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2020 IEEE 44th Annual Computers, Software, and Applications Conference (COMPSAC) **COMPSAC 2020**

Table of Contents

Message from the Standing Committee Chair	xxxvii
Message from the Standing Committee Vice Chair	xl
Message from the Program Chairs	xli
Message from COMPSAC 2020 Fast Abstract Co-Chairs	xliii
Message from the Workshop Chairs	xliv

COMPSAC 2020 Symposia

ASYS

Comparison of Collision Avoidance Algorithms for Autonomous Multi-Agent Systems	1
<i>Marco Moletta (KTH Royal Institute of Technology, Sweden) and Matteo Tadiello (KTH Royal Institute of Technology, Sweden)</i>	
Long Short-Term Memory-Based Intrusion Detection System for In-Vehicle Controller Area Network Bus	10
<i>Md Delwar Hossain (Nara Institute of Science and Technology, Japan), Hiroyuki Inoue (Hiroshima City University, Japan), Hideya Ochiai (The University of Tokyo, Japan), Doudou Fall (Nara Institute of Science and Technology, Japan), and Youki Kadobayashi (Nara Institute of Science and Technology, Japan)</i>	
Socially-Aware Multi-Agent Velocity Obstacle Based Navigation for Nonholonomic Vehicles	18
<i>Manuel Bolder (University of Trento), Luigi Palopoli (University of Trento), and Daniele Fontanelli (University of Trento)</i>	
Deep Learning for Hardware-Constrained Driverless Cars	26
<i>Bharathwaj Krishnaswami Sreedhar (KTH Royal Institute of Technology, Sweden) and Nagarajan Shunmugam (KTH Royal Institute of Technology, Sweden)</i>	
A Comparative Analysis of Foraging Strategies for Swarm Robotics using ARGoS Simulator	30
<i>Ambikeya Pradhan (University of Trento), Marta Boavida (University of Trento), and Daniele Fontanelli (University of Trento)</i>	

Improving the Behavior of Evasive Targets in Cooperative Target Observation	36
<i>Thayanne França da Silva (State University of Ceara, Brazil), Matheus Santos Araújo (State University of Ceara, Brazil), Raimundo Juracy Campos Ferro Junior (State University of Ceara, Brazil), Leonardo Ferreira da Costa (State University of Ceara, Brazil), João Pedro Bernardino Andrade (State University of Ceara, Brazil), Gustavo Augusto Lima de Campos (State University of Ceara, Brazil), and Joaquim Celestino Junior (State University of Ceara, Brazil)</i>	

CAP

A Real-Time Feature Indexing System on Live Video Streams	42
<i>Aditya Chakraborty (Purdue University), Akshay Pawar (Purdue University), Hojoung Jang (Purdue University), Shunqiao Huang (Purdue University), Sripath Mishra (Purdue University), Shuo-Han Chen (Academia Sinica), Yuan-Hao Chang (Academia Sinica), George K. Thiruvathukal (Loyola University Chicago), and Yung-Hsiang Lu (Purdue University)</i>	
Optimization of Parallel Applications Under CPU Overcommitment	51
<i>Tokiko Takayama (Kyushu Institute of Technology, Japan) and Kenichi Kourai (Kyushu Institute of Technology, Japan)</i>	
Pre-Design Stage Cost Estimation for Cloud Services	61
<i>Tomohisa Aoshima (Department of Risk Engineering, University of Tsukuba) and Kenichi Yoshida (Graduate School of Business Sciences, University of Tsukuba)</i>	
Towards an Architecture for Customizable Drones	67
<i>Mahmoud Hussein (CEA, LIST, Software and System Engineering Department (DILS), France) and Reda Nouacer (CEA, LIST, Software and System Engineering Department (DILS), France)</i>	
Heterogeneous Systems Modelling with Adaptive Traffic Profiles and its Application to Worst-Case Analysis of a DRAM Controller	73
<i>Matteo Andreatti (Arm Ltd., Cambridge, UK), Frances Conboy (Arm Ltd., Cambridge, UK), Giovanni Stea (University of Pisa, Italy), and Raffaele Zippo (University of Florence, Italy)</i>	
Resource Dependency Analysis in Multi-Core Systems	81
<i>Jakob Danielsson (Mälardalen University), Tiberiu Seceleanu (Mälardalen University), Marcus Jägemar (Ericsson AB), Moris Behnam (Mälardalen University), and Mikael Sjödin (Mälardalen University)</i>	

CELT

UNIFORM: Automatic Alignment of Open Learning Datasets	89
<i>Luca Cagliero (Politecnico di Torino), Lorenzo Canale (Politecnico di Torino), and Laura Farinetti (Politecnico di Torino)</i>	

MannAccess: A Novel Low Cost Assistive Educational Tool of Digital Image for Visually Impaired	97
<i>Alisson Renan Svaigen (State University of Maringá, Brazil), Laila Milainny Siqueira Bine (State University of Maringá, Brazil), Wuigor Iovens Siqueira Bine (State University of Maringá, Brazil), and Linnyer Beatrys Ruiz (State University of Maringá, Brazil)</i>	
Enhancing the Learning of Computing/IT Students with Open Educational Resources	107
<i>Henry C.B. Chan (The Hong Kong Polytechnic University), Yik Him Ho (The Hong Kong Polytechnic University), Edmundo Trevor (Universidad Politécnica de Madrid), and Sorel Reisman (CSU Fullerton)</i>	
The Use of Metadata in Open Educational Resources Repositories: An Exploratory Study	117
<i>William Simão de Deus (University of São Paulo, Brazil) and Ellen Francine Barbosa (University of São Paulo, Brazil)</i>	
DSLE: A Smart Platform for Designing Data Science Competitions	127
<i>Giuseppe Attanasio (Politecnico di Torino), Flavio Giobergia (Politecnico di Torino), Andrea Pasini (Politecnico di Torino), Francesco Ventura (Politecnico di Torino), Elena Baralis (Politecnico di Torino), Luca Cagliero (Politecnico di Torino), Paolo Garza (Politecnico di Torino), Daniele Apiletti (Politecnico di Torino), Tania Cerquitelli (Politecnico di Torino), and Silvia Chiusano (Politecnico di Torino)</i>	
Algorithmic Support for Personalized Course Selection and Scheduling	137
<i>Tyler Morrow (Sandia National Laboratories), Ali R. Hurson (Missouri University of Science and Technology), and Sahra Sedigh Sarvestani (Missouri University of Science and Technology)</i>	
A Short-Term Course of STEAM Education through IoT Exercises for High School Students	147
<i>Koki Ota (Shibaura Institute of Technology), Tsuyoshi Nakajima (Shibaura Institute of Technology), and Hiroki Suda (Shibaura Institute of Technology)</i>	
Experimental Didactic Proposal using VISIR Remote Laboratory to Learn Diode-Based Circuits.....	152
<i>Manuel Blazquez-Merino (DIEECTQAI, UNED), Clara Perez-Molina (DIEECTQAI, UNED), Manuel Castro (DIEECTQAI, UNED), Felix Garcia-Loro (DIEECTQAI, UNED), Elio San Cristobal (DIEECTQAI, UNED), Edmundo Tovar (School of Computer Engineering, UPM), and Sergio Martin-Gutierrez (DIEECTQAI, UNED)</i>	
A Comparative Study of the Academic Programs between Informatics/BioInformatics and Data Science in the U.S.	159
<i>Ismail Bile Hassan (Metropolitan State University) and Jigang Liu (Metropolitan State University)</i>	
Heart Rate Estimation from Face Videos for Student Assessment: Experiments on edBB	166
<i>Javier Hernandez-Ortega (Universidad Autonoma de Madrid, Spain), Roberto Daza (Universidad Autonoma de Madrid, Spain), Aythami Morales (Universidad Autonoma de Madrid, Spain), Julian Fierrez (Universidad Autonoma de Madrid, Spain), and Ruben Tolosana (Universidad Autonoma de Madrid, Spain)</i>	

Using Fine-Grained Test Cases for Improving Novice Program Fault Localization	172
<i>Zheng Li (Beijing University of Chemical Technology), Deli Yu (Beijing University of Chemical Technology), Yonghao Wu (Beijing University of Chemical Technology), and Yong Liu (Beijing University of Chemical Technology)</i>	
Digital Privacy Detectives: an Interactive Game for Classrooms	178
<i>Caroline D. Hardin (Western Washington University) and Jen Dalsen (University of Wisconsin - Madison)</i>	
Teaching Mathematics in Scientific Bachelor Degrees Using a Blended Approach	184
<i>Marina Marchisio (Università di Torino, Italy), Sara Remogna (Università di Torino, Italy), Fabio Roman (Università di Torino, Italy), and Matteo Sacchet (Università di Torino, Italy)</i>	
Automatic Formative Assessment in Computer Science: Guidance to Model-Driven Design	190
<i>Marina Marchisio (University of Torino, Italy), Tiziana Margaria (University of Limerick, Ireland), and Matteo Sacchet (University of Torino, Italy)</i>	

DSAT

TTED-PU:A Transferable Tax Evasion Detection Method Based on Positive and Unlabeled Learning	196
<i>Fa Zhang (Xi'an Jiaotong University, Xi'an, China), Bin Shi (Xi'an Jiaotong University, Xi'an, China), Bo Dong (Xi'an Jiaotong University, Xi'an, China), Qinghua Zheng (Xi'an Jiaotong University, Xi'an, China), and Xiangting Ji (Baidu Inc, China)</i>	
Transfer Learning from Planar to Spherical Images	206
<i>Takafumi Takeda (University of Tsukuba, Japan) and Kenichi Yoshida (University of Tsukuba, Japan)</i>	
A Novel Dynamic Data-Driven Algorithmic Trading Strategy Using Joint Forecasts of Volatility and Stock Price	214
<i>You Liang (Ryerson University), Aerambamoorthy Thavaneswaran (University of Manitoba), Alexander Paseka (University of Manitoba), Zimo Zhu (University of Manitoba), and Ruppa K. Thulasiram (University of Manitoba)</i>	
A Novel Tax Evasion Detection Framework Via Fused Transaction Network Representation	224
<i>Yingchao Wu (Xi'an Jiaotong University, China), Bo Dong (Xi'an Jiaotong University, China), Qinghua Zheng (Xi'an Jiaotong University, China), Rongzhe Wei (Xi'an Jiaotong University, China), Zhiwen Wang (Xi'an Jiaotong University, China), and Xuanya Li (Baidu Inc., China)</i>	
Simulating the Printed Circuit Board Assembly Process for Image Generation	234
<i>Johannes Nau (Technische Universität Ilmenau, Germany), Johannes Richter (GÖPEL electronic GmbH, Germany), Detlef Streitferdt (Technische Universität Ilmenau, Germany), and Michael Kirchhoff (Technische Universität Ilmenau)</i>	
Collaborative Filtering Recommendation Based on Multi-Domain Semantic Fusion	244
<i>Xiang Li (Beijing University of Technology), Jingsha He (Beijing University of Technology), Nafei Zhu (Beijing University of Technology), and Ziqiang Hou (Beijing University of Technology)</i>	

Data Linking as a Service: An Infrastructure for Generating and Publishing Linked Data on the Web	251
<i>Ivan Salvadori (Federal University of Santa Catarina, Brazil), Alexis Huf (Federal University of Santa Catarina, Brazil), and Frank Siqueira (Federal University of Santa Catarina, Brazil)</i>	
NEUD-TRI: Network Embedding Based on Upstream and Downstream for Transaction Risk Identification	261
<i>Jingyi An (Xi'an Jiaotong University, China), Qinghua Zheng (Xi'an Jiaotong University, China), Rongzhe Wei (Xi'an Jiaotong University, China), Bo Dong (Xi'an Jiaotong University, China), and Xuanya Li (Baidu Inc., China)</i>	
An Information Theoretic Learning for Causal Direction Identification	271
<i>Hang Wu (Georgia Institute of Technology, USA) and May D. Wang (Georgia Institute of Technology and Emory University, USA)</i>	
Training Confidence-Calibrated Classifier via Distributionally Robust Learning	279
<i>Hang Wu (Georgia Institute of Technology, USA) and May D. Wang (Georgia Institute of Technology and Emory University, USA)</i>	
Fault Diagnosis of Rolling Bearing Based on Grey Correlation VIKOR with Triangular Ordered Fuzzy Numbers	289
<i>Xingang Wang (Qilu University of Technology (Shandong Academy of Sciences), College of Computer Science and Technology, Jinan, China), Xin Wang (Qilu University of Technology (Shandong Academy of Sciences), College of Computer Science and Technology, Jinan, China), Chengwen Zhuang (Qilu University of Technology (Shandong Academy of Sciences), College of Computer Science and Technology, Jinan, China), and Tongyu Zhao (Qilu University of Technology (Shandong Academy of Sciences), College of Computer Science and Technology, Jinan, China)</i>	
Research on Network Awareness of Enterprise Evaluation System Indicators	295
<i>Ming Zhu (DongHua University), Pengyu Wan (DongHua University), Xiangyang Feng (DongHua University), Zhengyu Wang (DongHua University), and Wenpei Shao (DongHua University)</i>	
AI and ML-Driving and Exponentiating Sustainable and Quantifiable Digital Transformation.	300
<i>Chan Naseeb (IBM)</i>	
ReRe: A Lightweight Real-Time Ready-to-Go Anomaly Detection Approach for Time Series	306
<i>Ming-Chang Lee (Norwegian University of Science and Technology, Norway), Jia-Chun Lin (Norwegian University of Science and Technology), and Ernst Gunner Gan (Norwegian University of Science and Technology)</i>	
Human Gait Recognition Based on Integrated Gait Features using Kinect Depth Cameras	312
<i>Wonjin Kim (Towson University, USA), Yanggon Kim (Towson University, USA), and Ki Yong Lee (Sookmyung Women's University, South Korea)</i>	
RVAE-ABFA : Robust Anomaly Detection for HighDimensional Data Using Variational Autoencoder	318
<i>Yuda Gao (Xi'an Jiaotong University, Xi'an, China), Bin Shi (Xi'an Jiaotong University, Xi'an, China), Bo Dong (Xi'an Jiaotong University, Xi'an, China), Yan Chen (Xi'an Jiaotong University, Xi'an, China), Lingyun Mi (Xi'an Jiaotong University, Xi'an, China), Zhiping Huang (SERVYOU GROUP, China), and Yuanyuan Shi (SERVYOU GROUP, China)</i>	

Bayesian Neural Network Based Path Prediction Model Toward the Realization of Patent Valuation	324
<i>Weidong Liu (Inner Mongolia University, China), Wenbo Qiao (Inner Mongolia University, China), and Xin Liu (Inner Mongolia University, China)</i>	
Cinematographic Shot Classification through Deep Learning	329
<i>Bartolomeo Vacchetti (Politecnico di Torino, Turin, Italy), Tania Cerquitelli (Politecnico di Torino, Turin, Italy), and Riccardo Antonino (Politecnico di Torino, Turin, Italy)</i>	
Evaluation of Parameter Update Effects in Deep Semi-Supervised Learning Algorithms	335
<i>Elie Neghawi (Concordia University) and Yan Liu (Electrical and Computer Engineering, Concordia University, Montreal, Canada)</i>	
A Step Closer to Becoming Symbiotic with AI through EEG: A Review of Recent BCI Technology..	345
<i>Sarthak Dabas (Marquette University, USA), Piyush Saxena (Direct Supply, USA), Natalie Nordlund (The Chicago School of Professional Psychology, USA), and Sheikh I Ahamed (Marquette University, USA)</i>	

EATA

Secure IoT Data Management In A Private Ethereum Blockchain	353
<i>Vinay Kumar Calastray Ramesh (University of Nevada Las Vegas), Yoochwan Kim (University of Nevada Las Vegas), and Ju-Yeon Jo (University of Nevada Las Vegas)</i>	
G-IDS: Generative Adversarial Networks Assisted Intrusion Detection System	360
<i>Md Hasan Shahriar (Florida International University), Nur Imtiazul Haque (Florida International University), Mohammad Ashiqur Rahman (Florida International University), and Miguel Alonso Jr (Florida International University)</i>	
Managing Massive Amounts of Small Files in All-Flash Storage	370
<i>Rize Jin (Tianjin Polytechnic University), Joon-Young Paik (Tianjin Polytechnic University), Jianming Wang (Tianjin Polytechnic University), Yenewondim Biadgie (Ajou University), Yunbo Rao (University of Electronic Science and Technology of China), and Tae-Sun Chung (Ajou University)</i>	
Dual Adversarial Networks for Land-Cover Classification	378
<i>Jingyi An (Xi'an Jiaotong University, China), Rongzhe Wei (Xi'an Jiaotong University, China), Zhichao Zha (Xi'an Jiaotong University, China), and Bo Dong (Xi'an Jiaotong University, China)</i>	
Machine Learning Applied to Support Medical Decision in Transthoracic Echocardiogram Exams: A Systematic Review	384
<i>Vilson Soares de Siqueira (Federal Institute of Tocantins), Diego de Castro Rodrigues (Federal Institute of Tocantins), Colandy Nunes Dourado (Diagnostic Imaging Center, CDI), Moisés Marcos Borges (Diagnostic Imaging Center, CDI), Rogério Gomes Furtado (Diagnostic Imaging Center, CDI), Higor Pereira Delfino (Federal University of Goiás), Diego Stelle (Federal University of Goiás), Rommel Melgaço Barbosa (Federal University of Goiás), and Ronaldo Martins da Costa (Federal University of Goiás)</i>	

HCSC

Finding Emotion from Multi-Lingual Voice Data	392
<i>Nazia Hossain (American International University-Bangladesh; Bangladesh University of Engineering and Technology) and Mahmuda Naznin (Bangladesh University of Engineering and Technology)</i>	
Cue-Pin-Select, a Secure Mental Password Manager	402
<i>Enka Blanchard (Digitrust, Loria, Université de Lorraine), Ted Selker (Selker Design Research), Levi Gabasova (Institut de Planétologie et d'Astrophysique de Grenoble), and Eli Sennesh (Northeastern University)</i>	
Towards Identifying the Optimal Timing for Near Real-Time Smoking Interventions Using Commercial Wearable Devices	413
<i>Theodore Weber (StubHub, USA), Matthew Ferrin (Fast Enterprises, USA), Forest Sweeney (Western Washington University, USA), Shameem Ahmed (Western Washington University, USA), and Moushumi Sharmin (Western Washington University, USA)</i>	
InterViewR: A Mixed-Reality Based Interview Training Simulation Platform for Individuals with Autism	423
<i>Shameem Ahmed (Western Washington University, Bellingham, WA, USA), Wesley Deneke (Western Washington University, Bellingham, WA, USA), Victor Mai (IBM, Cumberland, MD, USA), Alexander Veneruso (Turn 10 Studios, Redmond, WA, USA), Matthew Stepita (Faithlife, Bellingham, WA, USA), Anais Dawson (Western Washington University, Bellingham, WA, USA), Bradley Hoefel (Western Washington University, Bellingham, WA, USA), Garrett Claeys (Western Washington University, Bellingham, WA, USA), Nicholas Lam (Western Washington University, Bellingham, WA, USA), and Moushumi Sharmin (Western Washington University, Bellingham, WA, USA)</i>	
IDEAL: An Interactive De-Anonymization Learning System	433
<i>Na Li (Prairie View A&M University, USA), Rajkumar Murugesan (Prairie View A&M University), Lin Li (Prairie View A&M University), and Hao Zheng (Prairie View A&M University)</i>	
Applying a Gamification Approach to Knowledge Management in Higher Education Institutions .	439
<i>Nouf Almujaally (The University of Warwick) and Mike Joy (The University of Warwick)</i>	

ITiP

Productivity Evaluation Indicators Based on LEAN and their Application to Compare Agile and Waterfall Projects	444
<i>Kumi Jinzenji (NTT Corporation), Akio Jin (NTT Corporation), and Tatsuya Muramoto (NTT Corporation)</i>	

Moving Vehicle Candidate Recognition and Classification Using Inception-ResNet-v2	451
<i>Anju Thomas (National Institute of Technology Tiruchirappalli), Harikrishnan P. M. (National Institute of Technology Tiruchirappalli), Palanisamy P. (National Institute of Technology Tiruchirappalli), and Varun P. Gopi (National Institute of Technology Tiruchirappalli)</i>	
WTC^2: Impact-Aware Threat Analysis for Water Treatment Centers	457
<i>Amarjit Datta (Tennessee Technological University), Mohammad Ashiqur Rahman (Florida International University, Miami, USA), and Hossain Shahriar (Kennesaw State University, Kennesaw, USA)</i>	
A Framework for Decentralized Private Random State Generation and Maintenance for Multiplayer Gaming Over Blockchain	467
<i>Russell Harkanson (University of Nevada, Las Vegas), Carter Chiu (University of Nevada, Las Vegas), Yoohwan Kim (University of Nevada, Las Vegas), and Ju-Yeon Jo (University of Nevada, Las Vegas)</i>	
A Systematic Literature Review of Practical Virtual and Augmented Reality Solutions in Surgery	473
<i>Jonas Roessel (Aalen University, Germany), Moritz Knoell (Aalen University, Germany), Jannic Hofmann (Aalen University, Germany), and Ricardo Buettner (Aalen University, Germany)</i>	
An ISO-Compliant Test Procedure for Technical Risk Analyses of IoT Systems Based on STRIDE... 483	
<i>Peter Danielis (University of Rostock, Germany), Moritz Beckmann (Test and Integration Center, T-Systems Multimedia Solutions GmbH, Dresden, Germany), and Jan Skodzik (Science and Culture of the State of Mecklenburg-Vorpommern Schwerin, Germany)</i>	
A Modular Edge-/Cloud-Solution for Automated Error Detection of Industrial Hairpin Weldings using Convolutional Neural Networks	489
<i>Johannes Vater (BMW Group), Pascal Schlaak (BMW Group), and Alois Knoll (Technical University of Munich)</i>	
A Suite of Metrics for Calculating the Most Significant Security Relevant Software Flaw Types	495
<i>Peter Mell (National Institute of Standards and Technology Gaithersburg) and Assane Gueye (Prometheus Computing)</i>	
A Systematic Literature Review of Research in the Surgical Field of Medical Robotics	501
<i>Ricardo Buettner (Aalen University), Alena Renner (Aalen University), and Anna Boos (Aalen University)</i>	
Blockchain: Future Facilitator of Asset Information Modelling and Management?	507
<i>Azzam Raslan (University of Nottingham Ningbo China), Georgios Kapogiannis (University of Nottingham Ningbo China), Ali Cheshmehzangi (University of Nottingham Ningbo China), Walid Tizani (University of Nottingham), and Dave Towey (University of Nottingham Ningbo China)</i>	
A Framework for Assembling Asset Information Models (AIMs) through Permissioned Blockchain.....	513
<i>Azzam Raslan (University of Nottingham Ningbo China), Georgios Kapogiannis (University of Nottingham Ningbo China), Ali Cheshmehzangi (University of Nottingham Ningbo China), Walid Tizani (University of Nottingham), and Dave Towey (University of Nottingham Ningbo China)</i>	

MOWU

- A WiFi Assisted Pedestrian Heading Estimation Method Using Gyroscope 519
Yankan Yang (Inner Mongolia University, Hohhot, China), Baoqi Huang (Inner Mongolia University, Hohhot, China), Zhendong Xu (Inner Mongolia University, Hohhot, China), and Runze Yang (Inner Mongolia University, Hohhot, China)
- Estimating Sleep Duration from Temporal Factors, Daily Activities, and Smartphone Use 529
Chih-You Chen (Fordham University), Sudip Vhaduri (Fordham University), and Christian Poellabauer (University of Notre Dame)

NCIW

- Design Issues in Running a Web Server on Bare PC Multi-Core Architecture 539
Nirmala Soundararajan (Towson University, USA), Ramesh Karne (Towson University, USA), Alexander Wijesinha (Towson University, USA), Navid Ordouie (Towson University, USA), and Hojin Chang (Susquehanna University, USA)
- Rapid Container Scheduling for Reactive Relocation of Individual HTTP Requests 549
Ryosuke Matsumoto (SAKURA internet, Inc) and Uchio Kondo (GMO Pepabo, Inc)
- Adaptive Topology for Scalability and Immediacy in Distributed Publish/Subscribe Messaging..... 559
Ryohei Banno (Kogakuin University, Japan) and Kazuyuki Shudo (Tokyo Institute of Technology, Japan)
- Proposal of an Efficient Blind Search Utilizing the Rendezvous of Random Walk Agents 568
Fumiya Toyoda (Kwansei Gakuin University), Yusuke Sakumoto (Kwansei Gakuin University), and Hiroyuki Ohsaki (Kwansei Gakuin University)
- Spatio-Temporal Volume Data Aggregation for Crowdsensing in VDTN 576
Yuuichi Teranishi (National Institute of Information and Communications Technology, Tokyo, Japan), Takashi Kimata (National Institute of Information and Communications Technology, Tokyo, Japan), Eiji Kawai (National Institute of Information and Communications Technology, Tokyo, Japan), and Hiroaki Harai (National Institute of Information and Communications Technology, Tokyo, Japan)
- An Empirical Study of Tightest Network Calculus Analyses for Networks with Multicast Flows.... 585
Bruno Cattelan (TU Kaiserslautern, Dept. of Computer Science, DISCO, Distributed Computer Systems Lab, Germany), Steffen Bondorf (Ruhr University Bochum, Faculty of Mathematics, Center of Computer Science, Germany), and Alberto E. Schaeffer-Filho (Federal University of Rio Grande do Sul (UFRGS), Institute of Informatics, Brazil)
- A Quantitative Evaluation of a Wide-Area Distributed System with SDN-FIT 591
Hiroki Kashiwazaki (Center for Cybersecurity R&D, National Institute of Informatics), Hiroki Takakura (National Institute of Informatics, Japan), and Shinji Shimojo (Osaka University, Japan)
- On the Effectiveness of Random Node Sampling in Influence Maximization on Unknown Graph .. 597
Yuki Wakisaka (Kwansei Gakuin University), Kazuyuki Yamashita (Kwansei Gakuin University), Sho Tsugawa (University of Tsukuba), and Hiroyuki Ohsaki (Kwansei Gakuin University)

On Estimating Network Topology from Observed Flow Sets at Measurement Nodes	603
<i>Keita Kitaura (Kwansei Gakuin University), Matsuo Ryotaro (Kwansei Gakuin University), Nakamura Ryo (Fukuoka University), and Ohsaki Hiroyuki (Kwansei Gakuin University)</i>	

SCH

Detection of Freezing of Gait in People with Parkinson’s Disease using Smartphones	609
<i>Luigi Borzì (Politecnico di Torino), Gabriella Olmo (Politecnico di Torino), Carlo Alberto Artusi (University of Turin), and Leonardo Lopiano (University of Turin)</i>	
ThermoCam: Smart Baby Monitoring Assistant	620
<i>M. Eren Akbiyik (IBM Deutschland GmbH, Germany), Cagan S. Coban (Koc University, Turkey), Elif Aygun (Bilkent University, Turkey), Huseyin Ziya Imamoglu (ETH Zurich, Switzerland), Doga Gurgunoglu (Bilkent University, Turkey), and Duygu Ider (Humboldt University, Germany)</i>	
What Happens in Peer-Support, Stays in Peer-Support: Software Architecture for Peer-Sourcing in Mental Health	628
<i>Mahsa Honary (University of Cambridge, UK), Jaejoon Lee (University of East Anglia, UK), Christopher Bull (Lancaster University, UK), Jiangtao Wang (Lancaster University, UK), and Sumi Helal (Lancaster University, UK)</i>	
Smart Algorithm for Unhealthy Behavior Detection in Health Parameters	638
<i>Leonardo Ferreira da Costa (Atlantic Institute, Brazil), Rodrigo Teixeira de Melo (Atlantic Institute, Brazil), Lucas Vieira Alves (Atlantic Institute, Brazil), Cleilton Lima Rocha (Atlantic Institute, Brazil), Eriko Werbet de Oliveira Araujo (Atlantic Institute, Brazil), Gustavo Augusto Lima de Campos (State University of Ceara, Brazil), Jerffeson Teixeira de Souza (State University of Ceara, Brazil), Andreas Triantafyllidis (Centre for Research and Technology Hellas, Greece), Anastasios Alexiadis (Centre for Research and Technology Hellas, Greece), Konstantinos Votis (Centre for Research and Technology Hellas, Greece), and Dimitrios Tzovaras (Centre for Research and Technology Hellas, Greece)</i>	
Regularization of Deep Neural Networks for EEG Seizure Detection to Mitigate Overfitting	648
<i>Mohammed Saqib (Georgia Institute of Technology), Yuanda Zhu (Georgia Institute of Technology), May Wang (Georgia Institute of Technology), and Brett Beaulieu-Jones (Harvard Department of Biomedical Informatics)</i>	
An Agent Program in an IoT System to Recommend Plans of Activities to Minimize Childhood Obesity	658
<i>Lucas V. Alves (State University of Ceará), Rodrigo T. de Melo (State University of Ceará), Leonardo F. da Costa (State University of Ceará), Cleilton L. Rocha (Atlantic Institute), Eriko W. de O. Araujo (Atlantic Institute), Gustavo A. L. de Campos (State University of Ceará), and Jerffeson T. de Souza (State University of Ceará)</i>	

Analysis of Sampling Techniques Towards Epileptic Seizure Detection from Imbalanced Dataset	668
<i>Mohammad Masum (Kennesaw State University), Hossain Shahriar (Kennesaw State University), and Hisham Haddad (Kennesaw State University)</i>	
Mobile Sensor-Based Fall Detection Framework	677
<i>Md Saiful Islam (Kennesaw State University), Hossain Shahriar (Kennesaw State University), Sweta Sneha (Kennesaw State University), Chi Zhang (Kennesaw State University), and Sheikh Ahamed (Marquette University)</i>	
Toward a Non-Intrusive, Affordable Platform for Elderly Assistance and Health Monitoring	683
<i>Guillaume Gingras (Université du Québec à Rimouski, Canada), Mehdi Adda (Université du Québec à Rimouski, Canada), and Abdenour Bouzouane (Université du Québec à Chicoutimi, Canada)</i>	
Using IoT in AAL Platforms for Older Adults: A Systematic Mapping	689
<i>Paulo Duarte (Federal University of Ceara, Brazil), Emanuel Ferreira Coutinho (Federal University of Ceara, Brazil), Jerome Boudy (Telecom SudParis, France), Mossaab Hariz (Telecom SudParis, France), and Windson Viana (Federal University of Ceara, Brazil)</i>	
Effects of Social Media Use on Health and Academic Performance Among Students at the University of Sharjah	695
<i>Syed Azizur Rahman (University of Sharjah - UAE), Amina Al Marzouqi (University of Sharjah - UAE), Swetha Variyath (University of Sharjah - UAE), Shristee Rahman (University of British Columbia - Canada), Masud Rabbani (Marquette University, USA), and Sheikh Iqbal Ahamed (Marquette University, USA)</i>	
Deep Learning Utilization in Beamforming Enhancement for Medical Ultrasound	701
<i>Mariam Fouad (Ruhr University Bochum (RUB), Germany and German University in Cairo (GUC), Egypt), Yousef Metwally (German University in Cairo (GUC), Egypt), Georg Schmitz (Ruhr University Bochum (RUB), Germany), Michael Huebner (BTU Cottbus - Senftenberg, Germany), and Mohamed A. Abd El Ghany (German University in Cairo (GUC), Egypt and TU Darmstadt (TUD), Germany)</i>	
Generating Region of Interests for Invasive Breast Cancer in Histopathological Whole-Slide-Image	707
<i>Shreyas Malakarjun Patil (Georgia Institute of Technology), Li Tong (Georgia Institute of Technology and Emory University), and May D. Wang (Georgia Institute of Technology and Emory University)</i>	
A Systematic Literature Review of Computer Support for Surgical Interventions	713
<i>Ricardo Buettner (Aalen University), Kai Wannemwetsch (Aalen University), and Daniel Loskan (Aalen University)</i>	
A Systematic Literature Review of Medical Chatbot Research from a Behavior Change Perspective	719
<i>Tobias Gentner (Aalen University), Timon Neitzel (Aalen University), Jacob Schulze (Aalen University), and Ricardo Büttner (Aalen University)</i>	

Mobile for Health: A Digital Intervention to Reduce Smoking in the United Arab Emirates 725
Syed Azizur Rahman (University of Sharjah - United Arab Emirates), Nabeel Al-Yateem (University of Sharjah - United Arab Emirates), Amina Al-Marzouqi (University of Sharjah - United Arab Emirates), Sheikh Iqbal Ahamed (Marquette University - USA), and Mohammad AlShabi (University of Sharjah - United Arab Emirates)

Towards Developing A Mobile-Based Care for Children with Autism Spectrum Disorder (mCARE) in low and Middle-Income Countries (LMICs) Like Bangladesh 730
Munirul M. Haque (University of Indianapolis, Indiana), Dipranjan Das Dipal (Marquette University, Milwaukee), Masud Rabbani (Marquette University, Milwaukee, WI), Md Ishrak Islam Zarif (Marquette University, Milwaukee, WI), Anik Iqbal (Marquette University, Milwaukee, WI), Shaheen Akhter (Institute of Paediatric Neurodisorder & Autism (IPNA), Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh), Shahana Parveen (National Institute of Mental Health, Dhaka, Bangladesh), Mohammad Rasel (Institute of Paediatric Neurodisorder & Autism (IPNA), Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh), Basana Rani Muhuri (Paediatric Nephrology, Chittagong Medical College(PRL)), Tanjir Soron (Telepsychiatry Research and Innovation Network Ltd), Syed Ishtiaque Ahmed (University of Toronto, Canada), and Sheikh Iqbal Ahamed (Marquette University, Milwaukee, WI)

Graph Convolutional Neural Networks to Classify Whole Slide Images 738
Roshan Konda (Georgia Institute of Technology, USA), Hang Wu (Georgia Institute of Technology, USA), and May D. Wang (Georgia Institute of Technology and Emory University, USA)

An Early Warning System for Hemodialysis Complications Utilizing Transfer Learning from HD IoT Dataset 743
Chihhsiong Shih (Tunghai University), Lai Youchen (Tunghai University), Cheng-hsu Chen (Division of Nephrology, Taichung Veterans General Hospital, Taichung, Taiwan), and William Cheng-Chung Chu (Tunghai University)

SEPT

Detecting Malicious Web Requests Using an Enhanced TextCNN 752
Lian Yu (Peking University), Lihao Chen (Peking University), Jingtao Dong (Peking University), Mengyuan Li (Peking University), Lijun Liu (Mobile China), Bai Zhao (Mobile China), and Chen Zhang (Mobile China)

Who Would Bob Blame? Factors in Blame Attribution in Cyberattacks Among the Non-Adopting Population in the Context of 2FA 762
Sarah Marie Peck (University of Connecticut), Mohammad Maifi Hasan Khan (University of Connecticut), Md Abdullah Al Fahim (University of Connecticut), Emil N Coman (University of Connecticut Health Center), Theodore Jensen (University of Connecticut), and Yusuf Albayram (University of Connecticut)

Improving Intrusion Detection Systems using Zero-Shot Recognition via Graph Embeddings 774
Saber Zerhoudi (Universität Passau, Germany), Michael Granitzer (Universität Passau, Germany), and Mathieu Garchery (Atos, Germany)

Dagbase: A Decentralized Database Platform Using DAG-Based Consensus	782
<i>Yepeng Ding (The University of Tokyo, Japan) and Hiroyuki Sato (The University of Tokyo, Japan)</i>	
CD-LEAK: Leaking Secrets from Audioless Air-Gapped Computers Using Covert Acoustic Signals from CD/DVD Drives	792
<i>Mordechai Guri (Ben Gurion University of the Negev, Israel)</i>	
Improving Attack Detection Performance in NIDS Using GAN	801
<i>Dongyang Li (Kyoto University), Daisuke Kotani (Kyoto University), and Yasuo Okabe (Kyoto University)</i>	
Cardinality Analysis to Classify Malicious Domain Names	810
<i>Kenichi Yoshida (University of Tsukuba), Kazunori Fujiwara (Japan Registry Services Co., Ltd), Akira Sato (University of Tsukuba), and Shuji Sannomiya (University of Tsukuba)</i>	
Transparent IDS Offloading for Split-Memory Virtual Machines	817
<i>Kouki Yamato (Kyushu Institute of Technology, Japan), Kenichi Kourai (Kyushu Institute of Technology, Japan), and Tarek Saadawi (City University of New York, USA)</i>	
Detection of Change of Users in SNS by Two Dimensional CNN	823
<i>Hiroshi Matsushita (Tokyo University of Technology, Japan) and Ryuya Uda (Tokyo University of Technology, Japan)</i>	
A Verifiable Secret Sharing Scheme without Using Multi-Party Computations	829
<i>Takumi Makino (Hiroshima City University), Yoko Kamidoi (Hiroshima City University), and Shin'ichi Wakabayashi (Hiroshima City University, Japan)</i>	
vSwitchGuard: Defending OpenFlow Switches Against Saturation Attacks	835
<i>Samer Khamaiseh (Midwestern State University), Edoardo Serra (Boise State University), and Dianxiang Xu (University of Missouri – Kansas City)</i>	

SETA

CUDAsmith: A Fuzzer for CUDA Compilers	845
<i>Bo Jiang (Beihang University, China), Xiaoyan Wang (Beihang University, China), W. K. Chan (City University of Hong Kong), T. H. Tse (The University of Hong Kong, Hong Kong), Na Li (CAST), Yongfeng Yin (Beihang University, China), and Zhenyu Zhang (Chinese Academy of Sciences, China)</i>	
How Much Support Can API Recommendation Methods Provide for Component-Based Synthesis?	856
<i>Jiixin Liu (National University of Defense Technology), Binbin Liu (National University of Defense Technology), Wei Dong (National University of Defense Technology), Yating Zhang (National University of Defense Technology), and Daiyan Wang (National University of Defense Technology)</i>	

A Drift Propensity Detection Technique to Improve the Performance for Cross-Version Software Defect Prediction	866
<i>Md Alamgir Kabir (City University of Hong Kong, Hong Kong), Jacky W. Keung (City University of Hong Kong, Hong Kong), Kwabena E. Bennin (Blekinge Institute of Technology, Sweden), and Miao Zhang (City University of Hong Kong, Hong Kong)</i>	
Smart Contracts Vulnerability Auditing With Multi-Semantics	876
<i>Zhen Yang (City University of Hong Kong, China), Jacky Keung (City University of Hong Kong, China), Miao Zhang (City University of Hong Kong, China), Yan Xiao (National University of Singapore, Singapore), Yangyang Huang (City University of Hong Kong, China), and Tik Hui (City University of Hong Kong, China)</i>	
Blocking Bug Prediction Based on XGBoost with Enhanced Features	886
<i>Xiaoyun Cheng (Harbin Engineering University), Naming Liu (Harbin Engineering University), Lin Guo (Harbin Engineering University), Zhou Xu (Chongqing University), and Tao Zhang (Macau University of Science and Technology)</i>	
Order in Chaos: Prioritizing Mobile App Reviews using Consensus Algorithms	896
<i>Layan Etaiwi (Polytechnique Montreal, Canada), Sylvie Hamel (Université de Montréal, Canada), Yann-Gael Gueheneu (Concordia University, Canada), William Flageol (Concordia University, Canada), and Rodrigo Morales (Concordia University, Canada)</i>	
An Empirical Investigation into the Effects of Code Comments on Issue Resolution	905
<i>Qiwei Song (Southeast University), Xianglong Kong (Southeast University), Lulu Wang (Southeast University), and Bixin Li (Southeast University)</i>	
Code Inspection Support for Recurring Changes with Deep Learning in Evolving Software	915
<i>Krishna Teja Ayinala (University of Nebraska at Omaha), Kwok Sun Cheng (University of Nebraska at Omaha), Kwangsung Oh (University of Nebraska at Omaha), Teukseob Song (Mokwon University), and Myoungkyu Song (University of Nebraska at Omaha)</i>	
MCFL: Improving Fault Localization by Differentiating Missing Code and Other Faults	927
<i>Zijie Li (University of CAS, Institution of Software, CAS, China), Long Zhang (University of CAS, Institution of Software, CAS, China), Zhenyu Zhang (State Key Lab. of Computer Sciences, Institution of Software, CAS, China), and Bo Jiang (Beihang University, China)</i>	
A Tool for Non-Intrusive and Privacy-Preserving Developers' Programming Activity Data Collection	937
<i>Yue Cao (State Key Laboratory for Novel Software Technology, Nanjing University, China), Liang Wang (State Key Laboratory for Novel Software Technology, Nanjing University, China), Zhiwen Zheng (State Key Laboratory for Novel Software Technology, Nanjing University, China), and Xianping Tao (State Key Laboratory for Novel Software Technology, Nanjing University, China)</i>	

Accuracy Improvement for Neural Program Synthesis via Attention Mechanism and Program Slicing	947
<i>Yating Zhang (National University of Defense Technology), Wei Dong (National University of Defense Technology), Daiyan Wang (National University of Defense Technology), Binbin Liu (National University of Defense Technology), and Jiaxin Liu (National University of Defense Technology)</i>	
CNN-Based Model for Chinese Information Processing and its Application in Large-Scale Book Purchasing	957
<i>Chi Guo (Wuhan University, China), Peilin Yu (Wuhan University, China), Wenfei Guo (Wuhan University, China), and Xiaxian Wang (Wuhan University, China)</i>	
Software Product Line Configuration and Traceability: an Empirical Study on SMarty Class and Component Diagrams	963
<i>Thais Nepomuceno (State University of Maringá, Brazil), Edson Oliveira Jr (State University of Maringá, Brazil), Ricardo Geraldi (PUCPR, Brazil), Andreia Malucelli (PUCPR, Brazil), Sheila Reinehr (PUCPR, Brazil), and Marco A. Graciotto Silva (Federal University of Technology, Brazil)</i>	
Recovering Software Product Line Architecture of Product Variants Developed with the Clone-and-Own Approach	969
<i>Jihyun Lee (Jeonbuk National University, Jeonju, Korea), Taeyoung Kim (Jeonbuk National University, Jeonju, Korea), and Sungwon Kang (KAIST, Daejeon, Republic of Korea)</i>	
IRBFL: An Information Retrieval Based Fault Localization Approach	975
<i>Zheng Li (Beijing University of Chemical Technology, China), Xue Bai (Beijing University of Chemical Technology, China), Haifeng Wang (Beijing University of Chemical Technology, China), and Yong Liu (Beijing University of Chemical Technology, China)</i>	
A Dynamic Resource Allocation Framework for Apache Spark Applications	981
<i>Kewen Wang (University of Connecticut, USA), Mohammad Maifi Hasan Khan (University of Connecticut, USA), and Nhan Nguyen (University of Connecticut, USA)</i>	
Boot Log Anomaly Detection with K-Seen-Before	989
<i>Johan Garcia (Karlstad University, Sweden) and Tobias Vehkajarvi (Karlstad University, Sweden)</i>	
Mining Timing Constraints from Event Logs for Process Model	995
<i>Zhenyu Zhang (San Diego State University), Chunhui Guo (California State University, Los Angeles), and Shangping Ren (San Diego State University)</i>	
Model Checking Software in Cyberphysical Systems	1001
<i>Marjan Sirjani (Malardalen University), Edward A. Lee (University of California Berkeley), and Ehsan Khamespanah (University of Tehran)</i>	
Developing Safe Smart Contracts	1011
<i>Sajjad Rezaei (University of Tehran), Ehsan Khamespanah (University of Tehran), Marjan Sirjani (Malardalen University), Ali Sedaghatbaf (Malardalen University), and Siamak Mohammadi (University of Tehran)</i>	

Application of Blockchain for Trusted Coordination in Collaborative Software Development	1020
<i>Stephen S. Yau (Arizona State University) and Jinal S. Patel (Arizona State University)</i>	

SISA

Smart-Power: A Smart Cyber-Physical System to Detect IoT Security Threat through Behavioral Power Profiling	1025
<i>AKM Jahangir Majumder (University of South Carolina Upstate), Jared D. Miller (University of South Carolina Upstate), Charles B. Veilleux (University of South Carolina Upstate), and Amir A. Asif (Holcombe Department of Electrical and Computer Engineering, Clemson University)</i>	
A Smart Cyber-Human System to Support Mental Well-Being through Social Engagement	1034
<i>AKM Jahangir Majumder (University of South Carolina Upstate), Jack Wilson Dedmond (Division of Mathematics and Computer Science University of South Carolina Upstate Spartanburg), Sean Jones (Division of Mathematics and Computer Science University of South Carolina Upstate Spartanburg), and Amir A. Asif (Holcombe Department of Electrical and Computer Engineering, Clemson University Clemson)</i>	
WoTnectivity: A Communication Pattern for Different Web of Things Connection Protocols	1043
<i>Manel Mena (University of Almería, Spain), Javier Criado (University of Almería, Spain), Luis Iribarne (University of Almería, Spain), and Antonio Leopoldo Corral Liria (University of Almería, Spain)</i>	
A Smart IoT Security System for Smart-Home Using Motion Detection and Facial Recognition	1049
<i>AKM Jahangir Majumder (University of South Carolina Upstate) and Joshua Aaron Izaguirre (University of South Carolina Upstate, SC, USA)</i>	
Blockchain in the Internet of Things: Architectures and Implementation	1056
<i>Oscar Delgado-Mohatar (Universidad Autonoma de Madrid, Spain), Ruben Tolosana (Universidad Autonoma de Madrid, Spain), Julian Fierrez (Universidad Autonoma de Madrid, Spain), and Aythami Morales (Universidad Autonoma de Madrid, Spain)</i>	

Fast Abstracts

Usable Everlasting Encryption using the Pornography Infrastructure (Fast Abstract)	1062
<i>Enka Blanchard (Digitrust, Loria, Université de Lorraine) and Siargey Kachanovich (Corpy & Co.)</i>	

Using the PerFECt Framework to Establish an Onlife Community for Theatre in Mathematics to Teach Principles of Computing	1064
<i>Nektarios Moumoutzis (Institute of Mathematics & Informatics, Bulgarian Academy of Sciences (IMI-BAS)), Dessislava Paneva-Marinova (Institute of Mathematics & Informatics, Bulgarian, Academy of Sciences (IMI-BAS), Sofia, Bulgaria), Chara Xanthaki (Computer Science Teacher in Secondary Education, Chania, Greece), Polyxeni Arapi (Lab. of Distr. Multimedia Inf. Systems & Applications, School of Electrical and Computer Engineering, Technical University of Crete (TUC/MUSIC), Chania, Greece), Nikos Pappas (Lab. of Distr. Multimedia Inf. Systems & Applications, School of Electrical and Computer Engineering, Technical University of Crete (TUC/MUSIC), Chania, Greece), and Stavros Christodoulakis (Lab. of Distr. Multimedia Inf. Systems & Applications, School of Electrical and Computer Engineering, Technical University of Crete (TUC/MUSIC), Chania, Greece)</i>	
Mobile Technology to Improve Physical Activity Among School-Aged Children in the United Arab Emirates	1066
<i>Amina Al-Marzouqi (University of Sharjah - United Arab Emirates), Nabeel Al-Yateem (University of Sharjah - United Arab Emirates), Syed Azizur Rahman (University of Sharjah - United Arab Emirates), Sheikh Iqbal Ahamed (Marquette University - USA), and Mohammad AlShabi (University of Sharjah - United Arab Emirates)</i>	
Analysing Privacy-Preserving Constraints in Microservices Architecture	1069
<i>Inna Vistbakka (Åbo Akademi University, Finland) and Elena Troubitsyna (KTH - Royal Institute of Technology, Sweden)</i>	
Abuse of the Cloud as an Attack Platform	1071
<i>Moitrayee Chatterjee (Texas Tech University), Prerit Datta (Texas Tech University), Faranak Abri (Texas Tech University), Akbar Siami Namin (Texas Tech University), and Keith S. Jones (Texas Tech University)</i>	
Compliance Requirements Checking in Variable Environments	1073
<i>Sara Sartoli (University of North Georgia), Sepideh Ghanavati (University of Maine), and Akbar Siami Namin (Texas Tech University)</i>	
Enhancing Proactive Control Mobile and Web Software Security Education with Hands-on Labware	1075
<i>Hossain Shahriar (Kennesaw State University), Kai Qian (Kennesaw State University), Atef Shalan (Georgia Southern University), and Fan Wu (Tuskegee University)</i>	
Google Scholar vs. Dblp vs. Microsoft Academic Search: An Indexing Comparison for Software Engineering Literature	1077
<i>Rubia Fatima (Tsinghua University, P.R.China), Affan Yasin (Tsinghua University, P.R.China), Lin Liu (Tsinghua University, P.R.China), and Jianmin Wang (Tsinghua University, P.R.China)</i>	
The Use of Grey Literature and Google Scholar in Software Engineering Systematic Literature Reviews	1079
<i>Rubia Fatima (Tsinghua University, P.R.China), Affan Yasin (Tsinghua University, P.R.China), Lin Liu (Tsinghua University, P.R.China), and Jianmin Wang (Tsinghua University, P.R.China)</i>	

Attacks and Mitigation Techniques for Iris-Based Authentication Systems	1081
<i>Laetitia Etienne (Kennesaw State University) and Hossain Shahriar (Kennesaw State University)</i>	
Does This Code Change Affect Program Behavior? Identifying Nonbehavioral Changes with Bytecode	1083
<i>Aoi Maejima (Osaka University), Yoshiki Higo (Osaka University), Junnosuke Matsumoto (Osaka University), and Shinji Kusumoto (Osaka University)</i>	
The Effect of Cognitive Load in Code Reading on Non-Programming Specific Environment	1085
<i>Hideaki Azuma (Osaka University, Japan), Shinsuke Matsumoto (Osaka University, Japan), Hidetake Uwano (National Institute of Technology, Japan), and Shinji Kusumoto (Osaka University, Japan)</i>	
A Study on Bottleneck Bandwidth Estimation Based on Acknowledge Reception on TCP BBR	1087
<i>Kanon Sasaki (Kogakuin University) and Saneyasu Yamaguchi (Kogakuin University)</i>	
Toward Ordering the Set of Modifications to Solve a Maintenance Request	1089
<i>Gustavo Villavicencio (Universidad Católica de Santiago del Estero, Argentina)</i>	
A Real-Time and Low-Cost Flash Flood Monitoring System to Support Transportation Infrastructure	1091
<i>Haroon Malik (Marshall University, Huntington, USA) and Wael Zatar (Marshall University, Huntington, USA)</i>	
Smart SE: Smart Systems and Services Innovative Professional Education Program	1093
<i>Hironori Washizaki (Waseda University), Kenji Tei (Waseda University), Kazunori Ueda (Waseda University), Hayato Yamana (Waseda University), Yoshiaki Fukazawa (Waseda University), Shinichi Honiden (Waseda University), Shoichi Okazaki (Waseda University), Nobukazu Yoshioka (National Institute of Informatics), and Naoshi Uchihira (Japan Advanced Institute of Science and Technology)</i>	
Towards Fast Data-Driven Smooth Path Planning with Fair Curves	1095
<i>Victor Parque (Waseda University) and Tomoyuki Miyashita (Waseda University)</i>	
Towards Software Value Co-Creation with AI	1097
<i>Hironori Washizaki (Waseda University / National Institute of Informatics / SYSTEM INFORMATION / eXmotion)</i>	
Value Driven Process Towards Software Engineering for Business and Society (SE4BS)	1099
<i>Hironori Washizaki (Waseda University / National Institute of Informatics / SYSTEM INFORMATION / eXmotion), Junzo Hagimoto (Takumi Business Place Corporation), Kazuo Hamai (NTT Comware Corporation / IIBA Japan Chapter), Mitsunori Seki (Growth Architectures & Teams, Inc.), Takeshi Inoue (Software Consultant), Shinya Taniguchi (Seiko Epson Corporation), Hiroshi Kobayashi (SYSTEM INFORMATION, CO., LTD.), Kenji Hiranabe (ESM, Inc.), and Eiichi Hanyuda (Mamezou Co., Ltd.)</i>	
Binary Similarity Analysis for Vulnerability Detection	1101
<i>Zeming Tai (Waseda University), Hironori Washizaki (Waseda University), Yoshiaki Fukazawa (Waseda University), Yurie Fujimatsu (Toshiba Corporation), and Jun Kanai (Toshiba Corporation)</i>	

Cache-Sharing Distributed Service Registry for Highly Dynamic V2X Environments	1103
<i>HyeongCheol Moon (Korea Advanced Institute of Science and Technology, Republic of Korea), KyeongDeok Baek (Korea Advanced Institute of Science and Technology, Republic of Korea), and In-Young Ko (Korea Advanced Institute of Science and Technology, Republic of Korea)</i>	
Using Recurrent Neural Network for Intelligent Prediction of Water Level in Reservoirs	1105
<i>Juntao Zhang (University of Nottingham, China), Ziyue Zhang (University of Nottingham, China), Ying Weng (University of Nottingham, UK), Simon Gosling (University of Nottingham, UK), Hui Yang (Ningbo Water Resources Bureau, China), Chenggang Yang (Ningbo Water Resources Bureau, China), Wenjie Li (Ningbo Water Resources Bureau, China), and Qun Ma (Ningbo Water Resources Bureau, China)</i>	
Towards a Modular and Customisable Model-Based Architecture for Autonomous Drones	1107
<i>Matheus Ladeira (LIAS Lab - ISAE ENSMA), Yassine Ouhammou (LIAS Lab - ISAE ENSMA), and Emmanuel Grolleau (LIAS Lab - ISAE ENSMA)</i>	
VRvisu++: A Tool for Virtual Reality-Based Visualization of MRI Images	1109
<i>Sandeep Reddivari (University of North Florida) and Jason Smith (School of Computing)</i>	
Learning Environment Containerization of Machine Learning for Cybersecurity	1111
<i>Hossain Shahriar (Kennesaw State University), Kai Qian (Kennesaw State University), and Hao Zhang (Kennesaw State University)</i>	

COMPSAC 2020 Workshops

ADMNET

On Delay Bounds and Measurements: A COTS Testbed for Network Performance Experimentation	1113
<i>Bruno Cattelan (TU Kaiserslautern, DISCO , Distributed Computer Systems Lab) and Steffen Bondorf (Ruhr University Bochum, Faculty of Mathematics, Center of Computer Science)</i>	
Mechanism of Cyclic Performance Fluctuation of TCP BBR and CUBIC TCP Communications	1119
<i>Kouto Miyazawa (Kogakuin University, Japan), Saneyasu Yamaguchi (Kogakuin University, Japan), and Aki Kobayashi (Kogakuin University, Japan)</i>	
Cache Management with Fadvice Based on LFU	1125
<i>Naomichi Fukuda (Kogakuin University Graduate School), Taisei Miura (Kogakuin University Graduate School), Kenichi Kourai (Kyushu Institute of Technology), and Saneyasu Yamaguchi (Kogakuin University Graduate School)</i>	
On the Optimal Cache Allocation in Information-Centric Networking	1131
<i>Jo Hagikura (Kwansei Gakuin University), Ryo Nakamura (Fukuoka University), and Hiroyuki Ohsaki (Kwansei Gakuin University)</i>	
On the Performance of End-to-End Routing in Complex Networks with Intermittent Links	1137
<i>Michika Ohnishi (Kwansei Gakuin University, Japan), Chuta Minamiguchi (Kwansei Gakuin University, Japan), and Hiroyuki Ohsaki (Kwansei Gakuin University, Japan)</i>	

MECPerf: An Application-Level Tool for Estimating the Network Performance in Edge Computing Environments	1143
<i>Chiara Caiazza (University of Florence), Leonardo Bernardi (University of Pisa), Marco Bevilacqua (University of Pisa), Alessandro Cabras (University of Pisa), Claudio Cicconetti (IIT-CNR), Valerio Luconi (IIT-CNR), Gabriele Sciurti (University of Pisa), Elisabetta Senore (University of Pisa), Emilio Vallati (University of Pisa), and Alessio Vecchio (University of Pisa)</i>	
Routing and Capacity Optimization Based on Estimated Latent OD Traffic Demand	1149
<i>Takumi Uchida (International Christian University, Japan), Keisuke Ishibashi (International Christian University, Japan), and Kensuke Fukuda (National Institute of Informatics, Japan)</i>	
Adaptive OS Switching for Improving Availability During Web Traffic Surges: A Feasibility Study	1156
<i>Katsuya Matsubara (Future University Hakodate, Japan) and Yuhei Takagawa (Future University Hakodate, Japan)</i>	

AIML

Using Blockchain Technologies to Improve Security in Federated Learning Systems	1163
<i>Andrew Ronald Short (University of West Attica, Greece), Helen C. Leligou (University of West Attica, Greece), Michael Papoutsidakis (University of West Attica, Greece), and Efstathios Theocharis (University of West Attica, Greece)</i>	
An Empirical Study on Algorithmic Bias	1169
<i>Sajib Sen (University of Memphis), Dipankar Dasgupta (University of Memphis), and Kishor Datta Gupta (University of Memphis)</i>	
Bat Algorithm Method for Automatic Determination of Color and Contrast of Modified Digital Images	1175
<i>Akemi Galvez (Toho University, Japan & University of Cantabria, Spain), Andres Iglesias (Toho University, Japan & University of Cantabria, Spain), Eneko Osaba (Tecnalia Basque Research and Technology Alliance (BRTA), Spain), and Javier Del Ser (TECNALIA, Basque Research and Technology Alliance (BRTA), Spain & University of Basque Country, Spain)</i>	
Unification of Machine Learning Features	1181
<i>Jayesh Patel (Rockstar Games)</i>	

AIOT

Transtracer: Socket-Based Tracing of Network Dependencies Among Processes in Distributed Applications	1186
<i>Yuuki Tsubouchi (SAKURA internet Inc.), Masahiro Furukawa (Hatena Co., Ltd.), and Ryosuke Matsumoto (SAKURA internet Inc.)</i>	

Discrimination of Sugarcane Varieties by Remote Sensing: A Review of Literature	1192
<i>Priscila M. Kai (Universidade Federal de Goias), Ronaldo M. da Costa (Universidade Federal de Goias), Bruna M. de Oliveira (Universidade Federal de Goias), Deborah S. A. Fernandes (Universidade Federal de Goias), Juliana Felix (Universidade Federal de Goias), and Fabrizzio Soares (Southern Oregon University, Universidade Federal de Goias)</i>	
Few-Shot Ontology Alignment Model with Attribute Attentions	1198
<i>Jingyu Sun (NTT Software Innovation Center, NTT Corporation), Susumu Takeuchi (NTT Software Innovation Center, NTT Corporation), and Ikuo Yamasaki (NTT Software Innovation Center, NTT Corporations)</i>	
Proposal of a Logical Sensor Architecture using WoT-Based Edge Microservices	1203
<i>Kazuki Miyagoshi (Osaka University, Japan), Yuuichi Teranishi (National Institute of Information and Communications Technology, Osaka University, Japan), Tomoya Kawakami (Fukui University, Osaka University, Japan), Tomoki Yoshihisa (Osaka University, Japan), and Shinji Shimojo (Osaka University, Japan)</i>	

BDCAA

SLA+: Narrowing the Difference between Data Sets in Heterogenous Cross-Project Defection Prediction	1209
<i>Jie Wu (Chongqing University), Yingbo Wu (Chongqing University), Min Zhou (Chongqing University), and Xiaoling Jiang (Chongqing University)</i>	
TRUSTD: Combat Fake Content using Blockchain and Collective Signature Technologies	1215
<i>Zakwan Jaroucheh (Edinburgh Napier University), Mohamad Alissa (Edinburgh Napier University), William J Buchanan (Edinburgh Napier University), and Xiaodong Liu (Edinburgh Napier University)</i>	
Reconstructing Compound Affective States using Physiological Sensor Data	1221
<i>Piyush Saxena (Direct Supply), Sarthak Dabas (Marquette Univeristy), Devansh Saxena (Marquette University), Nithin Ramachandran (Direct Supply), and Sheikh Iqbal Ahamed (Marquette University)</i>	
Towards Aggregation Based I/O Optimization for Scaling Bioinformatics Applications	1230
<i>Jack Stratton (Western Washington University), Michael Albert (Western Washington University), Quentin Jensen (Western Washington University), Max Ismailov (Western Washington University), Filip Jagodzinski (Western Washington University), and Tanzima Islam (Texas State University)</i>	

CCR

Deep Learning for Visual Segmentation: A Review	1236
<i>Jiaying Sun (Yangzhou University), Yujie Li (Fukuoka University), Huimin Lu (Kyushu Institute of Technology), Tohru Kamiya (Kyushu Institute of Technology), and Seiichi Serikawa (Kyushu Institute of Technology)</i>	

Data Analytics for the COVID-19 Epidemic	1241
<i>Ranran Wang (Zhongnan University of Economics and Law), Gang Hu (Zhongnan University of Economics and Law), Chi Jiang (Zhongnan University of Economics and Law), Huimin Lu (Kyushu Institute of Technology), and Yin Zhang (University of Electronic Science and Technology of China)</i>	
Kiwifruit Leaf Disease Identification Using Improved Deep Convolutional Neural Networks	1247
<i>Bin Liu (Northwest A&F University), Zefeng Ding (Northwest A&F University), Yun Zhang (Sun Yat-sen University), Dongjian He (Northwest A&F University), and Jinrong He (Yan'an University)</i>	

CDS

Smartphone Sensors for Modeling Human-Computer Interaction: General Outlook and Research Datasets for User Authentication	1253
<i>Alejandro Acien (Universidad Atonoma de Madrid), Aythami Morales (Universidad Autónoma de Madrid), Ruben Vera-Rodriguez (Universidad Autonoma de Madrid), and Julian Fierrez (Universidad Autonoma de Madrid)</i>	
Remote Assessing Children's Handwriting Spelling on Mobile Devices	1259
<i>Jaline Mombach (Universidade Federal de Goias), Fábio Diniz Rossi (Instituto Federal Farroupilha), Juliana Felix (Universidade Federal de Goias), and Fabrizio Soares (Southern Oregon University; Universidade Federal de Goias)</i>	
Estimation of Grasp States in Prosthetic Hands using Deep Learning	1265
<i>Victor Parque (Waseda University) and Tomoyuki Miyashita (Waseda University)</i>	

DADA

An Approach to Improving the Effectiveness of Data Augmentation for Deep Neural Networks ..	1270
<i>Seunghui Jang (Towson University, USA), Ki Yong Lee (Sookmyung Women's University, South Korea), and Yanggon Kim (Towson University, USA)</i>	
Data-Driven Adaptive Regularized Risk Forecasting	1276
<i>You Liang (Ryerson University), Aerambamoorthy Thavaneswaran (University of Manitoba), Zimo Zhu (University of Manitoba), Ruppa K. Thulasiram (University of Manitoba), and Md. Erfanul Hoque (University of Manitoba)</i>	
Modeling of Short-Term Electricity Demand and Comparison of Machine Learning Approaches for Load Forecasting	1282
<i>Behrouz Banitalebi (University of Manitoba), Srimantoora S. Appadoo (University of Manitoba), Aerambamoorthy Thavaneswaran (University of Manitoba), and Md. Erfanul Hoque (University of Manitoba)</i>	
Portfolio Optimization Using a Novel Data-Driven EWMA Covariance Model with Big Data	1288
<i>Zimo Zhu (University of Manitoba), Aerambamoorthy Thavaneswaran (University of Manitoba), Alexander Paseka (University of Manitoba), Julieta Frank (University of Manitoba), and Ruppa Thulasiram (University of Manitoba)</i>	

Dynamic Data Science Applications in Optimal Profit Algorithmic Trading	1294
<i>You Liang (Ryerson University), Aerambamoorthy Thavaneswaran (University of Manitoba), Na Yu (Ryerson University), Md. Erfanul Hoque (University of Manitoba), and Ruppa K. Thulasiram (University of Manitoba)</i>	
Ensemble Learning for Detecting Fake Reviews	1300
<i>Luis Gutierrez-Espinoza (Texas Tech University), Faranak Abri (Texas Tech University), Akbar Siami Namin (Texas Tech University), Keith S. Jones (Texas Tech University), and David R. W. Sears (Texas Tech University)</i>	
Ensemble Random Forests Classifier for Detecting Coincidentally Correct Test Cases	1306
<i>Shuvalaxmi Dass (Texas Tech University), Xiaozhen Xue (Adobe Inc.), and Akbar Siami Namin (Texas Tech University)</i>	
Seq2Image: Sequence Analysis using Visualization and Deep Convolutional Neural Network	1312
<i>Neda Tavakoli (Georgia Institute of Technology)</i>	

DBDM

Intelligent Application Switch and Key-Value Store Accelerated by Dynamic Caching	1318
<i>Tomoaki Kanaya (Kogakuin University Graduate School), Akihiro Nakao (Tokyo University), Shu Yamamoto (Tokyo University), Masato Oguchi (Ochanomizu University), and Saneyasu Yamaguchi (Kogakuin University)</i>	
Experimenting and Assessing a Distributed Privacy-Preserving OLAP over Big Data Framework: Principles, Practice, and Experiences	1324
<i>Alfredo Cuzzocrea (University of Calabria), Vincenzo De Maio (TU Wien), and Edoardo Fadda (Politecnico di Torino)</i>	
Towards Efficient and Secure Analysis of Large Datasets	1331
<i>Stelvio Cimato (Università degli studi di Milano, Italy) and Stefano Nicolò (Università degli studi di Milano, Italy)</i>	
A Framework for Fast MapReduce Processing Considering Sensitive Data on Hybrid Clouds	1332
<i>Shun Kawamoto (Hiroshima City University, Japan), Yoko Kamidoi (Hiroshima City University), and Shin'ichi Wakabayashi (Hiroshima City University, Japan)</i>	

ESAS

A Case for Semantic Annotation Of EHR	1338
<i>Sreenivasan M (National Institute of Technology Calicut) and Anu Chacko (National Institute of Technology Calicut)</i>	
An Evaluation of Reverse Image Search Performance of Google	1343
<i>Yiltan Bitirim (Eastern Mediterranean University, North Cyprus, via Mersin 10, Turkey), Selin Bitirim (Eastern Mediterranean University, North Cyprus, via Mersin 10, Turkey), Duygu Celik Ertugrul (Eastern Mediterranean University, North Cyprus, via Mersin 10, Turkey), and Onsen Toygar (Eastern Mediterranean University, North Cyprus, via Mersin 10, Turkey)</i>	

Capturing Causal Knowledge from Authoritative Medical Ontologies	1348
<i>Hengyi Hu (George Mason University) and Larry Kerschberg (George Mason University)</i>	
Modeling an AR Serious Game to Increase Attention of ADHD Patients	1354
<i>Saad Alqithami (Albaha University, Saudi Arabia)</i>	
Remote Heart Rate and Heart Rate Variability Detection and Monitoring from Face Video with Minimum Resources	1360
<i>Kazi Shafiul Alam (Marquette University, USA), Lin He (Marquette University, USA), Jiachen Ma (Marquette University, USA), Dipranjan Das (Marquette University, USA), Mike Yap (Conscious, Canada), Boris Kerjner (Conscious, Canada), Siam Rezwan (Johns Hopkins University, USA), Anik Iqbal (Marquette University, USA), and Sheikh Iqbal Ahamed (Marquette University, USA)</i>	

ICT4SmartGrid

Impacts of Size and History Length on Energetic Community Load Forecasting: A Case Study	1366
<i>Mickael Tits (CETIC - Centre d'Excellence en Technologies de l'Information et de la Communication, France), Benjamin Bernaud (CETIC - Centre d'Excellence en Technologies de l'Information et de la Communication, France), Amel Achour (CETIC - Centre d'Excellence en Technologies de l'Information et de la Communication, France), Maher Badri (CETIC - Centre d'Excellence en Technologies de l'Information et de la Communication, France), and Lotfi Guedria (CETIC - Centre d'Excellence en Technologies de l'Information et de la Communication, France)</i>	
Optimization of Large-Scale Commercial Electric Vehicles Fleet Charging Location Schedule Under the Distributed wind Power Supply	1373
<i>Teng Long (Tsinghua University, China) and Qing-Shan Jia (Tsinghua University, China)</i>	
GAMES: a General-Purpose Architectural Model for Multi-Energy System Engineering Applications	1380
<i>Luca Barbierato (Politecnico di Torino), Daniele Salvatore Schiera (Politecnico di Torino), Edoardo Patti (Politecnico di Torino), Enrico Macii (Politecnico di Torino), Enrico Pons (Politecnico di Torino), Ettore Francesco Bompard (Politecnico di Torino), Andrea Lanzini (Politecnico di Torino), Romano Borchiellini (Politecnico di Torino), and Lorenzo Bottaccioli (Politecnico di Torino)</i>	
Optimal Configuration and Placement of PV Systems in Building Roofs with Cost Analysis	1386
<i>Matteo Orlando (Politecnico di Torino), Lorenzo Bottaccioli (Politecnico di Torino), Edoardo Patti (Politecnico di Torino), Enrico Macii (Politecnico di Torino), Sara Vinco (Politecnico di Torino), and Massimo Poncino (Politecnico di Torino)</i>	

IEESD

A Resource-Saving Approach for Adding Redundancy to a Network-on-Chip System	1392
<i>Osadchuk Andriy (Technische Universität Ilmenau, Germany), Däne Bernd (Technische Universität Ilmenau, Germany), and Fengler Wolfgang (Technische Universität Ilmenau, Germany)</i>	

Anomaly Detection for Automotive Diagnostic Applications Based on N-Grams	1398
<i>Marcel Rumez (Karlsruhe University of Applied Sciences, Germany), Jinghua Lin (Karlsruhe University of Applied Sciences, Germany), Thomas Fuchß (Karlsruhe University of Applied Sciences, Germany), Reiner Kriesten (Karlsruhe University of Applied Sciences, Germany), and Eric Sax (Karlsruhe Institute of Technology, Germany)</i>	

MediComp

Techniques and Equipment for Automated Pupillometry and its Application to Aid in the Diagnosis of Diseases: A Literature Review	1405
<i>Higor Pereira Delfino (Instituto de Informatica, Universidade Federal de Goiás), Ronaldo Martins da Costa (Universidade Federal de Goiás), Juliana Felix (Universidade Federal de Goiás), João Gabriel Junqueira da Silva (Universidade Federal de Goiás), Hedenir Monteiro Pinheiro (Universidade Federal de Goiás), Vilson Soares de Siqueira (Universidade Federal de Goiás), Eduardo Nery Rossi Camilo (Fundação Banco de Olhos de Goiás), Deborah Silva Alves Fernandes (Universidade Federal de Goiás), and Fabrizio Soares (Southern Oregon University, Universidade Federal de Goiás)</i>	
EmCARE Applications in Managing the Emotional Skills of Children and Adolescents in the United Arab Emirates	1409
<i>Nabeel Al-Yateem (University of Sharjah - United Arab Emirates), Syed Azizur Rahman (University of Sharjah - United Arab Emirates), Amina Al-Marzouqi (University of Sharjah - United Arab Emirates), Sheikh Iqbal Ahamed (Marquette University - USA), and Mohammad AlShabi (University of Sharjah - United Arab Emirates)</i>	
A Comparative Evaluation of Heart Rate Estimation Methods using Face Videos	1413
<i>Javier Hernandez-Ortega (Universidad Autonoma de Madrid, Spain), Julian Fierrez (Universidad Autonoma de Madrid, Spain), Aythami Morales (Universidad Autonoma de Madrid, Spain), and David Diaz (Universidad Autonoma de Madrid, Spain)</i>	
A Two-Step Password Authentication System for Alzheimer Patients	1419
<i>Jamesa Hogges (Kennesaw State University), Hossain Shahriar (Kennesaw State University), Sweta Sneha (Kennesaw State University), and Sheikh Ahamed (Marquette University)</i>	
Automatic Orientation Identification of Pediatric Chest X-Rays	1424
<i>Afonso Fonseca (Universidade Federal de Goiás), Gabriel Silva Vieira (Instituto Federal Goiano - Campus Urutai), Juliana Felix (Universidade Federal de Goiás), Paulo Freire Sobrinho (Universidade Federal da Grande Dourados), Áurea Valéria Pereira Silva (Universidade do Estado do Mato Grosso), and Fabrizio Soares (Southern Oregon University; Universidade Federal de Goiás)</i>	

Exploiting Ensemble Classification Schemes to Improve Prognosis Process for Large for Gestational Age Fetus Classification 1430
Faheem Akhtar (Beijing University of Technology, China; Sukkur IBA University, Pakistan), Jianqiang Li (Beijing University of Technology, China), Pei Yan (University of Aizu, Japan), Azhar Imran (Beijing University of Technology, China), Gul Muhammad Shaikh (Sukkur IBA University, Pakistan), and Chun Xu (Xinjiang University of Finance and Economics, China)

CHOCSLAT: Chinese Healthcare-Oriented Computerised Speech & Language Assessment Tools 1435
Dave Towey (University of Nottingham Ningbo China, People's Republic of China), Lixian Jin (University of Nottingham Ningbo China, People's Republic of China), Hua Zhu (University of Birmingham, U.K), Jiaye Zhu (University of Birmingham, Birmingham, U.K), Kangming Feng (University of Nottingham Ningbo China, People's Republic of China), Huili Geng (University of Nottingham Ningbo China, People's Republic of China), Jing Lu (University of Nottingham Ningbo China, People's Republic of China), Tianyi Yu (University of Nottingham Ningbo China, People's Republic of China), and Yu Wang (University of Nottingham Ningbo China, People's Republic of China)

Multi-Frame Dimensionality-Reduction Difference Method for Extracting Key Frames of Video .. 1441
Shuaipeng Cai (Beijing University of Posts and Telecommunications , China), Qinyan Zhang (Beijing University of Posts and Telecommunications , China), Qing Wang (Tsinghua University , China), Yi Lei (Beijing Dfusion Co., Ltd. , China), and Jijiang Yang (Tsinghua University , China)

MVDA

Scalable Impact Range Detection against Newly Added Rules for Smart Network Verification 1446
Yutaka Takita (Fujitsu Laboratories Limited), Masatake Miyabe (Fujitsu Laboratories Limited), Hiroshi Tomonaga (Fujitsu Laboratories Limited), and Naoki Oguchi (Fujitsu Laboratories Limited)

Dynamic Fault Management in Service Function Chaining 1452
Shih-Ying Song (National Chiao Tung University, Taiwan) and Fuchun Joseph Lin (National Chiao Tung University, Taiwan)

Message-Passing Based Communication via Synchronous Execution (Channels) 1458
Nayef H. Alshammari (De Montfort University, United Kingdom)

NETSAP

Divider: Delay-Time Based Sender Identification in Automotive Networks 1465
Shuji Ohira (Nara Institute of Science and Technology), Araya Kibrom Desta (Nara Institute of Science and Technology), Tomoya Kitagawa (Nara Institute of Science and Technology), Ismail Arai (Nara Institute of Science and Technology), and Fujikawa Kazutoshi (Nara Institute of Science and Technology)

Scan-Based Self Anomaly Detection: Client-Side Mitigation of Channel-Based Man-in-the-Middle Attacks Against Wi-Fi	1473
<i>Sheng Gong (The University of Tokyo, Japan), Hideya Ochiai (The University of Tokyo, Japan), and Hiroshi Esaki (The University of Tokyo, Japan)</i>	
Anomalous IP Address Detection on Traffic Logs Using Novel Word Embedding	1479
<i>Satoru Koda (Fujitsu Laboratories LTD., Japan), Yusuke Kambara (Fujitsu Laboratories LTD., Japan), Takanori Oikawa (Fujitsu Laboratories LTD., Japan), Kazuyoshi Furukawa (Fujitsu Laboratories LTD., Japan), Yuki Unno (Fujitsu Laboratories LTD., Japan), and Masahiko Murakami (Fujitsu Laboratories LTD., Japan)</i>	
Attack Intention Estimation Based on Syntax Analysis and Dynamic Analysis for SQL Injection	1485
<i>Kotomi Kuroki (NTT Secure Platform Laboratories), Yo Kanemoto (NTT Secure Platform Laboratories), Kazufumi Aoki (NTT Secure Platform Laboratories), Yasuhiro Noguchi (Shizuoka university), and Masakatsu Nishigaki (Shizuoka university)</i>	

OER

The Development of Emerging Technological Applications for Not-for-Profit Organizations in Capstone Projects: A Case in Scout Association of Hong Kong	1491
<i>Cheuk Hang Au (The University of Sydney) and Richard Wing Cheung Lui (The Hong Kong Polytechnic University)</i>	
Model-Driven-Design of NREn Bridging Application: Case Study AfgREN	1497
<i>Salim Saay (Lero - The SFI Software Research Centre, University of Limerick, Limerick, Ireland) and Tiziana Margaria (CSIS and Lero -The SFI Software Research Centre, University of Limerick, Limerick, Ireland)</i>	
A Virtual Reality OER Platform to Deliver Phobia-Motivated Experiences	1503
<i>Denis Stepanov (University of Nottingham Ningbo China, People's Republic of China), Dave Towey (University of Nottingham Ningbo China, People's Republic of China), Tsong Yueh Chen (Swinburne University of Technology, Australia), and Zhi Quan Zhou (University of Wollongong, Australia)</i>	

QUORS

Refactoring Software in the Automotive Domain for Execution on Heterogeneous Platforms	1509
<i>Hugo Andrade (Chalmers University of Technology), Ivica Crnkovic (Chalmers University of Technology), and Jan Bosch (Chalmers University of Technology)</i>	
Comprehensive Review of Collaborative Network Attacks in MANET	1517
<i>Olufemi Fasunlade (University of Portsmouth, United Kingdom), Shikun Zhou (University of Portsmouth, United Kingdom), and David Sanders (University of Portsmouth, United Kingdom)</i>	

An Intelligent Health Analysis Approach to Detecting Potential Threats with Health Data Reuse	1521
<i>Fengbao Ma (Beijing Institute of Fashion Technology), Hongji Yang (Leicester University), William C. Chu (Tunhai University), and Qinyun Liu (Bath Spa University)</i>	
SoCeR: A New Source Code Recommendation Technique for Code Reuse	1527
<i>Md Mazharul Islam (Missouri State University) and Razib Iqbal (Missouri State University)</i>	

SAPSE

Cloud: A Platform To Launch Stealth Attacks	1533
<i>Moitrayee Chatterjee (Texas Tech University), Prerit Datta (Texas Tech University), Faranak Abri (Texas Tech University), Akbar Siami Namin (Texas Tech University), and Keith S. Jones (Texas Tech University)</i>	
Advanced, Privacy-Preserving and Approximate Big Data Management and Analytics in Distributed Environments: What is Now and What is Next	1539
<i>Alfredo Cuzzocrea (University of Calabria)</i>	

SCA

Smart Contract Microservitization	1544
<i>Siyuan Wang (Beihang University), Xuehan Zhang (Beihang University), Wei Yu (Beihang University), Kai Hu (Beihang University), and Jian Zhu (Beihang University)</i>	
Smart Computing Applications Using BLE and Mobile Intercloud Technologies	1550
<i>Yik Him Ho (The Hong Kong Polytechnic University, Hong Kong), Yerkezhan Sartayeva (The Hong Kong Polytechnic University, Hong Kong), Chak Pang Chiu (The Hong Kong Polytechnic University, Hong Kong), and Henry C. B. Chan (The Hong Kong Polytechnic University, Hong Kong)</i>	

SDIM

Making More Extensive and Efficient Typo-Tolerant Password Checkers	1556
<i>Enka Blanchard (Digitrust, Loria, Université de Lorraine)</i>	
Handwritten Signature Authentication Using Smartwatch Motion Sensors	1564
<i>Gen Li (The University of Tokyo) and Hiroyuki Sato (The University of Tokyo)</i>	
Centralized Control of Account Migration at Single Sign-On in Shibboleth	1572
<i>Satsuki Nishioka (Kyoto University) and Yasuo Okabe (Kyoto University)</i>	
Keystroke Biometrics in Response to Fake News Propagation in a Global Pandemic	1579
<i>Aythami Morales (Universidad Autonoma de Madrid), Alejandro Acien (Universidad Autonoma de Madrid), Julian Fierrez (Universidad Autonoma de Madrid), John V. Monaco (Naval Postgraduate School), Ruben Tolosana (Universidad Autonoma de Madrid), Ruben Vera (Universidad Autonoma de Madrid), and Javier Ortega-Garcia (Universidad Autonoma de Madrid)</i>	

Password Guessing-Based Legacy-UI Honeywords Generation Strategies for Achieving Flatness .	1585
<i>Muhammad Ali Fauzi (Norwegian University of Science and Technology (NTNU), Norway), Bian Yang (Norwegian University of Science and Technology (NTNU), Norway), and Edlira Martiri (Norwegian University of Science and Technology (NTNU), Norway)</i>	
Identity Management and Access Control for the GNSS Community within a European Research Infrastructure	1591
<i>José Manteigueiro (C4G - Collaboratory for Geosciences), Paul Crocker (Institute of Telecommunications), and Carlos Barrico (INESC Coimbra)</i>	

SECE

A Proposal for Edge Application Framework for Smart Factory	1597
<i>Masaki Sakai (Shibaura Institute of Technology, Japan), Tsuyoshi Nakajima (Shibaura Institute of Technology, Japan), and Kazuya Takahashi (Edgexcross consortium)</i>	
Performance Modeling of Publish/Subscribe Middleware Components	1603
<i>Aleksandar Antonic (University of Zagreb) and Martina Antonic (University of Zagreb)</i>	

SESS

A Neural Network for Interpolating Light-Sources	1609
<i>Simon Colreavy-Donnelly (De Montfort University), Stefan Kuhn (De Montfort University), Fabio Caraffini (De Montfort University), Stuart O'Connor (De Montfort University), Zacharias Anastassi (De Montfort University), and Simon Coupland (De Montfort University)</i>	
A NIS Directive Compliant Cybersecurity Maturity Assessment Framework	1616
<i>George Drivas (University of Piraeus), Argyro Chatzopoulou (APIROPLUS Solutions), Leandros Maglaras (De Montfort University), Costas Lambrinouidakis (University of Piraeus), Allan Cook (De Montfort University), and Helge Janicke (De Montfort University)</i>	
Analysing Petri Nets in a Calculus of Context-Aware Ambients	1622
<i>Francois Sieve (De Montfort University, United Kingdom), Vasileios Germanos (De Montfort University, United Kingdom), and Wen Zeng (De Montfort University, United Kingdom)</i>	
MRFS: A Multi-Resource Fair Scheduling Algorithm in Heterogeneous Cloud Computing	1628
<i>Hamed Hamzeh (Bournemouth University), Sofia Meacham (Bournemouth University), Kashaf Khan (British Telecom), Keith Phalp (Bournemouth University), and Angelos Stefanidis (Bournemouth University)</i>	
Interaction with Smartwatches Using Gesture Recognition: A Systematic Literature Review	1636
<i>Thamer Horbylon Nascimento (Instituto Federal Goiano; Universidade Federal de Goiás), Cristiane B. R. Ferreira (Universidade Federal de Goiás), Wellington G. Rodrigues (Universidade Federal de Goiás), and Fabrizio Soares (Southern Oregon University; Universidade Federal de Goiás)</i>	

SIS-SS

LESAR: Localization System for Environmental Sensors using Augmented Reality	1642
<i>Atsushi Tagami (KDDI Research, Japan) and Zhishu Shen (KDDI Research, Japan)</i>	
A Systematic Literature Review of Machine Learning-Based Disease Profiling and Personalized Treatment	1648
<i>Ricardo Buettner (Aalen University, Germany), Florian Klenk (Aalen University, Germany), and Marc Ebert (Aalen University, Germany)</i>	
Optimizing MAC Layer Performance for Wireless Sensor Networks in eHealth	1654
<i>Anwar Khan (Institute of Business Administration), Shama Siddiqui (DHA Suffa University), and Sayeed Ghani (Institute of Business Administration)</i>	
GSP for Virtual Sensors in eHealth Applications	1658
<i>Mehmet Ali Erturk (Istanbul University, Istanbul) and Luca Vollero (Università Campus Bio-Medico di Roma)</i>	

SoNeC

Understanding Veterans Expression of Anger Using Social Media Analysis	1664
<i>Nadiyah Johnson (Marquette University), Joseph Coelho (Marquette University), Md Fitrat Hossain (Marquette University), Thomas Kissane (Marquette University), Wylie Frydrychowicz (Marquette University), Madiraju Praveen (Marquette University), Zeno Franco (Medical College of Wisconsin), Katinka Hooyer (Medical College of Wisconsin), Priyanka Annareddy (Marquette University), and Sheikh Iqbal Ahmed (Marquette University)</i>	
Differentially Private Generation of Social Networks via Exponential Random Graph Models	1670
<i>Fang Liu (University of Notre Dame, IN, USA), Evercita Eugenio (Sandia National Laboratories, CA, USA), Ick Hoon Jin (Yonsei University, Seoul, Korea), and Claire Bowen (Urban Institute, Washington, D.C.)</i>	
Visualization for Analyzing Usage Status from Dialogue Systems	1676
<i>Yosuke Seki (Tokushima University)</i>	
Predicting the Political Polarity of Tweets Using Supervised Machine Learning	1682
<i>Michelle Voong (Univ. of Connecticut), Keerthana Gunda (Univ. of Connecticut), and Swapna S. Gokhale (Univ. of Connecticut)</i>	

SSML

Blockchain-Based Transaction Management in Smart Logistics: a Sawtooth Framework	1688
<i>Guido Perboli (Politecnico di Torino), Vittorio Capocasale (Politecnico di Torino), and Danilo Gotta (TIM)</i>	
Taxi Demand Prediction using an LSTM-Based Deep Sequence Model and Points of Interest	1694
<i>Bahman Askari (Leibniz University Hanover, Germany), Tai Le Quy (Leibniz University Hanover, Germany), and Eirini Ntoutsis (Leibniz University Hanover, Germany)</i>	

The European Concept of Smart City: A Taxonomic Analysis	1700
<i>Guido Perboli (Politecnico di Torino, Italy), Stanislav Fedorov (Politecnico di Torino, Italy), and Mariangela Rosano (Politecnico di Torino, Italy)</i>	
Estimating e-Consumers' Attitude Towards Parcel Locker Usage	1706
<i>Ionut Alexandru Mitrea (Politecnico di Torino, Italy), Giovanni Zenezini (Politecnico di Torino, Italy), Alberto De Marco (Politecnico di Torino, Italy), Filippo Maria Ottaviani (Politecnico di Torino, Italy), Tiziana Delmastro (LINKS Foundation, Italy), and Cristiana Botta (LINKS Foundation, Italy)</i>	
A Blockchain Token Economy Model for Financing a Decentralized Electric Vehicle Charging Platform	1712
<i>Vladislav Aistov (University of Mannheim), Benedikt Kirpes (University of Mannheim), and Micha Roon (Share&Charge Foundation)</i>	

STA

Testing Convolutional Neural Network using Adversarial Attacks on Potential Critical Pixels	1718
<i>Bo-Ching Lin (National Chiao Tung University, Taiwan), Hwai-Jung Hsu (Feng Chia University, Taiwan), and Shih-Kun Huang (National Chiao Tung University, Taiwan)</i>	
A Hybrid Algorithms Construction of Hyper-Heuristic for Test Case Prioritization	1724
<i>Zheng Li (Beijing University of Chemical Technology, China), Yanzhao Xi (Beijing University of Chemical Technology, China), and Ruilian Zhao (Beijing University of Chemical Technology, China)</i>	
A Method to Mask Dynamic Content Areas Based on Positional Relationship of Screen Elements for Visual Regression Testing	1730
<i>Yu Adachi (Software Innovation Center, NTT, Tokyo, Japan), Haruto Tanno (Software Innovation Center, NTT, Tokyo, Japan), and Yu Yoshimura (Software Innovation Center, NTT, Tokyo, Japan)</i>	

STPSA

sshr: An SSH Proxy Server Responsive to System Changes without Forcing Clients to Change	1736
<i>Hirofumi Tsuruta (SAKURA internet Inc.) and Ryosuke Matsumoto (SAKURA internet Inc.)</i>	
Security and Privacy Analysis of Wearable Health Device	1742
<i>Chi Zhang (Kennesaw State University), Hossain Shahriar (Kennesaw State University), and A B M Kamrul Riad (Kennesaw State University)</i>	
Understanding Social Engineers Strategies from the Perspective of Sun-Tzu Philosophy	1748
<i>Affan Yasin (Tsinghua University, P.R.China), Rubia Fatima (Tsinghua University, P.R.China), Lin Liu (Tsinghua University, P.R.China), Jianmin Wang (Tsinghua University, P.R.China), and Raian Ali (Hamad Bin Khalifa University, Qatar)</i>	

Hands-on Lab on Smart City Vulnerability Exploitation	1752
<i>Andrew Gomez (Kennesaw State University), Hossain Shahriar (Kennesaw State University), Victor Clincy (Kennesaw State University), and Atef Shalan (Georgia Southern University)</i>	
A Method for Assessing the Reliability of Business Processes that Reflects Transaction Documents Checking for each Department	1758
<i>Takafumi Komoto (National Institute of Informatics), Kokichi Futatsugi (Japan Advanced Institute of Science and Technology), and Nobukazu Yoshioka (National Institute of Informatics, Japan)</i>	
An Improved Design Scheme for Perceptual Hashing Based on CNN for Digital Watermarking ...	1764
<i>Zhaoxiong Meng (Kanagawa University, Japan), Tetsuya Morizumi (Kanagawa University, Japan), Sumiko Miyata (Shibaura Institute of Technology, Japan), and Hirotsugu Kinoshita (Kanagawa University, Japan)</i>	
Evolutionary Algorithms for Vulnerability Coverage	1770
<i>Shuvalaxmi Dass (Texas Tech University) and Akbar Siami Namin (Texas Tech University)</i>	
A Formal Analysis of Moving Target Defense	1777
<i>Muhammad Abdul Basit Ur Rahim (University of North Carolina at Charlotte), Qi Duan (University of North Carolina at Charlotte, NC), and Ehab Al-Shaer (University of North Carolina at Charlotte, NC)</i>	
A Novel Gesture Detection Technique to Increase Security in NFC Contactless Smartcards	1783
<i>Daniel Pérez Asensio (Technical University of Madrid, Spain) and Antonio Pérez Yuste (Technical University of Madrid, Spain)</i>	
Author Index	1789

Welcome to COMPSAC 2020

Sorel Reisman, Standing Committee Chair

It is my responsibility, as Standing Committee Chair, to welcome conference participants to COMPSAC 2020. Considering that this year's COMPSAC is unique and unlike any previous one, where do I start? After much soul searching, I have decided to explain how we came to make our 2020 event an 'unconference' conference. That is, we decided that almost all author submissions would be treated as they have in the past, *but without presentations and without physical, on-location conferencing events*. I am reluctant to label 2020 a "virtual" conference because all or most virtual conference sessions stream online, in real time or prerecorded. But more about that later. Here's how we came to create what might be called, 2020 *COMPSAU* – the Computers, Applications, and Software *Unconference*.

In February 2020, everything was fine and on schedule; many COMPSAC papers had been received and allocated by the volunteer committees to reviewers; many new ones were being received daily. At the beginning of the month, with no thoughts about viruses, we were making plans to hold our annual, two-day Program Committee (PC) meeting in Toronto later in March. The PC meeting is where conference organizers make final acceptance/rejection decisions about long and short papers, select best papers, confer about submissions for the other formats (i.e. workshops, posters, etc.), and discuss session formats and different policies for the July conference. However, within a few days, news about the virus, first in Wuhan and soon in other parts of the world was starting to make headlines. And those headlines were alarming. In the next few weeks we began receiving emails from our international team of conference organizers about their institutions' travel alerts, that they were going to be prohibited from traveling to Toronto for the PC meeting. By the end of February, so many were unable to travel that we decided to conduct the PC meeting via Zoom. At that time, we also started to consider alternatives for the conference should the virus become a pandemic.

At the beginning of March, we were completing negotiations and being asked to sign agreements with Madrid locales that we were planning to use for the hotels, reception, banquet, etc., some requiring non-refundable deposits. On March 11, the World Health Organization declared the virus outbreak to be a pandemic. It was clear then, from the reports of renowned, international scientists that the virus was not going to be gone by July. As scientists ourselves, we decided that we had no choice but to assume that the viability of the July meeting was at best problematic and that we needed to reconsider our plans.

We were faced with a quandary. Canceling the conference, which was one possibility, seemed to us to be unfair to the hundreds of authors who had written/submitted articles for our consideration. It would also negate the hundreds of hours of review time already expended by our volunteer reviewers. So how could we complete the reviews, send out acceptance letters, and at the same time provide authors with a definitive decision regarding the location of the July meeting? We didn't want authors whose papers were accepted to immediately buy airplane tickets for a venue that might not take place as planned. At the same time, while many other conferences, scheduled for April, May, and June were canceling their venues; few, if any conversations were taking place among other conference organizers about "virtualizing" their conferences. Discussions focused on canceling or delaying scheduled events. We decided, at the beginning of April, before sending notification letters, that the only fair thing to do was to cancel the physical venue and tell authors about that in their letters. At the same time, we decided to maintain our paper submission schedule, and to process and review papers as they arrived. Our goal was to ensure that COMPSAC continue its history of producing high quality proceedings for inclusion in IEEE Xplore. A break in that annual series could affect the ranking and rating of subsequent COMPSAC conferences.

So, we decided to cancel the physical event, to continue the review process, and to produce a peer reviewed conference proceedings. After all, at the end of the day, after a conference is over, publication of the papers in the proceedings in the Computer Society Digital Library (CSDL) and IEEE Xplore are mostly what remains as the legacy of a conference and the work of the authors. Keynote speakers, welcomes, banquets, etc., are rarely archived in our digital libraries.

Having made this decision, we also agreed to pass on to authors the benefit of our reduced costs for operating the reconfigured conference. While some seem to think that there should be negligible costs to organize a conference in this way, in fact that is simply not the case. There are sunk costs incurred in planning, announcing, and promoting a conference, even if it's canceled. As well, at the same time, planning for the next year's conference must also already be underway, also incurring costs. While we weren't sure at the end of March what our operating costs would be – none of us had been in this situation before – we decided that an almost 50% cut in registration fees would be reasonable considering that authors of accepted papers would not have to incur all the costs of travel to/from Madrid – saving them a significant amount of money and time.

One of the key issues that arose among conference organizers was whether to require authors of accepted papers to submit “recorded” versions of their presentations to accompany their papers. Most of our senior volunteers and reviewers felt that unless we were prepared to review those presentations to ensure that their content aligned with their papers, we should not make that an author requirement. As well, at the time, it was not clear whether our various information systems (e.g., CSDL, Xplore, etc.) were suitable and adaptable to allow for collection, archiving, and playback of such presentations. We also weren't sure what specifications, in terms of file types and sizes would be appropriate for such data. IEEE's policies regarding copyrights and the hosting of these additional kinds of media were not clear to us. Bear in mind that we were among the first to have to consider such issues. Since then, IEEE and the Computer Society have provided guidance to conference organizers later facing similar decisions, and fortunately for those following us, much more specific guidance is now available.

Another important issue that the committee discussed was how do we somehow offer registrants the ability to “meet” with each other and to interact with authors of the papers. After all, one of the benefits of attending a conference such as COMPSAC is to provide attendees the opportunity to “network” with other attendees. How might we do that in an “unconference” format. There are a variety of possible discussion forums available to address that requirement, including IEEE's own Collabratec, but for various reasons that solution was ruled out. As of this writing, we are experimenting with a handful of options to address the networking requirement.

Finally, because the Computer Society eventually defined and developed methodologies for virtualizing different parts of conferences, late in the Spring we were able to take advantage of their work and organize daily, live, plenary sessions during the planned conference days – July 14, 15, and 16. We are grateful to the plenary session chairs (Dejan Milojicic, Kathy Grise, and John Walz) and their panel members for agreeing to participate in those sessions.

As we start to consider COMPSAC 2021, we have decided that if the virus has subsided and the world has returned to normal, we will hold the conference in Madrid, from July 12-16, 2021. We intend to “clone” our original plans with the same team and in the same venue as 2020, but with a completely new conference theme. So put those dates in your calendar. If matters continue to be, as I said earlier, problematic, there are other models now available for us to consider. It is not out of the question that we will face the same set of decisions next February and March as we did this year. But now we have more options. IEEE and the Computer Society now have systems, policies, and practices that can enable us to have a completely online

conference, including author presentations and registrant networking. So, depending on circumstances, we will either be there in Madrid, or we will be online, or both. And I am absolutely delighted that this year's organizing team, all of whom are listed in the proceedings and on the website, have all agreed to serve again for 2021. And that includes our Madridian chairs Sergio Martin and Manuel Castro. They, together with my friends Edmundo Tovar and Sheikh Iqbal Ahamed, have shown great patience as we worked through this difficult time.

Till next year, please be healthy.

Message from the Standing Committee Vice Chair COMPSAC 2020

On behalf of the COMPSAC 2020 organization we would like to welcome you to the 44th Annual IEEE International Computers, Software, and Applications Conference (COMPSAC 2020), July 13-17, 2020. COMPSAC, the IEEE Computer Society Signature Conference on Computers, Software, and Applications, was first held in 1977 in Chicago. In the years since its founding, it has become one of the major international forums for academia, industry, and government to discuss research results, advancements and future trends in computer and software technologies and applications. The technical program includes research papers, research and industry panel discussions, fast abstracts, student research symposiums, and workshops on emerging important topics. It now alternates its meeting among sites in Asia, Europe, and North America. Over the years, its meetings have advanced the major topics in computing and software development. But, for 2020 we are having COMPSAC virtually due to the global COVID-19 pandemic.

The theme of COMPSAC 2020 is “Driving Intelligent Transformation of the Digital World”. As society changes with technology advancements, we have seen widespread expanded use of Artificial Intelligence and Big Data as affordable, practical tools for everyday computing. The opportunities to extend these technologies to transform the digital world are ever increasing. COMPSAC 2020 provides a platform for in-depth thoughts of such opportunities and challenges. It supports research and development of general methodology for data driven intelligence, digital transformation and a consideration of emerging applications for deployment, including Smart Health devices, networked healthcare, wearable computing, internet-of-things, cyber-physical systems, smart cities, and smart planet.

COMPSAC is a premier global forum for crosscutting computing research, practice and education. In its long history with the Computer Society, COMPSAC has established a strong reputation as a meeting with high quality technical content and wide-ranging discussion of technical issues. It is also known as a well-planned, well-organized, well-attended, and well-managed event.

The COMPSAC conference program is supported by several international societies including the Information Processing Society of Japan (IPSJ), Korean Institute of Information Scientists and Engineers (KISE), and China Computer Federation (CCF), and several special technical communities such as Big Data from the IEEE Computer Society. As a result, the conference will host 13 symposiums and 25 workshops, including a major workshop on Big Data and Artificial Intelligence. In addition, it will present virtual plenary panels that will provide an international perspective on the conference theme. Finally, it will also bring together funding agency and industry representatives from across the globe to address their vision for Intelligent Transformation of the Digital World - Challenges and Applications. Please join us for this year’s virtual conference and celebrate the success of those who contributed towards its online program!

COMPSAC received outstanding support from organizing committee and program committee members. Thank you to all volunteers for their work!

Sheikh Iqbal Ahamed, *Marquette University, USA*
COMPSAC Standing Committee Vice Chair

Message from the 2020 Program Chairs-in-Chief

Welcome to COMPSAC 2020, the 44th IEEE Computer Society International Conference on Computers, Software & Applications, and the first COMPSAC to be conducted without a physical meeting – an *unconference*! “Driving Intelligent Transformation of the Digital World” is our theme this year. Given the circumstances of the global COVID-19 pandemic, it is clear that staying relevant in a constantly evolving digital landscape is a challenge faced by researchers, developers, and producers in virtually every industry and area of study. Furthermore, though once limited to software-enabled devices, the ubiquity and increased reliance on digitally-enabled systems makes this challenge a universal issue. As relevance fuels change, many influencers will offer solutions that benefit their own priorities. Fortunately, history has shown that the building blocks of digital change are forged by those conducting foundational research and development of digital systems and human interaction. Those building blocks are then applied in innovative and novel ways that improve the ability of computing systems to provide services intended to improve our world. For instance, artificial intelligence (AI) is not new, but now that processing and data storage capabilities are widely available commodities, AI is utilized in numerous capacities, from vehicle safety systems, to virtual reality medical devices, to multi-user interactive gaming. The authors included in these proceedings, as well as all those who submitted papers to COMPSAC 2020, are those who have seized the opportunity to drive the use of computers, software, and applications in transforming the digital world, and their results will help define the path ahead.

We received over 450 submissions this year, to both our conference tracks and associated workshops. Using a double-blind system, each paper was reviewed by at least three Program Committee members. Symposia Chairs then made recommendations to the entire Program Committee for which papers to accept as regular papers, short papers, or fast abstracts. At the Program Committee meeting in March, we accepted 69 regular papers and 69 short papers. Also, 76 papers that were not accepted for the main conference were referred to COMPSAC workshops and fast abstracts. An additional 146 papers were submitted directly to our associated workshops. We extend our heartfelt gratitude to all submitting authors, and to more than 400 Program Committee Members who volunteered their time and effort to peer-review each paper, and to those who attended the Program Committee meeting. The workshops chairs, Ji-Jiang Yang, Yuuichi Teranishi, Dave Towey, and Sergio Segura, have done an outstanding job coordinating 28 workshops this year. We also recognize the General Chairs, Mohammad Zulkernine, Edmundo Tovar, and Hironori Kasahara, for their support and encouragement. Sheikh Iqbal Ahamed has worked tirelessly and diligently for many months to support our efforts as Steering Committee Vice-Chair. We also recognize the invaluable guidance, advice, support from Sorel Reisman, COMPSAC Standing Committee Chair, during this particularly challenging conference year.

We are pleased to announce two “Best Paper” Awards this year, to authors Nazia Hossain and Mahmuda Naznin for their paper titled “Finding Emotion from Multi-Lingual Voice Data,” and to authors

Hang Wu and May Wang for their paper titled “Training Confidence-Calibrated Classifier via Distributionally Robust Learning.” Both of these papers exemplify the high quality of work that has come to be associated with COMPSAC over the past 43 years, and we express our heartfelt congratulations to these authors for their selection as “Best Papers” for the 2020 conference.

While we will miss seeing everyone this year, we hope you will join us next year, again in Madrid, Spain, for COMPSAC 2021!

W. K. Chan, *City University, Hong Kong*

Bill Claycomb, *Carnegie Mellon University, USA*

Hiroki Takakura, *National Institute of Informatics, Japan*

Message from COMPSAC 2020 Fast Abstract Track

We welcome you all to the COMPSAC 2020 Fast Abstract Track, which this year covering 26 papers.

First, we sincerely thank the authors who submitted their papers despite COVID-19 pandemic. And, we appreciate the program committee for their dedication and hard work in thoroughly reviewing all the submissions and providing timely feedback to the authors. The Fast Abstract Co-Chairs selected the final papers after further rigorous reviews.

The accepted papers cover various computer, software and application related topics including, but not limited to: software and system development; security and privacy; computer simulation; networking technologies; databases; cloud computing; scientific computing; distributed systems; information processing; big data; data visualization; and computer education.

Special thanks go to Dr. Sheikh Ahamed for coordinating with the COMPSAC 2020 organizing team to ensure all accepted papers have been included in the COMPSAC proceedings. We sincerely hope that attendees will find the papers and presentations as interesting and thought-provoking as we have. Stay Healthy and Safe and we look forward to your contribution again in COMPSAC 2021!

COMPSAC 2020 Fast Abstract Co-chairs

Hossain Shahriar, *Kennesaw State University, USA*

Michiharu (Michael) Takemoto, *International Professional University of Technology in Tokyo, Japan*

Hiroki Kashiwazaki, *National Institute of Informatics, Japan*



Message from the Workshop Chairs

It is our pleasure to hold the workshops of the 44th IEEE International Computer Software and Application Conference, COMPSAC 2020 as a virtual, all-digital conference, with the theme of Driving Intelligent Transformation of the Digital World. Despite the world-wide COVID-19 outbreak situation in 2020, many research papers are submitted and presented in COMPSAC 2020 symposia and workshops. This year the COMPSAC conference includes 26 workshops covering different aspects of developing computer software and applications.

The workshops nicely complement the main conference symposia, together creating an exciting scientific program. COMPSAC workshops provide an excellent opportunity for the exchange of ideas and results in different areas of computer software and applications.

A significant contribution to the workshops comes from the main research focus of COMPSAC, especially along the software engineering and development aspects. There are six related workshops: “Quality Oriented Reuse of Software (QUORS)”, “Software Engineering for Cloud and Edge Computing (SECE)”, “Software Engineering for Smart Systems (SESS)”, “Security Aspects in Processes and Services Engineering (SAPSE)”, “Software Test Automation (STA)”, and “Security, Trust, and Privacy for Software Applications (STPSA)” contributing to about quarter of the accepted papers in the workshops.

In response to the digital world transformation theme this year, i.e., Driving Intelligent Transformation of the Digital World, five workshops are proposed: “Big Data Computation, Analysis, and Applications (BDCAA)”, “Deep Analysis of Data-Driven Applications (DADA)”, “Distributed Big Data Management (DBDM)”, “Secure Digital Identity Management (SDIM)”, and “Social Network Computing and Big Data (SoNeC)”. The workshops with related scope such as “Advances in AI and Machine Learning: Research & Practice (AIML)”, “Smart Computing & Applications (SCA)” also successfully contributed to the sessions in the workshops. These workshops have contributed to about quarter of all workshop sessions.

Needless to say, emerging technologies, networking, and applications form the third pillar in COMPSAC tradition with about half of the contributions.

We are pleased to report that the workshops in COMPSAC 2020 are well-balanced as well as highly interesting. We believe that the topics covered by the workshops are closely related to those contained in the main conference and hope that participants can benefit and stimulate new research ideas and approaches.

This year we received very large number of papers submitted to the workshops. The total number of accepted papers in all workshops is 114.

There are two major paths for contributions to workshops. The standard contribution path follows a direct submission to the workshops in response to the worldwide Call for Papers. Each paper submission undergoes a rigorous review process by at least two independent reviewers. This year we received 103 papers submitted to the workshops and 79 high quality papers were selected for presentation (acceptance rate: 76.7%).

Owing to the low acceptance rate in the main conference, some papers receiving highly positive reviews, but unfortunately cannot be accepted due to acceptance rate limitation, were referred to workshops for consideration. These papers had already undergone a rigorous review process and workshop organizers would ensure that they fit into the theme of the workshops, before they can be formally accepted for presentation. This year 35 papers were transferred from the main conference to the workshops.

We hereby thank all authors who submitted papers to the workshops for their support of the conference. Selection process was carefully carried out by the workshop organizers. We would like to thank the organizers of all workshops and the program committee members of workshops for their efforts and

excellent job, despite working under a very short review cycle. The workshop organizers had hard work to manage workshops on the situation following the COVID-19 outbreak. We also would like to thank all people involved into organizing the COMPSAC 2020 and standing committees for their help, to make COMPSAC 2020 a success.

We hope that the participants of COMPSAC 2020 will enjoy the conference, besides attending the live streamed special plenary speeches and panels.

Ji-Jiang Yang, *Tsinghua University, China*

Yuuichi Teranishi, *National Institute of Information and Communications Technology, Japan*

Dave Towey, *University of Nottingham Ningbo China, China*

Sergio Segura, *University of Seville, Spain*