



**Proceedings of the
2015 International Conference on
Big Data Applications and Services**

BigDAS'15

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Message from BigDAS 2015 Organizing Committee

It is a great pleasure to invite you to the international joint conference on Big Data Applications and Services (BigDAS 2015) and Digital Information Management (ICDIM 2015), which will be held in Jeju Island, South Korea, on October 20-23, 2015. BigDAS 2015/ICDIM 2015 are organized by Center of Enterprise Information Systems of Chungbuk National University, and hosted by Korea Big Data Service Society and Korea Institute of Enterprise Architecture.

The main topic of BigDAS 2015/ICDIM 2015 is “Power to change the world, Big Data”. The Big Data has become a core technology to provide innovative solutions in the many fields such as healthcare, manufacturing, social life, etc. The aim of BigDAS 2015/ICDIM 2015 is to present the innovative results, encourage academic and industrial interaction, and promote collaborative research in Big Data and digital information management worldwide. We expect that publications of our joint conference will be a cornerstone for the further related research and technology improvements in the field of Big Data and digital information management.

For BigDAS 2015/ICDIM 2015, we accepted many high quality papers, which will be published by the Association for Computing Machinery (ACM) and the Institute of Electrical and Electronics Engineers (IEEE). The organizing committee of BigDAS 2015/ICDIM 2015 has prepared 17 technical sessions and four workshops. The topics of technical sessions are Big Data models and algorithms, Big Data search and mining, Big Data visualization, Big Data application, information retrieval, natural language processing, image analysis and multimedia, computation intelligence, enterprises, and cloud computing and web service. The workshops are composed of the following topics: Smart emergency management using Big Data, 3D data and virtual training system standards, smart factory and transportation, as well as industrial-educational cooperation on business and data convergence. We hope you will find the results presented during the conference useful and inspiring for your future research.

We would like to express our sincere thanks to our sponsors Korean Federation of Science and Technology Societies (KOFST), Electronics and Telecommunications Research Institute (ETRI), Korea Institute of Science and Technology Information (KISTI), and many other organizations. We would also thank invited speakers, organizing committee and authors for their valuable contributions to the conference.

October 20, 2015
Seogwipo KAL Hotel, Jeju Island, South Korea

Kwan-Hee Yoo, *President of Korean Big Data Service Society*
Jong-Sup Choi, *President of Korea Institute of Enterprise Architecture*

Message from BigDAS 2015 Program Chairs

The 2015 International Conference on Big Data Applications and Services (BigDAS 2015) is held, jointly with the 10th International Conference on Digital Information Management (ICDIM 2015), at Seogwipo KAL Hotel in Jeju Island, South Korea, on October 20th-23rd, 2015. The joint BigDAS 2015/ICDIM 2015 conference is organized by Center of Enterprise Information Systems of Chungbuk National University, and hosted by Korea Big Data Service Society and Korea Institute of Enterprise Architecture.

The BigDAS 2015 conference aims to address the need of the academic community and industry about Big Data. It encourages academic and industrial interaction and promotes collaborative research in Big Data applications and services by bringing together academics, government and industry professionals to discuss recent progress and challenges in Big Data applications and services. Moreover, BigDAS 2015 also serves as a platform for theoreticians and practitioners to exchange their original research ideas on academic or industrial aspects of Big Data applications and services, present their new findings or innovative results on theoretical or practical aspects of Big Data, share their experiences on integrating new technologies into products and applications, discuss their work on performing Big Data applications and services in real-life situations, describe their development and operations of challenging Big Data related systems, and identify unsolved challenges.

For BigDAS 2015, we have recruited many international experts in Big Data applications and services to join our team of international program committee. As a result, our Program Committee consists of professionals from different parts of the world including Australia, Canada, China, Egypt, Germany, India, Indonesia, Italy, Japan, Malaysia, Poland, South Korea, Spain, Taiwan, Thailand, and USA. This committee has done an excellent job in completing the single-blind review and on-line double-blind debate processes. The paper selection process was thorough and competitive. Each submission was refereed by at least two reviewers. Among these submissions, we accepted 17 high-quality submissions as full research papers (i.e., an acceptance rate of less than 20%). To allow more researchers to express their opinions and vision on exploring new concepts and research directions, we also include some short papers and posters. This year, we have a rich program—which includes several invited talks, research paper presentations, workshops, and exhibitions—spanning over four days (October 20-23, 2015).

BigDAS 2015 would not have been possible without the help and effort of many people and organizations. We thank Korean Federation of Science and Technology Societies (KOFST), Electronics and Telecommunications Research Institute (ETRI), Korea Institute of Science and Technology Information (KISTI), and many other organizations, for their support of this conference. We also express our thanks to BigDAS 2015 Organizing Committee members, especially the Conference Co-Chairs (J.-S. Choi, S.H. Han, J.-Y. Lee, and T. Park) and Organizing Co-Chairs (E. Ariwa, S.-Y. Chi, W.-S. Cho, A. Florea, S. Fong, S.-J. Kang, S. Lee, W. Lee, P. Pichappan, R. Rodriguez, N. Sadek, and K.-H. Yoo) for their valuable advice and suggestions towards the conference. We are grateful to BigDAS 2015 Program Committee members for their professionalism and dedication in the process of judging the contributions of papers and producing constructive comments to the authors. We also thank authors and non-author participants of this conference. Last but not least, we thank the ACM staff (especially, C. Rodkin and A. Lacson) for their help in publishing the current proceedings.

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BigDAS 2015 Invited Talk

Technology Foresight through the Collaboration with Human Expert and Machine Intelligence

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We always make efforts to predict our future from the past and the present, since the prediction can make great changes in our life, especially in the fields of science and technology. Many organizations in the globe have surveys and announce emerging or disruptive technologies every year. Of course, they have developed their own processes to achieve the goal, but the insights of experts from related domains are usually absolute. In the era of Big data, due to the enormous amount of information, domain experts are struggling with timeliness and completeness in developing insights for the future. In KISTI, we introduced a methodology in which human experts are collaborating with machine intelligence to overcome the information flood. Data-intensive analysis methodology is applied to implement the machine intelligence to predict emerging technologies. The intelligent service platform, named InSciTe, includes data gathering, text mining, identity resolution, reasoning, complex event processing, and prescriptive analytics modules. InSciTe generates candidates of emerging technologies with the evidences why they are selected as candidates, and then domain experts make the final decision.

In this talk, I will introduce our intelligent service platform based on the data-intensive analysis. Besides, I will show several case studies in the domains of ICT, internet security, and healthcare as joint works with NIPA, KISA, and KRIBB respectively. For the cases with KRIBB, human experts collaborated with machine intelligence interactively to derive the results. We named this approach as Chi (Computer Human Interacting)-Delphi method for technology foresight.

As Web goes to connect machine intelligences in the era of Internet of Things, the collaboration between human intelligence and machine intelligence will be eventually the next great wave for predicting the future.



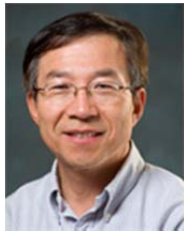
Hahn Sun-Hwa studied Chemical Engineering at Hanyang University and Information Engineering at Sungkyunkwan University for her undergraduate times. Dr. Hahn earned her Master's and Ph.D. degrees for Computer Science at KAIST.

BigDAS 2015 Invited Talk

Clarifying Big Data: The Concept and Its Applications

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In the past few years, “Big Data” has got a lot attention from industry and academia with various definitions in many ways. Such rapid growth in the field of big data created so much confusion surrounding its term and concept. It is worthwhile to clarify the concept of Big Data with a discussion of its managerial implications and presents its defining characteristics differentiating Big Data with traditional analytics. This concept “Big Data” is surely characterized by its sheer size: It is a large amount of data. The big data has become so different from our old data analytics because of volume, variety, velocity and veracity which have been implemented in the Big Data field. These drastic changes in the size, collection methods, and applications of data caused by Big Data technology and analytics demand managerial adjustments in both operations tactics and business strategies. This presentation will introduce the concept of Big Data in the context of three industries, namely, finance, supply chain and marketing and discusses how this concept can be applied in the business world. Although technical aspects of Big Data will be not covered in this presentation, it focuses on serving as a business discussion for the concept of Big Data.



Taeho Park is Director and Professor of School of Global Innovation and Leadership and Director of Silicon Valley Center for Operations and Technology Management in the Lucas College and Graduate School of Business at San Jose State University, USA. He founded Silicon Valley Center for Operations and Technology Management and the Silicon Valley Access Program which is designed to facilitate the development of innovation/technology businesses of foreign companies in Silicon Valley. He earned his Ph.D. in industrial engineering at University of Wisconsin-Madison. He has had numerous industry and research projects for companies and research institutes, such as Samsung Electronics, LG Display, KISTI, and Daejeon TechnoPark. His research interests include improvement of supply chain management systems, logistics network design and improvement, enterprise risk and sustainability management, design of operations systems, and technology management. His recent research projects include valuation of early-stage technology, enterprise risk management, collaboration among industry, university, and government, and knowledge service support for small-to-medium companies. He is Editor-in-Chief of the *Journal of Supply Chain and Operations Management*, and has published in *Journal of Operations Management*, *International Journal of Production Research*, *European Journal of Operational Research*, *California Journal of Operations Management*, *Computers & Industrial Engineering*, *Journal of Services Research*, and other journals.

BigDAS 2015 Invited Talk

Big Data Processing Flow

Mukesh Mohania
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New Delhi, India

Today enterprises are designing applications which require massive amount of heterogeneous data cleansing, correlation and integration. Cloud computing offers an exciting opportunity to bring on-demand applications to customers and is being used for delivering hosted services over the Internet and/or processing massive amount of data for business intelligence. In this talk, we will discuss the architecture of Big Data Platform, Cloud Computing, MapReduce, and Hadoop. We will then discuss how the cloud infrastructure can be used for data management services, and how the massive amount of data can be processed over cloud for various big data applications such as social media analysis, entity resolution, voice-of-customer analytics, personalized education, systems of engagement and insights, etc.



Mukesh Mohania is an IBM Distinguished Engineer and Chief Architect for Education Transformation area in IBM Research. He has worked extensively in the areas of Information Management, specifically, in Information Integration, Big Data Analytics, Data Warehousing, and Autonomic Computing. His work in these areas has led to the development of new products and also influenced several existing IBM products. He has received several awards within IBM, such as “Best of IBM”, “Excellence in People Management”, “Outstanding Innovation Award”, “Technical Accomplishment Award”, “Leadership by Doing”, and many more. He has published more than 120 papers and also filed more than 70 patents in these or related areas and more than 30 have already been granted. He is an IBM Master Inventor and a member of IBM Academy of Technology. He is an ACM Distinguished Scientist and an IEEE Golden Core member.

BigDAS 2015 Invited Talk

Stress Prediction, Social Routing, and Privacy Protection for Pedestrians

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Walking is a simple yet effective physical exercise. The benefit of walking for physical and mental health has been generally acknowledged. There are many studies that support the impact of walking on the prevention and control of major chronic diseases. Recent emerging mobile and wearable sensors make it easy to collect personal spatiotemporal data such as activity trajectories as well as vital sign in daily life. To encourage people to walk more often in a longer distance, information technologies can play an important role. We are pursuing a research project on developing algorithms and systems intelligently navigating pedestrians. In our project, we are addressing the following research issues:

1. Prediction of the stress of pedestrians.
2. Social navigation for pedestrians.
3. Differential privacy mechanism for protecting streaming data.

Our future plan is to develop a system which collects private data in a rigorously protected manner, and constructs routes for pedestrians considering both predicted mental stress and possible confluence with other users.



Masatoshi Yoshikawa is a Professor of Graduate School of Informatics at Kyoto University. He received the B.E., M.E. and Ph.D. degrees in Information Science from Kyoto University in 1980, 1982 and 1985, respectively. In 1985, he joined The Institute for Computer Sciences, Kyoto Sangyo University as an Assistant Professor. From April 1989 to March 1990, he has been a Visiting Scientist at the Computer Science Department of University of Southern California. In 1993, he joined Nara Institute of Science and Technology as an Associate Professor of Graduate School of Information Science. From April 1996 to January 1997, he has stayed at Department of Computer Science, University of Waterloo as a visiting associate professor. From June 2002 to March 2006, he served as a professor at Nagoya University. He is a Fellow of Information Processing Society of Japan (IP SJ) and the Institute of Electronics, Information and

Communication Engineers (IEICE). He has served as an editor of *VLDB Journal* and *Information Systems*. He was on the Program Committee of many conferences including IEEE ICDE2015. His current research interests include Medial Informatics, Information Technologies for Pedestrian Navigation, and Privacy Protection.

BigDAS 2015 Invited Talk

Big Data Mining Applications and Services

Carson K. Leung
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Data mining and analytics aims to analyze valuable data and extract implicit, previously unknown, and potentially useful information from the data. Due to advances in technology, high volumes of valuable data are generated at a high velocity in high varieties of data sources in various real-life business, scientific and engineering applications. Due to their high volumes, the quality and accuracy of these data depend on their veracity (uncertainty of data). This leads us into the new era of Big Data. This talk presents some works on big data mining and computing, especially on an important task of frequent pattern mining, which computes and mines from big data for interesting knowledge in the forms of frequently occurring sets of merchandise items in shopping markets, interesting co-located events, and/or popular individuals in social networks. The talk also shows how big data mining contributes to real-life applications and services.



Carson K. Leung is currently a Full Professor at the University of Manitoba, Canada. He obtained his BSc(Hons), MSc and PhD from the University of British Columbia, Canada. He has published more than 130 papers on the topics of big data computing, databases, data mining, social network analysis, as well as visual analytics—including papers in *ACM Transactions on Database Systems (TODS)*, *Social Network Analysis and Mining (SNAM)*, *Future Generation Computer Systems (FGCS)*, *Journal of Organizational Computing and Electronic Commerce (JOCEC)*, IEEE International Conference on Data Engineering (ICDE), IEEE International Conference on Data Mining (ICDM), and Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD). Over the past few years, he has served as an organizing committee member of ACM SIGMOD 2008, IEEE ICDM 2011, and IEEE/ACM ASONAM 2014, as well as a PC member of numerous international conferences including ACM KDD, ACM CIKM, and ECML/PKDD. Moreover, this year, he also serves as the PC Chair of the following conferences: IEEE International Conference Cloud and Big Data Computing (CBCom) 2015 and IEEE International Conference on Internet of Things (iThings) 2015.

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