The 35th Annual ACM Symposium on Applied Computing

Brno, Czech Republic
March 30 - April 3, 2020

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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
Conference Chair

Tomas Cerny
Conference Vice-Chair

On behalf of the Organizing Committee, we welcome you to the 35th Annual ACM Symposium on Applied Computing (SAC 2020), hosted by Red Hat Czech, Czech Technical University and Masaryk University of Czechia. For more than three decades 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 on Applied Computing 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 2020 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 SAC 2020 a high quality conference. We also thank our invited keynote speakers Prof. Irwin King of The Chinese University of Hong Kong, and Prof. Jan Faigl of Czech Technical University in Prague for sharing their knowledge and expertise with SAC 2020 attendees. Most of all, we would like to especially thank the authors and presenters for sharing their experience with the rest of us, and all attendees for joining us in Pisa, Italy this year.

The local organizing committee has been a major contributor to the success of the SAC 2020 conference. Our gratitude goes to the Local Arrangement Chairs Dana Machova, Katerina Klatilova and Matej Hrusovsky of Red Hat, Czechia. We extend our thanks to the Publication Chair, Dr. Hossain Shahriar, Kennesaw State University, USA, for his tremendous effort in putting together the conference proceedings, to the Posters Chairs, Dr. Alessio Bechini, University of Pisa, Italy and Dr. Miroslav Bures, Czech Technical University, Czechia, for his hard work to make a successful Poster Program, and to the Tutorials Chair Dr. Vasek Matyas, Masaryk University, Czechia, for arranging an exciting set of Tutorials. A big “thank you” also goes to Dr. Amin Mikler, University of North Texas, USA, for organising the Student Research Competition, as well as to Dr. John Kim, Utica College, USA, for playing the roles of treasurer, and Dr. Junyoung Heo, Hansung University, South Korea, for the role of registration chair and webmaster (and many more), and Drs. Juw Won Park, University of Lousiville, USA, and Eunjee Song, Baylor University, USA, for the role of publicity chair. Special thanks to our Program Co-Chairs: Dr. Dongwan Shin, New Mexico Tech University, USA, and Dr. Alessio Bechini, University of Pisa, Italy for coordinating and bringing together an excellent Technical Program.

Again, we welcome you to SAC 2020 in the beautiful city of Brno, Czechia. We hope you enjoy the conference and your stay in Brno. Next year, we invite you to participate in SAC 2021.

Message from the Program Chairs

Dongwan Shin
New Mexico Tech University
New Mexico, USA

Alessio Bechini
University of Pisa
Pisa, Italy

Welcome to the 35th International Symposium on Applied Computing (SAC 2020). For the past 34 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 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 the highly qualified papers for the Track. Since its inception nine 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 2020.

The open Call for Track Proposals and after prescreening the proposals, 42 Tracks were finally accepted for SAC 2020. 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 915 final paper submissions from over 55 different countries. The submitted papers underwent the blind review process and 224 submissions were finally accepted as full papers for inclusion in the Conference Proceedings and presentation during the Symposium. The final acceptance rate for SAC 2020 is (24.48%) for the overall track. In addition to the accepted full papers, 78 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. 42 submissions received and finally 9 (21.4%) papers were accepted for the SRC program.

The Technical Program of SAC 2020 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 2020 Technical Sessions a huge success. Some of the popular Tracks had an unprecedented submissions and having 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 2020 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, 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 lead by Red Hat Czech. We wish you all a pleasant stay in Brno, hope you have a great time at SAC 2020, and you will have the opportunity to share and exchange your ideas and foster new collaborations. We hope to see you all at SAC 2021.

Track Chairs

Theme: Artificial Intelligence and Agents

BIO - Bioinformatics

Juan Manuel Corchado, University of Salamanca, Spain
Paola Lecca, University of Trento, Italy
Dan Tulpan, University of Guelph, Canada

CIVIA- Computational Intelligence and Video & Image Analysis

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

EC- Applications of Evolutionary Computing

Federico Divina, Universidad Pablo de Olavide, Spain
Miguel Garcia Torres, Universidad Pablo de Olavide, Spain

IRMAS - Intelligent Robotics and Multi-Agent Systems Track

Daniel Kudenko, L3S – Leibniz Universität Hannover, Germany
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

VPHBA - Video Processing for Human Behavioral Analysis Track

Donatello Conte, University of Tours, France
Jean-Yves Ramel, University of Tours, France
Raffaella Lanzarotti, University of Milano, Italy

Theme: Distributed Systems

CC - Cloud Computing

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

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

NET - Networking Track

Marília Curado, University of Coimbra, Portugal
Mário M. Freire, University of Beira Interior, Portugal
Ivan Ganchev, University of Limerick, University of Plovdiv "Paisii Hilendarski", Ireland, Bulgeria
Mohamed Mosbah, LaBRI, Bordeaux INP, France

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

DASH - Data-Driven Analysis for Software and Hardware Co-Dependability Track

Jong-Hyouk Lee, Sangmyung University, South Korea

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
André Carvalho, ICMC, USP, Brazil
Carlos Ferreira, Polytechnic Institute of Porto, Portugal
Joao Gama, University of Porto, Portugal

GIA - GeoInformation Analytics Track

Eric Kergosien, University of LILLE, France
Cyril de Runz, University of Tours, France
Christian Sallaberry, University of Pau & Pays de l'Adour, France
Gavin Mcardle, University College Dublin, Ireland
Luis Otavio Alvares, Universidade Federal de Santa Catarina, Brazil

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
Hyoli Han, Illinois State University, USA
Sangsoo Sung, Google Inc., USA

Theme: Software Design and Development

BPMEA- Business Process Management & Enterprise Architecture Track

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

CASoM - Code Analysis and Software Mining Track

Tomas Cerny, Baylor University, USA
Premek Brada, University of West Bohemia, Czechia
Miroslav Bures, Czech Technical University in Prague, Czechia

RE - Requirement Engineering Track

Maria Lencastre, Universidade de Pernambuco, Brazil
Ana Moreira, Universidade NOVA de Lisboa, Portugal
Julio Cesar, Pontificia Universidade Católica do Rio de Janeiro, Brazil

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

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

SVT - Software Verification and Testing Track

Matthias Güdemann, IOHK, Hong Kong
Nikolai Kosmatov, CEA List and Thales Research & Technology, France

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Theme: System Software and Security

CPS - Cyber-Physical Systems Track

Song Han, University of Connecticut, USA
Jingtong Hu, University of Pittsburgh, USA
Jason Xue, City University of Hong Kong, Hong Kong

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

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
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

Juw Won Park, University of Louisville, USA
Jun Huang, Chongqing University of Posts and Telecom, China
Jinman Jung, Hannam University, South Korea

SAC 2020 Keynote

Title: Graph Embedding from Theory to Applications

Speaker: Prof. Irwin King, Department of Computer Science & Engineering, The Chinese University of Hong Kong

Abstract

Graph embedding refers to the problem of projecting the elements in a graph, including nodes, edges, substructures, or the whole graph, to a low-dimensional space while preserving the graph's structural information. Graph embedding is an essential technique for analyzing various types of large-scale networks such as social networks, traffic networks, semantic networks, etc. To cope with the growing scale and diversifying structure of modern networks, researchers have proposed novel methods for graph embedding for feature engineering. In this talk, we present the recent advances and future directions in the theoretical development graph embedding and introduce some common applications for social network analysis, such as node classification, link prediction, community detection, and social recommendation.

Biography

Prof. King's research interests include machine learning, social computing, AI, web intelligence, data mining, and multimedia information processing. In these research areas, he has over 300 technical publications in journals and conferences. He is an Associate Editor of the Journal of Neural Networks and ACM Transactions on Knowledge Discovery from Data (ACM TKDD). He is President of the International Neural Network Society (INNS) and an IEEE Fellow, Distinguished Member of ACM, and HKIE Fellow. Moreover, he is the General Co-chair of The WebConf 2020, ICONIP 2020, WSDM 2011, RecSys 2013, ACML 2015, and in various capacities in a number of top conferences such as WWW, NIPS, ICML, IJCAI, AAAI, etc. While he was on leave with AT&T Labs Research, San Francisco, he also taught classes as a Visiting Professor at UC Berkeley. He received his B.Sc. degree in Engineering and Applied Science from California Institute of Technology, Pasadena and his M.Sc. and Ph.D. degree in Computer Science from the University of Southern California, Los Angeles.

SAC 2020 Keynote

Title: Terrain Learning with Multi-legged Walking Robots in Autonomous Exploration Missions

Speaker: Prof. Jan Faigl, Department of Computer Science,
Czech Technical University in Prague, Czechia

Abstract

Robotic learning can be described as the robot ability to acquire and utilize the experience of the robot collected during its mission. In a particular scenario of autonomous exploration of a priori unknown environment, a multi-legged walking robot can take advantage of its locomotion capabilities to crawl various rough terrains. However, some of the terrains can be more costly to traverse than others, and therefore, a terrain characterization build online during the mission can support the overall mission performance. Besides, not only terrain learning is supportive in the exploration missions, but also adaptive locomotion control, localization, and terrain mapping have to be addressed to perform the exploration fully autonomously. In the talk, I will present examples of the developed solutions for all such essential building blocks of the autonomous exploration with a small hexapod walking robot. Finally, the talk will also cover an overview of the results achieved by the CTU-CRAS team in the Tunnel Circuit event of the DARPA Subterranean Challenge (SubT).

Biography

Assoc. Prof. Jan Faigl received Ing. degree in Electrical Engineering, branch Technical Cybernetics, Faculty of Electrical Engineering (FEE), Czech Technical University (CTU), Czechia in 2003 and a Ph.D. degree in Electrical Engineering and Information Technology, branch Artificial Intelligence and Biocybernetics, FEE, CTU, Czechia in 2010. He was a member of the winning team for the Mohamed Bin Zayed International Robotics Challenge (MBZIRC) in Challenge 3 and the 2nd place in Challenge 1. In 2019, he participated in Tunnel Circuit event of the DARPA SubT Challenge as member of the CTU-CRAS team that took the 1st place in DARPA non-funded teams and the 3rd place among all the teams. He has served as Program Committee member in several conferences, chairs of workshops and served as the guest editor of the special issue on “Online decision making in Multi-Robot Coordination” in Autonomous Robots journal. He currently serves as the associate editor of the IEEE Transactions on Automation Science and Engineering (T-ASE). Since 2013, he is leading the Computational Robotics Laboratory (http://comrob.fel.cvut.cz) within the Artificial Intelligence Center (http://aic.fel.cvut.cz). He is also co-founder of the Center for Robotics and Autonomous Systems (http://robotics.fel.cvut.cz). Dr. Faigl had been awarded the Antonin Svoboda Award from the Czech Society for Cybernetics and Informatics in 2011. He received best poster awards for IJCNN 2017, WSOM'16, and WSOM'14, best student paper award WSOM'19, and be the finalist of the best paper awards at RSS'18 and IROS'16. His current research interests include multi-goal planning, robotic information gathering, and robotic systems for autonomous long-term missions with life-long learning, which also comprises unsupervised learning, self-organizing systems, autonomous navigation, aerial systems, and path and motion planning techniques, robotic learning and locomotion control of multi-legged walking robots.

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Davide Rossi, University of Bologna, Italy

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Theme: Distributed Systems

CC - Cloud Computing Track

Track Co-Chairs: S.D Madhu Kumar, NIT Calicut, India
Priya Chandran, NIT Calicut, India

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Theme: AI and Agents

CIVIA - Computational Intelligence and Video & Image Analysis Track

Track Co-Chairs: Agostinho Rosa, University of Lisbon, Portugal
Yin-Fu Huang, National Yunlin University of Science and Technology, Taiwan
Mohammed El Hassouni, Mohammed V University in Rabat, Morocco
Rachid Jennane, University of Orleans, France

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Rosa Meo, Università degli Studi di Torino, Italy

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DS - Data Streams Track

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André Carvalho, ICMC, USP, Brazil
Carlos Ferreira, Polytechnic Institute of Porto, Portugal
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Cyril de Runz, University of Tours, France
Christian Sallaberry, University of Pau & Pays de l'Adour, France
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Daniel Kudenko, L3S – Leibniz Universität Hannover, Germany
Denis F. Wolf, University of São Paulo, Brazil

Poster Papers

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KLP - Knowledge and Language Processing Track

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Marco Rospocher, Università degli studi di Verona, Italy

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

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Martine Ceberio, Univerity of Texas El Paso, USA
Eric Monfroy, Université de Nantes, France
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Theme: Distributed Systems

MCA - Mobile Computing and Applications Track

Track Co-Chairs: Hong Va Leong, The Hong Kong Polytechnic University, China
Sheikh Iqbal Ahamed, Marquette University, USA

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MLA - Machine Learning and its Applications Track

Track Co-Chairs: Keon Myung Lee, Chungbuk National University, South Korea
Jee-Hyong Lee, Sungkyunkwan University, South Korea

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, University of Plovdiv "Paisii Hilendarski", Ireland, Bulgeria
Mohamed Mosbah, LaBRI, Bordeaux INP, France

Poster Papers

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OS - Operating Systems Track

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Bongjae Kim, Sun Moon University, 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, The Commissioner for Data Protection and Freedom of Information Baden-Württemberg, 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
Ana Moreira, Universidade NOVA de Lisboa, Portugal
Julio Cesar Sampaio do Prado, Pontificia Universidade Católica do Rio de Janeiro, Brazil

Poster Papers

Theme: System Software and Security

RS - Recommender Systems: Theory and Applications Track

Track Co-Chairs: Markus Zanker, Free University of Bozen-Bolzano, Italy
Panagiotis Symeonidis, Free University of Bozen-Bolzano, Italy
Yong Zheng, Illinois Institute of Technology, USA

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Patrizia Scandurra, University of Bergamo, Italy

Poster Papers

Student Research Abstract

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SE - Software Engineering Track

Track Co-Chairs: Byungjeong Lee, University of Seoul, South Korea
Eunjee Song, Baylor University, USA
Tao Zhang, Macau University of Science and Technology, China

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SEC - Computer Security Track

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Poster Papers

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, University Catholique de Louvain, Belgium
Thais Vasconcelos Batista, DIMAp – UFRN, Brazil

Theme: Information Systems

SONAMA - Social Network and Media Analysis Track

Track Chair: Sang-Wook Kim, Hanyang University, South Korea

Poster Papers

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SP - Software Platforms Track

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SVT - Software Verification and Testing Track

Track Co-Chairs: Matthias Güdemann, IOHK, Hong Kong
Nikolai Kosmatov, CEA List and Thales Research & Technology, France

Theme: Information Systems

SWA - Semantic Web and Applications Track

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

Poster Papers

Student Research Abstract

Theme: AI and Agents

VPHBA - Video Processing for Human Behavioral Analysis Track

Track Co-Chairs: Donatello Conte, University of Tours, France
Raffaella Lanzarotti, University of Milano, Italy
Jean-Yves Ramel , University of Tours, France

Poster Papers

Theme: Distributed Systems

WCN - Selected Areas of Wireless Communications and Networking Track

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Wei Wang, San Diego State University, USA

Theme: Distributed Systems

WT - Web Technologies Track

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Main Menu

Editorial Message

Special Track on Bioinformatics (BIO)

http://animalbiosciences.uoguelph.ca/~dtulpan/conferences/acmsacbio2020/

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Pusat Komputeran dan Informatik, Universiti Malaysia Kelantan, Kelantan, Malaysia

Goals and focus

The ACM SAC 2020 Bioinformatics Track aims at promoting current advances in biological sciences relying on analytical methods that integrate mathematical, physical and computer sciences.

The track is primary devoted to publishing papers very focused on timely well-defined biological issues whose solution have benefited from the use of computational techniques or the implementation of new ones. The track solicits submission of papers presenting a biological problem in a comprehensive way and (part of) its solution obtained through the application of computational methods including analysis, modeling and simulation.

Manuscripts presenting highly original results in the field of applied biology and are proof of an interdisciplinary collaboration between biologists and computer scientists are hosted in the BIO Track. This Track considered the innovative computational and methodological aspects very relevant, and gave great emphasis to contributions showing practical applications of computational methodologies to the solution of problems and question relevant to modern biological applicative domains. Algorithmic procedures for modelling and analysis of data are solicited in the following areas of research: bioinformatics for cancer biology and genomics, Computational methods for cell and molecular biology, computational methods for microbiology and synthetic biology, computational methods for neurobiology and development, computational methods for personalized medicine.

Statistics

SAC ACM BIO attracted 8 submissions from 6 countries (Brazil, India, Korea, Pakistan, Singapore and United States of America). The acceptance rate was 25%, with 2 manuscripts accepted for oral presentations and 2 manuscript accepted for poster presentations. The BIO Track Student Research Competition received 2 submissions, both accepted for poster presentations.

Description of accepted papers

The peculiarity of the papers of the 2020 edition is the strong focus on the applicative aspects of the theoretical frameworks and methodologies presented. Applicative domains concern the modelling of biological circuits, drug design based on mechanisms of attention, analysis and interpretation of 3D EEG signals, data and models of anti-microbial resistance.
A complete list of selected publication to be presented at ACM SAC BIO 2020 is included below.

Papers selected for oral presentation

- Sa'ed Abed, Adnan Rashid and Osman Hasan, Formal Analysis of the Biological Circuits using Higher-order-logic Theorem Proving, (to appear), 2020.
- Vedang Mandhana and Rutuja Taware, De Novo Drug Design Using Self Attention Mechanism, (to appear), 2020.

Papers selected for poster presentation

- Akshay Agarwal, Gowri Nayar and James Kaufman, Survey of Public Assay Data: Opportunities and Challenges to Understanding Antimicrobial Resistance, (to appear), 2020.
- Vedang Mandhana and Rutuja Taware, Classification of 3D Interpolated EEG Signals Using Hybrid R-3DCNN, (to appear), 2020.

SRC posters

- Chitaranjan Mahapatra, In silico pharmacological assessment of Mibefradil in single detrusor smooth muscle cells towards understanding urinary bladder over activity, (to appear), 2020.
- Paula Silva, Multimodal Deep Learning Based Approach for Cells State Classification, (to appear), 2020.

Acknowledgments

The SAC ACM BIO Track organizers like to express their gratitude to the Steering Committee of the SAC ACM 2020 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:

Alain Tchagang, Information and Communications Technologies, NRC, Canada.
Chaouki Regoui, Information and Communications Technologies, NRC, Canada.
Eleonora Lusito, the FIRC Institute of Molecular Oncology Foundation, The European Institute of Oncology, Italy.
Eric Paquet, Information and Communications Technologies, NRC, Canada.
Michela Lecca, Bruno Kessler Foundation, Center for Information Technology, Italy.
Mohd Saberi Mohamad
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 Business Process Management & Modeling

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

The Business Process Management & Modeling (BPMM) track aims at gathering researchers and practitioners around enterprise-relevant research topics with specific interest on modeling-based approaches and techniques, specifically focused on business processes.

In particular, we recognize that Business Process Management, while largely building upon Process Modeling for many aspects, is still a quite separate discipline and gathers a different community of researchers with respect to modeling-oriented activities, both for enterprise-wide modeling approaches in general, but even for the specific case of business process modeling.

For this track we sought contributions in the areas of well known business process modeling techniques, as well as modeling approaches specifically targeting multi-perspective enterprise and business modeling, IT & business modeling and goals alignment, tackling both technical (languages, systems, patterns, tools) and social (collaboration, human-in-the-loop) issues.

Topics of relevance for the BPMM track include models and architectures based on the abstraction of processes, services and events, Business Process Modeling, Business Process Management, Business Process Management and social software, semantic business processes, collaborative Process Management, collaborative Process Modeling, Adaptive Case Management and other non-workflow approaches to BPM, modelling patterns for processes and business, enterprise architecture, model-driven approaches, complex event processing, process performance monitoring, assessment, and control, business process improvement

In this first edition of the track we received 23 paper submissions from countries and territories as diverse as Belgium, Brazil, Finland, Germany, Iraq, Italy, the Netherlands, Portugal, Spain and the UK.

All papers have been reviewed by a Program Committee of 23 members, granting at least 3 extensive reviews per submission; 6 of the submitted papers have been accepted as full papers and 3 of them as posters.

The overall quality of the submissions received was very good. This consideration and the aforementioned numbers mark a success for the ACM SAC track on Business Process Management & Modeling. The high quality of the contributions presented in this proceeding is surely due to the talent and inspiration of our authors,to whom we would like to extend our thanks for their interest in the track, but also to the hard work of the members of the program committee that we would hereby like to thank as well:

Alberto Sillitti - Innopolis University, RU
Andrea Mauri - Delft University of Technology, NL
Barbara Re - Università di Camerino, IT
Christoph Czepa - University of Wien, AT
Eric Umuhoza - Carnegie Mellon University Africa, RW
Eugenio Zimeo - Università del Sannio, IT
Filippo Ricca - Università di Genova, IT
Florian Daniel - Politecnico di Milano, IT
Francesca Zerbato - Università di Verona, IT
Francesco Poggi - Università di Bologna, IT
Iman Helal - Cairo University, EG
Lerina Aversano - Università del Sannio, IT
Manuel Wimmer - Technische Universität Wien, AT
Marco Winckler - Université Paul Sabatier (Toulouse 3), FR
Maria-Eugenia Iacob - University of Twente, NL
Maurizio Leotta - Università di Genova, IT
Pierluigi Plebani - Politecnico di Milano, IT
Ralf Laue - University of Applied Sciences of Zwickau, DE
Schahram Dustdar - TU Wien, AT
Sven Casteleyn - Universitat Jaume I, ES
Søren Debois - IT University of Copenhagen, DK

Special thanks also go to the ACM SAC 2020 Conference Chairs and Program Chairs for their support and guidance.

Marco Brambilla
Davide Rossi

Editorial Message
Special Track on Code Analysis and Software Mining

Tomas Cerny - Baylor University, TX, USA
Premek Brada - University of West Bohemia, Pilsen, CZ
Miroslav Bures - FEE, Czech Technical University in Prague, CZ

Introduction

Code analysis and software mining is a broad research area. While one can easily name error detection or code-clone tools the utility is much broader. Code analysis can help with challenges such as auto-completion, early feedbacks on quality assurance, control-flow modeling or even reveal code smells. However, there are many ways we can use analysis these days, include bytecode or source bode or even the entire software repository processing the additions in time or metadata. Overall the code analysis utility may contribute to development, maintenance, monitoring, testing, quality assurance, and overall software sustainability.

ACM SAC Code Analysis and Software Mining track is new in 2020; however, it proved to be addressing important areas of research with reasonable interest from the research community. In this track we witness application on logging statements, to predict code clones, emphasis on comments, program statements, data analysis, and dynamic information flow tracking, extraction of maintainability index, and others.

Statistics

The code analysis and software mining track received 16 submissions from authors all around the world. Four 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. Four more submissions were selected to be part of the poster program.

Full papers:

Logging Statements' Prediction Based on Source Code Clones, Sina Gholamian and Paul A. S. Ward

Identification of Data Propagation Paths in Computer Programs for Efficient Dynamic, Information Flow Tracking, Sanoop Mallissery, Yu-Sung Wu and Chih-Hao Hsieh

Comparing Identifiers and Comments in Engineered and Non-Engineered Code: A Large-Scale Empirical Study, Otavio Lemos, Marcelo Suzuki, Adriano de Paula and Claire Le Goes

Is there a Correlation Between Code Comments and Issues? - An Exploratory Study, Vishal Misra, Sai Krupa Reddy Jakku and Sridhar Chimalakonda

Poster papers:

Towards Summarizing Program Statements in Source Code Search, Victor J. Marin, Iti Bansal and Carlos R. Rivero

Comparing Maintainability Index, SIG Method, and SQALE for Technical Debt Identification, Peter Strečanský, Stanislav Chren and Bruno Rossi

Evaluating Techniques for Method-Exact Energy Measurements, Christoph Bockisch and Felix Rieger

Semantic Code Clone Detection for Enterprise Applications, Jan Svacina, Jonathan Simmons and Tomas Cerny

Track Program Committee Members

Finally, we would like to acknowledge all the program committee members of the track and thank them for their contributions and help in reviewing and selecting the papers.

Matthew Patrick - University of Cambridge
Marta Cimitile - Università Telematica Unitelma Sapienza
Mario Luca Bernardi - University of Sannio
Marinos Kintis - University of Luxembourg
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Ivan Polasek - Slovak University of Technology in Bratislava
Karol Rastocny - Slovak University of Technology in Bratislava
Valentino Vranić - Slovak University of Technology in Bratislava
Miloš Savić - University of Novi Sad, Serbia
Petr Saloun - VŠB - Technical University of Ostrava
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Vaclav Rechtberger - FEE, Czech Technical University in Prague
Andrew Walker - Baylor University, TX, USA
Ian Laird - Baylor University, TX, USA
Johnathan Simmons - Baylor University, TX, USA
Byungkwan Jung - Baylor University, TX, USA

This track provides an exciting program for the ACM SAC 2020 symposium that will be held in Brno, Czech Republic in March and April 2020.

EDITORIAL MESSAGE
Special Track on Cloud Computing

***S.D Madhu Kumar**, NIT Calicut, India*

***Priya Chandran**, NIT Calicut, India*

Cloud Computing, has proved its mettle as a computing paradigm likely to maintain its place through the present decade of the 21st century too. Cloud based systems maintain their acceleration as they are adopted into newer domains, delivering their promise of faster solutions and improved data security. Cloud computing is now accepted as the backbone of the Internet of Everything and has earned the confidence of user and provider communities, on the underlying cloud computing technology. Companies across the world and academia have corroborated their faith in cloud technology, as evident from the profusion of products, projects and publications produced almost everywhere on earth!

This track on Cloud Computing, organized consecutively for the tenth 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.

With every passing year, the depth of the research problems addressed in the track increases, and the focus gets sharper, as it should be in a highly worked-on field. 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 18 submissions. The review process was very competitive with each paper receiving at least three reviews, and finally 4 full papers and 2 poster papers were selected for the track, bringing the acceptance rate to exactly 23.59% for full papers and 11.8% for posters.

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

Using application knowledge to reduce cold starts in FaaS services
Reproducible availability benchmarking of cloud-hosted DBMS
On making Xen detect hypercalls and memory accesses for simulating virtualization-enabled processors
Feasibility of container orchestration for adaptive performance isolation in multi-tenant SaaS applications
Towards a formal model for composable container systems.
Multi objective load balancing in distributed computing environment

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.

A short summary of the research work selected for this track

Function-as-a-Service platforms (FaaS), retained the interest they generated, and researchers have started looking into deeper problems associated with FaaS. In FaaS, code is deployed in the unit of single functions and the cloud provider handles resource management. Cold start handling in FaaS with application specific information has been shown to be a potentially useful thread for deeper research. A graph theoretical model for containers, is yet another approach to make container based cloud eservices more effective. A framework for automation of testing the availability and performance guarantees of distributed DBMS, developed and presented, shows that such systems still have a long way to go, to meet the requirements of cloud based applications, thus opening up a plethora of issues, rich with research scope and relevance. Adaptive performance isolation between multiple tenants in a SaaS application instance, is studied, and some of the causes of problems are identified, thus paving the way for future research in terms of making container based allocations more intelligent. A fundamental issue, the lack of performance simulators for virtualization enabled processor, is touched upon, with results of identifying some system level issues and addressing them.

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*
***Mohammed El Hassouni**, Mohammed V University in Rabat, Morocco*
***Rachid Jennane**, University of Orleans, France*

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 Knowledge System and Artificial Intelligence-oriented Learning. Many conferences have been dedicated to Evolutionary Computing (ICEC, GECCO, PPSN, etc.), Video & Image Analysis (ICIAR, ICIAP, ICASSP, IJCAI, etc.), but this track still calls for papers addressing practical applications of Computational Intelligence and Video & Image Analysis. Research papers using computational intelligence techniques (theoretical and practical) for video and image analyses will be highly considered.

This year, we have 8 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 2 oral papers. By the way, one poster paper is accepted for the poster section. In summary, including posters, we have 37.5% (3/8) acceptance rate for the CIVIA track.

The accepted oral papers are involved in different subfields, including deep convolutional neural network, medical image segmentation, and autonomous driving. 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 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 (Internet of Things, Industrial IoT, Smart Environments, Mashups, NewSQL) 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 (docker), fragmentation-redundancy-scattering, and trustworthy service-oriented and microservice architectures with explicit control of quality of service properties and monitoring of 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 14 submissions, of which 4 could be accepted after being reviewed by six to seven members of the program committee. The resulting acceptance rate is 29%.

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. **Black-box inter-application traffic monitoring for adaptive container placement**
   Francisco Neves, Ricardo Vilaça and Jose Pereira

2. **Benchmarking Microservice Performance: A Pattern-based Approach**
   Martin Grambow, Lukas Meusel, Erik Wittern and David Bermbach

3. **QoE-Aware Auto-Scaling of Heterogeneous Containerized Services (and its application to Health Services)**
   Guilherme Santos, Herve' Paulino and Tomé Verdasca

4. **Privacy Preserving Cooperative Computation for Personalized Web Search Applications**
   Kaaniche Nesrine, Masmoudi Souha, Znina Souha, Laurent Maryline and Demir Levent

In addition, three posters have been accepted:

5. **Towards a Replication Service for Data-Intensive Fog Applications**
   Jonathan Hasenburg, Martin Grambow and David Bermbach

6. **Spatial Bloom Filter in Named Data Networking: a Memory Efficient Solution**
   Filippo Berto, Luca Calderoni, Mauro Conti and Eleonora Losiouk

7. **ALISI: A Lightweight Identification System based on Iroha**
   Giuseppe Bernieri, Mauro Conti, Matteo Sovilla and Federico Turrin

EDITORIAL MESSAGE
Special Track on Decentralized Applications with Blockchain, DLT, and Crypto-Currencies (DAPP'20)

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

Blockchain has gained momentum since it has been brought to light by Bitcoin around ten 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), crypto-currencies and decentralized finance (DeFi).

We want to thank all the authors for submitting their proposal contributions to the ACM SAC'20 DAPP track. We are grateful to the many external reviewers for their time and hard work to select the best full papers and additional posters. Many thanks to the SAC organizing 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 decentralized applications (dApp) development with blockchain and other DLT. The CAS is taught in English at the University of Geneva or via video-conference and is worth 12 official 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.

The use of databases and big data in business and industry has entered into acritical momentum for the innovations to come in the near future. Like every new technology and business practice, big data faces the challenges of maturity and value-added performance. To this end, a number of critical developments have been realized: Security and privacy of big data in healthcare systems [Haraty et al., 2018], the cloud's increasing role in big data management, and The Internet of Things' role in generating data [Brdar et al., 2019]. A critical focus on the emerging technologies currently provides the next context for the integration of big data in every aspect of human activity [Lytras et al., 2015]. The Internet of Things will cause an unpredicted explosion in the delivery of directed custom-made services to human beings; and thus, the new generation of big data movement will exploit this feature to its full potential. In a way the matching of services to human needs will incorporate the identification, distribution and management of many machine-generated data. The following is a short indicative list of challenges for big data:

- Urban/Social applications enabled by big data, Internet of Things and cloud technologies,
- Open media, open data, and linked data, and
- Security and privacy issues.

A total of 17 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 29%. More specifically, among the 17 submitted papers only 5 papers have been selected as regular papers. In addition, 2 papers have been selected for presentation in the poster session.

The papers cover a wide range of topics including: hardware assisted check pointing, storing RDF data into NOSQL databases, graph streams, query refinements, multi-dimensional data analysis, fuzzy databases, and interactive integration of dynamic data.

We would like to take this opportunity to thank the colleagues who worked hard to make ACM SAC 2020 possible. Our special thanks go to all the authors and referees who all contributed to the success of DBDM track. We look forward to your participation and cooperation in the upcoming ACM SAC 2021.

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TRACK CHAIR 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 2020 ACM SAC Data Mining Track is the twentieth such event in the 35 years of ACM SAC tradition, co-chaired by Hasan Jamil and Rosa Meo.

Similar to previous years, the 2020 ACM SAC Data Mining Track solicited original, unpublished and novel papers for publication and presentation at the symposium. Although the response to the track was relatively lower than previous years, we have received a total of 17 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 4 full papers and 3 poster papers were accepted for the track, bringing the acceptance rate to approximately 23% for regular full papers, and 41% overall. We take this opportunity to thank all the authors who submitted their contributions making this track a popular and scholarly venue for exchanging ideas in data mining, and those authors who have consistently supported this track through the years.

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

Full papers:

1. *"Link Prediction via Community Detection in Bipartite Multi-Layer Graphs"* by Maksim Koptelov, Albrecht Zimmermann, Bruno Crémilleux and Lina Soualmia.
2. *"Affirmative Action Policies for Top-k Candidates Selection"* by Michael Mathioudakis, Carlos Castillo, Giorgio Barnabo and Sergio Celis.
3. *"Understanding Emotions in SNS Images from Posters' Perspectives"* by Junho Song, Kyungsik Han, Sang-Wook Kim and Dongwon Lee.
4. *"Predicting Disease Genes for Complex Diseases using Random Watcher-Walker"* by Lorenzo Madeddu, Giovanni Stilo and Paola Velardi.

Poster papers:

1. *"Applying Binary Decision Diagram to extract concepts from Triadic formal contexts"* by Julio Neves, Kaio Ananias, Cristiane Nobre, Luis Zarate and Mark Song.
2. *"Constraining Deep Representations with a Noise Module for Fair Classification"* by Mattia Cerrato, Roberto Esposito and Laura Li Puma.
3. *"Characterization of Long-lived and Non-long lived Profiles Through Biclustering"* by Marta Dias Moreira Noronha, Marcos Wander Rodrigues, Caio Eduardo Ribeiro, Cristiane Nobre, Mark Alan Junho Song and Luis Enrique Zárate.

Finally, we would like to thank the members of the SAC 2020 DM 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
Roberto Bayardo, Google, Inc.
Livio Bioglio, University of Turin, Italy
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Bertrand Cuissart, University of Caen Normandy, France
Philippe Fournier-Viger, Harbin Institute of Technology, China

Sherri Harms, University of Nebraska Kearney, USA
Szymon Jaroszewicz, The Institute of Computer Science, Polish Academy of Sciences, Poland
Pier Luca Lanzi, Politecnico di Milano, Italy
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
Yulong Pei, Technical University Eindhoven, Netherlands
Ruggero G. Pensa, University of Torino, Italy
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

We have an exciting program for SAC Data Mining Track, and overall SAC symposium in 2020. We hope to welcome you in Brno, Czech Republic in March, 2020.

EDITORIAL MESSAGE
Special Track on Data Streams

Albert Bifet, LTCI, Telecom ParisTech, France
André Carvalho, ICMC, USP, Brazil
Carlos Ferreira, INESC Porto, Polytechnic Institute 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 13 submissions from 10 different countries: Germany, Brazil, Portugal, USA, UK, Nepal, France, New Zealand, Japan and China. After a rigorous review process, where each paper was reviewed by at least 3 PC members, only 3 papers were accepted as full papers, giving the track an acceptance rate of 23%, and 2 papers were accepted to be presented in a poster session. The papers cover topics such as dependency tracking on multiple data streams, feature selection, dynamic topic modelling, situation mining from data streams, fraud detection and recommender systems.

We would like to thank the Program Committee, who was comprised of several experts from the field: *Albert Bifet*, Telecom Paris, France; Ehsan Aminian, University of Science and Technology, Iran; Annalisa Appice, Università degli Studi di Bari, Italy; Jean Paul Barddal, Pontifical Catholic University of Paraná, Brazil; Brais Cancela, INESC TEC, Portugal; Douglas Cardoso, CEFET-RJ, Brazil; André Carvalho, University of São Paulo, Brazil; Ricardo Cerri, Federal University of São Carlos, Brazil; Raja Chiky, ISEP, France; Carlo Combi, University of Verona, Italy; Joel Costa, Federal University of São Carlos, Brazil; José del Campo-Ávila, Universidad de Málaga, Spain; Hadi Fanaee-T, University of Oslo, Norway; Elaine Faria, Federal University of Uberlândia, Brazil; Carlos Ferreira, Polytechnic Institute of Porto, Portugal; João Gama, University of Porto, Portugal; Ricard Gavalda, Universitat Politècnica de Catalunya, Spain; Joao Gomes, Institute for Infocomm Research, Singapore; Heitor Murilo Gomes, Pontificia Universidade Catolica do Parana, Brazil; Marwan Hassani, Eindhoven University of Technology, Netherlands; Geoff Holmes, University of Waikato, New Zealand; Mark Last, Ben Gurion University, Israel; Byung Suk Lee, University Vermont, US; Florent Masseglia, INRIA, France; Nuno Moniz, University of Porto, Portugal; João Moreira, University of Porto, Portugal; Bernhard Pfahringer, University of Waikato, New Zealand; Ricardo Sousa, INESC TEC, Portugal; Elaine Sousa, University of Sao Paulo, Brasil; Eduardo Spinosa, Federal University of Parana, Brazil; Shazia Tabassum, University of Porto, Portugal; Bruno Veloso, INESC TEC, Portugal; João Vinagre, INESC TEC, Portugal.

We wish also to thank all the authors, and the Program Chairs of SAC 2020 for making this a successful meeting point for researchers interested in data streams.

Messages from Track Chairs
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 21 submissions with the following geographical distribution: 9 papers were from Asia, 11 from Europe, and 1 from North Africa. 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. Three 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 related to memory architecture, automotivie applications, and embedded systems design.

Novel memory technologies, such as non-volatile memory (NVM) and 3D-stacked hybrid memory, are an enabling technology of new embedded applications. The paper “Early Eviction and Swapping for MLC STT-RAM-based LLC” presents an improved cache eviction policy for MLC STT-RAM last level cache with the consideration of read and write disturbance between cache lines. The paper “Thermal-aware Memory System Synthesis for MPSoCs with 3D-stacked

Hybrid Memories" introduces a novel placement strategy for memory components in 3D-stacked MPSoCs to optimize temperature and performance of heterogeneous memory components.

Automotive applications, such as self-driving automobiles, require the synergy of real-time processing, machine learning, and low-power computing. The paper "On the Reliability of Hardware Event Monitors in MPSoCs for Critical Domains" discusses the reliability of hardware monitor devices and presents a method to discover and manage the inaccuracy and discrepancy in the readings. The paper "CleanET: Enabling Timing Validation for Complex Automotive Systems" presents a method for validating timing behaviors of complex, task-overlapping scenarios in time-driven automotive applications. The paper "IntPred: Flexible, Fast, and Accurate Object Detection for Autonomous Driving Systems" presents an energy-efficient object detection method for energy-constrained, safety-critical automotive applications.

Results of core embedded systems design topics, including security, timeliness, and robustness, are still blooming. The paper "Security Based Design Space Exploration for CP" introduces a design framework that considers the overhead of security enforcement in addition to performance for cyber-physical systems. The paper "VIRA: A Virtualization Assisted Deterministic System-Level Simulations" presents a method that exploits virtualization techniques for deterministic, reproducible simulation of hardware events. The paper "Adaptive Partitioning of Real-Time Tasks on Multiple Processors" introduces a new task migration strategy aiming at reduced movement between processors and improved utilizations of multicore systems.

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.

Special Track on GeoInformation Analysis

(ACM SAC, GIA track)

***Eric Kergosien**, University of LILLE, France*

***Cyril de Runz**, University of Tours, France*

***Christian Sallaberry**, University of Pau & Pays de l'Adour, Pau, France*

***Gavin Mcardle,** University College Dublin, Belfield, Dublin, Ireland*

***Luis Otavio Alvares,** Universidade Federal de Santa Catarina, Trindade, Florianópolis, Brazil*

Editorial:

The production and use of geo-referenced digital resources is expanding rapidly. In order to exploit their contents, the documents are annotated, indexed and analysed 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). 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, etc. A number of engines or services dedicated to the search for geographical information have been proposed: they mainly cover spatial information, but also spatio-temporal and thematic information, for others.

The purpose of GIA 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 Language Processing (NLP), Data Mining (DM) and Information Extraction (IE). This track follows the GIA Track organized in 2019 in Limassol (Cyprus).

This GIA special track, organized during the 35th ACM/SIGAPP Symposium On Applied Computing (SAC 2020, Brno, Czech Republic), consists of four accepted papers (4 long papers selected from 15 papers). The addressed topics (e.g, Preparation of Geographical Data, Geographical knowledge Extraction, Geographical Data Analytics) underline the various and complex issues addressed by Geomatics and Information Systems (IS) communities. These papers are listed in the following.

Accepted papers:

Automatic Flood Detection in Sentinel-2 Images Using Deep Convolutional Neural Networks
Authors: Pallavi Jain, Bianca Phelan and Robert Ross

Exploring Frequency-based Approaches for Efficient Trajectory Classification

Authors: Francisco Vicenzi, Lucas May Petry, Camila Leite da Silva, Luis Alvares and Vania Bogorny

Learning Locality Maps from Noisy Geospatial Labels
Authors: Manjeet Dahiya, Devendra Samatia and Kabir Rustogi

Sampling strategies to create moving regions from real world observations
Authors: Rogerio Costa, Enrico Miranda, Paulo Dias and José Moreira

Accepted Posters:

Mining Association Rules in Asymmetric Data For Territorial Evolution Modeling
Authors: Asma Gharbi, Cyril de Runz, Herman Akdag and Sami Faiz

A Contextual Edit Distance for Semantic Trajectories
Authors: Clément Moreau, Thomas Devogele, Veronika Peralta and Laurent Etienne

Acknowledgments:

We would like to thank the following reviewers of the GIA special track:

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- Mathieu Roche
- Christian Sallaberry
- Simon Schneider
- Bianca Schoen-Phelan
- Alfred Stein
- Maguelonne Teisseire

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 widespread diffusion of distributed processing frameworks and machine learning techniques for big data management and analysis are pervading many tasks related to information representation and analysys, such as Web Search, Information Filtering and Recommendation, and Social Media analysis. A variety of systems is employed 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, recordings, etc.), from etherogenous sources (universities, governamental institutions, private companies, and individuals), and created with distinct frequency (news streams, social network posts, etc.). The main issues related to the development of systems that address the above tasks include information content representation, relevance modeling, information categorization, learning to rank, relevant information source selection, dynamic query results and stream summarization, users' intention and reputation modeling when searching for information and when creating information. These issues are strictly related with modeling the context in which the search is carried out by considering 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 19th edition in the context of SAC. Its main aim is allowing researchers and practitioners to present and discuss their proposals and experiences in the middle of the theory-practice spectrum of multisource Information Retrieval, Filtering and recommendation. This year the Track includes three full papers (with an acceptance rate of 25%), and two poster papers. Each paper was peer reviewed by five members of the Program Committee (listed in these proceedings) to whom we express our gratitude: their help has been invaluable for carrying out a high quality selection process.

The full papers cover different up to date research topics related to Information Retrieval by distinct machine learning methods: learning to rank, query performance prediction, IR models for neophytes.

The first paper entitled "*Iterative Learning to Rank from Explicit Relevance Feedback*" by Mateus Malvessi Pereira, Elham Etemad and Fernando Paulovic, considers the implicit or explicit users feedback in order to understand their intent and improve the quality of retrieved documents. They propose a model that combines explicit relevance feedback and learning to rank techniques to improve the quality of retrieved documents. Besides evaluating the proposed method in general information retrieval cases, they applied it to the special case of Community Question Answering (CQA) systems and the evaluation demonstrated that the proposal outperforms other existing learning to rank techniques on most of the datasets of the bechmark.

The paper entitled "*Forward and Backward Feature Selection for Query Performance Prediction*" by Sébastien Déjean, Radu Tudor Ionescu, Josiane Mothe and Md Zia Ullah, discusses how to automatically estimate the search effectiveness for any given query, without having relevance judgements. State-of-the-art methods employing machine learning are impossible to interpret because of their black-box nature. Nevertheless, an interpretation is useful

for understanding the predictive model. With this in mind the authors investigate a new framework for feature selection in which the trained model explains well the prediction. It is founded on a step-wise (forward and backward) model selection approach where different subsets of query features are used to fit different models from which the system selects the best one. They found that the proposal, besides being readable and understandable, is as good as the majority of complex models, and it is better than non-selective models.

The third paper entitled "*Evaluating the Usefulness of Citation Graph and Document Metadata in Scientific Document Recommendation for Neophytes*" by Bissan Audeh, Michel Beigbeder, Christine Largeron and Diana Ramírez faces the problem of improving the retrieval of documents for neophytes engaged in querying digital libraries. Neophytes do not necessarily use appropriate keywords to express their information needs and they are not necessarily qualified to evaluate correctly the relevance of documents. The paper assumes that the retrieval system should take into consideration features other than content-based relevance. To test this hypothesis, they use machine learning methods with content-based index scores and additional features based on the citation graph and document metadata extracted from external resources. The analysis concludes that the use of additional features improves the performance of the system for a neophyte user, since the system is capable of finding more documents suitable for neophytes within the retrieved results than when using content-based features alone.

The two poster papers are about geographic information retrieval and audio representation learning.
The first poster-paper entitled "*Retrieval of Visiting Paths through Relevant Resources and Services for Enabling Smart Communities*" by Gloria Bordogna, Luca Frigerio and Anna Rampini, focuses the problem of searching within a multisource collection of both open data, describing authoritative territorial resources, and user generated ADS, describing private services offered in a geographic area. The objective is to enable prioretized and personalized queries capable to generate and rank convenient paths to sequentially visit different resources and services deemed relevant according to the personal user preferences and the geographic context.

The second post-paper entitled "*Unsupervised Cross-Modal Audio Representation Learning from Unstructured Multilingual Text*" by Alexander Schindler, Sergiu Gordea and Peter Knees is about an approach to unsupervised audio representation learning. Based on a triplet neural network architecture, they harnesses semantically related cross-modal information to estimate audio track-relatedness. By applying Latent Semantic Indexing they embed corresponding textual information into a latent vector space from which they derive track relatedness for online triplet selection. This topic modelling facilitates fine-grained selection of similar and dissimilar audio-track pairs to learn the audio representation. They show that the proposal is invariant to the variety of annotation styles as well as to the different languages of the collection.

5th December 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 21 submissions this year. After a rigorous double-blind review process, 5 were accepted as full papers. The overall acceptance rate is at a highly competitive 23.8%. The accepted papers are listed in the following which cover a wide range of topics in the IoT area:

- "Sensmart: Sensor Data Market for the Internet of Things" by Ricardo Miranda, Miguel Pardal and António Grilo
- "Embedded Machine Learning-Based Data Reduction in Application-Specific Constrained IoT Networks" by Adarsh Pal Singh and Sachin Chaudhari
- "A Smart Speaker Performance Measurement Tool" by Hyunsu Mun, Hyungjin Lee, SooHyun Kim and Youngseok Lee
- "AutoIoT: a Framework based on User-driven MDE for Generating IoT Applications" by Thiago Gomes Nepomuceno da Silva, Tiago Carneiro Pessoa, Paulo Maia, Muhammad Adnan, Alexander Martin and Thalyson Gomes Nepomuceno da Silva
- "OVER: Overhauling Vulnerability Detection for IoT through an Adaptable and Automated Static Analysis Framework" by Vinay Sachidananda, Suhas Bhairav and Yuval Elovici

In addition, three submissions were accepted as poster papers:

- "SeCon-NG: Implementing a Lightweight Cryptographic Library based on ECDH and ECDSA for the Development of Secure and Privacy-Preserving Protocols in Contiki-NG" by Eugene Frimpong and Antonios Michalas
- "Empowering Personalized Feedback on Hot Water Usage: A Field Study with Shower Meters" by Sebastian A. Günther, Carlo Stingl, Vlad C. Coroamă, Samuel Schöb and Thorsten Staake
- "Towards a Heterogeneous IoT Privacy Architecture" by Sanonda Datta Gupta and Sepideh Ghanavati

The program committee (PC) of the track features 26 well-established researchers in the IoT area. In alphabetical order, the PC members are: Jinsung Cho (KyungHee University, South Korea), Zongming Fei (University of Kentucky, USA), Sepideh Ghanavati (University of Maine, 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), Shancang Li (University of the West England, UK), Juan Luo (Hunan University, China),

Davide Maiorca (University of Cagliari, Italy), Alessio Merlo (University of Genova, Italy), Radu Mihailescu (Malmo University, Sweden), 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), Shigeng Zhang (Central South University, China), Liqiang Zhang (University of Indiana, USA), Liang Zhao (Dalian University of Technology, China), 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, *L3S – Leibniz Universität Hannover, Germany*
Denis F. Wolf, *ICMC – University of São Paulo, Brazil*

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.

In this sixth edition, there were 23 papers submitted from Europe (10), South America (4), North America (2), South Asia (2), North Africa (2), Middle East (2), and Far East (1). After a rigorous blind peer review process by 65 PC members, 6 regular papers and 3 poster papers were accepted to be presented in the SAC 2020 IRMAS track. The accepted papers cover important topics of this track, both on intelligent robotics and MAS, namely multi-robot path planning, multi-robot coalition formation, cooperative transportation, robot trajectory generation, social robot navigation, distributed planning under uncertainty, multi-agent routing, and agent-oriented design of cyber-physical systems.

Acknowledgment

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

Abel Gawel - ETH Zurich, Switzerland
Alberto Castellini - University of Verona, Italy
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Daniele Nardi - Univ. di Roma La Sapienza, Italy
David Portugal - University of Coimbra, Portugal
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P.B. Sujit - Indraprastha Inst. Inform. Techn., India
Paolo Stegagno - Univ. of Rhode Island, RI, USA
Paulo Gonçalves - Polyt. Castelo Branco, Portugal
Pedro Miraldo - University of Lisbon, Portugal
Pooyan Fazli - Cleveland State Univ., OH, USA
Rafael Fierro - Univ. of New Mexico, NM, USA
Raúl Marín Prades - Universitat Jaume-I, Spain
Ricardo V. Martín - University of Malaga, Spain
Roberto Inoue - Fed. Univ. of São Carlos, Brazil
Rodrigo Calvo - St. University of Maringá, Brazil
Sándor Fekete - Tech. U. Braunschweig, Germany
Serge Stinckwich - Un. Pierre Marie Curie, France
Sérgio Monteiro - University of Minho, Portugal
Thomas Hellström - Umeå University, Sweden
Tomas Krajnik - Czech Tech. Univ., Czech Rep.
Xi Yu - University of Pennsylvania, PA, USA
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 2020 IRMAS track. Finally, we offer special thanks to the SAC 2020 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 senior researcher of the Institute of Systems and Robotics at the University of Coimbra, Portugal. His main research interests are multi-robot systems, cooperative perception, distributed control, autonomous robots, and ambient assisted living. He was one of the founders of the IRMAS track and was co-chair of all 6 editions.

Daniel Kudenko is a research group leader at L3S Research Center, Leibniz University Hannover, Germany. Before, he was a member of the Computer Science faculty at the University of York, UK. His research interests include reinforcement learning, multi-agent systems, user modeling, and artificial intelligence for games and interactive entertainment. He was co-chair of the last 4 editions of IRMAS track.

Denis F. Wolf is an associate professor at ICMC, University of Sao Paulo, Brazil, where he leads the Mobile Robotics Laboratory. He obtained his Ph.D. degree in Computer Science from the University of Southern California in 2006. Most of his current research focuses on perception, decision-making, and control of autonomous robotic vehicles for urban and agricultural applications.

EDITORIAL MESSAGE
Special Track on Knowledge and Language Processing

Mauro Dragoni *Fondazione Bruno Kessler, Trento, Italy*
Marco Rospocher *Università degli studi di Verona, Verona, Italy*

The ACM SAC 2020 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 second 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 33 regular submissions, and 2 SRC contributions. Each submission was reviewed by experienced Programme Committee members. The selection process for the track was very competitive, resulting in the acceptance of:

8 full papers (acceptance rate: 24%):

- Decoupled Word Embeddings using Latent Topics (Heesoo Park and Jongwuk Lee)
- Better Together - An Ensemble Learner for Combining the Results of Ready-made Entity Linking Systems (Renato Stoffalette Joao, Pavlos Fafalios and Stefan Dietze)
- Aspect Level Sentiment Classification with Unbiased Attention and Target Enhanced Representations (Liu Peng, Liu Tingwen, Shi Jinqiao, Wang Xuebin, Yin Zelin and Zhao Can)
- On Document Representations for Detection of Biased News Articles (André Ferreira Cruz, Gil Rocha and Henrique Lopes Cardoso)
- Using Word Embeddings for Ontology-Driven Aspect-Based Sentiment Analysis (Sophie de Kok and Flavius Frasincar)
- Diversity Regularized Autoencoders for Text Generation (Hyeseon Ko, Junhyuk Lee, Jinhong Kim, Jongwuk Lee and Hyunjung Shim)
- Semantic Similarity To Improve Question Understanding in a Virtual Patient (Fréjus A. A. Laleye, Antonia Blanié, Antoine Brouquet, Dan Benhamou and Gaël de Chalendar)
- Mining Micro-Influencers from Social Media Posts (Simone Leonardi, Diego Monti, Giuseppe Rizzo and Maurizio Morisio)

2 posters:

- *Adapting Deep Learning for Sentiment Classification of Code-Switched Informal Short Text* (Muhammad Haroon Shakeel and Asim Karim)
- *Personalizing Large-scale Text Classification by Modeling Individual Differences* (Jungho Lee, Byung-Ju Choi, Yeachan Kim, Kang-Min Kim, Woo-Jong Ryu and SangKeun Lee)

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
Alessandro Oltramari
Amal Zouaq
Annalina Caputo
Antske Fokkens
Cataldo Musto
Chiara Di Francescomarino
Cristina Bosco
Daniele P. Radicioni
Danilo Croce
Danilo Dessi
Davide Buscaldi
Diego Reforgiato Recupero
Fabian Hoppe (a.r.)
Flavius Frasincar
Francesco Corcoglioniti
Francesco Osborne
Giuseppe Rizzo
Harald Sack
Itziar Aldabe
Ivan Donadello
Leo Wanner
Loris Bozzato
Ludovico Boratto
Luigi Di Caro
Marieke van Erp
Matteo Palmonari
Mikel Larrañaga (a.r.)
Nicolas Turenne
Piek Vossen
Pierpaolo Basile
Ruben Alonso
Sara Tonelli
Simon Mille
Simone Leonardi (a.r.)
Simone Magnolini
Stefania Marrara
Tommaso Caselli
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 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
Special Track on Knowledge Representation and reasoning (KRR)

Stefano Bistarelli, *Università di Perugia, Italy*
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 success: a total of 20 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 24 experts of the filed. From the submissions received, 5 papers were accepted as full papers and 1 more paper as poster. Therefore, 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 authors of the paper "Formal Verification of Debates in Argumentation Theory" develops a methodology to verify debates formalised as abstract argumentation framework, by first presenting a translation from debates to transition systems. Such a verification allow us to verify whether a given debate is able to satisfy certain properties. The paper "On Satisfiability Problem in Modal Logic S5" aims at studying different aspect of the satisfiability problem in the modal logic S5; the authors first introduce a new resolution method and then propose simplification rules that can be applied during pre-processing and solving. The work "A Categorization of Simultaneous Localization and Mapping Knowledge for Mobile Robots" advances a categorization of the knowledge managed in Simultaneous Localization and Mapping (SLAM) problems, based on existing ontologies and SLAM principles. The authors also classify recent and popular ontologies according to proposed categories, and highlight the lessons to learn from existing solutions. In the paper titled "GrCluster: A score function to model hierarchy in knowledge graph embeddings", the author introduce a novel score function called GrCluster. GrCluster is a simple, intuitive and efficient scoring function that considers the hierarchy of entities of a knowledge graph with the aim to measure the distance between Low-dimensional embeddings. The paper "Substitute Selection for a Missing Tool Using Robot-Centric Conceptual Knowledge Of Objects" presents an approach to tool substitution where robot-centric knowledge is generated in an unsupervised manner about objects from multi-modal sensory data captured by a robot. Finally, the paper "Argumentation For All" proposes the use of a web-based system for the development of applications of argumentation; the goal is foster to the capability to develop decision policies based on argumentation, to people that have little or no knowledge of logic programming or of an argumentation framework.

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 2020 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 17 years, Mobile Computing and Applications Tracks had been running successfully. The track features research papers drawn from different application domains in mobile computing, with more papers oriented towards wireless communication this year. 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..

It is to our great honor to have invited well-established researchers to serve on the international program committee. Each paper is sent to at least three independent program committee members, under a blind review process. In the end, all papers received at least three review reports. Acceptance was based on the recommendations and written comments by the reviewers. We concur that the accepted papers are of high quality. We would like to especially thank the program committee members and reviewers for their dedicated efforts:

> *Ivor Addo* from University of Wisconsin at Oshkosh, USA; *Angelo Brayner* from Federal University of Ceara, Brazil; *Ying Cai* from Iowa State University, USA; *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; *Md Kamrul Hasan* from Marquette University, USA; *Charles Hu* from National Central University, Taiwan; *Niharika Jain* from Marquette University, USA; *Rasib Khan* from Northern Kentucky University, USA; *Dik Lee* from Hong Kong University of Science and Technology, Hong Kong; *Ken Lee* from Microsoft, USA; *Po-Ruey Lei* from ROC Naval Academy, Taiwan; *Stephane Maag* from Institut Telecom SudParis, France; *Rodolfo Resende* from Universidade Federal de Minas Gerais, Brazil; *Weidong Shi* from University of Houston, USA; *Seongwook Youn* from Korea National University of Transportation, Korea; *Arkady Zaslavsky* from Deakin University, Australia; *Baihua Zheng* from Singapore Management University, Singapore.

In this track, ten submissions were received and after a rigorous review process, three regular and one poster papers are accepted.

2. THE CONTRIBUTED PAPERS

The first paper in the track represents an international collaboration between Germany and Brazil, jointly authored by C. Rieger, D. Lucrédio, R.P.M. Fortes, H. Kuchen, F. Dias, and L. Duarte, entitled "*A Model-Driven Approach to Cross-Platform Development of Accessible Business Apps*". This paper proposes a model-driven approach to develop mobile apps taking into consideration of accessibility need. A prototype is demonstrated based on the authors' MD^2 model for the visually impaired. The second paper is entitled "*Prongle: Lightweight Communication over Unassociated Wi-Fi*", by O. Waltar and J. Kangasharju. A proxy dongle is adopted to provide light-weight WiFi services to mobile devices with message relaying via Bluetooth, based on privacy preserving opportunistic communication. A prototype with Android devices is built and message delivery time is measured. The last paper in the track is "*A game-theoretic approach for the multi-objective frequency assignment problem in mobile networks*" by F. Laidoui, F.B.S. Tayeb, M. Bessedik, and F.Z. Laidi. It aims at providing a multi-objective optimization solution for frequency assignment in mobile networks by applying game theory. The hyper-volume metric and Nash value are adopted in the evaluation, showing a good compromise between the two key objectives.

The poster paper by Hyunsu Mun and Youngseok Lee bears the title "*AppSpeedXray: A Mobile Application Performance Measurement Tool*". This paper proposes a consolidated metric, called the speed index, to measure the performance of mobile applications based on a collection of performance metrics in five categories, without accessing to the source code or decompiling the app.

3. 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 2019. 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 TOCS, IEEE TPDS, TKDE, TMC, TMM, TC, and other journals. His research interests are in mobile computing, internet computing, distributed systems, distributed databases, and affective computing.

Sheikh Iqbal Ahamed is currently a professor and Chair of the Department of Computer Science and director of Ubicomp Lab at Marquette University. He is a senior member of IEEE, ACM, and IEEE Computer Society. He completed his Ph.D. in Computer Science from Arizona State University. His research interests include mHealth, security and privacy in pervasive computing, affective computing, middleware for ubiquitous/pervasive computing. He has over $1M research grants in mHealth and mobile/pervasive computing and collaborative mHealth projects, including international projects in Bangladesh, Nepal, Taiwan, Japan, Vietnam and China, led teams to build various mHealth systems. He has published 120+ peer reviewed papers and received 12 best paper/posters awards. He has been serving as the Standing Committee Vice Chair of COMPSAC since 2015. He is the Guest Editor of Computer Communications Journal.

EDITORIAL MESSAGE
Special Track on Networking

Mário M. Freire, University of Beira Interior, Portugal
Marília Curado, University of Coimbra, Portugal
Ivan Ganchev, University of Limerick, Ireland / University of Plovdiv "Paisii Hilendarski", Bulgaria
Mohamed Mosbah, LaBRI, Bordeaux INP, France

On behalf of the Program Committee of the Track on Networking of the 35th Annual ACM/SIGAPP Symposium on Applied Computing (ACM SAC 2020), it is our great pleasure to welcome you to the ACM SAC 2020, held from March 30 to April 3, 2020, in Brno, Czech Republic. In recent years, significant advances in computer networks, applications, and services have been made throughout the world. This 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 different aspects of computer networking.

In response to the call for papers, a total of 20 submissions were received, from which five were carefully selected for oral presentation in a technical session and two for poster presentation. Each paper was peer reviewed, through a double-blind process, by at least three members of the Technical Program Committee or additional reviewers. The set of papers accepted for this track covers a variety of research topics, which are of current interest, such as resource allocation for edge computing, priority schemes for network slice isolation, services in a software-defined networking (SDN) adopting time-based moving target defense mechanisms, spark-based port and net scan detection, network intrusion detection system for the Internet of Things (IoT), behavioral analysis of virtualized network functions, and prevention and early detection of forest fires.

The first paper selected for oral presentation was contributed by Andrea Araldo, Alessandro Di Stefano and Antonella Di Stefano and its title is "Resource Allocation for Edge Computing with Multiple Tenant Configurations". In this contribution, the authors address the problem of resource allocation for edge computing in the scenario of a Network Operator that owns resources at the Edge and allocates these to different Service Providers. The authors propose MORA, a polynomial time strategy, which allows the Network Operator to maximize its utility function, with respect to inter-domain traffic savings, improved users' QoE or other metrics of interest, and they show numerically that MORA performs close to the optimum. The numerical evaluation is performed on publicly available traces from Google and Alibaba clusters and in synthetic scenarios.

Network slicing allows the creation of dedicated virtual networks over a common network infrastructure, tailored to satisfy specific needs of the variety of applications and services envisaged in 5G. The second selected paper for oral presentation, entitled "Adapting Priority Schemes to Achieve Network Slice Isolation", focuses on this issue and was contributed by Afonso Oliveira and Teresa Vazão. The authors propose a slicing solution that allows a controlled preemption of low latency traffic while looking at the flexibility of traffic that requires a high throughput to establish a threshold at the ending of the preemption.

The concept of moving target defense has been proposed to increase uncertainty for attackers by continuously and dynamically changing attack surface of the systems. However, the tradeoff between security and performance is a critical issue in this kind of approaches. The paper by Júlio Mendonça *et al.*, entitled

"Performability Analysis of Services in a Software-Defined Networking Adopting Time-Based Moving Target Defense Mechanisms", investigates this tradeoff. The authors propose a model-based approach to evaluate performability aspects of services hosted in SDN environments using a time-based moving target defense mechanism.

The paper entitled "Spark-Based Port and Net Scan Detection" by Antonia Affinito *et al*. focuses on traditional approaches for port and net scan detection, previously abandoned due to their limited speed. The authors use Big Data Analytics to speed them up in order to cope with current high-speed networks. A threshold-based algorithm on Apache Spark is experimentally analysed in terms of detection performance and execution time and the results are compared with the ones obtained using real traffic traces from MAWI archive and MAWILab anomaly detectors.

The paper entitled "Enhanced Network Intrusion Detection System Protocol for Internet of Things" by Bacem Mbarek, Mouzhi Ge and Tomas Pitner explores efficient network intrusion detection systems (NIDS) in IoT networks. The authors propose a new NIDS protocol with an efficient replica detection algorithm to increase the utility and performance of existing NIDS, where a number of replica test nodes are intentionally inserted into the network to test the reliability and response of witness nodes. They evaluate and compate the proposed protocol with the state-of-the-art SVELTE protocol. The simulation study shows the proposed protocol can significantly increase the detection probability and reduce the energy consumption for detecting clone attacks in IoT networks.

Regarding the papers selected for poster presentation, the first one was written by Tommaso Cucinotta *et al*. and its title is "SOM-based Behavioral Analysis for Virtualized Network Functions". The authors propose a technique based on Self-Organizing Maps for classification of resource consumption behaviors of virtual machines in data centers with Network Function Virtualization (NFV). Initial preliminary results are reported about the use of this technique across the NFV data centers of the Vodafone network operator.

The second paper selected for poster presentation was written by Peter Peinl, Rossitza Goleva and Jugoslav Ackoski and it is entitled "Advanced System for the Prevention and Early Detection of Forest Fires (ASPires)". The authors outline the design and implementation of ASPires, an open advanced system for the prevention and early detection of forest fires. The authors put in evidence its potential to reduce reaction times and subsequently the damage and costs by the use of novel sensor and mobile communication technologies.

We sincerely thank all the authors who submitted their valuable papers to this track. We are grateful to the members of the Technical Program Committee and additional reviewers. Without their support, the organization of such high-quality track sessions would not have been possible. We are also indebted to many individuals and organizations that made this track happen, namely the ACM Special Interest Group on Applied Computing (SIGAPP). Last but not least, we are grateful to the members of the ACM SAC 2020 Organizing Committee for their help in all aspects of the organization of this track.

We hope that you will enjoy the 35th Annual ACM/SIGAPP Symposium on Applied Computing (ACM SAC 2020) and, in particular, the Track on Networking, in Brno, Czech Republic, and that you will find it a useful forum for the exchange of ideas, results, and recent findings.

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

Eight papers were originally submitted from eight different countries: Brazil, France, Italy, Japan, the Netherlands, Portugal, Spain, and the USA. Among those, three regular papers were selected for an acceptance rate of 38% as well as three posters. The Track Program Committee had 10 members: Walter Cazzola (University of Milan, Italy), Igor Dejanović (University of Novi Sad, Serbia), Pedro Henriques (University of Minho, Portugal), Zoltán Horváth (Eötvös Loránd University, Hungary), Geylani Kardas (Ege University, Turkey), Vineeth Paleri, (NIT Calicut, India), Nikolaos Papaspyrou (National Technical University of Athens, Greece), Adam Porter (University of Maryland, USA), Jaroslav Poruban (Technical University of Košice, Slovakia) and Boštjan Slivnik (University of Ljubljana, Slovenia).

3. The contributed papers

Full papers:

1. *Leonardo Filipe Rigon, Paulo Torrens, and Cristiano Vasconcellos. Inferring Types and Effects via Static Single Assignment.* A functional programming language based upon static single assignment form (i.e., with control flow and local mutability) is presented along with a prototype implementation and a type and effect inference algorithm.

2. *Vlad Serbanescu and Frank de Boer. On the Nature of Cooperative Scheduling in Active Objects.* This paper shows how the cooperative scheduling of the execution of active objects interacting via asynchronous method invocations can be reduced to a mode of execution whereby methods run to completion.

3. *Tadeus Prastowo, Luigi Palopoli, Luca Abeni, and Giuseppe Lipari. Analyses of a Model-Based Real-Time Language Embedded in C++.* The time complexity of Tice, a real-time language that is embedded in C++, is analyzed and validated. Engineering techniques to improve the language implementation are also presented.

Posters:

1. *Eduardo Mosqueira-Rey and David Alonso-Ríos. Usability Heuristics for Domain-Specific Languages (DSLs).* A set of usability heuristics for DSLs, which are based on those used for conventional Application Programming Interfaces (APIs), is presented along with a case study to illustrate how these are used in practice.

2. *Pierre Leca, Wijnand Suijlen, Ludovic Henrio, and Françoise Baude. Distributed Futures for Efficient Data Transfer Between Parallel Processes.* Distributed futures extend conventional futures for task parallel models to data parallel models. This facilitates programming a composition, in a task-parallel way, of several massively data-parallel tasks.

3. *José Nuno Macedo and João Saraiva. Expressing Disambiguation Filters as Combinators.* Disambiguation filters expressed as combinators are presented as an alternative to conventional rules to resolve ambiguity in parsers. This allows disambiguation rules to be changed without modifying the parser.

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.

RE@ACM-SAC 2020: A Summary of Recent Research

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ABSTRACT

This editorial gives details of the 13th edition of RE@ACM-SAC, including an update of a previous analysis for the first nine editions of the track.

1 INTRODUCTION

Requirements Engineering (RE) is increasingly recognized as a critically important activity in any systems engineering process. The arising of many complex software applications in many multidisciplinary domains, the speed with which they need to be developed, and the degree to which they are expected to change, all play a role in determining how the systems development process should be conducted. Independently of the nature of the software, producing proper requirements is fundamental for the development of high-quality complex software. Requirements is the precondition to deliver quality products designed to meet the complexities of our advanced information society. However, there are several inherent difficulties in RE, which leads to open problems dealing with both processes and products. Requirements must be measurable, testable, related to business goals, needs or opportunities, and defined to a level of detail to interact with system design. The demand for better, faster, and more usable software systems will continue, and RE will continue to evolve in order to deal with different development scenarios.

The 13th Edition of the Requirements Engineering Track is part of the 35th ACM Symposium on Applied Computing (ACM SAC). The ACM SAC has been a primary gathering forum for applied computer scientists, computer engineers, software engineers, and application developers from around the world. The objective of this track is to explore advances in RE to cope with the increasing demand for better, faster, and more usable software systems in heterogeneous and multidisciplinary environments.

2 HISTORY

A Retrospective Analysis of SAC Requirements Engineering Track[1] offers a bibliography analysis of the first 9 editions of the RE@ACM-SAC. It analyzes 7 different issues (origin of contributions, topics, types of contributions, requirements process categories, most citated works, source of citations, and trends) and produces quantitative results based on their bibliographic search. We update the data considering the 2017, 2018, and 2019 editions. Data gathering and analysis was done by hand, consulting the respective Proceedings. We selected three issues to report new data: *origin of contributions*, *topics*, and *cited works*.

Origin of contributions. Vilela et. al. found 24 countries and 10 most frequent contributors: Brazil (28 papers), Portugal (13), USA (9), UK (7), Italy (7), Spain (6), Germany (4), Japan (4), and Australia (3). We found that 14 countries published papers in the period 2017-2019. Of these, the countries with at least 2 papers are: Brazil (4), US (3), Canada (3), and Uk (2).

Topics. Using the 15 most common topics in Vilela et. al., we checked if they also appear in the last 3 editions. Table 1 shows, for each topic, the number of regular papers in the 9 first editions and the last 3. Note these topics are keywords selected by the authors (as in Vilela et. al.), not a taxonomy.

Table 1: Topics addressed in the last 12 years

Topics	Papers in the first 9 editions	Papers in the last 3 editions
GORE	24	4
Design software architecture	17	3
SPL/Feature Models/Variability	12	0
Behavioral Modes	11	0
Model-Driven Development	11	0
Use Cases	11	0
Non-Functional Requirements	10	1
Traceability	9	1
V&V	9	2
Requirements Analysis	9	0
Aspects	8	0
UML	8	0
Business Process	8	0
Natural Language	7	0
Tools	7	0

Table 2 lists the topics appearing at least twice and shows 5 new topics. When the keywords were not available, we extracted them (with our bias) from the abstract.

Citations. The papers of the 9 prior editions summed 577 citations in May 2016. As of December 2019, we found, using

[1] Jessyka Vilela, Enyo Goncalves, Ana Carla Holanda, Jaelson Castro, and Bruno Figueiredo. 2016. A retrospective analysis of SAC requirements: engineering track. SIGAPP Appl. Comput. Rev. 16, 2 (August 2016), 26-41. DOI: http://dx.doi.org/10.1145/2993231.2993234.

Google Scholar, that the papers of the last 3 editions were cited 48 times (35 in 2017, 11 in 2018, and 2 in 2019).

Table 2: Topics appearing more than twice in 2017-2020

Topics	Papers in the last 3 editions	In [1]
Requirements engineering	4	No
Self-adaptative/self-adaptation	3	No
Elicitation	2	Yes
Security	2	Yes
Requirements specification	2	No
Decision making	2	No

3 THE RE@ACM-SAC 2020 PROCESS

As track-chairs we set several processes for preparing the 2020 edition. One of the first was to determine the topics we would list in the Call for Papers. These topics, in Table 3, directed the type of contribution we were expecting to achieve the track goal.

Table 3: Topics proposed to the authors

Topics	
Requirements elicitation	Requirements for Scientific Domains
Requirements analysis	Quality of requirements
Requirement specification languages	Industry case studies and experiences with Requirements Engineering
Requirements methods, processes, and tools	Industry case studies and experiences with Requirements Engineering
Requirements management, traceability, viewpoints	Social, cultural, and cognitive factors in requirement engineering
Modelling of requirements, goals, and domains	Requirements engineering interaction with software architecture
Non-functional requirements	Requirement and Simulation
Aspect-oriented requirement engineering	Agent-oriented requirement engineering
Model-driven requirements engineering	Evolution of requirements over time, product families and variability
Requirement engineering education	

The RE@ACM-SAC'20 Program Committee was composed with 36 experts from different areas of RE, from 15 (fifteen) Universities of 17 (seventeen) countries:

- Andreas Vogelsang (TU Berlin, Germany)
- Camille Salinesi (Université Paris1 Panthéon-Sorbonne, France)
- Carla Silva (UFPE, Brazil)
- Daniel Berry (University of Waterloo, Canada)
- Daniel Mendez, (TUM, Germany)
- Didar Zowghi (University of Technology Sydney, Australia)
- Emilio Insfran (Universitat Politècnica de Valencia, Spain)
- Eric Knauss (Chalmers/Gothenburg University, Sweden)
- Fabiano Dalpiaz (Utrecht University, Netherlands)
- Graciela Hadad (Universidad Nacional del Oeste, Argentina)
- Guenther Ruhe (University Calgary, Canada)
- Guttorm Sindre (IDI/NTNU, Norway)
- Irit Hadar (University of Haifa, Israel)
- Isabel Brito (IPBeja, Portugal)
- Jaelson Castro (UFPE, Brazil)
- Jennifer Horkoff (Chalmers&University of Gothenburg, Sweden)
- João Araujo (Universidade NOVA de Lisboa, Portugal)
- João Pimentel (UFRPE, Brazil)
- John Mylopoulos (University of Ottawa, Canada)
- Jose Luis de la Vara (University of Castilla-La Mancha, Spain)
- Jorge Barreiros (Coimbra Polytechnic, Portugal)
- Lawrence Chung (University of Texas, Dallas)
- Lidia López (Universitat Politècnica de Catalunya, Spain)
- Luis Marcio Cysneiros (York University, Canada)
- Marcos Kalinowski (PUC-Rio, Brazil)
- Maya Daneva (University of Twente, Netherlands)
- Nan Niu (University of Cincinnati, USA)
- Nelly Bencomo (Aston University, UK)
- Nelly Condori-Fernandez (UDC, Spain) (VUA, The Netherlands)
- Norbert Seyff (FHNW, Switzerland)
- Oscar Pastor (Universitat Politecnica de Valencia, Spain)
- Patrick Mader (Technische Universitat Ilmenau, Germany)
- Renata Guizzardi (Federal University of Espírito Santo, Brazil)
- Seok-Won Lee (Ajou University, Republic of Korea)
- Sepideh Ghanavati (University of Maine, USA)
- Travis Breaux (Carnegie Mellon University, USA)

The review process initiated with a bidding process from the PC members. Each paper had, at least, four reviewers. Based on conflicting scores, discussions among reviewers were requested by the Track chairs. Conflicting scores and final scores were calculated by the Start system. Two papers followed a shepherding process controlled by the chairs. The chairs opted for staying out of the discussions, so all decisions were taken by the reviewers. As there was no physical PC meeting, no paper was revised again, keeping the original reviews and the discussion messages, which in most cases did not change the result. The reviews and discussions were conducted within the Start system.

The 2020 edition's co-chairs were Maria Lencastre, Ana Moreira and Julio Cesar Sampaio do Prado Leite.

4 THE PROGRAM

The RE Track of ACM-SAC'20 received 27 submissions from several countries in the Americas, Asia and Europe. The Program Committee reviewed all submissions and selected 7 regular papers and 3 posters. Below we provide a summary of each paper.

4.1 The Papers

Managing Sessions of Creative Requirements Elicitation and Assessment. R. Pinto, L.S. Silva and R. Valentim propose an information system that uses a combinatorial creativity technique to manage resources and assist in the requirements elicitation and evaluation. To assess the users' experience and the tool's efficiency in supporting the gathering of innovative requirements, the authors conducted 6 case studies with 47 people, aiming at evaluating the requirements engineers' experience with the tool and whether the tool was useful to raise creative requirements.

A Process to Support the Creation of iStar Extensions. E. Gonçalves, J. Araujo and J. Castro offer a systematic reference process for iStar extensions. By following this process, one avoids typical problems in current iStar extensions (e.g. ill-defined constructs, inconsistencies between abstract and concrete syntaxes). They offer a set of tasks to check the need for the extension, another set to create an extension, a catalogue of iStar extensions, a checklist to verify completeness, consistency and conflicts, and empirical means to evaluate the extension.

Towards a Library of Usability Requirements. A. Rodrigues da Silva and C. Sequeira propose a reusable library of usability requirements. They review the existing literature on usability requirements, and identify concerns related to the classification and specification of usability requirements. They argue the benefits of using RSL (Requirements Specification Language). The proposed approach has been applied and evaluated in its family of software products, and the perceived value was assessed by 12 participants through a questionnaire.

Lessons Learned about Oral-auditory and Visual-spatial Communication in Requirements Engineering with Deaf Stakeholders. A.C. Freitas Silva, C.L. Rodrigues, N. Chaveiro, R. Rodrigues de O. Garcia, S.B. Reis Duarte, M.A.R. Araújo, V.B. dos Santos, K.R.G. da Silva, P. M. S. Rodrigues, L.M. de Oliveira and C.C.S. Sousa describe how to elicit requirements from deaf stakeholders and report on the lessons learned. They observe that most deaf in Brazil use the Brazilian Sign Language (which is different from the sign languages in other countries), that not all deaf use sign language, that those who sign have difficulty working with written Portuguese, and that 40% of the Brazilian deaf population do not sign, using other means of language understanding including lip reading.

Incorporating the Voice of the Customer into Mass-Market Software Product Management. D. Naous, A. Giessmann and C. Legner explore a market research strategy (conjoint analysis) to analyze a sample of representative users to gain insights on preferences and utility. Conjoint analysis measures the joint effects of a set of independent variables on the ordering of a dependent variable. The analysis is based on responses to a questionnaire listing attributes and attributes level to produce a preference structure. A method for merging advanced conjoint analysis is proposed and is evaluated for the domain of secure cloud storage services.

Goal-based configuration analysis for networks of collaborative cyber-physical systems. J. Brings, M. Daun, T. Weyer and K. Pohl propose a strategy to automate the analysis of goal fulfillment of a configuration (specification) of networks of resources. Given a configuration, it is possible to check which requirements are met or not. The strategy relies on a mapping (traces) among the two representations (goals and configurations). An evaluation was performed for the network of resources (robots) aiming at transporting goods from one or more starting points to one or more end-points.

Towards the Improvement of Natural Language Requirements Descriptions: The C&L Tool. E. Sarmiento-Calisaya, E.H. Cárdenas, V. Cornejo-Aparicio and G.S. Alzamorao describe a tool to improve the quality of scenario/use case-based descriptions. The tool combines network analysis and text analysis to detect problems in the descriptions, as well as suggesting possible fixes. Network analysis relies on Petri Nets to find behavioral problems among scenarios. Test analysis is based on the representation grammar and uses the Stanford Core NLP.

4.2 The Posters

Request for Comments: Conversation Patterns in Issue Tracking Systems of Open-Source Projects. M. Rath and P. Mäder perform an empirical study on issue tracking systems to identify topics and patterns occurring in threads of comments. They analyze about 270,000 comments from 12 open-source projects. They defined three patterns of conversation (monolog, feedback, and collaboration), concluding that most conversations are collaborations about the status and the resolution of an issue and activities related to the version control.

Towards a Non-Functional Requirements Discovery Approach for Persuasive Systems. N. Condori Fernandez, J. Araujo, P. Lago and A. Catala explore UX assessment of behaviour change support systems, discussing the results of an empirical study addressing NFRs of persuasive technology solutions. They define the concept of user experience (UX) as "negative" UX, offering the theoretical ground to create a research design for assessing the negative UX with users of 2 applications.

Defining Agile Requirements Change Management: A Systematic Mapping Study. D. Albuquerque, M. Perkusich, A. Costa, F. Ramos, H. Almeida, E. Dilorenzo, E. Guimarães, E. Dantas and F. Chagas selected 21 primary studies to analyze the key steps of the agile requirements change management process and corresponding agile practices. They identified 3 steps and 11 distinct agile practices, also discussing some key features, challenges, and research gaps in the area.

5 CONCLUSION

For the 2020 edition we update the bibliography analysis of RE@ACM-SAC using the same process as in Section 2. So for topics (keywords) we now have: GORE with two more mentions (totaling 31), design software architecture with one more mention (21), SPL/Feature Models/Variability with three more mentions (15), Use Cases with one more mention (12), Requirements Analysis with one more mention (10), Tools with one more mention (8), requirements engineering with three more mentions (7), elicitation with three more mentions (5), requirements specification with one more mention (3). The topics mentioned in more than one paper are GORE (2 mentions), SPL/Feature Models/Variability (3), requirements engineering (3), elicitation (3). The new keywords are prioritization, massmarket systems, market research, user preferences, conjoint analysis, cardinality-based feature models, cyber-physical systems, sign language, deaf, stakeholder, scenario, quality, automation, combinatorial creativity, process, extension, modelling language or RSL, istar, requirements reuse. The countries of the papers are Switzerland, Germany (2), Peru, Brazil (2), Portugal (2).

ACKNOWLEDGMENTS

We would like to thank the authors for submitting their work to this track, and the PC members for reviewing and discussing all the papers. This work was partially supported by the NOVALINCS UID/CEC/04516/2019 and CNPq (Leite).

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

***Markus Zanker**, Free University of Bozen-Bolzano, Italy*
***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) 2020 provides a dedicated forum to researchers in the area of reommender 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, 2018 and 2019 previously. Thus, it is already the 6th 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 23 valid submissions and based on a rigorous review process each paper received at least three reviews. Finally, 4 long papers and 2 short papers were selected for the track, bringing the acceptance rate down to 17% for long papers. Accepted long submissions are presented orally, while short papers will be presented as posters in the ACM SAC 2020.

Our track was supported by 27 expert program committee members and who worked hard to provide valuable reviews for the submissions to our track:

- Christine Bauer, Johannes Kepler University Linz, Austria
- Vito Bellini, Politecnico di Bari, Italy
- Alejandro Bellogin, Universidad Autónoma de Madrid, Spain
- Ludovico Boratto, Eurecat, Barcelona, Spain
- Derek Bridge, Insight Centre for Data Analytics, Ireland
- Ivan Cantador, Universidad Autónoma de Madrid, Spain
- Ludovik Coba, Free University of Bozen-Bolzano, Italy
- Marco DeGemmis, University of Bari, Italy
- Mehdi Elahi, Free University of Bozen-Bolzano, Italy
- Jonathan Gemmell, DePaul University, USA
- Dietmar Jannach, AAU Klagenfurt, Austria
- Michael Jugovac, TU Dortmund, Germany
- Peter Knees, TU Wien, Austria
- Bart Knijnenburg, Clemson University, USA
- 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
- Laurens Rook, TU Delft, Netherlands
- Shaghayegh Sahebi, University at Albany, SUNY, USA
- Gabriele Sottocornola, Free University of Bozen-Bolzano, Italy
- Fabio Stella, University of Milan-Bicocca, Italy
- Zhu Sun, Nanyang Technological University, Singapore
- Marko Tkalcic, University of Primorska in Koper, Slovenia
- Wolfgang Wörndl, TU Munich, Germany
- 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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Yong Zheng, Illinois Institute of Technology, USA; yong.zheng@iit.edu

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

***Matteo Camilli**, Faculty of Computer Science, Free University of Bozen-Bolzano, Italy*

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

Introduction

The 8th Edition of the track on *Software Architecture: Theory, Technology, and Applications* (SA-TTA 2020) will be held in Brno (Czech Republic) as part of the 35th 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 a total of 15 submissions each one of them carefully reviewed by the 3 program committee members. According to the acceptance rate of 25%, the final discussion between program committee members and track co-chairs led to accept 4 contributions as full research papers, 2 contributions as posters papers, and 1 contribution as Student Research Competition (SRC) abstract.

Description of accepted papers

There were interdisciplinary research contributions covering a variety of topics related to: architectural styles for Internet of Things and Cloud of Things platforms, trustability and security concerns in Blockchain based choreographies, model-based development of microservice architectures, and domain engineering.

List of accepted full papers

1. Engineering Trustable Choreography-based Systems using Blockchain. Flavio Corradini, Alessandro Marcelletti, Andrea Morichetta, Andrea Polini, Barbara Re, Francesco Tiezzi
2. Detecting Architectural Integrity Violation Patterns Using Machine Learning. Alla Zakurdaeva, Michael Weiss
3. An Architectural Style for Internet of Things Systems. Lidiane Santos, Eduardo Silva, Thais Batista, Everton Cavalcante, Jair Leite, Flavio Oquendo

4. An Overview of Reference Architectures for Cloud of Things. Diógenes Dias, Flávia Delicato, Paulo Pires, Atslands Rego, Elisa Yumi Nakagawa

List of accepted poster papers

1. Model-driven Development of Microservice Architecture: An Experiment on the Quality in Use of a UML- and a DSL-based Approach. Jonas Sorgalla, Florian Rademacher, Sabine Sachweh, Albert Zündorf
2. Approaches for Describing Reference Architectures: Results of a Systematic Mapping. Pedro Henrique Valle, Lina Garcés, Silverio Martínez-Fernández, Elisa Yumi Nakagawa

List of accepted SRC abstracts

1. A Toolchain for Model-Based Development of a Robot Application. Mickaël Trezzy

Acknowledgments

We would like to thank all authors who contributed to the success of this track by submitting high quality research papers. We would like to extend the gratitude to all the program committee members and all the external reviewers for their evaluations and insights provided to authors.

Program committee members:

- Yamine Ait-Ameur IRIT/ENSEEIHT, France
- Paolo Arcaini, National Institute of Informatics, Japan
- Marco Autili, Università dell'Aquila, Italy
- Marcello M. Bersani, Politecnico di Milano, Italy
- Georg Buchgeher, SCCH GmbH Hagenberg, Austria
- Radu Calinescu, University of York (UK)
- Guglielmo De Angelis, ISTI-CNR, Italy
- Chan-gun Lee, Chung-Ang University, Korea
- Jihyun Lee Chonbuk, National University, South Korea
- Claudio Menghi, University of Luxembourg
- José Javier Merseguer, University of Zaragoza, Spain
- Marina Mongiello, Politecnico di Bari, Italy
- Henry Muccini, University of L'Aquila, Italy
- Elisa Yumi Nakagawa, University of São Paulo, Brazil
- Hongyu Pei-Breivold, ABB Corporate Research, Västerås, Sweden
- Diego Perez Palacin, Linnaeus University, Sweden
- Alexander Raschke, Universität Ulm, Germany
- Elvinia Riccobene, University of Milan, Italy
- Antonino Sabetta, SAP Research, France
- Lionel Seinturier University of Lille, France
- Marjan Sirjani, Malardalen University, Sweden
- Maria Spichkova, RMIT University Melbourne, Australia
- Damian A. Tamburri, TU/e JADS, Netherlands
- Catia Trubiani, Gran Sasso Science Institute (GSSI), Italy
- Xiwei Xu SSRG, NICTA, Sydney, Australia

EDITORIAL MESSAGE
Special Track on Software Engineering

Byungjeong Lee, *University of Seoul, Korea*
Eunjee Song, *Baylor University, USA*
Tao Zhang, *Macau University of Science and Technology, China*

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 23 different countries. All submitted papers underwent the double-blind review process and 15 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 26.3%. In addition to the accepted full papers, 5 papers that received relatively higher enough review scores were accepted as short papers for the Poster Program.

This year's SE Track is divided into four sessions: related presentations in *Software Architecture and Metamodeling, Project Management, Software Evolution 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 2020 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 2020 symposium's main organizers, especially Program Chairs, Dongwan Shin and Alessio Bechini, for their continuous help and advice and Publication Chair, Hossain Shahriar, and Poster Chairs, Alessio Bechini and Miroslav Bures, 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
2020 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 nineteenth 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:

Aslan Askarov (Aarhus University, Denmark)
Tom Chothia (University of Birmingham, UK)
Jannik Dreier (Université de Lorraine, France)
Paul Duplys (Robert Bosch GmbH, Germany)
Barbara Fila (INSA Rennes, IRISA, France)
Simone Fischer-Hübner (Karlstad University, Sweden)
Christian Gehrmann (Lund University, SE)
Christian Hammer (Potsdam University, DE)
Lucca Hirschi (Inria & LORIA, France)
Martin Johns (SAP Research, DE)
Erisa Karafili (Imperial College, UK)
Sokratis K Katsikas (Norwegian University of Science & Technology, NO)
Robert Künneman (CISPA Saarland University, DE)
Ilaria Matteucci (CNR, Italy)
Chris Novakovic (University of Birmingham, UK)
David Nowak (CNRS & Lille 1 University, FR)
Elizabeth Quaglia (Royal Holloway, UK)
Alejandro Russo (Chalmers, Sweden)
René Rydhof Hansen (Aalborg University, Denmark)
Sebastian Schinzel (Muenster University of Applied Sciences, DE)
Helen Treharne (University of Surrey, UK)
Melanie Volkamer (KIT, Germany)
Ruoyu Wang (Arizona State University, US)

This year we received 36 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. 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:

- Olivier and Han propose a new design of behavior-based malware signature, which are resistant against behavioral transformation and provide interpretable information about the decision of classification tasks.
- Kock et al. work concerns with testing web applications against race conditions that can have dramatic security implications. The underlying idea consists in combining race condition detection with dynamic testing, the former generating race condition candidates and the latter minimizing the number of false positives. The evaluation shows a reduction of candidates and some new race conditions with security implications.

- Xu et al. present novel attacks to evade Machine Learning-based classifiers that consider the whole call graph of an app. The authors craft adversarial apps based on two approaches and evaluate these approaches on a set of malware apps. The white-box approach achieves more than 70% evasion, where they know the exact configuration of the Machine Learning model.
- Bortolameotti et al. introduces HeadPrint, a tool that detects malicious applications in network traffic from header sequences. The authors evaluate HeadPrint using several databases of benign and malicious network traffic and compare HeadPrint's performance with DECANTeR. The results show that HeadPrint performs better at detecting malicious activity with fewer false alerts.
- Fuchs et al. analyse the security requirements for secure provisioning, storage and usage of credentials in an electric vehicle (EV), and proposes a security architecture for EV's charging and billing services, guaranteeing these requirements. The proposed solution is compliant with ISO 15118 and backward compatible for components that do not support the proposed architecture. They advance an implementation and evaluation of a proof of concept.
- Loch et al. address the problem of improving performance of taint analysis for Java programs written using the Java EE API. For this purpose, they present a tool called Juturna which performs taint analysis of string values in the program. Unlike prior taint analysis tools, Juturna utilizes program slicing to identify parts of the program where taint analysis is actually needed, and hence reduces performance overhead of taint tracking during execution of the program.
- Safarzadeh et al. present HAL-RD, a technique for synthesizing information contained within logs from disparate sources into a single, clear timeline describing an attack against a network. Their technique enables one to correlate entries across logs that would otherwise appear unrelated. The authors demonstrate the feasibility of HAL-RD using a running network intrusion example, and evaluate it using a further 11 similar attacks. Their technique is able to cross-correlate log entries with a high degree of precision, recall and accuracy.
- Abdelmawgood et al. present a method of protecting the kernel of a Virtual Machine. Attacks against the kernel are notoriously hard, however, the method presented by the authors works by marking parts of the kernel as read only, and building the machinery needed for a hypervisor to enforce this. This makes attacks based on malware chaining certain parts of the kernel code impossible.
- Demetrio et al. advance WAF-A-MoLE, a tool that defeats the ability of web application firewalls (WAFs) to detect SQL injection attacks. Leveraging the fact that semantically-equivalent SQL statements are often quite different syntactically, the authors propose a set of mutation operators that progressively transform a common malicious SQL injection string into an equally-malicious string that is undetected by state-of-the-art WAFs.
- McDonald et al. propose an approach for polymorphic circuit replacement based on random boolean logic expansion. The work addresses IP theft, which is a serious problem in the industrial context. The underlying idea is to derive an efficient method of expanding circuits to a given target size in order to make reverse engineering more difficult. This is done by converting it to a Boolean formula and applying a set of 28 expansion rules until a target size or a fixed number of expansion steps was reached.

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 Software-intensive Systems-of-Systems (SiSoS)

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

The increasing 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). Progressively SoS has been designed as Software-intensive SoS (SiSoS) and has been applied to different domains, e.g. environmental monitoring, emergency coordination, global traffic control, smart grids and smart cities. In particular, ubiquitous platforms such as the Internet of Things and nascent paradigms such as Cyber-Physical SoSs are accelerating the deployment of SiSoS. This conference track fostered original submissions ranging from SiSoS foundations to applications, from theory to practice.

Statistics

The Track Program Committee selected 2 full papers out of 5 submissions, giving an acceptance rate of 40%. These papers were selected based on originality, quality, soundness, and relevance to this conference track. Each submission was reviewed by four members of the Track Program Committee.

Topics

- SiSoS Mission: Specification & analysis; Formal contracts/contract-based approaches; Goal/task-orientation.
- SiSoS Modeling: Model-driven engineering; Model-based approaches; Formal modeling foundations.
- SiSoS Design: Architectural and detailed design; Design evaluation; Correction by design; Design for evolution; Design for 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 & technologies for SoS engineering; Service-orientation; Component and middleware frameworks.
- SiSoS Security and Privacy: SoS cybersecurity; SoS privacy & trust; SoS security against emergent behaviors.
- SiSoS Experience: Reports from real projects; Case studies in real-scale projects; Experience from SoS stakeholders.
- SiSoS General Issues: Taxonomies/ontologies; Software processes; Acquisition in the development of SoS.
- SiSoS Applications: Energy; Transportation; Global traffic control; Emergency coordination; Environmental monitoring; Smart grids; Healthcare; Manufacturing; Smart cities; Any other application.

Acknowledgment

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- Muhammad Ali Babar, The University of Adelaide, Australia
- Eduard Baranov, UCLouvain, Belgium
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- Eduard Baranov, UCLouvain, Belgium

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 34 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 7th of the SONAMA track, we received a total of 27 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 7 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 for their nice guidance and support. We look forward to seeing all of you in Brno, Czech Republic.

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EDITORIAL MESSAGE

Special Track on Software Platforms

Juw Won Park, University of Louisville, USA

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 25 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 5 regular full papers (with acceptance ratio 20%) and 4 poster papers have been accepted for publications in the proceedings of the conference. The regular papers accepted by this track include:

- Smart transportation platform for private transportation
- Smart home platform supporting decentralized adaptive automation control
- AppGen: A framework for automatic generation of data collection apps
- Time series analysis for enhancing the recognition of license plate number in video stream of IoT camera
- Counterfeiting scalable detection image Based system for E-commerce

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

- Sophisticated PV Prediction Platform Using Optimized PV Physical Model
- Day-Ahead Photovoltaic Power Forecasting using Numerical Weather Prediction based on Big Data Platform
- From Data Quality Conceptual Model To Interactive Visualization Tool in the Context Of Imperfect Data
- Internet of Things based Virtual Display Platform to Provide a Screen

The ACM SAC 2020 Software Platforms track was chaired by Drs. Juw Won Park, 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. Finally, the track chairs would like to thank all the authors who contributed to this track.

December 2020,

Drs. Juw Won Park, Jinman Jung and Jun Huang

Track Chairs, Software Platforms

EDITORIAL MESSAGE
Special Track on the Semantic Web and Applications

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

The technical track "The Semantic Web and Applications (SWA)" focuses on the topics related to Semantic Web Technologies and their Applications. The techniques to realize and/or utilize the Semantic Web are discussed in this track.

The focus of this track is to present research concerning issues such as: 1) learning/constructing ontologies for Semantic Web applications; 2) utilizing ontologies for data management, integration and interoperability in Semantic web applications; 3) architectures for achieving Semantic Web goals for specific application domains; and 4) improving search techniques (or engines) with Semantic Web technologies.

This track aims to tackle research problems and practical applications for the Semantic Web. Researchers and practitioners are invited to submit papers on the theoretical, technical and practical issues of Semantic Web and its Applications. We are particularly interested in applying Semantic Web technologies to specific application domains (e.g., e-learning, e-business, social informatics, healthcare informatics, biomedical informatics, and bioinformatics).

This track received 20 submissions, and accepted 5 papers for the regular paper session, one for the poster session and one for the SRC session. We are grateful to the authors for submitting the papers to this track. In addition, we would like to express our thanks to the program committee for this track.

Editorial message

Special Track on

Video Processing for Human Behavioral Analysis Track

Donatello Conte, University of Tours
LIFAT EA 6300, France
Raffaella Lanzarotti, Computer Science Departement
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Jean-Yves Ramel, University of Tours
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Human Behavioral Analysis (HBA) from videos has been researched for decades, having a rapid evolution in the last years. Two main branches in HBA are Human Action Recognition (HAR), studied for years, and Personality Behavior Recognition (PBR), that only recently has started to be explored in the computer vision research field. Tools for effectively analyzing these sort of behaviors have a major impact into everyone's life, with applications in health (e.g., support for mental disorders), security (e.g., forensics, preventive applications), human computer/machine/robot interaction (e.g., affective/interactive interfaces) and even entertainment (e.g., user-tailored systems). This track, organized for the first time at ACM SAC, has been started with the intention of providing a focus in all aspects of computer vision and pattern recognition devoted to the automatic analysis of human behavior by applying recent or new video processing techniques.

We received high quality papers from all parts of the world, contributing a total of 18 submissions. The review process was very competitive with each paper receiving at least three reviews. Finally 6 full papers and 2 poster papers were selected for the track.

The main topic addressed by selected papers is Action Recognition with 3 works out of 8: *Template co-updating in multi-modal human activity recognition systems*, *Lightweight Network Architecture for Real-Time Action Recognition*, and *Robust, Efficient and Privacy-Preserving Violent Activity Recognition in Videos*.

Close to Action Recognition topic, Gait and Gesture analysis has been discussed in 2 papers: *Towards a Data-Driven Method for RGB Video-Based Hand Action Quality Assessment in Real Time*, and *Markerless gait analysis in stroke survivors based on computer vision and deep learning: a pilot study.*

Affective computing has been dealt by the paper *A Decision Level Fusion Approach for Deception Detection Based on Speech and Behavioral Cues*, and video-based physiological monitoring has been addressed in the paper *Siamese-rPPG Network: Remote Photoplethysmography Signal Estimation from Face Videos.*

For the purpose of extracting useful data for behavior analysis, there is the topic of object tracking, that in this track has been presented in the paper *Appearance Features for Online Multiple Camera Multiple Target Tracking.*

We thank all the authors who submitted valuable papers to this track. We are grateful all the members of the Program Committee. Without their support, the organization of this track 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 Local Arrangement Chairs. We are grateful to the Symposium Program Chairs for their help in all aspects of the organization of this track.

Special Track on Web Technologies
Editorial Message

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 paves 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 13 paper submissions from countries such as the Netherlands, Spain, USA, Portugal, Germany, Czech Republic, Austria, Italy, France and Brazil. We believe this reaffirms both the interest of researchers and practitioners in the track, and the relevance of the theme. In fact, for the 2019 edition of the track, we announced the preparation of a Special Issue with best selected papers, to be published in the Information Processing and Management journal (Elsevier). The journal impact factor is 3.892 and is ranked Q1 (Computer science applications, information systems) according to Scimago. We are currently working on not only this special issue but also offering similar opportunities to 2020 SAC WT authors.

In this edition, submitted papers were reviewed by a Program Committee of 29 members, granting three to four reviews per submission; three of the submitted papers were accepted as full papers (acceptance rate = 23%) and two were accepted as posters.

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 13-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:

- Agustina Buccella, National University of Comahue, Argentina
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We wish you a pleasant and stimulating read.
Francesco, Cristian and Tim