2019 IEEE 9th International Conference on Consumer Electronics (ICCE-Berlin 2019)

Berlin, Germany
8 – 11 September 2019

Additional Copies of This Publication Are Available From:

Sunday, September 8 10:15 - 11:45

Security in CE Systems

Room: A1

Chair: Michael Hübner (Brandenmburg Technical University Cottbus, Germany)

Crypto based Multi-Variable Fingerprinting for Protecting DSP cores...N/A

Anirban Sengupta (Indian Institute of Technology Indore, India); Utkarsh Singh and Piyush Premchand (IIT Indore, India)

Enhanced Functional Obfuscation of DSP core using Flip-Flops and Combinational logic...N/A

Anirban Sengupta (Indian Institute of Technology Indore, India); Mahendra Rathor (IIT Indore, India)

An Approach for Biometric Verification Based on Human Body Communication using Convolutional Neural Network...12

Jingzhen Li (Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, China); Yuhang Liu, Tobore Igbe and Ze-dong Nie (Shenzhen Institute of Advanced Technology Chinese Academy of Sciences, China)

Secure firmware update in embedded systems...16

Levon Keleman and Danijel Matic (RTRK Institute for Computer Based Systems, Bosnia and Herzegovina); Miroslav Popovic (University of Novi Sad, Serbia); Ivan Kastelan (University of Novi Sad, Faculty of Technical Sciences, Serbia)

Consumer Healthcare Systems

Room: A2

Chair: Gabriele Foresi (Universita' Politecnica delle Marche, Italy)

A Machine-Learning Based Emotion Recognition System in Patients with Parkinson's Disease...20

Marianna Capecci (Università Politecnica delle Marche, Italy); Lucio Ciabattoni and Gabriele Foresi (Universita' Politecnica delle Marche, Italy); Andrea Monteriù and Lucia Pepa (Università Politecnica delle Marche, Italy)

Contactless measurement of physiological parameters...22

Manola Ricciuti, Gianluca Ciattaglia and Linda Senigagliesi (Università Politecnica delle Marche, Italy); Adelmo De Santis (Università Politenica delle Marche, Italy)

Multi-person remote heart-rate measurement from human faces - a CNN based approach...27

Thomas Pursche, Roland Clauß, Bernd Tibken, Reinhard Moeller, Marcel Walz and Robert Roth (University of Wuppertal, Germany)

The Decision Support System Developed for the Stroke Patients Support Platform...32

Milan Vidakovic (University of Novi Sad - Faculty of Technical Sciences, Serbia); Stefan Cosic, Ognjen Cosic and Ivan Kastelan (University of Novi Sad, Faculty of Technical Sciences, Serbia); Gordana Velikić (RTRK Computer Based Systems LLC, Serbia)

Sunday, September 8 11:45 - 12:15

NETWORKING: CAFFE BREAK

Room: A1/A2

Sunday, September 8 12:15 - 13:15

Panel 1: Consumer technology meets health care - Promises and Challenges

Nahum Gershon

Room: A1

Chair: Nahum Gershon (The MITRE Group, USA)

Mobile technology has gone a long way since the days when devices were produced unchecked, had a small number of capabilities and were of questionable quality. Such current and future devices are expected to revolutionize health care as we know it through mobile health. Not just enabling patients in remote places to get the health care they need, but also enabling everybody to get some treatments at home without visiting the physician's office. This could allow the early release of specific patients from the hospital when the treatment and rehabilitation could be done at home under the remote care of the physician or practitioner while the data is being captured and included in the patient's medical records. This may also revolutionize the existing overall model of the interaction of patients with their physicians and other health care practitioners. In this session, the audience and the panelists will discuss the promises and the challenges of this emerging field.

Sunday, September 8 13:15 - 14:00

Welcoming Ceremony during Lunch; Wahab Almuhtadi, President IEEE CE Society Jens Heithecker and Dirk Koslowski, IFA

Room: A1

Chair: Gordana Velikić (RTRK Computer Based Systems LLC, Serbia)

Sunday, September 8 14:00 - 14:45

Keynote 1: Dejan Milojicic: "Applying AI/ML to cybersecurity" (Hewlett Packard Labs, USA)

Bio: Dejan Milojicic is a distinguished technologist at Hewlett Packard Labs, Palo Alto, CA (1998-) leading system software teams over 4 continents and projects with budgets of hundreds US$M. He worked at the OSF Research Institute in Cambridge, MA and at the Mihajlo Pupin Institute in Belgrade, Serbia. Milojicic received his PhD from Kaiserslautern University, Germany; and his MSc/BSc from Belgrade University, Serbia. He was a technical director of the Open Cirrus Cloud Computing Testbed, with academic, industrial and government sites in the US, Europe, and Asia. He has published 2 books and 180 papers; he has 37 granted patents. He is an IEEE Fellow (2010) and ACM Distinguished Engineer (2008). Milojicic was on 8 PhD thesis committees and taught Cloud management course at SJSU. As president of the IEEE Computer Society (2014), he started Technology Predictions, the top viewed CS news. As the industry engagement chair, he started IEEE Infrastructure'18 conference.

Room: A1

Chair: Gordana Velikić (RTRK Computer Based Systems LLC, Serbia)

Cybersecurity is one of the key risks for any business today. Growing attack surface includes amateur threats, such as phishing, and sophisticated distributed denial of service attacks. Prevention is nearly impossible. Given enough time attackers will get in: cost of attack is low and automated probing will find a weakness. Advanced persistent threats show hackers are patient. Defense depends on security analysts who are rare, without training, and with high turnover. AI/ML can help with detection of threat signatures across the corporation and with advisory to security analysts. AI/ML can drive down response times from (hundreds of) hours to seconds and scale analyst effectiveness from 1 or 2 incidents to 1000s. With adequate knowledgebase, it can preserve corporate knowledge and transfer response learnt by AI to new analysts. To advance the adoption of AI/ML applied to cybersecurity, HPE is partnering with IEEE, SEI, and universities around the world. We are defining an annual grand challenge in applying AI/ML to cybersecurity, comprised of: 1) arena/rodeo to operate the challenge; 2) standards for operational metrics (preventing attacks; ensuring AI performs as expected); training data; workflows integrating AI into current processes; and human-machine teaming model; 3) knowledgebase for network traffic capture; policy for AI/ML configuration; AI strategies; execution environment; and capturing security analyst knowledge. Over years, grand challenge will result in a repository of training data, sharing data logs and attack details. As a result it will increase adoption of AI/ML in cybersecurity and reduce attacks.

Sunday, September 8 14:00 - 15:30

Poster session (1) & Creative Corner

Room: A2

Chair: Lucio Ciabattoni (Universita' Politecnica delle Marche, Italy)

Sunday, September 8 14:45 - 15:30

Keynote 2: Tiziana Catarci - "Why did my laundry turn pink?" (Towards usability evaluation in home appliances and consumer electronics) (University of Rome 'La Sapienza', Italy)

Room: A1

Chair: Nahum Gershon (The MITRE Group, USA)

The modern revolution in Information Technology (IT) has allowed us to interact in advanced ways with a plethora of technological artefacts. This has led to new shapes of user interfaces (UIs) and styles of interaction. Today's UIs range from simple mobile input devices with touchscreens and clickable symbols, to home appliances with physical buttons and smart displays, to immersive environments with augmented and virtual reality. The general feeling is that such an increased interactivity is a positive feature. However, differently from the majority of web and software tools, consumer electronics products are sold for a large part based on the functionalities they offer, and an excess of functionalities is likely to lead to less usable products. In addition, consumer electronics products are becoming more and more networked and part of a large ecosystem of connected devices, and today many of the most serious usability problems are caused by the ecosystem as a whole, not by the UIs of the individual products. Since the majority of end-users of consumer electronics products simply want their tasks done in the best way, a possibility to make such products more usable is the transfer of (part of) the task execution workload from the user to the system, as it is done in so-called smart systems. Then, the possible gain in usability needs to be precisely evaluated. Unfortunately, traditional user evaluation techniques from the Human-Computer Interaction (HCI) field fail to properly measure the usability of consumer electronics products, for which it would be required to observe the end-users conducting their own activities with the products for extended time frames. This is very expensive in terms of the time required to collect the data, strongly limiting the number of user tests that can be performed and, consequently, reducing the reliability of the evaluation techniques. To mitigate the above issues, it is becoming common practice to capture the interactions with UIs during daily use and save them into log files for later analysis using dedicated log studies. In this talk, after having introduced an HCI perspective over consumer electronics, we analyze the transition that is taking place in the HCI field towards the use of log studies in order to build frameworks for capturing actual user behavior (and not recalled behaviors or subjective impressions) and, consequently, effectively evaluating the usability of any kind of modern interactive device.

Sunday, September 8 15:30 - 16:00

NETWORKING: CAFFE BREAK

Room: A1/A2

Sunday, September 8 16:15 - 17:00

Keynote 3: Klaus-Robert Müller - "Machine learning and AI for the sciences - towards understanding" (Machine Learning Laboratory, Berlin Institute of Technology, Berlin, Germany)

Bio: Klaus-Robert Müller is a Professor for Machine Learning at the department of Computer Science at Technische Universität Berlin and at the Department of Cognitive Science and Engineering at Korea University, Seoul. For 5 years he was director of the Bernstein Center for Neurotechnology, from 2014 I became Co-director of the Berlin Center for Big Data and from 2018 he simultaneously became director of the Berlin Machine Learning Center. In 2012, Klaus-Robert Müller was elected to be a member of the German National Academy of Sciences - Leopoldina, in 2017 of the Berlin Brandenburg Academy of Sciences and also in 2017 as an external scientific member of the Max-Planck Society (MPII). Among other awards in 2014, he received the Berlin Science prize awarded by the governing Mayor of Berlin; in 2017 the Vodafone Innovation Award. Over all, there are more than 40 full time researchers under his direct supervision. His research interest is in the field of machine learning, deep learning and data analysis covering a wide range of theory and numerous scientific (Physics, Chemistry, Neuroscience and Biomedical Engineering) and industrial applications.

Room: A1

In recent years machine learning (ML) and Artificial Intelligence (AI) methods have begun to play a more and more enabling role in the sciences and in industry. In particular, the advent of large and/or complex data corpora has given rise to new technological challenges and possibilities. The talk will connect two topics (1) explainable AI (XAI) and (2) ML applications in sciences (e.g. Medicine and Quantum Chemistry) for gaining new insight. Specifically I will first introduce XAI methods (such as LRP) that are now readily available and allow for an understanding of the inner workings of nonlinear ML methods ranging from kernel methods to deep learning methods including LSTMs. In particular XAI allows to unmask clever Hans predictors. Then, ML for Quantum Chemistry is discussed, showing that ML methods can lead to highly useful predictors of quantum mechanical properties of molecules (and materials) reaching quantum chemical accuracies both across chemical compound space and in molecular dynamics simulations. Notably, these ML models do not only speed up computation by several orders of magnitude but can give rise to novel chemical insight. Finally, I will analyse morpholocal and molecular data for cancer diagnosis; also here highly interesting novel insights can be obtained. Note that while XAI is used for gaining a better understanding in the sciences, the introduced XAI techniques are readily useful in other application domains and industry as well.

Sunday, September 8 16:15 - 17:45

Audio/Video Systems (1)

Room: A2

Chair: Filippo Gabriele Prattìcò (Politecnico di Torino, Italy)

Light field image compression using Versatile Video Coding...70
Vasileios Avramelos (Ghent University - imec, IDLab, Belgium); Johan De Praeter and Glenn Van Wallendael (Ghent University - imec, Belgium); Peter Lambert (Ghent University - imec & IDLab, Belgium)

Artifacts reduction for very low bitrate image compression with generative adversarial networks...76
Sébastien Hamis and Titus Zaharia (Télécom SudParis, France); Olivier Rousseau (Be-Bound, France)

Hybridization of structured light and Time-of-Flight sensing using maximum a posteriori Markov Random Fields...82
Jeffrey Zhao and Watson Ly (Carleton University, Canada)

Video delivery subsystem for multi-SoC automotive machine vision platforms...88
Branislav Gamf, Srdjan Usorac and Milan Z. Bjelica (University of Novi Sad, Serbia); Zeljko Lukac (RT-RK Institute for Computer Based Systems, Serbia)

Super-resolution Image Reconstruction Utilizing High-Precision Skin Color for Face Images...91
Tomio Goto and Kano Keigo (Nagoya Institute of Technology, Japan)

Sunday, September 8 17:05 - 18:55

Enabling CE Technologies

Room: A1

Chair: Michael Hübner (Brandenmburg Technical University Cottbus, Germany)

Hardware Steganography for IP Core Protection of Fault Secured DSP Cores...N/A
Anirban Sengupta (Indian Institute of Technology Indore, India); Gargi Gupta and Harshit Jalan (IIT Indore, India)

IP Core Identification in FPGA Configuration Files using Machine Learning Techniques...103
Michael Huebner and Safdar Mahmood (Brandenburg University of Technology, Germany)

Read Threshold Calibration for Non-Volatile Flash Memories...109
Mohammed Rajab and Johann-Philipp Thiers (University of Applied Sciences, Konstanz, Germany); Juergen Freudenberger (University of Applied Sciences, Konstanz & Institute for System Dynamics (ISD), Germany)

Lifetime-Optimal Buffer Management on Flash-based Swap Framework for Smart TV...114
Taejoon Song, Yeonjin Noh, Gunho Lee and Youngjin Kim (LG Electronics, Korea)

Fast and Light-weight Binarized Neural Network Implemented in an FPGA using LUT-based Signal Processing and its Time-domain Extension for Multi-bit Processing...120
Ryuji Fuchikami ((Personal), Japan); Fumio Issiki (Finekit, Japan)

Robust Digital Signature to Protect IP Core against Fraudulent Ownership and Cloning...N/A
Anirban Sengupta, N. Prajwal Chandra and E. Ranjith Kumar (Indian Institute of Technology Indore, India)

Sunday, September 8 17:50 - 19:20

Audio/Video Systems (2)

Room: A2

Chair: Milan Vidakovic (University of Novi Sad - Faculty of Technical Sciences, Serbia)

DASH Transport Emulator System Supporting Multi-Broadcast Standards...125
Byungjun Bae (Electronics and Telecommunications Research Institute, Korea); Nayeon Kim (University of Science and Technology, Korea)

Video Captioning Based on Joint Image-Audio Deep Learning Techniques...127
Pao-Chi Chang, Jia-Ching Wang and Kai-Wen Liang (National Central University, Taiwan); Chien-Yao Wang (Academia Sinica, Taiwan); Pei-Sin Liaw (CYCU, Taiwan)

Hierarchical Model for Multimedia Content Classification...132
Sunil Bharitkar (HP Labs, Hewlett Packard, Inc., USA); Andre Lopes and Walter Flores (HP Inc., USA)

Porting Adaptive Multiple Transforms of a Versatile Video Coding decoder using OpenMP...138
Rafael Medina Morillas, Anup Saha and Manuel Floriano (Universidad Politécnica de Madrid, Spain); Miguel Chavarrias (Universidad Politecnica de Madrid, Spain); Fernando Pescador (Universidad Politécnica de Madrid, Spain)

Automated traffic congestion estimation via public video feeds...140
Ricardo Sciberas and Frankie Inguanez (MCAST, Malta)

Monday, September 9

Monday, September 9 10:15 - 11:00

Keynote 4: Ibrahim Gedeon - "Security and Privacy by Design" (TELUS, USA)

Bio: Ibrahim Gedeon is one of the telecommunications industry's eminent thought leaders. By combining insight and skill as an applied scientist with a lighthearted approach to leadership he is now Chief Technology Officer for TELUS, where he is responsible for all technology development and strategy.

Chairs: Wahab Almuhtadi (Algonquin College, India), Christian Groß (VDE, Germany)

With the promise of making life easier, more convenient and fun, consumers are turning to more and more devices to simplify their lives. And yet, consumer technology is really just a mosaic of badly integrated applications. At TELUS, putting customers first isn't just about ease of use. Instead, incorporating security and privacy from the onset, or by design, is an absolute necessity to safeguarding our customers' lives.

Monday, September 9 10:15 - 11:45

RF and Wireless Technologies

Room: A2

Chair: Ivan Kastelan (University of Novi Sad, Faculty of Technical Sciences, Serbia)

A 37 to 40 GHz Transceiver for Fifth Generation Communication Systems...146
Wei-Tsung Li (Industrial Technology Research Institute, Taiwan); Jeng-Han Tsai (National Taiwan Normal University, Taiwan); Hung-Yu Lin (Industry Technology Reasearch Institute, Taiwan)

Deep-learning Based Adaptive Beam Management Technique for Mobile High-speed 5G mmWave Networks...149
Woongsoo Na and Byungjun Bae (Electronics and Telecommunications Research Institute, Korea); Sukhee Cho (ETRI, Korea); Nayeon Kim (University of Science and Technology, Korea)

Reception Complexity and Power Consumption reduction with ASK in 3-layer LDM...152
Jae-Hwui Bae (Electronics and Telecommunications Research Institute, Korea)

Double Threshold Soft Decision Rule for Improving Performance of Cognitive Radio Networks...158
Alejandro A. Valenzuela (Bonn-Rhein-Sieg University of Applied Sciences, Germany); Hikmat N. Abdullah (Al-Nahrain University, Iraq); Nuha Bakr (University of Alnahrain, Iraq)

Evaluation of the BER Performance of LoRa Communication using BICM Decoding...162
Tallal Elshabrawy (The German University in Cairo, Egypt); Joerg Robert (Friedrich-Alexander Universität Erlangen-Nürnberg, Germany)

Monday, September 9 11:00 - 11:45

Keynote 5: Christian Gross (VDE) "Connected Consumers in a Digital World"

Room: A1

In the consumer goods industry, manufacturers are generally divided into "white goods" (particularly household appliances), "brown goods" (consumer electronics),"gray goods" (Information and communication technology) and in Germany also in so-called "red goods" (thermal technology). These companies are geared towards the specific needs of their end users (B2C), however, they also need to consider the specific interests of their retailers (B2B). Trendsetting product innovations with great application benefits and tailor-made functionality are topics that help them penetrate the market. The complexity management plays an important role in this process. Only those who rapidly build product and production architectures in line with the market needs and establish at the same time an agile organization can withstand the high pressure of global competition.

Monday, September 9 11:45 - 12:15

NETWORKING: COFFEE BREAK

Room: A1/A2

Monday, September 9 12:15 - 13:15

Panel 2: Women in technologies: Technology advances rapidly, how does it affect a woman's role and share in technology?

Dejan Milojicic

Room: A1

Chair: Dejan Milojicic (Hewlett Packard Labs, USA)

We are facing rapid development in every field of technology, yet, the gender issue remains unresolved. Do we make a mountain out of a molehill, or we need to take the matter more seriously? How organizations like IEEE, ACM, or VDE can help? Does it require change at every level of the society, or the engineers can provide a unique solution that will set a rule?

Be active part of this session, and help us find a point of view that is revolutionary.

Workshop 1: Unveil the principle behind a solution through technical writing

Tutorial: Unveil the principle behind a solution through technical writing

Akihiko K. Sugiyama

Room: A2

This tutorial presents a way to identify the principle behind a solution. Through a process of clarifying the problem-solution relationship in technical writing, a better logic for the paper is built. A solid logic directly benefits the author(s) by making reviewers understand the contribution of the paper easily, leading to a higher acceptance rate. It is emphasized that the earlier mentioned clarification process to establish a solid logic often unveils a more general principle behind a solution, which may open a door to another research. Some examples to convince the audience support the value of technical writing.

Monday, September 9 13:15 - 14:00

Keynote 6: Vasilis Ntziachristos - "Optical and optoacoustic imaging: the revolution of label free observations" (Technical University Munich & Helmholtz Zentrum München, Germany)

Room: A1

Chair: Milan Vidakovic (University of Novi Sad - Faculty of Technical Sciences, Serbia)

Optical imaging is unequivocally the most versatile and widely used visualization modality in the life sciences. Yet it has been significantly limited by photon scattering, which complicates the visualization of tissue beyond a few hundred microns. For the past few years, there has been an emergence of powerful new optical and optoacoustic imaging methods that offer high resolution imaging beyond the penetration limits of microscopic methods. The talk discusses progress in multi-spectral opto-acoustic tomography (MSOT) and mesoscopy (MSOM) that bring unprecedented optical imaging performance in visualizing anatomical, physiological and molecular biomarkers. Advances in light technology, detection methods and algorithms allow for highly-performing visualization in biology and medicine through several millimetres to centimetres of tissue and real-time imaging. The talk demonstrates implementations in the time and frequency domain, showcase how it is possible to accurately solve fluence and spectral coloring issues for yielding quantitative measurements of tissue oxygenation and hypoxia and demonstrate quantitative in-vivo measurements of inflammation, metabolism, angiogenesis in label free mode. In parallel, progress with clinical systems and the complementarity with ultrasound imaging, fluorescence molecular imaging and other modalities is discussed. Finally the talk offers insights into new miniaturized detection methods based on ultrasound detection using optical fibers, which could be used for minimally invasive applications.

13:15 *Optical and optoacoustic imaging: the revolution of label free observations*
Vasilis Ntziachristos (Technical University Munich & Helmholtz Zentrum München, Germany)

Monday, September 9 13:15 - 14:45

Creative Corner & Poster session (2)

Room: A2

Chair: Jose-Maria Flores-Arias (University of Cordoba, Spain)

Monday, September 9 13:15 - 14:00

Lunch

Room: A1/A2

Monday, September 9 14:00 - 14:45

Keynote 7: Peter Peumans - "When healthcare becomes personal: technology giving power to the patient" (IMEC, Belgium)

Room: A1

ABSTRACT Patient care is changing rapidly from a generic to a much more personalized approach. In addition, healthcare systems are shifting their focus from diagnosis to early disease interception and even disease prevention. Such a personalized and preventative approach to healthcare requires disruptive technology solutions to closely monitor one's health.

This talk will discuss the trends in health care and life science technologies that enable early diagnosis, disease prevention and effective personalized therapies. Examples of such technologies are high-precision medical-quality wearables and connected health sensors, and systems to integrate complex lab analytics and diagnostics into a consumer-friendly package.

Bio:

Dr. Peumans holds a Ph.D. in electrical engineering from Princeton University, and a bachelor's and master's degree from the Katholieke Universiteit Leuven. Prior to joining imec, Dr. Peumans was a professor of electrical engineering at Stanford University. He is the recipient of an NSF CAREER award and a Belgian-American Educational Foundation honorary fellowship. He currently leads imec's life science technologies program.

Monday, September 9 14:50 - 16:20

Energy management of CE Hardware/Software

Room: A1

Chair: Francisco J. Bellido-Outeiriño (University of Córdoba, Spain)

Case Study of Photovoltaic Energy Surplus Absorption by Charging Lithium-Ion Batteries Considering Charge-Discharge Energy Efficiency...215

Masahito Arima (Daiwa Can Company & Ritsumeikan University, Japan); Lei Lin and Masahiro Fukui (Ritsumeikan University, Japan)

Mapping Constrained Slot-Placement Problems to Ising Models and its Evaluations by an Ising Machine...221

Sho Kanamaru and Kazushi Kawamura (Waseda University, Japan); Shu Tanaka (Waseda University, Japan Science and Technology Agency, Japan); Tomita Yoshinori, Hidetoshi Matsuoka and Kaoru Kawamura (Fujitsu Laboratories, Ltd, Japan); Nozomu Togawa (Waseda University, Japan)

Efficient Ising Model Mapping for Induced Subgraph Isomorphism Problems Using Ising Machines...227

Natsuhito Yoshimura and Masashi Tawada (Waseda University, Japan); Shu Tanaka (Waseda University, Japan Science and Technology Agency, Japan); Junya Arai, Satoshi Yagi and Hiroyuki Uchiyama (NTT Software Innovation Center, Japan); Nozomu Togawa (Waseda University, Japan)

Power-Efficient Video Streaming on Mobile Devices Using Optimal Spatial Scaling...233

Christian Herglotz (Lehrstuhl für Multimediakommunikation und Signalverarbeitung, Friedrich-Alexander University Erlangen-Nürnberg (FAU)); Andre Kaup (University of Erlangen-Nuremberg, Germany); Stéphane Coulombe (École de Technologie Supérieure, Canada); Ahmad Vakili (Summit-Tech, Canada)

Monitoring of photovoltaic systems for self-consumption without over-consumption...239

Juan de Dios Fuentes-García and Jose-Maria Flores-Arias (University of Cordoba, Spain); Francisco J. Bellido-Outeiriño, Francisco J. Quiles Latorre, Manuel A. Ortiz López and Joaquín Garrido (University of Córdoba, Spain)

Artificial Intelligence (AI) and Deep Learning in CE applications (1)

Room: A2

Chair: Gabriele Foresi (Universita' Politecnica delle Marche, Italy)

Implementation of Yolo-v2 Image Recognition and Other Testbenches for a CNN Accelerator...242

Chan Kim and Hyunmi Kim (Electronics and Telecommunications Research Institute, Korea); Chun-Gi Lyuh (ETRI, Korea); Yong Cheol Cho (Electronics and Telecommunications Research Institute, Korea); Jeongmin Yang, Jaehoon Chung, Kyoung Seon Shin, Jinho Han, Minseok Choi and In-San Jeon (ETRI, Korea); Youngsu Kwon (Electronics and Telecommunications Research Institute, Korea)

Semantic Segmentation-Based Real-Time Shallow Depth-of-Field Imaging Using a Single Smartphone Camera...248

Yeongheon Mok, Heegwang Kim, JungSup Shin, Dohun Kim and Joonki Paik (Chung-Ang University, Korea)

Optimization of Head-related Transfer Function (HRTF) Models...251

Sunil Bharitkar (HP Labs, Hewlett Packard, Inc., USA)

Multiunit automotive perception framework: Synergy between AI and deterministic processing...257

Nives Kaprocki (Faculty of Technical Sciences, Serbia); Gordana Velikić (RTRK Computer Based Systems LLC, Serbia); Nikola Teslic (University of Novi Sad, Serbia); Momcilo Krunic (RT-RK Institute for Computer Based Systems, Serbia)

Monday, September 9 15:30 - 16:00

NETWORKING: CAFFE BREAK

Room: A1/A2

Monday, September 9 16:50 - 18:20

Entertainment, Gaming, VR and AR

Room: A1

Chair: Christopher N J Carmichael (University of Ontario Institute of Technology, Canada)

Intelligent SOMA interactive gaming system...261

Chen-Chia Chen (National Applied Research Laboratories & National Chip Implementation Center, Taiwan); Gang-Neng Sung (Taiwan Semiconductor Research Institute & National Applied Research Laboratories, Taiwan); Chih-Ting Kuo (National Chip Implementation Center, Taiwan); Yu-An Kuo (Taiwan Semiconductor Research Institute & National Applied Research Laboratories, Taiwan); Jin-Ju Chue, Chien-Ming Wu and Chun-Ming Huang (National Chip Implementation Center, Taiwan)

Real-Time Streaming of Sequential Volumetric Data for Augmented Reality Synchronized with Broadcast Video...267

Yuki Kawamura (NHK Science & Technology Research Laboratories & Japan Broadcasting Corporation, Japan); Yuki Yamakami, Hiroyasu Nagata and Koichiro Imamura (NHK, Japan)

Creating AR models for challenging sizes...269

Deborah Catania and Frankie Inguanez (MCAST, Malta)

A Makerspace Foot Pedal and Shoe Add-On for Seated Virtual Reality Locomotion...275

Marco D Valdez Balderas, Alvaro Uribe Quevedo, Christopher N J Carmichael, Bill Ko, Atiya Nova and Angela Tabafunda (University of Ontario Institute of Technology, Canada)

Unity3D-based app for 360VR subjective quality assessment with customizable questionnaires...281

Carlos Cortés and Narciso García (Universidad Politécnica de Madrid, Spain); Pablo Pérez (Nokia Bell Labs, Spain)

Monday, September 9 16:50 - 18:40

Artificial Intelligence (AI) and Deep Learning in CE Applications (2)

Room: A2

Chair: Ivan Kastelan (University of Novi Sad, Faculty of Technical Sciences, Serbia)

Facial Expression Recognition Using Robust Local Directional Strength Pattern Features and Recurrent Neural Network...283

Anders Skibeli Rokkones (Huddly AS, Norway); Md Zia Uddin and Jim Tørresen (University of Oslo, Norway)

Accuracy Improvement of Fashion Style Estimation with Attention Control of a Classifier...289

Risako Aoki, Takeshi Nakajima and Takuro Oki (Meiji University, Japan); Ryusuke Miyamoto (Meiji University & School of Science and Technology, Japan)

Estimating Power Consumption of Air-conditioners Using a Sequence-to-sequence Model...295

Inhwan Hwang, Hyeonje Cho, Yunhu Ji and Heejung Kim (Samsung Research, Samsung Electronics Co., Korea)

Deep Fashion Recommendation System with Style Feature Decomposition...301

Yong-Goo Shin, Yoon-Jae Yeo, Min-Cheol Sagong, Seo-Won Ji and Sung-Jea Ko (Korea University, Korea)

Dementia Screening System based on SNS Agency Robot...306

Toru Kobayashi, Naohiro Sameshima, Tetsuo Imai and Kenichi Arai (Nagasaki University, Japan); Tomoki Watanabe (NTT Corporation, Japan); Teiichiro Miyazaki and Akira Tsujino (Nagasaki University Hospital, Japan)

Monday, September 9 20:00 - 22:00

Gala Dinner

Rooms: Seehof Hotel, A1/A2

Tuesday, September 10 10:15 - 11:45

Internet of Things

Room: A1

Chair: Soumya Kanti Datta (EURECOM, France)

Model-Based Load Testing in the IoT System...310

Milica Matic, Eleonora Nan, Marija Antic and Sandra Ivanovic (University of Novi Sad, Serbia); Roman Pavlović (RT-RK, Comupter Based Systems, Serbia)

IoT Based People Detection for Emergency Scenarios...316

Soumya Kanti Datta and Khawla Mallat (EURECOM, France); Jean-Luc Dugelay (Institut EURECOM, France)

Monitoring Sake Brewing Processes with Compact Wireless Sensors...319

Yui Uehara (Graduate School of Engineering, Oita University, Japan); Satoshi Ohtake (Oita University, Japan); Takamoto Fukura (Fukura Syuzo Inc., Japan)

AMANDA: An Autonomous Self-Powered Miniaturized Smart Sensing Embedded System...324

Charalampos S Kouzinopoulos (Information Technologies Institute / Centre of Research and Technology Hellas, Greece); Dimitrios Tzovaras (Information Technologies Institute, Greece); Pawel Bembnowicz (Stichting IMEC Nederland, The Netherlands); Marcel Meli (Zurich University of Applied Sciences, Switzerland); Mathieu Bellanger (Lightricity Limited, United Kingdom (Great Britain)); Julien De Vos (E-peas S.A., Greece); Denis Pasero (Ilika Technologies Ltd, United Kingdom (Great Britain)); Martin Schellenberg (Microdul AG, Switzerland); Oskar Vujicic (Penta, Greece); Matthias Kauer (Lightricity Limited, United Kingdom (Great Britain))

Assistive Technology through Internet of Things and Edge Computing...330

Manoel José de Souza Júnior and Orlewilson Bentes Maia (TPV Technology, Brazil); Horacio Oliveira (Universidade Federal do Amazonas, Brazil); Eduardo James Souto (Federal University of Amazonas, Brazil); Raimundo Barreto (Universidade Federal do Amazonas, Brazil)

AR/VR for Education and Training

Room: A2

Chair: Fabrizio Lamberti (Politecnico di Torino, Italy)

Augmented reality for cultural heritage education...333

Cristian Perra and Elisavet Grigoriou (University of Cagliari, Italy); Antonio Liotta (University of Derby, United Kingdom (Great Britain)); Wei Song (Shangai Ocean University, Italy); Claudio Usai (University of Cagliai, Italy); Daniel D Giusto (University of Cagliari, Italy)

Virtual Learning Environment for an Industrial Assembly Task...337

Christian Hirt (ICVR, ETH Zurich, Switzerland); Valentin Holzwarth (University of Liechtenstein, Liechtenstein); Joy Gisler (ICVR, ETH Zurich, Switzerland); Johannes Schneider (University of Liechtenstein, Liechtenstein); Andreas Kunz (ICVR, ETH Zurich, Switzerland)

Virtual Reality for training the public towards unexpected emergency situations...343

Daniela De Luca, Arianna Fonsati and Anna Osello (Politecnico di Torino, Italy)

On the Usability of Consumer Locomotion Techniques in Serious Games: Comparing Arm Swinging, Treadmills and Walk-in-Place...348

Davide Calandra and Fabrizio Lamberti (Politecnico di Torino, Italy); Massimo Migliorini (Fondazione LINKS, Italy)

Tuesday, September 10 11:45 - 12:15

NETWORKING: CAFFE BREAK

Room: A1/A2

Tuesday, September 10 12:00 - 13:15

Assisted and Autonomous Driving (1)

Room: A2

Chair: Milan Z. Bjelica (University of Novi Sad, Serbia)

Deep Learning Based Classification of Pedestrian Vulnerability Trained on Synthetic Datasets...353
Jens Schleusner and Lothar Neu (Leibniz University Hannover, Germany); Nicolai Behmann (Leibniz Universität Hannover & Institute of Microelectronic Systems, Germany); Holger Blume (Leibniz Universitaet Hannover, Germany)

Automatic Headlight Leveling System with a Modular Design for the Automotive Aftermarket...357
Heiko Fechtner and Mark Stenner (University of Wuppertal, Germany); Thomas Kliem (Carsig GmbH, Germany); Thomas Teschner (Thomas Teschner Consulting, Germany); Johannes Schuster and Benedikt Schmuelling (University of Wuppertal, Germany)

Real-Time Multiple Pedestrian Tracking Based on Object Identification...363
Dohun Kim, Heegwang Kim, JungSup Shin, Yeongheon Mok and Joonki Paik (Chung-Ang University, Korea)

Integral image computation algorithm for GPU-enabled automotive platforms...366
Damjan Glamočić and Dejan Borđoški (Faculty of Technical Sciences, University of Novi Sad, Serbia); Branislav M. Todorović (RT-RK Institute for Computer Based Systems, Serbia); Tomislav Maruna (RT-RK Computer Based Systems LLC, Serbia)

Tuesday, September 10 12:15 - 13:15

Panel 3: The importance of towel for hitchhikers of the universe

Gordana Velikic

Room: A1

Chair: Gordana Velikić (RTRK Computer Based Systems LLC, Serbia)

We are leaving the futuristic novels lives. There is a rumors that Elon Musk based some of his visions based on his favorite SciFi books. Join this panel and let us know about your visions and favorite novels.

Tuesday, September 10 13:15 - 14:00

Keynote 8 during Lunch: Robert Riener - "Rehabilitation robots that cooperate and motivate" (ETH and University of Zurich, Switzerland)

Room: A1

Chair: Gordana Velikić (RTRK Computer Based Systems LLC, Serbia)

Robots can be very useful to restore movement abilities of upper and lower limbs. First, they can promote neurorehabilitation as training devices after neurological injuries such as spinal cord injury (SCI), traumatic brain injury and stroke. Second, they can be used as assistive devices to support patients or elders with gait impairments in daily life situations. However, current mechatronic solutions are still too bulky and their sensory technologies and control strategies are still too primitive to allow the correct motion intention. Therefore, they do not provide effective assist-as-needed support and are too inconvenient to use. In this talk I will present new patient-cooperative controllers, intention detection strategies and virtual reality technologies that will improve the rehabilitation of arm movements and gait. I will also present the Cybathlon, which is a new kind of Olympics-style championship, where people with physical disabilities compete against each other at tasks of daily life, with the aid of robotic technologies. The next Cybathlon will take place in Zurich, on May 2nd and 3rd 2020.

Workshop 2: How to make your home-automation - my way or the highway

Tutorial 101: How to make your home-automation - my way or the highway

Milan Vidakovic

Room: A2

Chair: Milan Vidakovic (University of Novi Sad - Faculty of Technical Sciences, Serbia)

Key point of each home-automation is to be controlled by a browser. Any browser. Plus - three levels: Level 1. Connect sensors to computer Level 2. Connect multiple computers to aggregating server Level 3. Present data to end user via browser This tutorial will talk about ways to achieve these three levels. Player 1 - ready to participate? We dare you!!!

Tuesday, September 10 14:00 - 14:45

Keynote 9: Daniel Wilms - "Standardization as enabler towards a data centric architecture in automotive" (BMW Group Research, New Technologies, Innovations, Germany)

Room: A1

Chair: Soumya Kanti Datta (EURECOM, France)

With the growing number of connected vehicles, changing customer expectations and the opportunities in creating innovation through the combination of digital information, the management and understanding of data gets more and more important. In this context, the domain specific knowledge, which is needed for standardization of data models is a key asset for a successful adaptation in the long run. The presentation will give an overview of some of the standardization activities at BMW Research in regard to vehicle signals and show examples on how it is already used within the company.

Tuesday, September 10 14:00 - 15:30

Poster session (3) & Creative Corner

Room: A2

Chair: Lucio Ciabattoni (Universita' Politecnica delle Marche, Italy)

An Immersive Service Guide for Home Appliances...370
Jakub Flotyński, Dominik Strugała, Krzysztof Walczak, Anna Englert, Mikołaj Maik and Adrian Nowak (Poznan University of Economics and Business, Poland); Tomasz Jenek (Amica S.A., Poland)

Open IoT Infrastructures for In-Home Energy Management and Control...376
Emilio J. Palacios-Garcia, Babak Arbab-Zavar, Juan Vasquez and Josep M. Guerrero (Aalborg University, Denmark)

Health Monitoring and Auto-Scaling RabbitMQ Queues within the Smart Home System...380
Milica Matic, Sandra Ivanovic, Marija Antic and Istvan Papp (University of Novi Sad, Serbia)

Performing Administrative Tasks on Multiple Home Automation Gateways...385
Sandra Ivanovic, Marija Antic and Milica Matic (University of Novi Sad, Serbia); Bojan Jagetić (RT-RK Computer Based Systems, Serbia)

Effective Photometric Alignment for Surround View Monitoring System...390
Kwon Lee, Deukhyeon Kim, Hoseok Do, Jihyun Kim and Kyuyeol Chae (LG Electronics, Korea)

Parallelization Of Object-oriented Machine Vision Algorithms For Embedded GPUs...392
Vesna Isic (Faculty of Technical Sciences, Serbia); Marko Milošević (Faculty of Technical Sciences, Novi Sad, Serbia); Nives Kaprocki (Faculty of Technical Sciences, Serbia); Nikola Teslic (University of Novi Sad, Serbia)

HIL Based Solution for ADAS Software Development and Verification...396
Uroš Živkovic (Faculty of Technical Sciences, Novi Sad, Serbia); Ognjen Djekic (Faculty Technical Sciences of Novi Sad, Serbia); Milena Milosevic (RT-RK Computer Based Systems LLC, Serbia); Zeljko Lukac (RT-RK Institute for Computer Based

Systems, Serbia)

An Automated Testing Methodology For Digital TV Middleware Implementations...400
Manoel José de Souza Júnior and Orlewilson Bentes Maia (TPV Technology, Brazil); Eddie B de Lima Filho (TPV & Universidade Federal do Amazonas - UFAM, Brazil); Rômulo Fabrício, Jr. and Aguinaldo Silva (TPV Technology, Brazil)

Cybersecurity Risk Assessment for IoT Platforms...N/A
Soumya Kanti Datta (EURECOM, France)

A Route Recommendation Method Based on Personal Preferences by Monte-Carlo Tree Search...404
Yuta Ishizaki (Waseda University, Japan); Toshinori Takayama (Zenrin DataCom Co., LTD., Japan); Nozomu Togawa (Waseda University, Japan)

Stage UI: Live TV Application Tailored for Mobile Devices...410
Lena Bobic (RT-RK, Serbia); Natasa Vukota (RT-RK Institute for Computer-Based Systems, Serbia); Gordana Velikić (RTRK Computer Based Systems LLC, Serbia); Ivan Kastelan (University of Novi Sad, Faculty of Technical Sciences, Serbia)

Tuesday, September 10 14:45 - 15:30

Keynote 10: Akihiko K. Sugiyama - "Phase: Unexplored Wilderness in Signal Enhancement" (Yahoo Japan Corporation, Japan)

Room: A1

Chair: Christian Herglotz (Friedrich-Alexander University Erlangen-Nürnberg (FAU), Germany)

his lecture presents importance and possibilities of phase information in signal enhancement. Phase has not been given as much attention in signal enhancement as its counterpart; i.e. magnitude. This is partially because Wang and Lim experimentally showed in 1982 that except for some conditions, accurate phase does not help improve the SNR. After three decades, signal processing applications have significantly expanded and with these new applications, some of the conditions Wang and Lim did not take into consideration have come up in the spotlight. Two examples of those new applications covered in this talk are impact noise suppression and mechanical noise suppression. Consumer products that need these applications have a huge market today. Different uses of phase information in those applications are presented with audio demonstrations.

Bio:

Akihiko Sugiyama (a.k.a. Ken Sugiyama), affiliated with Yahoo! JAPAN Research, has been engaged in a wide variety of research projects in signal processing such as audio coding and interference/noise control. His team developed the world's first Silicon Audio in 1994, a precursor of iPod. He served as the Chair of Audio and Acoustic Signal Processing Technical Committee, IEEE Signal Processing Society (SPS) [2011-2012], as associate editors for several journals such as IEEE Trans. Signal Processing [1994-1996], as the Secretary and a Member at Large to the Conference Board of SPS [2010-2011], as a member of the Awards Board of SPS [2015-2017], as the Chair of Japan Chapter of SPS [2010-2011], and a member of IEEE Fellow Committee. He was a Technical Program Chair for ICASSP2012. He has contributed to 17 chapters of books and is the inventor of 217 registered patents with more pending applications in the field of signal processing in Japan and overseas. He received 17 awards such as the 2002 IEICE Best Paper Award, the 2006 IEICE Achievement Award, and the 2013 Ichimura Industry Award. He has delivered 117 invited talks in 48 cities of 20 countries. He is Fellow of IEEE and IEICE, and a Distinguished Lecturer for IEEE SPS [2014-2015] and for IEEE CE (Consumer Electronics Society) [2017-2018].

Tuesday, September 10 15:30 - 16:00

NETWORKING: CAFFE BREAK

Room: A1/A2

Tuesday, September 10 15:45 - 17:00

Assisted and Autonomous Driving (2)

Room: A2

Chair: Milan Vidakovic (University of Novi Sad - Faculty of Technical Sciences, Serbia)

Tuesday, September 10 16:00 - 17:00

The IEEE CE chapters German, Italian, Serbian and VDE Creative Hour

Room: A1

Chair: Benedikt Schmuelling (University of Wuppertal, Germany)

Tuesday, September 10 17:05 - 19:00

NETWORKING: Reception, AWARDS, Sharing Stories

Room: A1/A2

Wednesday, September 11

Wednesday, September 11 10:15 - 16:15

Workshop 3 - Fundamentals of Deep Learning for Computer Vision

Room: A1

Chair: Milan Z. Bjelica (University of Novi Sad, Serbia)

In this instructor-led workshop supported by NVIDIA Deep Learning Institute (DLI), you will explore the fundamentals of deep learning by training neural networks and using results to improve performance and capabilities. You'll learn the basics of deep learning by training and deploying neural networks. Among other, you will be enabled to (1) implement common deep learning workflows, such as image classification and object detection; (2) experiment with data, training parameters, network structure, and other strategies to increase performance and capability; (3) deploy neural networks to start solving real-world problems. Upon completion, you'll be able to start solving problems on your own with deep learning. Each participant is awarded an official NVIDIA DLI certificate of course completion.

Note: Apply at the registration desk when collecting your badge! You will need your own laptop for the workshop, power and internet connection will be provided.

Wednesday, September 11 10:15 - 11:30

IFA Tour

Room: A1/A2

Wednesday, September 11 10:30 - 11:30

Instead of Farewell: Bonding Brainstorming and Networking

Includes caffee break
Room: A2

Additional Papers