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Computational Science and Its Applications – ICCSA 2018

18th International Conference
Melbourne, VIC, Australia, July 2–5, 2018
Proceedings, Part V

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Preface

These multiple volumes (LNCS volumes 10960–10964) consist of the peer-reviewed papers presented at the 2018 International Conference on Computational Science and Its Applications (ICCSA 2018) held in Melbourne, Australia, during July 2–5, 2018.

ICCSA 2018 was a successful event in the International Conferences on Computational Science and Its Applications (ICCSA) conference series, previously held in 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 a main pillar of most current research and 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 2018 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.

The success of the ICCSA conference series, in general, and ICCSA 2018, 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, International Advisory Committee members, International Liaison chairs, and people in other various roles. We would like to thank them all.

We would also like to thank Springer for their continuous support in publishing the ICCSA conference proceedings and for sponsoring some of the paper awards.

July 2018

David Taniar
Bernady O. Apduhan
Osvaldo Gervasi
Beniamino Murgante
Ana Maria A. C. Rocha

Welcome to Melbourne

Welcome to “The Most Liveable City”¹, Melbourne, Australia. ICCSA 2018 was held at Monash University, Caulfield Campus, during July 2–5, 2018.

Melbourne is the state capital of Victoria, and is currently the second most populous city in Australia, behind Sydney. There are lots of things to do and experience while in Melbourne. Here is an incomplete list:

- Visit and experience Melbourne’s best coffee shops
- Discover Melbourne’s hidden laneways and rooftops
- Walk along the Yarra River
- Eat your favourite food (Chinese, Vietnamese, Malaysian, Italian, Greek, anything, ... you name it)
- Buy souvenirs at the Queen Victoria Market
- Go up to the Eureka, the tallest building in Melbourne
- Visit Melbourne’s museums
- Walk and enjoy Melbourne’s gardens and parks
- Visit the heart-shape lake, Albert Park Lake, the home of the F1 Grand Prix
- Simply walk in the city to enjoy Melbourne experience
- Try Melbourne’s gelato ice cream

Basically, it is easy to live in and to explore Melbourne, and I do hope that you will have time to explore the city of Melbourne.

The venue of ICCSA 2018 was in Monash University. Monash University is a member of Go8, which is considered the top eight universities in Australia. Monash University has a number of campuses and centers. The two main campuses in Melbourne are Clayton and Caulfield. ICCSA 2018 was held on Caulfield Campus, which is only 12 minutes away from Melbourne CBD by train.

The Faculty of Information Technology is one of the ten faculties at Monash University. The faculty has more than 100 full-time academic staff (equivalent to the rank of Assistant Professor, Associate Professor, and Professor).

I do hope that you will enjoy not only the conference, but also Melbourne.

David Taniar

¹ The Global Liveability Report 2017, <https://www.cnbc.com/2017/08/17/the-worlds-top-10-most-liveable-cities.html>

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Keynote Speakers

New Frontiers in Cloud Computing for Big Data and Internet-of-Things (IoT) Applications

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Abstract. Computing is being transformed to a model consisting of services that are commoditised and delivered in a manner similar to utilities such as water, electricity, gas, and telephony. Several computing paradigms have promised to deliver this utility computing vision. Cloud computing has emerged as one of the buzzwords in the IT industry and turned the vision of “computing utilities” into a reality.

Clouds deliver infrastructure, platform, and software (application) as services, which are made available as subscription-based services in a pay-as-you-go model to consumers. Cloud application platforms need to offer

1. APIs and tools for rapid creation of elastic applications and
2. a runtime system for deployment of applications on geographically distributed computing infrastructure in a seamless manner.

The Internet of Things (IoT) paradigm enables seamless integration of cyber-and-physical worlds and opening up opportunities for creating newclass of applications for domains such as smart cities. The emerging Fog computing is extending Cloud computing paradigm to edge resources for latency sensitive IoT applications.

This keynote presentation will cover:

- a. 21st century vision of computing and identifies various IT paradigms promising to deliver the vision of computing utilities;
- b. opportunities and challenges for utility and market-oriented Cloud computing,
- c. innovative architecture for creating market-oriented and elastic Clouds by harnessing virtualisation technologies;
- d. Aneka, a Cloud Application Platform, for rapid development of Cloud/Big Data applications and their deployment on private/public Clouds with resource provisioning driven by SLAs;
- e. experimental results on deploying Cloud and Big Data/Internet-of-Things (IoT) applications in engineering, and health care, satellite image processing, and smart cities on elastic Clouds;

- f. directions for delivering our 21st century vision along with pathways for future research in Cloud and Fog computing.

Short Bio Dr. Rajkumar Buyya is a Redmond Barry Distinguished Professor and Director of the Cloud Computing and Distributed Systems (CLOUDS) Laboratory at the University of Melbourne, Australia. He is also serving as the founding CEO of Manjrasoft, a spin-off company of the University, commercializing its innovations in Cloud Computing. He served as a Future Fellow of the Australian Research Council during 2012-2016. He has authored over 625 publications and seven text books including “Mastering Cloud Computing” published by McGraw Hill, China Machine Press, and Morgan Kaufmann for Indian, Chinese and international markets respectively. He also edited several books including “Cloud Computing: Principles and Paradigms” (Wiley Press, USA, Feb 2011).

He is one of the highly cited authors in computer science and software engineering worldwide (h-index = 117, g-index = 255, 70,500 + citations). Dr. Buyya is recognized as a “Web of Science Highly Cited Researcher” in both 2016 and 2017 by Thomson Reuters, a Fellow of IEEE, and Scopus Researcher of the Year 2017 with Excellence in Innovative Research Award by Elsevier for his outstanding contributions to Cloud computing.

Software technologies for Grid and Cloud computing developed under Dr. Buyya’s leadership have gained rapid acceptance and are in use at several academic institutions and commercial enterprises in 40 countries around the world. Dr. Buyya has led the establishment and development of key community activities, including serving as foundation Chair of the IEEE Technical Committee on Scalable Computing and five IEEE/ACM conferences. These contributions and international research leadership of Dr. Buyya are recognized through the award of “2009 IEEE Medal for Excellence in Scalable Computing” from the IEEE Computer Society TCSC.

Manjrasoft’s Aneka Cloud technology developed under his leadership has received “2010 Frost & Sullivan New Product Innovation Award”. He served as the founding Editor-in-Chief of the IEEE Transactions on Cloud Computing. He is currently serving as Co-Editor-in-Chief of Journal of Software: Practice and Experience, which was established over 45 years ago. For further information on Dr. Buyya, please visit his cyberhome: www.buyya.com.

Approximation Problems for Digital Image Processing and Applications

Gianluca Vinti

Department of Mathematics and Computer Science,
University of Perugia, Italy

Abstract. In this talk, some approximation problems are discussed with applications to reconstruction and to digital image processing. We will also show some applications to concrete problems in the medical and engineering fields. Regarding the first, a procedure will be presented, based on approaches of approximation theory and on algorithms of digital image processing for the diagnosis of aneurysmal diseases; in particular we discuss the extraction of the pervious lumen of the artery starting from CT image without contrast medium. As concerns the engineering field, thermographic images are analyzed for the study of thermal bridges and for the structural and dynamic analysis of buildings, working therefore in the field of energy analysis and seismic vulnerability of buildings, respectively.

Short Bio Gianluca Vinti is Full Professor of Mathematical Analysis at the Department of Mathematics and Computer Science of the University of Perugia. He is Director of the Department since 2014 and member of the Academic Senate of the University. Member of the Board of the Italian Mathematical Union since 2006, member of the “Scientific Council of the GNAMPA-INdAM “(National Group for the Mathematical Analysis, the Probability and their Applications) since 2013, Referent for the Mathematics of the Educational Center of the “Accademia Nazionale dei Lincei” at Perugia since 2013 and Member of the Academic Board of the Ph.D. in Mathematics, Computer Science, Statistics organized in consortium (C.I.A.F.M.) among the University of Perugia (Italy), University of Florence (Italy) and the INdAM (National Institute of High Mathematics).

He is and has been coordinator of several research projects and he coordinates a research team who deals with Real Analysis, Theory of Integral Operators, Approximation Theory and its Applications to Signal Reconstruction and Images Processing.

He has been invited to give more than 50 plenary lectures at conferences at various Universities and Research Centers. Moreover he is author of more than 115 publications on international journals and one scientific monography on “Nonlinear Integral Operators and Applications” edited by W. de Gruyter. Finally he is member of the Editorial Board of the following international scientific journals: Sampling Theory in Signal and Image Processing (STSIP), Journal of Function Spaces and Applications, Open Mathematics, and others and he holds a patent entitled: “Device for obtaining informations on blood vessels and other bodily-cave parts”.

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