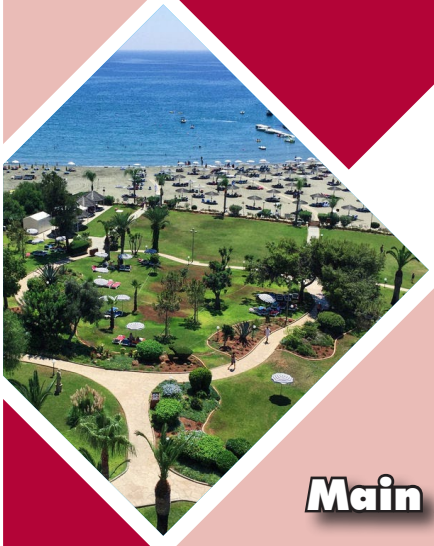
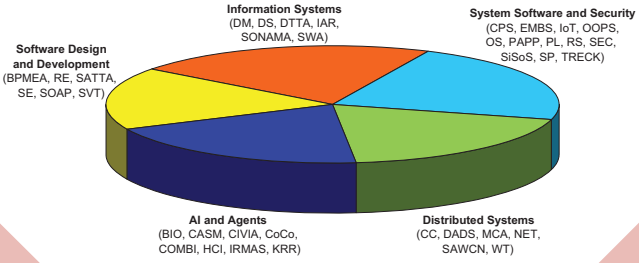
2019
Symposium on Applied Computing





Association for Computing Machinery

Advancing Computing as a Science & Profession

Limassol, Cyprus
April 8-12, 2019

Main Menu

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ACM Special Interested Group on Applied Computing

The 34th Annual ACM Symposium on Applied Computing

Limassol, Cyprus
April 8-12, 2019

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ACM SIGAPP

The ACM Special Interest Group on Applied Computing is ACM's primary applications-oriented SIG. Its mission is to further the interests of the computing professionals engaged in the development of new computing applications and applications areas and the transfer of computing technology to new problem domains. SIGAPP offers practitioners and researchers the opportunity to share mutual interests in innovative application fields, technology transfer, experimental computing, strategic research, and the management of computing. SIGAPP also promotes widespread cooperation among business, government, and academic computing activities. Its annual Symposium on Applied Computing (SAC) provides an international forum for presentation of the results of strategic research and experimentation for this inter-disciplinary environment. SIGAPP membership fees are: $15.00 for ACM Non-members, $15.00 for ACM Professional Members, and $8.00 for ACM Student Members. For further information on SIGAPP, please contact Jiman Hong at jiman@ssu.ac.kr or visit the SIGAPP website at http://www.acm.org/sigapp.

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Message from the Symposium Chairs

Chih Cheng Hung and George A. Papadopoulos

On behalf of the Organizing Committee, we welcome you to the 34th Annual ACM Symposium on Applied Computing (SAC 2019), hosted by the University of Cyprus and held in the beautiful coastal city of Limassol. This international forum has been dedicated to computer scientists, engineers and practitioners for the purpose of presenting their research findings and results in various areas of applied computing. The organizing committee is grateful for your participation in this exciting international event. We hope that this conference proves interesting and beneficial for all of you.

The Symposium is sponsored by the ACM Special Interest Group on Applied Computing (SIGAPP), whose mission is to further the interests of computing professionals engaged in the design and development of new computing applications, interdisciplinary applications areas, and applied research. This conference is dedicated to the study of applied computing research of real-world problems. In addition, this event provides an avenue to discuss and exchange new ideas in the wide spectrum of applied computing areas. We all recognize the importance of updating the latest developments and research in our current areas of expertise.

SAC 2019 offers Technical Tracks and Poster Sessions. The success of the conference can be attributed to the substantial contribution of dedicated Track Chairs and Co-Chairs. Each track maintains a program committee and a set of highly qualified reviewers. We wish to thank the Track Chairs, Co-Chairs, Committee Members and participating reviewers for their hard work and effort to make the SAC 2019 conference a high quality conference. We also thank our invited keynote speakers, Professor Jocelyn Chanussot from the Grenoble Institute of Technology (Grenoble INP), Grenoble, France, and Yiorgos (George) Chrysanthou from the University of Cyprus, Cyprus, for sharing their knowledge and expertise with SAC 2019 attendees. Most of all, we would like to especially thank the authors and presenters for sharing their experience with the rest of us and to all attendees for joining us in Limassol, Cyprus this year.

The local organizing committee has been a major contributor to the success of the SAC 2019 conference. Our gratitude goes to the local arrangement team, including Georgia Kapitsaki (Tutorial Chair), Christos Mettouris (Local Arrangement Chair), and Achilleas Achilleos (Posters Co-Chair) from the University of Cyprus, Cyprus. We also extend our thanks to the Publication Chair, Hossain Shahriar, Kennesaw State University, USA, for his tremendous effort in putting together the conference proceedings, and Posters Co-Chair, Alessio Bechini, University of Pisa, Pisa, Italy, for his hard work to make a successful Poster Program. Our thanks also go to SRC Chair Armin R. Mikler, Publicity Chair Junyoung Heo, and Treasurer John Kim. A special thanks to our Program Chairs, Dongwan Shin, New Mexico Tech, Socorro, New Mexico, USA, and Seiji Isotani, University of São Paulo, São Paulo, Brazil, for coordinating and bringing together an excellent Technical Program. We also highly appreciate the financial support of the ACM SIGAPP Chair, Jiman Hong, for our Student Travel Award Program (STAP). Finally, we would like to thank our co-sponsors: Microsoft (for SRC), the Cyprus Tourist Organization and Austrian Airlines.

It has been a great pleasure to working with all of you and learning so much from each of you. Again, we welcome you to SAC 2019 in the thriving city of Limassol, Cyprus. We hope you enjoy the SAC 2019 conference and your stay in Cyprus.

Chih-Cheng Hung, The ACM SAC 2019 Conference Chair
Kennesaw State University, Marietta, Georgia, USA
George A. Papadopoulos, The ACM SAC 2019 Conference Vice Chair
University of Cyprus, Nicosia, Cyprus

Message from the Program Chairs

Dongwan Shin
New Mexico Tech University
New Mexico, USA

Seiji Isotani
University of Sao Paulo
Sao Paulo, Brazil

Welcome to the 34th International Symposium on Applied Computing (SAC 2019). For the past 33 years, SAC has become a major international venue for computing researchers and applied practitioners to convene and share ideas on recent developments in a variety of applied areas of computer science and information technology. The success of SAC has been the consolidation of a wide range of applied areas into specialized modules called *Tracks*. Each of the Tracks is then organized and administered by experts in the respective areas by instituting program committees, carrying out blind reviews according to the ACM guidelines, and finally selecting highly qualified papers for the Track. Since its inception sixteen years ago, the Poster Sessions at SAC have become a tradition, and this year again the Poster will be an integral part of the Technical Program at SAC 2019.

The open Call for Track Proposals and after prescreening the proposals, 46 Tracks were finally accepted for SAC 2019. The prescreening and selections were made based on the success of those Tracks in the previous SACs as well as targeting new and emerging areas. The Call for Papers for these Tracks attracted 1067 final paper submissions from over 50 different countries. The submitted papers underwent the blind review process and 258 submissions were finally accepted as full papers for inclusion in the Conference Proceedings and presentation during the Symposium. The final acceptance rate for SAC 2019 is (24.2%) for the overall track. In addition to the accepted full papers, 76 submissions that received high enough review scores were accepted as poster papers for the Posters program. The Student Research Competition (SRC) program, sponsored by Microsoft Research, is designed to provide graduate students the opportunity to meet and exchange ideas with researchers and practitioners in their areas of interest. 57 SRC abstract submissions received and finally 17 (30%) submissions were accepted.

The Technical Program of SAC 2019 is made possible through the hard work of many people from the scientific community who have volunteered and committed many hours to make it a success. Much credit goes to all Track Chairs for making SAC 2019 Technical Sessions a huge success. Some of the popular Tracks had an unprecedented submissions and having at least three blind reviews for each paper was certainly a major challenge. Once again this year, we follow the previous years' tradition in organizing various tracks into five different themes. The Symposium Proceedings and the technical presentations are focused around these themes to form a series of related track sessions. On behalf of the entire SAC 2019 Organizing Committee, we congratulate all the authors for having their papers accepted in their respective Tracks, and we wish to thank all of those who made this year's technical program a great success. Specifically, we wish to thank the speakers, posters chair, SRC chair, track chairs, reviewers, technical program committee members, session chairs, presenters, and all the attendees. We also wish to convey our special thanks to the local organizing committee. We wish you all a pleasant stay in Limassol, Cyprus, and have the opportunity to share and exchange your ideas and foster new collaborations. We also hope to see you at SAC 2020.

Track Chairs

Theme: Artificial Intelligence and Agents

BIO - Computational Biology and Bioinformatics

Paola Lecca, University of Trento, Italy
Dan Tulpan, National Research Council, Canada
Juan Manuel Corchado Rodriguez, University of Salamanca, Spain

CIVIA- Computational Intelligence and Video & Image Analysis

Yin-Fu Huang, National Yunlin University of Science and Technology, Taiwan
Agostinho Rosa, University of Lisbon, Portugal

COMBI- Advances in COMputational Biomedical Imaging

Mohammed El Hassouni, Mohammed V University in Rabat, Morocco
Rachid Jennane, University of Orleans, France
Ayman El-Baz, University of Louisville, USA

HCI - Smart Human Computer Interaction

Soon Ki Jung, Kyungpook National University, South Korea
Anand Paul, Kyungpook National University, South Korea
Ganesh Kumar P., Anna University, India
Awais Ahmad, University of Milan, Italy

IRMAS - Intelligent Robotics and Multi-Agent Systems

Rui P. Rocha, ISR – University of Coimbra, Portugal
Daniel Kudenko, University of York, UK

KLP - Knowledge and Language Processing Track

Mauro Dragoni, Fondazione Bruno Kessler, Italy
Marco Rospocher, Fondazione Bruno Kessler, Italy

KomIS - Knowledge Discovery meets Information Systems Track

Fabio Mercorio, University of Milano-Bicocca, Italy
Mario Mezzanzanica, University of Milano-Bicocca, Italy
Antonio Picariello, University of Naples "Federico II", Italy

KRR - Knowledge Representation and Reasoning Track

Stefano Bistarelli, Università di Perugia, Italy
Martine Ceberio, Univerity of Texas El Paso, USA
Eric Monfroy, Université de Nantes, France
Francesco Santini, Università di Perugia, Italy

MLA - Machine Learning and its Applications Track

Keon Myung Lee, Chungbuk National University, South Korea
Jee-Hyong Lee, Sungkyunkwan University, South Korea

Theme: Distributed Systems

CC - Cloud Computing

Priya Chandran, National Institute of Technology Calicut, India
S.D Madhu Kumar, National Institute of Technology Calicut, India

CCNIV - Communication, Computing and Networking in Internet of Vehicles Track

Imen Jemili, University of Carthage, Tunisia
Mohamed Mosbah, Bordeaux INP, France

DADS - Dependable and Adaptive Distributed Systems

Karl M. Goeschka, UAS Technikum Vienna, Austria
Rui Oliveira, Universidade do Minho, Portugal
Peter Pietzuch, Imperial College London, United Kingdom
Giovanni Russello, University of Auckland, New Zealand

DAPP - Decentralized Applications with Blockchain, DLT and Crypto-Currencies Track

Jean-Marc Seigneur, University of Geneva/Reputaction, Switzerland/France

MCA - Mobile Computing and Applications Track

Hong Va Leong, The Hong Kong Polytechnic University, Hong Kong, China
Sheikh Iqbal Ahamed, Marquette University, USA

MiDOS - Microservices, DevOps, and Service-Oriented Architecture Track

Luís Cruz-Filipe, University of Southern Denmark, Denmark
Elisabetta Di Nitto, Politecnico di Milano, Italy
Jacopo Mauro, University of Southern Denmark, Denmark

NET - Networking Track

Mário M. Freire, University of Beira Interior, Portugal
Marília Curado, University of Coimbra, Portugal
Ivan Ganchev, University of Limerick, University of Plovdiv “Paisii Hilendarski”

WCN - Selected Areas of Wireless Communications and Networking Track
Dongkyun Kim, Kyungpook National University, South Korea
Wei Wang, San Diego State University, USA

WT - Web Technologies
Tim A. Majchrzak, University of Agder - Kristiansand, Norway
Cristian Mateos, UNICEN University - Tandil, Argentina
Francesco Poggi, University of Bologna - Bologna, Italy

Theme: Information Systems

DBDM - Databases and Big Data Management Track
Ramzi Haraty, Lebanese American University, USA
Apostolos Papadopoulos, Aristotle University, Greece
Junping Sun, Nova Southeastern University, USA

DLHWB - Digital Life for Human Well-being Track
Sara Comai, Politecnico di Milano, Italy
Luc De Witte, The University of Sheffield, UK
Fabio Salice, Politecnico di Milano, Italy

DM - Data Mining
Hasan Jamil, University of Idaho, United States
Rosa Meo, Università degli Studi di Torino, Italy

DS - Data Streams

Albert Bifet, LTCI, Telecom ParisTech, France
Andre Carvalho, ICMC, USP, Brazil
Joao Gama, University of Porto, Portugal

GIA - GeoInformation Analytics Track
Maguelonne Teisseire, UMR TETIS, France
Christian Sallaberry, University of PAU & PAYS ADOUR, France
Eric Kergosien, University of Lille, France
Cyril de Runz, University of Reims, France
Thomas Guyet, AGROCAMPUS-OUEST/IRISA, France

HI - Health Informatics Track
Anu Mary Chako, National Institute of Technology Calicut, India
Gopakumar G, National Institute of Technology Calicut, India

IAR - Information Access and Retrieval Track
Gloria Bordogna, CNR-IREA Consiglio Nazionale delle Ricerche - CNR IREA, Italy
Gabriella Pasi, Università degli Studi di Milano Bicocca -DISCo, Italy

SFECS - Sustainability of Fog/Edge Computing Systems Track
Christian Esposito, University of Napoli "Federico II", Italy
Florin Pop, University POLITEHNICA of Bucharest, Romania
Chang Choi, Chosun University, Republic of Korea

SONAMA - Social Network and Media Analysis
Sang-Wook Kim, Hanyang University, South Korea

SWA - Semantic Web and Applications Track
Soon Ae Chun, City University of New York, USA
Hyoil Han, Illinois State University, USA
Sangsoo Sung, Google Inc., USA

WICE - Web-based Technologies for Interactive Computing Education Track
Maiga Chang, Athabasca University, Canada
Hasan Jamil, University of Idaho, USA

Theme: Software Design and Development

BPMEA- Business Process Management & Enterprise Architecture

Marco Brambilla, Politecnico di Milano, Italy
Davide Rossi, University of Bologna, Italy

RE - Requirement Engineering

Maria Lencastre, Universidade de Pernambuco, Brazil
João Araújo, Universidade Nova de Lisboa, Portugal

SATTA - Software Architecture: Theory, Technology, and Applications Track

Marcello M. Bersani, Politecnico di Milano, Italy
Sungwon Kang, Korea Advanced Institute of Science and Technology, South Korea
Patrizia Scandurra, University of Bergamo, Italy

SE - Software Engineering

Tao Zhang, Harbin Engineering University, China
Byungjeong Lee, Univesity of Seoul, South Korea
Eunjee Song, Baylor University, United States

SVT - Software Verification and Testing Track

Matthias Guedemann, Diffblue Ltd., UK
Leonardo Mariani, University of Milano Bicocca, Italy

UE - Usability Engineering Track

Eduardo Mosqueira-Rey, University of A Coruña, Spain
Vicente Moret-Bonillo, University of A Coruña, Spain
David Alonso-Ríos, University of A Coruña, Spain

VSPLE - Variability and Software Product Line Engineering Track

Abdelhak-Djamel Seriai, University of Montpellier, France
Tewfik Ziadi, University Pierre et Marie Curie, France

Theme: System Software and Security

CPS - Cyber-Physical Systems Track

Jingtong Hu, University of Pittsburgh, USA
Jason Xue, City University of Hong Kong, Hong Kong
Qi Zhu, Northwestern University, USA

EMBS - Embedded Systems Track

Li-Pin Chang, National Chiao-Tung University, Taiwan
Marco Di Natale, Scuola Superiore S. Anna, Italy

IoT - Internet of Things Track

Gail-Joon Ahn, Arizona State University, USA
Seong-Je Cho, Dankook University, South Korea
Jun Zheng, NewMexico Institute of Mining and Technology, USA

NGPS - Next Generation Programming Paradigms and Systems Track

Davide Ancona, University of Genova, Italy
Frédéric Loulergue, Northern Arizona University, USA
Mirko Viroli, Alma Mater Studiorum - Università di Bologna, Italy
Danilo Pianini, Alma Mater Studiorum - Università di Bologna, Italy

OS - Operating Systems Track

George Hamer, South Dakota State University, USA
Bongjae Kim, Sun Moon Univeristy, South Korea
Jaeheung Lee, Daejeon University, South Korea

PDP - Privacy by Design in Practice Track

Ronald Petrlic, The Commissioner for Data Protection and Freedom of Information Baden-Württemberg, Germany
Christoph Sorge, Saarland University, Germany

PL - Programming Languages

Barrett Bryant, University of North Texas, United States
Rajeev Raje, Indiana University-Purdue University-Indianapolis, USA

RS - Recommender Systems: Theory and Applications Track
Markus Zanker, Free University of Bozen-Bolzano, Italy
Li Chen, Hong Kong Baptist University, Hong Kong, China
Panagiotis Symeonidis, Free University of Bozen-Bolzano, Italy
Yong Zheng, Illinois Institute of Technology, USA

SEC - Computer Security Track
Giampaolo Bella, Università di Catania, Italy
Rosario Giustolisi, IT University of Copenhagen, Denmark

SiSoS - Software-intensive Systems-of-Systems Track
Flavio Oquendo, IRISA - UMR CNRS – Univ. Bretagne Sud, France
Khalil Drira, LAAS - CNRS – Univ. Toulouse, France
Axel Legay, UCLouvain, Belgium
Thais Vasconcelos Batista, DIMAp – UFRN, Brazil

SP - Software Platforms Track
Jinman Jung, Hannam University, South Korea
Jun Huang, Chongqing University of Posts and Telecom, China

Keynote I

Title: Deep Learning for the Processing of Hyperspectral Data: Over a Decade of History

Speaker:

Prof. Jocelyn Chanussot
GIPSA-Lab
Grenoble Institute of Technology, France

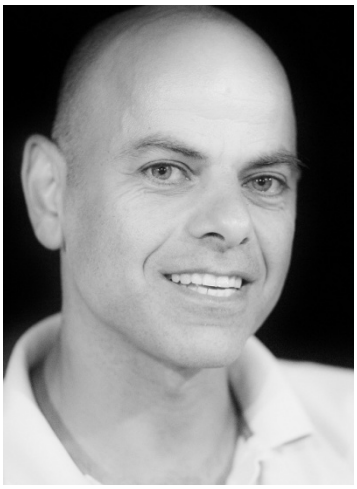
Biography

Jocelyn Chanussot received the M.Sc. degree in electrical engineering from the Grenoble Institute of Technology (Grenoble INP), Grenoble, France, in 1995, and the Ph.D. degree from the Université de Savoie, Annecy, France, in 1998. In 1999, he was with the Geography Imagery Perception Laboratory for the Delegation Generale de l'Armement (DGA - French National Defense Department). Since 1999, he has been with Grenoble INP, where he is currently a Professor of signal and image processing. He is conducting his research at the Grenoble Images Speech Signals and Automatics Laboratory (GIPSA-Lab). His research interests include image analysis, multicomponent image processing, nonlinear filtering, and data fusion in remote sensing. He has been a visiting scholar at Stanford University (USA), KTH (Sweden) and NUS (Singapore). Since 2013, he is an Adjunct Professor of the University of Iceland. In 2015-2017, he was a visiting professor at the University of California, Los Angeles (UCLA). Dr. Chanussot is the founding President of IEEE Geoscience and Remote Sensing French chapter (2007-2010) which received the 2010 IEEE GRS-S Chapter Excellence Award. He was the co-recipient of the NORSIG 2006 Best Student Paper Award, the IEEE GRSS 2011 and 2015 Symposium Best Paper Award, the IEEE GRSS 2012 Transactions Prize Paper Award and the IEEE GRSS 2013 Highest Impact Paper Award. He was a member of the IEEE Geoscience and Remote Sensing Society AdCom (2009- 2010), in charge of membership development. He was the General Chair of the first IEEE GRSS Workshop on Hyperspectral Image and Signal Processing, Evolution in Remote sensing (WHISPERS). He was the Chair (2009-2011) and Co-Chair of the GRS Data Fusion Technical Committee (2005-2008). He was a member of the Machine Learning for Signal Processing Technical Committee of the IEEE Signal Processing Society (2006-2008) and the Program Chair of the IEEE International Workshop on Machine Learning for Signal Processing, (2009). He was an Associate Editor for the IEEE Geoscience and Remote Sensing Letters (2005-2007) and for Pattern Recognition (2006-2008). Since 2007, he is an Associate Editor for the IEEE Transactions on Geoscience and Remote Sensing. He was the Editor-in-Chief of the IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (2011-2015). In 2013, he was a Guest Editor for the Proceedings of the IEEE and in 2014 a Guest Editor for the IEEE Signal Processing Magazine. He is a Fellow of the IEEE, a member of the Institut Universitaire de France (2012- 2017) and a 2018 Highly Cited Researcher (Clarivate Analytics).

Abstract

Over the past decade, deep learning techniques have been increasingly considered for the processing and analysis of hyperspectral data. A variety of tasks have been addressed, ranging from denoising, dimension reduction and feature extraction, to spectral unmixing, classification or data fusion. In 2008, the data fusion contest organized by the IEEE Geoscience and Remote Sensing Society served as an early warning milestone: the contest involved the classification of hyperspectral data. Among over 2000 entries to the contest, 9 out of the 10 best performing teams were using SVM and some sort of spectral spatial feature extraction or regularization. But the very best results were actually already achieved by a neural approach. In the following years and even more recently, deep learning techniques systematically dominate all the rankings. In this overview, special attention will be given to autoencoders and convolutional neural networks as well as their recent evolutions. In addition, the current challenges and future directions in the research of hyperspectral data processing will be provided.

Keynote II



Title: Data Driven Character Simulation

Speaker:

Yiorgos L. Chrysanthou
Computer Science Department
University of Cyprus, Cyprus

Biography

Yiorgos L. Chrysanthou is a Professor at the Computer Science Department of the University of Cyprus where he is heading the Graphics and Hypermedia lab. He is also the Research Director of the newly established Centre of Excellence on Interactive Media, Smart Systems and emerging Technologies (RISE). Yiorgos was educated in the UK (Queen Mary College, University of London) and worked for several years as a research fellow and a lecturer at University College London. He has published over 80 papers in journals and international conferences and served as the local or overall coordinator of over 27 research projects, related to 3D graphics, virtual reality and applications. His research interests lie in the general area of 3D Computer Graphics, recently focusing more on computer animation, algorithms for real-time AR and VR rendering and reconstruction of urban environments.

Abstract

Virtual environments are increasingly present in our lives, with a large number of potential applications. An indispensable component of many of these applications are virtual humans. From training for evacuation through to background scenes for a historical drama, virtual characters provide important context and constraints to the user; they can significantly improve the plausibility of the environment leading to a more realistic response, and ultimately, better understanding of the situation or better entertainment. Increasing processing power due to multicore architectures, improved clock speeds and highly programmable Graphics Processing Units (GPUs), enable designers and programmers to add multitudes of virtual characters in real-time applications. As the real-time rendering of the characters is becoming more and more realistic, there is a considerable gap between the rendering appearance and their simulated behavior. In this presentation we will look at some recent work on data-driven character simulation and animation covering both the simulation of virtual crowds and ambient life as well as the stylistic animation of individual characters.

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SD Madhu Kumar, NIT Calicut, India

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Track Co-Chairs: *Imen Jemili, University of Carthage, Tunisia*
Mohamed Mosbah, Bordeaux INP, France

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Theme: AI and Agents

CIVIA - Computational Intelligence and Video & Image Analysis Track

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Yin-Fu Huang, National Yunlin University of Science and Technology, Taiwan

Theme: AI and Agents

COMBI - Advances in COMputational Biomedical Imaging Track

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Rachid Jennane, University of Orleans, France
Ayman El-Baz, University of Louisville, USA

Theme: System Software and Security

CPS - Cyber-Physical Systems Track

Track Co-Chairs: *Jingtong Hu, University of Pittsburgh, USA*
Jason Xue, City University of Hong Kong, Hong Kong
Qi Zhu, Northwestern University, USA

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DADS - Dependable, Adaptive, and Secure Distributed Systems Track

Track Co-Chairs: *Karl M. Goeschka, UAS Technikum Vienna, Austria*
Rui Oliveira, Universidade do Minho, Portugal
Peter Pietzuch, Imperial College London, UK
Giovanni Russello, University of Auckland, New Zealand

Poster Papers

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DAPP - Decentralized Applications with Blockchain, DLT and Crypto-Currencies Track

Track Co-Chairs: *Jean-Marc Seigneur, University of Geneva, Switzerland and Reputaction, France*

Theme: Information Systems

DBDM - Databases and Big Data Management Track

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Apostolos N. Papadopoulos, Aristotle University, Greece
Junping Sun, Nova Southeastern University, USA

Poster Papers

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DLHWB - Digital Life for Human Well-being Track

Track Co-Chairs: *Sara Comai, Politecnico di Milano, Italy*
Luc De Witte, The University of Sheffield, UK
Fabio Salice, Politecnico di Milano, Italy

Theme: Information Systems

DM - Data Mining Track

Track Co-Chairs: *Hasan Jamil, University of Idaho, USA*
Rosa Meo, Università degli Studi di Torino, Italy

Theme: Information Systems

DS - Data Streams Track

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Andre Carvalho, ICMC, USP, Brazil
Carlos Ferreira, INESC Porto, University of Porto, Portugal
João Gama, INESC Porto, University of Porto, Portugal

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Theme: System Software and Security

EMBS - Embedded Systems Track

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Li-Pin Chang, National Chiao Tung University, Taiwan

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GIA - GeoInformation Analytics Track

Track Co-Chairs: *Maguelonne Teisseire, UMR TETIS, France*
Christian Sallaberry, University of Pau and Pays de l'Adour, France
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Cyril de Runz, University of Reims, France
Thomas Guyet, AGROCAMPUS-OUEST/IRISA, France

Poster Papers

Theme: AI and Agents

HCI - Smart Human Computer Interaction Track

Track Co-Chairs: *Anand Paul, Kyungpook National University, South Korea*
Soon Ki Jung, Kyungpook National University, South Korea
Awais Ahmad, University of Milan, Italy
Ganesh Kumar P., Anna University, India

Student Research Abstract

Theme: Information Systems

HI - Health Informatics Track

Track Co-Chairs: *Anu Mary Chako, National Institute of Technology Calicut, India*
Gopakumar G, National Institute of Technology Calicut, India

Poster Papers

Student Research Abstract

Theme: Information Systems

IAR - Information Access and Retrieval Track

Track Co-Chairs: *Gloria Bordogna, Consiglio Nazionale delle Ricerche – CNR IREA, Italy*
Gabriella Pasi, Università degli Studi di Milano Bicocca -DISCo, Italy

Theme: System Software and Security

IoT - Internet of Things Track

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IRMAS - Intelligent Robotics and Multi-Agent Systems Track

Track Co-Chairs: *Rui P. Rocha, ISR – University of Coimbra, Portugal*
Daniel Kudenko, University of York, UK

Poster Papers

Theme: AI and Agents

KomIS - Knowledge Discovery meets Information Systems Track

Track Co-Chairs: *Fabio Mercorio, University of Milano-Bicocca, Italy*
Mario Mezzanzanica, University of Milano-Bicocca, Italy
Antonio Picariello, University of Naples "Federico II", Italy

Theme: Distributed Systems

NET - Networking Track

Track Co-Chairs: *Mário M. Freire, University of Beira Interior, Portugal*
Marília Curado, University of Coimbra, Portugal
Ivan Ganchev, University of Limerick, Ireland and
University of Plovdiv "Paisii Hilendarski", Bulgaria

Poster Papers

Student Research Abstract

Theme: System Software and Security

NGPS - Next Generation Programming Paradigms and Systems Track

Track Co-Chairs: *Davide Ancona, Università di Genova, Italy*
Frédéric Loulergue, Northern Arizona University, USA
Mirko Viroli, Alma Mater Studiorum - Università di Bologna, Italy
Danilo Pianini, Alma Mater Studiorum - Università di Bologna, Italy

Theme: System Software and Security

OS - Operating Systems Track

Track Co-Chairs: *George Hamer, South Dakota State University, USA*
Bongjae Kim, Sun Moon Univeristy, South Korea
Jaeheung Lee, Daejeon University, South Korea

Theme: System Software and Security

PDP - Privacy by Design in Practice Track

Track Co-Chairs: *Ronald Petrlic, Federal Commissioner for Data Protection and Freedom of Information, Germany*
Christoph Sorge, Saarland University, Germany

Poster Papers

Theme: System Software and Security

PL - Programming Languages Track

Track Co-Chairs: *Barrett R. Bryant, University of North Texas, USA*
Rajeev Raje, Indiana University-Purdue University-Indianapolis, USA

Poster Papers

Theme: Software Design and Development

RE - Requirements Engineering Track

Track Co-Chairs: *Maria Lencastre, Universidade de Pernambuco, Brazil*
João Araújo, NOVA LINCS, Universidade Nova de Lisboa, Portugal

Poster Papers

Student Research Abstract

Theme: System Software and Security

RS - Recommender Systems: Theory and Applications Track

Track Co-Chairs: *Markus Zanker, Free University of Bozen-Bolzano, Italy*
Li Chen, Hong Kong Baptist University, China
Panagiotis Symeonidis, Free University of Bozen-Bolzano, Italy
Yong Zheng, Illinois Institute of Technology, USA

Poster Papers

Theme: Software Design and Development

SATTA - Software Architecture: Theory, Technology, and Applications Track

Track Co-Chairs: *Marcello M. Bersani, Politecnico di Milano, Italy*
Sungwon Kang, Korea Advanced Institute of Science and Technology, South Korea
Patrizia Scandurra, DIGIP, University of Bergamo, Italy

Theme: Software Design and Development

SE - Software Engineering Track

Track Co-Chairs: *Tao Zhang, Harbin Engineering University, China*
Byungjeong Lee, University of Seoul, South Korea
Eunjee Song, Baylor University, USA

Theme: Information Systems

SFECS - Sustainability of Fog/Edge Computing Systems Track

Track Co-Chairs: *Christian Esposito, University of Napoli "Federico II", Italy*
Florin Pop, University POLITEHNICA of Bucharest, and National Institute of Research and Development in Informatics, Romania
Chang Choi, Chosun University, South Korea

Theme: System Software and Security

SiSoS - Software-intensive Systems-of-Systems Track

Track Co-Chairs: *Flavio Oquendo, IRISA - UMR CNRS – Univ. Bretagne Sud, France*
Khalil Drira, LAAS - CNRS – Univ. Toulouse, France
Axel Legay, Université catholique de Louvain, Belgium
Thais Vasconcelos Batista, DIMAp – UFRN, Brazil

Theme: System Software and Security

SP - Software Platforms Track

Track Co-Chairs: *Jinman Jung, Hannam University, South Korea*
Jun Huang, Chongqing University of Posts and Telecom, China

Poster Papers

Theme: Software Design and Development

SVT - Software Verification and Testing Track

Track Co-Chairs: *Matthias Guedemann, Diffblue Ltd., UK*
Leonardo Mariani, University of Milano Bicocca, Italy

Theme: Information Systems

SWA - Semantic Web and Applications Track

Track Co-Chairs: *Soon Ae Chun, City University of New York, USA*
Hyoil Han, Illinois State University, USA
Sangsoo Sung, Google Inc., USA

Student Research Abstract

Theme: Software Design and Development

UE - Usability Engineering Track

Track Co-Chairs: *Eduardo Mosqueira Rey, University of A Coruña, Spain*
Vicente Moret Bonillo, University of A Coruña, Spain
David Alonso Ríos, University of A Coruña, Spain

Poster Papers

Theme: Software Design and Development

VSPLE - Variability and Software Product Line Engineering Track

Track Co-Chairs: *Abdelhak-Djamel Seriai, University of Montpellier, France*
Tewfik Ziadi, University Pierre et Marie Curie, France

Poster Papers

Theme: Distributed Systems

WCN - Selected Areas of Wireless Communications and Networking Track

Track Co-Chairs: *Dongkyun Kim, Kyungpook National University, South Korea*
Wei Wang, San Diego State University, USA

Theme: Information Systems

WICE - Web-based Technologies for Interactive Computing Education Track

Track Co-Chairs: *Maiga Chang, Athabasca University, Canada*
Hasan Jamil, University of Idaho, USA

Poster Papers

Theme: Distributed Systems

WT - Web Technologies Track

Track Co-Chairs: *Francesco Poggi, University of Bologna, Italy*
Cristian Mateos, UNICEN University - Tandil, Argentina
Tim A. Majchrzak, University of Agder - Kristiansand, Norway

Poster Papers

EDITORIAL MESSAGE
Special Track on Bioinformatics (BIO)

http://www.nrcbioinformatics.ca/acmsac2019

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Goals and focus

The Bioinformatics Track objective is to promote current advances in biological sciences and personalized medicine thanks to the contribution of analytical methods brought by mathematical, physical and computer sciences.

The topics of the BIO Track 2019 have been selected to attract significant results where the application of mathematical and computational analysis techniques to experimental data are crucial to achieve a better understanding of biological processes of which medical research, drugs developments and the health care can benefit.

Description of accepted papers

The papers of the ACM BIO Track 2019 edition exhibit an optimal balance between three fundamental aspects in bioinformatics research: (i) the constant reference to experimental data and their acquisition techniques, considered the starting point for each mathematical and computational model, (ii) the mathematical soundness of the computational approaches, and (iii) the analysis and validation of the model results. The BIO Track 2019 accepted publications present methods of analysis of biological data that are well integrated with the techniques of acquisition and analysis of the data themselves, and cover hot timely areas of systems biology such as drug target discovery, protein and metabolite biomarker discovery, and feature selection techniques for cancer data comparative analysis.

Statistics

The ACM BIO Track 2019 received 14 submissions this year authored by 39 researchers from 13 different countries (Brazil, Canada, Estonia, France, Ireland, Japan, Korea, Kuwait, Malaysia, Portugal,

Spain, Tunisia, USA) spanning 4 continents. Out of 14 submissions, 4 papers have been accepted for oral presentations and 1 paper for poster presentations.

Acknowledgments

The SAC ACM BIO Track organizers like to express their gratitude to the Steering Committee of the SAC ACM 2019, for their responsiveness and guidance with all the logistic and procedural aspects of the Track.

The Track organizers are extremely grateful to the Track Program and Reviewers Committee Members for their professionalism, valuable scientific expertise and outstanding punctuality that ensured the selection of high-quality papers:

Alex Graudenzi, University of Milano - Bicocca, Italy.
Anu Surendra, Digital Technologies, NRC, Canada.
Chaouki Regoui, Digital Technologies, NRC, Canada.
Chiara Damiani, Department of Informatics, Systems and Communication, Università degli Studi di Milano-Bicocca, Italy.
Daniela Giacomazza, Institute of Biophysics, National Research Council, Italy.
Eleonora Lusito, The FIRC Institute of Molecular Oncology Foundation, The European Institute of Oncology, Italy.
Eric Paquet, Digital Technologies, NRC, Canada.
Mahdi Belcaid, Department of Information and Computer Sciences, University of Hawaii, USA.
Marco Nobile, Department of Informatics, Systems and Communication, Università degli Studi di Milano-Bicocca, Italy.
Michela Lecca, Bruno Kessler Foundation, Center for Information Technology, Italy.
Paolo Cazzaniga, University of Bergamo, Italy.
Roberto Montemanni, Dalle Molle Institute for Artificial Intelligence, University of Lugano and SUPSI, Switzerland.
Umberto Ferraro Petrillo, Department of Statistical Science, University of Roma, Italy.

EDITORIAL MESSAGE
Special Track on Cloud Computing

Priya Chandran, NIT Calicut, India
S.D Madhu Kumar, NIT Calicut, India

Cloud Computing, the computing paradigm of the decade, maintains its accelerated pervasion into newer domains, achieving faster solutions and improved data security. Cloud computing has already proved its potential in meeting the demands of challenging applications, and is well on the way to forming the backbone of the Internet of Everything. The wide acceptability shows the increasing confidence of user and provider communities alike, on the underlying cloud computing technology. The leading companies, startups, and the middle order companies in the IT sector, almost invariably choose clouds as the platform for offering their services. The academia has also sustained its keen interest in this hot area, with an abundance of funded research projects at the leading universities across the globe.

This track on Cloud Computing, organized consecutively for the ninth time at ACM SAC, had been started with the intention of providing a forum for presenting research on various aspects of cloud computing, with emphasis on those describing research on different forms of virtualization techniques. The response to the track has been as overwhelming as ever this year too. We received high quality papers from all parts of the world, contributing a total of 26 submissions. The review process was very competitive with each paper receiving at least three reviews, and finally 6 full papers and 4 poster papers were selected for the track, bringing the acceptance rate to exactly 23.07% for full papers and 15.3% for posters.

The selected papers deal with a wide variety of cloud computing issues including those listed below:

- Policies for Secure Container Orchestration in the Cloud
- Energy Aware Container Scheduling for Micro Clouds
- Flexible Data Sharing by Combining Attribute-Based Encryption and Searchable Encryption
- High Throughput Serverless Computing Applications Modeling
- Container orchestration frameworks for management of multi-tenant database deployments and their performance
- Modeling Multilevel Consistency in Erasure Code Based Storage Systems
- Minimizing Financial Cost of Scientific Workflows Under Deadline Constraints in Multi-Cloud Environments
- Research Challenges in Diabetes Care in Cloud

We thank all the authors who submitted valuable papers to this track. We are grateful to the members of the Program Committee and to the additional reviewers. Without their support, the organization of the track's sessions would not have been possible. We also express our gratitude to organizations that made this track happen, namely the ACM Special Interest Group on Applied Computing (SIGAPP), National Institute of Technology Calicut, India. We are grateful to the Symposium Program Chairs for their help in all aspects of the organization of this track.

A short summary of the research work selected for this track

Security still remains the major issue of concern to researchers. Container orchestrators and their enhancements to make data secure, and efforts to speed up execution using Container orchestrators, are provided in two independent research efforts. The use of SSE, i.e., search over encrypted data, in conjunction with a policy protected symmetric key for decryption, is the secure performance enhancement scheme discovered in another venture. Hardware assisted encoding and decoding process and research outcomes from several groups, indicate a promising future for erasure code based storage system for hot data storage, and methods to provide different consistency types form the innovative contents of another research work. Workflow management being a key concern in cloud based systems, formulation of a workflow mapping problem to minimize the financial cost of deadline- constrained scientific workflows executed in multi-cloud environments, which is an NP- hard problem, forms the content of yet another interesting work. Serverless computing, for end users to efficiently exploit serverless computing for the optimized and cost-effective execution of loosely-coupled tasks, with a high level programming model, paves a way for a new research focus in the area.

EDITORIAL MESSAGE
Special Track on Communication, Computing, and Networking in Internet of Vehicles (CCNIV)

Imen Jemili,
Faculty of Sciences of Bizerte, University of Carthage, Tunisia
Mohamed Mosbah,
Univ. Bordeaux, CNRS, Bordeaux INP, LaBRI, UMR 5800, F-33400, Talence, France

Nowadays, the Internet of Vehicles (IoVs) is considered as an important symbol of the Smart City concept to tackle urgent problems, such as traffic congestion, road accidents and environmental pollution. This paradigm has a wide application prospect in building future Intelligent Transportation Systems, which are becoming a major research area dealing with many challenging issues concerning computation, communication, safety, etc. Giving rise to wealth of new possibilities and applications ranging from safety applications to infotainment services to drivers and passengers, the academia and the industry are actively pushing the development of IoVs and making it a reality.

The CCNIV track aims to offer a space for researchers/academics to discuss major research issues, to share new findings and to exchange ideas covering a variety of topics associated to Internet of Vehicles, connected and autonomous vehicles and Intelligent Transportation Systems.

In this first edition of the track, we received submissions from diverse countries. Each submission was assigned to at least three PC members, often more, for a fine and rigorous review process. As a result of this double-blind reviewing, we accept 3 full papers and 1 poster paper was selected for the track, bringing the acceptance rate to approximately 25% for full papers. For their time and valuable efforts in reviewing the submitted papers, we are grateful to the members of the Program Committee:

- Ryma Abassi, University of Carthage, Tunisia
- Takoua Abdellatif, Polytechnic School of Tunisia, Tunisia
- Anas Abou el kalam, Cadi Ayyad University, Marrakesh, Morocco
- Abdelfettah Belghith, King Saud University, Saudi Arabia
- Khalil Drira, LAAS-CNRS, France
- Michel Ferreira, University of Porto, Portugal
- Tahani Gazdar, King Abdulaziz University, Saudi Arabia
- Yacine Ghamri-Doudane, University La Rochelle, France
- Sihem Guemara, University of Carthage, Tunisia
- Mohamed Jmaiel, Digital Research Center of Sfax, Tunisia
- Pietro Manzoni, Polytechnic University of Valencia, Spain
- Mubashir Husain Rehmani, Waterford Institute of Technology, Ireland
- Damien Sauveron, University of Limoges, France
- Akka Zemmari, University of Bordeaux, France

We thank all the authors who submitted valuable papers to this track. We believe this track, able to attract contributions from multidisciplinary areas, can be more successful in the future editions of ACM SAC.

We also express our special thanks and gratitude to the SAC 2018 symposium's main organizers, to the Symposium Program Chairs and to Publication and Poster Chairs for their invaluable support and their help in all aspects of the organization of this track.

Track co chairs
Imen Jemili
Mohamed Mosbah

EDITORIAL MESSAGE
Special Track on the Computational Intelligence and Video & Image Analysis

Agostinho Rosa, *LaSEEB - ISR – IST, Portugal*
Yin-Fu Huang, *National Yunlin University of Science and Technology, Taiwan*

The special track on the Computational Intelligence and Video & Image Analysis (CIVIA) is a forum for engineers, researchers and practitioners throughout the world to share technical ideas and experiences related to the implementation and applications of Computational Intelligence, to Video & Image Analysis, and even to Systems Biology & BioMedicine. Many conferences have been dedicated to Evolutionary Computing (ICEC, GECCO, PPSN, etc), Video & Image Analysis (ICIAR, ICIAP, ICASSP, IJCAI, etc) and Systems Biology & BioMedical Engineering (ICSB, RECOMB, BME, etc), but they don't offer much on the blending of Computational Logic, Boolean Satisfiability and Soft Computing tools to address practical applications of Image Analysis and Bio Systems Modeling and Simulations. Thus, the research papers involved with applying computational intelligence techniques to video and image analyses would be welcome no matter how theoretical they are, should they have practical applications.

This year, we have 13 submissions for the CIVIA track, and the submissions are far less than those in previous years. But still to keep the acceptance rate less than 25% for the regular papers, we only accept 3 oral papers. By the way, although one poster paper is selected as accepted, the authors have withdrawn it for some reasons. Thus, we have 23% (3/13) acceptance rate for the CIVIA track.

The accepted oral papers are involved in different subfields, including animation, flexible job shop scheduling, and video retrieval. These subfields are all related to the topics or themes of the CIVIA track.

Finaly, we would like to thank all reviewers for their efforts in reviewing these papers. These reviewers consist of the program committee members and some professionals. Without their hard work, we could not complete this review process.

EDITORIAL MESSAGE
Special Track on CPS

Jingtong Hu, *University of Pittsburgh, USA*
Jason Xue, *City University of Hong Kong, Hong Kong*
Qi Zhu, *Northwestern University, USA*

Cyber-physical Systems (CPS) are engineered systems whose operations are monitored, coordinated, controlled, and integrated by a computing and communication core embedded in all types of objects and structures in the physical environment. CPS has emerged as a unifying name for systems where the cyber parts, i.e., the computing and communication parts, and the physical parts are tightly integrated, both at the design time and during operation. Such systems use computations and communication deeply embedded in and interacting with physical processes to add new capabilities to physical systems. Such systems must be operated safely, dependably, securely, efficiently and in real-time. These cyber-physical systems include a wide range of applications, such as transportation, healthcare, automotive, energy, manufacturing, entertainment, consumer electronics, environmental monitoring, aerospace, robotics, etc., all of which will be essential pieces of our social infrastructure. Therefore, advances in this field will have great technical, economic and societal impacts in the near future. However, the vision of CPS faces some core challenges of multidisciplinary research, as their relevant technologies appear in diverse areas of science and engineering. Therefore, there is an emerging consensus that new methodologies and tools need to be developed to support cyber-physical systems.

In this year's CPS track, all the papers went through a competitive selection process. Each paper is reviewed by at least 4 reviewers. We accepted 4 excellent papers out of 16 submissions, which results in an acceptance ratio of 25%. These 4 papers cover different interesting aspects of CPS, including efficiency, intelligence, and performance. The first paper presents programming adaptation policies to facilitate re-usability across various Wireless Sensor Networks(WSNs). The second paper presents a hybrid memory architecture and data allocation algorithms for embedded systems in CPS. The proposed architecture and algorithms can greatly improve the energy efficiency of embedded systems in CPS. These two works provide timely efficiency solutions for future CPS. The third and fourth paper both present storage optimization for future CPS, which can be essential components for building intelligent CPS. We have also accepted 1 paper as a poster presentation. In this paper, the authors show that the latest generation of hardware can significantly reduce the jitters in Time Sensitive Networking (TSN), which is is popular in many realtime embedded applications, including industrial automation and automotive.

The track chairs would also like to thank all the reviewers for their volunteer work. It is only possible with their valuable efforts and time that we can select these high-quality research works in this track.

EDITORIAL MESSAGE
Special Track on Dependable, Adaptive and Trustworthy Distributed Systems

Karl M. Goeschka, *UAS Technikum Vienna, Austria*
Rui Oliveira, *Universidade do Minho, Portugal*
Peter Pietzuch, *Imperial College London, United Kingdom*
Giovanni Russello, *University of Auckland, New Zealand*

Introduction

While computing is provided by the cloud and services increasingly pervade our daily lives, dependability, adaptiveness and security become a cornerstone of the information society.
Unfortunately, most innovative systems and applications suffer from a lack of dependability and security, which is fueled by global scale, mobility and heterogeneity, as well as the demand for resource awareness, green computing, and increasing cost pressure.

Among technical factors, software development methods, tools, and techniques contribute to dependability and security, as defects in software products and services may lead to failure and also provide typical access for malicious attacks. In addition, there is a wide variety of fault and intrusion tolerance techniques available, including persistence provided by databases, redundancy and replication, group communication, transaction monitors, reliable middleware, cloud infrastructures, light-weight virtualization, fragmentation-redundancy-scattering, and trustworthy service-oriented architectures with explicit control of quality of service properties and service level agreements.

Furthermore, adaptiveness is envisaged in order to react to observed, or act upon expected changes of the system itself, the context/environment (e.g., resource variability or failure/threat scenarios) or users' needs and expectations. Provided without explicit user intervention, this is also termed autonomous behavior or self-properties, and often involves monitoring, diagnosis (analysis, interpretation), and reconfiguration (repair). In particular, adaptation is also a means to achieve dependability and security in a computing infrastructure with dynamically varying structure and properties and can itself be provided as a service (Control-as-a-service).

Statistics

This year, we received 29 submissions, of which 8 could be accepted after being reviewed by six to seven members of the program committee. The resulting acceptance rate is 28%.

Acknowledgements

We would like to thank our program committee members for their support, their timely reviews and the numerous suggestions for improvements of papers.

Overview of the Sessions and Papers

The DADS track provides a forum for scientists and engineers in academia and industry for their latest research findings on selected topics in dependable, adaptive and trustworthy distributed systems. The following papers comprise this track:

1. **Don't Hesitate to Share! A Novel IoT Data Protection Scheme Based on BGN Cryptosystem**
   Subir Halder and Mauro Conti

2. **Securely deploying distributed computation systems on peer-to-peer networks**
   Kobe Vrancken, Frank Piessens and Raoul Strackx

3. **Failure Prediction in the Internet of Things due to Memory Exhaustion**
   Rafiuzzaman Mohammad, Julien Gascon-Samson, Karthik Pattabiraman and Sathish Gopalakrishnan

4. **Adaptive information dissemination in the Bitcoin network**
   João Marçal, Luís Rodrigues and Miguel Matos

5. **Planning Workflow Executions when Using Spot Instances in the Cloud**
   Richard Gil Martinez, Antonia Lopes and Luís Rodrigues

6. **Scalable Lightning Factories for Bitcoin**
   Alejandro Ranchal Pedrosa, Maria Potop Butucaru and Sara Tucci

7. **Quantitative Comparison of Unsupervised Anomaly Detection Algorithms for Intrusion Detection**
   Filipe Falcao, Tommaso Zoppi, Caio Barbosa, Anderson Santos, Baldoino Fonseca, Andrea Ceccarelli and Andrea Bondavalli

8. **A Library for Services Transparent Replication**
   Paola Pereira, Cristina Meinhardt, Fernando Dotti and Odorico Mendizabal

In addition, two posters have been accepted:

9. **Distributed Storage System based on Permissioned Blockchain**
   Racin Nygaard, Hein Meling and Leander Jehl

10. **Is it Safe to Dockerize my Database Benchmark?**
    Martin Grambow, Jonathan Hasenburg and David Bermbach

EDITORIAL MESSAGE
Special Track on Decentralized Applications with Blockchain, DLT and Crypto-Currencies (DAPP'19)

Jean-Marc Seigneur, *University of Geneva / Reputaction, Switzerland / France*

Blockchain has gained momentum since it has been brought to light by Bitcoin around 10 years ago. Since then, new DLT have been proposed and applied in many different application domains such as finance or supply chain, even if there are still limitations: energy consumption, attack-resistance, number of transactions per second. The goal of the SAC DAPP track is to review decentralized applications that benefit from the use of blockchains, other distributed ledger technologies (DLT) such as Directed Acyclic Graph (DAG), and/or crypto-currencies.

We would like to thank all the authors for submitting their proposal contributions to the ACM SAC'19 DAPP track. We are grateful to the many external reviewers for their time and hard work to select the best full papers and additional poster. Many thanks to the SAC organising committee, who believes in the potential of the DAPP track, as well as to the ACM SIGAPP!

If you are interested in following the field, join us on https://www.cas-blockchain-certification.com where you can find up to date information about the track and even register to an official Certificate of Advanced Studies (CAS) on decentralizef applications (dApp) development with blockchain and other DLT. The CAS is taught at University of Geneva or via video-conference and is worth 12 European ECTS credits, which are valid in many countries in the world.

EDITORIAL MESSAGE
Special Track on Databases and Big Data Management (DBDM)

Ramzi A. Haraty, *Lebanese American University, Lebanon*
Apostolos N. Papadopoulos, *Aristotle University, Greece*
Junping Sun, *Nova Southeastern University, USA*

The world nowadays revolves around dealing with extreme large amount of data presented in various formats. So it is inevitable that researchers focus on advancing the state of managing information. From here, the importance of database technology ranks amongst the hottest areas of research, taking into account the consistent need for faster query processing as well as for managing huge amounts of data. This year the track has received many papers covering different areas of databases.

A total of 20 papers were submitted to the Databases and Bid Data Management track. The track received papers from many countries – from Asia, Australia, Europe, North America, and South America – making this track a forum to share technical ideas and experiences relating to implementation and application of database theory and technology and to exchange ideas among international researchers in the area of database systems. Each paper was sent out to at least three reviewers. The selection process was more difficult this year, because the acceptance ratio was about 25%. More specifically, among the 20 submitted papers only 5 papers have been selected as regular papers. In addition, 3 papers have been selected for presentation in the poster session.

The selected papers cover a wide range of topics including: multi-way join processing over data streams, queries over web services, XML data management, query languages, similarity query processing in software repositories.

We would like to take this opportunity to thank the colleagues who worked hard to make ACM SAC 2019 possible. Our special thanks go to all the authors and referees who all contributed to the success of DTTA track. We look forward to your participation and cooperation in the upcoming ACM SAC 2020.

EDITORIAL MESSAGE
Special Track on Digital Life for Human Well-being - DLHWB

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Fabio Salice - Department of Electronics Information and Bioengineering,
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The special track DLHWB is dedicated to methodologies and technologies that can be helpful, guarantee and improve quality of life or support positive well-being. Digital services are an integral part of many aspects of our everyday life, from the workplace to leisure time, to our daily life in our own living environment. Digital Life for Human Well-being is part of the "smart society" and implies the need to respect the needs identified by Maslow's pyramid: physiological (for example, food and energy), safety, belonging (for example, friendship and social inclusion), esteem (for example, recognition) and self-fulfillment (for example, creativity) to achieve good quality of life.

This track, organized for the first time at ACM SAC, have been started with the intention of providing a forum for presenting research on various aspects related to well-being. The track topics included: Ageing, disability and technology; Ambient assisted living; Methodological approaches and tools for the assessment of wellbeing; Mobile applications for well-being; Tools to promote social/emotional/physical well-being; wearable devices to improve quality of life; Well-being of aging people; Well-being in education, employment and leisure activities. The received papers covered different of such aspects.

The selection process was very rigorous: each paper was blind-reviewed by at least 3 independent reviewers with expertise in the topic, and evaluated for originality, significance, technical content, and clarity of presentation.

The accepted papers deal with education and accessibility issues. In particular: The paper “Anatome: Anatomy Teaching and Learning Designed for All” introduces accessible educational technologies to improve the learning process of students, regardless of disability or specific need. In particular, it focusses on the models and the requirements that can guide the development of accessible educational technologies for teaching and learning Anatomy. The paper “Web-based authoring of multimedia intervention programs for mobile devices” instead focusses on tools to help health and education domain experts to independently conduct interventions, data collection and analyses using smartphones. Experiments have been carried out in the context of digital literacy courses for older adults who learn how to use smartphones: by receiving reminders and activities to be done from the instructors, their learning and engagement in the course, as well as their autonomy in the use of mobile devices can be increased.

We wish to thank all the people that have contributed to DLHWB track: in particular, all the authors; all the track PC members, the ACM Special Interest Group on Applied Computing (SIGAPP) and the Program Chairs for their help in all aspects of the track organization.

EDITORIAL MESSAGE
Data Mining (DM) Track

Hasan Jamil, *University of Idaho, USA*
Rosa Meo, *Università degli Studi di Torino, Italy*

ACM SAC Data Mining has a successful history of accepting quality papers and offering a stimulating platform for the exchange of ideas and disseminating cutting edge research to the community. The 2019 ACM SAC Data Mining Track is the nineteenth such event in the 34 years of ACM SAC tradition, co-chaired by Hasan Jamil and Rosa Meo.

Similar to previous years, the 2019 ACM SAC Data Mining Track solicited original, unpublished and novel papers for publication and presentation at the symposium. The response to the track was significant. We have received a total of 26 high quality papers from all parts of the world from both academia and industry. These submissions contain novel ideas and applications in a wide variety of areas in data mining. The review process was very competitive with each paper receiving at least three reviews, and finally six full papers and two poster paper were accepted for the track, bringing the acceptance rate to approximately 23% for regular full papers, and 30% overall. We take this opportunity to thank all the authors who submitted their contributions making this track an increasingly popular and scholarly venue for exchanging ideas in data mining.

The six research articles and two poster papers included in this year's track program are as follows:

Full papers:
1. *"Graph-based Selective Outlier Ensembles"* by Hamed Sarvari, Carlotta Domeniconi and Giovanni Stilo.
2. *"Dirichlet Process Mixture Models made Scalable and Effective by means of Massive Distribution"* by Khadidja Meguelati, Bénédicte Fontez, Nadine Hilgert and Florent Masseglia.
3. *"High-Performance Probabilistic Record Linkage via Multi-Dimensional Homomorphisms"* by Ari Rasch, Richard Schulze, Waldemar Gorus, Jan Hiller, Sebastian Bartholomäus and Sergei Gorlatch.
4. *"An Anomaly Detection Technique for Business Processes based on Extended Dynamic Bayesian Networks"* by Stephen Pauwels and Toon Calders.
5. *"Explaining Black Box Models by means of Local Rules"* by Eliana Pastor and Elena Baralis.
6. *"Pairwise Normalization in SimRank Variants: Problem, Solution, and Evaluation"* by Masoud Reyhani Hamedani and Sang-Wook Kim.

Poster papers:
1. *"Mining Product Opinions with Most Frequent Clusters of Aspect Terms"* by Chukwuma Ejieh, Christie Ezeife and Ritu Chaturvedi.
2. *"K-mixed Prototypes: A Clustering Algorithm for Relational Data with Mixed Attribute Types"* by Rahmah Brnawy and Nematollaah Shiri.

Finally, we would like to thank the members of the track program committee below for their contributions and help in reviewing and selecting the papers. They worked diligently and in a timely manner within a very short period of time.

Fabrizio Angiulli, Università della Calabria, Italy
Daniele Apiletti, Politecnico di Torino, Italy Elena Baralis, Politecnico di Torino, Italy
Livio Bioglio, University of Turin, Italy
Michelangelo Ceci, Università degli studi di Bari Aldo Moro, Italy
Jose Alfredo F. Costa, Universidade Federal do Rio Grande do Norte, Brasil
Bruno Cremilleux, University of Caen Normandy, France
Bertrand Cuissart, University of Caen Normandy, France
Luigi Di Caro, University of Torino, Italy
Sherri Harms, University of Nebraska Kearney, USA
Szymon Jaroszewicz, The Institute of Computer Science, Polish Academy of Sciences, Poland
Marzena Kryszkiewicz, Warsaw University of Technology, Poland
Carson K. Leung, University of Manitoba, Canada
Hong-Cheu Liu, University of South Australia, Australia
Giuseppe Manco, ICAR - CNR, Italy
Florent Masseglia, INRIA, France
Rajesh Natarajan, Tech Mahindra Americas Inc.
Raymond Ng, University of British Columbia, Canada
Stefano Paraboschi, Università degli Studi di Bergamo, Italy
Yulong Pei, Technical University Eindhoven, Netherlands
Ruggero G. Pensa, University of Torino, Italy
Clara Pizzuti, Institute for High Performance Computing and Networking (ICAR-CNR), Italy
Sanguthevar Rajasekaran, University of Connecticut, USA
Jan Rauch, University of Economics, Prague, Czech Republic
Christophe Rigotti, Institut National des Sciences Appliquées Lyon, France
Domenico Sacca, Università della Calabria, Italy
Lorenza Saitta, Università degli Studi del Piemonte Orientale, Italy
Daniel Sanchez, University of Granada, Spain
Franco Turini, University of Pisa, Italy
Raymond Wong, University of New South Wales, Australia

We have an exciting program for SAC Data Mining Track, and overall SAC symposium in 2019. We hope to welcome you in Limassol, Cyprus in April, 2019.

EDITORIAL MESSAGE
Special Track on Data Streams

Albert Bifet, *LTCI, Telecom ParisTech, France*
Andre Carvalho, *ICMC, USP, Brazil*
Carlos Ferreira, *INESC Porto, University of Porto, Portugal*
João Gama, *INESC Porto, University of Porto, Portugal*

The rapid growth in data science and technology, in particular in the complexity and volume of Big Data, has introduced new challenges for the research community. Several of these are related to the nature of data generation, since most of the data sources produce data continuously. Examples include sensor and wireless networks, radio frequency identification, customer click streams, telephone records, multimedia and scientific data, and sets of retail chain transactions, among others. These sources are called data streams, ordered sequences of instances that can typically be read only once or a small number of times due to its their high speed of flow and continuous nature. Data streams are characterized by being open-ended, and generated by non-stationary distributions. Thus, they are increasingly important in the research community, as new algorithms are needed to efficiently process this streaming data, to enable rapid and real-time updated understanding of the data. The goal of this track is to convene researchers who work with data streams, defining models, processing continuous queries, developing sampling, filtering and stream mining methods, machine learning, and visualization techniques and related issues.

This year, we received 15 submissions from 9 different countries: Italy, Germany, Brazil, Portugal, USA, UK, France, Netherlands and China. After a rigorous review process, where each paper was reviewed by at least 3 PC members, only 4 papers were accepted as full papers, giving the track an acceptance rate of 26%. The papers cover topics such as Hoeffding trees, exploiting entity information over a stream of reviews, efficiently finding duplicates and dynamic streaming sensor data segmentation for activity recognition.

We would like to thank the Program Committee, who was comprised of several experts from the field: *Annalisa Appice*, Università degli Studi di Bari, Italy, *Albert Bifet*, Telecom Paris, France, *Christian Bockermann*, University Dortmund, Germany, *José del Campo-Ávila*, Universidad de Málaga, Spain, *André Carvalho*, University of Sao Paulo (USP), Brazil, *Raja Chiky*, ISEP, France, *Carlo Combi*, University of Verona, Italy, *Alfredo Cuzzocrea*, ICAR-CNR and University of Calabria, Italy, *Carlos Ferreira*, University of Porto, Portugal, *Mohamed Gaber,* Tasmanian ICT Centre, Australia, *João Gama*, University of Porto, Portugal, *Ricard Gavaldà*, Universitat Politècnica de Catalunya, Spain, *João Gomes*, Institute for Infocomm Research, Singapore, *Geoff Holmes*, University of Waikato, New Zealand, *Elena Ikonomovska*, Josef Stefan Institute, Slovenia, *Petr Kosina*, University of Porto, Portugal, *Shonali Krishnaswamy,* Monash University, Australia, *Cyril Labbe*, University Grenoble, France, *Mark Last*, Ben Gurion University, Israel, *Byung Suk Lee*, University Vermont, US*, Florent Masseglia*, INRIA, France, *Rodrigo Mello*, University of Sao Paulo, Brazil, *Rosa Meo*, University of Torino, Italy, *João Moreira*, University of Porto, Portugal, *Irene Ntoutsi*, LMU Munich, Germany*, Vincent Becker*, ETH, Switzerland; *Mykola Pechenizkiy*, Eindhoven University of Technology, The Netherlands, *Pedro Rodrigues*, University of Porto, Portugal, *Josep Roure*, Universitat Politècnica de Catalunya, Spain, *Elaine Sousa*, University of Sao Paulo, Brasil, *Eduardo Spinosa*, Federal University of Parana, Brazil, *Philip Yu,* University of Illinois at Chicago, US, and *Indrė Žliobaitė*, Aalto University, Finland, *Hadi Fanaee*, University of Porto, Portugal, *Bernhard Pfahringer*, Univ. Waikato, New Zealand, *Felipe Pinage*, UFAM, Brazil

We wish also to thank all the authors, and the Program Chairs of SAC 2019 for making this a successful meeting point for researchers interested in data streams.

EDITORIAL MESSAGE

Special Track on Embedded Systems

Marco Di Natale, Scuola Superiore S. Anna, Italy
Li-Pin Chang, National Chiao Tung University, Taiwan

Introduction

A wide variety of applications, from consumer electronics to biomedical systems, automotive and avionics controls, and industrial plant automation require the development of complex, performance sensitive and reliable embedded functionality. Embedded systems require a tight coupling of hardware and software components with advanced analysis and synthesis techniques. Moreover, the market pressure calls for new methodologies that shorten the development time while taking into account a wide variety of constraints: performance, code size, power consumption, timeliness, maintainability, security and possibly scalability. Solutions can be proposed at different levels of abstraction, making use of an assortment of tools and methodologies: researchers and practitioners from industry and academia contribute with new ideas and experiments.

The focus of this track is on the application of novel and established techniques to the development of embedded systems. Solutions typically emerge from a merger of traditional domains (e.g. computer architecture, OS, compilers, security, software engineering, simulation). The track benefits also from direct experiences in the design and development of embedded devices in traditional and novel application areas, to highlight challengesand solutions in the system design/development process. Researchers and practitioners from academia and industry get a chance to keep in touch with problems, open issues and future directions in the field of development of dedicated applications for embedded systems.

Statistics

The embedded systems track received 22 submissions with the following geographical distribution: 7 papers were from Asia, 13 from Europe, 1 from North Africa and 1 from North America. 5 papers were selected to be part of the final program, with an acceptance ratio of 25% that confirms the very selective nature of the conference. Two more submissions were selected to be part of the poster program.

Track Program

The technical program for the Embedded Systems track includes papers that cover research topics on several architecture layers and process stages.

Energy conservation is still a critical concern for embedded devices, but now emerging techniques, such as machine learning, offer alternatives to energy characterization of complex software systems. The paper “Energy-Demand Estimation of Embedded Devices Using Deep Artificial Neural Networks” presents a black-box approach based on machine learning techniques to construct precise energy models for complex hardware devices. The paper “Refresh Optimised embedded-DRAM Caches based on Zero Data Detection” introduce a value-based refresh saving method that does not refresh zero memory blocks for power conserving.

Timing analysis and QoS guarantee involves not only software-level techniques but also hardware-level ones. The paper “A Time-predictable Branch Predictor” presents a time- predictable branch predictor co-designed with the associated worst-case execution time analysis. The paper “On Assessing the Viability of Probabilistic Scheduling with Dependent Tasks” aims at providing a clear understanding of probabilistic Worst-Case Execution Time distributions (pWCET) as a common concept of probabilistic timing and schedulability analysis. The paper “Impact of Source Scheduling on End-to-end Latencies in a QoS-aware Avionics Network” introduces a solution that preserves the worst-case end-to-end delay of avionics flows, and show how their scheduling in the table impacts the jitter of the video flows.

Design issues for storage systems and programming environments are flourishing in the area of embedded system design. The paper “A New Sequential-Write-Constrained Cache Management to MitigateWrite Amplification for SMR Drives” presents a sequential-write-constrained cache (SWC2) management to mitigate the write amplification issue of SMR drives. The paper “Graphical Program Transformations for Embedded Systems” presents a dataflow program transformation tool for Orcc, a high level embedded systems programming environment.

Acknowledgement

We would like to thank all the people that helped build the technical program and provided support for the track organization. We are especially grateful to all reviewers, who put their valuable time in providing the evaluation and the technical comments for all the submitted papers (with four reviews for most submissions), and helped select a stimulating program on a wide range of topics.

Also, we are grateful to the General Chairs, the Poster Chair and the Web Chairs for their support and coordination efforts.

We are sure the program will be of extreme interest to all researchers and practitioners and provide for fruitful discussion and future developments.

EDITORIAL MESSAGE
ACM SAC 2019 - GeoInformation Analytics (GIA) Track

The production and use of geo-referenced digital resources is expanding rapidly. In order to exploit their contents, the documents are annotated, indexed and analyzed according to data models dedicated to the description of particular domains. The multiple dimensions of data descriptors can be divided into three categories: location (spatial dimension), date/time (temporal dimension), and theme (thematic dimension). We call geographical data such multidimensional representations. In recent years, a variety of works have highlighted the potential of the extraction, analysis and retrieval of geographic information in corpora composed of textual documents, images, maps, ... A number of engines or services dedicated to the search for geographical information have been proposed: they cover spatial information for the vast majority, but also spatio-temporal and thematic information, for others.

The purpose of this Track is to bring together the growing community of professionals and researchers of the field of geographic information extraction, retrieval and analysis, and of the corresponding applications. GIA track is at the crossroads of several disciplines: of course geomatics, but also Knowledge Engineering (KE), Natural Languages Processing (NLP), Data Mining (DM) and Information Extraction (IE). This track follows the KEGeoD Track organized in 2018 in Pau (France).

GIA program:

- *Algorithms for mountain peaks discovery: a comparison* (Full Paper)
  *Rocio Nahime Torres, Federico Milani and Piero Fraternali (*federico1.milani@mail.polimi.it*)*
- *A graph based approach for functional urban areas delineation* (Full Paper)
  *Noudéhouénou Houssou, Jean-Loup Guillaume and Armelle Prigent (*jaderne@gmail.com*)*
- *A Transfer Learning Paradigm for Spatial Networks* (Full Paper)
  *Chidubem Iddianozie and Gavin McArdle (*chidubem.iddianozie@ucdconnect.ie*)*
- From spatio-temporal data to chronological networks: An application to wildfire analysis (Full Paper)
  *Didier Vega Oliveros, Moshé Cotacallapa, Leonardo N. Ferreira, Marcos Quiles, Zhao Liang, Elbert E. N. Macau and Manoel F. Cardoso (*didiervega@gmail.com*)*
- The role of Geographic Knowledge for sub-city level geolocation (*Poster)*
  *Laura Di Rocco, Michela Bertolotto, Davide Buscaldi, Barbara Catania and Giovanna Guerrini (*laura.dirocco@dibris.unige.it*)*
- *Similarity-based visual exploration of very large georeferenced multidimensional datasets* (*Poster)*
  *Erick Gomez Nieto and Roger Peralta (*egnsoda@gmail.com*)*

GIA track co-chairs:

- Thomas Guyet, AGROCAMPUS-OUEST/IRISA, 65 rue de Saint Brieuc, 35042 Rennes, France, email: thomas.guyet@irisa.fr
- Eric Kergosien, University of LILLE, GERiiCO lab, Domaine universitaire du "Pont de Bois", BP 60149, 9653 Villeneuve d'Ascq Cedex, France, email: eric.kergosien@univ-lille.fr

- Cyril de Runz, University of Reims, IUT de Reims, Chemin des Rouliers, CS30012 51687 Reims Cedex 2, email: cyril.de-runz@univ-reims.fr
- Christian Sallaberry, University of PAU & PAYS ADOUR, LIUPPA lab., Avenue du Doyen Poplawski, 64016 Pau, France, email: christian.sallaberry@univ-pau.fr
- Maguelonne Teisseire, UMR TETIS (Earth Observation and Geoinformation for Environment and Land Management research Unit) 500 rue Jean-François Breton, F-34093 Montpellier, France, email: maguelonne.teisseire@irstea.fr

GIA program committee members:

- Nathalie Abadie, IGN, Paris, France
- Luis Alvares, Universidade Federal de Santa Catarina (UFSC), Florianopolis, Brazil
- Vania Bogorny, Universidade Federal de Santa Catarina (UFSC), Florianopolis, Brazil
- Davide Buscaldi, University of Paris 13, Paris, France
- Cyril de Runz, University of Reims Champagne-Ardenne, Reims, France
- Rodolphe Devillers, University of Newfoundland, St. John, Canada
- Thomas Devogele, Université de Tours, Blois, France
- Bertrand Duménieu, EHESS, Paris, France
- Laurent Etienne, Université de Tours, Tours, France
- Carlos Andres Ferrero, Federal Institute of Santa Catarina, Florianópolis (IFSC), Florianopolis, Brazil
- Cidalia Fonte, University of Coimbra, Coimbra, France
- Asma Gharbi, University of Paris 8, Paris, France
- Thomas Guyet, AGROCAMPUS-OUEST/IRISA, Rennes, France,
- Eric Kergosien, University of Lille, Lille, France
- Lassi Lehto, Finnish Geospatial Research Institute (FGI), National Land Survey of Finland, Finland
- Bruno Martins, University of Lisbon, Lisbon, Portugal
- Gavin McArdle, UCD Dublin, Dublin Ireland
- Gerhard Navratil, TU Wien, Vienna, Austria
- Ana-Maria Olteanu-Raimond, IGN, Paris, France
- Julien Perret, IGN, Paris, France
- Ross Purves, University of Zurich, Zurich, Switzerland
- Mathieu Roche, CIRAD, Montpellier, France
- Christian Sallaberry, Université de Pau et des pays de l'Adour, Pau, France
- Maribel Yasmina Santos, University of Minho, Portugal
- Simon Scheider, Universiteit Utrecht, Utrecht, The Netherlands
- Alfred Stein, University of Twente, Twente, The Netherlands
- Maguelonne Teisseire, CIRAD, Montpellier, France

EDITORIAL MESSAGE
Smart Human Computer Interaction Special Track on Our Topic

***Anand Paul**, Kyungpook National University, Daegu, Korea*
***Soon Ki Jung,** Kyungpook National University, Daegu, Korea*
***Awais Ahmad**, Università degli Studi di Milano, Milano, Italy*
***Ganesh Kumar P.** Anna University, India,*

As the track chairs of the Smart Human Computer Interaction, we would like to publish the latest, innovative, and outstanding research results in the ACM SAC 2019. This track was called for papers and participation in the 34th ACM/SIGAPP Symposium on Applied Computing held in Limassol, Cyprus, on April 8 – 12, 2019. The major components of the track were human and computer interaction.

A total of 17 papers were submitted to the HCI track. They were initially reviewed by the selected reviewers. Based on the three review criteria on technical contributions, novelty, and completeness, 4 papers were accepted and requested for quality improvements according to the reviewers' comments and suggestions.

This editorial message not only delineates the paper submission, rigorous review, and quality assurance of the track HCI but also significantly appreciates the authors' patience for paper revisions according to the comments.

A full-body interaction is one of the key aspects of human-computer interaction. Therefore, the authors of the paper investigated the effect of a virtual avatar with different motion synchrony levels, using six-camera motion capture, a Kinect, and pre-recorded interactions. The results suggest that the different motion synchronization levels affect all current dependency measures (cybersickness, presence, and body ownership), and these measures are related differently to the motion synchrony levels. The results suggest that the different motion synchronization levels affect all current dependency measures (cybersickness, presence, and body ownership), and these measures are related differently to the motion synchrony levels.

Authors of the paper address the Improve Cutting Skill for Paper-cutting by the Pressure Control. A system is proposed that measures pressure to cut paper with a knife and a system to support the improvement of pressure control skill. Their device is a knife with a blade attached to the tip of the stylus, which can measure pressure, coordinates and cutting time. The purpose of this research is to improve for novices the control of cutting pressure for paper-cutting. The novices who practiced with our system were able to improve the average and variance of cutting pressures.

Mental stress can cause mental illnesses like anxiety and depression. It is often detected by experts, or via intrusive devices attached to a human, both are not viable in daily life. Recent research demonstrated that non-intrusive stress detection is viable through the analysis of mouse and gaze dynamics as a user is using the computer. Therefore, authors of the paper proposed detecting stress from mouse-gaze attraction based on the user interface layout information to build up appropriate models. To infer user stress level in tasks without being concerned on the actual UI. MoGa adopts an innovative mouse-gaze attraction model, which leverages the coordination between mouse and eye movement without considering the UI information. We evaluate the performance of MoGa with tasks on dynamic and fixed UI.

One of the research identifies and proposed an interface mechanism in blockchain for businesses based on a user-centric approach. The base of a user-centric approach in business is to increase user or consumer involvement in the business to increase productivity. As productivity is an important factor in the field of Human Computer Interaction, our approach can increase user input and output, quality and innovation while decreasing costs, errors for business by using smart contact and user-centric model defined by businesses. Smart contacts are a big hit nowadays as blockchain is becoming more mature. But user interaction to these contracts is very limited. Thus, user-centric approach is not fully applicable for such scenario.

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BIOGRAPHY
Anand Paul

Soon Ki Jung

Awais Ahmad received his Ph.D. in Computer Science and Engineering from Kyungpook National University, Daegu, Korea. He is currently working as Post Doc Researcher in Department of Computer Science, University of Milano, Italy. Previously, he was working as an Assistant Professor in the Department of Information and Communication Engineering, Yeungnam University. In 2014, he was also a visiting researcher in INTEL-NTU, National Taiwan University, Taiwan, where he was working on Wukong Project (Smart Home). Since 2013, he has published more than 100 International Journals/Conferences/Book Chapters in various reputed IEEE, Elsevier, and Springer Journals, whereas in leading conferences, i.e., IEEE Globecom 2015, IEEE Globecom 2016, IEEE LCN, 2016, and IEEE ICC 2017, respectively. Dr. Awais is also serving as Guest editor in various Elsevier and Springer Journals, including Future Generation Computer Systems (Elsevier), Sustainable City and Societies (Elsevier), and Computational Intelligence and Complexity (Springer), Multimedia Tools and Applications (Springer), IEEE Access, and Real-Time Image Processing Journal (Springer). Moreover, Dr. Awais is a member of IEEE and ACM, serving as a TPC member or reviewer in 20+ International Conferences and workshops in including IEEE Globecom, IEEE ICC, IEEE Infocom, ACM SAC, and much more. Furthermore, he is an invited reviewer in various journals, including IEEE Communication Letters, IEEE Transactions on Wireless Communications, IEEE Transactions on Intelligent Transportation System, IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, Ad-Hoc Networks Elsevier, Computer Network Elsevier, and IEEE Communications Magazine. Dr. Ahmad was the recipient of four prestigious awards: (1) IEEE Best Research Paper Award: International Workshop on Ubiquitous Sensor Systems (UWSS 2015), in conjunction with the Smart World Congress (SWC 2015), Beijing, China, August, (2) Research Award from President of Bahria University Islamabad, Pakistan in 2011, (3) best Paper Nomination Award in WCECS 2011 at UCLA, USA, and (4) best Paper Award in 1st Symposium on CS&E, Moju Resort, South Korea, in 2013. He was also serving as a Lab Admin of CCMP Labs from 2013 to 2017. He was also awarded as Best Outgoing Researcher of CCMP labs. His research interests include Big Data Analytics, Deep Learning, Sensor and Adhoc Network, Internet of Things, and Big Data Analytics.

Ganesh Kumar P

EDITORIAL MESSAGE
Special Track on Health Informatics (HI)

Anu Mary Chacko, NIT Calicut, India
Gopakumar G, NIT Calicut, India

Health Informatics is an emerging research area which deals with merging technology with medical research to provide better healthcare options to citizens of a nation. Health Informatics requires techniques and technologies to acquire, store, retrieve and use healthcare information so as to foster better collaboration between healthcare providers and patients. The most important purpose of health informatics is to deliver the effective, reliable and low cost healthcare to patients and provide information for healthcare reforms.

This track on Health Informatics, organized for the first time at ACM SAC, have been started with the intention of providing a forum for presenting research on various aspects of health informatics. The response to the track was overwhelming. We received high quality papers from all parts of the world, contributing a total of 24 submissions. The review process was very competitive with each paper receiving at least three reviews, and finally 5 full papers and 2 poster papers were selected for the track, bringing the acceptance rate to approximately 21% for full papers.

The selected papers deal with a wide variety of health informatics related topics including those listed below:

1. Application of Machine Learning approaches for predictive modeling
2. Alerts Management in Intravenous Electromedical Devices Using Bayesian Networks
3. Designing Data Interoperability in Ubiquitous Health Profile using semi-structured storage and processing etc.

We thank all the authors who submitted valuable papers to this track. We are grateful to the members of the Program Committee and to the additional reviewers. Without their support, the organization of the track's sessions would not have been possible. We also express our gratitude to organizations that made this track happen, namely the ACM Special Interest Group on Applied Computing (SIGAPP) and National Institute of Technology Calicut, India. We are grateful to the Symposium Program Chairs for their help in all aspects of the organization of this track

We are certain that issues pertaining to health informatics offer rich opportunities for research and this track on Health Informatics will continue to be a success in future editions of ACM SAC.

EDITORIAL MESSAGE
Special Track on Information Access and Retrieval

Gloria Bordogna, *Consiglio Nazionale delle Ricerche – CNR IREA*
Gabriella Pasi, *Università degli Studi di Milano Bicocca – DISCo*

The special Track on Information Access and Retrieval (IAR) was first organized within the ACM International Symposium on Applied Computing in 2002, to the main aim of allowing researchers and practitioners to present and discuss their proposals and experiences in the middle of the theory-practice spectrum of Information Retrieval and Information Filtering.

With the diffusion of the Web and Search Engines and social networks, Information Retrieval, Information Filtering and Recommendation tasks need to cope with several issues related to the widespread and pervasive diffusion of huge amounts of user generated contents of distinct nature and format (videos, images, maps, audio, texts), of distinct genre and topics (geographic information, products' and organizations' descriptions, scientific research documentations, news, opinions expressed in social network messages and blogs, etc.), from etherogenous sources (universities, governmental institutions, private companies, and individuals), and created with distinct rates and frequency (news steams, social network posts, etc.). Thus the research in this field besides the traditional topics of information content representation, document relevance modeling and information categorization, needs to face novel issues such as relevant information source selection, dynamic query results and stream summarization, and the users' intention modeling both when searching for information and when creating information. These tasks are strictly related with modeling the context in which the search is carried out by considering the information topicality, location, trust, reputation, freshness, etc., all contributing to define the relevance of documents to personal information needs.

This year the special track is in its 18th edition in the context of SAC, and it includes four full papers (with an acceptance rate of 25%), and a poster paper. Each paper was peer reviewed by at least 3 members of the Program Committee (listed in these proceedings) to whom we express our greatest gratitude: their help has been invaluable for carrying out a high quality selection process.
The full papers cover different hot research topics in information retrieval: recommender systems, music scores retrieval, Information Retrieval models.

The first paper entitled "The importance of being dissimilar in Recommendation", by Vito Walter Anelli, Tommaso Di Noia, Eugenio Di Sciascio, Azzurra Ragone and Joseph Trotta argues that similarity between users or items, although it keeps leading importance in computing recommendations, should be paired with a value of dissimilarity (computed not just as the complement of the similarity one). It formally models and injects this notion in some of the most used similarity measures and evaluate an approach to a recommendation scenario showing its effectiveness with respect to accuracy and diversity results on three different datasets.

The paper entitled "Ask Toscanini!—Architecting a Search Engine for Music Scores Beyond Metadata", by Arman Bahraini and Eli Tilevich discusses the user requirements, design choices, and software architecture of a search engine for querying music scores beyond metadata (e.g., instrument range, key/time signature, dynamics, etc.).

The paper “Hybrid Molecule-based Information Retrieval, by Nathalie CHARBEL, Christian Sallaberry, Sebastien Laborie and Richard Chbeir” proposes a graph-based search and ranking algorithm within a generic framework retrieving the data in the form of a novel augmented data structure for query answers, called hybrid molecules. The final objective is to improve the search results and reduce users’ efforts in tracking and interpreting them.

In the paper entitled “aMV-LSTM: an attention-based model with multiple positional text matching”, by Thiziri Belkacem, Taoufiq Dkaki, Jose G. Moreno and Mohand Boughanem a model is proposed combining position-based representation learning approach with the attention- based weighting process. An extension of a position-based model MV-LSTM with an attention layer is proposed, allowing a parameterizable architecture.

Finally, in the poster-paper entitled “Automatically Assessing the Quality of Wikipedia Contents”, by Elias Bassani and Marco Viviani, the problem of automatically evaluating the quality of Wikipedia contents is considered, by proposing a supervised approach based on Machine Learning to perform the classification of articles on qualitative bases.

1st January 2019

Gloria Bordogna and Gabriella Pasi

EDITORIAL MESSAGE
Special Track on Internet of Things (IoT)

Gail-Joon Ahn, *Arizona State University, USA*
Seong-Je Cho, *Dankook University, South Korea*
Jun Zheng, *New Mexico Institute of Mining and Technology, USA*

The Internet of Things (IoT) is a network of smart objects with pervasive and autonomous communication through internet connectivity. It has been emerged as a powerful and promising technology with significant technical, social and economic impacts. However, there are also lots of challenges to overcome to realize the potential benefits of IoT. The IoT track aims at bringing together researchers, experts, and practitioners from academia, industry, and government, to discuss current trends in research, practices, and education efforts of IoT. The track intends to foster the identification of the challenges facing IoT and approaches for solving them.

The IoT track attracted 29 submissions this year. After a rigorous double-blind review process, 7 were accepted as full papers. The overall acceptance rate is at a highly competitive 24%. The accepted papers are listed in the following which cover a wide range of topics in the IoT area:

- "iCORE: Continuous and Proactive Extrospection on Multi-core IoT Devices" by Penghui Zhang, Haehyun Cho, Ziming Zhao, Adam Doupé and Gail-Joon Ahn
- "Privacy-Preserving Delegable Authentication in the Internet of Thin" by Clémentine Gritti, Melek Önen and Refik Molva
- "An Architecture and Its Tools for Integrating IoT and BPMN in Agriculture Scenarios" by Jordano Celestrini, Renato Rocha, Estêvão Saleme, Celso Santos, José Gonçalves Pereira Filho and Rodrigo Andreão
- "Separate Session Key Generation Approach for Network and Application flows in LoRaWAN" by Suman Bala, Dominique Barthel and Said Gharout
- "Ensemble Trees Learning Based Improved Predictive Maintenance using IIoT for Turbofan Engines" by Sourajit Behera, Anurag Choubey, Chandresh Shambhubhai kanani, Yashwant Singh Patel, Rajiv Misra and Alberto Sillitti
- "Toward a Lightweight Ontology for Privacy Protection in IoT" by Mayke Arruda and Renato Freitas Bulcão-Neto
- "CyprIoT : Framework for Modelling and Controlling Network-Based IoT Applications" by Imad Berrouyne, Massimo Tisi, Jean-Marie MOTTU, Mehdi Adda and Jean-Claude Royer

In addition, two submissions were accepted as poster papers:

- "PEDAL:Power-Delay Product Objective Function for Internet of Things Applications" by Bardia Safaei, Ali Asghar Mohammad Salehi, Maryam Shirbeigi, Amir Mahdi Hosseini Monazzah and Alireza Ejlali
- "Hygieia: Data Quality Assessment for Smart Sensor Network" by Gabriel Rodrigues Caldas de Aquino, Claudio Miceli de Farias and Luci Pirmez

The program committee (PC) of the track features 27 well-established researchers in the IoT area. In alphabetical order, the PC members are:

Chinnapong Angsuchotmetee (Prince of Songkla University, Thailand)
Rakesh Bobba (Oregon State University, USA)
Jinsung Cho (KyungHee University, South Korea)
Kim-Kwong Raymond Choo (University of Texas at San Antonio, USA)
Zongming Fei (University of Kentucky, USA)
Sepideh Ghanavati (Texas Tech University, USA)
Jinhua Guo (University of Michigan, USA)
Junyoung Heo (Hansung University, South Korea)
Hongxin Hu (Clemson University, USA)
BooJoong Kang (Queen's University Belfast, UK)
Younghyun Kim (University of Wisconsin - Madison, USA)
Mun Kyu Lee (Inha University, South Korea)
Qingzhong Liu (Sam Houston State University, USA)
Davide Maiorca (University of Cagliari, Italy)
Bruce McMillin (Missouri University of Science of Technology, USA)
Alessio Merlo (University of Genova, Italy)
Radu Mihailescu (Malmo University, Sweden)
Hong Min (Hoseo University, South Korea)
Satyajayant Jay Misra (New Mexico State University, USA)
Mithun Mukherjee (Guangdong University of Petrochemical Technology, China)
Mengyu Qiao (South Dakota School of Mines & Technology, USA)
Ramyaa Ramyaa (New Mexico Tech, USA)
Filippo Ricca (University of Genova, Italy)
Houbing Song (Embry-Riddle Aeronautical University, USA)
Minseok Song (Inha University, South Korea)
Jiawei Yuan (Embry-Riddle Aeronautical University, USA)
Ziming Zhao (Rochester Institute of Technology, USA)

We would like to express our deepest gratitude to the PC members for their dedication to the high quality review process. We would also like to thank all the authors for submitting their work to the track. Your contributions are essential for the success of the track!

EDITORIAL MESSAGE
Special Track on Intelligent Robotics and Multi-Agent Systems

Rui P. Rocha, *ISR – University of Coimbra, Portugal*
Daniel Kudenko, *University of York, United Kingdom*

Foreword

The special track on Intelligent Robotics and Multi-Agent Systems (IRMAS) focuses on all aspects of intelligent robotics and multi-agent systems (MAS) including related areas and applications. Its primary goal is to exploit synergies between robotics and artificial intelligence (AI), more precisely between intelligent robotics and MAS, and bring together researchers from both fields. For many years, robotics and AI researchers have worked separately, both fields have matured enormously, and today there is a growing interest in getting the two research fields together. Many in robotics believe that the focus in the near future should be adding capabilities to robots that lie at the core of AI research. Reciprocally, AI researchers aim at embedding their techniques in physical robots that can perceive, reason and act in real, dynamic environments.

We invited papers to address the research topics covered by this track through a call for papers distributed in worldwide mailing lists on robotics and AI and in private mailing lists of the Program Committee (PC) members. The accepted papers cover important topics of this track, both on intelligent robotics and MAS.

In this fifth edition, there were 28 papers submitted from Europe (8), South America (9), USA (5), South Asia (4), and Far East (2). After a rigorous blind peer review process by 62 PC members, 7 regular papers and 2 poster papers were accepted for the conference, resulting in an overall acceptance rate of 32%.

Acknowledgment

Many people contributed to the success of this track. First of all, we would like to thank to all members of the international PC for their efforts in attracting quality papers and in providing thoughtful reviews on time. The PC members are listed here in alphabetical order:

Alberto Ruiz - University of Murcia, Spain
Alberto Viseras - German Aerospace C., Germany
Aleksei Shpilman - St. Petersburg NRAU, Russia
Alessandro Farinelli - University of Verona, Italy
Ann Nowé - Free University of Brussels, Belgium
Armando Sousa - University of Porto, Portugal
Arnoud Visser - Univ. Amsterdam, Netherlands
Chris. Kiekintveld - Un. Texas El Paso, TX, USA
Daniel Hennes, Univ. of Stuttgart, Germany
Daniele Nardi - Univ. di Roma La Sapienza, Italy
David Portugal - Ingeniarius Ltd, Portugal
Denis Wolf - University of São Paulo, Brazil
Enda Howley - Nat. Univ. Ireland Galway, Ireland
Fernando Cheein - Un. Técn. Fed. St. María, Chile
Frans A. Oliehoek - Delft Univ. Tec., Netherlands
Giovanni Beltrame - Éc. P. Montréal, QC, Canada
Giuseppe Loianno - New York Univ., NY, USA
Hakim Mabed - Univ. Bourgogne F.-C., France
Itsuki Noda - AIST, Japan
Jan Faigl - Czech Tech. Univ. Prague, Czech Rep.

Javier Alonso-Mora - TU Delft, Netherlands
Jefferson R. Souza - Fed. Univ. Uberlândia, Brazil
Jen Jen Chung - ETH Zurich, Switzerland
Jesús Capitán - University of Seville, Spain
João F. Ferreira - Nottingham Trent Univ., UK
João Quintas - Instituto Pedro Nunes, Portugal
José Guerrero - Universitat Illes Balears, Spain
Jun Ota - University of Tokyo, Japan
Kay Römer - Graz Univ. of Technology, Austria
Kurt Geihs - Kassel University, Germany Lounis Adouane - Institut Pascal, France
Lucia Pallottino - University of Pisa, Italy
Luis J. Manso - Aston University, UK
Luis Merino - Pablo de Olavide University, Spain
Luiz Chaimowicz - Fed. Un. Minas Gerais, Brazil
Luiz Mirisola - Tech. Institute Aeronautics, Brazil
Manuel Silva - Polytechnic of Porto, Portugal
Mark Hanheide - University of Lincoln, UK
Mauro Dragone - Heriot-Watt University, UK
Micael S. Couceiro - Ingeniarius Ltd., Portugal
Michael Yu Wang - HKUST, Hong Kong, China
Ming Liu - HKUST, Hong Kong, China
Nora Ayanian - Univ. South. California, CA, USA
Nuno Lau - University of Aveiro, Portugal
Olivier Simonin - Université de Lyon, France
Ouiddad Labbani-Igbida - Univ. Limoges, France
P.B. Sujit - Indraprastha Inst. Inform. Techn., India
Paulo Drews Jr. – Fed. Univ. Rio Grande, Brazil
Paulo Gonçalves - Polyt. Castelo Branco, Portugal
Pedro Miraldo - University of Lisbon, Portugal
Pedro Núñez - University of Extremadura, Spain
Pooyan Fazli - Cleveland State Univ., OH, USA
Pratap Tokekar - Virginia Tech Univ., VA, USA
Ricardo V. Martín - University of Malaga, Spain
Robert Fitch - ACFR, Sydney, Australia
Sandip Sen - University of Tulsa, OK, USA
Sérgio Monteiro - University of Minho, Portugal
Sören Schwertfeger - ShanghaiTech Univ., China
Thomas Hellström - Umeå University, Sweden
Tomas Krajnik - Czech Tech. Univ., Czech Rep.
Yen-Chen Liu - Nat. Cheng Kung Univ., Taiwan
Yu Zhang - Arizona State University, AZ, USA

We also want to thank all the authors who contributed to the SAC 2019 IRMAS track. Finally, we offer special thanks to the SAC 2019 Organizing Committee and the ACM SIGAPP.

About the Track Chairs

Rui P. Rocha is an assistant professor in the Dept. of Electrical and Computer Engineering and a permanent researcher of the Institute of Systems and Robotics at the University of Coimbra, Portugal. His main research interests are multi-robot systems, cooperative robotics, distributed control, autonomous robots, and ambient assisted living. He was the founder of the IRMAS track and was organizer and co-chair of all 5 editions.

Daniel Kudenko is a lecturer in computer science at the University of York, United Kingdom, where he leads the Reinforcement Learning Group. His research interests include machine (reinforcement) learning, multi- agent systems, user modeling, and artificial intelligence for games and interactive entertainment. He was co- chair of the last 3 editions of the IRMAS track.

EDITORIAL MESSAGE
Special Track on Knowledge and Language Processing

Mauro Dragoni
Fondazione Bruno Kessler
Trento, Italy

Marco Rospocher
University of Verona
Verona, Italy

The ACM SAC2019 special track on Knowledge and Language Processing (KLP) (http://klp.fbk.eu/) aims to promote a forum for scientists, engineers and practitioners, in academia and industry, to investigate techniques and application of knowledge engineering and natural language processing, focusing in particular on approaches combining them. This is an extremely interdisciplinary emerging research area, at the core of Artificial Intelligence, combining and complementing the scientific results from Natural Language Processing and Knowledge Representation and Reasoning.
This was the first edition of the Knowledge and Language Processing track at SAC. We invited original contributions combining and complementing the scientific results from Natural Language Processing and Knowledge Representation and Reasoning. The call for papers was circulated in several international mailing lists. We received 41 regular submissions. Each submission was reviewed by experienced Programme Committee members. The selection process for the track was very competitive, resulting in the acceptance of:

- 10 full papers (acceptance rate: 24%):
  - Same but Different: Distant Supervision for Predicting and Understanding Entity Linking Difficulty (*Renato Stoffalette Joao, Pavlos Fafalios and Stefan Dietze*)
  - Study of Linguistic Features Incorporated in a Literary Book Recommender System (*Haifa Alharthi and Diana Inkpen*)
  - Vocabulary based Community Detection and Characterization (*Giorgia Ramponi, Stefano Ceri, Marco Brambilla, Florian Daniel and Marco Di Giovanni*)
  - Few-shot classification in Named Entity Recognition task (*Alexander Fritzler, Varvara Logacheva and Maksim Kretov*)
  - Unveiling Middle-Level Concepts through Frequency Trajectories and Peaks Analysis (*Luigi Di Caro and Alice Ruggeri*)
  - Populating the Knowledge Base of a Conversational Agent: Human vs. Machine (*Hugo Patinho Rodrigues, Luisa Coheur and Eric Nyberg*)
  - A Case-based Approach Using Phonological Knowledge for Identifying Error Patterns in Children's Speech (*Maria Helena Franciscatto, Celio Trois, João Carlos Damasceno Lima, Vinícius Maran and Márcia Keske Soares*)
  - Exploring Lexico-Semantic Patterns for Aspect-Based Sentiment Analysis (*Frederique Baas, Olivier Bus, Alexander Osinga, Nikki van de Ven, Steffie van Loenhout, Lisanne Vrolijk, Kim Schouten and Flavius Frasincar*)
  - Detecting Reliable Novel Word Senses: A Network-Centric Approach (*Abhik Jana, Animesh Mukherjee and Pawan Goyal*)
  - Out-of-context Fine-grained Entity Classification (*Guillaume Jacquet, Jakub Piskorski and Sophie Chesney*)

- 4 posters:
    - Looking into the Past: Evaluating the Effect of Time Gaps in a Personalized Sentiment Model (*Siwen Guo, Sviatlana Höhn and Christoph Schommer*)
    - Overwhelmed by Negative Emotions? Maybe You Are Being Cyber-bullied! (*Pinar Arslan, Michele Corazza, Elena Cabrio and Serena Villata*)
    - A Hybrid Deep Learning Network for Modelling Opinionated Content (*Pantelis Agathangelou and Ioannis Katakis*)
    - A portable grammar-based NLG system for verbalization of structured data (*Simon Mille, Stamatia Dasiopoulou and Leo Wanner*)

We would like to thank the members of the Program Committee and the additional reviewers (a.r.) for their time and efforts in reviewing the contributions submitted to the track. All accepted contributions have been revised and improved based the PC feedback, thus setting the basis for two exciting track sessions at the conference.

Alberto Lavelli	Danilo Dessi	Giuseppe Rizzo	Marieke van Erp
Alessandro Oltramari	Davide Buscaldi	Harald Sack	Matteo Palmonari
Amal Zouaq	Davide Colla (a.r.)	Itziar Aldabe	Paramita Mirza
Andrea Cimino (a.r.)	Diego Reforgiato Recupero	Ivan Donadello	Pasquale Minervini
Anna Lisa Gentile	Dominique Brunato (a.r.)	Kim Schouten	Piek Vossen
Annalina Caputo	Elena Cabrio	Komal Florio (a.r.)	Pierpaolo Basile
Antske Fokkens	Enrico Mensa (a.r.)	Leo Wanner	Simon Mille
Chiara Di Francescomarino	Felice Dell'Orletta	Loris Bozzato	Stefania Marrara (a.r.)
Cristina Bosco	Francesco Corcoglioniti	Luigi Di Caro	Tommaso Caselli
Daniele P. Radicioni	German Rigau	Marco Brambilla	Valentina Tamma
Danilo Croce	Giulia Venturi (a.r.)	Marco Guerini	Valerio Basile

Organizers' Short Bios

Dr. **Mauro Dragoni** (https://pdi.fbk.eu/people/profile/dragoni) is a research scientist at Fondazione Bruno Kessler within the Process and Data Intelligence research unit (PDI). He received his Ph.D. in Computer Science from the University of Milan in 2010. His main research topics concerns the adoption of artificial intelligence solutions within healthcare real-world application. Moreover, he investigates on knowledge management, information retrieval, and machine learning strategies by focusing on their integration into real-world prototypes. He has been involved in a number of international research projects, including Organic.Lingua (FP7), Medical CPS (EIT), PROMO (FESR), and Presto (FESR). He co-authored more than 100 scientific publications in international journals, conferences, and workshop. He co-organized OWLED 2015; the Challenge on Conceptual Sentiment Analysis co-located with ESWC 2015, 2016, and 2018; the Workshop on Emotion and Sentiment Analysis co-located with ESWC 2016, 2017, and 2018; and he will be the general chair of OWLED 2016.

Dr. **Marco Rospocher** (https://marcorospocher.com/) is Associate Professor of Informatics (INF/01) at the University of Verona, within the Department of Foreign Languages and Literatures. He received his PhD in Information and Communication Technologies from the University of Trento in 2006. His current research interests are in the area of Artificial Intelligence, focusing in particular on ontologies, formalisms for Knowledge Representation and Reasoning, and methodologies and tools for Knowledge Acquisition and Information Extraction. He has been involved in a number of international research projects, including the EU-funded projects APOSDLE (FP6), PESCaDO (FP7), and NewsReader (FP7). He co-authored more than 70 scientific publications in international journals, conferences and workshops. He usually serves in the programme committees of relevant international conferences and workshops. He co-chaired the Posters and Demonstrations track of the 13th International Semantic Web Conference (2014) and the Doctoral Consortium at the 17th International Conference of the Italian Association for Artificial Intelligence (2018), and co-organized the 4th International Workshop on Detection, Representation, and Exploitation of Events in the Semantic Web (2015).

EDITORIAL MESSAGE
KomIS: Application of AI and Big Data Analytics

Fabio Mercorio, *University of Milan-Bicocca, Italy*
Mario Mezzanzanica, *University of Milan-Bicocca, Italy*
Antonio Picariello, *University of Naples "Federico II", Italy*

Today huge masses of data are available which represent the backbone of an increasing number of services and applications. Actually, companies recognise that a timely, accurate and significant knowledge derived from these data represents a value to deeply understand social, economic, and business phenomena, and to improve competitiveness in a dynamic business environment. Leveraging Knowledge Discovery techniques to such Information Systems can play a key role - especially in Big Data applications - in combining and analysing very large volumes of data to obtain meaningful and useful information for business and decision purposes. The goal of KomIS (Knowledge Discovery meets Information Systems) is to foster a cross-fertilisation among researchers and practitioners working on Knowledge Discovery and Information Systems.

Objectives of the track. Starting from the results of the previous editions, the KomIS track would deepen the debate on application-relevant aspects of **Applications of AI and Big Data Analytics**, with the aim of reporting and discussing experiences relating to deploying these systems in real-life contexts, that usually involve computer scientists, mathematicians, and statisticians working in close cooperation with application domain-experts. Specifically, KomIS encouraged contributions focusing and discussing technical ideas, exploratory experiences relating to real-world implementations of AI and Big Data Analytics into business contexts and their application in public or private sectors. Contributions discuss the challenges tackled, the contributions provided, and the solutions adopted, figuring out how one or more of the Knowledge Discovery tasks have been addressed, such as data sources selection and integration, data processing, transformation and cleaning, data mining, data design, and visualisation as well.

Statistics. We received 18 paper submissions from different countries such as France, Brasil, Italy, Greece, Taiwan, Australia, Jamaica, United Kingdom, USA, and Germany. We believe this reaffirms both the interest of researchers and practitioners in the track - now in its fourth edition - and the relevance of the theme. Submitted papers have been reviewed by a Program Committee of 20 members, granting 3-4 extensive reviews per submission; 5 of the submitted papers have been accepted as full papers whereas 2 have been accepted as poster. The list of keywords from the accepted contributions include: *Aggregating Place Information; Geographic Information Retrieval; Visual analytics; Crime Trajectory; LSTM Network; Trajectory prediction; Web Ranking; Federated Query Engine; SPARQL; Service Discovery; Linked Open Data. Deep Learning; Online Social Network; Community Detection; CNN; Crowding Estimation; Deep Learning; and Data Augmentation.*

Acknowledgements. We would like to thank all authors for their valuable contributions. We also thank the program committee members who voluntarily supported us in the reviewing activity. A special thank also goes to the ACM SAC 2019 Conference Chairs and Program Chairs for their support and guidance. Additional information related to KomIS can be found at http://www.crisp-org.it/komis/

EDITORIAL MESSAGE
Special Track on Knowledge Representation and reasoning (KRR)

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Martine Ceberio, *University of Texas El Paso (UTEP), US*
Eric Monfroy, *Universidad Técnica Federico Santa María, Valparaíso, Chile, and Université de Nantes, France*
Francesco Santini, *Università di Perugia, Italy*

The topic of the track covers an important field of research in Artificial Intelligence: KRR is indeed a trending topic (for instance, its Argumentation-theory subfield). A similar dedicated conference is the International Conference on Principles of Knowledge Representation and Reasoning, but all the major conferences in AI (e.g., AAAI, IJCAI, AAMAS, ECAI) have KRR among their topics of interest. KRR track will be a venue for all the researchers and practitioners working on the fundaments (but also applications) of reasoning, and the cross-fertilization among different approaches (e.g., Argumentation and Belief Revision).

Knowledge-representation and Reasoning (KRR) is the field of artificial intelligence that focuses on designing computer representations that capture information about the world that can be used to solve complex problems. Its goal is to understand and build intelligent behavior from the top down, focusing on what an agent needs to know with the purpose to behave intelligently, how this knowledge can be represented symbolically, and how automated reasoning procedures can make this knowledge available as needed. In KRR a fundamental assumption is that an agent's knowledge is explicitly represented in a declarative form, suitable for processing by dedicated reasoning engines. Topics of interest include, but are not limited to:

- Argumentation
- Belief revision and update, belief merging, etc.
- Commonsense reasoning
- Constraint solving, programming, technologies
- Contextual reasoning
- Description logics
- Diagnosis, abduction, explanation
- Inconsistency- and exception tolerant reasoning, para-consistent logics
- KR and autonomous agents: intelligent agents, cognitive robotics, multi-agent systems
- KR and decision making, game theory, social choice
- KR and machine learning, inductive logic programming, knowledge discovery and acquisition
- Logic programming, answer set programming, constraint logic programming
- Non-monotonic logics, default logics, conditional logics
- Preferences: modeling and representation, preference-based reasoning
- Reasoning about knowledge and belief, dynamic epistemic logic, epistemic and doxastic logics
- Reasoning systems and solvers, knowledge compilation
- Spatial reasoning and temporal reasoning, qualitative reasoning
- Uncertainty, representations of vagueness, many-valued and fuzzy logics

The special track was a huge success: a total of 23 papers were submitted for being anonymously reviewed. An excellent Program Committee was assembled to help with the review process. Each paper was reviewed by 3 members of the Program Committee, which was made of 27 experts of the field. From the submissions received, 6 papers were accepted as full papers and 1 more paper as poster. The rate of acceptance for the track is in line with that of the conference as a whole.

Three papers are related to different aspects of Argumentation. The main topic of 3 full papers is Argumentation in AI. The paper "Representing and Comparing Large Sets of Extensions of Abstract Argumentation Frameworks" presents and compares three different alternative representations of extensions, one of which is novel for the argumentation domain, and provides an empirical evaluation of their effectiveness in the comparison of large enumerations. A second paper, "On Scaling the Enumeration of the Preferred Extensions of Abstract Argumentation Frameworks", is still focused on Computational Argumentation: in particular, the authors propose an algorithm for efficiently computing the set of preferred extensions of a given AF; the adopted technique relies on first computing the ideal extension for the given AF, and then using it to prune some arguments so that a smaller AF is obtained. Finally, the third paper entitled "Interpretations and Models for Assumption-Based Argumentation" investigates an alternative characterization of semantics for Assumption-Based Argumentation (ABA) frameworks. Two more papers fall in the area of Logic and Constraints. The paper entitled "Expressive Cardinality Constraints on ALCSCC Concepts" extends a previous form of Description Logic with cardinality constraints. A second paper "Conflict History Based Search for Constraint Satisfaction Problem" proposes a dynamic and adaptive branching heuristic for CSP solving. The two remaining papers are respectively "Hybrid Temporal Situation Calculus" where the authors extend Reiter's temporal situation calculus by introducing continuous change due to passage of time in addition to discrete change due to actions, while the paper "Inferential Equivalence, Normal Forms, and Isomorphisms of Knowledge Bases in Institutions of Conditional Logics" introduces the notion of inferential equivalence of knowledge bases for two different nonmonotonic inference relations induced by a knowledge base.

As special track co-chairs, we would like to express our thanks to all those whose hard work made this track such a success. We express a very special word of thanks to all the authors who submitted papers to the special track. We also sincerely acknowledge the hard work of the Program Committee for reviewing the papers in such a detailed and timely fashion. Finally, we would like to thank the organizers of SAC-2019 for providing so much help and assistance in supporting this special track.

The track chairs of the Special Track on Knowledge Representation and reasoning (KRR)

Stefano Bistarelli, Martine Ceberio, Eric Monfroy, Francesco Santini

EDITORIAL MESSAGE
Special Track on Mobile Computing and Applications

***Hong Va Leong**, The Hong Kong Polytechnic University, Hong Kong*
***Sheikh Iqbal Ahamed**, Marquette University, USA*

1. THE MOBILE COMPUTING AND APPLICATIONS TRACK

For the past 16 years, Mobile Computing and Applications Tracks had been running successfully. The papers have been improving in quality and the competition has also become more and more severe, with dropping acceptance rate. This year, the track is experiencing a challenge in receiving fewer submissions from the past, and the set of accepted papers happens to be more concentrated geographically. With the relatively small sample size, this is perhaps the effect of statistical variations only. The track features research papers drawn from different application domains in mobile computing, with a very heavy orientation towards the recently upcoming areas of machine learning and artificial intelligence this year for security, privacy, localization and so on. To summarize, the track is dedicated to draw upon research efforts and expertise from different areas of research, so as to promote better synergy and to bring forth not only core communications and structures for application development and data management, but also important and upcoming research applications to realize the benefits of anywhere, any place and anytime pervasive and ubiquitous computing.

2. THE REVIEW PROCESS

It is to our great honor to have invited many well-established researchers with strong track records in the area of mobile computing and mobile data management to serve on the international program committee. We would like to express our deepest gratitude to the program committee members for their dedication to the high quality review process, within a relatively short review cycle. Each paper is sent to at least three independent reviewers in the program committee, under a blind review process. In the end, all papers received at least three review reports, commenting on their relative merits and shortcomings. Acceptance was based on the scores recommended by the reviewers, their relative level of confidence in the papers, as well as their written comments. We concur that the papers we accepted are of high quality and it is indeed unfortunate that many good quality papers could not be included in the proceedings, even as posters. We would especially like to thank the program committee members and additional reviewers for their dedicated efforts and help in reviewing the papers:

> *Ivor Addo* from University of Wisconsin at Oshkosh, USA; *Mohammad Adibuzzaman* from Purdue University, USA; *Angelo Brayner* from Federal University of Ceara, Brazil; *Guadalupe Canahuate* from University of Iowa, USA; *Chi-Yin Chow* from City University of Hong Kong, Hong Kong; *Alfredo Cuzzocrea* from University of Calabria, Italy; *Ling Feng* from Tsinghua University, China; *Osman Gani* from Miami University, USA; *Md Munirul Haque* from Purdue University, USA; *Takahiro Hara* from Osaka University, Japan; *Md Kamrul Hasan* from Marquette University, USA; *Charles Hu* from National Central University, Taiwan; *Niharika Jain* from Marquette University, USA; *Ferdous Kawsar* from Medical College of Wisconsin, USA; *Rasib Khan* from Northern Kentucky University, USA; *Dik Lee* from Hong Kong University of Science and Technology, Hong Kong; *Guanling Lee* from National Dong Hwa University, Taiwan; *Po-Ruey Lei* from ROC Naval Academy, Taiwan; *Seng Loke* from Deakin University, Australia; *Stephane Maag* from Institut Telecom SudParis, France; *AKM Majumder* from Miami University, USA; *Mohammad Rahman* from TnTech, USA; *Rodolfo Resende* from Universidade Federal de Minas Gerais, Brazil; *Weidong Shi* from University of Houston, USA; *Antonio Si* from Intuit Inc, USA; *Chandana Tamma* from Marquette University, USA; *Jianliang Xu* from Hong Kong Baptist University, Hong Kong; *Mi-Yen Yeh* from Academia Sinica, Taiwan; *Seongwook Youn* from Korea National University of Transportation, Korea; *Arkady Zaslavsky* from Deakin University, Australia; *Baihua Zheng* from Singapore Management University, Singapore.

In response to the Call-for-Papers, we received 19 submissions from 15 different countries, spanning across 4 continents, with most submissions coming from Europe, followed very closely by submissions from South America and Asia. There is also a submission from North America. The distribution is as follows: Europe (8.5), South America (5), Asia (4.5) and North America (1). After a rigorous review process, 5 papers are selected for inclusion in the Proceedings, being split among 3 Asian and 2 European contributions. We are faced with a tough selection process, and the acceptance rate for regular papers is only 26.3%. An international paper with highly favorable reviewers' comments that would have been accepted as regular papers in the past can only be accepted as a poster paper, with authors coming from 4 countries in Europe and Asia. This completes the profile of the Mobile Computing and Applications Track for SAC 2019.

3. THE CONTRIBUTED PAPERS

This year, the set of contributed papers represents a very heavy concentration on the application natures of mobile computing, whist deploying the up-surging and important research paradigms and technologies in machine learning and artificial intelligence, in the development of various mobile applications. One of the accepted papers represents collaborative efforts across institutions, another one across countries and yet the final poster paper even across continents for being exceptionally international.

Session: Mobile Applications

The first paper in the track is authored by Bo Sun, Tao Ban, Shun-Chieh Chang, Yeali Sun, Takeshi Takahashi and Daisuke Inoue, entitled "*A Scalable and Accurate Feature Representation Method for Identifying Malicious Mobile Applications*". This paper represents a machine learning approach to identify malicious applications. It is based on feature extraction from a large dataset collection from application store with 49K benign samples and 13K malicious samples. A semantic-based approach is adopted to represent the features, which are extracted via static analysis from API calls and permission requests from mobile applications, as well as metadata collected from a mobile store. Five supervised learning approaches are evaluated, and a multi-layer perceptron classifier is able to attain F-measures of as high as 0.995. The second paper is entitled "*Machine Learning for Improving Mobile User Satisfaction*" by Ismat Chaib Draa, Smail Niar, Fabien Bouquillon and Emmanuelle Grislin-Le Strugeon. This paper adopts machine learning in another perspective: identifying and classifying user context to optimize energy consumption. It exploits sensors and API to collect and analyze a large set of data to detect usage patterns and regularities, and to predict future user-actions. The classification and the prediction enable an agreement between the power consumption reduction opportunities and the user request satisfaction for implementing efficient power policies to control the power knobs. This framework is able to extend the battery life by up to 7 hours when compared with power manager implemented in an operating system. The next paper is by Jung-Hyun Lee, Woo-Jong Ryu, Kang-Min Kim and SangKeun Lee, entitled "*MoCA: A Novel Privacy-preserving Contextual Advertising Platform on Mobile Devices*". This paper adopts a semantic generalization model at the mobile device to determine the relevancy of in-app contextual advertisement based on a compressed knowledge base with 789 topics stored locally. The model is able to control the degree of privacy protection. The effectiveness in terms of relevance performance and system overheads has been evaluated with a real-world dataset. The relevance is very similar to that produced by a server. The memory consumption is marginal whereas the classification time is small, confirming that it can effectively and efficiently support mobile contextual advertising inside mobile devices. This is followed by the local host paper "*A Multi-Objective Indoor Localization Service for Smartphones*", authored by Andreas Konstantinidis, Aphrodite Demetriades and Savvas Pericleous. This paper presents a fine-grained, energy-efficient indoor localization service using only a subset of WiFi-based localization data on the client-side, maintaining user's privacy. It follows a fingerprinting-based indoor localization model that optimizes several conflicting objectives via a multi-objective evolutionary algorithm. Pareto optimal solutions are captured based on the Pareto front returned by the genetic algorithm. The weighted *k*NN approach is adopted to return the location. Three different movement scenarios by a professor, a student and a visitor in the local building have been studied. The last paper in the track is "*Acousess: Smartphone-based Logger to Assess Acoustical Conditions*" jointly by Takahiro Miura, Mari Ueda, Masaaki Hiroe and Ken-ichiro Yabu. This final paper is not only application-based, but also user-based with inputs from researchers and domain experts. It aims at clarifying the relationship between the objective noise level in individuals' daily life and their subjective discomfort to noise. The use of smartphone and questionnaire captures datasets on objective noise levels and correspondent subjective impressions. Acoustic experts provide annotation to the objective and subjective sound conditions. Analysis indicated that intrapersonal differences may be caused by personal situations including time and day and whether they were working, but the objective noise level is the primary driver.

Poster Session

The unique representative in the poster session manifests itself as a fully international effort with collaboration spanning across many countries. This joint research paper by Muhammad Ahmad, Adil Mehmood Khan, Manuel Mazzara, Salvatore Distefano, Amjad Ali and Ali Tufail bears a relatively long title "*Extended Sammon Projection and Wavelet Kernel Extreme Learning Machine for Gait-based Legitimate User Identification*". This paper attempts to identify users by extracting features represented by signals acquired by phone sensors on user movement and adopting the Extended Sammon Projection method for feature reduction. A wavelet kernel based extreme learning machine classifier is trained with movement data from authenticating four users and is shown to attain an accuracy of 97%.

4. THE TRACK CHAIRS

Hong Va Leong received his PhD from the University of California at Santa Barbara, and is currently an associate professor at the Hong Kong Polytechnic University. He is the program co-chairs of several conferences, including IMMCN, HS@I, CIC, and the track chair of SAC 2003 to 2018. He has served on the organizing committees for SIGMOD and VLDB and on the program committees of VLDB, EDBT, ICDE, ICDCS, MDM, CIKM and many others. He had also served as symposium and workshop chairs at IEEE COMPSAC for a number of years. He is a reviewer for ACM Transactions on Computer Systems, IEEE Transactions on Parallel and Distributed Systems, on Knowledge and Data Engineering, on Mobile Computing, on Multimedia, and on Computers, Information Systems, and other journals. His research interests are in mobile computing, internet computing, distributed systems, distributed databases, and digital libraries. He is a member of the ACM, IEEE Computer Society and IEEE Communications Society.

Sheikh Iqbal Ahamed is currently a professor and Chair of the Department of Computer Science and director of Ubicomp Lab at Marquette University, USA. He is a senior member of the IEEE, ACM, and the IEEE Computer Society. He completed his Ph.D. in Computer Science from Arizona State University, USA in 2003. His research interests include mHealth, security and privacy in pervasive computing, affective computing, middleware for ubiquitous/pervasive computing. Currently, he has over $1M research grants in mHealth and mobile/pervasive computing. He has a number of collaborative mHealth projects with the researchers of different universities and non-profit organizations in USA and international mHealth projects in Bangladesh, Nepal, Taiwan, Japan, Vietnam and China. Recently, he has led teams to build mHealth system for smoking cessation, suicide prevention, palliative care, cancer patient care etc. He has published 120+ peer reviewed journal, conference and workshop papers and received twelve best paper/posters awards in last five years. He serves regularly on international conference program committees in mobile computing, software engineering and pervasive computing. He has been serving as the Standing Committee Vice Chair of COMPSAC since 2015. He is the Guest Editor of Computer Communications Journal, Elsevier. Link to his high impact mHealth project: http://www.marquette.edu/research/documents/discover-2011-mobile-md.pdf.

EDITORIAL MESSAGE
Special Track on Microservices, DevOps, and Service-Oriented Architecture

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***Elisabetta Di Nitto**, Politecnico di Milano, Italy*
***Jacopo Mauro**, University of Southern Denmark, Denmark*

Service-oriented architectures have changed our vision of the Web, bringing a paradigmatic shift in the methodologies when designing and implementing distributed systems. Originally, the Web was mainly seen as a means of presenting information to a wide spectrum of people, but service-oriented programming triggered a radical transformation of the Web towards a computational fabric where loosely coupled services interact, can be discovered and then invoked. More recently, the microservices architectural style has been proposed, where applications are developed as a collection of fine-grained services running as independent processes. Distributed applications can then be constructed from independently deployable services taking advantage of the properties of the microservice architecture (e.g., flexibility, maintainability, reusability, compositionality, and scalability) as well as the elasticity of cloud infrastructure. From the practical point of view, the deployment and maintenance of (micro)services architectures are performed using DevOps, i.e., a collection of practices linking software development (Dev) with software operations (Ops). DevOps strongly advocates for automation and monitoring at all steps of software construction, from integration, testing, releasing to deployment and infrastructure management. By using the DevOps methodology, it is possible to reduce the time between committing a change to a system and the change being placed into normal production, while ensuring high quality.

The complex scenario of (Micro)Services and DevOps needs to be clarified on many aspects, both from the engineering and from the foundational points of view.

The Microservices, DevOps, and Service-Oriented Architecture (MiDOS) track aims to bring together researchers and practitioners having the common objective of transforming Service-Oriented, DevOps, and Microservice practices into a mature discipline with both solid scientific foundations and mature software engineering development methodologies supported by dedicated tools. In particular, we encourage works and discussions about what (Micro)Services and DevOps still need in order to achieve their goal.

The 2019 edition of MiDOS included double-blind reviewing of papers, in order to increase fairness and avoid bias in reviewing. Papers were blinded for submission, with authors' names and identifying details removed. Each paper was reviewed by three PC members. We received 16 papers among which four papers and one poster were accepted for publication. We would like to thank the authors of all the submitted papers for their interest in the special track. We are grateful for the efforts of the PC members: Alberto Lluch Lafuente, Alberto Núñez, Alceste Scalas, Antonio Bucchiarone, António Ravara, Dimka Karastoyanova, Emilio Tuosto, Farhad Arbab, Farouk Toumani, Florian Rademacher, Gianluigi Zavattaro, Gustavo Petri, Hernán Melgratti, Hugo Torres Vieira, Jacopo Soldani, José Fiadeiro, Luís Barbosa, Maryam Razavian, Massimo Villari, Roberto Zunino, Romain Demangeon, Ross Horne, Saverio Giallorenzo, Schahram Dustdar, Shuiguang Deng, Silvia Lizeth Tapia Tarifa, Víctor Rivera, and Violet Ka I Pun. We warmly thank the publicity chair, Saverio Giallorenzo, for disseminating the MiDOS call for papers. Finally, we also thank the MiDOS Steering Committee members, Claudio Guidi, Ivan Lanese, Manuel Mazzara, and Fabrizio Montesi, for their help and support.

EDITORIAL MESSAGE
Special Track on Next Generation Programming Paradigms and Systems

Davide Ancona, DIBRIS, *University of Genova, Italy*
***Frédéric Loulergue**, Northern Arizona University, USA*
***Mirko Viroli**, Alma Mater Studiorum - Università di Bologna, Italy*
***Danilo Pianini**, Alma Mater Studiorum - Università di Bologna, Italy*

Introduction

The complexity of modern software systems is continuously growing together with the communication capabilities and computational power of pervasive technology, embodied by a wide range of interacting heterogeneous smart devices.

This new scenario is posing serious challenges to software development, which hardly keeps pace with this technological evolution. Sophisticated frameworks exposed through application programming interfaces, or directly integrated with mainstream programming languages provide partial solutions to support big data streaming and complex analytic; dynamic, autonomous, and collective coordination and adaptation capabilities; emergent behavior in cooperating systems; Internet of Things (IoT) systems development and maintenance; and employment of cloud platforms and parallel architectures, in particular heterogeneous ones.

This calls for new abstractions, features, middlewares and tools able to reduce the time, effort, and cost of designing and developing the next generation software systems, improving performance, and ensuring reliability and security.

To this aim, NGPS is seeking to advance the state-of-the-art and the state-of-the-practice of computational models and paradigms, formal techniques and software methods for easing software development and verification, and improving efficiency of complex modern systems.

Statistical Information

In response to the call for papers, 5 papers were submitted to the track. All manuscripts were reviewed by three PC members. The program committee consisted of the following academic and industrial researchers.

Mohamad Al Hajj Hassan, Huawei, DE
Victor Allombert, Orléans University, FR
Lorenzo Bettini, DISIA, University of Florence, IT
Carl Friedrich Bolz-Tereick, DE
João Costa Seco, New University of Lisbon, PT
Hélène Coullon, IMT Atlantique, Inria, FR
Ferruccio Damiani, DI, University of Torino, IT
Simon Dobson, CS, University of St Andrews, UK
Kento Emoto, IPL-Lab, Kyushu Institute of Technology, JP

Erik Ernst, Google Inc., USA
Lukas Esterle, ALICE, Aston University, UK
Frédéric Gava, LACL, Université Paris-Est Créteil, FR
Philipp Haller, KTH Royal Institute of Technology, SE
Khaled Hamidouche AMD Research, USA
Geoff Hamilton, School of Computing, Dublin City University, IE
Robert Hirschfeld, HPI, University of Potsdam, DE
Hideya Iwasaki, The University of Electro-Communications, JP
Einar Broch Johnsen, UiO, University of Oslo, NO
Jaakko Järvi, II, University of Bergen, NO
Doug Lea, State University of New York at Oswego, USA
Alberto Lluch Lafuente, DTU COMPUTE, Technical University of Denmark, DK
Michele Loreti, DI, University of Camerino, IT
Hidehiko Masuhara, PRG, Tokyo Institute of Technology, JP
Virginia Niculescu, CS, Babes-Bolyai University of Cluj-Napoca, RO
Tobias Pape, HPI, University of Potsdam, DE
Nick Papoulias, University of La Rochelle, UMR LIENSs, CNRS, FR
Susanna Pelegatti, University of Pisa, IT
António Ravara, DI FCT, New University of Lisbon, PT
Barbara Re, SST, University of Camerino, IT
Sophie Robert, LIFO, Orléans University, FR
Stefan Rudolph, OC, Augsburg University, DE
Maurice ter Beek, FMT-ISTI, CNR, IT
Martin Wirsing, SoSy-Lab, LMU Munich, DE

We are very grateful to the members of the program committee and to the authors for submitting their contributions. Without their valuable support, it would not have been possible to organize the track.

List of Accepted Papers

Full papers

Safe Usage of Registers in BSPlib. Arvid Jakobsson, Frédéric Dabrowski and Wadoud Bousdira

EDITORIAL MESSAGE
Special Track on Privacy by Design in Practice

Ronald Petrlic, *The Commissioner for Data Protection and Freedom of Information Baden-Württember, Germany*
Christoph Sorge, *Saarland University, Germany*

The aim of the privacy by design in practice track is to promote research on privacy-preserving technologies to be used in practice. "Privacy by Design" (PbD) is a requirement in the general data protection regulation (GDPR). Thus, privacy needs to be considered by engineers from the beginning and built in to newly developed systems properly. A lot of research has been done in the field of privacy-enhancing technologies (PETS) in the past years. However, very few of those approaches have found their way into practice. The *ACM Symposium on Applied Computing (SAC)* provides a great opportunity for researchers to present practical research on PbD, leading to more privacy-friendly technology in the future.

PbD encompasses techniques from various fields of computer science. Therefore, the track greatly benefits from the conference's diverse research agenda and its broad audience. We aim at promoting the (legal) need to deal with privacy protection to those people who perform research on new technology. Legal researchers bringing in their view on privacy protection are very welcome to join this track to foster multi-disciplinary research. The track is also of interest for data protection agencies (DPAs), as they need to deal with PbD as well.

Statistics

This is the second edition of the privacy by design in practice (PDP) track at SAC. We received 20 papers and one student research abstract. Each paper was reviewed by a minimum of three reviewers. According to the ACM SAC guidelines, only 5 full papers could be accepted for the track, resulting in an acceptance rate of 25%. A number of quality papers had to be rejected. Additionally, we accepted two papers as poster papers, providing the authors the opportunity to present their work as a poster and retrieve valuable input from the conference participants. We are happy that *Karegar et al 's* paper "Helping John to Make Informed Decisions on Using Social Login" - a paper of the first edition of the PDP track in 2018 [1] - received the best paper award in the area "System Software and Security" (consisting of 10 SAC tracks in total).

Accepted Papers

Christoph Stach and *Frank Steimle*: "Recommender-based Privacy Requirements Elicitation - EPICUREAN: An Approach to Simplify Privacy Settings in IoT Applications with Respect to the GDPR"

Fatbardh Veseli, Kai Rannenberg and *Jetzabel Serna-Olvera*: "Engineering Privacy by Design - Lessons from the Design and Implementation of an Identity Wallet Platform"

Amir Shayan Ahmadian, Daniel Striiber and *Jan Jiirjens*: "Privacy-Enhanced System Design Modeling Based on Privacy Features"

Fabio Aiolli, Mauro Conti, Ankit Gangwal and *Mirko Polato*: "Mind Your Wallet's Privacy: Identifying Bitcoin Wallet Apps and User's Actions through Network Traffic Analysis"

Mina Namazi, Cihan Eryonucu, Erman Ayday and *Fernando Perez-Gonzalez*: "Dynamic Attribute-Based Privacy-Preserving Genomic Susceptibility Testing"

Accepted Poster Papers

Jihye Kim, Hankyung Ko and *Hyunok Oh*: "AILocker: Authenticated Image Locker for Video"

Pierre Dewitte, Kim Wuyts, Laurens Sion, Dimitri Van Landuyt, Ivo Emanuilov, Peggy Valcke and *Wouter Joosen*: "A Comparison of System Description Models for Data Protection by Design"

Program Committee

Christoph Bosch, Ulm University, Germany
Sven Bugiel, CISPA, Germany
Tooska Dargahi, University of Salford, Great Britain
Isao Echizen, National Institute of Informatics, Japan
Simone Fischer-Hilbner, Karlstad University, Sweden
Andrea Herrmann, University of Heidelberg, Germany
Felix Gomez Marmol, Universidad de Murcia, Spain
Nils Gruschka, University of Oslo, Norway
Pantaleone Nespol, Universidad de Murcia, Spain
Sebastian Pape, Goethe University Frankfurt, Germany
Andreas Reiter, Siemens AG, Austria
Burkhard Schafer, University of Edinburgh, Great Britain
Francesc Sebe Feixas, University of Lleida, Spain

We are very grateful for the support of our program committee, which did an excellent job.

Overall, we are happy that our (still) new track could attract such a high number of high-quality papers and we are looking forward to SAC 2019.

[1]: *Ronald Petrlic* and *Christoph Sorge*: "Session details: System software and security: PDP - privacy by design in practice track", Proceedings of the 33rd Annual ACM Symposium on Applied Computing, 2018

EDITORIAL MESSAGE
Special Track on Programming Languages

Barrett R. Bryant, *University of North Texas, USA*
Rajeev Raje, *Indiana University-Purdue University-Indianapolis, USA*

1. Objectives of the track

The Programming Languages (PL) Track provides researchers and practitioners with a forum to present their ideas and experience in designing new programming concepts and implementing programming languages. It includes the topics of Compiling Techniques, Domain-Specific Languages, Formal Semantics and Syntax, Garbage Collection, Language Design and Implementation, Languages for Modeling, Model-Driven Development and Model Transformation, New Programming Language Ideas and Concepts, New Programming Paradigms, Practical Experiences with Programming Languages, Program Analysis and Verification, Program Generation and Transformation, Programming Languages from All Paradigms (Agent-Oriented, Aspect-Oriented, Functional, Logic, Object-Oriented, etc.), and Visual Programming Languages.

2. Statistical information

Fifteen papers were originally submitted from seven different countries: Brazil, France, Germany, Japan, Portugal, Turkey, and the USA. Among those, six regular papers were selected for an acceptance rate of 40% as well as three posters. The Track Program Committee had 14 members: Roberto da Silva Bigonha (Universidade Federal de Minas Gerais, Brazil), Walter Cazzola, (University of Milan, Italy), Igor Dejanović (University of Novi Sad, Serbia), Michael Felderer (University of Innsbruck, Austria), Esther Guerra (Universidad Autónoma of Madrid, Spain), Pedro Henriques (University of Minho, Portugal), Geylani Kardas (Ege University, Turkey), Hans-Wolfgang Loidl (Heriot-Watt University, UK), Vineeth Paleri, (NIT Calicut, India), Nikolaos Papaspyrou (National Technical University of Athens, Greece), Marco Patrignani (University of Leuven, Belgium), Peter Pirkelbauer (University of Alabama at Birmingham, USA), Adam Porter (University of Maryland, USA), and Boštjan Slivnik (University of Ljubljana, Slovenia).

3. The contributed papers

Full papers:

1. *Christiano Braga. Towards a Simple Formal Semantic Framework for Compiler Construction*. π is an automata based method for describing operational semantics of programming languages. π may be used as a formal semantic framework for compiler construction integrated with program validation and its implementation in the Maude language to simplify the process of compiler construction in a rigorous way.

2. *Elton M. Cardoso, Rodrigo Ribeiro, Leonardo Reis, Mariza A. S. Bigonha, Roberto S. Bigonha and Vladimir O. Di Iorio. An Attribute Language Definition for Adaptable Parsing Expression Grammars*. Adaptable Parsing Expression Grammars are a formal model to describe the syntax of extensible languages and their extension mechanisms by adding syntactic attributes to ensure that new rules and grammars built during parsing time are syntactically correct.

3. *Jan C. Dageförde and Herbert Kuchen. Retrieval of Individual Solutions from Encapsulated Search with a Potentially Infinite Search Space*. Muli (Münster Logic-imperative Language) is a constraint-logic object-oriented programming language that provides for the control of the search space by the application developer. This facilitates the development of search applications without the search space becoming infinitely large.

4. *Caglar Durmaz, Kasim Sinan Yildirim and Geylani Kardas. PureMEM: A Structured Programming Model for Transiently Powered Computers*. Transiently powered computers are batteryless computing and sensing systems which can only operate intermittently. PureMEM is a structured task-based programming model which preserves forward progress and maintains data consistency in intermittent operation.

5. *Daisuke Yamaguchi and Kimio Kuramitsu. CPEG: A Typed Tree Construction from Parsing Expression Grammars with Regex-Like Captures.* CPEG is an extended parsing expression grammar with regular expression-like capture annotations, which allow flexible construction of syntax trees from arbitrary parsing patterns while guaranteeing structural constraints of syntax trees for any input strings.

6. *Christoph Rieger, Fabian Wrede and Herbert Kuchen. Musket: A Domain-Specific Language for High-Level Parallel Programming with Algorithmic Skeletons*. Algorithmic skeletons are patterns for parallel programming. Musket is a domain-specific language that includes algorithmic skeletons as domain abstractions which facilitate multi-core application development.

Posters:

1. *Torben Weis, Marian Waltereit, and Maximilian Uphof. Fyr: A Memory-Safe and Thread-Safe Systems Programming Language*. Fyr uses manual memory management to support systems where memory is scarce, while guaranteeing memory safety and thread safety.

2. *Jolan Philippe and Frederic Loulergue. Parallel Programming with Coq: Map and Reduce Skeletons on Trees*. SyDPaCC, a set of libraries for the Coq interactive theorem prover, is extended with distributed trees, including a parallel data structure and algorithmic skeletons.

3. *Luiz Camargo and Marcos Del Fabro. Applying a Data-centric framework for Developing Model Transformations*. Bloom is a data-centric language to develop model transformations, incorporating different execution capabilities and semantics of data-centric languages.

Acknowledgements

We would like to thank all authors for their valuable contributions. We also thank the program committee members who voluntarily supported us to recruit good papers and review the papers.

EDITORIAL MESSAGE
Special Track on Requirements Engineering

Maria Lencastre, *Universidade de Pernambuco, Brazil*
João Araujo, NOVA LINCS, *Universidade Nova de Lisboa, Portugal*

1. INTRODUCTION

Requirements Engineering (RE) is the branch of Software Engineering concerned with the real- world goals for, functions of, and constraints on software systems. RE is also concerned with the relationship of these factors to precise specifications of software behaviour and to their evolution over time and across software families. RE is increasingly recognized as a critical activity in any systems engineering process. Independently of the nature of the software, the elicitation, analysis, negotiation, specification, validation and management of requirements are fundamental for establishing quality in complex software. Only by fully understanding stakeholders' needs, and documenting them in a concise and unambiguous way, can we consistently deliver quality products designed to meet the complexity of our advanced information society.

The objective of this track is to explore different advances in RE, its relation with different areas, thereby reducing the gap between software engineering solutions and the way one specific domain of knowledge was seen up to given point.

2. CONTENTS OF THE TRACK

The Requirements Engineering Track of ACM-SAC 2019 received 18 submissions from several countries in the Americas, Asia and Europe. A board of 29 specialists reviewed all submissions and selected 5 (five) regular papers and 1 (one) poster, covering different areas of the field.

The paper "*ARRoW: Automatic Runtime Reappraisal of Weights for Self-Adaptation*" comes from the Aston University (UK) and Singapore University of Social Sciences (Singapore). It presents an approach to support the dynamic update of preferences/weights associated with the non-functional requirements (NFRs) and decision-making strategies in self-adaptive systems, while considering the current levels of satisficement that NFRs can reach during the system's operation. Experiments were performed and applied to a case study of the networking application domain where the decision-making has been improved.

The paper *"Goal Modeling for Collaborative Groups of Cyber-Physical Systems with GRL*" comes from the University of Duisburg-Essen. The authors describe empirical insights about applying the GRL for goal modeling of collaborative groups of CPS in the autonomous driving and collaborative transport robots application areas. Extensions to GRL addressing specific GRL limitations identified in this study are also proposed.

The paper *"Requirements for preventing logic flaws in the authentication procedure of web applications*" reports on a joint research of a set of French institutions (Orange labs Rennes, Univ. Rennes, Inria, CNRS, IMT Atlantique, IRISA, UBL). The goal is to strengthen the authentication procedure of web applications enforcing the security early in the design phase. An empirical study was conducted in nine web-based applications to demonstrate that logic flaws may compromise the authentication procedure. It was provided ten relevant requirements to be followed in the design of an authentication procedure.

The paper *"Logic-based methodology to help security architects in eliciting high-level network security requirements*" is presented by authors from the University of Toulouse, France. They propose a security methodology to automate the process of security zone specification and high- level network security requirements elicitation. They implemented a methodology in Answer Set Programming to automatically compute an optimal network security zone model considering the cost of the security solution. An e-commerce enterprise network infrastructure case study illustrates the methodology.

The paper "Contemporary Requirements Challenges and Issues: An Empirical Study in 11 Organizations" reports on a joint research of the National Institute of Informatics (Japan) and University of Limerick (Ireland). It reports an empirical study on the current requirements challenges and issues focusing on projects in enterprise software development environments that affect multiple (more than three) applications. A collection of requirements challenges and issues were identified. The findings indicate that identifying the ramifications of changes and balancing the level of design and solutions in requirements are becoming important in contemporary RE for enterprise software development environment.

The poster "*Elicitation of Technical Requirements in Large Research Projects: the CERBERO approach"* is written by authors from several institutions (IBM, U. Studi di Sassari, TNO, Ambiesense, U. Svizzera Italiana, Thales, Abinsula). Its main goals are to propose a new Technical Requirements Elicitation methodology for identification of all stakeholders in research project and their needs, and to apply the methodology and describe technical requirements of Horizon 2020 CERBERO project, whose aim is to develop a crosslayer model-based framework for multi-objective design of reconfigurable systems in uncertain hybrid environments.

3. ACKNOWLEDGEMENTS

Thanks to the authors who have submitted their works to the RE-Track. They have been a major contributor to the success of this track in SAC 2019 conference. Our gratitude goes to the program committee who works hard reviewing and discussing the papers. We are extremely grateful to our social media and publicity chair Isabel Brito (Instituto Politécnico de Beja, Portugal) who actively advertised our event via social media and mailing lists. We extend our thanks to the SAC 2019 general organization for bringing together an excellent Technical Program and organization.

EDITORIAL MESSAGE
Special Track on Recommender Systems: Theory, User Interactions and Applications

***Markus Zanker**, Free University of Bozen-Bolzano, Italy*
***Li Chen**, Hong Kong Baptist University, Hong Kong, China*
***Panagiotis Symeonidis**, Free University of Bozen-Bolzano, Italy*
***Yong Zheng**, Illinois Institute of Technology, USA*

The Track on Recommender Systems: Theory, User Interactions and Applications at ACM/SIGAPP Symposium on Applied Computing (ACM SAC) 2019 provides a dedicated forum to researchers in the area of recommender systems (RecSys) and user modeling for discussing open research problems, solid solutions, latest challenges, novel applications and innovative research approaches in RecSys. The development of RecSys promotes various research topics, such as user interaction and interfaces, algorithm design and evaluations, computational efficiency, and recommendation explanations. As one of applied sciences, the field of recommender systems attracts experts and receives contributions from multidisciplinary areas. This track was hosted in ACM SAC in the years of 2013, 2014, 2017 and 2018 previously. Thus, it is already the 5th issue of a track on RecSys research associated with ACM SAC.

The submissions and the selected papers from our track deal with a wide variety of recommender system issues including (not limited to) the topics as follows:

- **Recommender Systems**
  Conversational recommender systems
  Context-aware/Trust-based/Group/Social/Mobile and multi-channel recommenders
  Recommendation explanation
  New recommender applications
  Data mining and machine learning for development
  Novel paradigms, Theoretical foundations
  Preference elicitation
  Privacy and security issues in recommender systems
  Recommendation algorithms, Algorithm scalability, Evaluation metrics and studies
  Semantic technologies for recommendation
- **User modeling in Recommender Systems**
  User interface design
  User-adaptive interaction and personalization
  Empirical user studies
  Explanations in recommender systems
  User behavior analytics and user modeling
  User-centric studies and evaluations in recommender systems
  Privacy and security issues in recommender systems
  Recommender systems based on users' psychological characteristics, such as personality and emotions

This year, we received 22 valid submissions and based on a rigorous review process each paper received at least three reviews. Finally, 5 long papers and 3 short papers were selected for the track, bringing the acceptance rate down to 23% for long papers. Accepted long submissions are presented orally, while short papers will be presented as posters in the ACM SAC 2019.

Our track was supported by 26 expert program committee members and who worked hard to provide valuable reviews for the submissions to our track:

- Alejandro Bellogin, Universidad Autónoma de Madrid, Spain
- Ludovico Boratto, Eurecat, Barcelona, Spain
- Derek Bridge, Insight Centre for Data Analytics, Ireland
- Robin Burke, DePaul University, USA
- Ivan Cantador, Universidad Autónoma de Madrid, Spain
- Paolo Cremonesi, Politecnico di Milan, Italy
- Marco DeGemmis, University of Bari, Italy
- Zhenhua Dong, Huawei, Inc, China
- Mehdi Elahi, Free University of Bozen-Bolzano, Italy
- Jonathan Gemmell, DePaul University, USA
- Guibing Guo, Northeastern University, China
- Dietmar Jannach, AAU Klagenfurt, Austria
- Michael Jugovac, TU Dortmund, Germany
- Bart Knijnenburg, Clemson University, USA
- Andrej Košir, University of Ljubljana, Slovenia
- Pasquale Lops, University of Bari Aldo Moro, Italy
- Cataldo Musto, University of Bari Aldo Moro, Italy
- Julia Neidhardt, TU Vienna, Austria
- Weike Pan, Shenzhen University, China
- Francesco Ricci, Free University of Bozen-Bolzano, Italy
- Shaghayegh Sahebi, University at Albany, SUNY, USA
- Fabio Stella, University of Milan-Bicocca, Italy
- Zhu Sun, Nanyang Technological University, Singapore
- Marko Tkalcic, Free University of Bozen-Bolzano, Italy
- Jie Yang, Delft University of Technology, Netherlands
- Rongting Zhang, UT Austin, USA

Finally, we thank all the authors who submitted their valuable papers to this track and we are very grateful to the members of the Program Committee. Without their support, the organization of the track's sessions would not have been possible. We also express our gratitude to organizations that made this track happen. We believe this track will continue to be a success in the future editions of ACM SAC.

Track Chairs

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EDITORIAL MESSAGE
Special Track on Software Architecture: Theory, Technology, and Applications (SA-TTA)

***Marcello M. Bersani**, Politecnico di Milano, Italy*

***Sungwon Kang**, Korea Advanced Institute of Science and Technology, Daejeon, South Korea*

***Patrizia Scandurra**, DIGIP, University of Bergamo, Italy*

Introduction

The Seventh Edition of the track on *Software Architecture: Theory, Technology, and Applications* (SA-TTA 2019) will be held in Limassol (Cyprus) as part of the 34th ACM/SIGAPP Symposium on Applied Computing (SAC).

Software Architecture is a consolidated and necessary discipline centered on the idea of reducing complexity in software development and evolution through abstraction and separation of concerns. The goal of the track SA-TTA is to bring together researchers, practitioners and educators having the common objective of transforming *Software Architecture* into a mature discipline leveraging on both solid scientific foundations and validated engineering methodologies and tools. The main focus is in *Applied Software Architecture*, namely practical engineering concerns, experiences in tools development, and software architecture case studies. SA-TTA is focused broadly on how to address functional requirements and quality characteristics in the design, maintenance, and adaptation and evolution of software architectures through the support of automated techniques and tools. Of special interest are architecture description languages, formalisms, techniques, methodologies, tools, and runtime environments that support these activities, possibly exploiting model-driven engineering principles. A special emphasis is put also on technical aspects of software architectures development for specific class of software systems and application domains.

Statistics

The track received 23 submissions, each carefully reviewed by the 3 program committee members. According to the strict acceptance rate of 25%, the program committee accepted 6 submissions as research papers and 3 contribution as posters.

Description of accepted papers

There were interdisciplinary research contributions covering a variety of topics related to: gamification applied to architecture management, software maintainability, RESTful based architectures, Service based distributed systems and software refactoring.

Acknowledgments

We thank all authors who wrote articles for this track helping us to make it a success. We also thank the program committee members and all reviewers for their evaluations and critiques of manuscripts.

Program committee members

- Yamine Ait-Ameur - IRIT/ENSEEIHT, France
- Jesper Andersson - Linnaeus University Sweden
- Paolo Arcaini - National Institute of Informatics, Japan
- Marco Autili - University of L'Aquila, Italy
- Olivier Barais - INRIA, France
- Georg Buchgeher - SCCH GmbH Hagenberg, Austria
- Radu Calinescu - University of York (UK)
- Rafael Capilla - University Rey Juan Carlos - Madrid, Spain
- Guglielmo De Angelis - ISTI CNR, Pisa, Italy
- Naranker Dulay - Imperial College London, UK
- Kenneth Johnson - Auckland University of Technology, New Zealand
- Jens Knodel - Caruso GmbH, Germany
- Eva Kühn - Vienna University of Technology, Austria
- Chan-gun Lee - Chung-Ang University, Korea
- Jihyun Lee - Dept. of Software Engineering, Chonbuk National University
- Hernan Melgratti - University of Buenos Aires, Argentina
- Claudio Menghi - University of Gothemburg, Sweden
- José Javier Merseguer - University of Saragoza, Spain
- Marina Mongiello - Politecnico di Bari, Italy
- Henry Muccini - University of L'Aquila, Italy
- Elisa Yumi Nakagawa - University of São Paulo, Brazil
- Ileana Ober - IRIT/University of Toulouse, Fran e
- Hongyu Pei-Breivold - ABB Corporate Research, Västerås, Sweden
- Diego Perez Palacin - Linnaeus University, Sweden
- Clément Quinton - University of Lille, France
- Alexander Raschke - Universität Ulm, Germany
- Elvinia Riccobene - University of Milan, Italy
- Antonino Sabetta - SAP Research, France
- Lionel Seinturier - Univ. Lille & IUF - LIFL & Inria ADAM, France
- Marjan Sirjani - Malardalen University, Sweden
- Romina Spalazzese - Malmö University, Sweden
- Maria Spichkova - University Melbourne, Australia
- Damian A. Tamburri - TU/e – JADS, the Netherlands
- Kenji Tei - National Institute of Informatics, Japan
- Catia Trubiani - GSSI L'Aquila, Italy
- Danny Weyns - University of Linnaeus, Sweden
- Xiwei Xu - SSRG, NICTA, Sydney, Australia

EDITORIAL MESSAGE
Special Track on Software Engineering

***Tao Zhang**, Harbin Engineering University, China*
***Byungjeong Lee**, University of Seoul, Korea*
***Eunjee Song**, Baylor University, USA*

A special track on Software Engineering (SE Track) aims to be a forum for scientists, engineers and practitioners, in academia and industry to share new ideas, experiences and results, and to present their latest findings in any aspects of Software Engineering. SE Track emphasizes the design, implementation, management and applications of Software Engineering.

The Call for Papers for SE Track attracted 57 final paper submissions from 24 different countries. All submitted papers underwent the blind review process and 14 papers were finally accepted as full papers for inclusion in the Conference Proceedings and presentation during the Symposium. The final acceptance rate for SE Track is 24.6%. In addition to the accepted full papers, 7 papers that received relatively higher enough review scores was accepted as short paper for the Poster Program. The Student Research Competition (SRC) program is designed to provide graduate students the opportunity to meet and exchange ideas with researchers and practitioners. Two papers were finally accepted for the SRC program in SE Track.

This year's SE Track is divided into four sessions: related presentations in *Software Maintenance, Verification, and Validation*, *Testing and Quality Assurance*, *Project Management and Empirical Study* will be associated to a session, so as to promote sharing and discussion of ideas through the whole audience of a topic. Please check the program schedule for details.

On behalf of the entire SAC 2019 Organizing Committee, we congratulate all the authors for having their papers accepted in the SE Track. We are grateful to the members of the Program Committee and to the additional reviewers. Without their support, the organization of such high-quality track sessions would not be possible. We also wish to convey our special thanks to the SAC 2019 symposium's main organizers, especially Program Chairs, Dongwan Shin and Seiji Isotani, for their continuous help and advice and Publication Chair, Hossain Shahriar, and Poster Chairs, Alessio Bechini and Achilleas Achilleos, for their invaluable support.

Last but not least, we thank you for attending the conference on behalf of the Software Engineering Track and hope that you enjoy the program we have prepared for you.

EDITORIAL MESSAGE
2019 Special Track on Computer Security

Giampaolo Bella, *Università di Catania, Italy*

Rosario Giustolisi, *IT University of Copenhagen, Denmark*

As chairs of the Computer Security track, we are pleased to welcome you to its eighteenth edition at the ACM Symposium on Applied Computing. The Program Committee for this track, as in past years, is composed of eminent representatives from both industry and academia. Here is the list of members of this year's committee, in alphabetical order:

Denis Butin (TU Darmstadt, DE)
Sonja Buchegger (KTH, SE)
Søren Debois (IT University of Copenhagen, DK)
Stephanie Delaune (University of Rennes, FR)
Christian Gehrmann (Lund University, SE)
Christian Hammer (Potsdam University, DE)
Julio Hernandez-Castro (University of Kent, UK)
Martin Johns (SAP Research, DE)
Sokratis K Katsikas (Norwegian University of Science & Technology, NO)
Robert Künneman (CISPA Saarland University, DE)
Sebastian Lekies (Google, US)
Patrick McCorry (King's College, UK)
Marius Minea (Politehnica University Timisoara, RO)
Chris Novakovic (University of Birmingham, UK)
David Nowak (CNRS & Lille 1 University, FR)
Martin Ochoa (Universidad del Rosario, AR)
Catuscia Palamidessi (INRIA, FR)
Konrad Rieck (Technische Universitaet Braunschweig, DE)
Sebastian Schinzel (Muenster University of Applied Sciences, DE)
Helen Treharne (University of Surrey, UK)
Ruoyu Wang (Arizona State University, US)

This year we received 49 submissions, as usual from virtually everywhere in the world. The review process, which also involved a number of qualified delegates, was double-blind in the sense that the paper authors were kept anonymous from the reviewers. Each paper received at least 3 reviews, and all papers and reviews were ultimately discussed in depth by the entire Program Committee. As a result of this scientifically thrilling process, papers were marked either for acceptance or for rejection. In the end, only 10 papers were accepted, defining a selective acceptance rate of 20.4%. We are therefore confident of the high quality of the published material, and remain indebted to the reviewers for their thorough work.

Here is this edition's programme:

- Xuet al. propose a memorable unit-based recurrent neural networks to model password construction. Theirexperiments show that their model obtains higher efficiency than fine-grained character-level models.
- Spooren et al. compare two different approaches on the same set of Domain Generation Algorithms (DGA) that are typically used in malware: classical machine learning using manually engineered features and a ‘deep learning’ recurrent neural network. They show that the deep learning approach performs consistently better on all of the tested DGAs.
- Backes et al. provide a theoretical understanding for the identification of potentially exploitable security weaknesses. They propose an approach for conducting comprehensive what-if analyses in order to reason about mitigation in a conceptually well-founded manner.
- Brunner et al. present a model-based approach for continuous information security management based on semi-automated workflows triggered by changes of the underlying asset catalogue, the operational environment and the threat landscape.

- Chakraborty et al. present Ariel, the design and implementation of an information flow control architecture for Android based on the secure multi-execution of apps. Ariel demonstrably extends Android's system with support for executing multiple instances of apps.
- Ligatti et al. introduce the concept of collaborative authentication, or coauthentication, a single-factor technique in which multiple registered devices work together to authenticate a user.
- Zieglmeier et al. provide a conceptualization and implementation of a testbed for an automotive real-world scenario. They evaluate their testbed from multiple perspectives, including its fitness for the automotive scenario and the quality of the data that it generates.
- Amos et al. construct the first Spectre type attack in which the target and the attacker do not share any memory pages. They develop novel techniques for the attack and report on a proof-of-concept implementation of their new attack.
- Borrello et al. describe a stealthy injection vector design approach based on Return Oriented Programming (ROP) code reuse that provides novel features with respect to popular proof of concepts such as InstaStock and Jekyll.
- Welearegai et al. propose a novel approach to compare the precision, scalability and code coverage of two widely-used static analysis frameworks—WALA and SAFE.

About the track chairs

Giampaolo Bella is Associate Professor at the University of Catania, doing teaching and research in Computer Security and Formal Methods. He has chaired the Computer Security track at ACM SAC since its inception. After his Ph.D. from Cambridge University, he was a research associate at TU Munich, Cambridge University, and a senior researcher at SAP Research France. He has recently been developing formal approaches and methodologies to studying the security problem as a socio-technical, inter-disciplinary one.

Rosario Giustolisi is Assistant Professor at the IT University of Copenhagen. His research interests cover many aspects of computer security, including automated analysis of cryptographic protocols in the symbolic model, accountability notions in security protocols, and cybersocial security aspects of real-world systems. Before joining the security group at ITU, Rosario was a postdoc at SICS RISE and a member of the security lab in Lund, Sweden. He received his Ph.D. from the University of Luxembourg where he mainly worked in the design and analysis of secure exam protocols.

EDITORIAL MESSAGE
Special Track on Sustainability of Fog/Edge Computing Systems

***Christian Esposito**, University of Napoli "Federico II", Italy*
***Florin Pop**, University Politehnica of Bucharest, and National Institute of Research and Development in Informatics, Romania*
***Chang Choi**, Chosun University, Rep. of Korea*

Fog/Edge Computing paradigms are widely used in enterprises to address the emerging challenges of big data analysis, because of their underlying scalable, flexible and distributed data management schemes. The data centers in the Clouds are facing great challenges on the burden of the consequent increasing the amount of data to be man- aged and the additional requirements of location awareness and low latency at the edge of network necessary by smart cites and factories. These are the reasons why a centralized model cannot be an efficient solution for generated or required data by the IoT devices in those applications and there is the progressive shift towards fog nodes and smarted edge nodes mediating between the cloud and the IoT devices. The Fog/Edge computing paradigm is a decentralized model that transfers a part of low computing data analysis from the cloud to the intermediate (fog) nodes or the edges, performing only high computing tasks in the cloud. This new approach tries to minimize the three factors that negatively compromise the effective and efficient application of the Cloud computing to smart cities and factories, or similar application domains: the network bandwidth usage, decentralization of the data processing tasks and reduced response latency for clients (IoT devices). Fog/Edge computing is a hierarchical approach where the overall infrastructure is structured in multiple layers, each responsible of offering a good coordination and data management to the nodes at the lower layer. The lowest layer is usually composed of sensors and/or actuators that measure and/or control the environment or a given business process, implemented as mobile devices that are running a sensing/controlling application. In this case, combining Sustainable computing with Fog and Edge computing represents a new approach for increasing quality-of- service and efficiency of the system, creating the capability to present temporal and geo-coded information, and increasing innovation, and co-designing sustainable future large scale distributed systems. This new paradigm appears to offer a good approach in handling the scale factor of the data size, reducing the network bandwidth usage and the response latency of the system. In order to support specifically the Fog/Edge architectures, there is a need, for instance, of location-awareness and computation placement, replication and recovery. In many cases Edge resources would be required for both computation and data storage to address the time and locality constraints. There are multiple kinds of orchestration management solutions for virtualization in this type of architecture with different characteristics and drawbacks. This results in different restrictions for application definition, scalability, availability, load balancing and so on. Also, virtualization may be needed at multiple levels in a Fog/Edge architecture as it consists of the following levels of abstraction: at the sensing level we have the IoT devices/smart things, at the Edge level there are the gateways to a first collection and the data from the IoT devices and their preliminary processing, at the Fog level we have an additional data management layer, and at the Cloud level there is the compute/storage infrastructure with applications on top. Last, but not least, the energy efficiency is particularly important at the IoT and edge level since the devices may be equipped with a limited battery, possible difficult or impossible to be charged. So, optimizing the energy consumption is a must. To address several open research is- sues regarding sustainability of future Fog/Edge systems, this track aims at solicit contributions highlighting challenges, state-of-the-art, and solutions to a set of currently unresolved key questions including - but not limited to - performance, modeling, optimization, energy-efficiency, reliability, security, privacy and techno-economic

aspects of Fog/Edge systems. Through addressing these concerns while understanding their impacts and limitations, technological advancements will be channeled toward more sustainable/efficient platforms for tomorrow's ever-connected systems.

We have collected 27 submissions from authors from all over the world, mainly from China, Korea and Italy. Out of them we have accepted 5 submissions as full papers, and 2 submissions as poster papers, based on the received remarks from the contacted reviewers. "Towards a Seamless Coordination of Cloud and Fog: Illustration through the Internet-of-Things" discusses how cloud and fog could coordinate among each other by deciding where to place data or tasks so that the overall mission of the infrastructure is accomplished. "Resource-Sharing Optimization for Multicast D2D Communications Underlaying LTE-A Uplink Cellular Networks" illustrates how the multicast Device-to-device (D2D) communications technique can mitigate the co- channel interference caused by the co-existence of the conventional cellular users with D2D users."Word2Vec based Spelling Correction Method of Twitter Message" pro- poses a solution to correct misspelled words in Twitter messages by using an improved Word2Vec. "Fog Computing as the Key for Seamless Connectivity Handover in Future Vehicular Networks" studies the problem of a fog-aided architecture for seamless handover done by vehicles while traversing various dense heterogeneous cells. "Evaluation of ACE Properties of Traditional SQL and NoSQL Big Data Systems" contains a discussion of the tradeoff between the ACE properties in SQL and NoSQL big data systems, surveys the issues of NoSQL systems and proposes solution to make them sustainable for a wide class of applications.

We hope that the conference attendees and its proceedings' readers will find the papers in this track informative and useful for their research or industrial practice. The track organizers wish to thank the authors of all submitted manuscripts, without whom this special issue would not have been possible. They would especially like to thank the program committee members and additional reviewers for their dedicated efforts and help in reviewing the papers in a timely manner. We appreciate the assistance of the ACM SAC organizers throughout the process of bringing out this track.

We wish you a pleasant and stimulating read.
Christian, Florin and Chang

EDITORIAL MESSAGE
Track on Software-intensive Systems-of-Systems (SiSoS)

Flavio Oquendo, *IRISA - UMR CNRS – Univ. Bretagne Sud, France*
Khalil Drira, *LAAS - CNRS – Univ. Toulouse, France*
Axel Legay, *UCLouvain, Belgium*
Thais Vasconcelos Batista, *DIMAp – UFRN, Brazil*

Scope: Pervasiveness of networks has made possible to interconnect systems that were independently developed, operated, managed, and evolved, yielding a new kind of complex system, i.e. a system that is itself composed of systems, the so-called System-of-Systems (SoS). Software-intensive SoS (SiSoS) has become a hotspot in the last years, from both the research and industry viewpoints. Indeed, various aspects of our lives and livelihoods have progressively become dependent on some sort of Software-intensive SoS. This is the case of SiSoS found in different areas as diverse as energy, healthcare, manufacturing, and transportation; and applications that address societal needs, e.g. environmental monitoring, distributed energy grids, emergency coordination, global traffic control, and smart cities. Moreover, ubiquitous platforms such as the Internet of Things and nascent kinds of SoS such as Cyber-Physical SoSs are accelerating the deployment of Software-intensive SoS in the near future. Definitely, the unique characteristics of Software-intensive SoS raise a grand research challenge for the future of software-reliant systems in our industry and society due to its intrinsic features, among which evolutionary development and emergent behavior. This conference track fostered original submissions ranging from SiSoS foundations to applications, from theory to practice.

Statistics: The SiSoS Track received 8 regular paper submissions. Each submission was reviewed by four members of the Track Program Committee. The Track Program Committee selected 2 regular papers out of the 8 submitted as full papers, giving an acceptance rate of 25%. In addition, 2 regular papers were selected to be shorten as poster papers. These 2 full papers and 2 poster papers were selected for publication in the ACM proceedings of the conference. They were accepted based on originality, quality, soundness, and relevance to this conference track.

Key Topics: This track fosters (but is not limited to) submissions in the following topics:

- *SiSoS Mission:* Specification and analysis; Contract-based approaches; Goal-orientation, task orientation; Ontologies, reasoning; Relationships with emergent behaviors.
- *SiSoS Modeling:* Model-driven engineering; Models-at-runtime; Model-based approaches; Formal modeling foundations.
- *SiSoS Design:* Architectural and detailed design; Design evaluation; Correction by design; Design for evolution, scalability; Design for emergent behavior.
- *SiSoS Verification and Validation:* Testing; Compositional/statistical model checking; Simulation, co-simulation; Simulation of emergent behaviors.
- *SiSoS Construction and Evolution:* Evolutionary development; Correction by construction; Techniques &er; technologies for SoS engineering; Service-orientation; Component and middleware frameworks.
- *SiSos Security and Privacy:* SoS cybersecurity; SoS privacy and trust; Security against emergent behaviors in SoS.

- *SiSoS Experience:* Reports from real projects; Case studies in real-scale projects; Controlled experiments; Experience from SoS stakeholders.
- *SiSoS General issues:* Taxonomies, ontologies; Software processes; Project management; Acquisition in the development of SoS.
- *SiSoS Applications:* Energy; Transportation; Global traffic control; Emergency coordination; Environmental monitoring; Smart grids; Healthcare; Manufacturing; Smart cities among others.
- *Future perspectives, challenges, and directions.*

Acknowledgment: We would like to thank all the members of the Track Program Committee for providing thoughtful and knowledgeable reviews and for their effort in making SiSoS a successful conference track. Our thanks go also to Everton Cavalcante as Publicity Track Chair.

Track Program Committee:

EDITORIAL MESSAGE
Special Track on Social Network and Media Analysis (SONAMA)

Sang-Wook Kim, *Hanyang University, Korea*

With the advent of social network services such as Twitter, Facebook, Tumbler, and Google+, the research on social network and media analysis has been greatly advanced. In recent years, the interactions among people, sharing of knowledge and experiences, community activities in social network services increase greatly, which would make the research on social networks more important. Furthermore, as social media contents within social network services are rapidly being produced and consumed, the social media contents now account for the majority of content published on the world wide web. Social media is differentiated from traditional media in many aspects such as its frequency, quality, usability, immediacy, and permanence, which leads to significant potential to the social media analysis research.

The ACM SAC has been an important venue for the past 33 years, attracting computer scientists, computer engineers, software engineers, and application developers from around the world. The Social Network and Media Analysis (SONAMA) track of ACM SAC will provide a forum that brings together researchers and practitioners for exploring technologies, issues, experiences, and applications with a specific focus on the recent research trends and industrial needs in the related fields. Since social network and media analysis encompasses a variety of highly cross-disciplinary research issues, the SONAMA will foster collaborations and exchange of ideas and experiences among researchers working in various fields such as computer science, linguistics, statistics, sociology, geography, economics, and business.

This year, the 6th of the SONAMA track, we received a total of 39 submissions of high-quality papers from all over the world. The review process was very competitive with each paper receiving at least three reviews. We accepted 8 papers for oral presentations and 5 papers for poster presentations. We would like to thank all the authors who submitted their inspiring contributions to our track. Also, we sincerely appreciate our program committee members listed below who devoted their invaluable time and efforts for reviewing the submissions. Without their help, our track program could not be made so successful. Finally, we would like to give special thanks to program co-chairs Dongwan Shin and Seiji Isotani for their nice guidance and support. We look forward to seeing all of you in Limassol, Cyprus.

Program Committee Members

Claudio de Souza Baptista	Federal University of Campina Grande, Brazil
Ladjel Bellatreche	National Engineering School for Mechanics and Aerotechnics, France
Tru Hoang Cao	Ho Chi Minh University of Technology, Vietnam
Seong Je Cho	Dankook University, Korea
Chang Choi	Chosun University, Korea
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Christian Esposito	University of Salerno, Italy
Sheng Gao	BUPT, China
Ji-Woon Ha	Hanyang University, Korea
Masoud R. Hamedani	Dankook University, Korea
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Hao Huang	Ge Global Research, USA
Heasoo Hwang	University of Seoul, Korea
Mirjana Ivanovic	University of Novi Sad, Serbia
Hasan Jamil	University of Idaho, USA
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Jason J. Jung	Yeungnam University, Korea
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U Kang	Seoul National University, Korea
Pinar Karagoz	Middle East Technical University, Turkey
Mark Kibanov	University of Kassel, Germany
Chulyun Kim	Gachon University, Korea
Han-joon Kim	University of Seoul, Korea
Hyoungshick Kim	Sungkyunkwan University, Korea
Hyunchul Kim	Sangmyung University, Korea
Younghoon Kim	Seoul National University, Korea
Dongho Lee	Hanyang University, Korea
Jongwuk Lee	Pennsylvania State University, USA
Kiyong Lee	Sookmyung Women's University, Korea
Sang-Chul Lee	Hyundai Heavy Industries, Korea
Andrea Marino	University of Pisa, Italy
Pedro O.S Vaz de Melo	Universidade Federal de Minas Gerais, Brazil
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Milos Savic	University of Novi Sad, Serbia
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Min Song	Yonsei University, Korea
Francesca Spezzano	Boise State University, USA
Julien Velcin	University Lyon 2, France
Xiaojie Wang	BUPT, China
Jenq-Haur Wang	National Taipei University of Technology, Taiwan
Joyce Whang	Sungkyunkwan University, Korea
Junjie Yao	East China Normal University, China
ShinjaeYoo	Brookhaven National Laboratory, USA
Seok-Ho Yoon	Samsung Electronics, Korea
Eva Zangerle	University of Innsbruck, Austria
Xiangliang Zhang	King Abdullah University of Science and Technology, Saudi Arabia

EDITORIAL MESSAGE
Special Track on Software Platforms

***Jinman Jung**, Hannam University, Korea*
***Jun Huang**, Chongqing University of Posts and Telecom, China*

The software platforms are in a constant state of change with new devices and technologies introduced almost every day. As a result, software platform developers and researchers continue to evolve software technologies that are used for increasing mobile conversions and enhancing relationships among users. The structure of software systems involves working with a wide variety of software platforms and technologies range from embedded devices and smart phones on the low end, to enterprise and distributed systems on the high end. Many research questions remain open from limited battery to remote access control, interaction with external devices, assurance in quality of service, context aware adaptation to the environment, interface modeling or other issues (security and privacy problems) that are obstacles to thrive software platform technologies. This track aims to share research results and experiences in Software Platforms field with researchers and developers, the track addresses all of these research issues related to software platforms. This track has received 18 submissions from different countries around the world. Each paper has underwent a blind review process by three members of the track Technical Program Committee (TPC), and 4 regular full papers (with acceptance ratio 22%) and 2 poster papers have been accepted for publications in the proceedings of the conference. The regular papers accepted by this track include:

- Energy Efficient I0 stack Design for Wearable Device
- Design and Implementation of Emulab based Malware Analysis Service through Emulib
- Android Application Installation log Management System
- Exploring Technical and Social Sides for Service Composition in Scientific Software Ecosystems

In addition, two poster papers have been accepted by this track:

- A Design and Implementation Wind Farm Real time Simulator with Various Types of Wind Turbines considering Wake Effect
- A Novel Approach for Collecting and Sharing Software Metrics Data

The ACM SAC 2019 Software Platforms track was chaired by Drs. Jinman Jung and Jun Huang who wish to thank all the TPC members for their valuable time and technical input for running such an excellent track. Without their support and contributions, this track would not be successful. The special thanks will be given to the Drs. Dongwan Shin and Seiji Isotani for their leadership and superb work to organize the SAC conference. Finally, the track chairs would like to thank all the authors who contributed to this track.

December 2019,
Drs. Jinman Jung and Jun Huang
Track Chairs, Software Platforms

EDITORIAL MESSAGE
Special Track on the Semantic Web and Applications

***Soon Ae Chun**, City University of New York, USA*
***Hyoil Han**, Illinois State University, USA*
***Sangsoo Sung**, Google Inc. USA*

The technical track "The Semantic Web and Applications (SWA)" focuses on advancing the topics, techniques, and applications to realize and/or utilize the Semantic Web. The contributions to this track typically include research and development concerning issues such as: 1) developing ontologies for Semantic Web applications; modeling, management, integration and interoperability of Semantic Web data; 3) improving query techniques and quality enhancements; 4) Innovative approaches for achieving Semantic Web goals in specific application domains.

This year, the track received 35 submissions, and accepted 8 papers for the regular paper session, 2 short papers for the poster session, and a poster for the SRC session, which amounts to an acceptance rate of 28.5%. The topics covered by selected papers include:

- Ontologies learning and development, large-scale ontology alignment and matching
- Knowledge completion with Link predictions using background knowledge
- Modeling data cube in RDF for statistical multidimensional aggregation queries
- Efficient SPARQL processing in the client side with lighter servers.
- Ensuring the consistency and quality of data and data sources using temporal and context information
- Applications in change and event detection in satellite images, document generation, cross linguistic matching, scholarly events.

In the future, we plan to analyze and share the topical interests and research trends in the Semantic Web technologies and applications. We acknowledge the authors for submitting their papers to this track, and the program committee for their rigorous reviews to help us selecting the high quality papers.

EDITORIAL MESSAGE
Special Track on Usability Engineering

Eduardo Mosqueira Rey, *University of A Coruña, Spain*
Vicente Moret Bonillo, *University of A Coruña, Spain*
David Alonso Ríos, *University of A Coruña, Spain*

Introduction:

From a socio-cultural point of view, usability becomes increasingly important with the rise of the so-called information society and the new and innovative ways of interacting with computers in the post-PC era. However, achieving good usability is not easy: Usability has always been difficult to define, measure, and evaluate. Since usability is a multifaceted concept, we need a great diversity of usability techniques to perform a usability study. The study of usability has been somewhat disconnected from the development life cycle of a product. Usability results of real products are usually kept secret, as companies prefer not to openly disclose the defects of their products, etc. In this track we seek original, unpublished contributions that are mainly focused on applying usability engineering models and techniques to real products or theoretical studies with clear practical potential of being applied.

Statistics:

To this track ten papers were presented and three of them were accepted as full papers but one of them was retracted by the authors, so finally there were only two papers accepted (20% of acceptance for full papers). Also two additional papers were accepted as poster (an additional 20% of acceptance for posters).

Descriptions:

The papers accepted address the following novel aspects within the field of usability:

- "**Cognitive workload of in-car auditory-vocal interfaces on visuospatial sketchpad based on a dual task of visual pattern test**" Takahiro Miura, Ken-ichiro Yabu, Youji Shimizu, Kenichi Tanaka, Masamitsu Furukawa, Seiko Michiyoshi, Tetsuya Yamamoto, Kazutaka Ueda and Tohru Ifukube

The goal of this study is to quantify the cognitive workload of visuospatial components on operating voice-based interfaces. Particularly, we aim to quantify the user's visuospatial workload when they operate voice commands while driving and, then, comparing the reported workload that participants simultaneously used graphical interfaces. We used the quantitative measurement method to evaluate the workload on the visuospatial sketchpad by employing a dual task of pattern span test and usage of a target interface. The results indicated that even voice command interfaces affect the performance of the pattern span test regardless of the independence of the sketchpad and the phonological loop. Also, we quantitatively found that employing familiar words and their combinations for drivers could reduce the workload of voice-based operations.

- "**Usability Problems Discovery Based on the Automatic Detection of Usability Smells**". Rafael Ribeiro, Matheus Souza, Pedro Oliveira and Pedro Neto.

Web applications usage has gone through a big and fast growth in the past few years, becoming part of our daily lives. Large companies use these applications to provide their services. So, it is necessary to ensure the development of high-quality applications. One of the main attributes of a Web application that directly determines its success or failure is their usability, and several methods were developed to evaluate it. The most popular method of usability evaluation is the laboratory testing because it can directly evaluate users' reactions while interacting with the final application. However, performing this test entails high cost and complexity. So, aiming to simplify the execution of this evaluation and to ease the discovery of usability problems, this work proposes an approach to detect indicators of problems (usability smells), based on the capture of the user interaction in the production environment and automatic analysis of this interaction. A study carried out with the approach showed that smells indicated by it were able to aid the detection and correction of usability problems in a real application.

- "**User Experience Evaluation Focused on Viewpoints and Embodiment**". Cristina A Scheibler and Maria Andreia F Rodrigues

The sense of embodiment of users in interactive graphics applications controlled by virtual reality devices involves several senses. This paper presents a user experience evaluation focused on user viewpoints (first and third-person perspectives) and their influence on the sense of embodiment of users, in a mobile game wearing a Head Mounted Display device. More precisely, we show the significant influence of the use of first-person perspective, the synchronism between movements of the 3D game character and those from the player in real-world and participant's gender on the sense of embodiment. With respect to the genre, it was shown that the women participants perceived the SoE in both points of view, regardless of the game character being always in motion. As for the men participants, the sense of agency was influenced by the level of synchronism between player's and character's movements, resulting in the SoE being perceived only in the first-person perspective. We also concluded that the different points of view did not affect the user experience when playing the game, except for items that involved comfort and nausea.

- "**Developing a Mental Model for use in the Context of Computer Security**". Isaiah Liljestrand, Marcelo Gonzales and Dongwan Shin

A mental model is a useful tool for describing user's general mental processes that go into certain actions. In this paper, we investigate how to enhance the usability of security applications by considering human factors. Specifically, we study how to better understand and develop the user's mental model in the context of computer security through the use of the reasoned action approach (RAA). RAA explains that a user's behavior is determined by her intention to perform the behavior and the intention is, in turn, a function of attitudes towards the behavior, perceived norms (or social pressure), and perceived behavior control (capacity and relevant skills/abilities). A user study was conducted to test the validity of each of the main components of the model. Our user study concluded that alterations to a computer security application improved by the analysis through the mental model created improved user behavior.

Acknowledgement. Track chairs wish to thank the program committee members and collaborators for their effort in evaluating all the papers.

EDITORIAL MESSAGE
Special Track on Selected Areas of Wireless Communications and Networking (WCN)

Dongkyun Kim, *Kyungpook National University, Daegu, Republic of Korea*
Wei Wang, *San Diego State University, San Diego, California, USA*

Introduction:
Research on Wireless Communications and Networking (WCN) has been able to improve our lives in multiple ways. The need to communicate anytime, anywhere brought us many new wireless and networking technologies that we are using today, including cellular networks (3G/4G/5G), ad-hoc networks, sensor networks, WiMAX, etc. The invention of these technologies has created a new paradigm of research and developments. In particular, the past decade has seen a significant surge of research activities in wireless communications and networking. While several applications and services have been introduced, the demands for new applications still exist, requiring technical challenges to become bigger every day. In addition to the WCN research topics, a great number of individuals, researchers, academics are emphasizing new novel ideas and improving the performance of next generation of networking paradigms such as Future Internet architectures, Data-centric communications, and so on. This special track aims to bring together researchers, academics, individuals working on selected areas of wireless communications and networking to share their new ideas, latest findings and results.

Track Statistics:
The WCN track, started in 2014, is reaching this year its 6th edition. This edition has confirmed the interest of both researchers and practitioners in the track topics. A total of 28 paper submissions have been received from diverse countries--Algeria, Australia, Brazil, France, Israel, Italy, Ireland, Portugal, Qatar, South Korea, Spain, Pakistan, and the USA. Submitted papers have been reviewed by a Program Committee of 25 members, granting 3 extensive reviews per submission on average. WCN track keeps high quality and it is evident from its acceptance ratio, 7 of the submitted papers have been accepted as full papers (for an acceptance rate of about 25%) and 1 paper is accepted as a poster.

Description of Accepted Papers:
This year, we have received papers of very interesting wireless communication topics varying from area coverage problem in mobile WSNs, energy harvesting in M2M networks, congestion control in IoUT, and adaptive energy management for wireless sensor networks. Also, new emerging fields are also emphasized in this track such as Software Defined Networks based handover mechanisms for 5G networks, Reliability of Automatic Dependent Surveillance-Broadcast (ADS-B) Communications, the coexistence of the two service classes, eMBB and uRLLC, in 5G networks, and IEEE820.11ad mmWave aided object detection.

Acknowledgment:
First, the track chairs thank all the authors and researchers, who submitted their valuable work to this track. Many congrats to those authors who got their work accepted this year. The track chairs would like to thank the TPC and reviewers for handling review of the papers in this track. This track will not be successful without the diligent contribution and high quality timely reviews from the TPC/reviewers.

EDITORIAL MESSAGE
Web-based Technologies for Interactive Computing Education (WICE) Track

Maiga Chang, *Athabasca University, Canada*

Hasan Jamil, *University of Idaho, USA*

The Web-based Technologies for Interactive Computing Education at the ACM SAC is the first experimental track in SAC's 34-year tradition co-chaired by Maiga Chang and Hasan Jamil. This track is a response to the growing global realization that computer and information literacy is a basic and essential educational component needed to maintain a competitive edge in a global economy. This edition of this track has been to encourage and foster new models for *conversational intelligent tutoring system* for computing instruction delivery, and tutoring over the web. Overall, we aimed to offer a platform for cross fertilization of ideas from the communities of computer scientists and educational technologists toward developing smart web-based technologies and platforms for computing education.

We have received a total of 16 high quality papers from all parts of the world from both academia and industry. The review process was very competitive with each paper receiving at least three reviews, and finally four full papers and two poster paper were accepted for the track, bringing the acceptance rate to approximately 25% for regular full papers, and 38% overall. We take this opportunity to thank all the authors who submitted their contributions making it possible for us to choose the following papers and putting together a successful track program.

Full papers:

1. *"A Web-Based E-Assessment Tool for Design Patterns in UML Class Diagrams"* by Tobias Reischmann and Herbert Kuchen.
2. *"Meet Cyrus - The Query by Voice Mobile Assistant for the Tutoring and Formative Assessment of SQL Learners"* by Josue Godinez and Hasan Jamil.
3. *"Integrating Context-Awareness and Multi-Criteria Decision Making in Educational Learning"* by Yong Zheng, Shephalika Shekhar, Alisha Anna Jose and Sunil Kumar Rai.
4. *"Anchoring interactive points of interest on web-based instructional video: effects on students' interaction behavior and perceived experience"* by Maria Pimentel, Cristiane Yaguinuma, Diogo Santana Martins and Izabela Zaine.

Poster papers:

1. *"More than the Sum of its Parts: Composing Learning Formats from Core Components"* by Niels Heller, Sebastian Mader and François Bry.
2. *"Resources for Healthcare Workflow Modeling and Analysis"* by Hossain Shahriar, Chi Zhang and Md. Arabin Islam Talukder.

Finally, thanks are due to the members of the track program committee for a timely review of all the submissions.

Phil Benachour, Lancaster University, UK Mei-Hwa Chen, University of Albany, USA
Rita Kuo, New Mexico Institute of Mining and Technology, USA Aparna Lalingkar, IIIT Bangalore, India
Oscar Lin, Athabasca University, Canada
Murali Mani, University of Michigan - Flint, USA Hossain Shahriar, Kennesaw State University, USA Ahmed Tlili, University of Tunis, Tunisia
Li Wang, National Open University, China
Seng Yue Wong, University of Malaya, Malaysia
Haoran Xie, The Education University of Hong Kong, Hong Kong

We have an exciting program for SAC Web-based Technologies for Interactive Computing Education Track, and overall SAC symposium in 2019. We plan to welcome you in Limassol, Cyprus in April, 2019.

EDITORIAL MESSAGE
Special Track on Web Technologies

***Francesco Poggi**, University of Bologna - Bologna, Italy*
***Cristian Mateos**, UNICEN University - Tandil, Argentina*
***Tim A. Majchrzak**, University of Agder - Kristiansand, Norway*

The Web is relentlessly evolving. Once a single interconnection of static, physically distributed content passively accessed by human users through personal computers, during the explosion of Web-based social networks the Web evolved into an environment allowing users worldwide to interact and collaborate to create user-generated content within many virtual communities. In this line, Web 2.0 is the umbrella term used to encompass several developments which followed, namely social networking sites and social media sites (e.g., Facebook), blogs, wikis, folksonomies (e.g. Flickr), video sharing sites (e.g., YouTube), Web applications ("apps"), collaborative platforms, and mashup applications. Many technologies such as HTML 5, CSS3, AJAX and client-side scripting helped to bring these ideas into practice.

Moreover, the current Web can be seen as an evolutionary step from the Web 2.0 in that access to content is nowadays ubiquitous, content itself is far more heterogeneous, and "users" come in mixed and different flavors. First, ubiquitous access has been mainly pushed by the inception of mobile computing and mobile devices; in fact reports show that by 2020 the number of mobile device users will be about 70% of the global population. Second, served and published Web content is not only those following traditional interchange formats (text, images, video) but also executable code or Web APIs (e.g. Mashape.com, ProgrammableWeb.com), from which new applications can be built and in turn published back to the Web. The recent notion of "Web of objects", which find its root in Web-accessible IoT applications, promotes the interconnection of hardware elements capable of producing huge amounts of sensor data. Finally, the role of Web application end users and Web developer/designers is somewhat blurry, due to modern Web technologies that greatly simplify the creation/deployment of rich Web sites that might consume Web-accessible services. In addition, the advent of Semantic Web technologies pave the way to the creation of intelligent applications, and thus the tandem human user-browser is no longer the only way to take advantage of Web content.

In this context, novel approaches and techniques, new tools and frameworks are needed to address the increasing complexity of the Web that is coming and the applications therein. This track aims at bringing together researchers and practitioners from industry and academia working on both practical and foundational aspects of Web technologies, as well as other technologies that in the Web framework have found new and unexpected application fields.

We received 20 paper submissions from different countries such as the Netherlands, Germany, Italy, Japan, Portugal, Brazil, Argentina, Russia, France, USA and Spain. We believe this reaffirms both the interest of researchers and practitioners in the track, and the relevance of the theme. Submitted papers were reviewed by a Program Committee of 34 members, granting 3-4 reviews per submission; 5 of the submitted papers were accepted as full papers (acceptance rate = 25%) and 3 were accepted as posters. For this edition we are also glad to announce the preparation of a Special Issue with best selected papers from the track, to be published in the Information Processing and Management journal (Elsevier). The journal impact factor is 3.444 and is ranked Q1 (Computer science applications, information systems) according to Scimago.

In the opinion of the track chairs these achievements, when put in context, together with the quality of the submissions, mark a success of the ACM SAC track on Web Technologies in its 12-year anniversary. The quality of the contributions presented in this proceeding is also due to the hard work of the members of the program committee; we would hereby like to thank:

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We wish you a pleasant and stimulating read.
Francesco, Cristian and Tim