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Osvaldo Gervasi · Beniamino Murgante ·
Sanjay Misra · Ana Maria A. C. Rocha ·
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# Computational Science and Its Applications – ICCSA 2022 Workshops

Malaga, Spain, July 4–7, 2022
Proceedings, Part V

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# Preface

These six volumes (LNCS 13377–13382) consist of the peer-reviewed papers from the workshops at the 22nd International Conference on Computational Science and Its Applications (ICCSA 2022), which took place during July 4–7, 2022. The peer-reviewed papers of the main conference tracks are published in a separate set consisting of two volumes (LNCS 13375–13376).

This year, we again decided to organize a hybrid conference, with some of the delegates attending in person and others taking part online. Despite the enormous benefits achieved by the intensive vaccination campaigns in many countries, at the crucial moment of organizing the event, there was no certainty about the evolution of COVID-19. Fortunately, more and more researchers were able to attend the event in person, foreshadowing a slow but gradual exit from the pandemic and the limitations that have weighed so heavily on the lives of all citizens over the past three years.

ICCSA 2022 was another successful event in the International Conference on Computational Science and Its Applications (ICCSA) series. Last year, the conference was held as a hybrid event in Cagliari, Italy, and in 2020 it was organized as virtual event, whilst earlier editions took place in Saint Petersburg, Russia (2019), Melbourne, Australia (2018), Trieste, Italy (2017), Beijing, China (2016), Banff, Canada (2015), Guimaraes, Portugal (2014), Ho Chi Minh City, Vietnam (2013), Salvador, Brazil (2012), Santander, Spain (2011), Fukuoka, Japan (2010), Suwon, South Korea (2009), Perugia, Italy (2008), Kuala Lumpur, Malaysia (2007), Glasgow, UK (2006), Singapore (2005), Assisi, Italy (2004), Montreal, Canada (2003), and (as ICCS) Amsterdam, The Netherlands (2002) and San Francisco, USA (2001).

Computational science is the main pillar of most of the present research, and industrial and commercial applications, and plays a unique role in exploiting ICT innovative technologies. The ICCSA conference series provides a venue to researchers and industry practitioners to discuss new ideas, to share complex problems and their solutions, and to shape new trends in computational science.

Apart from the 52 workshops, ICCSA 2022 also included six main tracks on topics ranging from computational science technologies and application in many fields to specific areas of computational sciences, such as software engineering, security, machine learning and artificial intelligence, and blockchain technologies. For the 52 workshops we have accepted 285 papers. For the main conference tracks we accepted 57 papers and 24 short papers out of 279 submissions (an acceptance rate of 29%). We would like to express our appreciation to the Workshops chairs and co-chairs for their hard work and dedication.

The success of the ICCSA conference series in general, and of ICCSA 2022 in particular, vitally depends on the support of many people: authors, presenters, participants, keynote speakers, workshop chairs, session chairs, organizing committee members, student volunteers, Program Committee members, advisory committee

members, international liaison chairs, reviewers, and others in various roles. We take this opportunity to wholehartedly thank them all.

We also wish to thank our publisher, Springer, for their acceptance to publish the proceedings, for sponsoring some of the best papers awards, and for their kind assistance and cooperation during the editing process.

We cordially invite you to visit the ICCSA website https://iccsa.org where you can find all the relevant information about this interesting and exciting event.

July 2022

Osvaldo Gervasi
Beniamino Murgante
Sanjay Misra

# Welcome Message from Organizers

The ICCSA 2021 conference in the Mediterranean city of Cagliari provided us with inspiration to offer the ICCSA 2022 conference in the Mediterranean city of Málaga, Spain. The additional considerations due to the COVID-19 pandemic, which necessitated a hybrid conference, also stimulated the idea to use the School of Informatics of the University of Málaga. It has an open structure where we could take lunch and coffee outdoors and the lecture halls have open windows on two sides providing optimal conditions for meeting more safely.

The school is connected to the center of the old town via a metro system, for which we offered cards to the participants. This provided the opportunity to stay in lodgings in the old town close to the beach because, at the end of the day, that is the place to be to exchange ideas with your fellow scientists. The social program allowed us to enjoy the history of Malaga from its founding by the Phoenicians...

In order to provoke as much scientific interaction as possible we organized online sessions that could easily be followed by all participants from their own devices. We tried to ensure that participants from Asia could participate in morning sessions and those from the Americas in evening sessions. On-site sessions could be followed and debated on-site and discussed online using a chat system. To realize this, we relied on the developed technological infrastructure based on open source software, with the addition of streaming channels on YouTube. The implementation of the software infrastructure and the technical coordination of the volunteers were carried out by Damiano Perri and Marco Simonetti. Nine student volunteers from the universities of Málaga, Minho, Almeria, and Helsinki provided technical support and ensured smooth interaction during the conference.

A big thank you goes to all of the participants willing to exchange their ideas during their daytime. Participants of ICCSA 2022 came from 58 countries scattered over many time zones of the globe. Very interesting keynote talks were provided by well-known international scientists who provided us with more ideas to reflect upon, and we are grateful for their insights.

Eligius M. T. Hendrix

# Organization

ICCSA 2022 was organized by the University of Malaga (Spain), the University of Perugia (Italy), the University of Cagliari (Italy), the University of Basilicata (Italy), Monash University (Australia), Kyushu Sangyo University (Japan), and the University of Minho, (Portugal).

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## International Workshop on New Mobility Choices for Sustainable and Alternative Scenarios (NEWMOB 2022)

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## International Workshop on Privacy in the Cloud/Edge/IoT World (PCEIoT 2022)

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## 14th International Symposium on Software Engineering Processes and Applications (SEPA 2022)

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## International Workshop on Ports of the Future – Smartness and Sustainability (SmartPorts 2022)

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## International Workshop on Smart Tourism (SmartTourism 2022)

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## International Workshop on Specifics of Smart Cities Development in Europe (SPEED 2022)

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## International Workshop on Theoretical and Computational Chemistry and Its Applications (TCCMA 2022)

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## 14th International Workshop on Tools and Techniques in Software Development Process (TTSDP 2022)

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## International Workshop on Urban Regeneration: Innovative Tools and Evaluation Model (URITEM 2022)

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# Contents – Part V

**International Workshop on Socio-Economic and Environmental Models for Land Use Management (SEMLUM 2022)**

A Methodological Approach Based on the Choquet Integral for Sustainable Valuations . . . . . 3
*Francesco Tajani, Francesco Sica, Maria Rosaria Guarini, Pierluigi Morano, and Rossana Ranieri*

An Evaluation Methodology for the Feasibility Analysis of Energy Retrofit Investments . . . . . 15
*Francesco Tajani, Pierluigi Morano, Felicia Di Liddo, Endriol Doko, and Carmelo Maria Torre*

The Cost-Benefit Analysis for the Validation of Next Generation EU Investments: An Application to the Healthcare Sector . . . . . 27
*Marco Locurcio, Pierluigi Morano, Francesco Tajani, Felicia Di Liddo, and Ilaria Bortone*

**International Workshop on Ports of the Future Smartness and Sustainability (SmartPorts 2022)**

Special Economic Zones Planning for Sustainable Ports: General Approach for Administrative Simplifications and a Test Case . . . . . 47
*Domenica Savia Pellicanò and Maria Rosaria Trecozzi*

Special Economic Zones Planning for Sustainable Ports: Aggregate Economic Impact of Port of Gioia Tauro . . . . . 60
*Giuseppe Musolino, Antonio Cartisano, and Giuseppe Fortugno*

Special Economic Zones Planning for Sustainable Ports: The Test Case of Territorial Attractiveness and Urban Planning in Calabria Region . . . . . 72
*Dario A. Musolino and Paola Panuccio*

Special Economic Zones Planning for Sustainable Ports: The Role of Research and Training in the Calabria Region . . . . . 85
*Corrado Rindone, Francis M. M. Cirianni, Giuseppe Delfino, and Antonello I. Croce*

A Study on Ports' Emissions in the Adriatic Sea. . . . . 98
*Luca Braidotti and Marco Mazzarino*

The Logistic Carbon Footprint: A Dynamic Calculation Tool for an Indicator of the Sustainability of Logistic Processes with a Case Study on the Port of Trieste. . . . . 109
*Andrea Gallo*

Investigating the Competitive Factors of Container Ports in the Mediterranean Area: An Experimental Analysis Using DEA and PCA . . . . . 124
*Gianfranco Fancello, Patrizia Serra, Daniel M. Vitiello, and Valentina Aramu*

Port Clusters as an Opportunity for Optimizing Small-Scale LNG Distribution Chains: An Application to the Mediterranean Case . . . . . 140
*Patrizia Serra, Simona Mancini, Gianfranco Fancello, Federico Sollai, and Paolo Fadda*

Sea-Rail Intermodal Transport in Italian Gateway Ports: A Sustainable Solution? The Examples of La Spezia and Trieste. . . . . 156
*Marcello Tadini and Giuseppe Borruso*

Strategic Planning for Special Economic Zones to Ports of the Future: System of Models and Test Case . . . . . 173
*Francesco Russo, Giovanna Chilà, and Clara Zito*

Smart Ports from Theory to Practice: A Review of Sustainability Indicators . . . . . 185
*Silvia Battino and Maria del Mar Muñoz Leonisio*

Not Only Waterfront. The Port-City Relations Between Peripheries and Inner Harbors . . . . . 196
*Ginevra Balletto, Giuseppe Borruso, and Tiziana Campisi*

**International Workshop on Smart Tourism (Smart Tourism 2022)**

Rural Tourism and Walkability. Compare Sardinia and Gran Canaria Models. . . . . 211
*Silvia Battino, Ginevra Balletto, Alessandra Milesi, and Ainhoa Amaro García*

Game-Based e-Tourism-e-Health Using SQL . . . . . 222
*Chze-Yee Lim and Chien-Sing Lee*

**14th International Symposium on Software Engineering Processes and Applications (SEPA 2022)**

Image Gradient Based Iris Recognition for Distantly Acquired Face Images Using Distance Classifiers . . . . . 239
*Arnab Mukherjee, Kazi Shah Nawaz Ripon, Lasker Ershad Ali, Md. Zahidul Islam, and G. M. Mamun-Al-Imran*

E-Payment Continuance Usage: The Roles of Perceived Trust and Perceived Security. . . . . 253
*Thanh D. Nguyen and Quynh N. T. Tran*

Trustworthy Machine Learning Approaches for Cyberattack Detection: A Review . . . . . 265
*Blessing Guembe, Ambrose Azeta, Sanjay Misra, and Ravin Ahuja*

Comparing Effectiveness of Machine Learning Methods for Diagnosis of Deep Vein Thrombosis . . . . . 279
*Ruslan Sorano, Lars V. Magnusson, and Khurshid Abbas*

A Predictive Model for the Detection of Clients Suspicious Behavior . . . . . 294
*Marcelo Leon, Fidel Shagñay, Claudia Rivas, and Fabricio Echeverria*

Autoclassify Software Defects Using Orthogonal Defect Classification. . . . . 313
*Sushil Kumar, Meera Sharma, S. K. Muttoo, and V. B. Singh*

Traffic Control System Development Based on Computer Vision . . . . . 323
*Diogo Eugênio da Silva Cortez, Itamir de Morais Barroca Filho, Everson Mizael Cortez Silva, and Gustavo Girão*

Cerebrospinal Fluid Containers Navigator. A Systematic Literature Review . . . . . 340
*Yésica Rodríguez, Alejandra Huérfano, Fernando Yepes-Calderon, J. Gordon McComb, and Hector Florez*

Business Intelligence Analytics Tools . . . . . 352
*Teresa Guarda, Ana Carvaca, Ronald Gozabay, Mitzi Saquicela, and Helen Tomalá*

Empirical Analysis of Data Sampling-Based Ensemble Methods in Software Defect Prediction . . . . . 363
*Abdullateef O. Balogun, Babajide J. Odejide, Amos O. Bajeh, Zubair O. Alanamu, Fatima E. Usman-Hamza, Hammid O. Adeleke, Modinat A. Mabayoje, and Shakirat R. Yusuff*

MySQL Collaboration by Approving and Tracking Updates with Dependencies: A Versioning Approach . . . . . 380
*Dharavath Ramesh and Munesh Chandra Trivedi*

Software Sentiment Analysis Using Machine Learning with Different Word-Embedding . . . . . 396
*Venkata Krishna Chandra Mula, Sanidhya Vijayvargiya, Lov Kumar, Surender Singh Samant, and Lalita Bhanu Murthy*

Development of a Web-Based Knowledge Management Framework for Public-Private Partnership Projects in Nigeria . . . . . 411
*Akinbo Tomisin Faith, Fagbenle Olabosipo, and Amusan Lekan*

Security Evaluation Criteria of Open-Source Libraries . . . . . 422
*Vivian Mills and Sergey Butakov*

Lean Robotics: A Multivocal Literature Review . . . . . 436
*Adis Jasarevic and Ricardo Colomo-Palacios*

Multiperspective Web Testing Supported by a Generation Hyper-Heuristic . . . 447
*Juliana Marino Balera and Valdivino Alexandre de Santiago Júnior*

On the Machine Learning Based Business Workflows Extracting Knowledge from Large Scale Graph Data . . . . . 463
*Mert Musaoğlu, Merve Bekler, Hüseyin Budak, Celal Akçelik, and Mehmet S. Aktas*

Augmented Intelligence Multilingual Conversational Service for Smart Enterprise Management Software . . . . . 476
*Abidemi Emmanuel Adeniyi, Mukaila Olagunju, Joseph Bamidele Awotunde, Moses Kazeem Abiodun, Jinmisayo Awokola, and Morolake Oladayo Lawrence*

Recommendation of Microservices Patterns Through Automatic Information Retrieval Using Problems Specified in Natural Language . . . . . 489
*Álex dos Santos Moura, Mário Alan de Oliveira Lima, Fabio Gomes Rocha, and Michel S. Soares*

Crime Detection and Analysis from Social Media Messages Using Machine Learning and Natural Language Processing Technique . . . . . 502
*Xolani Lombo, Olaide N. Oyelade, and Absalom E. Ezugwu*

Residential Water Consumption Monitoring System Using IoT and MQTT Communication . . . . . 518
*Jacqueline del Pilar Villacís-Guerrero, Daniela Yessenia Cunalata-Paredes, José Roberto Bonilla-Villacís, Angel Soria, and Fátima Avilés-Castillo*

CALint: A Tool for Enforcing the Clean Architecture's Dependency Rule in Python . . . . . 534
*Clevio Orlando de Oliveira Junior, Jonathan Carvalho, Fábio Fagundes Silveira, Tiago Silva da Silva, and Eduardo Martins Guerra*

Genetic Data Analysis and Business Process Management Platform for Personalized Nutrition Service . . . . . 550
*Jitao Yang*

Electric Monitoring System for Residential Customers Using Wireless Technology . . . . . 560
*Jorge Buele, Juan Carlos Morales-Sánchez, José Varela-Aldás, Guillermo Palacios-Navarro, and Manuel Ayala-Chauvin*

Computer-Aided Forensic Authorship Identification in Criminology . . . . . 576
*András Kicsi, Péter Sánta, Dániel Horváth, Norbert Kőhegyi, Viktor Szvoreny, Veronika Vincze, Eszter Főző, and László Vidács*

Improved CNN Based on Batch Normalization and Adam Optimizer. . . . . 593
*Roseline Oluwaseun Ogundokun, Rytis Maskeliunas, Sanjay Misra, and Robertas Damaševičius*

The Application of SISO LSTM Networks to Forecast Selected Items in Financial Quarterly Reports – Case Study. . . . . 605
*Adam Galuszka, Eryka Probierz, Adrian Olczyk, Jerzy Kocerka, Katarzyna Klimczak, and Tomasz Wisniewski*

Design Assertions: Executable Assertions for Design Constraints . . . . . 617
*Yoonsik Cheon*

DC Health: Node-Level Online Anomaly Detection in Data Center Performance Data Monitoring . . . . . 632
*Walter Lopes Neto and Itamir de Morais Barroca Filho*

An Antibot-Based Web Voting System for Higher Institutions . . . . . 650
*Jessen Japheth, John Wejin, Sanjay Misra, and Jonathan Oluranti*

Efficient GitHub Crawling Using the GraphQL API . . . . . 662
*Adrian Jobst, Daniel Atzberger, Tim Cech, Willy Scheibel, Matthias Trapp, and Jürgen Döllner*

Software Functional Requirements Classification Using Ensemble Learning . . . . . 678
*Sanidhya Vijayvargiya, Lov Kumar, Aruna Malapati, Lalita Bhanu Murthy, and Sanjay Misra*

A Novel Approach to Recommendation System Business Workflows:
A Case Study for Book E-Commerce Websites . . . . . 692
*Mounes Zaval, Said Orfan Haidari, Pinar Kosan, and Mehmet S. Aktas*

An Approach to Business Workflow Software Architectures:
A Case Study for Bank Account Transaction Type Prediction . . . . . 709
*Fatma Gizem Çallı, Çağdaş Ayyıldız, Berke Kaan Açıkgöz, and Mehmet S. Aktas*

**Author Index** . . . . . 725