Advances in Intelligent Systems and Computing

Volume 1036

Series Editor

Janusz Kacprzyk, Systems Research Institute, Polish Academy of Sciences, Warsaw, Poland

Advisory Editors

Nikhil R. Pal, Indian Statistical Institute, Kolkata, India
Rafael Bello Perez, Faculty of Mathematics, Physics and Computing, Universidad Central de Las Villas, Santa Clara, Cuba
Emilio S. Corchado, University of Salamanca, Salamanca, Spain
Hani Hagras, School of Computer Science and Electronic Engineering, University of Essex, Colchester, UK
László T. Kóczy, Department of Automation, Széchenyi István University, Gyor, Hungary
Vladik Kreinovich, Department of Computer Science, University of Texas at El Paso, El Paso, TX, USA
Chin-Teng Lin, Department of Electrical Engineering, National Chiao Tung University, Hsinchu, Taiwan
Jie Lu, Faculty of Engineering and Information Technology, University of Technology Sydney, Sydney, NSW, Australia
Patricia Melin, Graduate Program of Computer Science, Tijuana Institute of Technology, Tijuana, Mexico
Nadia Nedjah, Department of Electronics Engineering, University of Rio de Janeiro, Rio de Janeiro, Brazil
Ngoc Thanh Nguyen, Faculty of Computer Science and Management, Wrocław University of Technology, Wrocław, Poland
Jun Wang, Department of Mechanical and Automation Engineering, The Chinese University of Hong Kong, Shatin, Hong Kong

The series "Advances in Intelligent Systems and Computing" contains publications on theory, applications, and design methods of Intelligent Systems and Intelligent Computing. Virtually all disciplines such as engineering, natural sciences, computer and information science, ICT, economics, business, e-commerce, environment, healthcare, life science are covered. The list of topics spans all the areas of modern intelligent systems and computing such as: computational intelligence, soft computing including neural networks, fuzzy systems, evolutionary computing and the fusion of these paradigms, social intelligence, ambient intelligence, computational neuroscience, artificial life, virtual worlds and society, cognitive science and systems, Perception and Vision, DNA and immune based systems, self-organizing and adaptive systems, e-Learning and teaching, human-centered and human-centric computing, recommender systems, intelligent control, robotics and mechatronics including human-machine teaming, knowledge-based paradigms, learning paradigms, machine ethics, intelligent data analysis, knowledge management, intelligent agents, intelligent decision making and support, intelligent network security, trust management, interactive entertainment, Web intelligence and multimedia.

The publications within "Advances in Intelligent Systems and Computing" are primarily proceedings of important conferences, symposia and congresses. They cover significant recent developments in the field, both of a foundational and applicable character. An important characteristic feature of the series is the short publication time and world-wide distribution. This permits a rapid and broad dissemination of research results.

**** Indexing: The books of this series are submitted to ISI Proceedings, EI-Compendex, DBLP, SCOPUS, Google Scholar and Springerlink ****

More information about this series at http://www.springer.com/series/11156

Leonard Barolli · Hiroaki Nishino ·
Tomoya Enokido · Makoto Takizawa
Editors

Advances in Networked-based Information Systems

The 22nd International Conference on Network-Based Information Systems (NBiS-2019)

Springer

Editors
Leonard Barolli
Department of Information
and Communication Engineering,
Faculty of Information Engineering
Fukuoka Institute of Technology
Fukuoka, Japan

Tomoya Enokido
Faculty of Business Administration
Rissho University
Tokyo, Japan

Hiroaki Nishino
Division of Computer Science
and Intelligent Systems,
Faculty of Science and Technology
Oita University
Oita, Japan

Makoto Takizawa
Department of Advanced Sciences,
Faculty of Science and Engineering
Hosei University
Tokyo, Japan

ISSN 2194-5357 ISSN 2194-5365 (electronic)
Advances in Intelligent Systems and Computing
ISBN 978-3-030-29028-3 ISBN 978-3-030-29029-0 (eBook)
https://doi.org/10.1007/978-3-030-29029-0

© Springer Nature Switzerland AG 2020
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, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Welcome Message from NBiS Steering Committee Co-chairs

Welcome to the 22nd International Conference on Network-Based Information Systems (NBiS-2019), which will be held at Oita University, Japan from September 5 to September 7, 2019.

The main objective of NBiS is to bring together scientists, engineers, and researchers from both network systems and information systems with the aim of encouraging the exchange of ideas, opinions, and experiences between these two communities.

NBiS started as a workshop and was held for 12 years together with DEXA International Conference as one of the oldest among DEXA Workshops. The workshop was very successful and in 2009 edition the NBiS was held at IUPUI, Indianapolis, the USA as an independent International Conference supported by many international volunteers. In following years, the NBiSs was held in Takayama, Gifu, Japan (2010), Tirana, Albania (2011) Melbourne, Australia (2012), Gwangju, Korea (2013), Salerno, Italy (2014), Taipei, Taiwan (2015), Ostrava, Czech Republic (2016), Toronto, Canada (2017), and Bratislava, Slovakia (2018).

In this edition of NBiS, many papers were submitted from all over the world. They were carefully reviewed and only high-quality papers will be presented during conference days. In conjunction with NBiS-2019 are held also eight International Workshops where specific and hot topics are deeply discussed.

Many volunteer people have kindly helped us to prepare and organize NBiS-2019. First of all, we would like to thank General Co-Chairs, Program Co-Chairs, and Workshops Co-Chairs for their great efforts to make NBiS-2019 a very successful event. We would like to thank all NBiS-2019 Organizing Committee Members, Program Committee Members, and other volunteers for their great help and support. We have special thanks also to Finance Chair and Web Administrator Co-Chairs. Finally, we thank the Local Organization Team at Oita University, Japan, for their good arrangements.

We do hope that you will enjoy the conference and have a good time in Oita, Japan.

NBiS Steering Committee Co-chairs

Leonard Barolli Fukuoka Institute of Technology (FIT), Japan
Makoto Takizawa Hosei University, Japan

Welcome Message from NBiS-2019 General Co-chairs

We would like to welcome you to the 22nd International Conference on Network-Based Information Systems (NBiS-2019), which will be held at Oita University, Japan, from September 5 to September 7, 2019.

It is our honor to chair this prestigious conference, as one of the important conferences in the field. Extensive international participation, coupled with rigorous peer reviews, has made this an exceptional technical conference. The technical program and workshops add important dimensions to this event. We hope that you will enjoy each and every component of this event and benefit from interactions with other attendees.

Since its inception, NBiS has attempted to bring together people interested in information and networking, in areas that range from the theoretical aspects to the practical design of new network systems, distributed systems, multimedia systems, Internet/Web technologies, mobile computing, intelligent computing, pervasive/ubiquitous networks, dependable systems, semantic services, Grid, P2P, and scalable computing. For NBiS-2019, we have continued these efforts as novel networking concepts emerge and new applications flourish. NBiS-2019 consists of the main conference and eight workshops. We received 120 papers, and out of them, 30 were accepted (25% acceptance ratio), which will be presented during the conference days.

The organization of an international conference requires the support and help of many people. A lot of people have helped and worked hard for a successful NBiS-2019 technical program and conference proceedings. First, we would like to thank all the authors for submitting their papers. We are indebted to Track Co-Chairs, Program Committee members, and reviewers who carried out the most difficult work of carefully evaluating the submitted papers.

We would like to give our special thanks to Prof. Leonard Barolli and Prof. Makoto Takizawa the chairs of the Steering Committee for giving us the opportunity to hold this conference and for their guidance on organizing the conference. We would like to thank Program Co-Chairs and Workshops Co-Chairs for their excellent work. We would like to express our great appreciation to our keynote speakers for accepting our invitation as keynote speakers of NBiS-2019.

We would like to thank the Local Arrangements Chairs and Local Organization Team at Oita University, Japan, for making good local arrangements for the conference.

We hope that you have an enjoyable and productive time during this conference and have a great time in Oita, Japan.

NBiS-2019 General Co-chairs

Hiroaki Nishino — Oita University, Japan
Kin Fun Li — University of Victoria, Canada
Chuan-Yu Chang — National Yunlin University of Science and Technology, Taiwan

Welcome Message from NBiS-2019 Program Committee Co-chairs

Welcome to the 22nd International Conference on Network-Based Information Systems (NBiS-2019), which will be held at Oita University, Japan, from September 5 to September 7, 2019.

The purpose of NBiS conference is to bring together developers and researchers to share ideas and research work in the emerging areas of network and information systems.

The contributions included in the proceedings of NBiS-2019 cover all aspects of theory, design, and application of computer networks and information systems. There are many topics of information networking such as cloud computing, wireless sensor networks, ad hoc networks, peer-to-peer systems, grid computing, social networking, multimedia systems and applications, security, distributed and parallel systems, and mobile computing.

In this edition, 120 submissions were received from all over the world. Each submitted paper was peer-reviewed by Program Committee members and external reviewers who are experts in the subject area of the paper. Then, the Program Committee accepted 30 papers (25% acceptance ratio). In the conference, program are also included the distinguished keynote addresses.

The organization of an International Conference requires the support and help of many people. First, we would like to thank all authors for submitting their papers. We would like to thank all Track Chairs and Program Committee Members, who carried out the most difficult work of carefully evaluating the submitted papers. We also would like to thank NBiS-2019 Workshops Chairs for organizing excellent workshops with NBiS-2019 conference.

We would like to give special thanks to Prof. Leonard Barolli and Prof. Makoto Takizawa, the Chairs of the Steering Committee of NBiS for their strong encouragement, guidance, insights, and for their effective coordination of conference organization. We would like to greatly thank General Co-Chairs for their great support and invaluable suggestions to make the conference a very successful event.

We hope you will enjoy the conference and have a great time in Oita, Japan.

NBiS-2019 Program Committee Co-chairs

Tomoya Enokido Rissho University, Japan
Marek R. Ogiela AGH University of Science and Technology, Poland
Isaac Woungang Ryerson University, Canada

Welcome Message from NBiS-2019 Workshops Co-chairs

Welcome to the NBiS-2019 Workshops to be held in conjunction with the 22nd International Conference on Network-Based Information Systems (NBiS-2019) at Oita University, Japan, from September 5 to September 7, 2019.

The goal of NBiS-2019 workshops is to provide a forum for international researchers and practitioners to exchange and share their new ideas, research results, and ongoing work on leading-edge topics in the different fields of network-based information systems and their applications. Some of the accepted workshops deal with topics that open up perspectives beyond the ordinary, thus enriching the topics usually addressed by the NBiS-2019 conference.

For this edition, the following workshops will be held with NBiS-2019.

1. The 14th International Workshop on Network-based Virtual Reality and Tele-existence (INVITE-2019)
2. The 13th International Workshop on Advanced Distributed and Parallel Network Applications (ADPNA-2019)
3. The 10th International Workshop on Heterogeneous Networking Environments and Technologies (HETNET-2019)
4. The 10th International Workshop on Intelligent Sensors and Smart Environments (ISSE-2019)
5. The 10th International Workshop on Trustworthy Computing and Security (TwCSec-2019)
6. The 9th International Workshop on Information Networking and Wireless Communications (INWC-2019)
7. The 8th International Workshop on Advances in Data Engineering and Mobile Computing (DEMoC-2019)
8. The 8th International Workshop on Web Services and Social Media (WSSM-2019)

We would like to thank the research community for their great response to NBiS-2019 workshops. The excellent technical program of the workshops was the result of professional work from workshop chairs, workshop program committees, reviewers, and authors.

We would like to give our special thanks to Prof. Leonard Barolli and Prof. Makoto Takizawa, the Steering Committee Chairs of NBiS conference for their strong encouragement and guidance to organize the NBiS-2019 workshops. We would like to thank NBiS-2019 General Co-Chairs and Program Co-Chairs for their advices to make the possible organization of NBiS-2019 workshops.

We would like to express special thanks to NBiS-2019 Web Administration Chairs for their timely unlimited support for managing the conference systems. We also would like to thank NBiS-2019 Local Arrangement Co-Chairs and Local Organization Team at Oita University, Japan, for making the local arrangement for the conference and workshops.

We wish all of you an entertaining and rewarding experience in all workshops and NBiS-2019 conference.

NBiS-2019 Workshops Co-chairs

Shunsuke Okamoto Seikei University, Japan
Shih-Hao Chang Tamkang University, Taiwan
Hiroaki Kikuchi Meiji University, Japan

NBiS-2019 Organizing Committee

Honorary Chair

Seigo Kitano	Oita University, Japan

General Co-chairs

Hiroaki Nishino	Oita University, Japan
Kin Fun Li	University of Victoria, Canada
Chuan-Yu Chang	National Yunlin University of Science and Technology, Taiwan

PC Co-chairs

Tomoya Enokido	Rissho University, Japan
Marek R. Ogiela	AGH University of Science and Technology, Poland
Isaac Woungang	Ryerson University, Canada

Workshop Co-chairs

Shunsuke Okamoto	Seikei University, Japan
Shih-Hao Chang	Tamkang University, Taiwan
Hiroaki Kikuchi	Meiji University, Japan

Award Co-chairs

Minoru Uehara	Toyo University, Japan
David Taniar	Monash University, Australia
Fumiaki Sato	Toho University, Japan

Publicity Co-chairs

Akio Koyama	Yamagata University, Japan
Markus Aleksy	ABB AG, Germany
Farookh Hussain	University Technology of Sydney, Australia

International Liaison Co-chairs

Wenny Rahayu	La Trobe University, Australia
Lidia Ogiela	Pedagogical University of Cracow, Poland
Arjan Durresi	IUPUI, USA
Manuel Moreira da Silva	CEOS. PP, Politécnico do Porto, Portugal

Local Arrangement Co-chairs

Ken'ichi Furuya	Oita University, Japan
Makoto Nakashima	Oita University, Japan

Finance Chair

Makoto Ikeda	Fukuoka Institute of Technology, Japan

Web Administrator Co-chairs

Miralda Cuka	Fukuoka Institute of Technology, Japan
Kevin Bylykbashi	Fukuoka Institute of Technology, Japan
Donald Elmazi	Fukuoka Institute of Technology, Japan

Steering Committee

Leonard Barolli	Fukuoka Institute of Technology, Japan
Makoto Takizawa	Hosei University, Japan

Track Areas and PC Members

Track 1: Mobile and Wireless Networks

Track Co-chairs

Tetsuya Shigeyasu	Prefectural University of Hiroshima, Japan
Vamsi Krishna Paruchuri	University of Central Arkansas, USA
Evjola Spaho	Polytechnic University of Tirana, Albania

PC Members

Nobuyoshi Sato	Iwate Prefectural University, Japan
Kanunori Ueda	Kochi University of Technology, Japan
Masaaki Yamanaka	Japan Coast Guard Academy, Japan

Takuya Yoshihiro	Wakayama University, Japan
Tomoya Kawakami	Nara Institute of Science and Technology, Japan
Masaaki Noro	Fujitsu Laboratory, Japan
Admir Barolli	Aleksander Moisiu University of Durresi, Albania
Makoto Ikeda	Fukuoka Institute of Technology, Japan
Keita Matsuo	Fukuoka Institute of Technology, Japan
Elis Kulla	Okayama University of Science, Japan
Noriki Uchida	Fukuoka Institute of Technology, Japan
Arjan Durresi	IUPUI, USA
Sriram Chellappan	University of South Florida (USF), USA

Track 2: Internet of Things and Big Data

Track Co-chairs

Nik Bessis	Edge Hill University, UK
Chun-Wei Tsai	National Ilan University, Taiwan
Patrick Hung	University of Ontario Institute of Technology, Canada

PC Members

Ella Perreira	Edge Hill University, UK
Sergio Toral	University of Seville, Spain
Stelios Sotiriadis	Birkbeck, University of London, UK
Eleana Asimakopoulou	Hellenic National Defence College, Greece
Xiaolong Xu	University of Posts and Telecommunications, China
Kevin Curran	Ulster University, UK
Kamen Kanev	Shizuoka University, Japan
Shih-Chia Huang	National Taipei University of Technology, Taiwan
Jorge Roa	UTN Santa Fe, Argentina
Alvaro Joffre Uribe	Universidad Militar Nueva Granada, Colombia
Marcelo Fantinato	University of Sao Paulo, Brazil
Marco Zennaro	Wireless and T/ICT4D Laboratory, Italy
Priyanka Rawat	University of Avignon, France
Francesco Piccialli	University of Naples Federico II, Italy
Chi-Yuan Chen	National Ilan University, Taiwan

Track 3: Cloud, Grid, and Service-Oriented Computing

Track Co-chairs

Ciprian Dobre	Polytechnic University of Bucharest, Romania
Olivier Terzo	Istituto Superiore Mario Boella (ISMB), Italy
Muhammad Younas	Oxford Brookes University, UK

PC Members

Zia Rehman	COMSATS University Islamabad, Pakistan
Walayat Hussain	University of Technology Sydney, Australia
Farookh Hussain	University of Technology Sydney, Australia
Adil Hammadi	Sultan Qaboos University, Oman
Rui Pais	University of Stavanger, Norway
Raymond Hansen	Purdue University, USA
Antorweep Chakravorty	University of Stavanger, Norway
Rui Esteves	National Oilwell Varco, Norway
Constandinos X. Mavromoustakis	University of Nicosia, Cyprus
Ioan Salomie	Technical University of Cluj-Napoca, Romania, Romania
George Mastorakis	Technological Educational Institute of Crete, Greece
Sergio L. Toral Marín	University of Seville, Spain
Marc Frincu	West University of Timisoara, Romania
Alexandru Costan	IRISA/INSA Rennes, France
Xiaomin Zhu	National University of Defense Technology, China
Radu Tudoran	Huawei, Munich, Germany
Mauro Migliardi	University of Padua, Italy
Harold Castro	Universidad de Los Andes, Colombia
Andrea Tosatto	Open-Xchange, Germany
Rodrigo Calheiros	Western Sydney University, Australia

Track 4: Multimedia and Web Applications

Track Co-chairs

Takahiro Uchiya	Nagoya Institute of Technology, Japan
Tomoyuki Ishida	Fukuoka Institute of Technology, Japan
Nobuo Funabiki	Okayama University, Japan

PC Members

Shigeru Fujita	Chiba Institute of Technology, Japan
Yuka Kato	Tokyo Woman's Christian University, Japan
Yoshiaki Kasahara	Kyushu University, Japan
Rihito Yaegashi	Kagawa University, Japan
Kazunori Ueda	Kochi University of Technology, Japan
Ryota Nishimura	Keio University, Japan
Shohei Kato	Nagoya Institute of Technology, Japan
Shinsuke Kajioka	Nagoya Institute of Technology, Japan
Atsuko Muto	Nagoya Institute of Technology, Japan
Kaoru Sugita	Fukuoka Institute of Technology, Japan

Noriyasu Yamamoto	Fukuoka Institute of Technology, Japan
Hiroaki Nishino	Oita University, Japan

Track 5: Ubiquitous and Pervasive Computing

Track Co-chairs

Chi-Yi Lin	Tamkang University, Taiwan
Joan Arnedo Moreno	Open University of Catalonia, Spain
Elis Kulla	Okayama University of Science, Japan

PC Members

Jichiang Tsai	National Chung Hsing University, Taiwan
Chang Hong Lin	National Taiwan University of Science and Technology, Taiwan
Meng-Shiuan Pan	Tamkang University, Taiwan
Chien-Fu Cheng	Tamkang University, Taiwan
Ang Chen	University of Pennsylvania, USA
Santi Caballe	Open University of Catalonia, Spain
Evjola Spaho	Polytechnic University of Tirana, Albania
Makoto Ikeda	Fukuoka Institute of Technology, Japan

Track 6: Network Security and Privacy

Track Co-chairs

Takamichi Saito	Meiji University, Japan
Sriram Chellappan	University of South Florida, USA
Feilong Tang	Shanghai Jiao Tong University, China

PC Members

Satomi Saito	Fujitsu Laboratories, Japan
Kazumasa Omote	University of Tsukuba, Japan
Koji Chida	NTT, Japan
Hiroki Hada	NTT Security (Japan) KK, Japan
Hirofumi Nakakouji	Hitachi, Ltd., Japan
Na Ruan	Shanghai Jiaotong University, China
Chunhua Su	Osaka University, China
Kazumasa Omote	University of Tsukuba, Japan
Toshihiro Yamauchi	Okayama University, Japan
Masakazu Soshi	Hiroshima City University, Japan
Bagus Santoso	The University of Electro-Communications, Japan
Laiping Zhao	Tianjin University, China
Jingyu Hua	Nanjing University, China
Xiaobo Zhou	Tianjin University, China

Yuan Zhan	Nanjing University, China
Yizhi Ren	Hangzhou Dianzi University, China
Arjan Durresi	IUPUI, USA
Vamsi Krishna Paruchuri	University of Central Arkansas, USA

Track 7: Database, Data Mining, and Semantic Computing

Track Co-chairs

Wendy K. Osborn	University of Lethbridge, Canada
Eric Pardade	La Trobe University, Australia
Akimitsu Kanzaki	Shimane University, Japan

PC Members

Asm Kayes	La Trobe University, Australia
Ronaldo dos Santos Mello	Universidade Federal de Santa Catarina, Brazil
Saqib Ali	Sultan Qaboos University, Oman
Hong Quang Nguyen	Ho Chi Minh City International University, Vietnam
Irena Holubova	Charles University Prague, Czech Republic
Prakash Veeraraghavan	La Trobe University, Australia
Carson Leung	University of Manitoba, Canada
Marwan Hassani	Aachen University, Germany
Tomoki Yoshihisa	Osaka University, Japan
Tomoya Kawakami	NAIST, Japan
Atsushi Takeda	Tohoku Gakuin University, Japan
Yoshiaki Terashima	Soka University, Japan
Yuuichi Teranishi	NICT, Japan
Jackie Rice	University of Lethbridge, Canada
Yllias Chali	University of Lethbridge, Canada
John Zhang	University of Lethbridge, Canada

Track 8: Network Protocols and Applications

Track Co-chairs

Irfan Awan	University of Bradford, UK
Sanjay Kuamr Dhurandher	NSIT, University of Delhi, India
Hsing-Chung Chen	Asia University, Taiwan

PC Members

Samia Loucif	ALHOSN University, UAE
Abdelhamid Mammeri	Ottawa University, Ontario, Canada
Jun He	University of New Brunswick, Canada
Peyman Kabiri	University of Science and Technology, Iran
Chen Chen	University of Texas, USA

Ahmed Abdelgawad	Central Michigan University, USA
Wael Elmedany	University of Bahrain, Bahrain
Behrouz Maham	School of Electrical and Computer Engineering, Iran
Rubem Pereira	Liverpool John Moores University, UK
Carlos Juiz	University of the Balearic Islands, Spain
Faheem Ahmed	Thompson Rivers University, Canada
Paulo Gil	FCT-UNL, Portugal
Michael Mcguire	University of Victoria, Canada
Steven Guan	Xi'an Jiaotong-Liverpool University, China
Gregorio Romero	Universidad Politecnica de Madrid, Spain
Amita Malik	Deenbandhu Chhotu Ram University of Science and Technology, India
Mayank Dave	NIT, Kurukshetra, India
Vinesh Kumar	University of Delhi, India
R. K. Pateriya	MANIT, Bhopal, India
Himanshu Aggarwal	Punjabi University, India
Neng-Yih Shih	Asia University, Taiwan
Yeong-Chin Chen	Asia University, Taiwan
Hsi-Chin Hsin	National United University, Taiwan
Ming-Shiang Huang	Asia University, Taiwan
Chia-Cheng Liu	Asia University, Taiwan
Chia-Hsin Cheng	National Formosa University, Yunlin County, Taiwan
Tzu-Liang Kung	Asia University, Taiwan
Gene Shen	Asia University, Taiwan
Jim-Min Lin	Feng Chia University, Taiwan
Chia-Cheng Liu	Asia University, Taiwan
Yen-Ching Chang	Chung Shan Medical University, Taiwan
Shu-Hong Lee	Chienkuo Technology University, Taiwan
Ho-Lung Hung	Chienkuo Technology University, Taiwan
Gwo-Ruey Lee	Lung-Yuan Research Park, Taiwan
Li-Shan Ma	Chienkuo Technology University, Taiwan
Chung-Wen Hung	National Yunlin University of Science and Technology University, Taiwan
Yung-Chen Chou	Asia University, Taiwan
Chen-Hung Chuang	Asia University, Taiwan
Jing-Doo Wang	Asia University, Taiwan
Jui-Chi Chen	Asia University, Taiwan
Young-Long Chen	National Taichung University of Science and Technology, Taiwan

Track 9: Intelligent and Cognitive Computing

Track Co-chairs

Lidia Ogiela	Pedagogical University of Cracow, Poland
Farookh Hussain	University of Technology Sydney, Australia
Hae-Duck Joshua Jeong	Korean Bible University, Korea

PC Members

Yiyu Yao	University of Regina, Canada
Daqi Dong	University of Memphis, USA
Jan Platoš	VŠB Technical University of Ostrava, Czech Republic
Pavel Krömer	VŠB Technical University of Ostrava, Czech Republic
Urszula Ogiela	AGH University of Science and Technology, Poland
Jana Nowaková	VŠB Technical University of Ostrava, Czech Republic
Hoon Ko	Chosun University, Korea.
Chang Choi	Chosun University, Korea
Gangman Yi	Gangneung-Wonju National University, Korea
Wooseok Hyun	Korean Bible University, Korea
Hsing-Chung Jack Chen	Asia University, Taiwan
Jong-Suk Ruth Lee	KISTI, Korea
Hyun Jung Lee	Yonsei University, Korea
Ji-Young Lim	Korean Bible University, Korea
Omar Hussain	UNSW Canberra, Australia
Saqib Ali	Sultan Qaboos University, Oman
Morteza Saberi	UNSW Canberra, Australia
Sazia Parvin	UNSW Canberra, Australia
Walayat Hussain	University of Technology Sydney, Australia

Track 10: Parallel and Distributed Computing

Track Co-chairs

Kin Fun Li	University of Victoria, Canada
Bhed Bista	Iwate Prefectural University, Japan
Giovanni Cozzolino	University of Naples Federico II, Italy

PC Members

Deepali Arora	University of Victoria, Canada
Kosuke Takano	Kanagawa Institute of Technology, Japan
Masahiro Ito	Toshiba Lab, Japan
Watheq ElKharashi	Ain Shams University, Egypt
Martine Wedlake	IBM, USA

Jiahong Wang	Iwate Prefectural University, Japan
Shigetomo Kimura	University of Tsukuba, Japan
Chotipat Pornavalai	King Mongkut's Institute of Technology Ladkrabang, Thailand
Danda B. Rawat	Howard University, USA
Gongjun Yan	University of Southern Indiana, USA
Shu-Shaw Wang	Dallas Baptist University, USA
Naonobu Okazaki	Miyazaki University, Japan
Yoshiaki Terashima	Soka University, Japan
Atsushi Takeda	Tohoku Gakuin University, Japan
Tomoki Yoshihisa	Osaka University, Japan
Akira Kanaoka	Toho University, Japan
Flora Amato	University of Naples Federico II, Italy
Vincenzo Moscato	University of Naples Federico II, Italy
Walter Balzano	University of Naples Federico II, Italy
Francesco Moscato	University of Campania Luigi Vanvitelli, Italy
Francesco Mercaldo	Consiglio Nazionale delle Ricerche (CNR), Italy
Alessandra Amato	University of Naples Federico II, Italy
Francesco Piccialli	University of Naples Federico II, Italy

NBiS-2019 Reviewers

Ali Khan Zahoor
Barolli Admir
Barolli Leonard
Bista Bhed
Caballé Santi
Chang Chuan-Yu
Chellappan Sriram
Chen Hsing-Chung
Chen Xiaofeng
Cui Baojiang
Di Martino Beniamino
Durresi Arjan
Enokido Tomoya
Ficco Massimo
Fun Li Kin
Funabiki Nobuo
Gotoh Yusuke
Hussain Farookh
Hussain Omar
Javaid Nadeem
Jeong Joshua
Ikeda Makoto
Ishida Tomoyuki
Izu Tetsuya
Kikuchi Hiroaki
Kohana Masaki
Koyama Akio
Kulla Elis
Lee Kyungroul
Matsuo Keita
Na Ruan
Nishigaki Masakatsu
Nishino Hiroaki
Ogiela Lidia
Ogiela Marek
Okada Yoshihiro
Omote Kazumasa
Palmieri Francesco
Paruchuri Vamsi Krishna
Rahayu Wenny
Rawat Danda
Shibata Yoshitaka
Saito Takamichi
Sato Fumiaki
Spaho Evjola
Sugita Kaoru
Takizawa Makoto
Tang Feilong
Taniar David
Terzo Olivier
Uchida Noriki
Uchiya Takahiro
Uehara Minoru
Venticinque Salvatore
Wang Xu An
Woungang Isaac
Xhafa Fatos
Yamaguchi Toshihiro
Yim Kangbin
Younas Muhammad

Welcome Message from INVITE-2019 Workshop Organizers

Welcome to the 14th International Workshop on Network-based Virtual Reality and Tele-existence (INVITE-2019), which will be held in conjunction with the 22nd International Conference on Network-Based Information Systems (NBiS-2019) from September 5 to September 7, 2019, at Oita University, Japan.

The INVITE international workshop serves as a forum for the exchange of information and ideas regarding network-based Virtual Reality (VR) and tele-existence, 2D and 3D computer graphics, computer animation, multimedia, object-oriented approach, Web technology, and e-Learning. All participants of this workshop can share ideas and research work in the emerging areas of network-based VR and tele-existence.

Many people have kindly helped us to prepare and organize the INVITE workshop. First of all, we would like to thank the NBiS-2019 organization committee for their support, guidance, and help for making the workshop. We would like to express our special thanks to all of the INVITE program committee members and reviewers for organizing the workshop and reviewing the submitted papers, respectively.

We hope you will enjoy the workshop and have a great time in Oita, Japan.

INVITE-2019 Workshop Organizers

Yoshitaka Shibata	Iwate Prefectural University, Japan
Tomoyuki Ishida	Fukuoka Institute of Technology, Japan

INVITE-2019 Organizing Committee

Workshop Co-chairs

Yoshitaka Shibata	Iwate Prefectural University, Japan
Tomoyuki Ishida	Fukuoka Institute of Technology, Japan

Program Committee Members

Koji Koyamada	Kyoto University, Japan
Yasuo Ebara	Kyoto University, Japan
Hideo Miyaji	Tokyo City University, Japan
Tetsuro Ogi	Keio University, Japan
Akihiro Miyakawa	Nanao City, Japan
Kaoru Sugita	Fukuoka Institute of Technology, Japan
Noriki Uchida	Fukuoka Institute of Technology, Japan

Welcome Message from ADPNA-2019 Workshop Co-chairs

Welcome to the 13th International Workshop on Advanced Distributed and Parallel Network Applications (ADPNA-2019), which will be held in conjunction with the 22nd International Conference on Network-Based Information Systems (NBiS-2019) from September 5 to September 7, 2019, at Oita University, Japan.

The purpose of this workshop is to bring together developers and researchers to share ideas and research work in the emerging areas of distributed and parallel network applications.

The papers included in ADPNA-2019 cover aspects of theory, design, and application of distributed and parallel systems and applications. ADPNA-2019 contains high-quality research papers. Each submitted paper was peer-reviewed by Program Committee members who are experts in the subject area of the paper.

For organizing a workshop, the support and help of many people are needed. First, we would like to thank all of the authors for submitting their papers. We also appreciate the support from Program Committee members and reviewers who carried out the most difficult work of carefully evaluating the submitted papers.

We would like to thank NBiS-2019 Co-Chairs, Program Co-Chair, and Workshops Co-Chairs, for their support and strong encouragement and guidance in organizing the workshop. We would like to express special thanks to NBiS-2019 Web Administrator Chairs for their timely unlimited support for managing the conference system.

We also would like to thank NBiS-2019 local arrangement members for making the local arrangement for the conference and workshops.

We hope you will enjoy ADPNA-2019 and NBiS-2019 International Conference and have a great time in Oita, Japan.

ADPNA-2019 Workshop Organizers

Makoto Takizawa	Hosei University, Japan
Leonard Barolli	Fukuoka Institute of Technology (FIT), Japan

ADPNA-2019 Workshop PC Chair

Tomoya Enokido	Rissho University, Japan

ADPNA-2019 Organizing Committee

Workshop Organizers

Makoto Takizawa	Hosei University, Japan
Leonard Barolli	Fukuoka Institute of Technology (FIT), Japan

Workshop PC Chair

Tomoya Enokido	Rissho University, Japan

Program Committee

Makoto Ikeda	Fukuoka Institute of Technology, Japan
Elis Kulla	Okayama University of Science, Japan
Akio Koyama	Yamagata University, Japan
Admir Barolli	Aleksander Moisiu University of Durres, Albania
Wenny Rahaya	La Trobe University, Australia
Evjola Spaho	Polytechnic University of Tirana, Albania
Fumiaki Sato	Toho University, Japan
Minoru Uehara	Toyo University, Japan
Fatos Xhafa	Technical University of Catalonia, Spain
David Taniar	Monash University, Australia
Keita Matsuo	Fukuoka Institute of Technology, Japan
Tomoyuki Ishida	Fukuoka Institute of Technology, Japan
Kaoru Sugita	Fukuoka Institute of Technology, Japan

Welcome Message from HETNET-2019 Workshop Organizers

Welcome to the 10th International Workshop on Heterogeneous Networking Environments and Technologies (HETNET-2019), which will be held in conjunction with the 22nd International Conference on Network-Based Information Systems (NBiS-2019) from September 5 to September 7, 2019, at Oita University, Japan.

Due to advances in networking technologies, and especially, in wireless and mobile communication technologies, and devices with different networking interfaces, the networking systems are moving toward the integration of wired and wireless resources leading to Heterogeneous Networking Environments and Technologies (HETNET). Such environments comprise and integrate wireless LANs, multiple MANETs, Cellular Networks, Wireless Sensor Networks, Wireless Mesh Networks, and so on. Besides, other types of networking systems such as Grid and P2P systems are going wireless and mobile adding yet another dimension to the HETNET.

The integration of various networking paradigms into one networking system is requiring new understandings, algorithms and insights, frameworks, middleware and architectures for the effective design, integration, and deployment aiming at achieving secure, programmable, robust, transparent, and ubiquitous HETNETs.

The aim of this workshop is to present innovative researches, methods, and techniques related to HETNETs and their applications.

Many people contributed to the success of HETNET-2019. First, we would like to thank the organizing committee of NBiS-2019 International Conference for giving us the opportunity to organize the workshop. We would like to thank all authors for submitting their research works and for their participation. We are looking forward to meet them again in the forthcoming editions of the workshop.

We hope you will enjoy the workshop and have a great time in Oita, Japan.

HETNET-2019 Workshop Chair

Leonard Barolli — Fukuoka Institute of Technology (FIT), Japan

HETNET-2019 Workshop PC Chair

Jugappong Nawichai — Chiang Mai University, Thailand

HETNET-2019 Organizing Committee

Workshop Chair

Leonard Barolli	Fukuoka Institute of Technology, Japan

Workshop PC Chair

Jugappong Nawichai	Chiang Mai University, Thailand

Program Committee Members

Markus Aleksy	ABB, Germany
Paul Chung	Loughborough University, UK
Ciprian Dobre	University Politehnica of Bucharest, Romania
Makoto Ikeda	Fukuoka Institute of Technology, Japan
Axel Korthaus	Swinburne University of Technology, Australia
Kin Fun Li	University of Victoria, Canada
John Mashford	CSIRO, Melbourne, Australia
Hiroaki Nishino	University of Oita, Japan
Wenny Rahayu	La Trobe University, Australia
Makoto Takizawa	Hosei University, Japan
David Taniar	Monash University, Australia
Runtong Zhang	Beijing Jiaotong University, China
Pruet Boonma	Chiang Mai University, Thailand
Paskorn Champrasert	Chiang Mai University, Thailand
Yuthapong Somchit	Chiang Mai University, Thailand

Welcome Message from ISSE-2019 Workshop Co-chairs

To automatically provide human-centric services, it is desired to build smart environments for such purposes. The background system needs to first detect and collect needed information in the environment via various sensors like video cameras, RFIDs, infrared sensors, motion sensors, and pressure sensors. The information is then processed for understanding the context and intention of the people in the environment. Finally, the services are provided in a timely manner. Sensing technology, embedded systems, wireless communications, computer vision, and intelligent methods are the core to build integrated smart environments. Previous ISSE's were held in Fukuoka, Japan (2010), Barcelona, Spain (2011), Melbourne, Australia (2012), Gwangju, Korea (2013), Salerno, Italy (2014), Taipei, Taiwan (2015), Ostrava, Czech Republic (2016), Toronto, Canada (2017), and Bratislava, Slovakia (2018).

The 10th International Workshop on Intelligent Sensors and Smart Environments (ISSE-2019) will provide a platform for researchers to meet and exchange their thoughts. ISSE-2019 will be held in conjunction with the 22nd International Conference on Network-Based Information Systems (NBiS-2019) at Oita University, Japan, from September 5 to September 7, 2019.

Many people contributed to the CFP and paper review of ISSE-2019. We wish to thank the program committee members for their great effort. We also would like to express our gratitude to Steering Committee Co-Chairs, Program Co-Chairs, and Workshops Co-Chairs of NBiS-2019. Last but not least, we would like to thank and congratulate all the contributing authors for their support and excellent work.

ISSE-2019 Workshop Co-chairs

Chuan-Yu Chang	National Yunlin University of Science and Technology, Taiwan
Leonard Barolli	Fukuoka Institute of Technology (FIT), Japan

ISSE-2019 Organizing Committee

Workshop Co-chairs

Chuan-Yu Chang	National Yunlin University of Science and Technology, Taiwan
Leonard Barolli	Fukuoka Institute of Technology (FIT), Japan

Program Committee Co-chairs

Takahiro Uchiya	Nagoya Institute of Technology, Japan
Chuan-Yu Chang	National Yunlin University of Science and Technology, Taiwan

Program Committee Members

Keita Matsuo	Fukuoka Institute of Technology (FIT), Japan
Evjola Spaho	Polytechnic University of Tirana, Albania
Markus Aleksy	ABB AG Corporate Research Center, Germany
Fatos Xhafa	Technical University of Catalonia, Spain
Makoto Ikeda	Fukuoka Institute of Technology (FIT), Japan
Chien-Cheng Lee	Yuan Ze University, Taiwan
Jose Bravo	Castilla-La Mancha University, Spain
Ching-Lung Chang	National Yunlin University of Science and Technology, Taiwan
Chu-Song Chen	Academia Sinica, Taiwan
Hsu-Yung Cheng	National Central University, Taiwan
Ding-An Chiang	Tamkang University, Taiwan
Wu-Chih Hu	National Penghu University, Taiwan
Lei Jing	University of Aizu, Japan
Wei-Ru Lai	Yuan Ze University, Taiwan
Wen-Ping Lai	Yuan Ze University, Taiwan
Jiann-Shu Lee	National University of Tainan, Taiwan
Kin Fun Li	University of Victoria, Canada
Chi-Yi Lin	Tamkang University, Taiwan
Jiming Liu	Hong Kong Baptist University, Hong Kong
Wei Lu	Keene University, USA
Mihai Sima	University of Victoria, Canada
Wen-Fong Wang	National Yunlin University of Science and Technology, Taiwan
Zhiwen Yu	Northwestern Polytechnical University, China

Welcome Message from TwCSec-2019 Workshop Co-chairs

It is our great pleasure to welcome you to the 10th International Workshop on Trustworthy Computing and Security (TwCSec-2019), which will be held in conjunction with the 22nd International Conference on Network-Based Information Systems (NBiS-2019) at Oita University, Japan, from September 5 to September 7, 2019.

This international workshop is a forum for sharing ideas and research work in the emerging areas of trustworthy computing, security, and privacy. Computers reside at the heart of systems on which people now rely, both in critical national infrastructures and in their homes, cars, and offices. Today, many of these systems are far too vulnerable to cyber attacks that can inhibit their operation, corrupt valuable data, or expose private information. Future systems will include sensors and computers everywhere, exacerbating the attainment of security and privacy. Current security practices largely address current and known threats, but there is a need for research to consider future threats.

We encouraged contributions describing innovative work on security of next-generation operating systems (OS), secure and resilient network protocols, theoretical foundations and mechanisms for privacy, security, trust, human–computer interfaces for security functions, key distribution/management, intrusion detection and response, secure protocol configuration and deployment, and improved ability to certify and analyze system security properties, and integrating hardware and software for security.

Many people contributed to the success of TwCSec-2019. First, we would like to thank the organizing committee of NBiS-2019 International Conference for giving us the opportunity to organize the workshop. We would like to thank all authors of the workshop for submitting their research works and for their participation. We

are looking forward to meet them again in the forthcoming editions of the workshop.

Finally, we would like to thank the Local Arrangement Chairs for the local arrangement of the workshop.

We hope you will enjoy the workshop and have a great time in Oita, Japan.

TwCSec-2019 Workshop Co-chairs

Leonard Barolli	Fukuoka Institute of Technology (FIT), Japan
Arjan Durresi	Indiana University–Purdue University Indianapolis (IUPUI), USA
Hiroaki Kikuchi	Meiji University, Japan

TwCSec-2019 Organizing Committee

Workshop Co-chair

Leonard Barolli	Fukuoka Institute of Technology (FIT), Japan
Arjan Durresi	Indiana University–Purdue University Indianapolis (IUPUI), USA
Hiroaki Kikuchi	Meiji University, Japan

Advisory Co-chairs

Makoto Takizawa	Hosei University, Japan
Raj Jain	Washington University in St. Louis, USA

Program Committee Members

Sriram Chellappan	University of South Florida, USA
Koji Chida	NTT, Japan
Qijun Gu	Texas State University–San Marcos, USA
Tesuya Izu	Fujitsu Ltd., Japan
Youki Kadobayashi	Nara Institute of Science and Technology, Japan
Akio Koyama	Yamagata University, Japan
Michiharu Kudo	IBM Japan, Japan
Sanjay Kumar Madria	Missouri University of Science and Technology, USA
Masakatsu Morii	Kobe University, Japan
Masakatsu Nishigaki	Shizuoka University, Japan
Vamsi Paruchuri	University of Central Arkansas, USA
Hiroshi Shigeno	Keio University, Japan
Yuji Suga	Internet Initiative Japan Inc., Japan
Keisuke Takemori	KDDI Co., Japan
Ryuya Uda	Tokyo University of Technology, Japan
Xukai Zou	Indiana University Purdue–University Indianapolis (IUPUI), USA
Wenye Wang	North Carolina State University, USA
Hiroshi Yoshiura	University of Electro-Communications, Japan
Farookh Hussain	University of Technology Sydney, Australia

Welcome Message from INWC-2019 Workshop Organizers

It is our great pleasure to welcome you to the 9th International Workshop on Information Networking and Wireless Communications (INWC-2019), which will be held in conjunction with the 22nd International Conference on Network-Based Information Systems (NBiS-2019) at Oita University, Japan, from September 5 to September 7, 2019.

This international workshop is a forum for sharing ideas and research work in the emerging areas of information networking and wireless communications. Nowadays, information networks are developing very rapidly and evolving into heterogeneous networks. Thus, we have an increasing number of applications and devices. To optimize the communication in these heterogeneous systems, we need to propose and evaluate more complex schemes, algorithms, and protocols for wired and wireless networks.

Wireless communications are characterized by high bit error rates and burst errors, which arise due to interference fading, shadowing, terminal mobility, and so on. Since the traditional design of the algorithms, methods and protocols of the wired Internet did not take wireless networks into account, the performance over wireless networks is largely degraded. Especially, multi-hop communication aggravates the problem of wireless communication even further. To solve these problems, there has been increased interest to propose and design new algorithms and methodologies for wireless communication.

The aim of this workshop is to present the innovative researches, methods, and numerical analysis for wireless communication and wireless networks.

Many people contributed to the success of INWC-2019. First, we would like to thank the organizing committee of NBiS-2019 International Conference for giving us the opportunity to organize the workshop. We would like to thank all the authors of the workshop for submitting their research works and for their participation. We are looking forward to meet them again in the forthcoming editions of the workshop.

Finally, we would like to thank the Local Arrangement Chairs for the local arrangement of the workshop.

We hope you will enjoy the workshop and have a great time in Oita, Japan.

INWC-2019 Workshop Co-chairs

Leonard Barolli	Fukuoka Institute of Technology, Japan
Hiroshi Maeda	Fukuoka Institute of Technology, Japan

INWC-2019 Workshop PC Chair

Makoto Ikeda	Fukuoka Institute of Technology, Japan

INWC-2019 Organizing Committee

Workshop Co-chairs

Leonard Barolli	Fukuoka Institute of Technology, Japan
Hiroshi Maeda	Fukuoka Institute of Technology, Japan

Workshop PC Co-chair

Makoto Ikeda	Fukuoka Institute of Technology, Japan

Program Committee Members

Arjan Durresi	Indiana University–Purdue University Indianapolis (IUPUI), USA
Shinichi Ichitsubo	Kyushu Institute of Technology, Japan
Elis Kulla	Okayama University of Science, Japan
Zhi Qi Meng	Fukuoka University, Japan
Irfan Awan	Bradford University, UK
Tsuyoshi Matsuoka	Kyushu Sangyo University, Japan
Fatos Xhafa	Technical University of Catalonia, Spain
Kiyotaka Fujisaki	Fukuoka Institute of Technology, Japan
Noriki Uchida	Fukuoka Institute of Technology, Japan
Keita Matsuo	Fukuoka Institute of Technology, Japan
Shinji Sakamoto	Seikei University, Japan

Welcome Message from DEMoC-2019 Workshop Chair

Welcome to the 8th International Workshop on Advances in Data Engineering and Mobile Computing (DEMoC-2019) which will be held in conjunction with the 22nd International Conference on Network-Based Information Systems (NBiS-2019) at Oita University, Japan, from September 5 to September 7, 2019.

This international workshop is to bring together practitioners and researchers from both academia and industry in order to have a forum for discussion and technical presentations on the current researches and future research directions related to these hot research areas: data engineering and mobile computing. We encouraged contributions describing innovative work on DEMoC-2019 workshop.

Many people contributed to the success of DEMoC-2019. First, we would like to thank the organizing committee of NBiS-2019 International Conference for giving us the opportunity to organize the workshop. We would like to thank all the authors of the workshop for submitting their research works and for their participation. We are looking forward to meet them again in the forthcoming editions of the workshop.

Finally, we would like to thank the Local Arrangement Chairs for the local arrangement of the workshop.

We hope you will enjoy the workshop and have a great time in Oita, Japan.

DEMoC-2019 Workshop Chair

Yusuke Gotoh Okayama University, Japan

DEMoC-2019 Organizing Committee

Workshop Organizer

Yusuke Gotoh	Okayama University, Japan

Program Committee

Toshiyuki Amagasa	Tsukuba University, Japan
Akihito Hiromori	Osaka University, Japan
Akiyo Nadamoto	Konan University, Japan
Kenji Ohira	Nara Institute of Science and Technology, Japan
Shusuke Okamoto	Seikei University, Japan
Wenny Rahayu	La Trobe University, Australia
David Taniar	Monash University, Australia
Hideo Taniguchi	Okayama University, Japan
Tsutomu Terada	Kobe University, Japan
Tomoki Yoshihisa	Osaka University, Japan

Welcome Message from WSSM-2019 Workshop Co-chairs

Welcome to Bratislava and the 8th International Workshop on Web Services and Social Media (WSSM-2019), which is held in conjunction with the 22nd International Conference on Network-Based Information Systems (NBiS-2019) at Oita University, Japan from September 5 to September 7, 2019.

Web systems with IoT technology produce big data and they are becoming increasingly important in our society. The AI engine enables us to build novel web services for home and business use. In the next-generation social network services, not only consumer but also IoT will generate contents, which will drive our activity on the Internet.

The International Workshop on Web Services and Social Media (WSSM) encompasses a wide range of topics in the research, design and implementation of Web-related things, especially, social activity on the Internet. The 1st edition of the workshop (WSSM-2012) was held in Melbourne, Australia, the 2nd edition in Gwangju, Korea, the 3rd edition in Salerno, Italy, the 4th edition in Taipei, Taiwan, the 5th edition in Ostrava, Czech Republic, the 6th edition in Toronto, Canada, and the 7th edition in Bratislava, Slovakia. This time, we are honored to hold the 8th edition of the workshop.

This workshop provides an international forum for researchers and participants to share and exchange their experiences, discuss challenges, and present original ideas in all aspect of Web Services and Social Media.

Many people contributed to the success of WSSM-2019. First, we would like to thank the organizing committee of NBiS-2019 International Conference for giving us the opportunity to organize the workshop. We would like to thank our program committee members and all authors for submitting their research works and for their participation.

Finally, we would like to thank the Local Arrangement Chairs of NBiS-2019 conference. We hope you will enjoy WSSM-2019 workshop and NBiS-2019 International Conference and have a great time in Oita, Japan.

WSSM-2019 Workshop Co-chairs

Shusuke Okamoto	Seikei University, Japan
Masaki Kohana	Chuo University, Japan

WSSM-2019 Organizing Committee

Workshop Co-chairs

Shusuke Okamoto	Seikei University, Japan
Masaki Kohana	Chuo University, Japan

Program Chair

Masayuki Ihara	NTT Service Evolution Laboratories, Japan

Program Committee Members

Fatos Xhafa	Technical University of Catalonia, Spain
Hiroki Sakaji	The University of Tokyo, Japan
Jun Iio	Chuo University, Japan
Kin Fun Li	University of Victoria, Canada
Leonard Barolli	Fukuoka Institute of Technology, Japan
Makoto Ikeda	Fukuoka Institute of Technology, Japan
Makoto Takizawa	Hosei University, Japan
Masaru Kamada	Ibaraki University, Japan
Masaru Miyazaki	NHK, Japan
Tatsuhiro Yonekura	Ibaraki University, Japan
Tomoya Enokido	Rissho University, Japan
Yoshihiro Kawano	Tokyo University of Information Sciences, Japan
Yusuke Gotoh	Okayama University, Japan

NBiS-2019 Keynote Talks

3D Graphics Applications for Education and Visualization

Yoshihiro Okada

Kyushu University, Kyushu, Japan

Abstract. In this talk, I will introduce the research activities about 3D graphics applications. We have developed environments for 3D graphics applications for many years. We have proposed a new system for 3D graphics applications called IntelligentBox. I will present the IntelligentBox and several applications, especially for education and visualization. There are many education applications such as collaborative dental training system, Tai Chi-based physical therapy game, and so on. While as visualization applications, we can mention room layout system, Time-tunnel (a visual analytics tool for multi-dimensional data), Treecube (a visualization tool for browsing 3D multimedia data), and so on. I will introduce the development activities of our laboratory for e-learning materials using 3D graphics and VR/AR, such as web-based interactive educational materials for Japanese history and IoT security, and games for medical education.

Secure Resilient Edge Cloud Designed Network

Tarek Saadawi

The City University of New York, City College, New York, USA

Abstract. IoT systems have put forth new requirements in all aspects of their existence: a diverse QoS requirement, resiliency of computing and connectivity, and the scalability to support massive number of end devices in a plethora of envisioned applications. The trustworthy IoT/cyber-physical system (CPS) networking for smart and connected communities will be realized by distributed secure resilient Edge Cloud (EC). This distributed EC system will be a network of geographically distributed EC nodes, brokering between end devices and Backend Cloud (BC) servers. In this talk, I will present three main topics in the secure resilient cloud designed network: (1) resource management in mobile cloud computing; (2) information management in dynamic distributed databases; and (3) biological-inspired intrusion detection system (IDS). A focus in the presentation will be on the biological-inspired IDS.

Container-Leveraged Service Realization Challenges for Cloud-Native Computing

JongWon Kim

Gwangju Institute of Science & Technology (GIST), Gwangju, Korea

Abstract. Cloud-native computing, employing container-based microservices architecture, is accelerating its adoption for agile and scalable service deployment over worldwide multi-cloud infrastructure. In order to transparently enable diversified inter-connections for container-based cloud-native computing, by leveraging SDN/NFV technology, we need to tie distributed IoT things through multi-site edge clouds to hyper-scale core clouds. Thus, in this talk, I first attempt to relate the open-source-driven development for CNI (Container Networking Interface) and CSI (Container Storage Interface) to the required container-enabled cloud-native computing/storage with end-to-end (i.e., IoT–SDN/NFV–Cloud) inter-connections. Then, selected container-leveraged service realization challenges such as multi-tenant/multi-cluster Kubernetes orchestration, pvc (physical+virtual+containerized) harmonization, kernel-friendly accelerated and secured networking, and network-aware service meshes will be briefly discussed.

Contents

The 22nd International Conference on Network-Based Information Systems (NBiS-2019)

Evaluation of an OI (Operation Interruption) Protocol to Prevent Illegal Information Flow in the IoT 3
Shigenari Nakamura, Tomoya Enokido, and Makoto Takizawa

Evaluation of Data and Subprocess Transmission Strategies in the Tree-Based Fog Computing Model 15
Ryuji Oma, Shigenari Nakamura, Dilawaer Duolikun, Tomoya Enokido, and Makoto Takizawa

Performance Evaluation of WMNs by WMN-PSOHC System Considering Random Inertia Weight and Linearly Decreasing Vmax Replacement Methods 27
Shinji Sakamoto, Seiji Ohara, Leonard Barolli, and Shusuke Okamoto

Implementation of a Fuzzy-Based Simulation System and a Testbed for Improving Driving Conditions in VANETs Considering Drivers's Vital Signs 37
Kevin Bylykbashi, Ermioni Qafzezi, Makoto Ikeda, Keita Matsuo, and Leonard Barolli

Multi-cloud System for Content Sharing Using RAID-Like Fragmentation 49
Takumi Murakami and Shinji Sugawara

A VR System for Alleviating a Fear of Heights Based on Vital Sensing and Placebo Effect 62
Iku Kitanosono, Toshiyuki Haramaki, Tsuneo Kagawa, and Hiroaki Nishino

Exploring Bit Arrays for Join Processing in Spatial Data Streams 73
Wendy Osborn

2D Color Image Enhancement Based on Conditional Generative Adversarial Network and Interpolation 86
Yen-Ju Li, Chun-Hsiang Chang, Chitra Meghala Yelamandala, and Yu-Cheng Fan

Position Follow-up Control for Hand Delivery of Object Between Moving Robot Arms of Remote Robot Systems with Force Feedback 96
Qin Qian, Yutaka Ishibashi, Pingguo Huang, and Yuichiro Tateiwa

A SOA Based SLA Negotiation and Formulation Architecture for Personalized Service Delivery in SDN 108
Shuraia Khan and Farookh Khadeer Hussain

An Energy-Efficient Process Replication Algorithm with Multi-threads Allocation 120
Tomoya Enokido, Dilawaer Duolikun, and Makoto Takizawa

Application of Perceptual Features for User Authentication in Distributed Systems 132
Marek R. Ogiela and Lidia Ogiela

User Oriented Protocols for Data Sharing and Services Management 137
Lidia Ogiela, Makoto Takizawa, and Urszula Ogiela

Development of Borehole Imaging Method with Using Visual-SLAM 142
Tsuneo Kagawa

A Mechanism of Window Switching Prediction Based on User Operation History to Facilitate Multitasking 154
Keizo Sato, Shotaro Imada, Shinya Mazume, and Makoto Nakashima

Opportunistic Communication by Pedestrians with Roadside Units as Message Caches 167
Tomoyuki Sueda and Naohiro Hayashibara

VLSI Implementation of K-Best MIMO Detector with Cost-Effective Pre-screening and Fast Sorting Design 178
Jheng-Jhan He and Chih-Peng Fan

Meal Information Recognition Based on Smart Tableware Using Multiple Instance Learning 189
Liyang Zhang, Kohei Kaiya, Hiroyuki Suzuki, and Akio Koyama

From Ivory Tower to Democratization and Industrialization: A Landscape View of Real-World Adaptation of Artificial Intelligence 200
Toshihiko Yamakami

Data Exportation Framework for IoT Simulation Based Devices 212
Yahya Al-Hadhrami, Nasser Al-Hadhrami, and Farookh Khadeer Hussain

Earthquake and Tsunami Workflow Leveraging the Modern HPC/Cloud Environment in the LEXIS Project 223
Thierry Goubier, Andrea Ajmar, Carmine D'Amico, Paul Dubrulle, Susanna Grita, Stephane Louise, Jan Martinovič, Tomáš Martinovič, Natalja Rakowsky, Paolo Savio, Danijel Schorlemmer, Alberto Scionti, and Olivier Terzo

Alternative Paths Reordering Using Probabilistic Time-Dependent Routing 235
Martin Golasowski, Jakub Beránek, Martin Šurkovský, Lukáš Rapant, Daniela Szturcová, Jan Martinovič, and Kateřina Slaninová

A Proposal of Recommendation Function for Solving Element Fill-in-Blank Problem in Java Programming Learning Assistant System 247
Nobuo Funabiki, Shinpei Matsumoto, Su Sandy Wint, Minoru Kuribayashi, and Wen-Chun Kao

Web-Based Interactive 3D Educational Material Development Framework and Its Authoring Functionalities 258
Daiki Hirayama, Wei Shi, and Yoshihiro Okada

Data Relation Analysis Focusing on Plural Data Transition for Detecting Attacks on Vehicular Network 270
Jun Yajima, Takayuki Hasebe, and Takao Okubo

Gait-Based Authentication for Smart Locks Using Accelerometers in Two Devices 281
Kazuki Watanabe, Makoto Nagatomo, Kentaro Aburada, Naonobu Okazaki, and Mirang Park

Automatic Vulnerability Identification and Security Installation with Type Checking for Source Code 292
Shun Hinatsu, Koichi Shimizu, Takeshi Ueda, Benoît Boyer, and David Mentré

Blockchain-Based Malware Detection Method Using Shared Signatures of Suspected Malware Files 305
Ryusei Fuji, Shotaro Usuzaki, Kentaro Aburada, Hisaaki Yamaba, Tetsuro Katayama, Mirang Park, Norio Shiratori, and Naonobu Okazaki

Draft Design of Li-Fi Based Acquisition Layer of DataLake Framework for IIoT and Smart Factory 317
ByungRae Cha, Sun Park, Byeong-Chun Shin, and JongWon Kim

A Novel Hybrid Recommendation System Integrating Content-Based and Rating Information 325
Tan Nghia Duong, Viet Duc Than, Tuan Anh Vuong, Trong Hiep Tran, Quang Hieu Dang, Duc Minh Nguyen, and Hung Manh Pham

The 14th International Workshop on Network-Based Virtual Reality and Tele-Existence (INVITE-2019)

Proposal of a High-Presence Japanese Traditional Crafts Presentation System Integrated with Different Cultures 341
Yangzhicheng Lu, Tomoyuki Ishida, Akihiro Miyakwa, Yoshitaka Shibata, and Hiromasa Habuchi

Proposal of Interactive Information Sharing System Using Large Display for Disaster Management 350
Ryo Nakai, Tomoyuki Ishida, Noriki Uchida, Yoshitaka Shibata, and Hiromasa Habuchi

A TEFL Virtual Reality System for High-Presence Distance Learning 359
Steven H. Urueta and Tetsuro Ogi

A Trial Development of 3D Statues Map with 3D Point Server 369
Hideo Miyachi

Driving Simulator System for Disaster Evacuation Guide Based on Road State Information Platform 377
Yoshitaka Shibata and Akira Sakuraba

The 13th International Workshop on Advanced Distributed and Parallel Network Applications (ADPNA-2019)

Estimation Method of Traffic Volume Using Big-Data 387
Kazuki Someya, Ryozo Kiyohara, and Masashi Saito

Experimental Evaluation of Publish/Subscribe-Based Spatio-Temporal Contents Management on Geo-Centric Information Platform 396
Kaoru Nagashima, Yuzo Taenaka, Akira Nagata, Katsuichi Nakamura, Hitomi Tamura, and Kazuya Tsukamoto

DTN Sub-ferry Nodes Placement with Consideration for Battery Consumption 406
Kazunori Ueda

Concept Proposal of Multi-layer Defense Security Countermeasures Based on Dynamic Reconfiguration Multi-perimeter Lines 413
Shigeaki Tanimoto, Yuuki Takahashi, Ayaka Takeishi, Sonam Wangyal, Tenzin Dechen, Hiroyuki Sato, and Atsushi Kanai

Fault Detection of Process Replicas on Reliable Servers 423
Hazuki Ishii, Ryuji Oma, Shigenari Nakamura, Tomoya Enokido, and Makoto Takizawa

Deep Recurrent Neural Networks for Wi-Fi Based Indoor Trajectory Sensing 434
Hao Li, Joseph K. Ng, and Junxing Ke

The 10th International Workshop on Heterogeneous Networking Environments and Technologies (HETNET-2019)

A Model for Mobile Fog Computing in the IoT 447
Kosuke Gima, Ryuji Oma, Shigenari Nakamura, Tomoya Enokido, and Makoto Takizawa

Converting Big Video Data into Short Video: Using 360-Degree Cameras for Searching Students Location and Judging Students Learning Style 459
Noriyasu Yamamoto

Crowdsourcing Platform for Healthcare: Cleft Lip and Cleft Palate Case Studies 465
Krit Khwanngern, Juggapong Natwichai, Suriya Sitthikham, Watcharaporn Sitthikamtiub, Vivatchai Kaveeta, Arakin Rakchittapoke, and Somboon Martkamjan

Jaw Surgery Simulation in Virtual Reality for Medical Training 475
Krit Khwanngern, Narathip Tiangtae, Juggapong Natwichai, Aunnop Kattiyanet, Vivatchai Kaveeta, Suriya Sitthikham, and Kamolchanok Kammabut

The 10th International Workshop on Intelligent Sensors and Smart Environments (ISSE-2019)

Fusion Method of Depth Images and Visual Images for Tire Inspection 487
Chien-Chou Lin, Chun-Cheng Chang, Ching-Lung Chang, and Chuan-Yu Chang

A Research on Constructing the Recognition System for the Dynamic Pedestrian Traffic Signals Through Machine Vision 493
Chien-Chung Wu and Yi-Chieh Hsug

Learning Depth from Monocular Sequence with Convolutional LSTM Network 502
Chia-Hung Yeh, Yao-Pao Huang, Chih-Yang Lin, and Min-Hui Lin

Two-Dimensional Inductance Plane Sensor for Smart Home Door Lock 508
Wen-Shan Lin, Chao-Ting Chu, and Chian C. Ho

Wearable EMG Gesture Signal Acquisition Device Based on Single-Chip Microcontroller 517
Wen-Shan Lin, Chao-Ting Chu, and Chian C. Ho

Ring-Based Routing for Industrial Wireless Sensor Networks 526
Ching-Lung Chang, Hao-Ting Lee, and Chuan-Yu Chang

Proposal of Research Information Collection System 537
Takahiro Uchiya, Ryoa Sugisaki, and Ichi Takumi

Agricultural Pests Damage Detection Using Deep Learning 545
Ching-Ju Chen, Jian-Shiun Wu, Chuan-Yu Chang, and Yueh-Min Huang

The 10th International Workshop on Trustworthy Computing and Security (TwCSec-2019)

Analysis of Actual Propagation Behavior of WannaCry Within an Intranet (Extended Abstract) 557
Takanori Oikawa, Masahiko Takenaka, and Yuki Unno

Proposal and Evaluation of Authentication Method Having Shoulder-Surfing Resistance for Smartwatches Using Shift Rule 560
Makoto Nagatomo, Kazuki Watanabe, Kentaro Aburada, Naonobu Okazaki, and Mirang Park

Evaluation of Manual Alphabets Based Gestures for a User Authentication Method Using s-EMG 570
Hisaaki Yamaba, Shotaro Usuzaki, Kayoko Takatsuka, Kentaro Aburada, Tetsuro Katayama, Mirang Park, and Naonobu Okazaki

Analysis of the Reasons Affecting the Simulation Results of SAR Imaging 581
Xing-Xiu Song

Finite Element Simulation of Blasting Robote with ANSYS 586
Xing-Xiu Song

The 9th International Workshop on Information Networking and Wireless Communications (INWC-2019)

Performance Evaluation of VegeCare Tool for Tomato Disease Classification 595
Natwadee Ruedeeniraman, Makoto Ikeda, and Leonard Barolli

Performance Analysis of WMNs by WMN-PSODGA Simulation System Considering Load Balancing: A Comparison Study for Exponential and Weibull Distribution of Mesh Clients 604
Seiji Ohara, Admir Barolli, Shinji Sakamoto, and Leonard Barolli

Evaluation of 13.56 MHz RFID System Considering Tag Magnetic Field Intensity 620
Yuki Yoshigai and Kiyotaka Fujisaki

Numerical Analysis of Fano Resonator in 2D Periodic Structure for Integrated Microwave Circuit 630
Hiroshi Maeda, Naoki Higashinaka, and Akihito Ochi

The 8th International Workshop on Advances in Data Engineering and Mobile Computing (DEMoC-2019)

Evaluation of I/O Performance Regulating Function with a Virtual Machine 641
Takashi Nagao, Nasanori Tanabe, Kazutoshi Yokoyama, and Hideo Taniguchi

A Continuous Media Data Broadcasting Model for Base Stations Moving Straight 650
Tomoki Yoshihisa, Yusuke Gotoh, and Akimitsu Kanzaki

A Support System for Second Tourism 658
Yusuke Gotoh

Omotenashi Robots: Generating Funny Dialog Using Visitor Geographical Information 669
Kazuki Haraguchi, Satoshi Aoki, Tomohiro Umetani, Tatsuya Kitamura, and Akiyo Nadamoto

The 8th International Workshop on Web Services and Social Media (WSSM-2019)

Web Service for Searching Halal Compliant Restaurants 683
Imama, Masaki Kohana, and Masaru Kamada

Implementation of Interactive Tutorial for IslayPub by Hooking User Events 692
Daisuke Tanaka, Masaki Kohana, Michitoshi Niibori, Yasuhiro Ohtaki, Shusuke Okamoto, and Masaru Kamada

A Smart Lock Control System with Home Situation 700
Katsumi Ohkura and Masaki Kohana

Card Price Prediction of Trading Cards Using Machine Learning Methods 705
Hiroki Sakaji, Akio Kobayashi, Masaki Kohana, Yasunao Takano, and Kiyoshi Izumi

Kawaii in Tweets: What Emotions Does the Word Describe in Social Media? 715
Jun Iio

Development of Goals Achievement Sharing System Based on Approach Goals in Positive Psychology 722
Yoshihiro Kawano

A Real-Time Programming Battle Web Application by Using WebRTC 731
Ryoya Fukutani, Shusuke Okamoto, Shinji Sakamoto, and Masaki Kohana

Author Index 739