empirical data. Three of the large-scale multi-agent network models she and the CASOS group have developed in the counter-terrorism area are: BioWar a city-scale dynamic-network agent-based model for understanding the spread of disease and illness due to natural epidemics, chemical spills, and weaponized biological attacks; DyNet a model of the change in covert networks, naturally and in response to attacks, under varying levels of information uncertainty; and RTE a model for examining state failure and the escalation of conflict at the city, state, nation, and international as changes occur within and among red, blue, and green forces.

Dr. Carley is the director of the Center for Computational Analysis of Social and Organizational Systems (CASOS) which has over 25 members, including students, post-doctoral fellows, research staff, and faculty. She is the founding co-editor of the journal Computational and Mathematical Organization Theory which she now co-edits with Dr. Terrill Frantz. She has co-edited several books in the computational organizations and dynamic network area.
Keynote Information

Digital Twins for Manufacturing Systems: Leveraging Real-Time Information through Modeling and Simulation

Author: Dawn M. Tilbury
Location: EA Wing, EA011
Day | Time: Wednesday, May 24, 2023 | 9:00 a.m.—10:00 a.m.

Abstract: Advances in computing and networking technologies have enabled massive amounts of data to be collected from manufacturing plant floors, and stored either locally or in the cloud. Although data quality remains an important challenge, Digital Twins enable this data to be used, together with models of manufacturing processes, to create useful information and advise human operators on recommended actions. Standards for Digital Twins are emerging, and there are opportunities to create different types of Digital Twins that can best utilize the data that exists. In this talk, we will present a requirements framework for Digital Twins in the manufacturing domain, including the important properties of re-usability, interoperability, interchangeability, extensibility and maintainability. Several examples of digital twins that we have created will be presented, with potential outcomes of reduced costs and improved productivity. Future challenges and opportunities in the area of Digital Twins for manufacturing systems will also be discussed.

Biography: Dawn M. Tilbury is the inaugural Ronald D. and Regina C. McNeil Department Chair of Robotics at the University of Michigan, and the Herrick Professor of Engineering. She received the B.S. degree in Electrical Engineering from the University of Minnesota, and the M.S. and Ph.D. degrees in Electrical Engineering and Computer Sciences from the University of California, Berkeley. Her research interests lie broadly in the area of control systems, including applications to robotics and manufacturing systems. From 2017 to 2021, she was the Assistant Director for Engineering at the National Science Foundation, where she oversaw a federal budget of nearly $1 billion annually, while maintaining her position at the University of Michigan. She has published more than 200 articles in refereed journals and conference proceedings. She is a Fellow of IEEE, a Fellow of ASME, and a Life Member of SWE.
Tutorials Information

**Tutorial I:** A Tutorial on Bayesian Sequential Data Assimilation for Dynamic Data-Driven Simulation

**Date | Time:** Tuesday, May 23, 2023 | 4:00 p.m. – 5:30 p.m.  
**Presenter:** Xiaolin Hu  
**Location:** I Wing, i104

**Tutorial II:** Introductory Tutorial on Agent-Based Modeling and Simulation

**Date | Time:** Wednesday, May 24, 2023 | 4:00 p.m. – 5:30 p.m.  
**Presenter:** Charles Macal  
**Location:** I Wing, i224

**Tutorial III:** Defining DEVS and Real-Time DEVS Models Using DEVS-Graphs Online Environment

**Date | Time:** Thursday, May 25, 2023 | 9:00 a.m. – 10:30 a.m.  
**Presenters:** Cristina Ruiz Martin and Gabriel Wainer  
**Location:** I Wing, i104

**Tutorial IV:** Tools and Applications using Cosys-AirSim: A Real-Time Simulation Framework Expanded for Complex Industrial Applications

**Date | Time:** Thursday, May 25, 2023 | 3:30 p.m. – 5:00 p.m.  
**Presenters:** Jean-Edouard Blanquet, Erik Verreycken, Wouter Jansen, Anthony Schenck, Nico Huebel, Connor Verhulst and Jan Steckel  
**Location:** I Wing, i104

**Tutorial V:** A Tutorial Introduction to Colored Petri Nets (CPNs) Based Modeling and Simulation

**Date | Time:** Friday, May 26, 2023 | 9:00 a.m. – 10:30 a.m.  
**Presenter:** Vijay Gehlot  
**Location:** I Wing, i104
Map
Mohawk College
Fennell Campus
<table>
<thead>
<tr>
<th>Time</th>
<th>Session Block</th>
<th>ANSS</th>
<th>SPECTS/CNS</th>
<th>MLS</th>
<th>MSM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tuesday 23-May-23</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:00 a.m.—10:30 a.m.</td>
<td>SCS Plenary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.—11:00 a.m.</td>
<td>Break</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:00 a.m.—12:30 p.m.</td>
<td>Session Block I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:30 p.m.—2:00 p.m.</td>
<td>Lunch</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:00 p.m.—3:30 p.m.</td>
<td>Session Block II</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:30 p.m.—4:00 p.m.</td>
<td>Break</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:00 p.m.—5:30 p.m.</td>
<td>Session Block III</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Wednesday 24-May-23</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:00 a.m.—10:00 a.m.</td>
<td>SCS Plenary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:00 a.m.—10:30 a.m.</td>
<td>Break</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:30 a.m.—12:00 p.m.</td>
<td>Session Block V</td>
<td></td>
<td>i126</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:00 p.m.—1:30 p.m.</td>
<td>Lunch</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:30 p.m.—3:30 p.m.</td>
<td>Session Block VI</td>
<td></td>
<td>i126</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:30 p.m.—4:00 p.m.</td>
<td>Break</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:00 p.m.—5:30 p.m.</td>
<td>Session Block VII</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Thursday 25-May-23</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:00 a.m.—10:30 a.m.</td>
<td>Session Block VIII</td>
<td>i126</td>
<td>i125</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.—11:00 a.m.</td>
<td>Break</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:00 a.m.—12:30 p.m.</td>
<td>Session Block IX</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:30 p.m.—2:00 p.m.</td>
<td>Lunch</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:00 p.m.—3:00 p.m.</td>
<td>Session Block X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:00 p.m.—3:30 p.m.</td>
<td>Break</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:30 p.m.—5:30 p.m.</td>
<td>Session Block XI</td>
<td>i126</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Friday 26-May-23</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:00 a.m.—10:30 a.m.</td>
<td>Session Block XII</td>
<td>i126</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.—11:00 a.m.</td>
<td>Break</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:00 a.m.—12:30 p.m.</td>
<td>Session Block XIII</td>
<td>i126</td>
<td>i125</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Sessions at a Glance

<table>
<thead>
<tr>
<th>Time</th>
<th>Date</th>
<th>Session Block</th>
<th>TMS</th>
<th>SimAUD</th>
<th>SimEd</th>
<th>MSCS</th>
<th>CPS</th>
<th>ET-DT</th>
<th>HSAA</th>
<th>WIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 a.m.</td>
<td>Tuesday 23</td>
<td>SCS Plenary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.</td>
<td>Tuesday 23</td>
<td>Break</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:00 a.m.</td>
<td>Tuesday 23</td>
<td>Session Block I</td>
<td></td>
<td>i104</td>
<td></td>
<td></td>
<td></td>
<td>i125</td>
<td>i126</td>
<td></td>
</tr>
<tr>
<td>12:30 p.m.</td>
<td>Tuesday 23</td>
<td>Lunch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:00 p.m.</td>
<td>Tuesday 23</td>
<td>Session Block II</td>
<td></td>
<td></td>
<td>i125</td>
<td>i104</td>
<td></td>
<td>i126</td>
<td>i126</td>
<td></td>
</tr>
<tr>
<td>3:30 p.m.</td>
<td>Tuesday 23</td>
<td>Break</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:00 p.m.</td>
<td>Tuesday 23</td>
<td>Session Block III</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:00 a.m.</td>
<td>Wednesday 24</td>
<td>SCS Plenary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:00 a.m.</td>
<td>Wednesday 24</td>
<td>Break</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.</td>
<td>Wednesday 24</td>
<td>Session Block V</td>
<td></td>
<td></td>
<td>i125</td>
<td>i126</td>
<td></td>
<td>i104</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:00 p.m.</td>
<td>Wednesday 24</td>
<td>Lunch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:30 p.m.</td>
<td>Wednesday 24</td>
<td>Session Block VI</td>
<td></td>
<td></td>
<td>i126</td>
<td>i125</td>
<td></td>
<td>i104</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:30 p.m.</td>
<td>Wednesday 24</td>
<td>Break</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:00 p.m.</td>
<td>Wednesday 24</td>
<td>Session Block VII</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:00 a.m.</td>
<td>Thursday 25</td>
<td>Session Block VIII</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.</td>
<td>Thursday 25</td>
<td>Break</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:00 a.m.</td>
<td>Thursday 25</td>
<td>Session Block IX</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:30 p.m.</td>
<td>Thursday 25</td>
<td>Lunch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:00 p.m.</td>
<td>Thursday 25</td>
<td>Session Block X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:00 p.m.</td>
<td>Thursday 25</td>
<td>Break</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:30 p.m.</td>
<td>Thursday 25</td>
<td>Session Block XI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:00 a.m.</td>
<td>Friday 26</td>
<td>Session Block XII</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:30 a.m.</td>
<td>Friday 26</td>
<td>Break</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:00 a.m.</td>
<td>Friday 26</td>
<td>Session Block XIII</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The table above is a simplified representation of the sessions at a glance. Each row represents a session block, and the columns represent different sessions or events (TMS, SimAUD, SimEd, etc.).
Daily Agendas
Tuesday
Simulation of Architectural and Urban Design (SimAUD)

Session I
11:00 a.m. — 12:30 p.m. Room: I Wing, i125

Micro-Scale Urban Simulation of Pedestrian Heat Stress: A Case Study of Cardiff, Wales, UK by Jianxiang Huang, Xu Tang and Phil Jones

Modeling and Calibrating Digital Twin of Automatic Garbage Collection System in Sejong City by Tae-Sub Yun, Minsang Park and Il-Chul Moon

UrbanFlow: Designing Comfortable Outdoor Areas by Daoming Liu, Florian Rist and Dominik Michels

Session II
2:00 p.m. — 3:30 p.m. Room: I Wing, i125

Communication Patterns by Saqib Aziz, Giovaani Betti, Felix Deiters, Iris Inokhosa and Markus Jacobi

Integrating Conditional Shape Embedding with Generative Adversarial Network to Assess Raster Format Architectural Sketch by Han Tu, Yichao Shi and Meng Xu

Sensing Behavior Framework: Acquisition and Communication of Occupancy Behavior Data by Panagiota Pouliou, Martin Tamke, Paul Nicholas and Kare Stockholm Poulsgaard

Session III
4:00 p.m. — 5:30 p.m. Room: I Wing, i125

Game Engines as a Performance-Aware Participatory and Interactive Design Platform: A Prototypical Workflow by Arman Khalilbeigi Khameneh and Alicia Nahmad Vazquez

Algorithms for Voxel-based Architectural Space Analysis by Rhys Goldstein, Kean Walmsley, Nigel Morris and Alexander Tessier

Aesthetics as a Criterion: Navigating Solution Spaces Utilizing Computer Vision, the Aesthetic Measure, and Artificial Neural Networks by Victor Sardenberg and Mirco Becker
Humans, Societies and Artificial Agents (HSAA)

Session I  11:00 a.m.—12:30 p.m.  Room: I Wing, i126

**Opening Talk**

*(WiP) Using Agent Based Modelling and Participatory Systems Modelling to Create Serious Games with an Artificial Intelligence Simulating Component* by David Wurster, Elisabeth Späth, Blanca Luque-Capellas, Petra Ahrweiler, Massimo Rusconi and Jesús Siqueiros

*(WiP) Challenges of Using a Microsimulation-based Model for the Cost of Living Crises* by Kashif Zia, Andreas Hoehn, Corinna Elsenbroich and Alison Heppenstall

*(WiP) Coordination Failure As Barrier To Economic Development* by Isaak Mengesha

Session II  2:00 p.m.—3:30 p.m.  Room: I Wing, i126

*Binary Opinion Dynamics with Mesophilic Agents* by Patrick Shepherd, Anh Ngo, Said Maalim and Isaac Gray

*An Agent-based Modeling of Mobs Using Theoretical Constructs of Collective Action* by Samer Al-khateeb, Jack Burright, Nitin Agarwal and Rebecca Murray

*The Effect of Empathy on Happiness in Social Networks: An Agent-Based Simulation Study* by Nicholas Bishop and Hamdi Kavak

Session III  4:00 p.m.—5:30 p.m.  Room: I Wing, i126

*Developing a Large-Scale Agent-Based Model Using the Spiral Software Development Process* by Maxim Malikov, Fahad A. Aloraini, Andrew Crooks, Hamdi Kavak and William Kennedy

*Identifying the Building Blocks of Social Simulation Models: A Qualitative Analysis Using Open-Source Codes in NetLogo* by Shannon Cheng, Philippe Giabbanelli and Zaiyi Kuang

*Firm-level Propagation of the Effect of Disruption of International Trade through Domestic Supply Chains* by Hiroyasu Inoue and Yasuyuki Todo
### 16th Theory and Foundations of Modeling & Simulation (TMS)

**Session I** 11:00 a.m.—12:30 p.m.  
**Room: I Wing, i104**

- *Facilitating the Interoperability and Reuse of Extensions of Fuzzy Cognitive Maps* by Ryan Schuerkamp, Philippe Giabbanelli and Nicolas Daclin

- *Energy and Power Evaluation of Parallel DEVS Simulations on Multicore Architectures* by Guillermo Trabes, Veronica Gil Costa and Gabriel Wainer

- *A New Family of xDEVS Simulators for Enhanced Performance* by Roman Cardenas, Patricia Arroba and Jose L. Risco-Martin

### Cyber Physical Systems (CPS)

**Session II** 2:00 p.m.—3:30 p.m.  
**Room: I Wing, i104**

- *Formalizing Cyber-Physical System Interfaces Using DEVS* by Gabriel Wainer and Rishabh Jiresal

- *Synthesizing Orchestration Algorithms for FMI 3.0* by Simon Hansen, Claudio Gomes and Zahra Kazemi

- *Development Of QSS and PID Control Algorithm inside RT-DEVS Framework* by Mahya Shahmohammadimehrjardi and Gabriel Wainer
Wednesday
# Annual Modeling and Simulation Conference 2023

## Agenda

### Simulation of Architectural and Urban Design (SimAUD)

**Wednesday May 24, 2023**

**Session V  10:30 a.m.—12:00 p.m.  Room:  I Wing, i125**

- A Case Study on Generating Eco-Conscious Office Buildings Using a Data-Informed Optimization Framework by Gen Karoji

- Urban Design Optimizer: A Comparative User Interface Study for a Web-Embedded Tool by F. Peter Ortner, Anna Claudia Yenardi and Jing Zhi Tay

- Comparing Apartment Balcony Design Options in Toronto for Useability, Healthy Lighting, and Daylight Availability by Fion Ouyang, Terri Peters, Alstan Jakubiec and Ted Kesik

**Session VII  4:00 p.m.—5:30 p.m.  Room:  I Wing, i125**

- Stochastic Assessment for Model-Predictive Control of a Variable Refrigerant Flow System by Seo-Hee Choi, Seongkwan Cho and Cheol Soo Park

- Uncertainty Quantification of Overall Heat Transfer Coefficient (U-Value) for a Glazing System with External Venetian Blind by JeongYun Lee and Cheol-Soo Park

- (WiP) Generative Design for a Complete Community Park by Samah Kamalmaz, Sara Diamond, Jeremy Bowes, Greg Van Alstyne, Robert Wright, Matthew Roorda, Sara Wagner, Rhys Goldstein and Jacky Bibliowicz

- (WiP) Comparing Results of Measured and Simulated Glare in Learning Environments by Julia Di Giorgio and Terri Peters
### Session V
**10:30 a.m.—12:00 p.m.**  
**Room: I Wing, i126**

#### Healthcare Simulation and Neural Networks

*Study on Mild Cognitive Impairment and Alzheimer's Disease Classification using a New Ontogenic Neural Architecture, the Supervised Reconfigurable Growing Neural Gas* by Ylermi Cabrera-León, Patricio García Báez, Pablo Fernández-López and Carmen Paz Suarez-Araujo


*Vaccination Accessibility Analysis: Modeling Historical Patterns of Redlining and Access to Healthcare Services* by Suncica Milosevic and Ajla Aksamija

---

### Session VI
**1:30 p.m.—3:30 p.m.**  
**Room: I Wing, i126**

#### Computer-Assisted Therapy and Physiology Simulation

*Towards a Patient-Specific Obstetric Simulator Through Opensim Musculoskeletal and Bash Skinned Human Modeling* by Bahador Dodge, Hunter J. Bennett, Oleksandr Kravchenko, Von Jamora, Marco Parente, Renato Natal Jorge, Dulce Oliveira, Marlies Nitschke, Anne D. Koelewijn, Andrew Moore, Menachem Miodovnik and Michel Audette

*Multi-Material, Approach-Guided, Controlled-Resolution Breast Meshing for Fe-Based Interactive Surgery Simulation* by Motaz Alqaoud, John Plemmons, Eric Feliberti, Krishnanand Kaipa, Gabor Fichtinger, Yiming Xiao, Tanweer Rashid and Michel Audette

*Design and Implementation of a Generic Circuit Solver for Physiological Lumped-Parameter Modeling* by Jeffrey Webb, Aaron Bray and Rachel Clipp

*Elucidating the Role of the His-Purkinje System during Long QT Mediated Arrhythmias* by Anthony Owusu-Mensah, Omer Berenfeld and Michel Audette

---

### Session VII
**4:00 p.m.—5:30 p.m.**  
**Room: I Wing, i126**

#### MSM Panel
## Agenda

### Wednesday May 24, 2023

### Emerging Topic—Digital Twins (ET-DT)

### Session V 10:30 a.m.—12:00 p.m. Room: I Wing, i104

#### Foundations

- *Modeling and Synchronizing Digital Twin Environments* by Juan Alberto Llopis, Paula Munoz, Javier Criado, Javier Troya, Luis Iribarne and Antonio Vallecillo
- *Formal Approach to Digital Twin Specification* by Mama Diakité and Mamadou Traore
- *Examining Model Qualities and Their Impact on Digital Twins* by Bentley Oakes, Claudio Gomes, Joachim Denil, Julien Deantoni, João Cambeiro, John Fitzgerald and Peter Gorm Larsen

### Session VI 1:30 p.m.—3:30 p.m. Room: I Wing, i104

#### Invited Talk & Panel

- *Invited Talk: A DEVS-based Engine for Building Digital Quadruplets*
  Presenter: Gabriel Wainer
- *Panel: Interoperability of Digital Twins*

### Session VII 4:00 p.m.—5:45 p.m. Room: I Wing, i104

#### Applications & CPS II

- *Building A Digital Twin of an Automated Robot Workcell* by Deogratias Kibira, Guodong Shao and Rishabh Ventekesh
- *A Statechart Template Library for IoT System Modelling* by Clyde Rempillo and Sadaf Mustafiz
- *(WiP) Co-Simulation For Controlled Environment Agriculture* by Pascal Archambault, Istvan David, Eugene Syriani and Houari Sahraoui
Thursday
### Communications and Network Simulation (CNS)

#### 26th Symposium on Performance Evaluation of Computer and Telecommunication Systems (SPECTS)

**Session VIII**  
9:00 a.m.—10:30 a.m.  
**Room:** I Wing, i125

- **Machine Learning Models for Channel Status Classification in M-MIMO Systems Using Limited CSI Feedback** by Benjamin Earle, Ala’a Al-Habashna, Gabriel Wainer, Xingliang Li and Guoqiang Xue

- **PO-MAC: A Software Defined Performance-Optimized MAC Strategy for Optical Data Center Networks** by David Georgantas and Peristera Baziana

- **(WiP) Human-out-of-the-Loop Swarm-Based IoT Network Penetration Testing by IoT Devices** by Thomas Schiller and Sean Mondesire

- **(WiP) Attachable IoT-based Digital Twin Construction for Face Mask Production Line** by Byeong Soo Kim, Bong Gu Kang, Taehoon Kim and Jungmin Yun

### Simulation Education and Simulation-Based Learning (SimEd)

**Session XI**  
3:30 p.m.—4:30 p.m.  
**Room:** I Wing, i125

- **An Open Source Video Analytics Tool for Analyzing Learner Navigation in Immersive Simulated Environment** by Noah Soriano, Ashkan Negahban, Sabahattin Gokhan Ozden and Omar Ashour

- **A Project-Based Approach for Teaching Numerical Integration in Continuous Simulation** by Yuzhong Shen and Masha Sosonkina

### Modeling & Simulation in Cyber Security (MSCS)

**Session XI**  
4:30 p.m.—5:30 p.m.  
**Room:** I Wing, i125


- **GreenThread – Blockchain, Non-Fungible Token (NFT), Model Cards, Self-Sovereign Identity, and IPFS enabled Sustainable Circular Fashion Platform** by Eranga Bandara, Nadini Sahabandu, Sachin
55th Annual Simulation Symposium (ANSS)

Session VIII  9:00 a.m.—10:30 a.m.  Room: I Wing, i126

Methods and Tools

Agent-Based Model Output Analysis – A Comprehensive Statistical Framework by Janani Venugopalan, Gaurav Deshkar, Jayanta Kshirsagar, Divye Singh, Justin Jose and Harshal Hayatnagarkar

Modeling Forced Migration: A System Dynamic Approach by Troy Curry, Arie Croitoru and Andrew Crooks

Hybrid Agent-Based and Discrete Event Simulation in MASON by Giuseppe D’Ambrosio and Sean Luke

Session XI  3:30 p.m.—5:00 p.m.  Room: I Wing, i126

Methods and Tools

Simulation and Optimization Techniques for Mitigation of Disruptions to Supply Chains by Rajhersh Patel, Abhisekh Rana, Sean Luke, Carlotta Domeniconi, Andrew Crooks, Hamdi Kavak and James Jones

Error Estimators for Adaptive Scheduling Algorithm for Serial Co-simulation by Emin Oguz Inci, Claudio Gomes, Jan Croes and Wim Desmet

Decision Support Framework for Automating the Optimization of Edge Computing Federations by Antonio F. Rodríguez-Liria, Román Cárdenas, Patricia Arroba, José M. Moya, José L. Risco-Martín and Gabriel Wainer
### Ph.D. Colloquium

**Session IX**  
11:00 a.m.—12:30 p.m.  
Room: I Wing, i126

Co-Optimization of Cyber-Physical Systems: Leveraging Domain Knowledge in Multi-domain System Development Processes by Yon Vanommeslaeghe

Accelerating the Training of Artificial Neural Networks Using Data Parallelization and CPU Affinity on CPUS and GPUS by Jorge Lopez

An Agent-Based Model and Simulation to Explore Possible Solutions to Food and Nutrition Insecurity for College Students in the United States by Candace Sapp

A High-Performance DEVS Simulator for Multi-GPU Platforms by Guillermo Trabes

Electrical Distribution System Resilience Improvements Via Customer Preference for Bidirectional Charging Electric Vehicles by Clark Petri

Deep ABM for Agent Actions and Interaction for Southwest Border Interdictions by Chris Prather

**12:30 p.m.—2:00 p.m.**  
Room: I Wing, i126

### Ph.D. Colloquium Panel (Over Lunch)

**Session X**  
2:00 p.m.—3:00 p.m.  
Room: I Wing, i126

### Ph.D. Colloquium Keynote

Bahter Abdulhai, Ph.D., P.Eng.

Talk: Mindset Transformation from a Ph.D. Grad to Professorship – Dream Big

Professor and Director, Toronto Intelligent Transportation Systems Centre  
Co Director, iCity Centre for Automated and Transformative Transportation Systems – iCity CATTs.

Department of Civil and Mineral Engineering, University of Toronto  
35 St. George St., #105, Toronto, Ontario, Canada M5S 1A4

Email

Website

YouTube: The traffic game – can traffic lights learn to be smart? Baher Abdulhai at TEDxUTSC

Baher Abdulhai has been a professor at the University of Toronto since 1998. Born in Cairo, Egypt in 1966, and earned his Ph.D. in engineering from the University of California Irvine, Irvine, California, USA, in 1996.
Friday
Session XII  
9:00 a.m.—10:30 a.m.  
Room: I Wing, i125

Modeling Multimodal CO2 Transportation for Carbon Capture, Utilization, and Storage by Robin J. Clark, Majbah Uddin, Michael R. Hilliard, Josh Thompson, Matthew H. Langholtz and Erin Webb

A Multiplayer Human-in-the-Loop Autonomous Driving Simulation Framework with Virtual Reality Technology by Defu Cui and Yuzhong Shen

Towards a Digital Twin of a Retail Loyalty Scheme by James Battye, Peter Baudains and Jonathan A. Ward

Session XIII  
11:00 a.m.—12:30 p.m.  
Room: I Wing, i125

A Simulation Environment for Reducing Food Waste Via Reinforcement Learning by Sebastian Pilarski, Aman Sidhu and Daniel Varro

Preserving Simulation Insight while Removing Data: Verification of Compressed Simulation Traces Via Machine Learning by My Nguyen, Duc Vu, Anh Vo, Luke Liang and Philippe Giabbanelli
### Annual Modeling and Simulation Conference 2023
#### Agenda

Friday May 26, 2023

#### 55th Annual Simulation Symposium (ANSS)

<table>
<thead>
<tr>
<th>Session XII</th>
<th>Room: I Wing, i126</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 a.m.—10:30 a.m.</td>
<td></td>
</tr>
<tr>
<td><strong>Real World Applications</strong></td>
<td></td>
</tr>
<tr>
<td>Predictive Modeling and Simulation System for the Management of Harmful Cyanobacteria Blooms by Beatriz Herguedas, José L. Risco-Martín, Segundo Esteban, José A. López-Orozco and Eva Besada-Portas</td>
<td></td>
</tr>
<tr>
<td>A Survey of Visualization Capabilities for Simulation Environments by Bruno St-Aubin and Gabriel Wainer</td>
<td></td>
</tr>
<tr>
<td>A Generic Modeling Approach Towards Simulating an Urban Primary And Secondary Healthcare Facility Network by Najiya Fatma and Varun Ramamohan</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session XIII</th>
<th>Room: I Wing, i126</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:00 a.m.—12:30 p.m.</td>
<td></td>
</tr>
<tr>
<td><strong>Real World Applications</strong></td>
<td></td>
</tr>
<tr>
<td>Model-based Systems Engineering and Simulation of a Molten Salt Reactor Power Plant for Requirements Analysis by Stephen Pair and Michael Jones</td>
<td></td>
</tr>
<tr>
<td>DEVS-Based Modeling and Simulation of Data-Driven Exploration Algorithms of Lentic Water Bodies with an ASV by Samuel Ferrero-Losada, Eva Besada-Portas, José L. Risco-Martín and José A. López Orozco</td>
<td></td>
</tr>
</tbody>
</table>
The City of Hamilton
Things to Do in Hamilton

**Canadian Warplane Heritage Museum**
9280 Airport Road, Mount Hope, ON L0R 1WO
Phone: +1 905-679-4183  https://www.warplane.com/
A collection of over forty aircraft has grown through the friendship of Dennis Bradley and Alan Ness. Their love of aviation and their desire to maintain and preserve Canada's aviation history saw restoration projects that were not only great pieces of workmanship but airworthy examples.

**Dundurn Castle**
610 York Blvd, Hamilton, Ontario L8R 3H1
Phone: +1 905-521-3168  https://www.hamilton.ca/things-do/hamilton-civic-museums/dundurn-national-historic-site
Experience a guided tour of this 40-room Italianate-style villa built in the 1830's on Burlington Heights; the former site of a fortified military encampment established by the British during the War of 1812. Once home to Sir Allan Napier MacNab, railway magnate, lawyer and Premier of the United Canadas (1854-1856) and his family, today Dundurn Castle tells the story of the family who lived above stairs and the servants who lived and worked below stairs. Her Majesty, The Queen Consort is the museum’s Patron and the great, great, great granddaughter of Sir Allan MacNab.

**HMCS Haida National Historic Site**
Pier 9, 658 Catharine St N, Hamilton, ON L8L 8K4
Phone: +1 905-526-6742  https://parks.canada.ca/lhn-nhs/on/haida
The last Tribal Destroyer in the world, HMCS HAIDA is Canada’s most famous warship. She inspires countless adults and children and draw visitors from Ontario, across North America and from around the globe. This WWII Tribal Class destroyer is now a floating memorial and naval museum.

**Bayfront Park**
200 Harbour Front Drive Bay at Strachan, Hamilton, ON L8L 1C8
Phone: +1 905-546-2489  https://www.hamilton.ca/things-do/parks-green-space/parks-trails/parkfinder
Bayfront Park is a 16-hectare park found in the West-end of Hamilton Harbour in the North End neighbourhood of Hamilton, Ontario, Canada. Over $9 million transformed formerly vacant land into a versatile green space, with 1,800 metres of shoreline integrating fish habitat, native vegetation and facilities.
Westfield Heritage Village
1049 Kirkwall Road Rockton, Hamilton, ON L0R 1X0
Phone: +1 519-621-8851  https://westfieldheritage.ca/

Westfield Heritage Village Conservation Area is located just outside of the village of Rockton, Ontario. The site is open daily from 8:00 am to 8:00 pm for walking, hiking and bird-watching. The historical buildings are only open on special program days. Check the website for further information.

Albion Falls
885 Mountain Brow Blvd, Hamilton, ON L8W 1R6
Phone: +1 905-546-2666  https://tourismhamilton.com/albion-falls/

Albion Falls is one of the most picturesque waterfalls in the region and one of the city's most popular. The Red Hill Creek in the east end’s King’s Forest tumbles over rock that’s been formed over time into steps and shelves, fanning outwards into a beautiful cascade of rushing water. Albion Falls is a stepped jewel, classified as a cascade as it ripples over the Niagara Escarpment. It is almost as wide (18 metres) as it is tall (19 metres). It is visible from two viewing platforms, but there is currently no access to the bottom. Rocks from around the falls were used in the construction of Hamilton’s famous Rock Garden, a National Historic Site at Hamilton’s Royal Botanical Gardens.

Hamilton Museum of Steam & Technology
900 Woodward Ave, Hamilton, ON L8H 7N2

This National Historic Site is recognized as a civil and power engineering landmark. Today the museum preserves two massive steam-powered beam engines, which pumped water in Hamilton from 1859 to 1910, as well as a collection of artifacts relating Hamilton’s industrial past. The museum interprets Hamilton’s relationship with water, steam power, and industrialization.

Little Rays Nature Centre
869 Barton St E, Hamilton, ON L8L 3B4
Phone: +1 613-822-8924  https://littlerays.org/

Meet and interact with our rescue animals and learn about conservation at one of our 4 Nature Centers. Found in Ottawa, Hamilton, Edmonton and Syracuse. We offer general admission and private tours and more. Little Ray’s offers nature centers, exhibits and animal encounters that are hands on, educational and always lots of fun! We are the largest exotic animal rescue in North America and a proud member of Canada’s Accredited Zoos and Aquariums (CAZA).
Conference Award Recipients
Conference Award Recipients

**Best Paper Award:**
HSAA Track
Paper Title: Binary Opinion Dynamics with Mesophilic Agents
Authors: Patrick Shepherd, Anh Ngo, Said Maalim, and Isaac Gray

**Runner Up Paper Award:**
ANSS Track
Paper Title: Error Estimators for Adaptive Scheduling Algorithm for Serial Co-simulation
Authors: Emin Oguz Inci, Claudio Gomes, Jan Croes, and Wim Desmet

**Outstanding Reviewers:**
Lynne Serre
Defence Research and Development Canada

Yon Vanommeslaeghe
University of Antwerp

Christian Lopez
Lafayette College

Brandon Haworth
University of Victoria
SCS Board of Directors
Award Recipients
<table>
<thead>
<tr>
<th>Award</th>
<th>2019 Recipient</th>
<th>2020 Recipient</th>
<th>2021 Recipient</th>
<th>2022 Recipient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outstanding Professional Contribution Award</td>
<td>Saikou Diallo</td>
<td></td>
<td>Lin Zhang</td>
<td></td>
</tr>
<tr>
<td>Mcleod Founder's Award for Distinguished Service to the Profession</td>
<td></td>
<td></td>
<td>Gabriel Wainer</td>
<td></td>
</tr>
<tr>
<td>Presidential Award for Enabling the Modeling and Simulation Discipline</td>
<td></td>
<td></td>
<td>Azad Madni</td>
<td></td>
</tr>
<tr>
<td>Young Simulation Scientist</td>
<td>Philippe Giabbanelli</td>
<td>Cristina Ruiz Martin</td>
<td>Hamdi Kavak</td>
<td>Maria Julia Blas</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Christopher Lynch</td>
</tr>
<tr>
<td>Outstanding Service Award</td>
<td>Gabriel Wainer</td>
<td></td>
<td>Rodrigo Castro</td>
<td></td>
</tr>
<tr>
<td>Distinguished Service Award</td>
<td>Adelinde Uhrmacher</td>
<td></td>
<td>Yiannis Papelis</td>
<td></td>
</tr>
<tr>
<td>Presidential Award for Service to the Society</td>
<td>John Sokolowski</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fellows</td>
<td>Levent Yilmaz</td>
<td>Richard Fujimoto</td>
<td>Adelinde M. Uhrmacher</td>
<td>Charles M. Macal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Jose Granda</td>
</tr>
</tbody>
</table>
We are grateful to the National Science Foundation (NSF) for providing travel awards that allow students to attend the conference.
WORLDWIDE LEADER IN MODELING & SIMULATION
Serving individuals and organizations in more than 150 countries.

For over 70 years, SCS has set the standard as the first society devoted solely to the advancement of modeling and simulation. Our objective is to promote M&S as a discipline and profession through continuous research and education. We provide M&S professionals with a dynamic community and forum to publish, present, and discuss new results, developments, applications, and lessons learned, enabling the exchange between and mutual support of industry, government, and academia.

SCS serves engineers, scientists, managers, educators, business professionals and students from all around the world.

Opportunities for skill development and advancement include:

1. **Membership**
   - Take advantage of networking opportunities, access publications and journals, share your research findings, and more.

2. **Publications**
   - Get up to date M&S information from our journals.

3. **Conferences**
   - Participants may present papers, attend technical sessions, visit exhibit areas, interact with vendors, and network with other M&S professionals.

4. **Education**
   - SCS strives to help individuals move towards making a transition from a field of Modeling and Simulation to a profession.

SCS is a 501(c)3 non-profit organization with four primary business areas: membership, publications, conferences and education.

SCS serves engineers, scientists, managers, educators, business professionals and students from all around the world.

www.scs.org  |  P: (858) 277-3888  |  F: (858) 277-3930 or (858) 633-1559  |  Email: scs@scs.org