Procedia Computer Science

Proceedings of the International Conference on Information and Communication Technologies, ICICT 2014, 3-5 December 2014 at Bolgatty Palace & Island Resort, Kochi, India

Guest Editors

Editor in Chief   Philip Samuel

Associate Editors

Rekha K James
Sudeep Elayidom M
Binu Paul
Sariga Raj

ICICT 2014 organized by

School of Engineering, Cochin University of Science and Technology, Kochi – 682022, Kerala, India, ICICT 2014 Website: http://icict.cusat.ac.in/

Proceedings of the International Conference on Information and Communication Technologies, ICICT 2014, 3-5 December 2014 at Bolgatty Palace & Island Resort, Kochi, India

EDITORIAL

Information and communication technologies grows at an unprecedented rates, reorganizing our societies, reordering our priorities, redefining our work places, reconstructing our pedagogy, regrouping our relations, recreating our values and reforming our entertainments. It has been influencing the way we do business, travel, commerce, medicinal support or governance. Information and communication technologies touch all facets of human life. ICICT 2014, the International Conference on Information and Communication Technologies is a major interdisciplinary international conference, providing a forum for researchers, engineers, practitioners and educators to meet, present and discuss the most recent research results, innovations, trends, experiences and concerns in the field of Information and Communication Technologies and its applications to the real world.

We are very pleased to introduce the proceedings of the International Conference on Information and Communication Technologies, ICICT 2014, Kochi. The research and development activities presented at the International Conference on Information and Communication Technologies organized by School of Engineering, Cochin University of Science and Technology, Kochi is included in this volume. The conference was held from 3-5 December 2014 at Bolgatty Palace & Island Resort, Kochi, India, with the support from TEQIP Phase II.

ICICT 2014 conference provided an umbrella for researchers working in information and communication technologies and related areas to meet. Many conferences are narrow in their scope so that a holistic picture and an integrated view to solutions are missing. Our conference enabled a cross platform interaction, cross fertilization of ideas and discussion which were essential to develop more robust and scalable systems. In ICICT 2014 conference, latest research results were submitted as papers in different tracks named Intelligent Methods & Applications, Internet Based Systems, Software Systems & Engineering, Networks & Communication Techniques, Devices & Systems and Image Processing. Although research in this area is still in its early stage, promising results have been demonstrated by experimental systems built in

academic and industrial laboratories. There is a need for further research and better understanding of what Information and Communication Technology can offer.

The International Conference on Information and Communication Technologies, ICICT 2014, was hosted at Kochi, India. This is significant considering the success stories that is coming out from this region in the field of information and communication technologies. India joining the elite global space club of Martian explorers on 24th September 2014, as the first nation in the world to successfully reach Mars on its first attempt is one such recent news. With this, India now joins the United States, the former Soviet Union and the European Space Agency as the only groups to have successfully sent a probe to Mars. Only with a strong base in information and communication technologies, the Mangalayaan project succeeded. The International Conference on Information and Communication Technologies has helped researchers in different countries to interact with each other. In addition, ICICT 2014 has given several Indian researchers to move up the value chain and showcase their research work to the outside world through the publication of ICICT 2014 proceedings in the prestigious Elsevier Procedia Computer Science.

It has been an honor for me to get the chance to edit the proceedings for the conference. It was a great experience to work in cooperation with the international programming committee to call for papers, review papers and finalize papers to be included in the proceedings. Refereeing papers for an international conference such as ICICT 2014 is a complex process that relies on the goodwill of those researchers involved in the field. We received an overwhelming response of 550+ research papers to our ICICT 2014 conference. About 220 papers made their way into the final stage with an acceptance rate of about 40% for ICICT 2014. The papers were reviewed for ICICT 2014 by two, and in some cases, three peers. I express my gratitude to all these reviewers for their time and effort in reviewing the papers. Without their commitment it would not be possible to have the papers selected in the proceedings. The quality of these papers is a tribute to the authors and also to the reviewers who have guided any necessary improvement.

I use this space to acknowledge the invaluable contributions of all who helped the organization of the conference and publication of the proceedings. The financial support offered from TEQIP Phase II and the timely support and patronage of the team of Cochin University of Science and Technology were of immense help. I thank our esteemed Vice-Chancellor, Prof. J.

Letha, Pro-Vice-Chancellor, Prof. K. Poulose Jacob and Principal and Dean of Engineering, Prof. G. Madhu, Cochin University of Science and Technology, India for their support and blessings. Without their support, the conference could not have been the success that it was.

Organizing the conference to bring together researchers, judge their work fairly and provide a platform for them to present their research contributions requires the involvement of several persons. We would like to thank all the organizing committee, advisory board members, editorial board, reviewers and all the people involved in conducting this conference and making this event a memorable one. The enthusiasm of my colleagues at Cochin University of Science and Technology was very much appreciable. Along with several others, the voluminous work rendered by Unni A.M, Vinod Kumar P P, Shelbi Joseph, Shahana T K and Babitha T Jose in ICICT organizing were commendable.

Proceedings of this international conference compress various scholars' several years of rich experience in industry, teaching and research in the areas of Information and Communication Technologies. Hope this book may lead to a practical thrust and creative discussions which may give birth to innovative tools and techniques beneficial for the mankind. I thank all authors of research papers who have responded to our call for paper presentation, without whose expert input there would have been no conference. Above all, I thank almighty God for making this a reality.

Place: Kochi
Date: 5ᵗʰ December 2014

Dr. Philip Samuel
Editor in Chief
Proceedings of the International Conference on Information and Communication Technologies, ICICT 2014, Kochi, India
Cochin University of Science & Technology
Email: philipcusat@gmail.com
        philips@cusat.ac.in,

International Conference on Information and Communication Technologies, ICICT 2014, 3-5 December 2014, Organizing Committee

Patrons

J. Letha, Hon. Vice-Chancellor, Cochin University of Science and Technology, India
K. Poulose Jacob, Hon. Pro-Vice-Chancellor, Cochin University of Science and Technology, India

Advisory Committee
Mike Hinchey, Lero, University of Limerick
Boris Stilman, University of Colorado Denver, USA
Zbigniew SURAJ, University of Rzeszow, Poland
Sankar K. Pal, Indian Statistical Institute, Kolkata, India
Sreela Sasi, Gannon University, Pensilvania, USA
Deepu Rajan, Nanyang Technical University, Singapore
Roger G Marshall, Plymouth State University, New Hampshire, USA
Ajith Abraham, MIR Labs, USA
David Peter S, Cochin University of Science and Technology, India
Vargheese Paul, Cochin University of Science and Technology, India
V Gopakumar, State Project Facilitation Unit, TEQIP, Kerala

General Chair
G. Madhu, Cochin University of Science and Technology, India

Programme Chair
Philip Samuel, Cochin University of Science and Technology, India

Programme Co-Chairs
Rekha K James and Sudeep Elayidom M, Cochin University of Science and Technology, India

Programme Committee
Schahram Dustdar, Technical University of Vienna
Sebastián Ventura Soto, University of Cordoba, Spain
Andreas Rausch, Clausthal University of Technology, Germany
Lefteris Angelis, Aristotle University of Thessaloniki, Greece
Andrew L. Nelson, Androtics LLC, Tucson Arizona, USA
Janos Botzheim, Tokyo Metropolitan University, Japan
Heder Soares Bernardino, Federal University of Juiz de Fora, Brazil
Frantisek Zboril jr., Brno University of Technology, Czech Republic
Bernadetta Kwintiana Ane, University of Stuttgart, Germany
Toshiyuki MAEDA, Hannan University, Japan
Virgilijus Sakalauskas, Vilinius University, Lithuania
Garenth Lim king Hann, Curtin University, Malaysia
Ing. Jan Samek, Brno University of Technology, Czech Republic
José Raúl Romero Salguero, University of Cordoba, Spain

Kuruvilla Varghese, Indian Institute of Science, Bangalore
Dalia Kriksciuniene, Vilinius University, Lithuania
Jimson Mathew, nm2 Logic, United Kingdom
Wolfgang Reif, University of Augsburg, Germany
Giancarlo Mauri,University of Milano-Bicocca, Italy
Francisco Javier Cabrerizo Lorite, UNED, Spain
Ender Özcan, University of Nottingham, UK
Sung-Bae Cho, Yonsei University, Korea
Roy P. Paily, Indian Institute of Technology, Guwahati
Hana Rezankova, University of Economics, Czech Republic
Boris Tudjarov, Technical University of Sofia, Bulgaria
Wei-Chiang Hong, Hangzhou Dianzi University, China
José Valente de Oliveira, Universidade do Algarve, Portugal
Juan Jose Flores Romero, University of Michoacan, Mexico
Rozita Jamili Oskouei, Institute for Advanced Studies in Basic Science (IASBS),Iran
Antonio Cicchetti, Mälardalen University, Sweden
Chanchal Roy, University of Saskatchewan, Canada
Sergio Segura, University of Seville, Spain
C Samuel, Indian Institute of Technology, Varanasi
Frédéric Mallet, Univ. Nice Sophia Antipolis, France
Marjan Mernik, University of Maribor, Slovenia
Sasikumar Punnekkat, Mälardalen University, Sweden
Carmine Gravino, University of Salerno, Italy
Helio Perroni Filho, University of Tsukuba, Japan
Juan M. Carrillo de Gea, University of Murcia, Spain
Abdel Obaid,University of Quebec at Montreal, Canada
Andrea Corradini, Kolding School of Design, Denmark
Giovanni Acampora, Nottingham Trent University, UK
Sasi Gopalan, Cochin University of Science and Technology, India
Gopikakumari R, Cochin University of Science and Technology, India
Mridula S, Cochin University of Science and Technology, India
Mythili P, Cochin University of Science and Technology, India
Abdulla P, Cochin University of Science and Technology, India
Deepa Sankar, Cochin University of Science and Technology, India
Babita Roslind Jose, Cochin University of Science and Technology, India
Shahana T K, Cochin University of Science and Technology, India
Jibukumar M G, Cochin University of Science and Technology, India
Renumol V G, Cochin University of Science and Technology, India
Sheena Mathew, Cochin University of Science and Technology, India
Santhosh Kumar G, Cochin University of Science and Technology, India
Sumam Mary Idicula, Cochin University of Science and Technology, India
Supriya M H, Cochin University of Science and Technology, India
Pramod K V, Cochin University of Science and Technology, India
Kannan B, Cochin University of Science and Technology, India

Finance Committee
Shelby Joseph, Cochin University of Science and Technology, India (Chair)
Shahana T K, Cochin University of Science and Technology, India

Publicity Chair
Unni A M, Cochin University of Science and Technology, India

Website Chair
Vinod Kumar P P, Cochin University of Science and Technology, India

Proceedings & Certificates
Binu Paul, Cochin University of Science and Technology, India (Chair)
Sariga Raj, Cochin University of Science and Technology, India
Babita Roslind Jose, Cochin University of Science and Technology, India

Local Organizing Committee
Johnson T P, Cochin University of Science and Technology, India
Anju Pradeep, Cochin University of Science and Technology, India
Premkumar C V, Cochin University of Science and Technology, India
Daleesha M Viswanathan, Cochin University of Science and Technology, India
Santhosh Kumar M B, Cochin University of Science and Technology, India
Sariga Raj, Cochin University of Science and Technology, India
Ancy Zachariah, Cochin University of Science and Technology, India
Damodaran V, Cochin University of Science and Technology, India
Pramod Pavithran, Cochin University of Science and Technology, India
Latha R Nair, Cochin University of Science and Technology, India
Preetha S, Cochin University of Science and Technology, India
Sheena S, Cochin University of Science and Technology, India
Binsu C Kovoor, Cochin University of Science and Technology, India

Inaugural Keynote Address by T.P.Sreenivasan, at the International Conference on Information and Communication Technologies, ICICT 2014, 10 am, 3 Dec 2014

Abstract

 As a part of the generation, which straddled the Twentieth and the Twenty-first centuries, I am an enthusiast and evangelist of technology as well as a skeptic. The enthusiasm arises from the excitement of the immense possibilities that the technological revolution has opened up for mankind, the way the world has become a global village and the way information is literally on our fingertips. The skepticism is on account of the challenges that it has imposed on a whole generation, which is not yet ready to assimilate and adapt themselves to the dramatic changes. The sacrifice of privacy, peace of mind, time and patience is the price we pay for the many boons of technology.

Technology has transformed every profession beyond recognition, including diplomacy and education. The fruits of modern technology do not reach every human being in the same measure. The world is hardly flat. Lack of adequate connectivity and even electricity deprives the majority of nations of the blessings of technology, while they are affected by its evils such as pandemics.

Man had learnt to live with nature, with all its blessings and fury, but technology has brought in the degradation of the planet and the man is yet to find a safety net. Humanity stands bewildered like a jet-lagged traveller, whose body is not able to adjust to the change of the time zone to which he has been transported. It needs time to learn a new language, to acclimatize and to become a part of the new dispensation.

The speed of technology cannot be slowed, nor can it be reversed. Human ingenuity has to find ways and means to benefit from the new opportunities and to meet the new challenges. As humans explore new frontiers of knowledge, the humankind has to master the art of living in a new world.

Speaker Biography: T.P. Sreenivasan, (IFS 1967) is the Executive Vice-Chairman, Kerala State Higher Education Council, India. He was the former ambassador of India to United Nations and Governor for India of the IAEA. He is also the Director General, Kerala International Centre. His website is www.tpsreenivasan.com

Keynote Address by Prof. Rajib Mall

Title: Program Slicing and Its Applications

Abstract: Program slicing is a program analysis technique that has widespread application primarily in software engineering activities, but is a promising technique that is poised for

applications in other areas such as social networks as well. A program slicing approach is based a dependency model of a program that is popularly represented as a graph. Based on this dependency model, various notions of slicing can be introduced. We briefly highlight these notions of slicing and provide an overview of their applications. The talk does not assume much research background in the area of program analysis and primarily targets to expose researchers working in various fields to the program slicing techniques, so that they can investigate its applicability to their respective research problems.

Speaker Biography: RAJIB MALL, PhD, is Professor & Head, Department of Computer Science and Engineering, IIT Kharagpur. He has vast practical experience in developing industry-oriented software systems. Dr. RAJIB MALL obtained all his professional degrees: Bachelor's, Master's, and the Doctoral degrees from the Indian Institute of Science, Bangalore. He worked for Motorola (India) for about three years before joining the faculty of Computer Science and Engineering at IIT, Kharagpur. He has guided more than a dozen Ph.D. theses and has published more than 150 refereed international journal and conference papers. He has done consultancy projects for organizations such as General Motors, Infosys, Honeywell, and Usha Telecom. He works mostly in the areas of program analysis and design of traditional as well as emerging software systems. He is also well known for his celebrated books on "Fundamentals Of Software Engineering", PHI Learning, "Real-Time Systems : Theory and Practice", Pearson Education and "Fundamentals of Mobile Computing", Prentice-Hall Of India.

Keynote Address by Prof. Rajkumar Buyya

Title: Market-Oriented Cloud Computing and Big Data Applications

Abstract: Computing is being transformed to a model consisting of services that are commoditized and delivered in a manner similar to utilities such as water, electricity, gas, and telephony. In such a model, users access services based on their requirements without regard to where the services are hosted. 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. Several IT vendors have started offering computation, storage, and application hosting services, and provide coverage in several continents, supporting Service-Level Agreements (SLA) backed performance and uptime promises for their services. 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. The price that Cloud Service Providers charge can vary with time and the quality of service (QoS) expectations of consumers.

This keynote presentation covers (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 applications in engineering, gaming, and health care domains (integrating sensors networks, mobile devices), ISRO satellite image

processing on elastic Clouds, and (f) directions for delivering our 21st century vision along with pathways for future research.

Speaker Biography: Dr. Rajkumar Buyya is Professor of Computer Science and Software Engineering, Future Fellow of the Australian Research Council, 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 has authored over 450 publications and four text books including "Mastering Cloud Computing" published by McGraw Hill and Elsevier/Morgan Kaufmann, 2013 for Indian 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=86, g-index=176, 34200+ citations). Microsoft Academic Search Index ranked Dr. Buyya as the world's top author in distributed and parallel computing between 2007 and 2012. "A Scientometric Analysis of Cloud Computing Literature" by German scientists ranked Dr. Buyya as the World's Top-Cited (#1) Author and the World's Most-Productive (#1) Author in 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 TCSC Medal for Excellence in Scalable Computing". Manjrasoft's Aneka Cloud technology developed under his leadership has received "2010 Asia Pacific Frost & Sullivan New Product Innovation Award" and "2011 Telstra Innovation Challenge, People's Choice Award". He is currently serving as the foundation Editor-in-Chief (EiC) of IEEE Transactions on Cloud Computing and Co-EiC of Journal of Software: Practice and Experience. For further information on Dr. Buyya, please visit his cyberhome: www.buyya.com

Keynote Address by Deepak P, Researcher & Prasad M. Deshpande

Title: "Similarity Search: Navigating the Choices for Similarity Operators"

Abstract: With the growing variety of entities that have their presence on the web, increasingly sophisticated data representation and indexing mechanisms to retrieve relevant entities to a query are being devised. Though relatively less discussed, another dimension in retrieval that has recorded tremendous progress over the years has been the development of mechanisms to enhance expressivity in specifying information needs; this has been affected by the advancements in research on similarity operators. In this tutorial, we focus on the vocabulary of similarity operators that has grown from just a set of two operators, top-k and skyline search, as it stood in the early 2000s. Today, there are efficient algorithms to process complicated needs such as finding the top-k customers for a product wherein the customers are to be sorted based on the rank of the chosen product in their preference list. Arguably due to the complexity in the

specification of new operators such as the above, uptake of such similarity operators has been low even though emergence of complex entities such as social media profiles warrant significant expansion in query expressivity. In this tutorial, we systematically survey the set of similarity operators and mechanisms to process them effectively. We believe that the importance of similarity search operators is immense in an era of when the web is populated with increasingly complex objects spanning the entire spectrum, though mostly pronounced in the social and e-commerce web.

Speaker Biography:

Deepak P: Deepak P is a researcher in the Information Management Group at IBM Research-India, Bangalore. He obtained his B.Tech degree from Cochin University, India followed by M.Tech and PhD degrees from IIT Madras, India, all in Computer Science. His current research interests include Similarity Search, Spatiotemporal Data Analytics, Graph Mining, Information Retrieval and Machine Learning. He has authored over 20 papers in reputed conferences and has filed several patent applications with the US PTO including two issued patents. He has been working in the area of similarity search since 2008; he co-chaired the 2011 EDBT Workshop on New Trends in Similarity Search. He is a senior member of the ACM and IEEE.

Prasad M. Deshpande: Prasad M Deshpande is a Senior Technical Staff Member at IBM Research - India and Manager of the Watson Foundations - Platforms and Infrastructure group. His areas of expertise lie in data management, specifically data integration, OLAP, data mining and text analytics. He received a B. Tech in Computer Science and Engineering from IIT, Bombay and a M.S. and Ph.D. in Database systems from the University of Wisconsin, Madison. He is an ACM Distinguished Scientist and member of the IBM Academy of Technology. His current focus is in the areas of data discovery and curation for big data platforms, data integration and machine data analytics. He has worked at several companies, including IBM Almaden Research Center prior to joining IBM Research - India in 2005. He has more than 40 publications in reputed conferences and journals and 11 patents issued. He has served on the Program Committee of many conferences and has been the Industry Chair for COMAD 2009 and COMAD 2013, PC Co-Chair for COMAD 2011, ACM Compute 2010 and the 2011 EDBT Workshop on New Trends in Similarity Search.