

The Computational Planet.

Preface to ICCS 2022

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1. Introduction

Welcome to the 22nd annual International Conference on Computational Science (ICCS - <https://www.iccs-meeting.org/iccs2022/>), to be held on 21-23 June at Brunel University London, United Kingdom. After more than two years of a pandemic that has changed so much of our world and daily lives, this edition marks our return to a – partially – in-person event. Those who are not yet able to join us in London have the option to participate online, as all conference sessions will be streamed.

Although the challenges of such a hybrid format are manifold, we have tried our best to keep the ICCS community as dynamic, creative and productive as always. We are proud to present the proceedings you are reading as a result of that.

Standing on the River Thames in southeast England at the head of a 50-mile (80 km) estuary down to the North Sea, London is the capital and largest city of England and the United Kingdom. With a rich history spanning back to Roman times, modern London is one of the world's global cities, having a prominent role in areas ranging from arts and entertainment to commerce, finance and education. London is the biggest urban economy in Europe and one of the major financial centres in the world. It also features Europe's largest concentration of higher education institutions.

ICCS 2022 is jointly organized by Brunel University London, the University of Amsterdam, NTU Singapore, and the University of Tennessee.

Brunel University London is a public research university located in the Uxbridge area of London. It was founded in 1966 and named after the Victorian engineer Isambard Kingdom Brunel, who managed to design and build a 214m long suspension bridge in Bristol back in 1831. Brunel is well-known for its excellent Engineering and Computer Science Departments, and its campus houses a dedicated conference centre (the Hamilton Centre) which has been used to host ICCS. It is also one of the few Universities to host a full-length athletics track, which has been used both for practice purposes by athletes such as Usain Bolt for the 2012 Olympics, and for graduation ceremonies.

The International Conference on Computational Science is an annual conference that brings together researchers and scientists from mathematics and computer science as basic computing disciplines, as well as researchers from various application areas who are pioneering computational methods in sciences such as physics, chemistry, life sciences, engineering, arts, and humanitarian fields, to discuss problems and solutions in the area, identify new issues, and shape future directions for research.

Since its inception in 2001, ICCS has attracted increasingly higher quality and numbers of attendees and papers, and this year – in spite of the ongoing pandemic - is not an exception, with over 300 expected participants. The proceedings series have become a primary intellectual resource for computational science researchers, defining and advancing the state-of-the-art in this field.

The theme for 2022, "**The Computational Planet**," highlights the role of Computational Science in tackling the current challenges of the all-important quest for sustainable development. This conference will be a unique event focusing on recent developments in scalable scientific algorithms, advanced software tools; computational grids; advanced numerical methods; and novel application areas. These innovative novel models, algorithms, and tools drive new science through efficient application in physical systems, computational and systems biology, environmental systems, finance, and others.

ICCS is well known for its excellent lineup of keynote speakers. The keynotes for 2022 are:

- **Robert Axtell**, George Mason University, United States of America
- **Peter Coveney**, University College London, United Kingdom
- **Thomas Engels**, Technische Universität Berlin, Germany
- **Neil Ferguson**, Imperial College London, United Kingdom
- **Giulia Galli**, The University of Chicago, United States of America
- **Rebecca Wade**, Heidelberg Institute for Theoretical Studies, Germany

This year we had 474 submissions (169 submissions to the main track and 305 to the thematic tracks). In the main track, 55 full papers were accepted (32%); in the thematic tracks, 120 full papers (39%). A higher acceptance rate in the thematic tracks is explained by the nature of these, where track organisers personally invite many experts in a particular field to participate in their sessions.

ICCS relies strongly on our thematic track organizers' vital contributions to attract high-quality papers in many subject areas. We would like to thank all committee members from the main and thematic tracks for their contribution to ensure a high standard for the accepted papers. We would also like to thank *Springer*, *Elsevier*, and *Intelligibilis* for their support. Finally, we appreciate all the local organizing committee members for their hard work to prepare for this conference.

We are proud to note that ICCS is an A-rank conference in the CORE classification.

We wish you good health in these troubled times and look forward to meeting you at the conference, whether virtually or in-person.

June 2022

The ICCS 2022 Organizers:

Derek Groen
Clélia de Mulatier
Maciej Paszynski
Valeria V. Krzhizhanovskaya
Jack J. Dongarra
Peter M.A. Sloot

2. Local Organizing Committee at Brunel University London

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Diana Suleimenova
Xiaohui Liu
Zidong Wang
Steven Sam
Alireza Jahani
Yani Xue
Nadine Aburumman
Katie Mintram
Arindam Saha
Nura Abubakar

3. Thematic Tracks and Organizers**Advances in High-Performance Computational Earth Sciences: Applications and Frameworks – IHPCES**

Takashi Shimokawabe, Kohei Fujita, Dominik Bartuschat

Artificial Intelligence and High-Performance Computing for Advanced Simulations – AIHPC4AS

Maciej Paszynski

Biomedical and Bioinformatics Challenges for Computer Science – BBC

Mario Cannataro, Giuseppe Agapito, Mauro Castelli, Riccardo Dondi, Rodrigo Weber dos Santos, Italo Zoppis

Computational Collective Intelligence – CCI

Marcin Maleszka, Ngoc Thanh Nguyen, Dosam Hwang

Computational Health – CompHealth

Sergey Kovalchuk, Stefan Thurner, Georgiy Bobashev, Jude Hemanth, Anastasia Angelopoulou

Computational Optimization, Modelling, and Simulation – COMS

Xin-She Yang, Leifur Leifsson, Slawomir Koziel

Computer Graphics, Image Processing and Artificial Intelligence – CGIPAI

Andres Iglesias

Machine Learning and Data Assimilation for Dynamical Systems – MLDADS

Rossella Arcucci

Multiscale Modelling and Simulation – MMS

Derek Groen, Diana Suleimenova, Bartosz Bosak, Gabor Závodszy, Stefano Casarin, Ulf D. Schiller, Wouter Edeling

Quantum Computing – QCW

Katarzyna Rycerz, Marian Bubak

Simulations of Flow and Transport: Modeling, Algorithms and Computation – SOFTMAC

Shuyu Sun, Jingfa Li, James Liu

Smart Systems: Bringing Together Computer Vision, Sensor Networks and Machine Learning – SmartSys

Pedro Cardoso, João Rodrigues, Jânio Monteiro, Roberto Lam

Software Engineering for Computational Science – SE4Science

Jeffrey Carver, Caroline Jay, Yochannah Yehudi, Neil Chue Hong

Solving Problems with Uncertainty – SPU

Vassil Alexandrov, Aneta Karaivanova

Teaching Computational Science – WTCS

Angela Shiflet, Nia Alexandrov

Uncertainty Quantification for Computational Models – UNEQUIVOCAL

Wouter Edeling, Anna Nikishova

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