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Modern approaches to spectrum management

Mina Dashti
Islamic Azad University

During most of the twentieth century, regulators adopted a command and control approach to spectrum management. During the past twenty years, advances in wireless technology and ever increasing demand for wireless spectrum have forced regulators to seek new approaches to spectrum management that are more efficient and more flexible than previous methods. While engineers remain the core contributors to this vital field, innovations in spectrum management have come from many disciplines, including economics, business, policy and law. Provided with a broad set of choices, regulators face difficult decisions ahead.

In this presentation, we examine the motivation and implications of various approaches, including unlicensed spectrum; commons, market-based, and unrestricted usage; spectrum sharing; liberalization; technology neutrality, and service neutrality with particular consideration for the interference and harmonization implications, and the potential gains and/or losses for incumbent spectrum users. The implications of new spectrum policy for future wireless technology and vice versa are profound.

Speaker: Prof. Mina Dashti is with Islamic Azad University, Eastern Tehran Branch in Iran. From 2005-2014, she served as a project manager and later head of the ITU and APT Research Group of the Communication Regulatory Authority in Tehran, Iran where she provided technical and regulatory criteria for minimizing spillover and eliminate harmful interference, analyzed the results of GSM spectrum measurements in the boundary areas to find a method of resolving harmful interference and accelerating cross border coordination, collaborated in drafting of various bilateral cross border frequency coordination agreements, attended international and regional conferences such as ITU-R study group meetings, WTSA, and APG15-3.
She is currently a visiting professor in the Radio Science Lab at UBC.

Friday 13 January

400 - 500 pm

MCLD 418

UBC ECE

Information
Joint Aerospace and Electromagnetics Chairs
Dave Michelson
davem@ece.ubc.ca

IEEE Joint Aerospace and Electromagnetics Chapter

Damir Novosel
Quanta Technology

Distinguished Lecturer

Thursday 08 December

4:30PM to 5:30PM

BC Hydro
Edmonds A01 Auditorium
Southpoint Room
6911 Southpoint Dr Bby

Industry trends and innovation: past, present, and future

Reliable and efficient electrical grid operation is critical to society. Electrical utility industry has been experiencing significant changes in the last decade caused by new technology trends, environmental drivers and weather patterns, changing public needs, and regulatory requirements. The electrical power and energy industry in the next decades will be different than it is today to meet the demands of the society and address challenges. We are at a cross-roads in making business and technical decisions that will allow us to optimally and cost-effectively manage the grid.

The presentation will address how electrical grid developed since the first electric power plant, what some of the challenges and opportunities facing modern grids are, and how industry trends and innovation will shape the future grid.

Topics discussed are:

- Industry trends and transformation drivers
- Optimized hybrid grids: Incorporating distributed energy resources, microgrids, storage and electrical vehicles
- Wide area monitoring, protection, and control
- Education and workforce needs
- Key success factors to prepare for the grid of the future.

It will also address how IEEE provides technical leadership by tapping volunteers to offer an unbiased and independent service to the industry, benefiting from synergies between private and public sectors (utilities, vendors, academia, national labs, regulatory organizations, and other industry participants).

Speaker: Dr. Damir Novosel (SM 1994, F 2003) is president of Quanta Technology, a subsidiary of Quanta Services, a Fortune 500 company. Previously, he was vice president of ABB Automation Products and president of KEMA T&D US. He has led development and implementation of a number of pioneering concepts, methods, and products that improved reliability and efficiency of power grids.

Damir is elected to National Academy of Engineers in 2014. Dr. Novosel is IEEE PES President (2016-2017). He served as chair of the PES Technical Council, Vice President of Technology, and a member of the PES Governing Board from 2010 to 2012. Damir is also member of the CIGRE US National Committee and received the Attwood Associate award.

Damir holds 16 US and international patents and published over 100 articles in Transactions, Journals and Proceedings, receiving PES 2011 and 2013 Prize Paper Awards. He has led or participated in numerous IEEE standards, publications and other initiatives.

He holds PhD and MSc degrees in electrical engineering from Mississippi State University (where he was a Fulbright scholar) and the University of Zagreb, Croatia, respectively. He was elected Mississippi State University Distinguished Engineering Fellow in 2015.

Information
Joint Power & Energy Chair
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IEEE PES Power & Energy Society®

DEIS

Bending the cost curve: Towards a $1000 diagnostic X-ray imager for scalable and sustainable healthcare

Karim S. Karim
University of Waterloo

Distinguished Lecturer

Monday 19 December
2 pm

Room ASB 9896
Applied Science Building
Simon Fraser University
8888 University Dr Bby

Cost, quality and accessibility are major barriers to disease detection globally. For an easily communicable disease like tuberculosis, diagnostic or screening tests based on sputum, blood and urine analysis have slow response, are difficult to administer in remote locations, and have relatively high transportation and storage costs. Medical-grade state-of-the-art digital x-ray imaging systems are versatile in disease detection, faster, incorporate teleradiology for remote diagnosis, but are prohibitively expensive making them affordable only by major hospitals or labs that are located mostly in urban centers with high patient volumes.

Here, a low-cost, high quality, digital x-ray imaging system could address many global health issues by enabling fast, accessible and inexpensive early detection of curable diseases including tuberculosis especially in rural, remote or under-populated areas. In this research, we propose an inexpensive, high quality, digital X-ray system by focusing on the X-ray imager, a component that can reach 50% of the manufacturing cost of an imaging system. High manufacturing costs today are largely a function of small production volumes and various specialized fabrication processes.

Our approach incorporates a technology developed in-house that leverages existing LCD-TFT display manufacturing infrastructure because it is fully compatible with TFT display manufacturing lines: a low dark current, high quantum efficiency optical radiation sensor that rivals state-of-the-art amorphous silicon PIN photodiodes. Our novel sensor technology yields a high performance, low manufacturing cost diagnostic X-ray imager that can help achieve sustainable healthcare globally.

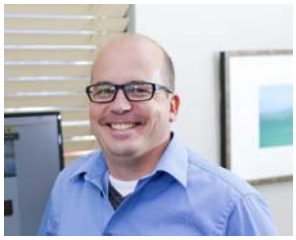
Speaker: Karim S. Karim is currently a Professor in the Department of Electrical and Computer Engineering at the University of Waterloo. His research interests (http://star.uwaterloo.ca) encompass system, circuit, device and process development using amorphous semiconductors for digital imaging applications. Since 1998, he has co-authored 200 publications (mostly with his graduate students). He is an IEEE Electron Devices Society Distinguished Lecturer, a Full Member of the American Association of Physicists in Medicine, and a registered Professional Engineer in Canada. Karim is also the Founder and CTO of KA Imaging, a medical device startup that designs and manufactures digital X-ray imagers for medical and industrial applications.

Information
Electron Devices Chair
Bonnie Gray
bgray@sfu.ca

IEEE Electron Devices Society

IEEE Okanagan Subsection
Presents

Keith MacIntyre, P.Eng.
President, Big Bear Software Inc.



Real World Software, Entrepreneurship & Community

Time & Date: 5pm–6pm, Monday, December 5th, 2016
Location: E105, Okanagan College, 1000 KLO Rd., Kelowna, BC V1Y 4X8

Talk Abstract:

Software Development can seem abstract at times when learning concepts, theories and algorithms. I will take you through my 18-year journey of writing and deploying large software applications, leading teams, working for start-ups and starting my own company. I will share with you my successes, and more importantly the lessons learned from my failures. I will talk about the importance of mentorship, choosing a company to work for and my approach to building teams. Lastly, I will demonstrate the importance of community within a company, and being an active member of the community you live in.

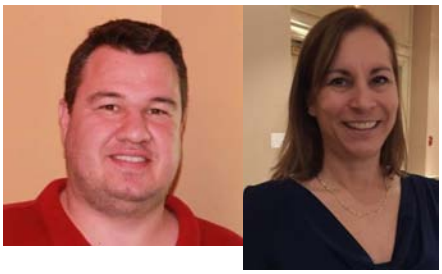
Speaker Biography:

Keith MacIntyre graduated from the University of Alberta with an Electrical Engineering Degree in 1998. He started writing software with some of the first home PC's in the 1980's. He quickly became a key software developer at General Dynamics Canada redeveloping election preparation and tabulation software for touch-screen voting systems used in numerous US elections. He has twice been the first employee for two start-ups that grew into successful 30+ person companies. He has personally written military tactical simulators used for training in the Middle East, chemical and nuclear disaster simulators used by the US Army, a pandemic flu simulator used by the Center for Disease Control, and many other products and systems. He has been running Big Bear Software Inc. for 13 years, 6 of those from Penticton. He is an active member of the community have been an executive member of JCI Penticton, a Director on the Chamber of Commerce, and ran in a municipal election for School Trustee, finding a balance between, work, community and raising his two sons.

Registration is open now: https://events.vtools.ieee.org/m/42253
Refreshments (& Pizza) will be provided. For further information please contact:
Youry Khmelevsky (email: youry@ieee.org)

IEEE Okanagan Subsection
Presents

McCall Milligan, Jim Nastos and Jan O'Brien
Department of Institutional Research, Okanagan College



Data Analytics in Educational Institutions: Building a Predictive Model for Student Enrolment

Time & Date: 4pm–5pm, Wednesday, December 7th, 2016
Location: E103, Okanagan College, 1000 KLO Rd., Kelowna, BC V1Y 4X8

Talk Abstract: Now more than ever, planning and decision-making is data, rather than gut, driven. While there are many existing models for regression, prediction and learning, choosing an appropriate model involves understanding the associated data deeply. Often, choosing a standard model is still insufficient if the analyst is not customizing their model to handle the intricacies of their data.

We describe our development process of a Markov chain and Dynamic Markov Chain-based model for predicting college enrolments. The model is compared and contrasted against previously-attempted models. We include a demo of using our interface into the model, which allows for roughly 600 configurations of parameters, and many additional override value options.

The ideas presented here are applicable to many dynamical systems involving population migration in a discrete-time process.

Speaker Biography: Jim Nastos earned his PhD from UBC Okanagan in Interdisciplinary Studies. He is currently a College Professor of Computer Science at Okanagan College, and previously worked as an Institutional Research Data Analyst at Okanagan College, a math and computer science lecturer at the UBCO and a math lecturer at the UAlberta. His academic research has been published in mathematics, computer science, physics, social networks, bioinformatics and marketing venues.

McCall Milligan earned his bachelor of Applied Mathematics at UBC Okanagan. He will be entering an MSc program in financial modeling and risk analysis in 2017. McCall is currently working as an Analyst at Okanagan College in the Institutional Research and Planning office.

Jan O'Brien is Manager of Institutional Research and Planning at Okanagan College. She has been in higher education for over 20 years, in Faculty, co-op education and administration. The department works with data to support planning and evaluation of college programming. Jan earned a Master of Science degree from the University of Leicester and a bachelor of business administration degree from Simon Fraser University. Before working in higher education, Jan worked in technology marketing in Vancouver.

Registration is open now: https://events.vtools.ieee.org/m/42254
Refreshments will be provided. For further information please contact:
Youry Khmelevsky (email: youry@ieee.org)

Congratulations to new IEEE Fellows

IEEE FELLOW IS A DISTINCTION RESERVED FOR SELECT IEEE MEMBERS WHO HAVE MADE EXTRAORDINARY CONTRIBUTIONS TO OUR PROFESSION. IT IS THIS SPIRIT OF HARD WORK AND CURIOSITY COUPLED WITH INSIGHT THAT MOVES OUR PROFESSION FORWARD.

Juri Jatskevich, University of British Columbia, for contributions to modeling of electric machines and switching converters

Jiangchuan Liu, Simon Fraser University, for contributions to multimedia communications and content distribution over the Internet

Panos Nasiopoulos, University of British Columbia, for leadership in DVD authoring and digital multimedia technologies

Zhen Wang, University of British Columbia, for contributions to statistical signal processing for multimedia security and brain data analytics

Zuo-Guang Ye, Simon Fraser University, for contributions to piezoelectric and ferroelectric materials for high-performance electromechanical transducers

Congratulations to you all!

2017 IEEE Vancouver elected executive positions

Member	Entity	Role
Rama Vinnakota	Section	Chair
Lee Vishloff	Section	Past Chair
Guillaume Boisset	Section	Vice-Chair
Steven McClain	Section	Treasurer
Nimesh Shah	Section	Secretary
Matthew Reid	Northern BC Sub-Section	Chair
Youry Khmelevsky	Okanagan Sub-Section	Chair
Scott Tully	Affinity Group - Consultants Network	Chair
Terry Martinich	Affinity Group - Life membership	Chair
Parastoo Kheirkhah Dehkordi	Affinity Group - Women In Engineering	Chair
Sean Garrity	Affinity Group - Young Professionals	Chair
Bonnie Gray	Chapter - Electron Devices	Chair
Sara Khosravi	Chapter - Engineering in Medicine & Biology	Chair
Dave Michelson	Chapter - Joint Aerospace & Electromagnetics	Chair
Ahmed Hussein	Chapter - Joint Applied Physics	Chair
Ljiljana Trajkovic	Chapter - Joint Section Circuits and Systems	Chair
Vincent Wong	Chapter - Joint Communications	Chair
Bob Gill	Chapter - Joint Computing	Chair
Ryozo Nagamune	Chapter - Joint Control, Robotics, and Cybernetics	Chair
Jeff Bloemink	Chapter - Joint Industry Applications and Electronics	Chair
Darrell Koskinen	Chapter - Joint Management	Chair
Serdar Soylu	Chapter - Oceans, Geoscience & Remote Sensing	Chair
Dipendra Rai	Chapter - Joint Power & Energy	Chair
Shahriar Mirabbasi	Chapter - Joint Solid State Circuits & Technology	Chair
Martin Ordonez	Chapter - Power Electronics	Chair
Ivan Bajic	Chapter - Signal Processing	Chair

I am pleased to announce the above members have agreed to fulfil the many important elected positions on our executive for 2017. Each of these positions, along with our many committee positions are vital to the success of IEEE Vancouver. All of the positions were filled by acclamation. I am especially grateful to those who continue to contribute year after year. This continuity makes for a strong organization. Thank you all.

Lee Vishloff, Chair

Welcome.. 165 arrivals to IEEE Vancouver!!

Amir Abdi ..... GS
Taylor Adam ..... ST
Sin Afrooze ..... GS
Md Ahmed ..... M
Brayden Aimar ..... ST
Mohammad Akbari ..... GS
Ramamurthy Akella ..... M
Jalal Amini ..... GS
Jade Andersen ..... ST
Mirko Andjic ..... M
Nikola Arnaut ..... M
Lazar Atanackovic ..... ST
Lauren Atkinson ..... M
Ahmed Awad ..... M
Gabrielle Balao ..... GS
Clarence Barce ..... ST
Harpreet Bardin ..... M
Chris Barreiro Stewart ..... ST
Adrian Boivin ..... ST
Christopher Bond ..... ST
Tobias Braun ..... ST
Terence Calderbank ..... ST
Stuart Chambers ..... M
Ken Chidlow ..... M
Courtney Collins ..... ST
Peiman Dadkhah ..... ST
Jay Dahiya ..... ST
Ke Dai ..... GS
Tony De Francesco ..... M
Tyler Delane ..... M
Owen Delisle ..... ST
Raj Singh Dhawal ..... M
Shuan Dong ..... GS
Shane Doyle ..... ST
Alireza Ebadighajari ..... GS
Nourhan Eid ..... GS
Shady Elbassiouny ..... GS
Halid Erhan ..... ST
Jason Fakidis ..... ST
Fang Fang ..... GS
Andrea Ferrone ..... ST
Daniel Fonseca ..... ST
Alan Foote ..... M
Lestley Gabo ..... ST
Maria Garcia ..... ST
Igor Gasovic-Varga ..... ST
Andrei Gavrilov ..... ST
Konstantin Gerasimov ..... M
Jared Gray ..... ST
Graham Green ..... M
Brendan Gribbons ..... M
Adib Ahmed Habib ..... GS
David Hampson ..... ST
Nandinee Haq ..... GS
Waqar Haque ..... M
Tony Harris ..... M
Qiyun He ..... M
Chris Heatley ..... ST
Hooman Homayouni ..... GS
Kevin Hong ..... ST
Aidin Houshmand ..... ST
Ramy Hussein ..... GS
Mrinmoy Jana ..... GS
Abbasali Kermali ..... ST
Shakiba Kheradmand ..... GS
Ramzi Khsib ..... M
Grayson King ..... ST
Matthew Knight Knight ..... ST
Snehasish Kumar ..... GS
Chris Kwiatkowski ..... ST
Jim Lee ..... ST
Charles Lewthwaite ..... ST
Jiang Lin ..... M
Xuhong Liu ..... GS
Badrun Naher Liya ..... GS
Jamie Lo ..... ST
Ivan Lobachev ..... GS
Candice Loo ..... ST
Brandon Loss ..... ST
Michael MacDougall ..... AM
Clive Mackay ..... AM
Andrew MacNeill ..... ST
Atif Mahmud ..... ST
Bhavik Maisuria ..... ST
Clara Mak ..... GS
Riley Marsh ..... M
Xuekun Meng ..... GS
Meng Meng ..... ST
Sepehr MohaimenianPour ..... GS
Nasreen Mohsin ..... GS
Shelby Mosbrucker ..... ST
Somar Musa ..... M
Naveen Mysore ..... GS
Sohail Nazari ..... M
Him Wai Ng ..... M
Dustin Nguyen ..... ST
Mila Nikolic ..... ST
Severin Nowak ..... ST
Marie O'Brien ..... GS
David Olson ..... M
Pavlo Omelchenko ..... GS
Paul Oostindie ..... M
Tony Paquette ..... M
Hyunkyoo Park ..... GS
Yoobin Park ..... ST
Vamsi Krishna Pathipati ..... M
Camellia Peng ..... ST
Yifan Evan Peng ..... GS
Yan Peng ..... GS
Wade Penson ..... ST
Duy Pham ..... M
Angie Pinchbeck ..... ST
Helena Maria Pulido Calderon ..... ST
Enrique Quintana ..... M
Jonnathan Quintero ..... M
Bernhard Rabus ..... M
MD Rahman ..... ST
Anindya Roy ..... GS
Carlos Sanchez ..... GS
Lemuel Santos ..... ST
Adriano Sela Aviles ..... ST
Mehran Shafighy ..... GS
Bhavit Sharma ..... ST
Seyed Arash Sheikholeslam ..... M
Andrew Simpson ..... ST
Christian Slater ..... ST
Saeid Soltanian ..... M
Mark Stevens ..... M
Laurel Stothers ..... GS
Stefan Strbac ..... M
Yanan Sun ..... GS
Zeyad Tamimi ..... ST
Katharyn Taylor ..... ST
Visal Thiara ..... ST
Alexander Toews ..... ST
Joshua Trainor-Matties ..... ST
Brody Travis ..... ST
Mervin Truong ..... ST
Paige Tyler ..... ST
Brian Uifalusi ..... M
Klaske van Heusden ..... M
Daniel Wahl ..... GS
Yuan Wang ..... M
Jacky Wang ..... ST
James Webber ..... ST
Michael Williams ..... M
Eric Wood ..... ST
Qiong Wu ..... M
Meng Xi ..... GS
Fan Xia ..... GS
Zihao Xie ..... ST
Howard Yang ..... M
Kai Yang ..... ST
Asphand Yar ..... ST
Troy Yee ..... M
Renjiao Yi ..... GS
Vincent Yuan ..... ST
Tim Yue ..... ST
Sepehr Zarif Mansour ..... GS
Shing Zhan ..... GS
Jenny Zhang ..... ST
Joy Zhang ..... ST
Chris Zheng ..... M
Yulong Zheng ..... ST
Yang Zhou ..... M

AF Affiliate - AM Associate - F Fellow - GS Graduate Student - LF Life Fellow LM Life - LS Life Senior - M Member - SM Senior - ST Student

Retrospective & Prospective SPARKLING Trajectories for Accelerated 2D Anatomical Imaging at 7T Using Compressed Sensing

Philippe Ciuciu (CEA/NeuroSpin & INRIA Saclay /Parietal)

Monday 12 December 2016, 1:30pm-2:30pm, KAIS2020, KAIS Building, 2332 Main Mall, UBC

Abstract:

Decreasing scanning time in Magnetic Resonance Imaging (MRI) is critical for improving patient comfort, reducing exam costs and limiting patient movement. The time saved may alternatively be used to improve spatial resolution in anatomical MRI. Since the last decade, this concern has been addressed notably using Compressed Sensing (CS). This theory [Candès et al, 2006; Donoho, 2006] and its recent refinements [Adcock et al, 2013; Roman et al, 2014; Boyer et al, 2014; Chun et al, 2016; Bigot et al, 2016] guarantee optimal image recovery from massively undersampled data provided that three conditions are met: (i) the image is (or asymptotically) sparse in an appropriate representation; (ii) the pseudo-random sampling strategy is adequate (e.g., variable density or multilevel sampling) to break the coherence barrier; (iii) image reconstruction is performed using a non-linear recovery algorithm (e.g., Lasso) that promotes sparsity in the transformed domain. Although significant breakthroughs have been achieved in the CS community over the last years [Candès & Plan, 2011; Adcock et al, 2013], actual implementations in MRI [Lustig et al, 2007] are sub-optimal for 2D (or even 3D) imaging. The reason is that most of theoretical results consider isolated measurements whereas MRI data are collected along piecewise or more regular k-space trajectories. Hence, existing theories are only implementable on real scanners by considering the third dimension as the readout direction or by inducing randomness over already existing sampling schemes (lines, spokes, spirals ...).

In this talk, I will first present the mathematically-principled algorithm we have developed to produce physically plausible 2D trajectories [Boyer et al, 2016; Chauffert et al, 2016] according to a prescribed variable density while allowing fast coverage and massive undersampling of k-space. *Retrospective* simulation results demonstrate that the proposed **SPARKLING** (**S**egmented **P**rojection **A**lgorithm for **R**andom **k**-space samp**LING**) curves outperform competing schemes (radial and spiral) by about 3 dB in terms of SNR, especially in the very high resolution (2048x2048) context. Next, retrospective CS tests on real data collected on an ex-vivo baboon brain allowed us to achieve a 16-fold acceleration in 2D high-resolution (1024x1024) anatomical imaging. Last but not least, we *prospectively* implemented these trajectories within a GRE-FLASH MR pulse sequence on a 7T Siemens scanner. High-resolution (400 µm in-plane, 512x512) T2*-weighted image was acquired with an 8-fold undersampled SPARKLING trajectory leading to the same acceleration factor in time [Lazarus et al, submitted].

Bio:

Philippe Ciuciu (IEEE SM'10) is a senior research scientist at the French Atomic Energy Commission (CEA), a government-funded technological research organization. Since 2007, he has been with NeuroSpin a neuroimaging center dedicated to ultra-high field MRI and its applications to neuroscience. Prior to that, he received his Engineering (1996) and Ph.D. (2000) degrees in electrical engineering respectively from the ESIEA Paris school and the University of Paris-Sud. Then he joined the Life Science Division of CEA in the Frédéric Joliot Hospital Facility (SHFJ) for a 2 year post-doctoral fellowship where he was hired on a permanent researcher position to develop signal processing methods for functional Magnetic Resonance Imaging (fMRI) data. He has coauthored more than 170 research outputs, including 40 peer-reviewed journal papers.

IEEE ICIP 2016, Notes on Conference

Image Processing: From Academia to Profitable Products and Back

The IEEE International Conference on Image Processing, ICIP 2016, was held in Phoenix, from September 25th to 28th. ICIP belongs to the family of conferences under the common umbrella of IEEE Signal Processing Society.

The wide scope of topics catered to everyone's interest and taste, but there have been a couple of clear focal points, drawing notable attention. In my opinion, there was a visibly increased interest in:

- Virtual reality
- Deep learning as applied to image processing
- Light field processing

Virtual Reality (VR) seems to be getting out into the public. It went from numerous not so commercially successful attempts in the past, through revisited research papers, into now very specialized devices, fueled by the interest and the investments delivered by social media. The companies that are involved are well known, and chances are that you are reading these lines thanks to hardware and software of those companies. VR, and related differently named offshoots: mixed reality, merged reality, augmented reality, are not technologies of the future anymore. However, VR still requires significant research work, refinement, as well as mapping of the even more optimal algorithms into viable industrial solutions. There will be much more back and forth interchange between research and industry, and this will probably result in amazing breakthroughs in the near future.

Deep learning, coming naturally into the world of image processing through the general signal processing, became mainstream due to well-developed theoretical foundations, and a recent rapid decline of hardware prices, as well as advances in neural network training techniques. Most of the theory was developed a couple of decades ago, but found the implementation only recently. Curiously enough, even the matching of the reviewers and the conference papers was done using the machine learning algorithms, proving that the signal processing is omnipresent.

The light field processing technology is clearly the next breakthrough in the way how we obtain, record, deliver, and present images. The amount of information that needs to be stored and processed is epic, hence, the silicon design industry is expected to step up in the future, and support it

Other equally important conference topics covered wide areas. Here are some, just as an illustration: computer vision for vehicular technology, depth field image processing, video and image compression, content identification and forensics, multispectral processing, action recognition, remote sensing, statistical models and learning, optical flow, medical imaging, multi-camera, and point of view television, networking and image processing.

ICIP 2016 showed the research and industrial trends in Image Processing. It came as no surprise that some results from the conference, especially in the area of VR, have already been implemented in widely accepted commercial products.