Lecture Notes in Computer Science 12253

Founding Editors

Gerhard Goos
Karlsruhe Institute of Technology, Karlsruhe, Germany
Juris Hartmanis
Cornell University, Ithaca, NY, USA

Editorial Board Members

Elisa Bertino
Purdue University, West Lafayette, IN, USA
Wen Gao
Peking University, Beijing, China
Bernhard Steffen
TU Dortmund University, Dortmund, Germany
Gerhard Woeginger
RWTH Aachen, Aachen, Germany
Moti Yung
Columbia University, New York, NY, USA

More information about this series at http://www.springer.com/series/7407

Osvaldo Gervasi · Beniamino Murgante ·
Sanjay Misra · Chiara Garau ·
Ivan Blečić · David Taniar ·
Bernady O. Apduhan · Ana Maria A. C. Rocha ·
Eufemia Tarantino · Carmelo Maria Torre ·
Yeliz Karaca (Eds.)

Computational Science and Its Applications – ICCSA 2020

20th International Conference
Cagliari, Italy, July 1–4, 2020
Proceedings, Part V

Springer

Editors
Osvaldo Gervasi
University of Perugia
Perugia, Italy

Sanjay Misra
Chair- Center of ICT/ICE
Covenant University
Ota, Nigeria

Ivan Blečić
University of Cagliari
Cagliari, Italy

Bernady O. Apduhan
Department of Information Science
Kyushu Sangyo University
Fukuoka, Japan

Eufemia Tarantino
Polytechnic University of Bari
Bari, Italy

Yeliz Karaca
Department of Neurology
University of Massachusetts
Medical School
Worcester, MA, USA

Beniamino Murgante
University of Basilicata
Potenza, Potenza, Italy

Chiara Garau
University of Cagliari
Cagliari, Italy

David Taniar
Clayton School of Information Technology
Monash University
Clayton, VIC, Australia

Ana Maria A. C. Rocha
University of Minho
Braga, Portugal

Carmelo Maria Torre
Polytechnic University of Bari
Bari, Italy

ISSN 0302-9743 ISSN 1611-3349 (electronic)
Lecture Notes in Computer Science
ISBN 978-3-030-58813-7 ISBN 978-3-030-58814-4 (eBook)
https://doi.org/10.1007/978-3-030-58814-4

LNCS Sublibrary: SL1 – Theoretical Computer Science and General Issues

© Springer Nature Switzerland AG 2020
This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

These seven volumes (LNCS volumes 12249–12255) consist of the peer-reviewed papers from the International Conference on Computational Science and Its Applications (ICCSA 2020) which took place from July 1–4, 2020. Initially the conference was planned to be held in Cagliari, Italy, in collaboration with the University of Cagliari, but due to the COVID-19 pandemic it was organized as an online event.

ICCSA 2020 was a successful event in the conference series, previously held 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, industrial and commercial applications, and plays a unique role in exploiting ICT innovative technologies. The ICCSA conference series has provided a venue for 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 general track, ICCSA 2020 also included 52 workshops in various areas of computational science, ranging from computational science technologies to specific areas of computational science, such as software engineering, security, machine learning and artificial intelligence, blockchain technologies, and of applications in many fields. We accepted 498 papers, distributed among 6 conference main tracks, which included 52 in workshops and 32 short papers. 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 2020 in particular, vitaly depends on the support from 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 wholeheartedly thank them all.

We also wish to thank our publisher, Springer, for their acceptance to publish the proceedings, for sponsoring part 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 http://www.iccsa.org where you can find all the relevant information about this interesting and exciting event.

July 2020

Osvaldo Gervasi
Beniamino Murgante
Sanjay Misra

Welcome to the Online Conference

The COVID-19 pandemic disrupted our plans for ICCSA 2020, as was the case for the scientific community around the world. Hence, we had to promptly regroup and rush to set in place the organization and the underlying infrastructure of the online event.

We chose to build the technological infrastructure using only open source software. In particular, we used Jitsi (`jitsi.org`) for the videoconferencing, Riot (`riot.im`) together with Matrix (`matrix.org`) for chat and asynchronous communication, and Jibri (`github.com/jitsi/jibri`) for live streaming sessions on YouTube.

Six Jitsi servers were set up, one for each parallel session. The participants of the sessions were helped and assisted by eight volunteer students (from the Universities of Cagliari, Florence, Perugia, and Bari), who assured technical support and smooth running of the conference proceedings.

The implementation of the software infrastructure and the technical coordination of the volunteers was carried out by Damiano Perri and Marco Simonetti.

Our warmest thanks go to all the volunteering students, to the technical coordinators, and to the development communities of Jitsi, Jibri, Riot, and Matrix, who made their terrific platforms available as open source software.

Our heartfelt thanks go to the keynote speakers: Yaneer Bar-Yam, Cecilia Ceccarelli, and Vincenzo Piuri and to the guests of the closing keynote panel: Mike Batty, Denise Pumain, and Alexis Tsoukiàs.

A big thank you goes to all the 454 speakers, many of whom showed an enormous collaborative spirit, sometimes participating and presenting in almost prohibitive times of the day, given that the participants of this year's conference come from 52 countries scattered over many time zones of the globe.

Finally, we would like to thank Google for letting us livestream all the events via YouTube. In addition to lightening the load of our Jitsi servers, that will allow us to keep memory and to be able to review the most exciting moments of the conference.

We all hope to meet in our beautiful Cagliari next year, safe from COVID-19, and finally free to meet in person and enjoy the beauty of the ICCSA community in the enchanting Sardinia.

July 2020

Ivan Blečić
Chiara Garau

Organization

ICCSA 2020 was organized by the University of Cagliari (Italy), University of Perugia (Italy), University of Basilicata (Italy), Monash University (Australia), Kyushu Sangyo University (Japan), and University of Minho (Portugal).

Honorary General Chairs

Antonio Laganà	Master-UP, Italy
Norio Shiratori	Chuo University, Japan
Kenneth C. J. Tan	Sardina Systems, UK
Corrado Zoppi	University of Cagliari, Italy

General Chairs

Osvaldo Gervasi	University of Perugia, Italy
Ivan Blečić	University of Cagliari, Italy
David Taniar	Monash University, Australia

Program Committee Chairs

Beniamino Murgante	University of Basilicata, Italy
Bernady O. Apduhan	Kyushu Sangyo University, Japan
Chiara Garau	University of Cagliari, Italy
Ana Maria A. C. Rocha	University of Minho, Portugal

International Advisory Committee

Jemal Abawajy	Deakin University, Australia
Dharma P. Agarwal	University of Cincinnati, USA
Rajkumar Buyya	The University of Melbourne, Australia
Claudia Bauzer Medeiros	University of Campinas, Brazil
Manfred M. Fisher	Vienna University of Economics and Business, Austria
Marina L. Gavrilova	University of Calgary, Canada
Yee Leung	Chinese University of Hong Kong, China

International Liaison Chairs

Giuseppe Borruso	University of Trieste, Italy
Elise De Donker	Western Michigan University, USA
Maria Irene Falcão	University of Minho, Portugal
Robert C. H. Hsu	Chung Hua University, Taiwan

Tai-Hoon Kim	Beijing Jaotong University, China
Vladimir Korkhov	Saint Petersburg University, Russia
Sanjay Misra	Covenant University, Nigeria
Takashi Naka	Kyushu Sangyo University, Japan
Rafael D. C. Santos	National Institute for Space Research, Brazil
Maribel Yasmina Santos	University of Minho, Portugal
Elena Stankova	Saint Petersburg University, Russia

Workshop and Session Organizing Chairs

Beniamino Murgante	University of Basilicata, Italy
Sanjay Misra	Covenant University, Nigeria
Jorge Gustavo Rocha	University of Minho, Portugal

Award Chair

Wenny Rahayu	La Trobe University, Australia

Publicity Committee Chairs

Elmer Dadios	De La Salle University, Philippines
Nataliia Kulabukhova	Saint Petersburg University, Russia
Daisuke Takahashi	Tsukuba University, Japan
Shangwang Wang	Beijing University of Posts and Telecommunications, China

Technology Chairs

Damiano Perri	University of Florence, Italy
Marco Simonetti	University of Florence, Italy

Local Arrangement Chairs

Ivan Blečić	University of Cagliari, Italy
Chiara Garau	University of Cagliari, Italy
Ginevra Balletto	University of Cagliari, Italy
Giuseppe Borruso	University of Trieste, Italy
Michele Campagna	University of Cagliari, Italy
Mauro Coni	University of Cagliari, Italy
Anna Maria Colavitti	University of Cagliari, Italy
Giulia Desogus	University of Cagliari, Italy
Sabrina Lai	University of Cagliari, Italy
Francesca Maltinti	University of Cagliari, Italy
Pasquale Mistretta	University of Cagliari, Italy
Augusto Montisci	University of Cagliari, Italy
Francesco Pinna	University of Cagliari, Italy

Davide Spano	University of Cagliari, Italy
Roberto Tonelli	University of Cagliari, Italy
Giuseppe A. Trunfio	University of Sassari, Italy
Corrado Zoppi	University of Cagliari, Italy

Program Committee

Vera Afreixo	University of Aveiro, Portugal
Filipe Alvelos	University of Minho, Portugal
Hartmut Asche	University of Potsdam, Germany
Ginevra Balletto	University of Cagliari, Italy
Michela Bertolotto	University College Dublin, Ireland
Sandro Bimonte	CEMAGREF, TSCF, France
Rod Blais	University of Calgary, Canada
Ivan Blečić	University of Sassari, Italy
Giuseppe Borruso	University of Trieste, Italy
Ana Cristina Braga	University of Minho, Portugal
Massimo Cafaro	University of Salento, Italy
Yves Caniou	Lyon University, France
José A. Cardoso e Cunha	Universidade Nova de Lisboa, Portugal
Rui Cardoso	University of Beira Interior, Portugal
Leocadio G. Casado	University of Almeria, Spain
Carlo Cattani	University of Salerno, Italy
Mete Celik	Erciyes University, Turkey
Hyunseung Choo	Sungkyunkwan University, South Korea
Min Young Chung	Sungkyunkwan University, South Korea
Florbela Maria da Cruz Domingues Correia	Polytechnic Institute of Viana do Castelo, Portugal
Gilberto Corso Pereira	Federal University of Bahia, Brazil
Alessandro Costantini	INFN, Italy
Carla Dal Sasso Freitas	Universidade Federal do Rio Grande do Sul, Brazil
Pradesh Debba	The Council for Scientific and Industrial Research (CSIR), South Africa
Hendrik Decker	Instituto Tecnológico de Informática, Spain
Frank Devai	London South Bank University, UK
Rodolphe Devillers	Memorial University of Newfoundland, Canada
Joana Matos Dias	University of Coimbra, Portugal
Paolino Di Felice	University of L'Aquila, Italy
Prabu Dorairaj	NetApp, India/USA
M. Irene Falcao	University of Minho, Portugal
Cherry Liu Fang	U.S. DOE Ames Laboratory, USA
Florbela P. Fernandes	Polytechnic Institute of Bragança, Portugal
Jose-Jesus Fernandez	National Centre for Biotechnology, CSIS, Spain
Paula Odete Fernandes	Polytechnic Institute of Bragança, Portugal
Adelaide de Fátima Baptista Valente Freitas	University of Aveiro, Portugal

Manuel Carlos Figueiredo	University of Minho, Portugal
Maria Celia Furtado Rocha	PRODEB–PósCultura, UFBA, Brazil
Chiara Garau	University of Cagliari, Italy
Paulino Jose Garcia Nieto	University of Oviedo, Spain
Jerome Gensel	LSR-IMAG, France
Maria Giaoutzi	National Technical University of Athens, Greece
Arminda Manuela Andrade Pereira Gonçalves	University of Minho, Portugal
Andrzej M. Goscinski	Deakin University, Australia
Sevin Gümgüm	Izmir University of Economics, Turkey
Alex Hagen-Zanker	University of Cambridge, UK
Shanmugasundaram Hariharan	B.S. Abdur Rahman University, India
Eligius M. T. Hendrix	University of Malaga, Spain, and Wageningen University, The Netherlands
Hisamoto Hiyoshi	Gunma University, Japan
Mustafa Inceoglu	EGE University, Turkey
Peter Jimack	University of Leeds, UK
Qun Jin	Waseda University, Japan
Farid Karimipour	Vienna University of Technology, Austria
Baris Kazar	Oracle Corp., USA
Maulana Adhinugraha Kiki	Telkom University, Indonesia
DongSeong Kim	University of Canterbury, New Zealand
Taihoon Kim	Hannam University, South Korea
Ivana Kolingerova	University of West Bohemia, Czech Republic
Nataliia Kulabukhova	Saint Petersburg University, Russia
Vladimir Korkhov	Saint Petersburg University, Russia
Rosa Lasaponara	CNR, Italy
Maurizio Lazzari	CNR, Italy
Cheng Siong Lee	Monash University, Australia
Sangyoun Lee	Yonsei University, South Korea
Jongchan Lee	Kunsan National University, South Korea
Chendong Li	University of Connecticut, USA
Gang Li	Deakin University, Australia
Fang Liu	AMES Laboratories, USA
Xin Liu	University of Calgary, Canada
Andrea Lombardi	University of Perugia, Italy
Savino Longo	University of Bari, Italy
Tinghuai Ma	Nanjing University of Information Science and Technology, China
Ernesto Marcheggiani	Katholieke Universiteit Leuven, Belgium
Antonino Marvuglia	Research Centre Henri Tudor, Luxembourg
Nicola Masini	CNR, Italy
Ilaria Matteucci	CNR, Italy
Eric Medvet	University of Trieste, Italy
Nirvana Meratnia	University of Twente, The Netherlands

Noelia Faginas Lago	University of Perugia, Italy
Giuseppe Modica	University of Reggio Calabria, Italy
Josè Luis Montaña	University of Cantabria, Spain
Maria Filipa Mourão	IP from Viana do Castelo, Portugal
Louiza de Macedo Mourelle	State University of Rio de Janeiro, Brazil
Nadia Nedjah	State University of Rio de Janeiro, Brazil
Laszlo Neumann	University of Girona, Spain
Kok-Leong Ong	Deakin University, Australia
Belen Palop	Universidad de Valladolid, Spain
Marcin Paprzycki	Polish Academy of Sciences, Poland
Eric Pardede	La Trobe University, Australia
Kwangjin Park	Wonkwang University, South Korea
Ana Isabel Pereira	Polytechnic Institute of Bragança, Portugal
Massimiliano Petri	University of Pisa, Italy
Maurizio Pollino	Italian National Agency for New Technologies, Energy and Sustainable Economic Development, Italy
Alenka Poplin	University of Hamburg, Germany
Vidyasagar Potdar	Curtin University of Technology, Australia
David C. Prosperi	Florida Atlantic University, USA
Wenny Rahayu	La Trobe University, Australia
Jerzy Respondek	Silesian University of Technology, Poland
Humberto Rocha	INESC-Coimbra, Portugal
Jon Rokne	University of Calgary, Canada
Octavio Roncero	CSIC, Spain
Maytham Safar	Kuwait University, Kuwait
Francesco Santini	University of Perugia, Italy
Chiara Saracino	A.O. Ospedale Niguarda Ca' Granda, Italy
Haiduke Sarafian	Penn State University, USA
Marco Paulo Seabra dos Reis	University of Coimbra, Portugal
Jie Shen	University of Michigan, USA
Qi Shi	Liverpool John Moores University, UK
Dale Shires	U.S. Army Research Laboratory, USA
Inês Soares	University of Coimbra, Portugal
Elena Stankova	Saint Petersburg University, Russia
Takuo Suganuma	Tohoku University, Japan
Eufemia Tarantino	Polytechnic University of Bari, Italy
Sergio Tasso	University of Perugia, Italy
Ana Paula Teixeira	University of Trás-os-Montes and Alto Douro, Portugal
Senhorinha Teixeira	University of Minho, Portugal
M. Filomena Teodoro	Portuguese Naval Academy, University of Lisbon, Portugal
Parimala Thulasiraman	University of Manitoba, Canada
Carmelo Torre	Polytechnic University of Bari, Italy
Javier Martinez Torres	Centro Universitario de la Defensa Zaragoza, Spain
Giuseppe A. Trunfio	University of Sassari, Italy

Pablo Vanegas	University of Cuenca, Ecuador
Marco Vizzari	University of Perugia, Italy
Varun Vohra	Merck Inc., USA
Koichi Wada	University of Tsukuba, Japan
Krzysztof Walkowiak	Wroclaw University of Technology, Poland
Zequn Wang	Intelligent Automation Inc., USA
Robert Weibel	University of Zurich, Switzerland
Frank Westad	Norwegian University of Science and Technology, Norway
Roland Wismüller	Universität Siegen, Germany
Mudasser Wyne	SOET National University, USA
Chung-Huang Yang	National Kaohsiung Normal University, Taiwan
Xin-She Yang	National Physical Laboratory, UK
Salim Zabir	France Telecom Japan Co., Japan
Haifeng Zhao	University of California, Davis, USA
Fabiana Zollo	University of Venice, Italy
Albert Y. Zomaya	The University of Sydney, Australia

Workshop Organizers

Advanced Transport Tools and Methods (A2TM 2020)

Massimiliano Petri	University of Pisa, Italy
Antonio Pratelli	University of Pisa, Italy

Advances in Artificial Intelligence Learning Technologies: Blended Learning, STEM, Computational Thinking and Coding (AAILT 2020)

Valentina Franzoni	University of Perugia, Italy
Alfredo Milani	University of Perugia, Italy
Sergio Tasso	University of Perugia, Italy

Workshop on Advancements in Applied Machine Learning and Data Analytics (AAMDA 2020)

Alessandro Costantini	INFN, Italy
Daniele Cesini	INFN, Italy
Davide Salomoni	INFN, Italy
Doina Cristina Duma	INFN, Italy

Advanced Computational Approaches in Artificial Intelligence and Complex Systems Applications (ACAC 2020)

Yeliz Karaca	University of Massachusetts Medical School, USA
Dumitru Baleanu	Çankaya University, Turkey, and Institute of Space Sciences, Romania
Majaz Moonis	University of Massachusetts Medical School, USA
Yu-Dong Zhang	University of Leicester, UK

Affective Computing and Emotion Recognition (ACER-EMORE 2020)

Valentina Franzoni	University of Perugia, Italy
Alfredo Milani	University of Perugia, Italy
Giulio Biondi	University of Florence, Italy

AI Factory and Smart Manufacturing (AIFACTORY 2020)

Jongpil Jeong	Sungkyunkwan University, South Korea

Air Quality Monitoring and Citizen Science for Smart Urban Management. State of the Art And Perspectives (AirQ&CScience 2020)

Grazie Fattoruso	ENEA CR Portici, Italy
Maurizio Pollino	ENEA CR Casaccia, Italy
Saverio De Vito	ENEA CR Portici, Italy

Automatic Landform Classification: Spatial Methods and Applications (ALCSMA 2020)

Maria Danese	CNR-ISPC, Italy
Dario Gioia	CNR-ISPC, Italy

Advances of Modelling Micromobility in Urban Spaces (AMMUS 2020)

Tiziana Campisi	University of Enna KORE, Italy
Giovanni Tesoriere	University of Enna KORE, Italy
Ioannis Politis	Aristotle University of Thessaloniki, Greece
Socrates Basbas	Aristotle University of Thessaloniki, Greece
Sanja Surdonja	University of Rijeka, Croatia
Marko Rencelj	University of Maribor, Slovenia

Advances in Information Systems and Technologies for Emergency Management, Risk Assessment and Mitigation Based on the Resilience Concepts (ASTER 2020)

Maurizio Pollino	ENEA, Italy
Marco Vona	University of Basilicata, Italy
Amedeo Flora	University of Basilicata, Italy
Chiara Iacovino	University of Basilicata, Italy
Beniamino Murgante	University of Basilicata, Italy

Advances in Web Based Learning (AWBL 2020)

Birol Ciloglugil	Ege University, Turkey
Mustafa Murat Inceoglu	Ege University, Turkey

Blockchain and Distributed Ledgers: Technologies and Applications (BDLTA 2020)

Vladimir Korkhov	Saint Petersburg University, Russia
Elena Stankova	Saint Petersburg University, Russia
Nataliia Kulabukhova	Saint Petersburg University, Russia

Bio and Neuro Inspired Computing and Applications (BIONCA 2020)

Nadia Nedjah	State University of Rio de Janeiro, Brazil
Luiza De Macedo Mourelle	State University of Rio de Janeiro, Brazil

Computer Aided Modeling, Simulation and Analysis (CAMSA 2020)

Jie Shen	University of Michigan, USA

Computational and Applied Statistics (CAS 2020)

Ana Cristina Braga	University of Minho, Portugal

Computerized Evidence Based Decision Making (CEBDEM 2020)

Clarice Bleil de Souza	Cardiff University, UK
Valerio Cuttini	University of Pisa, Italy
Federico Cerutti	Cardiff University, UK
Camilla Pezzica	Cardiff University, UK

Computational Geometry and Applications (CGA 2020)

Marina Gavrilova	University of Calgary, Canada

Computational Mathematics, Statistics and Information Management (CMSIM 2020)

Maria Filomena Teodoro	Portuguese Naval Academy, University of Lisbon, Portugal

Computational Optimization and Applications (COA 2020)

Ana Rocha	University of Minho, Portugal
Humberto Rocha	University of Coimbra, Portugal

Computational Astrochemistry (CompAstro 2020)

Marzio Rosi	University of Perugia, Italy
Cecilia Ceccarelli	University of Grenoble, France
Stefano Falcinelli	University of Perugia, Italy
Dimitrios Skouteris	Master-UP, Italy

Cities, Technologies and Planning (CTP 2020)

Beniamino Murgante	University of Basilicata, Italy
Ljiljana Zivkovic	Ministry of Construction, Transport and Infrastructure and Institute of Architecture and Urban & Spatial Planning of Serbia, Serbia
Giuseppe Borruso	University of Trieste, Italy
Malgorzata Hanzl	University of Łódź, Poland

Data Stream Processing and Applications (DASPA 2020)

Raja Chiky	ISEP, France
Rosanna VERDE	University of Campania, Italy
Marcilio De Souto	Orleans University, France

Data Science for Cyber Security (DS4Cyber 2020)

Hongmei Chi	Florida A&M University, USA

Econometric and Multidimensional Evaluation in Urban Environment (EMEUE 2020)

Carmelo Maria Torre	Polytechnic University of Bari, Italy
Pierluigi Morano	Polytechnic University of Bari, Italy
Maria Cerreta	University of Naples, Italy
Paola Perchinunno	University of Bari, Italy
Francesco Tajani	University of Rome, Italy
Simona Panaro	University of Portsmouth, UK
Francesco Scorza	University of Basilicata, Italy

Frontiers in Machine Learning (FIML 2020)

Massimo Bilancia	University of Bari, Italy
Paola Perchinunno	University of Bari, Italy
Pasquale Lops	University of Bari, Italy
Danilo Di Bona	University of Bari, Italy

Future Computing System Technologies and Applications (FiSTA 2020)

Bernady Apduhan	Kyushu Sangyo University, Japan
Rafael Santos	Brazilian National Institute for Space Research, Brazil

Geodesign in Decision Making: Meta Planning and Collaborative Design for Sustainable and Inclusive Development (GDM 2020)

Francesco Scorza	University of Basilicata, Italy
Michele Campagna	University of Cagliari, Italy
Ana Clara Mourao Moura	Federal University of Minas Gerais, Brazil

Geomatics in Forestry and Agriculture: New Advances and Perspectives (GeoForAgr 2020)

Maurizio Pollino	ENEA, Italy
Giuseppe Modica	University of Reggio Calabria, Italy
Marco Vizzari	University of Perugia, Italy

Geographical Analysis, Urban Modeling, Spatial Statistics (GEOG-AND-MOD 2020)

Beniamino Murgante	University of Basilicata, Italy
Giuseppe Borruso	University of Trieste, Italy
Hartmut Asche	University of Potsdam, Germany

Geomatics for Resource Monitoring and Management (GRMM 2020)

Eufemia Tarantino	Polytechnic University of Bari, Italy
Enrico Borgogno Mondino	University of Torino, Italy
Marco Scaioni	Polytechnic University of Milan, Italy
Alessandra Capolupo	Polytechnic University of Bari, Italy

Software Quality (ISSQ 2020)

Sanjay Misra	Covenant University, Nigeria

Collective, Massive and Evolutionary Systems (IWCES 2020)

Alfredo Milani	University of Perugia, Italy
Rajdeep Niyogi	Indian Institute of Technology, Roorkee, India
Alina Elena Baia	University of Florence, Italy

Large Scale Computational Science (LSCS 2020)

Elise De Doncker	Western Michigan University, USA
Fukuko Yuasa	High Energy Accelerator Research Organization (KEK), Japan
Hideo Matsufuru	High Energy Accelerator Research Organization (KEK), Japan

Land Use Monitoring for Sustainability (LUMS 2020)

Carmelo Maria Torre	Polytechnic University of Bari, Italy
Alessandro Bonifazi	Polytechnic University of Bari, Italy
Pasquale Balena	Polytechnic University of Bari, Italy
Massimiliano Bencardino	University of Salerno, Italy
Francesco Tajani	University of Rome, Italy
Pierluigi Morano	Polytechnic University of Bari, Italy
Maria Cerreta	University of Naples, Italy
Giuliano Poli	University of Naples, Italy

Machine Learning for Space and Earth Observation Data (MALSEOD 2020)

Rafael Santos	INPE, Brazil
Karine Ferreira	INPE, Brazil

Building Multi-dimensional Models for Assessing Complex Environmental Systems (MES 2020)

Marta Dell'Ovo	Polytechnic University of Milan, Italy
Vanessa Assumma	Polytechnic University of Torino, Italy
Caterina Caprioli	Polytechnic University of Torino, Italy
Giulia Datola	Polytechnic University of Torino, Italy
Federico dell'Anna	Polytechnic University of Torino, Italy

Ecosystem Services: Nature's Contribution to People in Practice. Assessment Frameworks, Models, Mapping, and Implications (NC2P 2020)

Francesco Scorza	University of Basilicata, Italy
David Cabana	International Marine Center, Italy
Sabrina Lai	University of Cagliari, Italy
Ana Clara Mourao Moura	Federal University of Minas Gerais, Brazil
Corrado Zoppi	University of Cagliari, Italy

Open Knowledge for Socio-economic Development (OKSED 2020)

Luigi Mundula	University of Cagliari, Italy
Flavia Marzano	Link Campus University, Italy
Maria Paradiso	University of Milan, Italy

Scientific Computing Infrastructure (SCI 2020)

Elena Stankova	Saint Petersburg State University, Russia
Vladimir Korkhov	Saint Petersburg State University, Russia
Natalia Kulabukhova	Saint Petersburg State University, Russia

Computational Studies for Energy and Comfort in Buildings (SECoB 2020)

Senhorinha Teixeira	University of Minho, Portugal
Luís Martins	University of Minho, Portugal
Ana Maria Rocha	University of Minho, Portugal

Software Engineering Processes and Applications (SEPA 2020)

Sanjay Misra	Covenant University, Nigeria

Smart Ports - Technologies and Challenges (SmartPorts 2020)

Gianfranco Fancello	University of Cagliari, Italy
Patrizia Serra	University of Cagliari, Italy
Marco Mazzarino	University of Venice, Italy
Luigi Mundula	University of Cagliari, Italy

Ginevra Balletto	University of Cagliari, Italy
Giuseppe Borruso	University of Trieste, Italy

Sustainability Performance Assessment: Models, Approaches and Applications Toward Interdisciplinary and Integrated Solutions (SPA 2020)

Francesco Scorza	University of Basilicata, Italy
Valentin Grecu	Lucian Blaga University, Romania
Jolanta Dvarioniene	Kaunas University of Technology, Lithuania
Sabrina Lai	University of Cagliari, Italy
Iole Cerminara	University of Basilicata, Italy
Corrado Zoppi	University of Cagliari, Italy

Smart and Sustainable Island Communities (SSIC 2020)

Chiara Garau	University of Cagliari, Italy
Anastasia Stratigea	National Technical University of Athens, Greece
Paola Zamperlin	University of Pisa, Italy
Francesco Scorza	University of Basilicata, Italy

Science, Technologies and Policies to Innovate Spatial Planning (STP4P 2020)

Chiara Garau	University of Cagliari, Italy
Daniele La Rosa	University of Catania, Italy
Francesco Scorza	University of Basilicata, Italy
Anna Maria Colavitti	University of Cagliari, Italy
Beniamino Murgante	University of Basilicata, Italy
Paolo La Greca	University of Catania, Italy

New Frontiers for Strategic Urban Planning (StrategicUP 2020)

Luigi Mundula	University of Cagliari, Italy
Ginevra Balletto	University of Cagliari, Italy
Giuseppe Borruso	University of Trieste, Italy
Michele Campagna	University of Cagliari, Italy
Beniamino Murgante	University of Basilicata, Italy

Theoretical and Computational Chemistry and its Applications (TCCMA 2020)

Noelia Faginas-Lago	University of Perugia, Italy
Andrea Lombardi	University of Perugia, Italy

Tools and Techniques in Software Development Process (TTSDP 2020)

Sanjay Misra	Covenant University, Nigeria

Urban Form Studies (UForm 2020)

Malgorzata Hanzl	Łódź University of Technology, Poland

Urban Space Extended Accessibility (USEaccessibility 2020)

Chiara Garau	University of Cagliari, Italy
Francesco Pinna	University of Cagliari, Italy
Beniamino Murgante	University of Basilicata, Italy
Mauro Coni	University of Cagliari, Italy
Francesca Maltinti	University of Cagliari, Italy
Vincenza Torrisi	University of Catania, Italy
Matteo Ignaccolo	University of Catania, Italy

Virtual and Augmented Reality and Applications (VRA 2020)

Osvaldo Gervasi	University of Perugia, Italy
Damiano Perri	University of Perugia, Italy
Marco Simonetti	University of Perugia, Italy
Sergio Tasso	University of Perugia, Italy

Workshop on Advanced and Computational Methods for Earth Science Applications (WACM4ES 2020)

Luca Piroddi	University of Cagliari, Italy
Laura Foddis	University of Cagliari, Italy
Gian Piero Deidda	University of Cagliari, Italy
Augusto Montisci	University of Cagliari, Italy
Gabriele Uras	University of Cagliari, Italy
Giulio Vignoli	University of Cagliari, Italy

Sponsoring Organizations

ICCSA 2020 would not have been possible without tremendous support of many organizations and institutions, for which all organizers and participants of ICCSA 2020 express their sincere gratitude:



Springer International Publishing AG, Germany
(https://www.springer.com)



Computers Open Access Journal
(https://www.mdpi.com/journal/computers)



IEEE Italy Section, Italy
(https://italy.ieeer8.org/)



Centre-North Italy Chapter IEEE GRSS, Italy
(https://cispio.diet.uniroma1.it/marzano/ieee-grs/index.html)



Italy Section of the Computer Society, Italy
(https://site.ieee.org/italy-cs/)



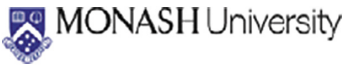
University of Cagliari, Italy
(https://unica.it/)



University of Perugia, Italy
(https://www.unipg.it)



University of Basilicata, Italy
(http://www.unibas.it)



Monash University, Australia
(https://www.monash.edu/)



Kyushu Sangyo University, Japan
(https://www.kyusan-u.ac.jp/)





University of Minho, Portugal
(https://www.uminho.pt/)



Scientific Association Transport Infrastructures, Italy
(https://www.stradeeautostrade.it/associazioni-e-organizzazioni/asit-associazione-scientifica-infrastrutture-trasporto/)



Regione Sardegna, Italy
(https://regione.sardegna.it/)



Comune di Cagliari, Italy
(https://www.comune.cagliari.it/)

Referees

A. P. Andrade Marina	ISCTE, Instituto Universitário de Lisboa, Portugal
Addesso Paolo	University of Salerno, Italy
Adewumi Adewole	Algonquin College, Canada
Afolabi Adedeji	Covenant University, Nigeria
Afreixo Vera	University of Aveiro, Portugal
Agrawal Smirti	Freelancer, USA
Agrawal Akshat	Amity University Haryana, India
Ahmad Waseem	Federal University of Technology Minna, Nigeria
Akgun Nurten	Bursa Technical University, Turkey
Alam Tauhidul	Louisiana State University Shreveport, USA
Aleixo Sandra M.	CEAUL, Portugal
Alfa Abraham	Federal University of Technology Minna, Nigeria
Alvelos Filipe	University of Minho, Portugal
Alves Alexandra	University of Minho, Portugal
Amato Federico	University of Lausanne, Switzerland
Andrade Marina Alexandra Pedro	ISCTE-IUL, Portugal
Andrianov Sergey	Saint Petersburg State University, Russia
Anelli Angelo	CNR-IGAG, Italy
Anelli Debora	University of Rome, Italy
Annunziata Alfonso	University of Cagliari, Italy
Antognelli Sara	Agricolus, Italy
Aoyama Tatsumi	High Energy Accelerator Research Organization, Japan
Apduhan Bernady	Kyushu Sangyo University, Japan
Ascenzi Daniela	University of Trento, Italy
Asche Harmut	Hasso-Plattner-Institut für Digital Engineering GmbH, Germany
Aslan Burak Galip	Izmir Insitute of Technology, Turkey
Assumma Vanessa	Polytechnic University of Torino, Italy
Astoga Gino	UV, Chile
Atman Uslu Nilüfer	Manisa Celal Bayar University, Turkey
Behera Ranjan Kumar	National Institute of Technology, Rourkela, India
Badsha Shahriar	University of Nevada, USA
Bai Peng	University of Cagliari, Italy
Baia Alina-Elena	University of Perugia, Italy
Balacco Gabriella	Polytechnic University of Bari, Italy
Balci Birim	Celal Bayar University, Turkey
Balena Pasquale	Polytechnic University of Bari, Italy
Balletto Ginevra	University of Cagliari, Italy
Balucani Nadia	University of Perugia, Italy
Bansal Megha	Delhi University, India
Barazzetti Luigi	Polytechnic University of Milan, Italy
Barreto Jeniffer	Istituto Superior Técnico, Portugal
Basbas Socrates	Aristotle University of Thessaloniki, Greece

Berger Katja	Ludwig-Maximilians-Universität München, Germany
Beyene Asrat Mulatu	Addis Ababa Science and Technology University, Ethiopia
Bilancia Massimo	University of Bari Aldo Moro, Italy
Biondi Giulio	University of Firenze, Italy
Blanquer Ignacio	Universitat Politècnica de València, Spain
Bleil de Souza Clarice	Cardiff University, UK
Blečić Ivan	University of Cagliari, Italy
Bogdanov Alexander	Saint Petersburg State University, Russia
Bonifazi Alessandro	Polytechnic University of Bari, Italy
Bontchev Boyan	Sofia University, Bulgaria
Borgogno Mondino Enrico	University of Torino, Italy
Borruso Giuseppe	University of Trieste, Italy
Bouaziz Rahma	Taibah University, Saudi Arabia
Bowles Juliana	University of Saint Andrews, UK
Braga Ana Cristina	University of Minho, Portugal
Brambilla Andrea	Polytechnic University of Milan, Italy
Brito Francisco	University of Minho, Portugal
Buele Jorge	Universidad Tecnológica Indoamérica, Ecuador
Buffoni Andrea	TAGES sc, Italy
Cabana David	International Marine Centre, Italy
Calazan Rogerio	IEAPM, Brazil
Calcina Sergio Vincenzo	University of Cagliari, Italy
Camalan Seda	Atilim University, Turkey
Camarero Alberto	Universidad Politécnica de Madrid, Spain
Campisi Tiziana	University of Enna KORE, Italy
Cannatella Daniele	Delft University of Technology, The Netherlands
Capolupo Alessandra	Polytechnic University of Bari, Italy
Cappucci Sergio	ENEA, Italy
Caprioli Caterina	Polytechnic University of Torino, Italy
Carapau Fermando	Universidade de Evora, Portugal
Carcangiu Sara	University of Cagliari, Italy
Carrasqueira Pedro	INESC Coimbra, Portugal
Caselli Nicolás	PUCV Chile, Chile
Castro de Macedo Jose Nuno	Universidade do Minho, Portugal
Cavallo Carla	University of Naples, Italy
Cerminara Iole	University of Basilicata, Italy
Cerreta Maria	University of Naples, Italy
Cesini Daniele	INFN-CNAF, Italy
Chang Shi-Kuo	University of Pittsburgh, USA
Chetty Girija	University of Canberra, Australia
Chiky Raja	ISEP, France
Chowdhury Dhiman	University of South Carolina, USA
Ciloglugil Birol	Ege University, Turkey
Coletti Cecilia	Università di Chieti-Pescara, Italy

Coni Mauro	University of Cagliari, Italy
Corcoran Padraig	Cardiff University, UK
Cornelio Antonella	Università degli Studi di Brescia, Italy
Correia Aldina	ESTG-PPorto, Portugal
Correia Elisete	University of Trás-os-Montes and Alto Douro, Portugal
Correia Florbela	Polytechnic Institute of Viana do Castelo, Portugal
Costa Lino	Universidade do Minho, Portugal
Costa e Silva Eliana	ESTG-P Porto, Portugal
Costantini Alessandro	INFN, Italy
Crespi Mattia	University of Roma, Italy
Cuca Branka	Polytechnic University of Milano, Italy
De Doncker Elise	Western Michigan University, USA
De Macedo Mourelle Luiza	State University of Rio de Janeiro, Brazil
Daisaka Hiroshi	Hitotsubashi University, Japan
Daldanise Gaia	CNR, Italy
Danese Maria	CNR-ISPC, Italy
Daniele Bartoli	University of Perugia, Italy
Datola Giulia	Polytechnic University of Torino, Italy
De Luca Giandomenico	University of Reggio Calabria, Italy
De Lucia Caterina	University of Foggia, Italy
De Morais Barroca Filho Itamir	Federal University of Rio Grande do Norte, Brazil
De Petris Samuele	University of Torino, Italy
De Sá Alan	Marinha do Brasil, Brazil
De Souto Marcilio	LIFO, University of Orléans, France
De Vito Saverio	ENEA, Italy
De Wilde Pieter	University of Plymouth, UK
Degtyarev Alexander	Saint Petersburg State University, Russia
Dell'Anna Federico	Polytechnic University of Torino, Italy
Dell'Ovo Marta	Polytechnic University of Milano, Italy
Della Mura Fernanda	University of Naples, Italy
Deluka T. Aleksandra	University of Rijeka, Croatia
Demartino Cristoforo	Zhejiang University, China
Dereli Dursun Ahu	Istanbul Commerce University, Turkey
Desogus Giulia	University of Cagliari, Italy
Dettori Marco	University of Sassari, Italy
Devai Frank	London South Bank University, UK
Di Francesco Massimo	University of Cagliari, Italy
Di Liddo Felicia	Polytechnic University of Bari, Italy
Di Paola Gianluigi	University of Molise, Italy
Di Pietro Antonio	ENEA, Italy
Di Pinto Valerio	University of Naples, Italy
Dias Joana	University of Coimbra, Portugal
Dimas Isabel	University of Coimbra, Portugal
Dirvanauskas Darius	Kaunas University of Technology, Lithuania
Djordjevic Aleksandra	University of Belgrade, Serbia

Duma Doina Cristina	INFN-CNAF, Italy
Dumlu Demircioğlu Emine	Yıldız Technical University, Turkey
Dursun Aziz	Virginia Tech University, USA
Dvarioniene Jolanta	Kaunas University of Technology, Lithuania
Errico Maurizio Francesco	University of Enna KORE, Italy
Ezugwu Absalom	University of KwaZulu-Natal, South Africa
Fattoruso Grazia	ENEA, Italy
Faginas-Lago Noelia	University of Perugia, Italy
Falanga Bolognesi Salvatore	ARIESPACE, Italy
Falcinelli Stefano	University of Perugia, Italy
Farias Marcos	National Nuclear Energy Commission, Brazil
Farina Alessandro	University of Pisa, Italy
Feltynowski Marcin	Lodz University of Technology, Poland
Fernandes Florbela	Instituto Politecnico de Bragança, Portugal
Fernandes Paula Odete	Instituto Politécnico de Bragança, Portugal
Fernandez-Sanz Luis	University of Alcala, Spain
Ferreira Ana Cristina	University of Minho, Portugal
Ferreira Fernanda	Porto, Portugal
Fiorini Lorena	University of L'Aquila, Italy
Flora Amedeo	University of Basilicata, Italy
Florez Hector	Universidad Distrital Francisco Jose de Caldas, Colombia
Foddis Maria Laura	University of Cagliari, Italy
Fogli Daniela	University of Brescia, Italy
Fortunelli Martina	Pragma Engineering, Italy
Fragiacomo Massimo	University of L'Aquila, Italy
Franzoni Valentina	Perugia University, Italy
Fusco Giovanni	University of Cote d'Azur, France
Fyrogenis Ioannis	Aristotle University of Thessaloniki, Greece
Gorbachev Yuriy	Coddan Technologies LLC, Russia
Gabrielli Laura	Università Iuav di Venezia, Italy
Gallanos Theodore	Austrian Institute of Technology, Austria
Gamallo Belmonte Pablo	Universitat de Barcelona, Spain
Gankevich Ivan	Saint Petersburg State University, Russia
Garau Chiara	University of Cagliari, Italy
Garcia Para Ernesto	Universidad del Pais Vasco, EHU, Spain
Gargano Riccardo	Universidade de Brasilia, Brazil
Gavrilova Marina	University of Calgary, Canada
Georgiadis Georgios	Aristotle University of Thessaloniki, Greece
Gervasi Osvaldo	University of Perugia, Italy
Giano Salvatore Ivo	University of Basilicata, Italy
Gil Jorge	Chalmers University, Sweden
Gioia Andrea	Polytechnic University of Bari, Italy
Gioia Dario	ISPC-CNT, Italy

Giordano Ludovica	ENEA, Italy
Giorgi Giacomo	University of Perugia, Italy
Giovene di Girasole Eleonora	CNR-IRISS, Italy
Giovinazzi Sonia	ENEA, Italy
Giresini Linda	University of Pisa, Italy
Giuffrida Salvatore	University of Catania, Italy
Golubchikov Oleg	Cardiff University, UK
Gonçalves A. Manuela	University of Minho, Portugal
Gorgoglione Angela	Universidad de la República, Uruguay
Goyal Rinkaj	IPU, Delhi, India
Grishkin Valery	Saint Petersburg State University, Russia
Guerra Eduardo	Free University of Bozen-Bolzano, Italy
Guerrero Abel	University of Guanajuato, Mexico
Gulseven Osman	American University of The Middle East, Kuwait
Gupta Brij	National Institute of Technology, Kurukshetra, India
Guveyi Elcin	Yildiz Teknik University, Turkey
Gülen Kemal Güven	Namk Kemal University, Turkey
Haddad Sandra	Arab Academy for Science, Technology and Maritime Transport, Egypt
Hanzl Malgorzata	Lodz University of Technology, Poland
Hegedus Peter	University of Szeged, Hungary
Hendrix Eligius M. T.	Universidad de Málaga, Spain
Higaki Hiroaki	Tokyo Denki University, Japan
Hossain Syeda Sumbul	Daffodil International University, Bangladesh
Iacovino Chiara	University of Basilicata, Italy
Iakushkin Oleg	Saint Petersburg State University, Russia
Iannuzzo Antonino	ETH Zurich, Switzerland
Idri Ali	University Mohammed V, Morocco
Ignaccolo Matteo	University of Catania, Italy
Ilovan Oana-Ramona	Babes-Bolyai University, Romania
Isola Federica	University of Cagliari, Italy
Jankovic Marija	CERTH, Greece
Jorge Ana Maria	Instituto Politécnico de Lisboa, Portugal
Kanamori Issaku	RIKEN Center for Computational Science, Japan
Kapenga John	Western Michigan University, USA
Karabulut Korhan	Yasar University, Turkey
Karaca Yeliz	University of Massachusetts Medical School, USA
Karami Ali	University of Guilan, Iran
Kienhofer Frank	WITS, South Africa
Kim Tai-hoon	Beijing Jiaotong University, China
Kimura Shuhei	Tottori University, Japan
Kirillov Denis	Saint Petersburg State University, Russia
Korkhov Vladimir	Saint Petersburg University, Russia
Koszewski Krzysztof	Warsaw University of Technology, Poland
Krzysztofik Sylwia	Lodz University of Technology, Poland

Kulabukhova Nataliia	Saint Petersburg State University, Russia
Kulkarni Shrinivas B.	SDM College of Engineering and Technology, Dharwad, India
Kwiecinski Krystian	Warsaw University of Technology, Poland
Kyvelou Stella	Panteion University of Social and Political Sciences, Greece
Körting Thales	INPE, Brazil
Lal Niranjan	Mody University of Science and Technology, India
Lazzari Maurizio	CNR-ISPC, Italy
Leon Marcelo	Asociacion de Becarios del Ecuador, Ecuador
La Rocca Ludovica	University of Naples, Italy
La Rosa Daniele	University of Catania, Italy
Lai Sabrina	University of Cagliari, Italy
Lalenis Konstantinos	University of Thessaly, Greece
Lannon Simon	Cardiff University, UK
Lasaponara Rosa	CNR, Italy
Lee Chien-Sing	Sunway University, Malaysia
Lemus-Romani José	Pontificia Universidad Católica de Valparaiso, Chile
Leone Federica	University of Cagliari, Italy
Li Yuanxi	Hong Kong Baptist University, China
Locurcio Marco	Polytechnic University of Bari, Italy
Lombardi Andrea	University of Perugia, Italy
Lopez Gayarre Fernando	University of Oviedo, Spain
Lops Pasquale	University of Bari, Italy
Lourenço Vanda	Universidade Nova de Lisboa, Portugal
Luviano José Luís	University of Guanajuato, Mexico
Maltese Antonino	University of Palermo, Italy
Magni Riccardo	Pragma Engineering, Italy
Maheshwari Anil	Carleton University, Canada
Maja Roberto	Polytechnic University of Milano, Italy
Malik Shaveta	Terna Engineering College, India
Maltinti Francesca	University of Cagliari, Italy
Mandado Marcos	University of Vigo, Spain
Manganelli Benedetto	University of Basilicata, Italy
Mangiameli Michele	University of Catania, Italy
Maraschin Clarice	Universidade Federal do Rio Grande do Sul, Brazil
Marigorta Ana Maria	Universidad de Las Palmas de Gran Canaria, Spain
Markov Krassimir	Institute of Electrical Engineering and Informatics, Bulgaria
Martellozzo Federico	University of Firenze, Italy
Marucci Alessandro	University of L'Aquila, Italy
Masini Nicola	IBAM-CNR, Italy
Matsufuru Hideo	High Energy Accelerator Research Organization (KEK), Japan
Matteucci Ilaria	CNR, Italy
Mauro D'Apuzzo	University of Cassino and Southern Lazio, Italy

Mazzarella Chiara	University of Naples, Italy
Mazzarino Marco	University of Venice, Italy
Mazzoni Augusto	University of Roma, Italy
Mele Roberta	University of Naples, Italy
Menezes Raquel	University of Minho, Portugal
Menghini Antonio	Aarhus Geofisica, Italy
Mengoni Paolo	University of Florence, Italy
Merlino Angelo	Università degli Studi Mediterranea, Italy
Milani Alfredo	University of Perugia, Italy
Milic Vladimir	University of Zagreb, Croatia
Millham Richard	Durban University of Technology, South Africa
Mishra B.	University of Szeged, Hungary
Misra Sanjay	Covenant University, Nigeria
Modica Giuseppe	University of Reggio Calabria, Italy
Mohagheghi Mohammadsadegh	Vali-e-Asr University of Rafsanjan, Iran
Molaei Qelichi Mohamad	University of Tehran, Iran
Molinara Mario	University of Cassino and Southern Lazio, Italy
Momo Evelyn Joan	University of Torino, Italy
Monteiro Vitor	University of Minho, Portugal
Montisci Augusto	University of Cagliari, Italy
Morano Pierluigi	Polytechnic University of Bari, Italy
Morganti Alessandro	Polytechnic University of Milano, Italy
Mosca Erica Isa	Polytechnic University of Milan, Italy
Moura Ricardo	CMA-FCT, New University of Lisbon, Portugal
Mourao Maria	Polytechnic Institute of Viana do Castelo, Portugal
Mourão Moura Ana Clara	Federal University of Minas Gerais, Brazil
Mrak Iva	University of Rijeka, Croatia
Murgante Beniamino	University of Basilicata, Italy
Muñoz Mirna	Centro de Investigacion en Matematicas, Mexico
Nedjah Nadia	State University of Rio de Janeiro, Brazil
Nakasato Naohito	University of Aizu, Japan
Natário Isabel Cristina	Universidade Nova de Lisboa, Portugal
Nesticò Antonio	Università degli Studi di Salerno, Italy
Neto Ana Maria	Universidade Federal do ABC, Brazil
Nicolosi Vittorio	University of Rome, Italy
Nikiforiadis Andreas	Aristotle University of Thessaloniki, Greece
Nocera Fabrizio	University of Illinois at Urbana-Champaign, USA
Nocera Silvio	IUAV, Italy
Nogueira Marcelo	Paulista University, Brazil
Nolè Gabriele	CNR, Italy
Nuno Beirao Jose	University of Lisbon, Portugal
Okewu Emma	University of Alcala, Spain
Oluwasefunmi Arogundade	Academy of Mathematics and System Science, China
Oppio Alessandra	Polytechnic University of Milan, Italy
P. Costa M. Fernanda	University of Minho, Portugal

Parisot Olivier	Luxembourg Institute of Science and Technology, Luxembourg
Paddeu Daniela	UWE, UK
Paio Alexandra	ISCTE-Instituto Universitário de Lisboa, Portugal
Palme Massimo	Catholic University of the North, Chile
Panaro Simona	University of Portsmouth, UK
Pancham Jay	Durban University of Technology, South Africa
Pantazis Dimos	University of West Attica, Greece
Papa Enrica	University of Westminster, UK
Pardede Eric	La Trobe University, Australia
Perchinunno Paola	Uniersity of Cagliari, Italy
Perdicoulis Teresa	UTAD, Portugal
Pereira Ana	Polytechnic Institute of Bragança, Portugal
Perri Damiano	University of Perugia, Italy
Petrelli Marco	University of Rome, Italy
Pierri Francesca	University of Perugia, Italy
Piersanti Antonio	ENEA, Italy
Pilogallo Angela	University of Basilicata, Italy
Pinna Francesco	University of Cagliari, Italy
Pinto Telmo	University of Coimbra, Portugal
Piroddi Luca	University of Cagliari, Italy
Poli Giuliano	University of Naples, Italy
Polidoro Maria João	Polytecnic Institute of Porto, Portugal
Polignano Marco	University of Bari, Italy
Politis Ioannis	Aristotle University of Thessaloniki, Greece
Pollino Maurizio	ENEA, Italy
Popoola Segun	Covenant University, Nigeria
Pratelli Antonio	University of Pisa, Italy
Praticò Salvatore	University of Reggio Calabria, Italy
Previtali Mattia	Polytechnic University of Milan, Italy
Puppio Mario Lucio	University of Pisa, Italy
Puttini Ricardo	Universidade de Brasilia, Brazil
Que Zeli	Nanjing Forestry University, China
Queiroz Gilberto	INPE, Brazil
Regalbuto Stefania	University of Naples, Italy
Ravanelli Roberta	University of Roma, Italy
Recanatesi Fabio	University of Tuscia, Italy
Reis Ferreira Gomes Karine	INPE, Brazil
Reis Marco	University of Coimbra, Portugal
Reitano Maria	University of Naples, Italy
Rencelj Marko	University of Maribor, Slovenia
Respondek Jerzy	Silesian University of Technology, Poland
Rimola Albert	Universitat Autònoma de Barcelona, Spain
Rocha Ana	University of Minho, Portugal
Rocha Humberto	University of Coimbra, Portugal
Rocha Maria Celia	UFBA Bahia, Brazil

Rocha Maria Clara	ESTES Coimbra, Portugal
Rocha Miguel	University of Minho, Portugal
Rodriguez Guillermo	UNICEN, Argentina
Rodríguez González Alejandro	Universidad Carlos III de Madrid, Spain
Ronchieri Elisabetta	INFN, Italy
Rosi Marzio	University of Perugia, Italy
Rotondo Francesco	Università Politecnica delle Marche, Italy
Rusci Simone	University of Pisa, Italy
Saganeiti Lucia	University of Basilicata, Italy
Saiu Valeria	University of Cagliari, Italy
Salas Agustin	UPCV, Chile
Salvo Giuseppe	University of Palermo, Italy
Sarvia Filippo	University of Torino, Italy
Santaga Francesco	University of Perugia, Italy
Santangelo Michele	CNR-IRPI, Italy
Santini Francesco	University of Perugia, Italy
Santos Rafael	INPE, Brazil
Santucci Valentino	Università per Stranieri di Perugia, Italy
Saponaro Mirko	Polytechnic University of Bari, Italy
Sarker Iqbal	CUET, Bangladesh
Scaioni Marco	Politecnico Milano, Italy
Scorza Francesco	University of Basilicata, Italy
Scotto di Perta Ester	University of Naples, Italy
Sebillo Monica	University of Salerno, Italy
Sharma Meera	Swami Shraddhanand College, India
Shen Jie	University of Michigan, USA
Shou Huahao	Zhejiang University of Technology, China
Siavvas Miltiadis	Centre of Research and Technology Hellas (CERTH), Greece
Silva Carina	ESTeSL-IPL, Portugal
Silva Joao Carlos	Polytechnic Institute of Cavado and Ave, Portugal
Silva Junior Luneque	Universidade Federal do ABC, Brazil
Silva Ângela	Instituto Politécnico de Viana do Castelo, Portugal
Simonetti Marco	University of Florence, Italy
Situm Zeljko	University of Zagreb, Croatia
Skouteris Dimitrios	Master-Up, Italy
Solano Francesco	Università degli Studi della Tuscia, Italy
Somma Maria	University of Naples, Italy
Sonnessa Alberico	Polytechnic University of Bari, Italy
Sousa Lisete	University of Lisbon, Portugal
Sousa Nelson	University of Algarve, Portugal
Spaeth Benjamin	Cardiff University, UK
Srinivsan M.	Navodaya Institute of Technology, India
Stankova Elena	Saint Petersburg State University, Russia
Stratigea Anastasia	National Technical University of Athens, Greece

Šurdonja Sanja	University of Rijeka, Croatia
Sviatov Kirill	Ulyanovsk State Technical University, Russia
Sánchez de Merás Alfredo	Universitat de Valencia, Spain
Takahashi Daisuke	University of Tsukuba, Japan
Tanaka Kazuaki	Kyushu Institute of Technology, Japan
Taniar David	Monash University, Australia
Tapia McClung Rodrigo	Centro de Investigación en Ciencias de Información Geoespacial, Mexico
Tarantino Eufemia	Polytechnic University of Bari, Italy
Tasso Sergio	University of Perugia, Italy
Teixeira Ana Paula	University of Trás-os-Montes and Alto Douro, Portugal
Teixeira Senhorinha	University of Minho, Portugal
Tengku Izhar Tengku Adil	Universiti Teknologi MARA, Malaysia
Teodoro Maria Filomena	University of Lisbon, Portuguese Naval Academy, Portugal
Tesoriere Giovanni	University of Enna KORE, Italy
Thangeda Amarendar Rao	Botho University, Botswana
Tonbul Gokchan	Atilim University, Turkey
Toraldo Emanuele	Polytechnic University of Milan, Italy
Torre Carmelo Maria	Polytechnic University of Bari, Italy
Torrieri Francesca	University of Naples, Italy
Torrisi Vincenza	University of Catania, Italy
Toscano Domenico	University of Naples, Italy
Totaro Vincenzo	Polytechnic University of Bari, Italy
Trigo Antonio	Instituto Politécnico de Coimbra, Portugal
Trunfio Giuseppe A.	University of Sassari, Italy
Trung Pham	HCMUT, Vietnam
Tsoukalas Dimitrios	Centre of Research and Technology Hellas (CERTH), Greece
Tucci Biagio	CNR, Italy
Tucker Simon	Liverpool John Moores University, UK
Tuñon Iñaki	Universidad de Valencia, Spain
Tyagi Amit Kumar	Vellore Institute of Technology, India
Uchibayashi Toshihiro	Kyushu University, Japan
Ueda Takahiro	Seikei University, Japan
Ugliengo Piero	University of Torino, Italy
Valente Ettore	University of Naples, Italy
Vallverdu Jordi	University Autonoma Barcelona, Spain
Vanelslander Thierry	University of Antwerp, Belgium
Vasyunin Dmitry	T-Systems RUS, Russia
Vazart Fanny	University of Grenoble Alpes, France
Vecchiocattivi Franco	University of Perugia, Italy
Vekeman Jelle	Vrije Universiteit Brussel (VUB), Belgium
Verde Rosanna	Università degli Studi della Campania, Italy
Vermaseren Jos	Nikhef, The Netherlands

Vignoli Giulio	University of Cagliari, Italy
Vizzari Marco	University of Perugia, Italy
Vodyaho Alexander	Saint Petersburg State Electrotechnical University, Russia
Vona Marco	University of Basilicata, Italy
Waluyo Agustinus Borgy	Monash University, Australia
Wen Min	Xi'an Jiaotong-Liverpool University, China
Westad Frank	Norwegian University of Science and Technology, Norway
Yuasa Fukuko	KEK, Japan
Yadav Rekha	KL University, India
Yamu Claudia	University of Groningen, The Netherlands
Yao Fenghui	Tennessee State University, USA
Yañez Manuel	Universidad Autónoma de Madrid, Spain
Yoki Karl	Daegu Catholic University, South Korea
Zamperlin Paola	University of Pisa, Italy
Zekeng Ndadji Milliam Maxime	University of Dschang, Cameroon
Žemlička Michal	Charles University, Czech Republic
Zita Sampaio Alcinia	Technical University of Lisbon, Portugal
Živković Ljiljana	Ministry of Construction, Transport and Infrastructure and Institute of Architecture and Urban & Spatial Planning of Serbia, Serbia
Zoppi Corrado	University of Cagliari, Italy
Zucca Marco	Polytechnic University of Milan, Italy
Zullo Francesco	University of L'Aquila, Italy

Contents – Part V

International Workshop on Geomatics in Forestry and Agriculture: New Advances and Perspectives (GeoForAgr 2020)

Evaluation of Meteorological Data-Based Models for Potential and Actual Evapotranspiration Losses Using Flux Measurements 3
Mirka Mobilia and Antonia Longobardi

GNSS Network RTK for Automatic Guidance in Agriculture: Testing and Performance Evaluation 19
Fabio Radicioni, Aurelio Stoppini, Raffaella Brigante, Andrea Brozzi, and Grazia Tosi

The Contribution of Remote Sensing and Silvicultural Treatments to the Assessment of Decline in an Oak Deciduous Forest: The Study Case of a Protected Area in Mediterranean Environment 36
Fabio Recanatesi, Matteo Piccinno, Benedetta Cucca, Carlo Maria Rossi, and Maria Nicolina Ripa

Evaluating the Potential of Vegetation Indices in Detecting Drought Impact Using Remote Sensing Data in a Mediterranean Pinewood 50
Benedetta Cucca, Fabio Recanatesi, and Maria Nicolina Ripa

Unsupervised Burned Area Mapping in a Protected Natural Site. An Approach Using SAR Sentinel-1 Data and K-mean Algorithm. 63
Giandomenico De Luca, Giuseppe Modica, Carmen Fattore, and Rosa Lasaponara

Using Sentinel 2 Data to Guide Nitrogen Fertilization in Central Italy: Comparison Between Flat, Low VRT and High VRT Rates Application in Wheat 78
Francesco Santaga, Paolo Benincasa, and Marco Vizzari

International Workshop on Collective, Massive and Evolutionary Systems (IWCES 2020)

A Learning Based Approach for Planning with Safe Actions 93
Rajdeep Niyogi, Saurabh Sharma, Michal Vavrecka, and Alfredo Milani

Service Composition in a Context-Aware Setting with Functionally Equivalent Services 106
Sujata Swain and Rajdeep Niyogi

Formal Verification of a Distributed Algorithm for Task Execution 120
Amar Nath and Rajdeep Niyogi

Semantic Similarity Measures for Topological Link Prediction 132
Giulio Biondi and Valentina Franzoni

International Workshop on Large Scale Computational Science (LSCS 2020)

Large Scale Automatic Computations for Feynman Diagrams with up to Five Loops 145
E. de Doncker, F. Yuasa, O. Olagbemi, and T. Ishikawa

Performance Evaluation of Strassen Matrix Multiplication Supporting Triple-Double Precision Floating-Point Arithmetic 163
Tomonori Kouya

Acceleration of Boltzmann Equation for Core-Collapse Supernova Simulations on PEZY-SC Processors 177
Hideo Matsufuru and Kohsuke Sumiyoshi

International Workshop on Land Use Monitoring for Sustanability (LUMS 2020)

Shrinking Phenomena in Italian Inner Mountainous Areas. Resilience Strategies 195
Francesco Rotondo, Giovanni Marinelli, and Luca Domenella

Evaluating Socio-spatial Exclusion: Local Spatial Indices of Segregation and Isolation in Naples (Italy) 207
Maria Cerreta, Giuliano Poli, and Maria Reitano

Sustainable Local Development and Smart Specialisation Strategies: Recent Developments in Agri-food Research and Innovation Partnerships in Puglia, Italy 221
Manuela Persia, Pasquale Balena, Alessandro Bonifazi, Maria Immacolata Marzulli, Antonio Orlando, and Carmelo M. Torre

International Workshop on Machine Learning for Space and Earth Observation Data (MALSEOD 2020)

An Approach to Classify Burned Areas Using Few Previously Validated Samples 239
Olga O. Bittencourt, Fabiano Morelli, Cícero A. S. Júnior, and Rafael Santos

Total Solar Irradiance Forecasting with Keras Recurrent Neural Networks . . . 255
Amita Muralikrishna, Luis E. A. Vieira, Rafael D. C. dos Santos, and Adriano P. Almeida

Assessing Satellite Image Time Series Clustering Using Growing SOM 270
Rodrigo de Sales da Silva Adeu, Karine Reis Ferreira, Pedro R. Andrade, and Lorena Santos

International Workshop on Building Multi-dimensional Models for Assessing Complex Environmental Systems (MES 2020)

The Estimation of the Optimal Level of Productivity for Sponsors in the Recovery and Enhancement of the Historical-Architectural Heritage . . . 285
Luigi Dolores, Maria Macchiaroli, Gianluigi De Mare, Antonio Nesticò, Gabriella Maselli, and Elena Merino Gómez

Evaluating the Urban Quality Through a Hybrid Approach: Application in the Milan (Italy) City Area 300
Oppio Alessandra, Bottero Marta, Dell'Anna Federico, Dell'Ovo Marta, and Gabrielli Laura

Universal Design-Based Framework to Assess Usability and Inclusion of Buildings 316
Erica Isa Mosca and Stefano Capolongo

Urban Ecosystem Services: A Review of Definitions and Classifications for the Identification of Future Research Perspectives 332
Caterina Caprioli, Marta Bottero, and Giulio Mondini

Complex Projects Assessment. The Impact of Built Environment on Healthcare Staff Wellbeing 345
Andrea Brambilla, Alessandro Morganti, Göran Lindahl, Andrea Riva, and Stefano Capolongo

An Analytic Network Process (ANP)-Based Approach for Investigating Alternative Planning Scenarios of Mining Activities in Piedmont Region 355
Vanessa Assumma, Marta Bottero, Giulio Mondini, and Elisa Zanetta

Exploring the Redundancy Capacity Through a System Dynamics Approach 366
Marta Bottero, Giulia Datola, and Elena De Angelis

International Workshop on Ecosystem Services: Nature's Contribution to People in Practice. Assessment Frameworks, Models, Mapping, and Implications (NC2P 2020)

Use of Landscape Metrics and Multi-criteria Analysis to Identify Landscape Units Concerning of Vegetation of Quadrilátero Ferrífero - MG 381
Lourdes Manresa Camargos, Nicole Andrade da Rocha, and Ana Clara Mourão Moura

Locally-Provided and Globally-Relevant Ecosystem Services: A Needed Distinction for Quantification 394
Dani Broitman

Spatial Distribution of Surface Temperature and Land Cover: A Study Concerning Sardinia, Italy 405
Sabrina Lai, Federica Leone, and Corrado Zoppi

Soil Ecosystem Services and Sediment Production: The Basilicata Region Case Study 421
Angela Pilogallo, Lucia Saganeiti, Francesco Scorza, and Beniamino Murgante

International Workshop on Open Knowledge for Socio-economic Development (OKSED 2020)

Smart Communities and Knowledge Sharing as Main Tools to Achieve Common Purposes 439
Luigi Mundula and Flavia Marzano

The Impact of the COVID-19 Outbreak on the Socio-Economic Issues of the Black Sea Region Countries 453
George Abuselidze and Lela Mamaladze

Integrated Data and Service Platforms for Smart Energy Networks as a Key Component for Smart Cities 468
Jan-Philipp Exner, Michelle Krämer, Dirk Werth, Andreas Eitel, Jochen Britz, and Boris Brandherm

Short Papers

Numerical Analysis of Single Jet Impinging a Flat and Non-flat Plate 487
Flávia V. Barbosa, Senhorinha F. C. F. Teixeira, and José C. F. Teixeira

Computational Models of Defect Clustering for Tethered Bilayer Membranes 496
Tomas Raila, Marija Jankunec, Tadas Meškauskas, and Gintaras Valinčius

Model of Post Fire Erosion Assessment Using RUSLE Method, GIS Tools and ESA Sentinel DATA 505
Gabriele Nolè, Valentina Santarsiero, Antonio Lanorte, Biagio Tucci, Vito Augusto Capurso, Francesco Vito Ronco, and Beniamino Murgante

A Mobile Small Sized Device for Air Pollutants Monitoring Connected to the Smart Road: Preliminary Results 517
Stefano Chiesa, Maurizio Pollino, and Sergio Taraglio

Using Google Trends, Gaussian Mixture Models and DBSCAN for the Estimation of Twitter User Home Location 526
Paola Zola, Paulo Cortez, and Maurizio Tesconi

Lurking Reduction at School Through Virtual Communities of Practice: The Binario 9 ¾ Project. 535
Fabio Sartori, Claudia Maga, Barbara Tosi, and Alessandro Varallo

The Navigation of Multi-itineraries for the Cultural Heritage Context 544
Yuri Palazzo, Silvia Calegari, Paolo Avogadro, and Matteo Dominoni

Adsorption of Atoms on a Crystalline Ice Surface Model: Results from Periodic *ab Initio* Simulations 553
Stefano Ferrero, Berta Martínez-Bachs, Joan Enrique-Romero, and Albert Rimola

A Combined DFT and RRKM-Based Study on the Reactivity of HCO + NH_2 on Amorphous Water Ice Surface. 561
Joan Enrique-Romero, Albert Rimola, and Cecilia Ceccarelli

Spatio-Temporal Dynamics of Urban and Natural Areas in the Northern Littoral Zone of Rome: Land-Cover Change Analysis During the Last Thirty Years. Preliminary Results 567
Maurizio Pollino, Francesco Lodato, and Nicola Colonna

Attractive Arcade-Based Platform Approach to Exam Preparation 576
Matheus Lorenzato Braga, Victor Martins de Sousa, Clara Scheffer Emerich, and Rafael Américo Führich

The Cross Validation in Automated Valuation Models: A Proposal for Use 585
Agostino Valier

Neural Nets on FPGA a Machine Vision Algorithm Applied On MNIST Dataset Using Hls4ml Library. 597
Fabrizio Alfonsi, Alessandro Gabrielli, and Elisabetta Ronchieri

Assessing the Impact of Land Use Changes on Ecosystem Services Value . . . 606
Angela Pilogallo, Lucia Saganeiti, Francesco Scorza, and Beniamino Murgante

Cyber-Physical Platform for Preeclampsia Detection 617
Iuliana Marin, Maria Iuliana Bocicor, and Arthur-Jozsef Molnar

System Integration and Functional Priorities to Maximize Profit and Loss for Smart Factory 626
Jeong Seog Kho and Jongpil Jeong

Impact of Renewable Energy Installations on Habitat Quality 636
Valeria Muzzillo, Angela Pilogallo, Lucia Saganeiti, Valentina Santarsiero, Francesco Scorza, and Beniamino Murgante

Habitat Degradation: A Comparative Study Between Tomar (PT) and Potenza (IT) 645
Luciana Nolè, Angela Pilogallo, Lucia Saganeiti, Francesco Scorza, Luis Santos, and Beniamino Murgante

Fast Multiple Montgomery Multiplications Using Intel AVX-512IFMA Instructions 655
Daisuke Takahashi

Algorithms for Enhancing Satellite Imagery to Discover Archaeological Finds Covered by Shadow 664
Stefano Chiappini, Francesco Di Stefano, Eva Savina Malinverni, and Roberto Pierdicca

Test Case Generation Framework for Client-Server Apps: Reverse Engineering Approach 674
Emine Dumlu Demircioğlu and Oya Kalıpsız

A Novel Cleaning Method for Yield Data Collected by Sensors: A Case Study on Winter Cereals 684
Antonio Natale, Sara Antognelli, Emanuele Ranieri, Andrea Cruciani, and Antonio Boggia

Physical and Numerical Models of Atmospheric Urban Dispersion of Pollutants 692
D. Toscano, M. Marro, B. Mele, F. Murena, and P. Salizzoni

Optimal Field Calibration of Multiple IoT Low Cost Air Quality Monitors: Setup and Results 700
E. Esposito, G. D'Elia, S. Ferlito, A. Del Giudice, G. Fattoruso, P. D'Auria, S. De Vito, and G. Di Francia

An ADMM Approach for Constructing Abnormal Subspace of Sparse PCA 709
Wenmin Jiang, Ying Zhao, and Kazi Abir Adnan

Prevalence of Calves' Cryptosporidiosis in Northern Kazakhstan. 718
Altay Ussenbayev, Dariyash Kurenkeyeva, Christian Bauer, and Ablaikhan Kadyrov

Formal Language Model for Transcriptome and Proteome Data Integration 727
Reginaldo Inojosa da Silva Filho, Ricardo Luis de Azevedo da Rocha, and Claudio Santos Oliveira

Towards Integration of Containers into Scientific Workflows: A Preliminary Experience with Cached Dependencies 736
Bruno da Silva Alves and Andrea Schwertner Charão

Modeling Interstellar Amorphous Solid Water Grains by Tight-Binding Based Methods: Comparison Between GFN-XTB and CCSD(T) Results for Water Clusters 745
Aurèle Germain and Piero Ugliengo

Error Correction in Nanopore Reads for *de novo* Genomic Assembly 754
Jacqueline Aldridge-Águila, Diego Álvarez-Saravia, Marcelo Navarrete, and Roberto Uribe-Paredes

A Large-Scale Security Analysis of Web Vulnerability: Findings, Challenges and Remedies. 763
Primož Cigoj, Živa Stepančič, and Borka Jerman Blažič

Embryo Spatial Model Reconstruction 772
Darius Dirvanauskas, Rytis Maskeliūnas, Vidas Raudonis, and Sanjay Misra

Author Index 781