

Commenced Publication in 1973

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison

Lancaster University, Lancaster, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Friedemann Mattern

ETH Zurich, Zürich, Switzerland

John C. Mitchell

Stanford University, Stanford, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

TU Dortmund University, Dortmund, Germany

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Gerhard Weikum

Max Planck Institute for Informatics, Saarbrücken, Germany

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

Osvaldo Gervasi · Beniamino Murgante
Sanjay Misra · Ana Maria A.C. Rocha
Carmelo M. Torre · David Tanar
Bernady O. Apduhan · Elena Stankova
Shangguang Wang (Eds.)

Computational Science and Its Applications – ICCSA 2016

16th International Conference
Beijing, China, July 4–7, 2016
Proceedings, Part IV

Editors

Osvaldo Gervasi
University of Perugia
Perugia
Italy

Beniamino Murgante
University of Basilicata
Potenza
Italy

Sanjay Misra
Covenant University
Ota
Nigeria

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

Carmelo M. Torre
Polytechnic University
Bari
Italy

David Taniar
Monash University
Clayton, VIC
Australia

Bernady O. Apduhan
Kyushu Sangyo University
Fukuoka
Japan

Elena Stankova
Saint Petersburg State University
Saint Petersburg
Russia

Shangguang Wang
Beijing University of Posts
and Telecommunications
Beijing
China

ISSN 0302-9743

ISSN 1611-3349 (electronic)

Lecture Notes in Computer Science

ISBN 978-3-319-42088-2

ISBN 978-3-319-42089-9 (eBook)

DOI 10.1007/978-3-319-42089-9

Library of Congress Control Number: 2016944355

LNCS Sublibrary: SL1 – Theoretical Computer Science and General Issues

© Springer International Publishing Switzerland 2016

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, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made.

Printed on acid-free paper

This Springer imprint is published by Springer Nature

The registered company is Springer International Publishing AG Switzerland

Preface

These multi-volume proceedings (LNCS volumes 9786, 9787, 9788, 9789, and 9790) consist of the peer-reviewed papers from the 2016 International Conference on Computational Science and Its Applications (ICCSA 2016) held in Beijing, China, during July 4–7, 2016.

ICCSA 2016 was a successful event in the series of conferences, previously held in Banff, Canada (2015), Guimares, 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), (as ICCS) Amsterdam, The Netherlands (2002), and San Francisco, USA (2001).

Computational science is a main pillar of most present research as well as industrial and commercial activities and it plays a unique role in exploiting ICT innovative technologies. The ICCSA conference series has been providing 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 general tracks, ICCSA 2016 also included 33 international workshops, in various areas of computational sciences, ranging from computational science technologies to specific areas of computational sciences, such as computer graphics and virtual reality. The program also featured three keynote speeches and two tutorials.

The success of the ICCSA conference series, in general, and ICCSA 2016, in particular, is due to the support of many people: authors, presenters, participants, keynote speakers, session chairs, Organizing Committee members, student volunteers, Program Committee members, Steering Committee members, and many people in other various roles. We would like to thank them all.

We would also like to thank our sponsors, in particular NVidia and Springer for their very important support and for making the Best Paper Award ceremony so impressive.

We would also like to thank Springer for their continuous support in publishing the ICCSA conference proceedings.

July 2016

Shangguang Wang
Osvaldo Gervasi
Bernady O. Apduhan

Organization

ICCSA 2016 was organized by Beijing University of Post and Telecommunication (China), University of Perugia (Italy), Monash University (Australia), Kyushu Sangyo University (Japan), University of Basilicata (Italy), University of Minho, (Portugal), and the State Key Laboratory of Networking and Switching Technology (China).

Honorary General Chairs

Junliang Chen	Beijing University of Posts and Telecommunications, China
Antonio Lagana	University of Perugia, Italy
Norio Shiratori	Tohoku University, Japan
Kenneth C.J. Tan	Sardina Systems, Estonia

General Chairs

Shangguang Wang	Beijing University of Posts and Telecommunications, China
Osvaldo Gervasi	University of Perugia, Italy
Bernady O. Apduhan	Kyushu Sangyo University, Japan

Program Committee Chairs

Sen Su	Beijing University of Posts and Telecommunications, China
Beniamino Murgante	University of Basilicata, Italy
Ana Maria A.C. Rocha	University of Minho, Portugal
David Taniar	Monash University, Australia

International Advisory Committee

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

International Liaison Chairs

Ana Carla P. Bitencourt	Universidade Federal do Recôncavo da Bahia, Brazil
Alfredo Cuzzocrea	ICAR-CNR and University of Calabria, Italy
Maria Irene Falcão	University of Minho, Portugal

Robert C.H. Hsu	Chung Hua University, Taiwan
Tai-Hoon Kim	Hannam University, Korea
Sanjay Misra	University of Minna, Nigeria
Takashi Naka	Kyushu Sangyo University, Japan
Rafael D.C. Santos	National Institute for Space Research, Brazil
Maribel Yasmina Santos	University of Minho, Portugal

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 Chair

Zibing Zheng	Sun Yat-Sen University, China
Mingdong Tang	Hunan University of Science and Technology, China
Yutao Ma	Wuhan University, China
Ao Zhou	Beijing University of Posts and Telecommunications, China
Ruisheng Shi	Beijing University of Posts and Telecommunications, China

Workshop Organizers

Agricultural and Environment Information and Decision Support Systems (AEIDSS 2016)

Sandro Bimonte	IRSTEA, France
André Miralles	IRSTEA, France
Thérèse Libourel	LIRMM, France
François Pinet	IRSTEA, France

Advances in Information Systems and Technologies for Emergency Preparedness and Risk Assessment (ASTER 2016)

Maurizio Pollino	ENEA, Italy
Marco Vona	University of Basilicata, Italy
Beniamino Murgante	University of Basilicata, Italy

Advances in Web-Based Learning (AWBL 2016)

Mustafa Murat Inceoglu	Ege University, Turkey
------------------------	------------------------

Bio- and Neuro-Inspired Computing and Applications (BIOCA 2016)

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

Computer-Aided Modeling, Simulation, and Analysis (CAMSA 2016)

Jie Shen	University of Michigan, USA and Jilin University, China
Hao Chenina	Shanghai University of Engineering Science, China
Xiaoqiang Lian	Donghua University, China
Weichun Shi	Shanghai Maritime University, China
Yujie Liu	Southeast Jiaotong University, China

Computational and Applied Statistics (CAS 2016)

Ana Cristina Braga	University of Minho, Portugal
Ana Paula Costa Conceicao Amorim	University of Minho, Portugal

Computational Geometry and Security Applications (CGSA 2016)

Marina L. Gavrilova	University of Calgary, Canada
---------------------	-------------------------------

Computational Algorithms and Sustainable Assessment (CLASS 2016)

Antonino Marvuglia	Public Research Centre Henri Tudor, Luxembourg
Mikhail Kanevski	Université de Lausanne, Switzerland
Beniamino Murgante	University of Basilicata, Italy

Chemistry and Materials Sciences and Technologies (CMST 2016)

Antonio Laganà	University of Perugia, Italy
Noelia Faginas Lago	University of Perugia, Italy
Leonardo Pacifici	University of Perugia, Italy

Computational Optimization and Applications (COA 2016)

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

Cities, Technologies, and Planning (CTP 2016)

Giuseppe Borruso	University of Trieste, Italy
Beniamino Murgante	University of Basilicata, Italy

Databases and Computerized Information Retrieval Systems (DCIRS 2016)

Sultan Alamri	College of Computing and Informatics, SEU, Saudi Arabia
Adil Fahad	Albaha University, Saudi Arabia
Abdullah Alamri	Jeddah University, Saudi Arabia

Data Science for Intelligent Decision Support (DS4IDS 2016)

Filipe Portela	University of Minho, Portugal
Manuel Filipe Santos	University of Minho, Portugal

Econometrics and Multidimensional Evaluation in the Urban Environment (EMEUE 2016)

Carmelo M. Torre	Polytechnic of Bari, Italy
Maria Cerreta	University of Naples Federico II, Italy
Paola Perchinunno	University of Bari, Italy
Simona Panaro	University of Naples Federico II, Italy
Raffaele Attardi	University of Naples Federico II, Italy

Future Computing Systems, Technologies, and Applications (FISTA 2016)

Bernady O. Apduhan	Kyushu Sangyo University, Japan
Rafael Santos	National Institute for Space Research, Brazil
Jianhua Ma	Hosei University, Japan
Qun Jin	Waseda University, Japan

Geographical Analysis, Urban Modeling, Spatial Statistics (GEO-AND-MOD 2016)

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

GPU Technologies (GPUTech 2016)

Gervasi Osvaldo	University of Perugia, Italy
Sergio Tasso	University of Perugia, Italy
Flavio Vella	University of Rome La Sapienza, Italy

ICT and Remote Sensing for Environmental and Risk Monitoring (RS-Env 2016)

Rosa Lasaponara	Institute of Methodologies for Environmental Analysis, National Research Council, Italy
Weigu Song	University of Science and Technology of China, China
Eufemia Tarantino	Polytechnic of Bari, Italy
Bernd Fichtelmann	DLR, Germany

7th International Symposium on Software Quality (ISSQ 2016)

Sanjay Misra	Covenant University, Nigeria
--------------	------------------------------

International Workshop on Biomathematics, Bioinformatics, and Biostatistics (IBBB 2016)

Unal Ufuktepe	American University of the Middle East, Kuwait
---------------	--

Land Use Monitoring for Soil Consumption Reduction (LUMS 2016)

Carmelo M. Torre	Polytechnic of Bari, Italy
Alessandro Bonifazi	Polytechnic of Bari, Italy
Valentina Sannicandro	University of Naples Federico II, Italy
Massimiliano Bencardino	University of Salerno, Italy
Gianluca di Cugno	Polytechnic of Bari, Italy
Beniamino Murgante	University of Basilicata, Italy

Mobile Communications (MC 2016)

Hyunseung Choo	Sungkyunkwan University, Korea
----------------	--------------------------------

Mobile Computing, Sensing, and Actuation for Cyber Physical Systems (MSA4IoT 2016)

Saad Qaisar	NUST School of Electrical Engineering and Computer Science, Pakistan
Moonseong Kim	Korean Intellectual Property Office, Korea

Quantum Mechanics: Computational Strategies and Applications (QM-CSA 2016)

Mirco Ragni	Universidade Federal de Bahia, Brazil
Ana Carla Peixoto Bitencourt	Universidade Estadual de Feira de Santana, Brazil
Vincenzo Aquilanti	University of Perugia, Italy
Andrea Lombardi	University of Perugia, Italy
Federico Palazzetti	University of Perugia, Italy

Remote Sensing for Cultural Heritage: Documentation, Management, and Monitoring (RSCH 2016)

Rosa Lasaponara	IRMMA, CNR, Italy
Nicola Masini	IBAM, CNR, Italy Zhengzhou Base, International Center on Space Technologies for Natural and Cultural Heritage, China
Chen Fulong	Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences, China

Scientific Computing Infrastructure (SCI 2016)

Elena Stankova	Saint Petersburg State University, Russia
Vladimir Korkhov	Saint Petersburg State University, Russia
Alexander Bogdanov	Saint Petersburg State University, Russia

Software Engineering Processes and Applications (SEPA 2016)

Sanjay Misra	Covenant University, Nigeria
--------------	------------------------------

Social Networks Research and Applications (SNRA 2016)

Eric Pardede	La Trobe University, Australia
Wenny Rahayu	La Trobe University, Australia
David Taniar	Monash University, Australia

Sustainability Performance Assessment: Models, Approaches, and Applications Toward Interdisciplinarity and Integrated Solutions (SPA 2016)

Francesco Scorza	University of Basilicata, Italy
Valentin Grecu	Lucia Blaga University on Sibiu, Romania

Tools and Techniques in Software Development Processes (TTSDP 2016)

Sanjay Misra	Covenant University, Nigeria
--------------	------------------------------

Volunteered Geographic Information: From Open Street Map to Participation (VGI 2016)

Claudia Ceppi	University of Basilicata, Italy
Beniamino Murgante	University of Basilicata, Italy
Francesco Mancini	University of Modena and Reggio Emilia, Italy
Giuseppe Borruso	University of Trieste, Italy

Virtual Reality and Its Applications (VRA 2016)

Oswaldo Gervasi	University of Perugia, Italy
Lucio Depaolis	University of Salento, Italy

Web-Based Collective Evolutionary Systems: Models, Measures, Applications (WCES 2016)

Alfredo Milani	University of Perugia, Italy
Valentina Franzoni	University of Rome La Sapienza, Italy
Yuanxi Li	Hong Kong Baptist University, Hong Kong, SAR China
Clement Leung	United International College, Zhuhai, China
Rajdeep Niyogi	Indian Institute of Technology, Roorkee, India

Program Committee

Jemal Abawajy	Deakin University, Australia
Kenny Adamson	University of Ulster, UK
Hartmut Asche	University of Potsdam, Germany
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
Yves Caniou	Lyon University, France

José A. Cardoso e Cunha	Universidade Nova de Lisboa, Portugal
Carlo Cattani	University of Salerno, Italy
Mete Celik	Erciyes University, Turkey
Alexander Chemeris	National Technical University of Ukraine KPI, Ukraine
Min Young Chung	Sungkyunkwan University, Korea
Elisete Correia	University of Trás os Montes e Alto Douro, Portugal
Gilberto Corso Pereira	Federal University of Bahia, Brazil
M. Fernanda Costa	University of Minho, Portugal
Alfredo Cuzzocrea	ICAR-CNR and University of Calabria, Italy
Florbela Maria da Cruz	Intituto Politécnico de Viana do Castelo, Portugal
Domingues Correia	
Vanda Marisa da Rosa	FCT from University Nova de Lisboa, Portugal
Milheiro Lourenço	
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
Adelaide de Fátima Baptista	University of Aveiro, Portugal
Valente Freitas	
Carina Soares da Silva	Escola Superior de Tecnologias da Saúde de Lisboa, Portugal
Fortes	
Frank Devai	London South Bank University, UK
Rodolphe Devillers	Memorial University of Newfoundland, Canada
Joana Dias	University of Coimbra, Portugal
Prabu Dorairaj	NetApp, India/USA
M. Irene Falcao	University of Minho, Portugal
Cherry Liu Fang	U.S. DOE Ames Laboratory, USA
Florbela Fernandes	Polytechnic Institute of Bragança, Portugal
Jose-Jesús Fernandez	National Centre for Biotechnology, CSIS, Spain
Mara Celia Furtado Rocha	PRODEB-Pós Cultura/UFBA, Brazil
Akemi Galvez	University of Cantabria, Spain
Paulino Jose Garcia Nieto	University of Oviedo, Spain
Marina Gavrilova	University of Calgary, Canada
Jerome Gensel	LSR-IMAG, France
Mara Giaoutzi	National Technical University, Athens, Greece
Andrzej M. Goscinski	Deakin University, Australia
Alex Hagen-Zanker	University of Cambridge, UK
Malgorzata Hanzl	Technical University of Lodz, Poland
Shanmugasundaram	B.S. Abdur Rahman University, India
Hariharan	
Tutut Herawan	Universitas Teknologi Yogyakarta, Indonesia
Hisamoto Hiyoshi	Gunma University, Japan
Fermin Huarte	University of Barcelona, Spain
Andrés Iglesias	University of Cantabria, Spain
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, Korea
Ivana Kolingerova	University of West Bohemia, Czech Republic
Dieter Kranzlmüller	LMU and LRZ Munich, Germany
Antonio Laganà	University of Perugia, Italy
Rosa Lasaponara	National Research Council, Italy
Maurizio Lazzari	National Research Council, Italy
Cheng Siong Lee	Monash University, Australia
Sangyoun Lee	Yonsei University, Korea
Jongchan Lee	Kunsan National University, Korea
Clement Leung	United International College, Zhuhai, China
Chendong Li	University of Connecticut, USA
Gang Li	Deakin University, Australia
Ming Li	East China Normal University, China
Fang Liu	AMES Laboratories, USA
Xin Liu	University of Calgary, Canada
Savino Longo	University of Bari, Italy
Tinghuai Ma	NanJing University of Information Science and Technology, China
Isabel Cristina Maciel Natário	FCT from University Nova de Lisboa, Portugal
Sergio Maffioletti	University of Zurich, Switzerland
Ernesto Marcheggiani	Katholieke Universiteit Leuven, Belgium
Antonino Marvuglia	Research Centre Henri Tudor, Luxembourg
Nicola Masini	National Research Council, Italy
Nirvana Meratnia	University of Twente, The Netherlands
Alfredo Milani	University of Perugia, Italy
Sanjay Misra	Federal University of Technology Minna, Nigeria
Giuseppe Modica	University of Reggio Calabria, Italy
José Luis Montaña	University of Cantabria, Spain
Beniamino Murgante	University of Basilicata, Italy
Jiri Nedoma	Academy of Sciences of the Czech Republic, Czech Republic
Laszlo Neumann	University of Girona, Spain
Irene Oliveira	University of Trás os Montes e Alto Douro, Portugal
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, Korea
Telmo Pinto	University of Minho, Portugal

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. Proserpi	Florida Atlantic University, USA
Maria Emilia F. Queiroz	University of Minho, Portugal
Athayde	
Wenny Rahayu	La Trobe University, Australia
Jerzy Respondek	Silesian University of Technology, Poland
Ana Maria A.C. Rocha	University of Minho, Portugal
Maria Clara Rocha	ESTES Coimbra, Portugal
Humberto Rocha	INESC-Coimbra, Portugal
Alexey Rodionov	Institute of Computational Mathematics and Mathematical Geophysics, Russia
Jon Rokne	University of Calgary, Canada
Octavio Roncero	CSIC, Spain
Maytham Safar	Kuwait University, Kuwait
Chiara Saracino	A.O. Ospedale Niguarda Ca' Granda - Milano, Italy
Haiduke Sarafian	The Pennsylvania State University, USA
Jie Shen	University of Michigan, USA
Qi Shi	Liverpool John Moores University, UK
Dale Shires	U.S. Army Research Laboratory, USA
Takuo Suganuma	Tohoku University, Japan
Sergio Tasso	University of Perugia, Italy
Parimala Thulasiraman	University of Manitoba, Canada
Carmelo M. Torre	Polytechnic of Bari, Italy
Giuseppe A. Trunfio	University of Sassari, Italy
Unal Ufuktepe	American University of the Middle East, Kuwait
Toshihiro Uchibayashi	Kyushu Sangyo University, Japan
Mario Valle	Swiss National Supercomputing Centre, Switzerland
Pablo Vanegas	University of Cuenca, Ecuador
Piero Giorgio Verdini	INFN Pisa and CERN, Italy
Marco Vizzari	University of Perugia, Italy
Koichi Wada	University of Tsukuba, Japan
Krzysztof Walkowiak	Wroclaw University of Technology, Poland
Robert Weibel	University of Zurich, Switzerland
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
Kewen Zhao	University of Qiongzhou, China
Albert Y. Zomaya	University of Sydney, Australia

Reviewers

Abawajy, Jemal	Deakin University, Australia
Abuhelaleh, Mohammed	University of Bridgeport, USA
Acharjee, Shukla	Dibrugarh University, India
Andrianov, Sergei Nikolaevich	Universitetskii prospekt, Russia
Aguilar, José Alfonso	Universidad Autónoma de Sinaloa, Mexico
Ahmed, Faisal	University of Calgary, Canada
Alberti, Margarita	University of Barcelona, Spain
Amato, Alba	Seconda Università degli Studi di Napoli, Italy
Amorim, Ana Paula	University of Minho, Portugal
Apduhan, Bernady	Kyushu Sangyo University, Japan
Aquilanti, Vincenzo	University of Perugia, Italy
Asche, Hartmut	Posdam University, Germany
Athayde Maria, Emlia Feijão Queiroz	University of Minho, Portugal
Attardi, Raffaele	University of Napoli Federico II, Italy
Azam, Samiul	United International University, Bangladesh
Azevedo, Ana	Athabasca University, USA
Badard, Thierry	Laval University, Canada
Baiocchi, Marco	University of Perugia, Italy
Bartoli, Daniele	University of Perugia, Italy
Bentayeb, Fadila	Université Lyon, France
Bilan, Zhu	Tokyo University of Agriculture and Technology, Japan
Bimonte, Sandro	IRSTEA, France
Blecic, Ivan	Università di Cagliari, Italy
Bogdanov, Alexander	Saint Petersburg State University, Russia
Borruso, Giuseppe	University of Trieste, Italy
Bostenaru, Maria	“Ion Mincu” University of Architecture and Urbanism, Romania
Braga Ana, Cristina	University of Minho, Portugal
Canora, Filomena	University of Basilicata, Italy
Cardoso, Rui	Institute of Telecommunications, Portugal
Cepi, Claudia	Polytechnic of Bari, Italy
Cerreta, Maria	University Federico II of Naples, Italy
Choo, Hyunseung	Sungkyunkwan University, South Korea
Coletti, Cecilia	University of Chieti, Italy
Correia, Elisete	University of Trás-Os-Montes e Alto Douro, Portugal
Correia Florbela Maria, da Cruz Domingues	Instituto Politécnico de Viana do Castelo, Portugal
Costa, Fernanda	University of Minho, Portugal
Crasso, Marco	National Scientific and Technical Research Council, Argentina
Crawford, Broderick	Universidad Católica de Valparaíso, Chile

Cuzzocrea, Alfredo	University of Trieste, Italy
Cutini, Valerio	University of Pisa, Italy
Danese, Maria	IBAM, CNR, Italy
Decker, Hendrik	Instituto Tecnológico de Informática, Spain
Degtyarev, Alexander	Saint Petersburg State University, Russia
Demartini, Gianluca	University of Sheffield, UK
Di Leo, Margherita	JRC, European Commission, Belgium
Dias, Joana	University of Coimbra, Portugal
Dilo, Arta	University of Twente, The Netherlands
Dorazio, Laurent	ISIMA, France
Duarte, Júlio	University of Minho, Portugal
El-Zawawy, Mohamed A.	Cairo University, Egypt
Escalona, Maria-Jose	University of Seville, Spain
Falcinelli, Stefano	University of Perugia, Italy
Fernandes, Florbela	Escola Superior de Tecnologia e Gestão de Bragança, Portugal
Florence, Le Ber	ENGEEES, France
Freitas Adelaide, de Fátima Baptista Valente	University of Aveiro, Portugal
Frunzete, Madalin	Polytechnic University of Bucharest, Romania
Gankevich, Ivan	Saint Petersburg State University, Russia
Garau, Chiara	University of Cagliari, Italy
Garcia, Ernesto	University of the Basque Country, Spain
Gavrilova, Marina	University of Calgary, Canada
Gensel, Jerome	IMAG, France
Gervasi, Osvaldo	University of Perugia, Italy
Gizzi, Fabrizio	National Research Council, Italy
Gorbachev, Yuriy	Geolink Technologies, Russia
Grilli, Luca	University of Perugia, Italy
Guerra, Eduardo	National Institute for Space Research, Brazil
Hanzl, Malgorzata	University of Lodz, Poland
Hegedus, Peter	University of Szeged, Hungary
Herawan, Tutut	University of Malaya, Malaysia
Hu, Ya-Han	National Chung Cheng University, Taiwan
Ibrahim, Michael	Cairo University, Egypt
Ifrim, Georgiana	Insight, Ireland
Irazábal, Emanuel	Universidad Nacional del Nordeste, Argentina
Janana, Loureio	University of Mato Grosso do Sul, Brazil
Jaiswal, Shruti	Delhi Technological University, India
Johnson, Franklin	Universidad de Playa Ancha, Chile
Karimipour, Farid	Vienna University of Technology, Austria
Kapcak, Sinan	American University of the Middle East in Kuwait, Kuwait
Kiki Maulana, Adhinugraha	Telkom University, Indonesia
Kim, Moonseong	KIPO, South Korea
Kobusińska, Anna	Poznan University of Technology, Poland

Korkhov, Vladimir	Saint Petersburg State University, Russia
Koutsomitropoulos, Dimitrios A.	University of Patras, Greece
Krishna Kumar, Chaturvedi	Indian Agricultural Statistics Research Institute (IASRI), India
Kulabukhova, Nataliia	Saint Petersburg State University, Russia
Kumar, Dileep	SR Engineering College, India
Laganà, Antonio	University of Perugia, Italy
Lai, Sen-Tarn	Shih Chien University, Taiwan
Lanza, Viviana	Lombardy Regional Institute for Research, Italy
Lasaponara, Rosa	National Research Council, Italy
Lazzari, Maurizio	National Research Council, Italy
Le Duc, Tai	Sungkyunkwan University, South Korea
Le Duc, Thang	Sungkyunkwan University, South Korea
Lee, KangWoo	Sungkyunkwan University, South Korea
Leung, Clement	United International College, Zhuhai, China
Libourel, Thérèse	LIRMM, France
Lourenço, Vanda Marisa	University Nova de Lisboa, Portugal
Machado, Jose	University of Minho, Portugal
Magni, Riccardo	Pragma Engineering srl, Italy
Mancini Francesco	University of Modena and Reggio Emilia, Italy
Manfreda, Salvatore	University of Basilicata, Italy
Manganelli, Benedetto	Università degli studi della Basilicata, Italy
Marghany, Maged	Universiti Teknologi Malaysia, Malaysia
Marinho, Euler	Federal University of Minas Gerais, Brazil
Martellozzo, Federico	University of Rome “La Sapienza”, Italy
Marvuglia, Antonino	Public Research Centre Henri Tudor, Luxembourg
Mateos, Cristian	Universidad Nacional del Centro, Argentina
Matsatsinis, Nikolaos	Technical University of Crete, Greece
Messina, Fabrizio	University of Catania, Italy
Millham, Richard	Durban University of Technology, South Africa
Milani, Alfredo	University of Perugia, Italy
Misra, Sanjay	Covenant University, Nigeria
Modica, Giuseppe	Università Mediterranea di Reggio Calabria, Italy
Mohd Helmy, Abd Wahab	Universiti Tun Hussein Onn Malaysia, Malaysia
Murgante, Beniamino	University of Basilicata, Italy
Nagy, Csaba	University of Szeged, Hungary
Napolitano, Maurizio	Center for Information and Communication Technology, Italy
Natário, Isabel Cristina Maciel	University Nova de Lisboa, Portugal
Navarrete Gutierrez, Tomas	Luxembourg Institute of Science and Technology, Luxembourg
Nedjah, Nadia	State University of Rio de Janeiro, Brazil
Nguyen, Tien Dzung	Sungkyunkwan University, South Korea
Niyogi, Rajdeep	Indian Institute of Technology Roorkee, India

Oliveira, Irene	University of Trás-Os-Montes e Alto Douro, Portugal
Panetta, J.B.	Tecnologia Geofísica Petróleo Brasileiro SA, PETROBRAS, Brazil
Papa, Enrica	University of Amsterdam, The Netherlands
Papathanasiou, Jason	University of Macedonia, Greece
Pardede, Eric	La Trobe University, Australia
Pascale, Stefania	University of Basilicata, Italy
Paul, Padma Polash	University of Calgary, Canada
Perchinunno, Paola	University of Bari, Italy
Pereira, Oscar	Universidade de Aveiro, Portugal
Pham, Quoc Trung	HCMC University of Technology, Vietnam
Pinet, Francois	IRSTEA, France
Pirani, Fernando	University of Perugia, Italy
Pollino, Maurizio	ENEA, Italy
Pusatli, Tolga	Cankaya University, Turkey
Qaisar, Saad	NURST, Pakistan
Qian, Junyan	Guilin University of Electronic Technology, China
Raffaeta, Alessandra	University of Venice, Italy
Ragni, Mirco	Universidade Estadual de Feira de Santana, Brazil
Rahman, Wasiur	Technical University Darmstadt, Germany
Rampino, Sergio	Scuola Normale di Pisa, Italy
Rahayu, Wenny	La Trobe University, Australia
Ravat, Franck	IRIT, France
Raza, Syed Muhammad	Sungkyunkwan University, South Korea
Roccatello, Eduard	3DGIS, Italy
Rocha, Ana Maria	University of Minho, Portugal
Rocha, Humberto	University of Coimbra, Portugal
Rocha, Jorge	University of Minho, Portugal
Rocha, Maria Clara	ESTES Coimbra, Portugal
Romano, Bernardino	University of l'Aquila, Italy
Sannicandro, Valentina	Polytechnic of Bari, Italy
Santiago Júnior, Valdivino	Instituto Nacional de Pesquisas Espaciais, Brazil
Sarafian, Haiduke	Pennsylvania State University, USA
Schneider, Michel	ISIMA, France
Selmaoui, Nazha	University of New Caledonia, New Caledonia
Scerri, Simon	University of Bonn, Germany
Shakhov, Vladimir	Institute of Computational Mathematics and Mathematical Geophysics, Russia
Shen, Jie	University of Michigan, USA
Silva-Fortes, Carina	ESTeSL-IPL, Portugal
Singh, Upasana	University of Kwa Zulu-Natal, South Africa
Skarga-Bandurova, Inna	Technological Institute of East Ukrainian National University, Ukraine
Soares, Michel	Federal University of Sergipe, Brazil
Souza, Eric	Universidade Nova de Lisboa, Portugal
Stankova, Elena	Saint Petersburg State University, Russia

Stalidis, George	TEI of Thessaloniki, Greece
Taniar, David	Monash University, Australia
Tasso, Sergio	University of Perugia, Italy
Telmo, Pinto	University of Minho, Portugal
Tengku, Adil	La Trobe University, Australia
Thorat, Pankaj	Sungkyunkwan University, South Korea
Tiago Garcia, de Senna Carneiro	Federal University of Ouro Preto, Brazil
Tilio, Lucia	University of Basilicata, Italy
Torre, Carmelo Maria	Polytechnic of Bari, Italy
Tripathi, Ashish	MNNIT Allahabad, India
Tripp, Barba	Carolina, Universidad Autnoma de Sinaloa, Mexico
Trunfio, Giuseppe A.	University of Sassari, Italy
Upadhyay, Ashish	Indian Institute of Public Health-Gandhinagar, India
Valuev, Ilya	Russian Academy of Sciences, Russia
Varella, Evangelia	Aristotle University of Thessaloniki, Greece
Vasyunin, Dmitry	University of Amsterdam, The Netherlands
Vijaykumar, Nandamudi	INPE, Brazil
Villalba, Maite	Universidad Europea de Madrid, Spain
Walkowiak, Krzysztof	Wroclav University of Technology, Poland
Wanderley, Fernando	FCT/UNL, Portugal
Wei Hoo, Chong	Motorola, USA
Xia, Feng	Dalian University of Technology (DUT), China
Yamauchi, Toshihiro	Okayama University, Japan
Yeoum, Sanggil	Sungkyunkwan University, South Korea
Yirsaw, Ayalew	University of Botswana, Botswana
Yujie, Liu	Southeast Jiaotong University, China
Zafer, Agacik	American University of the Middle East in Kuwait, Kuwait
Zalyubovskiy, Vyacheslav	Russian Academy of Sciences, Russia
Zeile, Peter	Technische Universitat Kaiserslautern, Germany
Žemlička, Michal	Charles University, Czech Republic
Zivkovic, Ljiljana	Republic Agency for Spatial Planning, Belgrade
Zunino, Alejandro	Universidad Nacional del Centro, Argentina

Sponsoring Organizations

ICCSA 2016 would not have been possible without the tremendous support of many organizations and institutions, for which all organizers and participants of ICCSA 2016 express their sincere gratitude:



Springer International Publishing AG, Switzerland
(<http://www.springer.com>)



NVidia Co., USA
(<http://www.nvidia.com>)



Beijing University of Post and Telecommunication, China
(<http://english.bupt.edu.cn/>)



State Key Laboratory of Networking and Switching Technology, China



University of Perugia, Italy
(<http://www.unipg.it>)



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



MONASH University

Monash University, Australia
(<http://monash.edu>)



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



Universidade do Minho
Escola de Engenharia

Universidade do Minho, Portugal
(<http://www.uminho.pt>)

Contents – Part IV

Information Systems and Technologies

Where the Streets Have Known Names	1
<i>Paulo Dias Almeida, Jorge Gustavo Rocha, Andrea Ballatore, and Alexander Zipf</i>	
Functions and Perspectives of Public Real Estate in the Urban Policies: The Sustainable Development Plan of Syracuse	13
<i>Laura Gabrielli, Salvatore Giuffrida, and Maria Rosa Trovato</i>	
Soil Loss, Productivity and Cropland Values GIS-Based Analysis and Trends in the Basilicata Region (Southern Italy) from 1980 to 2013	29
<i>Antonella Dimotta, Mario Cozzi, Serverino Romano, and Maurizio Lazzari</i>	
Fair Planning and Affordability Housing in Urban Policy. The Case of Syracuse (Italy).	46
<i>Grazia Napoli, Salvatore Giuffrida, and Maria Rosa Trovato</i>	
Cap Rate and the Historic City. Past and Future of the Real Estate of Noto (Italy)	63
<i>Salvatore Giuffrida, Salvatore Di Mauro, and Alberto Valenti</i>	
Industrial Areas and the City. Equalization and Compensation in a Value-Oriented Allocation Pattern.	79
<i>Salvatore Giuffrida, Grazia Napoli, and Maria Rosa Trovato</i>	
Environmental Noise Sensing Approach Based on Volunteered Geographic Information and Spatio-Temporal Analysis with Machine Learning	95
<i>Miguel Torres-Ruiz, Juan H. Juárez-Hipólito, Miltiadis Demetrios Lytras, and Marco Moreno-Ibarra</i>	
A Knowledge-Based Approach for the Implementation of a SDSS in the Partenio Regional Park (Italy)	111
<i>Maria Cerreta, Simona Panaro, and Giuliano Poli</i>	
Factors of Perceived Walkability: A Pilot Empirical Study	125
<i>Ivan Blečić, Dario Canu, Arnaldo Cecchini, Tanja Congiu, and Giovanna Fancello</i>	
Evaluating the Effect of Urban Intersections on Walkability	138
<i>Ivan Blečić, Arnaldo Cecchini, Dario Canu, Andrea Cappai, Tanja Congiu, and Giovanna Fancello</i>	

Coupling Surveys with GPS Tracking to Explore Tourists' Spatio-Temporal Behaviour	150
<i>Ivan Blečić, Dario Canu, Arnaldo Cecchini, Tanja Congiu, Giovanna Fancello, Stefania Mauro, Sara Levi Sacerdotti, and Giuseppe A. Trunfio</i>	
Countryside vs City: A User-Centered Approach to Open Spatial Indicators of Urban Sprawl	161
<i>Alessandro Bonifazi, Valentina Sannicandro, Raffaele Attardi, Gianluca Di Cugno, and Carmelo Maria Torre</i>	
Integrating Financial Analysis and Decision Theory for the Evaluation of Alternative Reuse Scenarios of Historical Buildings.	177
<i>Carmelo M. Torre, Raffaele Attardi, and Valentina Sannicandro</i>	
Spatial Analysis for the Study of Environmental Settlement Patterns: The Archaeological Sites of the Santa Cruz Province.	191
<i>Maria Danese, Gisela Cassiodoro, Francisco Guichón, Rafael Goñi, Nicola Masini, Gabriele Nolè, and Rosa Lasaponara</i>	
Self-renovation in Rome: Ex Ante, in Itinere and Ex Post Evaluation	204
<i>Maria Rosaria Guarini</i>	
Enhancing an IaaS Ontology Clustering Scheme for Resiliency Support in Hybrid Cloud	219
<i>Toshihiro Uchibayashi, Bernady Apduhan, Kazutoshi Niho, Takuo Suganuma, and Norio Shiratori</i>	
A Simple Stochastic Gradient Variational Bayes for Latent Dirichlet Allocation	232
<i>Tomonari Masada and Atsuhiko Takasu</i>	
On Optimizing Partitioning Strategies for Faster Inverted Index Compression	246
<i>Xingshen Song, Kun Jiang, Yu Jiang, and Yuexiang Yang</i>	
The Analysis for Ripple-Effect of Ontology Evolution Based on Graph	261
<i>Qiuyao Lv, Yingping Zhang, and Jinguang Gu</i>	
Linearizability Proof of Stack Data	277
<i>Jun-Yan Qian, Guo-Qing Yao, Guang-Xi Chen, and Ling-Zhong Zhao</i>	
Anonymous Mutual Authentication Scheme for Secure Inter-Device Communication in Mobile Networks	289
<i>Youngseok Chung, Seokjin Choi, and Dongho Won</i>	

Recommending Books for Children Based on the Collaborative and Content-Based Filtering Approaches	302
<i>Yiu-Kai Ng</i>	
Ontology Evaluation Approaches: A Case Study from Agriculture Domain. . . .	318
<i>Anusha Indika Walisadeera, Athula Ginige, and Gihan Nilendra Wikramanayake</i>	
Effort Estimation for Program Modification in Object Oriented Development	334
<i>Yashvardhan Sharma</i>	
Populational Algorithm for Influence Maximization.	346
<i>Carolina Ribeiro Xavier, Vinícius da Fonseca Vieira, and Alexandre Gonçalves Evsukoff</i>	
Software Variability Composition and Abstraction in Robot Control Systems	358
<i>Davide Brugali and Mauro Valota</i>	
A Methodological Approach to Identify Type of Dependency from User Requirements	374
<i>Anuja Soni and Vibha Gaur</i>	
Evolution of XSD Documents and Their Variability During Project Life Cycle: A Preliminary Study	392
<i>Diego Benincasa Fernandes Cavalcanti de Almeida and Eduardo Martins Guerra</i>	
Efficient, Scalable and Privacy Preserving Application Attestation in a Multi Stakeholder Scenario	407
<i>Toqeer Ali, Jawad Ali, Tamleek Ali, Mohammad Nauman, and Shahrulniza Musa</i>	
An Approach for Code Annotation Validation with Metadata Location Transparency	422
<i>José Lázaro de Siqueira Jr., Fábio Fagundes Silveira, and Eduardo Martins Guerra</i>	
Towards a Software Engineering Approach for Cloud and IoT Services in Healthcare	439
<i>Lisardo Prieto-Gonzalez, Gerrit Tamm, and Vladimir Stantchev</i>	
Smaller to Sharper: Efficient Web Service Composition and Verification Using On-the-fly Model Checking and Logic-Based Clustering.	453
<i>Khai Huynh, Tho Quan, and Thang Bui</i>	

MindDomain: An Interoperability Tool to Generate Domain Models Through Mind Maps	469
<i>Alejo Ceballos, Fernando Wanderley, Eric Souza, and Gilberto Cysneiros</i>	
Using Scrum Together with UML Models: A Collaborative University-Industry R&D Software Project	480
<i>Nuno Santos, João M. Fernandes, M. Sameiro Carvalho, Pedro V. Silva, Fábio A. Fernandes, Márcio P. Rebelo, Diogo Barbosa, Paulo Maia, Marco Couto, and Ricardo J. Machado</i>	
Rockfall Hazard Assessment in an Area of the “Parco Archeologico Storico-Naturale Delle Chiese Rupestri” of Matera (Basilicata Southern-Italy)	496
<i>Lucia Losasso, Stefania Pascale, and Francesco Sdao</i>	
Integrating Computing to STEM Curriculum via CodeBoard	512
<i>Hongmei Chi, Clement Allen, and Edward Jones</i>	
Trusted Social Node: Evaluating the Effect of Trust and Trust Variance to Maximize Social Influence in a Multilevel Social Node Influential Diffusion Model	530
<i>Hock-Yeow Yap and Tong-Ming Lim</i>	
Enhanced Metaheuristics with the Multilevel Paradigm for MAX-CSPs	543
<i>Noureddine Bouhmala, Mikkel Syse Groesland, and Vette Volden-Freberg</i>	
Processing of a New Task in Conditions of the Agile Management with Using of Programmable Queues.	554
<i>P. Sosnin</i>	
Using CQA History to Improve Q&A Experience	570
<i>Cleyton Souza, Franck Aragão, José Remígio, Evandro Costa, and Joseana Fechine</i>	
The Use of Computer Technology as a Way to Increase Efficiency of Teaching Physics and Other Natural Sciences	581
<i>E.N. Stankova, A.V. Barmasov, N.V. Dyachenko, M.N. Bukina, A.M. Barmasova, and T.Yu. Yakovleva</i>	
A Nonlinear Multicriteria Model for Team Effectiveness	595
<i>Isabel Dórdio Dimas, Humberto Rocha, Teresa Rebelo, and Paulo Renato Lourenço</i>	
Assessment of the Code Refactoring Dataset Regarding the Maintainability of Methods.	610
<i>István Kádár, Péter Hegedűs, Rudolf Ferenc, and Tibor Gyimóthy</i>	

A Public Bug Database of GitHub Projects and Its Application in Bug Prediction	625
<i>Zoltán Tóth, Péter Gyimesi, and Rudolf Ferenc</i>	
Towards an Intelligent System for Monitoring Health Complaints	639
<i>André Oliveira, Filipe Portela, Manuel Filipe Santos, and José Neves</i>	
Proposal to Reduce Natural Risks: Analytic Network Process to Evaluate Efficiency of City Planning Strategies	650
<i>Roberto De Lotto, Veronica Gazzola, Silvia Gossenberger, Cecilia Morelli di Popolo, and Elisabetta Maria Venco</i>	
Data Processing for a Water Quality Detection System on Colombian Rio Piedras Basin	665
<i>Edwin Castillo, David Camilo Corrales, Emmanuel Lasso, Agapito Ledezma, and Juan Carlos Corrales</i>	
Validation of Coffee Rust Warnings Based on Complex Event Processing . . .	684
<i>Julián Eduardo Plazas, Juan Sebastián Rojas, David Camilo Corrales, and Juan Carlos Corrales</i>	
Author Index	701