

**PROCEEDINGS OF  
THE 2017 INTERNATIONAL CONFERENCE ON  
INFORMATION & KNOWLEDGE ENGINEERING**

**IKE 2017**

**Editors**

**Hamid R. Arabnia  
Leonidas Deligiannidis, Ray Hashemi  
Fernando G. Tinetti**

**Associate Editor**

**Ashu M. G. Solo**



***CSCE'17***

July 17-20, 2017

Las Vegas Nevada, USA

[americancse.org](http://americancse.org)

©CSREA Press

This volume contains papers presented at The 2017 International Conference on Information & Knowledge Engineering (IKE'17). Their inclusion in this publication does not necessarily constitute endorsements by editors or by the publisher.

### **Copyright and Reprint Permission**

Copying without a fee is permitted provided that the copies are not made or distributed for direct commercial advantage, and credit to source is given. Abstracting is permitted with credit to the source. Please contact the publisher for other copying, reprint, or republication permission.

Copyright © 2017 CSREA Press  
ISBN: 1-60132-463-4  
Printed in the United States of America



# Foreword

It gives us great pleasure to introduce this collection of papers to be presented at the 2017 International Conference on Information and Knowledge Engineering (IKE'17), July 17-20, 2017, at Monte Carlo Resort, Las Vegas, USA.

An important mission of the World Congress in Computer Science, Computer Engineering, and Applied Computing, CSCE (a federated congress to which this conference is affiliated with) includes *"Providing a unique platform for a diverse community of constituents composed of scholars, researchers, developers, educators, and practitioners. The Congress makes concerted effort to reach out to participants affiliated with diverse entities (such as: universities, institutions, corporations, government agencies, and research centers/labs) from all over the world. The congress also attempts to connect participants from institutions that have **teaching** as their main mission with those who are affiliated with institutions that have **research** as their main mission. The congress uses a quota system to achieve its institution and geography diversity objectives."* By any definition of diversity, this congress is among the most diverse scientific meeting in USA. We are proud to report that this federated congress has authors and participants from 64 different nations representing variety of personal and scientific experiences that arise from differences in culture and values. As can be seen (see below), the program committee of this conference as well as the program committee of all other tracks of the federated congress are as diverse as its authors and participants.

The program committee would like to thank all those who submitted papers for consideration. About 65% of the submissions were from outside the United States. Each submitted paper was peer-reviewed by two experts in the field for originality, significance, clarity, impact, and soundness. In cases of contradictory recommendations, a member of the conference program committee was charged to make the final decision; often, this involved seeking help from additional referees. In addition, papers whose authors included a member of the conference program committee were evaluated using the double-blinded review process. One exception to the above evaluation process was for papers that were submitted directly to chairs/organizers of pre-approved sessions/workshops; in these cases, the chairs/organizers were responsible for the evaluation of such submissions. The overall paper acceptance rate for regular papers was 27%; 9% of the remaining papers were accepted as poster papers (at the time of this writing, we had not yet received the acceptance rate for a couple of individual tracks.)

We are very grateful to the many colleagues who offered their services in organizing the conference. In particular, we would like to thank the members of Program Committee of IKE'17, members of the congress Steering Committee, and members of the committees of federated congress tracks that have topics within the scope of IKE. Many individuals listed below, will be requested after the conference to provide their expertise and services for selecting papers for publication (extended versions) in journal special issues as well as for publication in a set of research books (to be prepared for publishers including: Springer, Elsevier, BMC journals, and others).

- *Prof. Nizar Al-Holou (Congress Steering Committee); Professor and Chair, Electrical and Computer Engineering Department; Vice Chair, IEEE/SEM-Computer Chapter; University of Detroit Mercy, Detroit, Michigan, USA*
- *Prof. Hamid R. Arabnia (Congress Steering Committee); Graduate Program Director (PhD, MS, MAMS); The University of Georgia, USA; Editor-in-Chief, Journal of Supercomputing (Springer); Fellow, Center of Excellence in Terrorism, Resilience, Intelligence & Organized Crime Research (CENTRIC).*
- *Dr. Travis Atkison; Director, Digital Forensics and Control Systems Security Lab, Department of Computer Science, College of Engineering, The University of Alabama, Tuscaloosa, Alabama, USA*
- *Dr. Arianna D'Ulizia; Institute of Research on Population and Social Policies, National Research Council of Italy (IRPPS), Rome, Italy*
- *Prof. Kevin Daimi (Congress Steering Committee); Director, Computer Science and Software Engineering Programs, Department of Mathematics, Computer Science and Software Engineering, University of Detroit Mercy, Detroit, Michigan, USA*
- *Prof. Zhanhisina Gulnur Davletzhanovna; Vice-rector of the Science, Central-Asian University, Kazakhstan, Almaty, Republic of Kazakhstan; Vice President of International Academy of Informatization, Kazakhstan, Almaty, Republic of Kazakhstan*

- *Prof. Leonidas Deligiannidis (Congress Steering Committee); Department of Computer Information Systems, Wentworth Institute of Technology, Boston, Massachusetts, USA; Visiting Professor, MIT, USA*
- *Prof. Mary Mehnoosh Eshaghian-Wilner (Congress Steering Committee); Professor of Engineering Practice, University of Southern California, California, USA; Adjunct Professor, Electrical Engineering, University of California Los Angeles, Los Angeles (UCLA), California, USA*
- *Prof. Ray Hashemi (Session Chair, IKE); Professor of Computer Science and Information Technology, Armstrong Atlantic State University, Savannah, Georgia, USA*
- *Prof. Dr. Abdeldjalil Khelassi; Computer Science Department, Abou beker Belkaid University of Tlemcen, Algeria; Editor-in-Chief, Medical Technologies Journal; Associate Editor, Electronic Physician Journal (EPJ) - Pub Med Central*
- *Prof. Louie Lolong Lacatan; Chairperson, Computer Engineering Department, College of Engineering, Adamson University, Manila, Philippines; Senior Member, International Association of Computer Science and Information Technology (IACSIT), Singapore; Member, International Association of Online Engineering (IAOE), Austria*
- *Dr. Andrew Marsh (Congress Steering Committee); CEO, HoIP Telecom Ltd (Healthcare over Internet Protocol), UK; Secretary General of World Academy of BioMedical Sciences and Technologies (WABT) a UNESCO NGO, The United Nations*
- *Dr. Somya D. Mohanty; Department of Computer Science, University of North Carolina - Greensboro, North Carolina, USA*
- *Dr. Ali Mostafaeipour; Industrial Engineering Department, Yazd University, Yazd, Iran*
- *Dr. Houssem Eddine Nouri; Informatics Applied in Management, Institut Supérieur de Gestion de Tunis, University of Tunis, Tunisia*
- *Prof. Dr., Eng. Robert Ehimen Okonigene (Congress Steering Committee); Department of Electrical & Electronics Engineering, Faculty of Engineering and Technology, Ambrose Alli University, Nigeria*
- *Prof. James J. (Jong Hyuk) Park (Congress Steering Committee); Department of Computer Science and Engineering (DCSE), SeoulTech, Korea; President, FTRA, EiC, HCIS Springer, JoC, IJITCC; Head of DCSE, SeoulTech, Korea*
- *Dr. Prantosh K. Paul; Department of Computer and Information Science, Raiganj University, Raiganj, West Bengal, India*
- *Dr. Xuewei Qi; Research Faculty & PI, Center for Environmental Research and Technology, University of California, Riverside, California, USA*
- *Dr. Akash Singh (Congress Steering Committee); IBM Corporation, Sacramento, California, USA; Chartered Scientist, Science Council, UK; Fellow, British Computer Society; Member, Senior IEEE, AACR, AAAS, and AAAI; IBM Corporation, USA*
- *Chiranjibi Sitaula; Head, Department of Computer Science and IT, Ambition College, Kathmandu, Nepal*
- *Ashu M. G. Solo (Publicity), Fellow of British Computer Society, Principal/R&D Engineer, Maverick Technologies America Inc.*
- *Prof. Fernando G. Tinetti (Congress Steering Committee); School of CS, Universidad Nacional de La Plata, La Plata, Argentina; Co-editor, Journal of Computer Science and Technology (JCS&T).*
- *Varun Vohra; Certified Information Security Manager (CISM); Certified Information Systems Auditor (CISA); Associate Director (IT Audit), Merck, New Jersey, USA*
- *Dr. Haoxiang Harry Wang (CSCE); Cornell University, Ithaca, New York, USA; Founder and Director, GoPerception Laboratory, New York, USA*
- *Prof. Shiuh-Jeng Wang (Congress Steering Committee); Director of Information Cryptology and Construction Laboratory (ICCL) and Director of Chinese Cryptology and Information Security Association (CCISA); Department of Information Management, Central Police University, Taoyuan, Taiwan; Guest Ed., IEEE Journal on Selected Areas in Communications.*
- *Prof. Layne T. Watson (Congress Steering Committee); Fellow of IEEE; Fellow of The National Institute of Aerospace; Professor of Computer Science, Mathematics, and Aerospace and Ocean Engineering, Virginia Polytechnic Institute & State University, Blacksburg, Virginia, USA*
- *Prof. Jane You (Congress Steering Committee); Associate Head, Department of Computing, The Hong Kong Polytechnic University, Kowloon, Hong Kong*

We would like to extend our appreciation to the referees, the members of the program committees of individual sessions, tracks, and workshops; their names do not appear in this document; they are listed on the web sites of individual tracks.

As Sponsors-at-large, partners, and/or organizers each of the followings (separated by semicolons) provided help for at least one track of the Congress: Computer Science Research, Education, and Applications Press (CSREA); US Chapter of World Academy of Science; American Council on Science &

Education & Federated Research Council (<http://www.americancse.org/>); HoIP, Health Without Boundaries, Healthcare over Internet Protocol, UK (<http://www.hoip.eu>); HoIP Telecom, UK (<http://www.hoip-telecom.co.uk>); and WABT, Human Health Medicine, UNESCO NGOs, Paris, France (<http://www.thewabt.com/> ). In addition, a number of university faculty members and their staff (names appear on the cover of the set of proceedings), several publishers of computer science and computer engineering books and journals, chapters and/or task forces of computer science associations/organizations from 3 regions, and developers of high-performance machines and systems provided significant help in organizing the conference as well as providing some resources. We are grateful to them all.

We express our gratitude to keynote, invited, and individual conference/tracks and tutorial speakers - the list of speakers appears on the conference web site. We would also like to thank the followings: UCMSS (Universal Conference Management Systems & Support, California, USA) for managing all aspects of the conference; Dr. Tim Field of APC for coordinating and managing the printing of the proceedings; and the staff of Monte Carlo Resort (Convention department) at Las Vegas for the professional service they provided. Last but not least, we would like to thank the Co-Editors of IKE'17: Prof. Hamid R. Arabnia, Prof. Leonidas Deligiannidis, Prof. Ray Hashemi, and Prof. Fernando G. Tinetti.

We present the proceedings of IKE'17.

***Steering Committee, 2017***  
***<http://americancse.org/>***

