THE SOCIETY FOR
MODELING & SIMULATION
INTERNATIONAL

ANNSIM

Annual Modeling and Simulation Conference 2025

MAY 26-29, 2025

Complutense University of Madrid, Madrid, Spain

Table of Contents

Personal Belongings

SCS and Complutense University are not responsible for any items left in the breakout rooms. We recommend that you make sure to take your things during lunch and before the end of each day.

Conference Organization

Organizing Committee

General Chair: Jose L. Risco-Martin, Complutense University of Madrid

Vice-General Chair: Ghaith Rabadi, School of Modeling, Simulation and Training, University of Central Florida

Program Co-Chairs: Deniz Cetinkaya, Bournemouth University and Roman Cardenas, Polytechnic University of Madrid

Proceedings Chairs: Samuel Ferrero-Losada, Complutense University of Madrid, Madrid, Spain, Ahmad Bany Abdelnabi, School of Modeling and Simulation, University of Central Florida, Orlando, Florida

Awards Chairs: Andreas Tolk and Herbert Prähofer

Conference Organization

Tracks and Chairs

Annual Simulation Symposium (ANSS), Chairs: Joachim Denil, University of Antwerp, and Yilin Huang, Delft University of Technology

Communications technologies and Networking Simulation (CNS), Chairs: Abdolreza Abhari, Toronto Metropolitan University and Patricia Arroba, Universidad Politecnica de Madrid

Cyber-Physical Systems and Digital Twins (CPS/DT), Chairs: Soheil Sabri, University of Central Florida and Yon Vanommeslaeghe, University of Antwerp

High Performance Computing and Simulation (HPC), Chairs: James Nutaro, Oak Ridge National Laboratory and Francisco M. Garcia, Universidad Complutense de Madrid

Humans Agents and Cooperative Artificial Societies (HACAS) Chairs: Thomas Cleman, HAW Hamburg and Kathleen Salazar-Serna, Pontificia Universidad Javeriana

Machine Learning and AI (MLAIS), Chairs: Avleen Malhi, University of Warwick and Bianica Pieres, The MITRE Corporation

Modeling and Simulation for Sustainability and Smart Energy Systems (S&SES) Chairs: James Nutaro, Oak Ridge National Laboratory and Dominique Blouin, Telecom Paris

Modeling and Simulation in Cyber Security (MSCS) Chairs: Sachin Shetty, Old Dominion and Danda Rawat, Howard University

Modeling and Simulation in Medicine, Chairs: Michel Audette, Old Dominion University and Jerzy W. Rozenblit, University of Arizona

Simulation in Education and Training (SET) Chairs: Ghaith Rabadi, School of Modeling, Simulation, and Training, University of Central Florida and Jalal Possik, Universite Catholique de Lille

Symposium on Simulation for Architecture and Urban Design (SimAUD), Chairs: Mohamed Aly Etman, University at Buffalo, Gabriel Wurzer, TU Wien and Angelos Chronis, Infrared City and Austrian Institute of Technology

Theory and Foundations for Modeling and Simulation (TMS) Chairs: Gabriel Wainer, Carleton University and Paolo Bocciarelli, University of Rome Tor Vergata

Tutorials, Chairs: Scott Rosen, The MITRE Corporation, Gulesin Sena Das, De Montfort University, Souvik Barat, Tata Consultancy Services Research

Ph.D. Colloquium, Chairs: Cristina Ruiz Martin, Carleton University and Josue Pagan, Technical University of Madrid

Welcome

Welcome from The Society for Modeling and Simulation International (SCS)

Welcome from the ANNSIM'25 Conference Chairs

Dear Colleagues and Friends,

On behalf of the Organizing Committee, welcome to the Annual Modeling and Simulation Conference (ANNSIM 2025)! We are delighted to host you here in Madrid at the Facultad de Informática of the Universidad Complutense de Madrid.

This year, ANNSIM brings together researchers, practitioners, and students from around the world to share the latest advances in modeling and simulation. Our program covers a wide range of topics, from the core theories and methods that underpin our field to exciting new areas like Artificial Intelligence, Cloud and Quantum Computing, Digital Twins, and High-Performance Computing applied to simulation.

Over the next few days, you will have the opportunity to attend presentations across our diverse technical tracks. We are especially excited to feature two outstanding keynote speakers:

On Monday, **Prof. Rajkumar Buyya** from the University of Melbourne will discuss simulation toolkits for next-generation Cloud and Quantum Computing.

On Tuesday, **Prof. Carolina Cruz-Neira** from the University of Central Florida will share her insights on Visualization, Immersion, and Digital Twins.

In addition to the main tracks and keynotes, the program includes insightful tutorials, a PhD Colloquium for our emerging researchers, and a Work-in-Progress track showcasing the latest ongoing work. We hope you will also join us for the Conference Reception to connect with colleagues in a relaxed setting.

Putting together a conference like ANNSIM takes a tremendous amount of effort. We want to extend our sincere gratitude to the entire Organizing Committee, the Society for Modeling and Simulation International, the Track Chairs, the Program Committee members, and all the reviewers for their hard work and dedication. We also thank our authors and speakers for sharing their valuable research with us.

We encourage you to actively participate in the sessions, engage in discussions, and take advantage of the networking opportunities. We hope ANNSIM 2025 is a productive and enjoyable experience for everyone. Please also take some time to explore the wonderful city of Madrid.

Welcome once again!

Sincerely,

José L. Risco Martin

ANNSIM 2025 General Chair *Universidad Complutense de Madrid, Spain*

Ghaith Rabadi

ANNSIM2025Vice-General Chair *University of Central Florida, Orlando, FL, USA*

Deniz Cetinkaya

ANNSIM2025 Program Co-Chair *Bournemouth University, United Kingdom*

Román Cárdenas

ANNSIM 2025 Program Co-Chair *Polytechnic University of Madrid, Spain*

General Information

General Information

Registration

Your registration for SCS's 2025 Annual Modeling and Simulation Conference (ANNSIM'25) includes the following: morning, afternoon breaks, lunch on Monday and Tuesday, the Monday evening reception and access to all sessions and tutorials. The Monday reception will be located in the Cafeteria.

- **Registration Hours** **Location: Main Hall**
  - ◊ **Monday**, May 26, 2025 8:30 a.m.—5:00 p.m.
  - ◊ **Tuesday**, May 27, 2025 8:30 a.m.—5:00 p.m.
  - ◊ **Wednesday**, May 28, 2025 8:30 a.m.—5:00 p.m.
  - ◊ **Thursday**, May 29, 2025 8:30 a.m.—12:00 p.m.

  Please note that the Registration Desk will be closed for lunch from Monday through Thursday.
- **Continental Breakfast** **Location: Cafeteria**
  - ◊ **Monday,** May 26, 2025 8:00 a.m.—9:00 a.m.
  - ◊ **Tuesday,** May 27, 2025 8:00 a.m.—9:00 a.m.
  - ◊ **Wednesday,** May 28, 2025 8:00 a.m.—9:00 a.m.
  - ◊ **Thursday,** May 29, 2025 8:00 a.m.—9:00 a.m.
- **Coffee Breaks** **Location: Cafeteria**
  - ◊ **Monday,** May 26, 2025 10:30 a.m.—11:00 a.m. | 3:00 p.m.—3:30 p.m.
  - ◊ **Tuesday,** May 27, 2025 10:30 a.m.—11:00 a.m. | 3:00 p.m.—3:30 p.m.
  - ◊ **Wednesday,** May 28, 2025 10:30 a.m.—11:00 a.m. | 3:00 p.m.—3:30 p.m.
  - ◊ **Thursday**, May 29, 2025 10:30 a.m.—11:00 a.m.
- **Plenary Session with Keynotes (Conference Hall)**
  - ◊ **Monday** 9:00 a.m.—10:30 a.m.—SCS Keynote:

    Professor Rajkumar Buyya
  - ◊ **Tuesday** 9:00 a.m.—10:30 a.m.—SCS Keynote:

    Professor Carolina Cruz-Neira

General Information

Conference Meetings & Events Summary

••Monday
Plenary Session with Welcome and Keynote (9:00 a.m.—10:30 a.m.)
Technical Sessions (11:00 a.m.—5:00 p.m.)
Lunch (12:30 p.m.—1:30 p.m.)
Tutorial I (1:30 p.m.—3:00 p.m.)
Welcome Reception (5:00 p.m.—7:00 p.m.)

••Tuesday
Plenary Session with Keynote and Awards (9:00 a.m.—10:30 a.m.)
Technical Sessions (11:00 a.m.—5:00 p.m.)
Lunch (12:30 p.m. —1:30 p.m.)
Tutorial II (1:30 p.m.—3:00 p.m.)

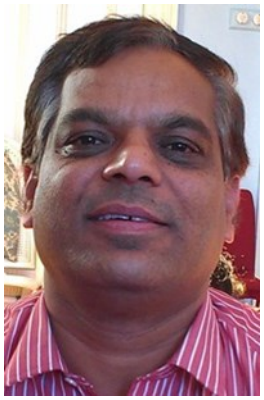
••Wednesday
Technical Sessions (9:00 a.m.—5:00 p.m.)
Tutorial III (1:30 p.m.—3:00 p.m.)
Ph.D. Colloquium (11:00 a.m.—3:00 p.m.)

••Thursday
Technical Sessions (9:00 a.m.—12:30 p.m.)

Keynotes

Keynote Information

Systems and Simulation Toolkits for Building and Evaluating Solutions for Next-Gen Cloud and Quantum Computing



Professor Rajkumar Buyya, Director, Cloud Computing and Distributed Systems (CLOUDS) Lab,
The University of Melbourne, Australia
CEO, Manjrasoft Pvt Ltd, Melbourne, Australia

Location: Conference Hall:

Monday, May 26, 2025
9:15 a.m.—10:30 a.m.

Abstract:

The twenty-first-century digital infrastructure and applications are driven by Cloud computing and emerging Quantum computing paradigms. The Cloud computing paradigm has been transforming computing into the 5th utility wherein "computing utilities" are commoditized and delivered to consumers like traditional utilities such as water, electricity, gas, and telephony. It offers infrastructure, platform, and software as services, which are made available to consumers as subscription-oriented services on a pay-as-you-go basis over the Internet. Its use is growing exponentially with the continued development of new classes of applications such as AI-powered models (e.g., ChatGPT) and the mining of crypto currencies such as Bitcoins. To make Clouds pervasive, Cloud application platforms need to offer (1) APIs and tools for rapid creation of scalable and elastic applications and (2) a runtime system for deployment of applications on geographically distributed Data Centre infrastructures (with Quantum computing nodes) in a seamless manner.

Keynote Information (Continued)

These wide ecosystems of cloud architectures integrated with new accelerators such as Quantum processing capabilities, along with the increasing demand for energy-efficient IT technologies, require timely, repeatable, and controllable methodologies for evaluation of algorithms, applications, and policies before their implementation in cloud products. As utilization of real testbeds limits the experiments to the scale of the testbed and makes the reproduction of results an extremely difficult undertaking, alternative approaches for testing and experimentation leverage development of new Cloud technologies. A suitable alternative is the utilization of simulations tools, which open the possibility of evaluating the hypothesis prior to software development in an environment where one can reproduce tests. Specifically in the case of Cloud computing, where access to the infrastructure incurs payments in real currency, simulation-based approaches offer significant benefits, as it allows Cloud customers to test their services in a repeatable and controllable environment free of cost, and to tune the performance bottlenecks before deploying on real Clouds and quantum processors. At the provider side, simulation environments allow evaluation of different kinds of resource leasing scenarios under varying load and pricing distributions. Such studies could aid the providers in optimizing the resource access cost with focus on improving profits.

This keynote presentation covers (1) 21st century vision of computing and identifies various emerging IT paradigms that make it easy to realize the vision of computing utilities, (2) different approaches for evaluation of resource management and application scheduling algorithms, (3) latest CloudSim 7G toolkit supporting modeling, simulation, and experimentation of emerging Cloud computing infrastructures and application services, (4) case studies on the use of CloudSim in development

Keynote Information (Continued)

and evaluation of policies for (a) management of Cloud Data Centre resource to minimise energy-consumption, (5) use of Aneka 6G software system for scheduling of applications to minimise the cost of computation, yet meeting users QoS requirements, and (6) new directions on modelling and simulation of Quantum computing systems and applications.

Biography:

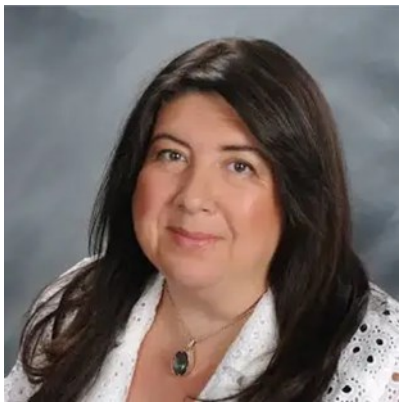
Dr. Rajkumar Buyya is a Redmond Barry Distinguished Professor and Director of the Quantum Cloud Computing and Distributed Systems (qCLOUDS) Laboratory at the University of Melbourne, Australia. He is also serving as the founding CEO of Manjrasoft, a spin-off company of the University, commercializing its innovations in Cloud Computing. He has authored over 850 publications and seven textbooks including "Mastering Cloud Computing" published by McGraw Hill, China Machine Press, and Morgan Kaufmann for Indian, Chinese and international markets respectively. Dr. Buyya is one of the highly cited authors in computer science and software engineering worldwide (h-index=172, g-index=380, i10-index=809, and 157,600+ citations). A bibliometric study by Stanford University and Elsevier since 2019 (for six consecutive years), Dr. Buyya is recognized as the Highest-Cited author in the Distributed Computing field worldwide. He graduated 60 PhD students who are working in world-leading research universities and high-tech companies such as Microsoft, Google, and IBM. He has been recognized as IEEE Fellow, a "Web of Science Highly Cited Researcher" for seven times since 2016, the "Best of the World" twice for research fields (in Computing Systems in 2019/2024 and Software Systems in 2021/2022/2023) as well as "Lifetime Achiever" and "Superstar of Research" in "Engineering and Computer Science" discipline twice (2019 and 2021) by the Australian Research Review.

Keynote Information

Software technologies for Grid, Cloud, Fog, Quantum computing developed under Dr.Buyya's leadership have gained rapid acceptance and are in use at several academic institutions and commercial enterprises in 50+ countries around the world. Manjrasoft's Aneka Cloud technology developed under his leadership has received "Frost New Product Innovation Award". He served as founding Editor-in-Chief of the IEEE Transactions on Cloud Computing. He is currently serving as Editor-in-Chief of Software: Practice and Experience, a long-standing journal in the field established in 1970. He has presented over 750 invited talks (keynotes, tutorials, and seminars) on his vision on IT Futures, Advanced Computing technologies, and Spiritual Science at international conferences and institutions in Asia, Australia, Europe, North America, and South America. He has recently been recognized as a Fellow of the Academy of Europe. For further information on Dr.Buyya, please visit his cyberhome: www.buyya.com

Keynote Information (Continued)

Unlocking the Future: 30 Years of Innovation at the Crossroads of Visualization, Immersion, and Digital Twins



Carolina Cruz-Neira, Agere Chair Professor in Computer Science
College of Engineering and Computer Science
University of Central Florida, Orlando, FL, USA

Location: Conference Hall:

Tuesday, May 27, 2025
9:15 a.m.—10:30 a.m.

Abstract:

The talk starts with a brief overview of over 30 years of hands-on experience at the vibrant intersection of visualization, immersion, and modeling & simulation (M&S). This talk unveils how these disciplines have converged to create a powerful gateway to digital twins, transforming discovery, insights, processes, and decision making. The talk will discuss several innovative projects and initiatives that have driven this evolution and discuss how leveraging these technologies across diverse fields has accelerated the successful integration and deployment of digital twins. However, many of these successes and potential solutions risk being overshadowed by the growing pressure to rapidly launch "new and innovative" digital twin technologies and applications which may still be in emergent stages.

This presentation shares “from-the trenches” experiences on developing technologies and applications that have been critical to accelerate the deployment, integration, and acceptance of digital twins to yield successful outcomes. In particular, the presentation discusses visualization’s critical role in the emerging digital twins and AI ecosystem. The presentation focuses on where the true innovation opportunities are today and how to get there.

Keynote Information (Continued)

The talk's intention is to understand the complexity, gaps and challenges we face, while revealing insights that can guide us toward more sustainable, impactful solutions in the digital twin landscape.

Biography:

Dr. Carolina Cruz-Neira, a member of the National Academy of Engineering, is a pioneer in the areas of virtual reality (VR), interactive visualization, and digital twins. Her work has translated to standard tools in industry, government, and academia. She is known world-wide for being the creator of the CAVE VR system, for transferring research into practice by spearheading several Open-Source initiatives, such as VRJuggler, and by leading entrepreneurial initiatives to commercialize research. She has over 150 publications and, together with her collaborators, has been awarded over $400 million in grants, contracts, and donations. She is recognized for founding successful VR research centers: the Virtual Reality Applications Center at Iowa State University, the Louisiana Immersive Technologies Enterprise, and the Emerging Analytics Center at the University of Arkansas. She serves in international technology boards, government technology advisory committees.

One of her recent roles was being part of the National Academies report on Foundational Research Gaps and Future Directions for Digital Twins. She enjoys intersecting her research with the arts and the humanities through dance performances and museum installations. She has been named one of the top innovators in virtual reality and one of the top three greatest women visionaries in VR. She is the first person inducted to the National Academy of Engineering for contributions to immersive technologies and VR, she is a member of the IEEE VR Academy, an IEEE Fellow, an ACM Computer Pioneer,

Keynote Information (Continued)

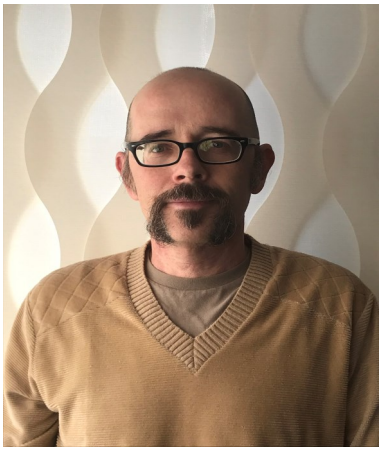
an AWE XR Hall of Fame member, and a Modeling and Simulation Hall of Fame; She received the IEEE VR Achievement Award and the International Digital Media & Arts Society Distinguished Career Award among many national and international recognitions. She has given numerous keynote addresses, and she advises governments on how VR can help to give industries a competitive edge leading to regional economic growth. She has appeared in numerous national and international TV shows and podcasts as an expert on her discipline and several documentaries have been produced about her life and career. Currently, Dr. Cruz is the Agere Chair in Computer Science at the University of Central Florida where she is the co-lead of the UCF Digital Twin Initiative.

TMS Session Keynote Information

AI-assisted Metamorphic Testing for Domain-specific Modelling and Simulation

Professor Dr. Juan de Lara

Computer Science at Universidad Autónoma, Madrid Spain



Location: Classroom 14:

Wednesday, May 28, 2025
9:00 a.m.—10:30 a.m.

Abstract:

Testing is essential to improve the correctness of software systems. Metamorphic testing (MT) is an approach especially suited when the system under test lacks oracles, or they are expensive to compute. However, building an MT environment for a particular domain (e.g., cloud simulation, automated driving simulation, production system simulation, etc) requires substantial effort.

To alleviate this problem, we propose a model-driven engineering approach to automate the construction of MT environments, which is especially useful to test domain-specific modelling and simulation systems. Starting from a meta-model capturing the domain concepts, and a description of the domain execution environment, our approach produces an MT environment featuring comprehensive support for the MT process. This includes the definition of domain-specific metamorphic relations, their evaluation, detailed reporting of the testing results, and the automated search-based generation of follow-up test cases.

In this talk, I will present the approach, along with ongoing work and perspectives for integrating intelligent assistance based on large language models in the MT process. The work is a joint collaboration with Pablo Gómez-Abajo, Pablo C. Cañizares and Esther Guerra from the miso research group.

TMS Session Keynote Information

Biography:
Juan de Lara is full professor at the computer science department of the Universidad Autónoma of Madrid (Spain), where he leads the modelling and software engineering research (miso) team together with Esther Guerra. His main research interests are in automated software engineering, model-driven development, low-code development, domain-specific languages and language engineering, conversational agents and intelligent assistants. This research has led to building many practical tools including Asymob, AToM3, metaDepth, merlin, and Gotten – and the publication of more than 270 papers in international journals and conferences. He has been the PC co-chair of several conferences within his research areas, like MODELS, SLE, ICGT, ICMT and FASE, he is on the editorial board of the SoSyM journal (Springer), and has been involved in the organization of workshops on topics like flexible modelling, multi-level modelling and low-code development.

Tutorials Information

Tutorial I: Introduction to Quantum Computing: Designing Quantum Circuits and Running Them on Quantum Simulators

Date | Time: Monday, May 26, 2025 | 1:30 p.m.– 3:00 p.m.
Presenter: Deniz Cetinkaya
Location: Classroom 14

Tutorial II: Defining a Shared Standard of Verification and Validation for Agent-Based Models

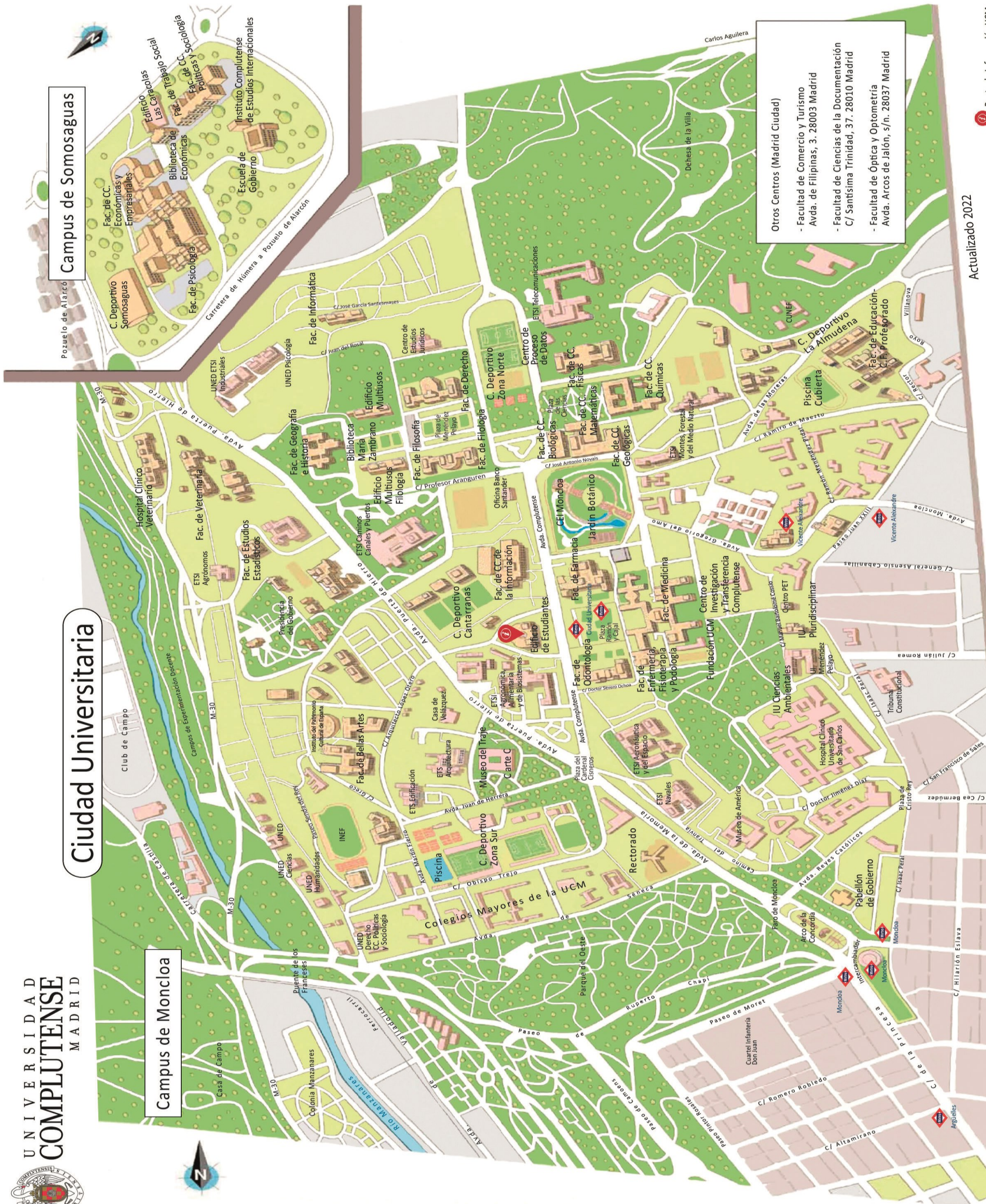
Date | Time: Monday, May 27, 2025| 1:30 p.m.– 3:00 p.m.
Presenter: Sarah Wise
Location: Classroom 14

Tutorial III: Python-Based Simulation Platforms

Date | Time: Monday, May 28, 2025| 1:30 p.m.—3:00 p.m.
Presenter: Wenbing Zhao
Location: Classroom 15

Map

Complutense University Campus



Agenda at a Glance

ANNSIM'25 Ses

		ANSS	CNS	CPS/DT	HACAS	TMS
Monday, May 26, 2025						
9:00 a.m. — 10:30 a.m.	SCS Plenary					
10:30 a.m.—11:00 a.m.	Break					
11:00 a.m.—12:30 p.m.	Session Block I					
12:30 p.m.—1:30 p.m.	Kick Off Lunch					
1:30 p.m. — 3:00 p.m.	Session Block II					
3:00 p.m. — 3:30 p.m.	Break					
3:30 p.m. — 5:00 p.m.	Session Block III					
Tuesday, May 27, 2025						
9:00 a.m. —10:30 a.m.	SCS Plenary					
10:30 a.m.—11:00 a.m.	Break					
11:00 a.m.—12:30 p.m.	Session Block IV					
12:30 p.m.—1:30 p.m.	Lunch on your own					
1:30 p.m. — 3:00 p.m.	Session Block V					
3:00 p.m. — 3:30 p.m.	Break					
3:30 p.m. — 5:00 p.m.	Session Block VI					
Wednesday, May 28, 2025						
9:00 a.m. — 10:30 a.m.	Session Block VII					
10:30 a.m.—11:00 a.m.	Break					
11:00 a.m.—12:30 p.m.	Session Block VIII					
12:30 p.m.—1:30 p.m.	Lunch on your own					
1:30 p.m. — 3:00 p.m.	Session Block IX					
3:00 p.m. — 3:30 p.m.	Break					
3:30 p.m. — 5:00 p.m.	Session Block X					
Thursday, May 29, 2025						
9:00 a.m. — 10:30 a.m.	Session Block XI					
10:30 a.m.—11:00 a.m.	Break					
11:00 a.m.—12:30 p.m.	Session Block XII					

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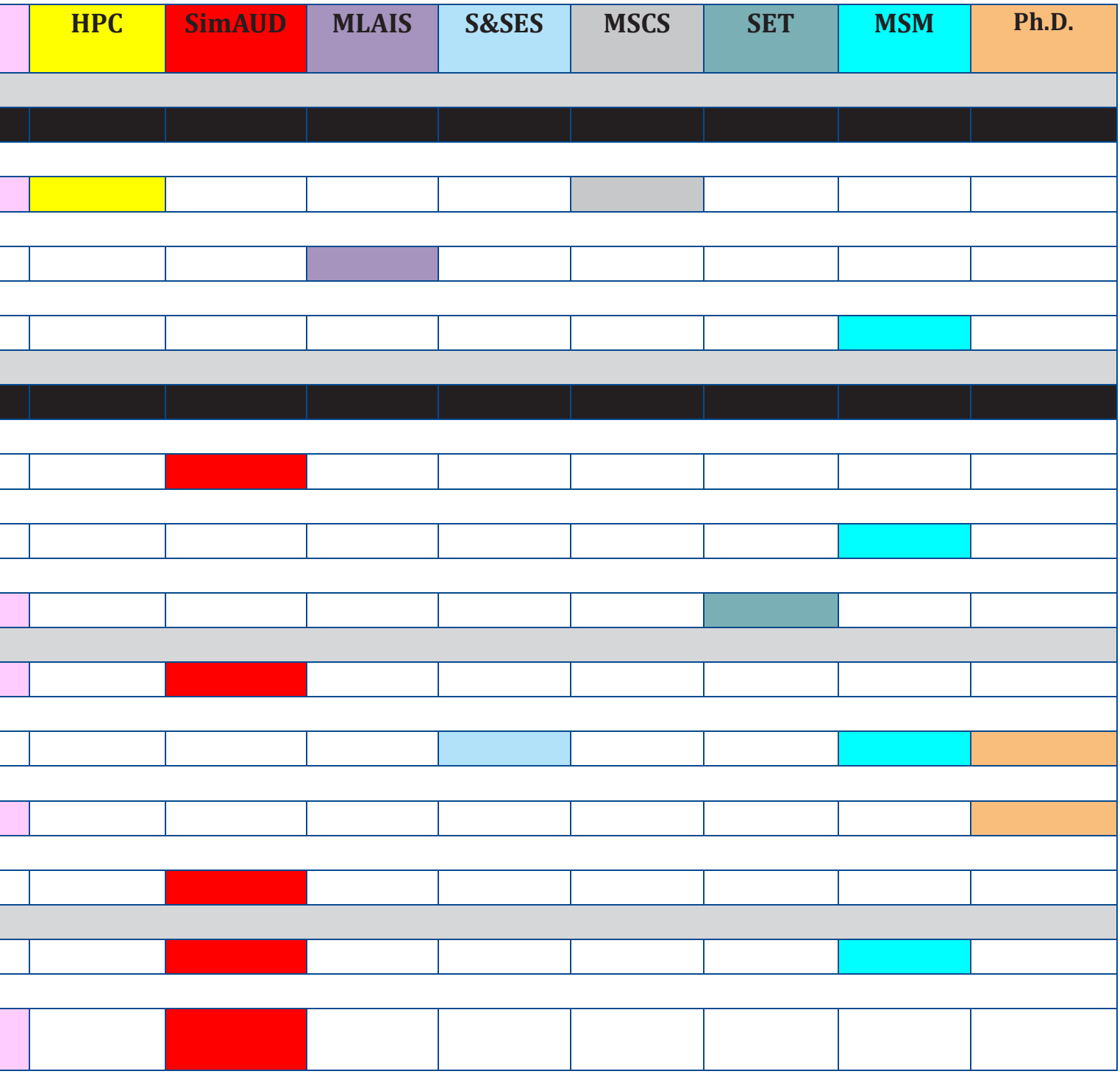

Daily Agendas

Monday

Annual Modeling and Simulation Conference 2025

Agenda

Monday, May 26, 2025

Theory and Foundations for Modeling and Simulation (TMS)

Session Block I 11:00 a.m.—12:30 p.m. Room: Classroom 13

Incorporating Human-in-the-loop Interactivity through the Integration of Discrete Event Simulation and Virtual Reality by Joseph Jabbour, Jalal Possik, Adriano O. Solis, Charles Yaacoub, Danny Kieken and Greg Zacharewicz

Data-driven Simulation-based Analysis of Collaborative Business Processes in Distributed Environments by Paolo Bocciarelli and Andrea D'Ambrogio

Robustify Simulation Uncertainty Quantification against Input Data Outlier by Haoting Zhang and Jingxu Xu

High Performance Computing and Simulation (HPC)

Session Block I 11:00 a.m.—12:30 p.m. Room: Classroom 14

Comparison of the Performance Evaluation of the Intel Quantum Simulator on the HPC Systems by Daniel Talaván-Vega, Pablo Fernández-Alonso, Paloma Rodríguez-Oliver, Moisés Gaitán-Fernández, Javier Corral-García and Juan-Antonio Rico-Gallego

Quantum Emulation for High-performance Computing Centers: Qaptiva HPC by Cyril Allouche, Jefferson Andres Bravo Montes and Miriam Bastante Chichon

Simulating Quantum Circuits with Hard-core Bosons by David da Costa

Annual Modeling and Simulation Conference 2025

Agenda

Monday, May 26, 2025

Modeling and Simulation in Cyber Security (MSCS)

Session Block I 11:00 p.m.—12:30 p.m. Room: Classroom 15

A Modeling and Simulation Framework to Support Cybersecurity Engineering by Moussa Koita, Youssouf M. Diagana, Oumar Y. Maiga and Mamadou Kaba Traoré

Automatic Generation of CNN Models for Radiofrequency Fingerprinting by Rogelio García-Aguirre, Carlos Mex-Perera and Eva M. Navarro-López

Machine Learning and AI in Simulation (MLAIS)

Session Block II 1:30 p.m.—3:00 p.m. Room: Classroom 13

BuilDa: A Thermal Building Data Generation Framework for Transfer Learning by Thomas Krug, Fabian Raisch, Markus Wirnsberger, Dominik Aimer, Ferdinand Sigg, Benjamin Schäfer and Benjamin Tischler

Real-Time Efficiency Control for Sim-to-Real Systems Using Spiking-Neural-Networks-based Reinforcement Learning by Yijing Fan, Chun Zhao, Lin Zhang and Heming Zhang

Towards a Validity Frame of Multi-modal Surrogate Models for Traffic Simulation by Raheleh Biglari, Claudio Gomes and Joachim Denil

Annual Modeling and Simulation Conference 2025

Agenda

Monday, May 26, 2025

Annual Simulation Symposium (ANSS)

Session Block III 3:30 p.m.—5:00 p.m. Room: Classroom 13

Simulation Analysis of Sensor Placement and Target Interaction in DEVS Formalism by Yeeun Park, Hyungho Na and Il-Chul Moon

Simulating Combinatorial Double Auctions: A Devs and Multi-agent Approach with Different Participant Behavior by Juan De Anton Heredero, Cristina Ruiz Martin, Félix Villafáñez and David Poza

Simulating Web3 Tokenomics with Agent-Based Models by Don Berndt and Ricardo Lasa

Cyber-Physical Systems and Digital Twins (CPS/DT)

Session Block III 3:30 p.m.—5:00 p.m. Room: Classroom 15

FMI-based Distributed Co-simulation with Enhanced Security and Intellectual Property Safeguards by Santiago Gil, Ecem E. Bas, Chirstian D. Jensen, Sebastian Engelsgaard, Giuseppe Abbiati and Cláudio Gomes

Towards a Standardized Framework for Developing Trustworthy Self-Adaptive Robotic Systems by Sahar Nasimi Nezhad, Bert Van Acker and Paul De Meulenaere

Towards Federating IoT and Simulation Systems: An HLA-Based Approach by Michel El Haddad, Jalal Possik, Emilio Jimenez, Marco Gotelli, Roy Abi Zeid Daou and Charles Yaacoub

Modeling and Simulation in Medicine (MSM)

Session Block III 3:30 p.m.—15:00 p.m. Room: Classroom 14

Keynote: Quantum Discrete Optimization and Its Applications in Healthcare

by Professor Wojciech Bożejko, Head of Department of Control Systems and Mechatronics, Faculty of Information and Telecommunication Technologies, Wroclaw University of Science and Technology

Abstract: The presentation concerns the application of quantum computing in discrete optimization, with a special focus on the D-Wave quantum annealer. After an introduction to the concept of quantum computing and the differences between the quantum gate approach (e.g. IBM, IQM, Google) and quantum annealing (D-Wave), the application of the latter in solving optimization problems is discussed. Modeling of problems for D-Wavequantum annealer is based on the QUBO (Quadratic Unconstrained Binary Optimization) model as well as the Ising model. The presentation describes a case study of tasks scheduling optimization. The mathematical model takes into account time constraints and binary decision variables. The potential applications are very wide: from production planning to scheduling nurses in a hospital. The use of a quantum machine already increases the possibilities of hybrid CPU+QPU algorithms, and in the future, with larger quantum computers, it will allow solving problems of sizes that are not yet possible to calculate.

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Tuesday

Annual Modeling and Simulation Conference 2025

Agenda

Tuesday, May 27, 2025

57th Annual Simulation Symposium (ANSS)

Session Block IV 11:00 a.m.—12:30 p.m. Room: Classroom 13

Discrepancy of Lane Flow Distribution and Lane-Wise Speed Distribution When Simulating Lane-Drop Bottleneck in Simulation of Urban Mobility (SUMO): A Comparison of Two Car-Following Models by Chukun Gao

A Multiscale Model for Australian Army Recruitment and Training Planning by Katie Mortimer, Cameron Pike and Terry Caelli

Minimum Time Search and Rescue Missions Involving UAVs with a Framework Supported by DEVS, RHC and PEA by Juan Bautista Bordón Ruiz, Jose L. Risco-Martin, Eva Besadas-Porta and José A. López-Orozco

Humans Agents and Cooperative Artificial Societies (HACAS)

Session Block IV 11:00 a.m.—12:30 p.m. Room: Classroom 14

Using Virtual Reality to Simulate and Study the Movements of School Shooters by Christopher A. McClurg and Alan R. Wagner

Toward a Quantitative Science of Nonviolence: Sensitivity Analysis of an Agent-Based Model of Nonviolent Resistance by Joshua Steakelum, Hang Trung Dinh and Lance Fiondella

Annual Modeling and Simulation Conference 2025

Agenda

Tuesday, May 27, 2025

Simulation of Architectural and Urban Design (SimAUD)

Session Block IV **11:00 a.m.—12:30 p.m.** **Room: Classroom 15**

Enhancing Environmental Performance-driven Design Decisions through Immersive Exploration by Amir Malka, Naga Venkata Sai Kumar Manapragada and Jonathan Natanian

Towards Quantifying Visual Exposure and the Resulting Privacy Concerns in Residential Building by Jaeha Kim, Katharina Kral and Timur Dogan

A Simulation-based Approach to Teaching HVAC Design to Architecture Students by Ali Irani and Christoph Reinhart

Annual Modeling and Simulation Conference 2025

Agenda

Tuesday, May 27, 2025

Communication technologies and Networking Simulation (CNS)

Session Block V 1:30 p.m.—3:00 p.m. Room: Classroom 5

Modeling and Simulation of Virtual Cut-through Routing in Multidimensional Interconnection Networks by Benjamin Ehrlich, Yelena Rykalova and Lev B. Levitin

An Adaptive Data Transfer Technique for Sensor-based Systems by Juan Contreras and Shikharesh Majumdar

Modeling and Simulation in Medicine (MSM)

Session Block V 1:30 p.m.—3:00 p.m. Room: Classroom 15

A Virtual Coaching Approach for the Computer-Assisted Surgical Trainer by Jonas Bloem, Jerzy Rozenblit and Klaus Buchenrieder

Towards a Prototype for Virtual Reality and Haptic Feedback Integration in Computer-Assisted Surgical Training by Ashlee Diggles, Nimra Anjum, Jason F. Zhang, Vaidehi Pujary, Jerzy W. Rozenblit and Eugene H. Chang

Annual Modeling and Simulation Conference 2025

Agenda

Tuesday, May 27, 2025

Cyber-Physical Systems and Digital Twins (CPS/DT)

Session Block VI 3:30 p.m.—5:00 p.m. Room: Classroom 15

Dynamic Development of Traffic Simulations for Urban Digital Twins by Martin McCarthy, Carolina Cruz-Neira and Dirk Reiners

Developing Urban Digital Twin for Mobility by Zeeshan ALI, Mama Diakité and Mamadou Kaba Traore

Theory and Foundations for Modeling and Simulation (TMS)

Session Block VI 3:30 p.m.—5:00 p.m. Room: Classroom 13

A Framework for Iterative Verification and Validation of MILP Scheduling Models Based on Petri Nets by Shengrui Peng and Helena Szczerbicka

Toward Models of Collective Intelligence for Goal-Directed Search in Exploratory Simulation and Analysis by Levent Yilmaz

Simulation of Cyanobacteria Behavior in Water Bodies with cell-DEVS and Lattice -Boltzmann Methods by Samuel Ferrero-Losada, Jose L. Risco-Martin, José Antonio López-Orozco and Roman Cardenas

Simulation in Education and Training (SET)

Session Block VI 3:30 p.m.—5:00 p.m. Room: Classroom 14

Advancing Digital Twin Education through Graduate Certification by Ghaith Rabadi, Bulent Soykan, Soheil Sabri and Sean Mondesire

Simulation as Transformative Approach for Enhancing Lean Performance Impact Assessment, Lean Sustainability, and Lean Learning by Anne Zouggar, Jalal Possik and Adriano Solis

Data-Driven Design for Developing a Virtual Laboratory for STEM Education by Yiyang Li and Yuzhong Shen

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Wednesday

Annual Modeling and Simulation Conference 2025

Agenda

Wednesday, May 28, 2025

Humans Agents and Cooperative Artificial Societies (HACAS)

Session Block VII **9:00 a.m.—10:30 a.m.** **Room: Classroom 13**

The Transparency Imperative: The Need for Model Documentation for Engaging with Public Policy Following the EU AI Act by Michael Frank Belfrage, Fabian Lorig, Christopher Frantz, Jason Tucker and Paul Davidsson

Combination of Agent-based Social Simulation Models: Approaches and Challenges by Emil Johansson, Fabian Lorig and Paul Davidsson

Realistic Social Networks in Agent-based Modeling by Maxim Malikov and Kathleen Salazar-Serna

Theory and Foundations for Modeling and Simulation (TMS)

Session Block VII **9:00 a.m.—10:30 a.m.** **Room: Classroom 14**

KEYNOTE: *AI-assisted Metamorphic Testing for Domain-specific Modelling and Simulation* by Juan de Lara (see page 20 for more details)

Wednesday, May 28, 2025

Simulation of Architectural and Urban Design (SimAUD)

Session Block VII 9:00 a.m.—10:30 a.m. Room: Classroom 15

Validation of the Shape Transformation Protocol for Simulating Non-cuboid Compartments in CFAST using FDS Simulations by Chengde Wu, Wei Yan and Mark J. Clayton

Brute-Force Optimization Workflow with Parallel Computing for Building Lifecycle Analysis: A Comparison with Multi-Objective Optimization with the Evolutionary Approach by Yang Yang and Marco Cimillo

Enhancing Building Retrofit Decision-making: A Synergistic Approach Combining Calibrated Simulations and Machine Learning by Navid Shirzadi and Meli Stylianou

Annual Modeling and Simulation Conference 2025

Agenda

Wednesday, May 28, 2025

Annual Simulation Symposium (ANSS)

Session Block VIII 11:00 a.m.—12:30 p.m. Room: Classroom 13

Simulation Quality in DES, SD and ABM: An Algorithmic Approach by Chris Lawrence

Reproducibility and Replicability of Simulation Models by Yilin Huang

A Review of Quantum Modeling and Simulation Approaches for Lithium-ion Batteries by Deniz Cetinkaya and Amor Abdelkader

Modeling and Simulation for Sustainability and Smart Energy Systems (S&SES)

Session Block VIII 11:00 a.m.—12:30 p.m. Room: Classroom 14

Economy and Sustainability Analysis with a Novel Modular Configurable Multi-modal White-box Building Model by Haozhen Cheng, Veit Hagenmeyer and Hüseyin K. Çakmak

Effect of Electric Vehicle Charging Scheduling and Battery Energy Storage System on Grid Load at an Airport by Primoz Godec and Steve McKeever

Annual Modeling and Simulation Conference 2025

Agenda

Wednesday, May 28, 2025

Modeling and Simulation in Medicine (MSM)

Session Block VIII 11:00 a.m.—12:30 p.m. Room: Classroom 8

Simulation of Breast Deformation Due to Ultrasound Probe by Motaz M. Alqaoud, John Plemmons, Eric Feliberti, Oleksandr Kravchenko, Krishnanand Kaipa, Gabor Fichtinger and Michel Audette

Impact of a Dynamic Nurse-to-patient Ratio Policy in the ICU: A Hybrid Simulation Model by Qootalkoloub Heissat and Lena Abu-El-Haija

Ph.D. Colloquium

Session Block VIII 11:00 a.m.—12:30 p.m. Room: Classroom 12

Digital Technologies for Scenario-Based Lifecycle Frameworks for Early-Stage Urban Design by Alejandro Fuentes

Proximal Policy Optimization for Multi-Agent Engagements in beyond Visual Range Air Combat by Joao Dantas

Discrete Event Simulation Model for Comprehensive Cervical Cancer Care in India: A Case Study of AIIMS Bhopal by Varad Puntambekar

On Structural Adaptivity in Region-based Process Mining by Shengrui Peng

Model Directed Systems Engineering for Cyanobacteria Bloom Management by Samuel Ferrero-Losada

Annual Modeling and Simulation Conference 2025

Agenda

Wednesday, May 28, 2025

Theory and Foundations for Modeling and Simulation (TMS)

Session Block IX 1:30 p.m.—3:00 p.m. Room: Classroom 13

DEVSMap: On the Path of Standardized DEVS Model Representation by Sasisekhar Mangalam Govind, Roman Cardenas and Gabriel Wainer

A Theoretical Framework for Model-Based Life Cycle Engineering of Simulation Models by Philipp Zech, Hans Vangheluwe and Ruth Breu

Parallel-DEVS Specification Language for Modeling: Mathematical Approach and Grammar by Gaston Batchoudi, Clément Foucher and Eric Ramat

Ph.D. Colloquium

Session Block IX 1:30 p.m.—3:00 p.m. Room: Classroom 12

Microfluidic Systems Enhanced by Artificial Intelligence for Water Analysis: Simulation and Sensing Perspectives by Juan Sandubete-López

Container Based Simulation: A Framework for Large Simulation Experiments by Daniel Seufferth

Modeling and Simulating the Behavior of a Non-verbal Autistic Individual: The Digital Twin Approach by Dominik Mukrecki

Modeling and Simulation of Logistic Flows in Container Ports GOLF - Generator of Logistic Flow by Farshad Shamlu

DEVSMAP: On the Path of Standardized DEVS Model Representation by Sasisekhar Mangalam Govind

Annual Modeling and Simulation Conference 2025

Agenda

Wednesday, May 28, 2025

Communication technologies and Networking Simulation (CNS)

Session Block X **3:30 p.m.—5:00 p.m.** **Room: Classroom 13**

DEVS over MQTT to Enable Distributed Real-Time Simulation by Roman Cardenas, Patricia Arroba, Segundo Esteban and Jose L. Risco-Martin

Optimizing Energy Efficiency Performance in RIS-assisted Near-field Mimo System Using Deep Rl by Amjad AI Iqbal, Ala'a Al-Habashna, Gabriel Wainer and Gary Boudreau

Simulation of Deep Neural Networks by Data Parallelization by Jorge A. Lopez and Abdolreza Abhari

Simulation of Architectural and Urban Design (SimAUD)

Session Block X **3:30 p.m.—5:00 p.m.** **Room: Classroom 15**

Evaluating Window-to-wall Ratio in Generative AI Architectural Design: Insights from SHAP Analysis and Predictive Modeling by Kaiheng Zhang, Muxin Jia and Taro Narahara

Carbon Neutral Solar Powered Outdoor Cooling Shelter by Ji Yoon Bae, Kayleigh Houde, Eric Teitelbaum and Dorit Aviv

SyncPerception: A Real-time Urban Perception Prediction Tool Based on Graph Neural Networks by Ziqi Cui and Shangyu Lou

Modeling the Joint Effects of Thermal Comfort, Built Environment, and Socio-Demographics on Active Mobility: A Data-driven Approach by Xiaoyue Yan, Timur Dogan and Yang Yang

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Thursday

Annual Modeling and Simulation Conference 2025

Agenda

Thursday, May 29, 2025

Simulation of Architectural and Urban Design (SimAUD)

Session Block XI 9:00 a.m.—10:30 a.m. Room: Classroom 15

Methods for Analyzing and Mapping the Spatiotemporal Dynamics of Light and Temperature in Architectural Design by Vasiliki Fragkia and Isak Worre Foged

Assessing Urban Wind Environments: A Design Optimization Framework by Vasiliki Fragkia and Kaushik Lalitha

Advanced Weather Data Morphing for Future Climate-based Building Simulation a Modular Python Tool Utilizing Enhanced Morphing Algorithms for EPW File Generation by Sophie Maximiliane Hamann, Angelos Chronis, Oana Taut and Theodoros Galanos

Modeling and Simulation in Medicine (MSM)

Session Block XI 9:00 a.m.—10:30 p.m. Room: Classroom 13

A Phenomenological Model of the Endometrial Cycle: Sensitivity Analysis of Prostaglandin Imbalances in Heavy Menstrual Bleeding by Alexandria Johnson, Carolina Ramirez Mazo, David Archer, Andrew Moore, Enrico Tronci, Michel Audette and Mette Olufsen

Computational Analysis of the Novel LQT3 Mutations G1481V and Q1491H in Myocardial and Purkinje Cells by Anthony Owusu-Mensah, Omer Berenfeld, Quentin Plumereau and Michel Audette

Effects of Torso Impedance on in Silico Voltage Mapping of Cardiac Dipoles of Rotors by Estela Sánchez-Carballo, Francisco-Manuel Melgarejo-Meseguer, Jose Luis Rojo-Alvarez and Omer Berenfeld

Annual Modeling and Simulation Conference 2025

Agenda

Thursday, May 29, 2025

Theory and Foundations for Modeling and Simulation (TMS)

Session Block XII 11:00 a.m.—12:30 p.m. Room: Classroom13

A Unified Benchmarking Framework for Evaluating Discrete Event Simulation Engines by Beatriz Herguedas, Roman Cardenas, Patricia Arroba, Eva Besada Portas and Jose L. Risco-Martin

PROMETHeUS: Bridging Accessibility and Flexibility in DEVS by Curtis Edward Winstanley, Gabriel Wainer and Iryna Borshchova

Translating StateCharts+Class Diagrams (SCCD) to the Discrete-EVent System Specification (DEVS) by Sam Pieters and Hans Vangheluwe

Simulation of Architectural and Urban Design (SimAUD)

Session Block XII 11:00 a.m.—12:30 p.m. Room: Classroom 15

Graph-based Analysis of Best Practices in Autism Centre Design by Dania Al-Harasis and Wassim Jabi

Case Study on Applying Multi-criteria Genetic Algorithms for Hotel Design Optimisation by Agnieszka Adamska-Idzikowska and Radoslaw Idzikowski

Living Lab Digital Twin: Case Study of the Development of a Research-oriented Digital Twin in a LEED Platinum Academic Building by David Gerber, Niko McGlashan, Simon Breslav and Azam Khan

Annual Modeling and Simulation Conference 2025

Agenda

Work in Progress

Wednesday, May 28, 2025

Session Block IX 1:30 p.m.—3:00 p.m. Room: Classroom 14

Multi-Sensor Fusion and SLAM-Based Digital Twin Integration for Simulated Accessibility Assessments in Complex Architectural Environments by Luis Borunda

Real-Time Prediction of Brain Deformation in Surgical Simulators Using Transformer-Based Surrogates by Fabian Greifeneder, Wolfgang Fenz, Benedikt Alkin, Johannes Brandstetter and Philipp Moser

Comparative Analysis between Different Optimization Methods for Indoor Daylight across Six Different Locations by Manal Anis, Sumedh Pendurkar, Yun Kyu Yi and Guni Sharon

Postural Stability Assessment Based on Deep Learning, Cameras, and Low-cost Sensor Technology by Shiyang Li, Josue Pagan, Milagros Jaén-Vargas and Jose Javier Serrano Olmedo

Session Block X 3:30 p.m.—5:00 p.m. Room: Classroom 14

Automated Fact-Checking Using Discrete Event System Specification Based on Concept of Concurrent Simulation by Quy Thanh Le, Maamar el Amine Hamri, Aznam Yacoub and Ismail Badache

Towards a Modeling and Simulation Approach for Socio-ecosystems Based on the Minsky's Triad and Digital Twins by Chevenslove Edouard, Paul-Antoine Bisgambiglia, Raphael Duboz and Gauthier Quesnel

Towards Composite Discrete Event and Agent-based Simulations by Kevin A. Brown, Jonathan Ozik, Swann Perarnau, Nicholson Collier, Jamie Cook and Jason Liu

Towards a Model of the Italian Wheat System: Agent-based Simulations for Sustainable Policies Design by Gianfranco Giulioni, Concetta Cardillo, Alessandro Ceccarelli, Arianna Di Paola and Edmondo Di Giuseppe

Annual Modeling and Simulation Conference 2025

Agenda

Work in Progress

Thursday, May 29, 2025

Session Block XI 9:00 a.m.—10:30 p.m. Room: Classroom 14

Building Analysis Tool: Designing for the Visually Impaired by Eleftheria Papadosifou, Eleni Papakosta, Kacper Wasilewski, Nouhaila Elmalouli, Sahil Yousaf, Gonzalo Garcia-Perate, Lora Fahmy and Angelos Chronis

Emotion-aware Autonomous Vehicle Control: A Novel Framework for Driver State Management through Adaptive AI-driven Interventions by Ancuta Margondai, Sara Willox, T'Kara Mullins and Mustapha Mouloua

Agent-based Simulation of a Support System to Improve Accessibility for Disabled Individuals in Hospitals by Duygu Kaya, Ali Firat Inal, Kursat Turker, Gulesin Sena Das and Deniz Cetinkaya

Simulation Based Learning for Hybrid Laboratory Experiences by Carmen Caiseda, Omayra Rivera-Castro, Carlos Martínez-Bonilla, Gabriele Haynes and Álvaro Lecompte

Session Block XI 11:00 a.m.—12:30 p.m. Room: Classroom 14

Analyzing Economic Recessions Probabilities through Interest Rates and Labor Market Indicators by Jeremis N. Morales

Multimodel Validation of Simulation Scenarios for Optimization of the New Dynamic Electricity Prices by Thomas Wiedemann

Improving Automatic Parallelization for Equation Based Mathematical Modeling and Simulation Using Metaheuristic Optimization by Abdelazim G. Hussien and Adrian Pop

Contribution to Model-based Interoperable Simulations: The MBS Approach by Rolf Miemba Makita, Martin Kubic, François Trousset and Greg Zacharewicz

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