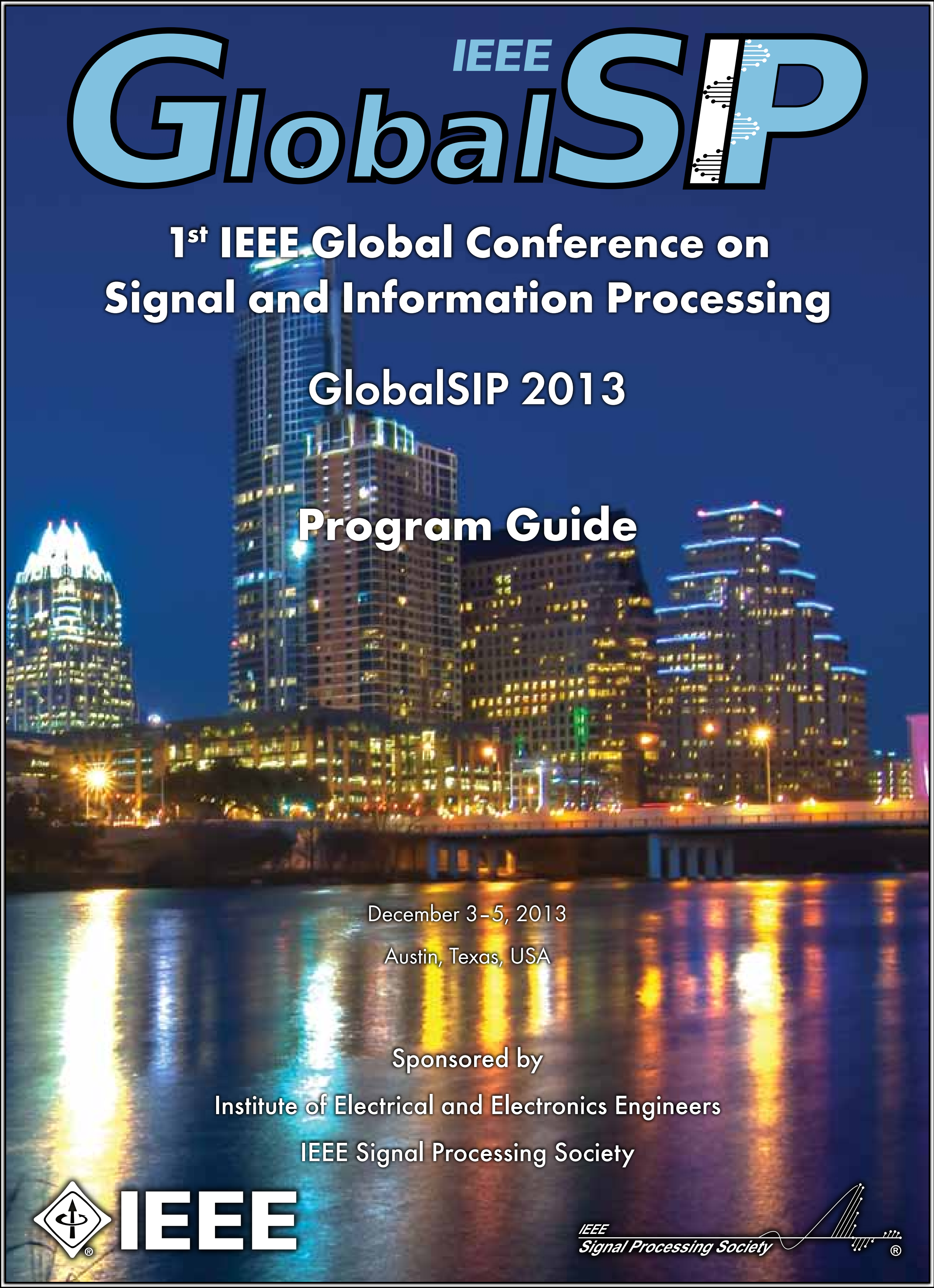

IEEE GlobalSIP

1st IEEE Global Conference on Signal and Information Processing

GlobalSIP 2013

Program Guide

December 3–5, 2013

Austin, Texas, USA

Sponsored by

Institute of Electrical and Electronics Engineers

IEEE Signal Processing Society

IEEE

IEEE Signal Processing Society

Tuesday, December 3

Wednesday, December 4

Thursday, December 5

* Pau Hana: The time after work. It is considered a time for relaxation, informal socializing with friends, and enjoyment.

General Chairs' Welcome

On behalf of the IEEE Global Conference on Signal and Information Processing (GlobalSIP) Organizing Committee, we would like to cordially welcome you to Austin, Texas. Austin is known as the Live Music Capital of the World. Indeed, Austin offers many opportunities to experience music just a stones throw away from the convention center, but it also has much to offer residents and visitors. Austin is also the capital of Texas and is home to the University of Texas at Austin, leading technology companies, and a number of emerging startups in diverse areas from signal processing, communications, semiconductors, and gaming. Several annual events are held in Austin including the Formula 1 US Grand Prix, the Austin City Limits Music Festival (ACL), and the South-by-Southwest music, film, and interactive conference and festival (SXSW also called "Southy-By").

The conference venue is the Austin Convention Center. Constructed of native Texas materials, from rustic limestone to polished granite, the different facades of the center reflect the architectural diversity of an historic and vibrant city. Nearby are many hotels, restaurants, and live music. Recreation opportunities abound. Lady Bird Lake trail is a great place for walking, running, and biking. Barton Springs is a huge spring fed pool that is open year round with pleasant 69°F water temperature. Zilker park is available for flying a kite or relaxing. Mountain biking is available with the Barton Creek Greenbelt close by, not to mention many road biking opportunities in and around the city. We hope that you will have a chance to experience some of what Austin has to offer.

We are excited to host the first annual GlobalSIP conference in Austin. GlobalSIP is a new flagship IEEE Signal Processing Society conference, with a focus on signal and information processing and up-and-coming signal processing themes. Beyond being yet another conference, GlobalSIP breaks the mold of other established conferences with a brand new format. The conference is comprised entirely of co-located symposia selected based on responses to the call-for-symposia proposals. Each symposium is run by its own technical committee and controls its own keynote session and two technical poster sessions. A particular innovation of our format is to interleave the keynote sessions throughout the day, so that attendees have the opportunity to attend keynotes in diverse areas. This fits with the vision of the conference to provide exposure to new areas and applications of signal processing. The conference also features a conference-wide plenary and a lunch panels, and we would like to thank our plenary and lunch panel speakers: Jelena Kovačević, Piotr Indyk, David Haussler, Jim Truchard, Mari Ostendorf and Dilek Hakkani-Tur.

We hope that you will enjoy this new format and look forward to your participation in future years.

Putting together a new conference is a challenge. Our sincere gratitude goes to our technical program chairs, Charlie Bouman, Rob Nowak and especially to Anna Scaglione for all the innovative planning and execution in the very short time between approval of GlobalSIP and December 2013 that led to the exciting symposia we have at this inaugural GlobalSIP, and for developing the policies and procedures that will govern the new format of GlobalSIP. We couldn't have picked a better finance chair than Joe Cavallaro to deal with all the challenges associated with starting a new conference with a new format. We are indebted to Mark Plumbley who, beyond his excellent service as publications chair, made sure we met our deadlines, and identified and solved a myriad of problems we encountered as they developed. Robert Daniels did a superb job with facilities, local programs and assisted in promoting the event. Rick Brown, Ken Ma and especially Beatrice Pesquet-Popescu were instrumental in publicizing the conference despite the very challenging deadlines they had to work with. Fawzi Behmann and the IEEE Central Texas chapter helped us identify sponsors, attract industry participants and offer continuing education credits to participants. Finally, Billene Cannon and CMS were instrumental in making GlobalSIP a reality. The entire team also deserves our deep appreciation for being so patient with us! We also gratefully acknowledge the precious financial support from our Silver Sponsor, National Instruments, as well as Now Publishers, Inc. and InView Corporation. Finally, we thank the IEEE Signal Processing Society for giving us the opportunity to experiment with this new format.

We hope that you will not only enjoy the technical and social programs of the conference, but also enjoy meeting local people and experiencing local culture during your stay in Austin. We look forward to meeting you soon.

Robert W. Heath Jr.
Ahmed Tewfik
General Chairs, GlobalSIP 2013

Technical Program Overview

Welcome to Austin, Texas for the inaugural IEEE Global Conference on Signal and Information Processing. GlobalSIP is a new flagship IEEE Signal Processing Society conference that targets hot topics and up-and-coming themes in signal and information processing. GlobalSIP is organized differently from other IEEE SPS meetings to encourage new SPS research directions and to foster emerging areas.

GlobalSIP is comprised of symposia selected to span a diverse range of exciting and important topics in signal and information processing. Each symposium listed below was organized separately by independent technical committees. The symposia are tied together through co-location, common timing, a shared plenary, non-overlapping keynote lectures and parallel poster sessions.

Advancing Neural Engineering Through Big Data
Bioinformatics and Systems Biology
Controlled Sensing For Inference: Applications, Theory and Algorithms
Cyber-Security and Privacy
Emerging Challenges in Network Sensing, Inference, and Communication
Energy Harvesting and Green Wireless Communications
Graph Signal Processing
Information Processing in the Smart Grid
Information Processing over Networks
Low-Dimensional Models and Optimization in Signal Processing
Low-Power Systems and Signal Processing
Millimeter Wave Imaging and Sensing
Mobile Imaging
Network Theory
New Sensing and Statistical Inference Methods
Optimization in Machine Learning and Signal Processing
Signal and Information Processing in Finance and Economics
Software Defined and Cognitive Radios

The symposia program committees have done an amazing job of bringing researchers together on these exciting themes and carefully reviewing submitted papers to ensure a high quality conference. Special thanks go to the symposia organizers: George Atia, Waheed U. Bajwa, Robert Calderbank, Rui Castro, Volkan Cevher, Goutam Chattopadhyay, Randy Cole, Mark A. Davenport, Minh N. Do, Marco Duarte, Brian L. Evans, Manish Goel, Deniz Gunduz, Jarvis Haupt, Shalinee Kishore, Negar Kiyavash, Nitish Krishna Murthy, Dmitry Malioutov, Jose Moura, Iyad Obeid, Antonio Ortega, Devangi Parikh, Joseph Picone, Ilya Pollak, Michael Rabbat, Pradeep Ravikumar, Sourabh Ravindran, Markku Renfors, Alejandro Ribeiro, Justin Romberg, Venkatesh Saligrama, Sujay Sanghavi, Lalitha Sankar, Ali H. Sayed, David M. Sheen, Jarmo Takala, Murat Torlak, Sennur Ulukus, Parv Venkitasubramaniam, Haris Vikalo, Rebecca Willett, Aylin Yener, Byung-Jun Yoon, Fuli Yu, and Qing Zhao.

We are especially pleased with the outstanding set of keynote talks at GlobalSIP. Many of the symposia target new theory, methods and applications. The keynotes will help to introduce the themes of each symposium and have been scheduled so that GlobalSIP participants can attend all the talks. We would like to thank the keynote speakers for their important contributions to GlobalSIP: François Baccelli, Francis Bach, Lawrence Carin, David Castañón, Christophe Chamley, Christopher Cieri, Inderjit Dhillon, Eran Fishler, Christina Fragouli, Alan Gatherer, Bernd Girod, fred harris, Jennifer Hasler, Babak Hassibi, Alfred O. Hero III, Payam Heydari, Trey Ideker, Piotr Indyk, Jack Judy, Eric Kolaczyk, Gerhard Kramer, Vikram Krishnamurthy, Wei Li, Steven H. Low, Xiaolin Lu, Mauro Maggioni, James Moody, Karen Moxon, Stephen C. Pratt, Kari Pulli, Ram Rajagopal, Kannan Ramchandran, Benjamin Recht, Nicholas D. Sidiropoulos, Sheridan Titman, Lang Tong, Wade Trappe, Pierre Vandergheynst, Naveen Verma, David A. Wheeler, Gregory Wornell, Roy Yates, and Gil Zussman.

Finally we wish to thank all the authors for their efforts. Their papers are the key to the exceptionally high-quality of GlobalSIP. We appreciate their participation and look forward to learning about their research. Finally, we express our gratitude to Lance Cotton from Conference Management Services, whose prompt and professional assistance was invaluable in putting together the technical program.

Charles Bouman, Robert Nowak, and Anna Scaglione
Technical Program Chairs, GlobalSIP 2013

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The University of Texas at Austin

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Bioinformatics and Systems Biology
Haris Vikalo, Byung-Jun Yoon and Fuli Yu

Controlled Sensing For Inference: Applications, Theory and Algorithms
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Emerging Challenges in Network Sensing, Inference, and Communication
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Energy Harvesting and Green Wireless Communications
Aylin Yener and Sennur Ulukus

Graph Signal Processing
Antonio Ortega and Michael Rabbat

Information Processing over Networks
Jose Moura, Ali H. Sayed and Qing Zhao

Information Processing in the Smart Grid
Shalinee Kishore and Lalitha Sankar

Low-Dimensional Models and Optimization in Signal Processing
Volkan Cevher, Justin Romberg, Marco Duarte and Mark A. Davenport

Low-Power Systems and Signal Processing
Sourabh Ravindran, Devangi Parikh, Nitish Krishna Murthy and Randy Cole

Mobile Imaging
Minh N. Do

Millimeter Wave Imaging and Communications
Goutam Chattopadhyay, David M. Sheen and Murat Torlak

New Sensing and Statistical Inference Methods
Waheed U. Bajwa, Rui Castro and Jarvis Haupt

Network Theory
Alejandro Ribeiro and Deniz Gunduz

Optimization in Machine Learning and Signal Processing
Sujay Sanghavi and Pradeep Ravikumar

Software Defined and Cognitive Radios
Brian L. Evans, Markku Renfors, Jarmo Takala and Manish Goel

Signal and Information Processing in Finance and Economics
Ilya Pollak and Dmitry Malioutov

Tuesday, December 3, 2013, 08:30 - 09:00, Ballroom C

Jelena Kovačević, Carnegie Mellon University

Problems in Biological Imaging: Opportunities for Signal Processing

In recent years, the focus in biological sciences has shifted from understanding single parts of larger systems, sort of vertical approach, to understanding complex systems at the cellular and molecular levels, horizontal approach. Thus the revolution of "omics" projects, genomics and now proteomics. Understanding complexity of biological systems is a task that requires acquisition, analysis and sharing of huge databases, and in particular, high-dimensional databases. Processing such huge amount of bioimages visually by biologists is inefficient, time-consuming and error-prone. Therefore, we would like to move towards automated, efficient and robust processing of such bioimage data sets. Moreover, some information hidden in the images may not be readily visually available. Thus, we do not only help humans by using sophisticated algorithms for faster and more efficient processing but also because new knowledge is generated through use of such algorithms.

The ultimate dream is to have distributed yet integrated large bioimage databases which would allow researchers to upload their data, have it processed, share the data, download data as well as platform-optimized code, etc, and all this in a common format. To achieve this goal, we must draw upon a whole host of sophisticated tools from signal processing, machine learning and scientific computing. I will address some of these issues in this presentation, especially those where signal processing expertise can play a significant role.

Jelena Kovačević received a Ph.D. degree from Columbia University. She then joined Bell Labs, followed by Carnegie Mellon University in 2003, where she is currently a Professor in the Departments of BME and ECE and the Director of the Center for Bioimage Informatics. She received the Belgrade October Prize and the E.I. Jury Award at Columbia University. She is a coauthor on an SP Society award-winning paper and is a coauthor of the books "Wavelets and Subband Coding" and "Foundations of Signal Processing". Dr. Kovacevic is the Fellow of the IEEE and was the Editor-in-Chief of the IEEE Transactions on Image Processing. She was a keynote speaker at several meetings and has been involved in organizing numerous conferences. Her research interests include multiresolution techniques and biomedical applications.

Wednesday, December 4, 08:30 - 09:30, Ballroom C

Piotr Indyk, Massachusetts Institute of Technology

Recent Developments in the Sparse Fourier Transform

The Fast Fourier Transform (FFT) is a widely used numerical algorithm. It computes the Discrete Fourier Transform (DFT) of an n-dimensional signal in O(n log n) time. It is not known whether its running time can be improved. However, in many applications, most of the Fourier coefficients of a signal are "small" or equal to zero, i.e., the output of the transform is (approximately) sparse. In this case, it is known that one can compute the set of non-zero coefficients much faster, even in sub-linear time.

In this talk I will give an overview of recent highly efficient algorithms for computing the Sparse Fourier Transform. One of the algorithms has the running time of O(k log n), where k is the number of non-zero Fourier coefficients of the signal. This improves over the runtime of the FFT for any k = o(n). I will also give a few examples of applications impacted by these developments.

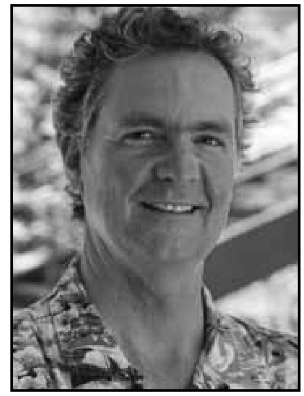
The talk will cover the material from the joint papers with Fadel Adib, Badih Ghazi, Haitham Hassanieh, Michael Kapralov, Dina Katabi, Eric Price and Lixin Shi. The papers are available at http://groups.csail.mit.edu/netmit/sFFT/

Piotr Indyk is a Professor of Electrical Engineering and Computer Science at MIT. He joined MIT in 2000, after earning PhD from Stanford University. Earlier, he received Magister degree from Uniwersytet Warszawski in 1995. Piotr's research interests lie in the design and analysis of efficient algorithms. Specific interests include: high-dimensional computational geometry, sketching and streaming algorithms, sparse recovery and compressive sensing. He has received the Sloan Fellowship (2003), the Packard Fellowship (2003) and the MIT Faculty Research Innovation Fellowship (2012). His work on sparse Fourier sampling has been named to Technology Review "TR10" in 2012, while his work on locality-sensitive hashing has received the 2012 Kanellakis Theory and Practice Award.

Thursday, December 5, 08:30 - 09:30, Ballroom C

David Haussler, University of California, Santa Cruz

Cancer Genomics



University of California, Santa Cruz has built the Cancer Genomics Hub (CGHub) for the US National Cancer Institute, designed to hold up to 5 petabytes of research genomics data (up to 50,000 whole genomes), including data for all major NCI projects. To date it has served more than 8.3 petabytes of data to more than 300 research labs. Cancer is exceedingly complex, with thousands of subtypes involving an immense number of different combinations of mutations. The only way we will understand it is to gather together DNA data from many thousands of cancer genomes so that we have the statistical power to distinguish between recurring combinations of mutations that drive cancer progression and "passenger" mutations that occur by random chance. Currently, with the exception of a few projects such as ICGC and TCGA, most cancer genomics research is taking place in research silos, with little opportunity for data sharing. If this trend continues, we lose an incredible opportunity.

Soon cancer genome sequencing will be widespread in clinical practice, making it possible in principle to study as many as a million cancer genomes. For these data to also have impact on understanding cancer, we must begin soon to move data into a global cloud storage and computing system, and design mechanisms that allow clinical data to be used in research with appropriate patient consent. A global alliance for sharing genomic and clinical data is emerging to address this problem. This is an opportunity we cannot turn away from, but involves both social and technical challenges.

Reference: http://www.eecs.berkeley.edu/Pubs/TechRpts/2012/EECS-2012-211.html

David Haussler leads the team that posted the first publicly available computational assembly of the human genome sequence on the Internet on July 7, 2000. Since then, as a distinguished professor of biomolecular engineering at the University of California, Santa Cruz, he has led efforts to develop tools to understand the meaning inside the DNA code. His team's analysis tools help make it possible to understand the changes to individual genomes that drive health and disease. He is an organizing member of a new global alliance of the top research, health care, and disease advocacy organizations that have taken the first steps to standardize and enable secure sharing of genomic and clinical data. David leads the alliance's computational genomics research, which is the crucial component of all genomic medical research. Among other benefits, this effort will unlock the power of the genome for understanding cancer and rare diseases.

Haussler received his Ph.D. in computer science from the University of Colorado at Boulder and belongs to the National Academy of Sciences and the American Academy of Arts and Sciences.

Lunch Sessions

Tuesday, December 3, 12:00 - 13:30, Ballroom C

CEO Lunch with Dr. Jim Truchard, National Instruments

Wednesday, December 4, 12:00 - 13:30, Ballroom C

Ari Gesher — Adaptive Adversaries: Building Systems to Fight Fraud and Cyber Intruders

Statistical methods tends to fail when there is someone on the other side of a problem actively evading detection. Here we look at three systems successfully used to fight adaptive adversaries engaged in fraud and cyber attacks. Using a combination of data mining techniques and interactive human analysis, these systems are protecting commercial banks, pharmaceutical companies, and governments.

Ari Gesher is a senior engineer and Engineering Ambassador at Palantir Technologies. At Palantir Technologies, Ari has split his time between working as a backend engineer on Palantir's analysis platform, thinking and writing about Palantir's vision for human-driven information data systems, and moonlighting on Palantir's Philanthropic engineering team. His current role involves understanding and discussing Palantir's role in the world of analytics, big data, and the future of technology. An alumnus of the University of Illinois computer science department, Ari has worked in the software industry for the past fifteen years, including a stint as the lead engineer for the SourceForge.net open source software archive.

Ari often speaks on the topic of big data and the limits of automated decision making. Recently, he's spoken at MIT's Technology Review's EmTech Conference, KDD 2013, Harvard Business School, the Institute for the Future's Tech Horizons Conference, multiple O'Reilly Strata Big Data Conferences, the Economist Future Technologies Summit, and PayPal's TechXploration series.

Thursday, December 5, 12:00 - 13:30, Ballroom C

Lunch Panel: Speech for Games - Mari Ostendorf and Dilek Hakkani-Tur

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Emerging Challenges in Network Sensing, Inference, and Communication - Keynotes

Christina Fragouli, *University of California, Los Angeles*, **Creating Secrets Out of Erasures: A New Approach to Network Secrecy**

We explore a new opportunity for security, that does not rely on the limited computational capabilities of an adversary, Eve, but instead, on her limited network presence. Current cryptographic methods rely on that Eve cannot perform sufficient fast certain operations, eg., large integer factorization. Instead, we can leverage the fact that she is not omnipresent in a wireless domain, and does not wiretap all links of a large wired network. We review and present a number of recent results, that range from information theoretical characterizations for erasure networks, to secure network coding bounds over arbitrary graphs, to testbed implementations.

Christina Fragouli joined UCLA in 2013 as an Associate Professor. She received the B.S. degree in Electrical Engineering from the National Technical University of Athens, Athens, Greece in 1996 and the M.Sc. and Ph.D. degrees in Electrical Engineering from the University of California, Los Angeles in 1998 and 2000, respectively. She has worked at the Information Sciences Center, AT&T Labs, Florham Park New Jersey and the National University of Athens. She also visited Bell Laboratories, Murray Hill, NJ and DIMACS, Rutgers University. Between 2006-2007, 2007-2012 and 2012-2013 she was an FNS Assistant Professor, an Assistant Professor and an Associate Professor, respectively, in the School of Computer and Communication Sciences, EPFL, Switzerland. She received the Fulbright Fellowship for her graduate studies, the Outstanding Ph.D. Student Award 2000-2001 from the Electrical Engineering Department, UCLA, the Zonta Award 2008 in Switzerland, the Starting Investigator ERC Award in 2009 and best paper awards at Mobihoc 2013 and MASCOTS 2011. She served as an Associate Editor for the IEEE Communications Letters, Elsevier Computer Communication, IEEE Transactions on Communications and IEEE Transactions on Information Theory. She is currently an Associate Editor for IEEE Transactions on Mobile Computing. She is also serving as a Distinguished Lecturer for the IEEE Information Theory Society.

James Moody, *Duke University*, **Connecting the Dots: Network Models for Diffusion, Social Integration and Health**

Social life is fundamentally interdependent: what we do and who we are depend significantly on a rich evolving fabric of social contacts. But despite this theoretical importance, empirical social scientists are just beginning to systematically include network measurement and modeling in our work. Here I discuss recent advances in network models focusing on the interdependent problems of structural cohesion and diffusion, with relevance to a wide variety of empirical puzzles ranging from network epidemiology to political polarization. I end by discussing future directions for social network research.

James Moody is the Robert O. Keohane professor of sociology at Duke University. He has published extensively in the field of social networks and social theory. His work has focused theoretically on the network foundations of social cohesion and diffusion, with a particular emphasis on building tools and methods for understanding dynamic social networks. He has used network models to help understand school racial segregation, adolescent health, and the development of scientific disciplines. Moody's work is funded by the National Science Foundation, the National Institutes of Health and the Robert Wood Johnson Foundation. He is winner of INSNA's (International Network for Social Network Analysis) Freeman Award for scholarly contributions to network analysis and editor of the on-line Journal of Social Structure.

Rebecca Willett, *University of Wisconsin-Madison*, **Efficient Tracking in Dynamic Environments**

Modern sensors are collecting data at unprecedented rates, often from platforms with limited processing power and bandwidth for data transmission. To cope with this data deluge, we must develop robust methods for efficiently extracting information from large-scale streaming data. This task is most tractable when the information of interest exhibits low-dimensional spatio-temporal structure. However, in practical scenarios ranging from motion imagery to network analysis, the environment is nonstationary, resulting in both poor empirical performance and weak theoretical guarantees. I will describe a novel "dynamic mirror descent" method which addresses this challenge by learning and tracking low-dimensional models underlying the data. The associated regret bounds, in contrast to competing online learning regret bounds, reflect this underlying spatio-temporal structure. These concepts are demonstrated empirically in the context of sequential compressive observations of a dynamic scene and tracking influences within a dynamic network.

Rebecca Willett is an associate professor in the Electrical and Computer Engineering Department at the University of Wisconsin-Madison. She completed her PhD in Electrical and Computer Engineering at Rice University in 2005 and was an assistant then associate professor of Electrical and Computer Engineering at Duke University from 2005 to 2013. Prof. Willett received the National Science Foundation CAREER Award in 2007, is a member of the DARPA Computer Science Study Group, and received an Air Force Office of Scientific Research Young Investigator Program award in 2010. Prof. Willett has also held visiting researcher positions at the Institute for Pure and Applied Mathematics at UCLA in 2004, the University of Wisconsin-Madison 2003-2005, the French National Institute for Research in Computer Science and Control (INRIA) in 2003, and the Applied Science Research and Development Laboratory at GE Healthcare in 2002. Her research interests include network and imaging science with applications in medical imaging, neural coding, astronomy, and social networks. Additional information, including publications and software, are available online at http://willett.ece.wisc.edu.

Emerging Challenges in Network Sensing, Inference, and Communication I

ECNSICa.PF.1 DISTRIBUTED SPARSE REGRESSION BY CONSENSUS-BASED PRIMAL-DUAL PERTURBATION OPTIMIZATION
Tsung-Hui Chang, National Taiwan University of Science and Technology, Taiwan; Angelia Nedich, University of Illinois at Urbana-Champaign, United States; Anna Scaglione, University of California, Davis, United States

ECNSICa.PF.2 ESTIMATION OF EXCHANGEABLE GRAPH MODELS BY STOCHASTIC BLOCKMODEL APPROXIMATION
Stanley Chan, Thiago Costa, Edoardo Airoldi, Harvard University, United States

ECNSICa.PF.3 COMPUTING SCALABLE MULTIVARIATE GLOCAL INVARIANTS OF LARGE (BRAIN-) GRAPHS
Disa Mhembere, Johns Hopkins University, United States; William Gray Roncal, Johns Hopkins University, Johns Hopkins University Applied Physics Laboratory, United States; Daniel Sussman, Carey E Priebe, Johns Hopkins University, United States; Rex Jung, Sephira Ryman, University of New Mexico, United States; Jacob R. Vogelstein, Johns Hopkins University Applied Physics Laboratory, United States; Joshua T. Vogelstein, Duke University, Johns Hopkins University, Child Mind Institute, United States; Randal Burns, Johns Hopkins University, United States

ECNSICa.PF.4 ESTIMATING INFECTION SOURCES IN A NETWORK WITH INCOMPLETE OBSERVATIONS
Wuqiong Luo, Wee Peng Tay, Nanyang Technological University, Singapore

ECNSICa.PF.5 ALARM: A LOGISTIC AUTO-REGRESSIVE MODEL FOR BINARY PROCESSES ON NETWORKS
Ameya Agaskar, Yue M. Lu, Harvard School of Engineering and Applied Sciences, United States

ECNSICa.PF.6 INDIAN BUFFET GAME WITH NON-BAYESIAN SOCIAL LEARNING
Chunxiao Jiang, Yan Chen, Yang Gao, K. J. Ray Liu, University of Maryland, United States

ECNSICa.PF.7 MIGRAINE: MRI GRAPH RELIABILITY ANALYSIS AND INFERENCE FOR CONNECTOMICS
William Gray Roncal, Zachary Koterba, Johns Hopkins University Applied Physics Laboratory, United States; Disa Mhembere, Johns Hopkins University, United States; Dean Kleissas, Johns Hopkins University Applied Physics Laboratory, United States; Joshua T. Vogelstein, Duke University, United States; Randal Burns, Johns Hopkins University, United States; Anita Bowles, Dimitrios Donavos, University of Maryland, United States; Sephira Ryman, Rex Jung, University of New Mexico, United States; Lei Wu, Vince Calhoun, University of New Mexico/The Mind Research Network, United States; Jacob R. Vogelstein, Johns Hopkins University Applied Physics Laboratory, United States

Emerging Challenges in Network Sensing, Inference, and Communication II

ECNSICb.PF.1 INFERENCE OF FUNCTIONAL CONNECTIVITY IN NEUROSCIENCES VIA HAWKES PROCESSES
Patricia Reynaud-Bouret, University of Nice Sophia-Antipolis, France; Vincent Rivoirard, University Paris-Dauphine, France; Christine Tuleau-Malot, University of Nice Sophia-Antipolis, France

ECNSICb.PF.2 SPARSE MIMO RADAR VIA STRUCTURED MATRIX COMPLETION
Yuejie Chi, The Ohio State University, United States

ECNSICb.PF.3 COMPETITIVE PRIVACY: DISTRIBUTED COMPUTATION WITH PRIVACY GUARANTEES
Lalitha Sankar, Arizona State University, United States

ECNSICb.PF.4 DISTRIBUTED OPTIMIZATION OF STRONGLY CONVEX FUNCTIONS ON DIRECTED TIME-VARYING GRAPHS
Angelia Nedich, Alexander Olshevsky, University of Illinois at Urbana-Champaign, United States

ECNSICb.PF.5 CONTACT GRAPH BASED ROUTING IN OPPORTUNISTIC NETWORKS
Divya Alok Sharma, Mark Coates, McGill University, Canada

ECNSICb.PF.6 HOW LOCAL CAN A NODE'S VIEW BE AND STILL GUARANTEE SUM-CAPACITY IN INTERFERENCE NETWORKS?
David Kao, Cornell University, United States

ECNSICb.PF.7 A PATH ALGORITHM FOR LOCALIZING ANOMALOUS ACTIVITY IN GRAPHS
James Sharpnack, Carnegie Mellon University, United States

Information Processing over Networks - Keynotes

Stephen C. Pratt, *Arizona State University*, **Distributed Information Processing by Insect Societies**

Insect societies are the leading examples of collective cognition by social groups. Much like a single animal, a colony of ants can evaluate its surroundings, process information, and make decisions. Cognition emerges from a network of interacting ants, just as individual cognition emerges from interactions among neurons in the brain. The special appeal of these societies is that their parts-individual insects-are themselves complex cognitive entities, providing a unique opportunity to study the interplay between information processing at these two levels. In this talk I will show how individual behavioral rules and communication networks allow many poorly informed ants to make effective collective decisions. I will further show how colonies amplify the limited cognitive capacity of single ants and how they evade certain irrational consequences of individual choice. Finally, I will consider the limits of collective cognition by exploring when it can improve performance by integrating multiple agents, and when it can instead lead to harmful information cascades.

Stephen C. Pratt received a Ph.D. in neurobiology and behavior from Cornell University, Ithaca, NY, in 1997. Since then, he has worked at Harvard University, the Massachusetts Institute of Technology, Princeton University, and the University of Bath, U.K. He is currently an Associate Professor in the School of Life Sciences at Arizona State University,Tempe, AZ. His research focuses on the emergence of complex social behavior in leaderless and decentralized animal groups, particularly social insects. He employs both theoretical and empirical approaches, and is also active in the development of bio-inspired algorithms for swarm robotics applications.

Christophe Chamley, *Boston University*, **Dynamic Social Learning in Economics**

Christophe Chamley received an MA in Mathematics at the University of Strasbourg (France) and PhD in economics at Harvard University. He is professor of economics at Boston University and director of studies at the EHESS (Paris). He is a fellow of the Econometric Society. He held visiting positions at Harvard University, MIT, Stanford University, University of Bonn, University Carlos III in Madrid, and University of Louvain. He published in all top journals in economics on the theory of optimal taxation and the public debt, history of public finances, monetary policy, economic fluctuations, social learning. He is the author of Rational Herds: Economic Models of Social Learning at Cambridge University Press.

Information Processing over Networks I

IPNa.PB.1 **SOCIAL LEARNING WITH DECENTRALIZED CHOICE OF PRIVATE SIGNALS**
Christophe Chamley, Boston University, United States; Anna Scaglione, University of California, Davis, United States

IPNa.PB.2 **ON THE O(1/K) CONVERGENCE OF ASYNCHRONOUS DISTRIBUTED ALTERNATING DIRECTION METHOD OF MULTIPLIERS**
Ermin Wei, Asuman Ozdaglar, Massachusetts Institute of Technology, United States

IPNa.PB.3 **ON THE PROBABILITY DISTRIBUTION OF DISTRIBUTED OPTIMIZATION STRATEGIES**
Jianshu Chen, Ali H. Sayed, University of California, Los Angeles, United States

IPNa.PB.4 **DISTRIBUTED MINI-BATCH RANDOM PROJECTION ALGORITHMS FOR REDUCED COMMUNICATION OVERHEAD**
Soomin Lee, Angelia Nedich, University of Illinois at Urbana-Champaign, United States

IPNa.PB.5 **DISTRIBUTED AUGMENTED LAGRANGIAN ALGORITHMS: CONVERGENCE RATE**
Dusan Jakovetic, José M. F. Moura, Carnegie Mellon University, United States; João Xavier, Instituto Superior Tecnico, Portugal

IPNa.PB.6 **DIFFUSION BASED COLLABORATIVE DECISION MAKING IN NONCOOPERATIVE SOCIAL NETWORK GAMES**
Omid Namvar Gharehshiran, Vikram Krishnamurthy, University of British Columbia, Canada

IPNa.PB.7 **MEAN-CENTRIC EQUILIBRIUM: AN EQUILIBRIUM CONCEPT FOR LEARNING IN LARGE-SCALE GAMES**
Brian Swenson, Soummya Kar, Carnegie Mellon University, United States; João Xavier, Instituto Superior Tecnico, Portugal

IPNa.PB.8 **ONLINE LEARNING FOR NETWORK OPTIMIZATION UNDER UNKNOWN MODELS**
Yixuan Zhai, Qing Zhao, University of California, Davis, United States

IPNa.PB.9 **NETWORKED OPTIMIZATION WITH ADAPTIVE COMMUNICATION**
Konstantinos I. Tsianos, Sean F. Lawlor, Jun Ye Yu, Michael G. Rabbat, McGill University, Canada

Information Processing over Networks II

IPNb.PB.1 **MEAN FIELD MESSAGE PASSING FOR COOPERATIVE SIMULTANEOUS RANGING AND SYNCHRONIZATION**
Bernhard Etzlinger, Daniel Bartel, Werner Haselmayr, Andreas Springer, Johannes Kepler University Linz, Austria

IPNb.PB.2 **NODE REMOVAL VULNERABILITY OF THE LARGEST COMPONENT OF A NETWORK**
Pin-Yu Chen, Alfred O. Hero, University of Michigan, United States

IPNb.PB.3 **REACHING BAYESIAN BELIEF OVER NETWORKS IN THE PRESENCE OF COMMUNICATION NOISE**
Yunlong Wang, Petar Djuric, Stony Brook University, United States

IPNb.PB.4 **A DISTRIBUTED COLLAPSE OF A NETWORK'S DIMENSIONALITY**
Adam Wilkerson, Harish Chintakunta, Hamid Krim, North Carolina State University, United States; Terrence J. Moore, Ananthram Swami, U.S. Army Research Laboratory, United States

IPNb.PB.5 **DIFFUSION ANALYSIS OF DISTRIBUTED ADAPTIVE NETWORKS WITH GRAPHICAL EVOLUTIONARY GAME**
Chunxiao Jiang, Yan Chen, K. J. Ray Liu, University of Maryland, United States

IPNb.PB.6 **MULTI-SCALE ANOMALY DETECTION IN COMPLEX DYNAMIC NETWORKS**
Arash Golibagh Mahyari, Selin Aviyente, Michigan State University, United States

IPNb.PB.7 **A UNIFIED ALGORITHMIC APPROACH TO DISTRIBUTED OPTIMIZATION**
João Mota, Instituto Superior Tecnico / Carnegie Mellon University, Portugal; João Xavier, Pedro Aguiar, Institute of Systems and Robotics, Instituto Superior Tecnico, Technical University of Lisbon, Portugal; Markus Püschel, ETH Zurich, Switzerland

IPNb.PB.8 **NETWORKS AS SIGNALS, WITH AN APPLICATION TO A BIKE SHARING SYSTEM**
Ronan Hamon, Pierre Borgnat, Patrick Flandrin, Ecole Normale Supérieure de Lyon, France; Céline Robardet, Institut National des Sciences Appliquées de Lyon, France

New Sensing and Statistical Inference Methods - Keynotes

Eric Kolaczyk, *Boston University*, **A Compressed PCA Subspace Method for Anomaly Detection in High-Dimensional Data**

Random projection is widely used as a method of dimension reduction. In recent years, its combination with standard techniques of regression and classification has been explored. In this talk we present a method for its use in anomaly detection in high-dimensional settings, in conjunction with principal component analysis (PCA) and corresponding subspace detection methods. We assume a so-called spiked covariance model for the underlying data generation process and a Gaussian random projection. We adopt a hypothesis testing perspective of the anomaly detection problem, with the test statistic defined to be the magnitude of the residuals of a PCA analysis. Under the null hypothesis of no anomaly, we characterize the relative accuracy with which the mean and variance of the test statistic from compressed data approximate those of the corresponding test statistic from uncompressed data. Furthermore, under a suitable alternative hypothesis, we provide expressions that allow for a comparison of statistical power for detection. Finally, whereas these results correspond to the ideal setting in which the data covariance is known, we show that it is possible to obtain the same order of accuracy when the covariance of the compressed measurements is estimated using a sample covariance, as long as the number of measurements is of the same order of magnitude as the reduced dimensionality. We illustrate the practical impact of our results in the context of predicting volume anomalies in Internet traffic data.

Eric Kolaczyk is Professor of Statistics, and Director of the Program in Statistics, in the Department of Mathematics and Statistics at Boston University, where he also is an affiliated faculty member in the Program in Bioinformatics, the Program in Computational Neuroscience, and the Division of Systems Engineering. Prof. Kolaczyk's main research interests currently revolve around the statistical analysis of network-indexed data, and include both the development of basic methodology and inter-disciplinary work with collaborators in bioinformatics, computer science, geography, neuroscience, and sociology. Besides various research articles on these topics, he has also authored a book in this area – Statistical Analysis of Network Data: Methods and Models (Springer, 2009). He has given various short courses on material from his book in recent years, including for the Center for Disease Control (CDC) and the Statistical and Applied Mathematical Sciences Institute (SAMSI) in the US as well as similar venues in Belgium, England, and France. Prior to his working in the area of networks, Prof. Kolaczyk spent a decade working on statistical multi-scale modeling. Prof. Kolaczyk has served as associate editor on several journals, including currently the Journal of the American Statistical Association and previously the IEEE Transactions in Image Processing. He has also served as co-organizer for workshops focused on networks and network data. He is an elected fellow of the American Statistical Association (ASA), an elected senior member of the Institute for Electrical and Electronics Engineers (IEEE), and an elected member of the International Statistical Institute (ISI).

Pierre Vandergheynst, *Swiss Federal Institute of Technology (EPFL)*, **Compressive Source Separation: Algorithms and Applications**

We propose and analyze a new model for Hyperspectral Images (HSI) based on the assumption that the whole signal is composed of a linear combination of few sources, each of which has a specific spectral signature, and that the spatial abundance maps of these sources are themselves piecewise smooth and therefore efficiently encoded via typical sparse models. We derive new sampling schemes exploiting this assumption and give theoretical lower bounds on the number of measurements required to reconstruct HSI data and recover their source model parameters. This allows us to segment hyperspectral images into their source abundance maps directly from compressed measurements. We also propose efficient optimization algorithms and perform extensive experimentation on synthetic and real datasets, which reveals that our approach can be used to encode HSI with far less measurements and computational effort than traditional CS methods.

Pierre Vandergheynst received the M.S. degree in physics and the Ph.D. degree in mathematical physics from the Université catholique de Louvain, Louvain-la-Neuve, Belgium, in 1995 and 1998, respectively. From 1998 to 2001, he was a Postdoctoral Researcher with the Signal Processing Laboratory, Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland. He was Assistant Professor at EPFL (2002-2007), where he is now an Associate Professor. His research focuses on harmonic analysis, sparse approximations and mathematical data processing in general with applications covering signal, image and high dimensional data processing, sensor networks, computer vision. He was co-Editor-in-Chief of Signal Processing (2002-2006) and Associate Editor of the IEEE Transactions on Signal Processing (2007-2011), the flagship journal of the signal processing community. He has been on the Technical Committee of various conferences, serves on the steering committee of the SPARS workshop and was co-General Chairman of the EUSIPCO 2008 conference. Pierre Vandergheynst is the author or coauthor of more than 70 journal papers, one monograph and several book chapters. He has received two IEEE best paper awards. Professor Vandergheynst is a laureate of the Apple 2007 ARTS award and of the 2009-2010 De Boelpaepe prize of the Royal Academy of Sciences of Belgium.

Alfred O. Hero III, *University of Michigan*, **Spatio-temporal Graphical Models for High Dimensional Data**

Graphical models provide a sparse parsimonious description of the dependency structure of multivariate data. When the data has dependency over both time and space there can be additional structure that can be exploited to reduce the complexity of the model. We will present recent approaches to exploiting such structure for Gaussian graphical models.

Alfred O. Hero III received the B.S. (summa cum laude) from Boston University (1980) and the Ph.D from Princeton University (1984), both in Electrical Engineering. Since 1984 he has been with the University of Michigan, Ann Arbor, where he is the R. Jamison and Betty Williams Professor of Engineering. His primary appointment is in the Department of Electrical Engineering and Computer Science and he also has appointments, by courtesy, in the Department of Biomedical Engineering and the Department of Statistics. In 2008 he was awarded the Digiteo Chaire d'Excellence, sponsored by Digiteo Research Park in Paris, located at the Ecole Superieure d'Electricite, Gif-sur-Yvette, France. He is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) and several of his research articles have received best paper awards. Alfred Hero was awarded the University of Michigan Distinguished Faculty Achievement Award (2011). He received the IEEE Signal Processing Society Meritorious Service Award (1998) and the IEEE Third Millenium Medal (2000). Alfred Hero was President of the IEEE Signal Processing Society (2006-2008) and was on the Board of Directors of the IEEE (2009-2011) where he served as Director of Division IX (Signals and Applications). Alfred Hero's recent research interests are in statistical signal processing, machine learning and the analysis of high dimensional spatio-temporal data. Of particular interest are applications to networks, including social networks, multi-modal sensing and tracking, database indexing and retrieval, imaging, and genomic signal processing.

New Sensing and Statistical Inference Methods I

NSSIMa.PD.1 PLUG-AND-PLAY PRIORS FOR MODEL BASED RECONSTRUCTION
Singanallur Venkatakrishnan, Charles A. Bouman, Purdue University, United States; Brendt Wohlberg, Los Alamos National Laboratory, United States

NSSIMa.PD.2 SINGLE IMAGE SUPER RESOLUTION VIA MANIFOLD LINEAR APPROXIMATION USING SPARSE SUBSPACE CLUSTERING
Chinh Dang, Mohammad Aghagolzadeh, Abdolreza Moghadam, Hayder Radha, Michigan State University, United States

NSSIMa.PD.3 SPATIO-SPECTRAL ANOMALOUS CHANGE DETECTION IN HYPERSPECTRAL IMAGERY
James Theiler, Los Alamos National Laboratory, United States

NSSIMa.PD.4 LOCAL ERROR DETECTION IN SPARSE MAGNETIC RESONANCE IMAGING
Vimal Singh, Ahmed H. Tewfik, The University of Texas at Austin, United States

NSSIMa.PD.5 FUNDAMENTAL LIMITS FOR SUPPORT RECOVERY OF TREE-SPARSE SIGNALS FROM NOISY COMPRESSIVE SAMPLES
Akshay Soni, Jarvis Haupt, University of Minnesota, Twin Cities, United States

NSSIMa.PD.6 ROBUST AND SPARSE ESTIMATION OF TENSOR DECOMPOSITIONS
Hyon-Jung Kim, Esa Ollila, Visa Koivunen, Aalto University, Finland; Christophe Croux, K.U. Leuven, Belgium

NSSIMa.PD.7 MULTISCALE SPARSE REPRESENTATION CLASSIFICATION FOR ROBUST HYPERSPECTRAL IMAGE ANALYSIS
Minshan Cui, Saurabh Prasad, University of Houston, United States

NSSIMa.PD.8 NEARLY OPTIMAL LINEAR EMBEDDINGS INTO VERY LOW DIMENSIONS
Elyot Grant, Chinmay Hegde, Piotr Indyk, Massachusetts Institute of Technology, United States

NSSIMa.PD.9 LEARNING OVERCOMPLETE DICTIONARIES WITH L0-SPARSE NON-NEGATIVE MATRIX FACTORISATION
Ken O'Hanlon, Mark D. Plumbley, Queen Mary, University of London, United Kingdom

NSSIMa.PD.10 LEARNING FEATURES IN DEEP LEARNING ARCHITECTURES WITH UNSUPERVISED KERNEL K-MEANS
Karl Ni, Ryan Prenger, Lawrence Livermore National Laboratory, United States

NSSIMa.PD.11 COMPRESSIVE ANOMALY DETECTION IN LARGE NETWORKS
Xiao Li, University of California, Davis, United States; H. Vincent Poor, Princeton University, United States; Anna Scaglione, University of California, Davis, United States

NSSIMa.PD.12 BAYESIAN PAIRWISE COLLABORATION DETECTION IN EDUCATIONAL DATASETS
Andrew Waters, Christoph Studer, Richard Baraniuk, Rice University, United States

NSSIMa.PD.13 CLUSTERING ON MULTI-LAYER GRAPHS VIA SUBSPACE ANALYSIS ON GRASSMANN MANIFOLDS
Xiaowen Dong, Pascal Frossard, Pierre Vandergheynst, École Polytechnique Fédérale de Lausanne, Switzerland; Nikolai Nefedov, Eidgenössische Technische Hochschule Zürich, Switzerland

NSSIMa.PD.14 THRESHOLD EFFECTS IN PARAMETER ESTIMATION FROM COMPRESSED DATA
Pooria Pakrooh, Ali Pezeshki, Louis L. Scharf, Colorado State University, United States

NSSIMa.PD.15 SPARSE REPRESENTATION CLASSIFICATION VIA SEQUENTIAL LASSO SCREENING
Yun Wang, Xu Chen, Peter J. Ramadge, Princeton University, United States

NSSIMa.PD.16 A THEORETICAL FRAMEWORK FOR SURROGATE SUPERVISION MULTIVIEW LEARNING
Raviv Raich, Oregon State University, United States

New Sensing and Statistical Inference Methods II

NSSIMb.PD.1 STRUCTURED SAMPLING OF STRUCTURED SIGNALS
Bo Li, Athina Petropulu, Rutgers, The State University of New Jersey, United States

NSSIMb.PD.2 ANAMORPHIC TIME STRETCH TRANSFORM AND ITS APPLICATION TO ANALOG BANDWIDTH COMPRESSION
Mohammad H. Asghari, Bahram Jalali, University of California, Los Angeles, United States

NSSIMb.PD.3 SUB-NYQUIST MEDICAL ULTRASOUND IMAGING: EN ROUTE TO CLOUD PROCESSING
Alon Eilam, Tanya Chernyakova, Yonina C. Eldar, Technion - Israel Institute of Technology, Israel; Arcady Kempinski, General Electric Healthcare, Israel

NSSIMb.PD.4 DOMAIN-SPECIFIC PROGRESSIVE SAMPLING OF FACE IMAGES
Jianxiong Liu, Christos Bouganis, Peter Y.K. Cheung, Imperial College London, United Kingdom

NSSIMb.PD.5 INFINITE GAUSSIAN MIXTURE MODELS FOR ROBUST DECISION FUSION OF HYPERSPECTRAL IMAGERY AND FULL WAVEFORM LIDAR DATA
Hao Wu, Saurabh Prasad, University of Houston, United States

NSSIMb.PD.6 PROJECTIONS DESIGNS FOR COMPRESSIVE CLASSIFICATION
Hugo Reboredo, Francesco Renna, Instituto de Telecomunicações, Universidade do Porto, Portugal; Robert Calderbank, Duke University, United States; Miguel R. D. Rodrigues, University College London, United Kingdom

NSSIMb.PD.7 ADAPTIVE DICTIONARIES FOR COMPRESSIVE IMAGING
Mohammad Aghagolzadeh, Hayder Radha, Michigan State University, United States

NSSIMb.PD.8 TRACK ESTIMATION USING LINK LINE CROSSING INFORMATION IN WIRELESS NETWORKS
Peter Hillyard, Samira Daruki, Neal Patwari, Suresh Venkatasubramanian, University of Utah, United States

NSSIMb.PD.9 TWO-PART RECONSTRUCTION IN COMPRESSED SENSING
Yanting Ma, Dror Baron, North Carolina State University, United States; Deanna Needell, Claremont McKenna College, United States

NSSIMb.PD.10 DUAL-SCALE MASKS FOR SPATIO-TEMPORAL COMPRESSIVE IMAGING
Zachary Harmany, University of Wisconsin-Madison, United States; Roummel Marcia, University of California, Merced, United States; Rebecca Willett, University of Wisconsin-Madison, United States

NSSIMb.PD.11 INFORMATION-DRIVEN SENSOR PLANNING: NAVIGATING A STATISTICAL MANIFOLD
Douglas Cochran, Arizona State University, United States; Alfred O. Hero, University of Michigan, United States

NSSIMb.PD.12 PARAMETRIC POISSON PROCESS IMAGING
Dongeek Shin, Ahmed Kirmani, Andrea Colaco, Vivek Goyal, Massachusetts Institute of Technology, United States

NSSIMb.PD.13 DISTRIBUTED ESTIMATION IN SENSOR NETWORKS WITH QUALITY FEEDBACK: A GENERAL FRAMEWORK
Nicolo Michelusi, Urbashi Mitra, University of Southern California, United States

NSSIMb.PD.14 PERFORMANCE GUARANTEES FOR UNDERSAMPLED RECURSIVE SPARSE RECOVERY IN LARGE BUT STRUCTURED NOISE
Brian Lois, Namrata Vaswani, Chenlu Qiu, Iowa State University, United States

NSSIMb.PD.15 COMPUTATIONALLY-EFFICIENT BLIND SUB-NYQUIST SAMPLING FOR SPARSE SPECTRA
Sameer Pawar, Venkatesan Ekambaram, Kannan Ramchandran, University of California, Berkeley, United States

Network Theory Symposium - Keynotes

Alfred O. Hero III, *University of Michigan*, **Modeling of Interaction Networks: Challenges and Emerging Solutions**

Data-driven inference of communities, pathways, and connections in large interaction networks is complicated by many factors. These factors include statistical sampling variability, asynchronous data collection, and the existence of node interactions along multiple dimensions. Sampling variability causes random variations of network topology that must be taken into account in order to perform hypothesis testing on properties of the network. Asynchronous data collection makes sample averaging unreliable for estimation of node interactions. Aggregation of multi-dimensional node interactions, e.g., some obtained from relational (edge) observations and some obtained from behavioral (node) observations, requires a rational multimodality fusion model. Some recent approaches and solution strategies for addressing these and other challenges will be presented in the context of network inference from spatio-temporal social and biological data.

Alfred O. Hero III received the B.S. (summa cum laude) from Boston University (1980) and the Ph.D from Princeton University (1984), both in Electrical Engineering. Since 1984 he has been with the University of Michigan, Ann Arbor, where he is the R. Jamison and Betty Williams Professor of Engineering. His primary appointment is in the Department of Electrical Engineering and Computer Science and he also has appointments, by courtesy, in the Department of Biomedical Engineering and the Department of Statistics. In 2008 he was awarded the Digiteo Chaire d'Excellence, sponsored by Digiteo Research Park in Paris, located at the Ecole Superieure d'Electricite, Gif-sur-Yvette, France. He is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) and several of his research articles have recieved best paper awards. Alfred Hero was awarded the University of Michigan Distinguished Faculty Achievement Award (2011). He received the IEEE Signal Processing Society Meritorious Service Award (1998) and the IEEE Third Millenium Medal (2000). Alfred Hero was President of the IEEE Signal Processing Society (2006-2008) and was on the Board of Directors of the IEEE (2009-2011) where he served as Director of Division IX (Signals and Applications).

Alfred Hero's recent research interests are in statistical signal processing, machine learning and the analysis of high dimensional spatio-temporal data. Of particular interest are applications to networks, including social networks, multi-modal sensing and tracking, database indexing and retrieval, imaging, and genomic signal processing.

Gerhard Kramer, *Technische Universität München*, **Multi-Terminal Information Theory for Channels with Block Fading and Fast Feedback**

The availability of fast feedback enables fast power, rate, and beam control that increases channel capacity. We develop an information-theoretic framework for multi-user channels with block fading, delay, and feedback by describing a class of models we call "networks with in-block memory (iBM)". Particular attention will be paid to Gaussian models and relaying.

Gerhard Kramer is Alexander von Humboldt Professor and Head of the Institute for Communications Engineering at the Technische Universität München (TUM). He received the B.Sc. and M.Sc. degrees in electrical engineering from the University of Manitoba, Winnipeg, MB, Canada in 1991 and 1992, respectively, and the Dr. sc. techn. (Doktor der technischen Wissenschaften) degree from the ETH Zürich, Switzerland, in 1998. From 1998 to 2000, he was with Endora Tech AG, Basel, Switzerland, as a communications engineering consultant. From 2000 to 2008 he was with the Math Center, Bell Labs, Alcatel-Lucent, Murray Hill, NJ, as a Member of Technical Staff. He joined the University of Southern California (USC), Los Angeles, CA, as a Professor of Electrical Engineering in 2009. He joined TUM in 2010.

François Baccelli, *Ecole Normale Supérieure*, **Adaptive Spatial Aloha, Fairness and Stochastic Geometry**

This work aims at combining adaptive protocol design, utility maximization and stochastic geometry. We focus on a spatial adaptation of Aloha within the framework of ad hoc networks. We consider quasi-static networks in which mobiles learn the local topology and incorporate this information to adapt their medium access probability (MAP) selection to their local environment. We consider the cases where nodes cooperate in a distributed way to maximize the global throughput or to achieve proportional fair medium access. We show that nodes can compute their optimal MAPs as solutions to certain fixed point equations. The main performance analysis result of the paper is that this type of distributed adaptation can be analyzed using stochastic geometry. In this case, we show that, when the nodes form a homogeneous Poisson point process in the Euclidean plane, the distribution of the optimal MAP can be obtained from that of a certain shot noise process w.r.t. the node Poisson point process and that the mean utility can also be derived from this distribution.

François Baccelli is a specialist in stochastic network theory. His research directions are at the interface of Applied Mathematics, Probability, Stochastic Geometry, Communications and Information Theory. He is co-author of research monographs on point processes, max plus algebras, queuing networks and stochastic geometry. His impact beyond the university can be measured by current and past projects with Alcatel, France-Telecom, AT&T Bell Laboratories, Intel, Sprint and Qualcomm. He received his doctorate from Paris University in 1983. He currently leads the research group on network theory in INRIA-Paris and holds an academic appointment in Computer Science at Ecole Normale Supérieure in Paris. He was Professor of Applied Mathematics at Ecole Polytechnique (1991-2003). He has held visiting positions at the Universities of Maryland, California-Berkeley and Cambridge, at the Mathematics Group of Bell Laboratories, and at Stanford, Eindhoven and Heriot-Watt Universities. He was elected as a member of the French Academy of Sciences in 2005.

Nicholas D. Sidiropoulos, *University of Minnesota - Minneapolis*, **Joint Backpressure Power Control and Interference Cancellation for Wireless Multi-hop Networks**

Back-pressure network control is a core element of modern multi-hop networking research, because it can support maximum stable end-to-end throughput. For wireline networks, back-pressure can be implemented locally, in a distributed fashion, and is relatively lightweight in terms of system resources. The situation is different for wireless networks, due to interference. In this talk, we will begin by reviewing the basics of back-pressure network operations, with emphasis on power control and interference cancellation issues. The starting point is that interference cancellation can be judiciously employed together with power control to further enhance network throughput. Effective cancellation requires that the interfering signal can be reliably decoded, implying that power control and interference cancellation are tightly coupled. This leads to a joint Back-Pressure Power Control and Interference Cancellation (BPPC-IC) problem formulation, with the pragmatic constraint that each receiver can cancel at most one interfering signal. This problem is shown to be NP-hard, and approximate solutions are proposed. Simulation results demonstrate that joint optimization of power control and interference cancellation pays off, enabling considerably higher end-to-end network throughput, and lower average delay due to reduced backlogs.

Nicholas D. Sidiropoulos (Fellow, IEEE) received the Diploma in Electrical Engineering from the Aristotelian University of Thessaloniki, Greece, and M.S. and Ph.D. degrees in Electrical Engineering from the University of Maryland - College Park, in 1988, 1990 and 1992, respectively. He is currently a Professor in the Department of Electrical and Computer Engineering at the University of Minnesota - Minneapolis. His research interests are in signal processing for communications, convex optimization, cross-layer resource allocation for wireless networks, and multiway analysis - i.e., linear algebra for data arrays indexed by three or more variables. His current research focuses primarily on signal and tensor analytics, with applications in cognitive radio, big data, and preference measurement. He received the NSF/CAREER award in 1998, and the IEEE Signal Processing Society (SPS) Best Paper Award in 2001, 2007, and 2011. He served as IEEE SPS Distinguished Lecturer (2008-2009), and as Chair of the IEEE Signal Processing for Communications and Networking Technical Committee (2007-2008). He received the 2010 IEEE Signal Processing Society Meritorious Service Award, and the 2013 Distinguished Alumni Award from the Department of Electrical and Computer Engineering of the University of Maryland, College Park.

Network Theory I

NTa.PC.1 **LINK-FAILURE DETECTION IN NETWORK SYNCHRONIZATION PROCESSES**
Rahul Dhal, Jackeline Abad Torres, Sandip Roy, Washington State University, United States

NTa.PC.2 **PARALLEL PURSUIT FOR DISTRIBUTED COMPRESSED SENSING**
Dennis Sundman, Saikat Chatterjee, Mikael Skoglund, KTH Royal Institute of Technology, Sweden

NTa.PC.3 **CODED SLOTTED ALOHA WITH VARYING PACKET LOSS RATE ACROSS USERS**
Cedomir Stefanovic, Petar Popovski, Aalborg University, Denmark

NTa.PC.4 **ALTERNATIVE AXIOMATIC CONSTRUCTIONS FOR HIERARCHICAL CLUSTERING OF ASYMMETRIC NETWORKS**
Gunnar Carlsson, Stanford University, United States; Facundo Mémoli, University of Adelaide, Australia; Alejandro Ribeiro, Santiago Segarra, University of Pennsylvania, United States

NTa.PC.5 **AN ANALYSIS OF THE TEMPORAL CORRELATION OF INTERFERENCE IN EXTENDED WIRELESS NETWORKS**
C. Emre Koksal, Ohio State University, United States

NTa.PC.6 **ON THE NECESSITY OF FULL-STATE MEASUREMENT FOR STATE-SPACE NETWORK RECONSTRUCTION**
Philip Pare, Vasu Chetty, Sean Warnick, Brigham Young University, United States

NTa.PC.7 **CONSENSUS-BASED DISTRIBUTED ONLINE PREDICTION AND OPTIMIZATION**
Konstantinos I. Tsianos, Michael G. Rabbat, McGill University, Canada

NTa.PC.8 **ROBUST TOMOGRAPHY VIA NETWORK TRAFFIC MAPS LEVERAGING SPARSITY AND LOW RANK**
Morteza Mardani, Georgios B. Giannakis, University of Minnesota, United States

NTa.PC.9 **A TOPOLOGICAL MAX-FLOW-MIN-CUT THEOREM**
Robert Ghrist, University of Pennsylvania, United States; Sanjeevi Krishnan, University of Pennsylvania, United States

NTa.PC.10 **INTERACTIVE RELAY ASSISTED SOURCE CODING**
Farideh Ebrahim Rezagah, Elza Erkip, Polytechnic Institute of New York University, United States

NTa.PC.11 **RESOURCE TRADEOFFS IN DISTRIBUTED SUBSPACE TRACKING OVER THE WIRELESS MEDIUM**
Matthew Nokleby, Duke University, United States; Waheed Bajwa, Rutgers University, United States

NTa.PC.12 **DISTRIBUTED DATA CLEANSING VIA A LOW-RANK DECOMPOSITION**
Ioannis Schizas, The University of Texas at Arlington, United States

NTa.PC.13 **CHARACTERIZATION OF CONNECTIVITY DYNAMICS IN INTRINSIC BRAIN NETWORKS**
Vince Calhoun, The Mind Research Network & The University of New Mexico, United States; Maziar Yaesoubi, Barnaly Rashid, Robyn Miller, The Mind Research Network, United States

NTa.PC.14 **DISAGGREGATED BUNDLE METHODS FOR DISTRIBUTED MARKET CLEARING IN POWER NETWORKS**
Yu Zhang, University of Minnesota, United States; Nikolaos Gatsis, The University of Texas at San Antonio, United States; Georgios B. Giannakis, University of Minnesota, United States

NTa.PC.15 **IDENTIFIABILITY OF SPARSE STRUCTURAL EQUATION MODELS FOR DIRECTED AND CYCLIC NETWORKS**
Juan Andres Bazerque, Brian Baingana, Georgios B. Giannakis, University of Minnesota, United States

NTa.PC.16 **NEURAL NETWORK MODULATION, DYNAMICS AND PLASTICITY**
Christian G. Fink, Ohio Wesleyan University, United States; Michal Zochowski, Victoria Booth, University of Michigan, United States

NTa.PC.17 **TRAFFIC OPTIMIZATION TO CONTROL EPIDEMIC OUTBREAKS IN METAPOPULATION MODELS**
Victor Preciado, Michael Zargham, University of Pennsylvania, United States

NTa.PC.18 **A CONVEX FRAMEWORK FOR OPTIMAL INVESTMENT ON DISEASE AWARENESS IN SOCIAL NETWORKS**
Victor Preciado, Faryad Darabi Sahneh, Caterina Scoglio, University of Pennsylvania, United States

NTa.PC.19 **A PARSIMONIOUS MODEL FOR WIRELESS CONNECTIVITY IN ROBOTIC NETWORKS**
Jonathan Fink, Jeffrey Twigg, Paul Yu, Brian Sadler, U.S. Army Research Laboratory, United States

NTa.PC.20 **SMART METER PRIVACY FOR MULTIPLE USERS IN THE PRESENCE OF AN ALTERNATIVE ENERGY SOURCE**
Jesus Gomez-Vilardebo, CTTC, Spain; Deniz Gunduz, Imperial College London, United Kingdom

Network Theory II

NTb.PC.1 **OPTIMAL DEPLOYMENT OF CACHES IN THE PLANE**
Mihaela Mitici, University of Twente, Netherlands; Jasper Goseling, University of Twente, Delft University, Netherlands; Maurits de Graaf, University of Twente, Thales B.V. Netherlands, Netherlands; Richard J. Boucherie, University of Twente, Netherlands

NTb.PC.2 **STUDY OF USER ON/OFF PATTERNS IN RANDOM NETWORKS**
Weijia Han, Jiandong Li, Xidian Unversity, China; Shuguang Cui, Texas A&M University, United States

NTb.PC.3 **BAYESIAN QUICKEST CHANGE POINT DETECTION AND LOCALIZATION IN SENSOR NETWORKS**
Jun Geng, Lifeng Lai, Worcester Polytechnic Institute, United States

NTb.PC.4 **JOINT SIGNAL AND CHANNEL STATE INFORMATION COMPRESSION FOR UPLINK NETWORK MIMO SYSTEMS**
Jin-Kyu Kang, Korea Advanced Institute of Science and Technology, Republic of Korea; Osvaldo Simeone, New Jersey Institute of Technology, United States; Joonhyuk Kang, Korea Advanced Institute of Science and Technology, Republic of Korea; Shlomo Shamai (Shitz), Technion - Israel Institute of Technology, Israel

NTb.PC.5 **BEAMFORMING DESIGN FOR JOINT LOCALIZATION AND DATA TRANSMISSION IN DISTRIBUTED ANTENNA SYSTEMS**
Seongah Jeong, Korea Advanced Institute of Science and Technology, Republic of Korea; Osvaldo Simeone, Alexander Haimovich, New Jersey Institute of Technology, United States; Joonhyuk Kang, Korea Advanced Institute of Science and Technology, Republic of Korea

NTb.PC.6 **DISTRIBUTED STOCHASTIC MULTICOMMODITY FLOW OPTIMIZATION**
Nikolaos Chatzipanagiotis, Michael Zavlanos, Duke University, United States

NTb.PC.7 **A STUDY OF SEMANTIC DATA COMPRESSION**
Basak Guler, Aylin Yener, The Pennsylvania State University, United States; Prithwish Basu, Raytheon BBN Technologies, United States

NTb.PC.8 **ON A CONSISTENT PROCEDURE FOR DISTRIBUTED RECURSIVE NONLINEAR LEAST-SQUARES ESTIMATION**
Soummya Kar, José M. F. Moura, Carnegie Mellon University, United States; H. Vincent Poor, Princeton University, United States

NTb.PC.9 **SOURCE LOCALIZATION IN COMPLEX NETWORKS USING A FREQUENCY-DOMAIN APPROACH**
Chenguang Xi, Usman Khan, Tufts University, United States

NTb.PC.10 **OPPORTUNISTIC RELAYING WITH PARTIAL CSI AND DYNAMIC RESOURCE ALLOCATION**
Islam El-Bakoury, Alexandria University, Egypt; Karim Seddik, Ayman Elezabi, American University in Cairo (AUC), Egypt

NTb.PC.11 **DISTRIBUTED COMPRESSED SENSING IN DYNAMIC NETWORKS**
Stacy Patterson, Rensselaer Polytechnic Institute, United States; Yonina C. Eldar, Idit Keidar, Technion - Israel Institute of Technology, Israel

NTb.PC.12 **RECENT ADVANCES IN SUPERVISED LEARNING FOR BRAIN GRAPH CLASSIFICATION**
Jonas Richiardi, Stanford University and University of Geneva, United States; Bernard Ng, Stanford University and INRIA Saclay, United States

NTb.PC.13 **UNDERSTANDING NETWORKS AND THEIR BEHAVIORS USING SHEAF THEORY**
Michael Robinson, American University, United States

NTb.PC.14 **ON CONSTANT GAPS FOR THE K-PAIR USER TWO-WAY GAUSSIAN INTERFERENCE CHANNEL WITH INTERACTION**
Zhiyu Cheng, Natasha Devroye, University of Illinois at Chicago, United States

NTb.PC.15 **HYBRID CODING: A NEW PARADIGM FOR RELAY COMMUNICATION**
Paolo Minero, University of Notre Dame, United States; Sung Hoon Lim, Samsung Advanced Institute of Technology, Republic of Korea; Young-Han Kim, University of California, San Diego, United States

NTb.PC.16 **AVAILABILITY AND LOCALITY IN DISTRIBUTED STORAGE**
Ankit Singh Rawat, Dimitris Papailiopoulos, Alexandros Dimakis, The University of Texas at Austin, United States

NTb.PC.17 **TOPOLOGICAL ANALYSIS OF THE STEADY-STATE MEAN-SQUARE DEVIATION IN NOISY CONSENSUS**
Victor Preciado, Alex Tozzo, University of Pennsylvania, United States

NTb.PC.18 **EXPLOITING INTERFERENCE FOR EFFICIENT DISTRIBUTED COMPUTATION IN CLUSTER-BASED WIRELESS SENSOR NETWORKS**
Steffen Limmer, Fraunhofer Heinrich Hertz Institute, Germany; Slawomir Stanczak, Fraunhofer Heinrich Hertz Institute/Technische Universität Berlin, Germany; Mario Goldenbaum, Technische Universität Berlin, Germany; Renato L.G. Cavalcante, Fraunhofer Heinrich Hertz Institute, Germany

NTb.PC.19 **FINDING ROLE COMMUNITIES IN DIRECTED NETWORKS USING ROLE-BASED SIMILARITY, MARKOV STABILITY AND THE RELAXED MINIMUM SPANNING TREE**
Mariano Beguerisse-Diaz, Borislav Vangelov, Mauricio Barahona, Imperial College London, United Kingdom

NTb.PC.20 **DISTORTION EXPONENT WITH SIDE-INFORMATION DIVERSITY**
Inaki Estella-Aguerri, Deniz Gunduz, Imperial College London, United Kingdom

Optimization in Machine Learning and Signal Processing - Keynotes

Francis Bach, *Ecole Normale Superieure*, **Beyond Stochastic Gradient Descent for Large-scale Machine Learning**

Many machine learning and signal processing problems are traditionally cast as convex optimization problems. A common difficulty in solving these problems is the size of the data, where there are many observations ("large n") and each of these is large ("large p"). In this setting, online algorithms such as stochastic gradient descent which pass over the data only once, are usually preferred over batch algorithms, which require multiple passes over the data. Given n observations/iterations, the optimal convergence rates of these algorithms are O(1/\sqrt{n}) for general convex functions and reaches O(1/n) for strongly-convex functions. In this talk, I will show how the smoothness of loss functions may be used to design novel algorithms with improved behavior, both in theory and practice: in the ideal infinite-data setting, an efficient novel Newton-based stochastic approximation algorithm leads to a convergence rate of O(1/n) without strong convexity assumptions, while in the practical finite-data setting, an appropriate combination of batch and online algorithms leads to unexpected behaviors, such as a linear convergence rate for strongly convex problems, with an iteration cost similar to stochastic gradient descent. (Joint work with Nicolas Le Roux, Eric Moulines and Mark Schmidt.)

Francis Bach is a researcher in the Sierra INRIA project-team, in the Computer Science Department of the Ecole Normale Superieure, Paris, France. He graduated from the Ecole Polytechnique, Palaiseau, France, in 1997, and earned his PhD in 2005 from the Computer Science division at the University of California, Berkeley. His research interests include machine learning, statistics, optimization, graphical models, kernel methods, sparse methods and statistical signal processing. He has been awarded a starting investigator grant from the European Research Council in 2009.

Inderjit Dhillon, *University of Texas at Austin*, **Sparse Inverse Covariance Estimation for a Million Variables**

The L1-regularized Gaussian maximum likelihood estimator has been shown to have strong statistical guarantees in recovering a sparse inverse covariance matrix even under high-dimensional settings. However, it requires solving a difficult non-smooth log-determinant program with number of parameters that scale quadratically with the number of Gaussian variables. State-of-the-art methods thus do not scale to problems with more than 20,000 variables. In this talk, I will describe a quadratic approximation method that can solve 1-million dimensional L1-regularized log determinant problems (which would thus have a trillion parameters) on a single computer. In order to do so, we carefully exploit the underlying structure of the problem. Our innovations include (i) a second-order Newton-like method, (ii) division of the variables into free and fixed sets, (iii) a block co-ordinate descent method, and (iv) a memory efficient scheme that approximates key quantities within the algorithm. Even with the latter approximations, the proposed BIGQUIC algorithm can achieve a quadratic convergence rate. Experimental results using synthetic and real application data demonstrate the improvements in performance over otherstate-of-the-art methods.

This is joint work with Cho-Jui Hsieh, Matyas Sustik and Pradeep Ravikumar.

Inderjit Dhillon is a Professor of Computer Science and Mathematics at The University of Texas at Austin. He is closely affiliated with the Institute for Computational Engineering and Sciences(ICES), and also with the Division of Statistics and Scientific Computation(SSC), Dept of Electrical and Computer Engineering(ECE), and the Center for Computational Biology and Bioinformaics(CCBB). Inderjit received his B.Tech. degree from the Indian Institute of Technology at Bombay, and Ph.D. from the University of California at Berkeley. At Berkeley, Inderjit studied computer science and mathematics with Beresford Parlett and Jim Demmel. His thesis work led to the fastest known numerically stable algorithm for the symmetric tridiagonal eigenvalue/eigenvector problem. Software based on this work is now part of all state-of-the-art numerical software libraries. Inderjit's current research interests are in big data, machine learning, network analysis, numerical optimization and scientific computing.Inderjit received an NSF Career Award in 2001, a University Research Excellence Award in 2005, the SIAG Linear Algebra Prize in 2006, the Moncrief Grand Challenge Award in 2010, the SIAM Outstanding Paper Prize in 2011, and the ICES Distinguished Research Award in 2013. Along with his students, he has received several best paper awards at leading data mining and machine learning conferences. Inderjit has published over 100 journal and conference papers, and has served on the Editorial Board of the Journal of Machine Learning Research, the IEEE Transactions of Pattern Analysis and Machine Intelligence, Foundations and Trends in Machine Learning and the SIAM Journal for Matrix Analysis and Applications. He has served on several panels, including the Committee of Visitors, at the National Science Foundation. He is a Senior Member of the Institute of Electrical and Electronics Engineers(IEEE), a member of the Association for Computing Machinery(ACM), the Society for Industrial and Applied Mathematics(SIAM) and the American Association for the Advancement of Science(AAAS).

Babak Hassibi, *California Institute of Technology*

Babak Hassibi is a Professor of Electrical Engineering at Caltech. He received his PhD in EE from Stanford. His research spans several areas of communications, signal processing and control; his current focus is wireless networks and genomic signal processing. Babak has received several awards for his work, including the NSF Career and an Okawa award in 2002, a Packard fellowship and a Presidential early career award (PECASE) in 2003, and an invitation to participate in the NAE's "Frontiers in engineering" in 2004. He has served as an associate editor for the IEEE Transactions on Information Theory since 2003. Babak is currently the Executive officer for Electrical Engineering at Caltech.

Tuesday, December 3		10:00 - 12:00
Poster Session	OMLSPa.PE	Poster Area E

Optimization in Machine Learning and Signal Processing I

OMLSPa.PE.1 IMAGE DEBLOCKING USING CONVEX OPTIMIZATION WITH MODIFIED TOTAL VARIATION METHOD
Wenjing Zhu, Oscar C. Au, Wei Dai, Xingyu Zhang, Jiali Li, Hong Zhang, Hong Kong University of Science and Technology, Hong Kong SAR of China

OMLSPa.PE.3 SELECTIVE SAMPLING ALGORITHMS FOR COST-SENSITIVE MULTICLASS PREDICTION
Alekh Agarwal, Microsoft Research, United States

OMLSPa.PE.4 GENDER CLASSIFICATION OF DEPTH IMAGES BASED ON SHAPE AND TEXTURE ANALYSIS
Xiaolong Wang, Chandra Kambhamettu, University of Delaware, United States

OMLSPa.PE.5 FAST L0-BASED IMAGE DECONVOLUTION WITH VARIATIONAL BAYESIAN INFERENCE AND MAJORIZATION-MINIMIZATION
Ganchi Zhang, Nick Kingsbury, University of Cambridge, United Kingdom

OMLSPa.PE.6 A VARIATIONAL FRAMEWORK FOR SINGLE LOW LIGHT IMAGE ENHANCEMENT USING BRIGHT CHANNEL PRIOR
Xueyang Fu, Delu Zeng, Yue Huang, Xinghao Ding, Ministry of Education; Xiamen University, China; Xiao-Ping Zhang, Ministry of Education; Xiamen University; Ryerson University, Canada

OMLSPa.PE.7 GAUSSIAN MIXTURE MARKOV RANDOM FIELD FOR IMAGE DENOISING AND RECONSTRUCTION
Ruoqiao Zhang, Charles A. Bouman, Purdue University, United States; Jean-Baptiste Thibault, GE Healthcare, United States; Ken D. Sauer, University of Notre Dame, United States

OMLSPa.PE.8 EFFICIENT CROWDSOURCING FOR MULTI-CLASS LABELING TASKS
Sewoong Oh, Hee Won Kwon, University of Illinois at Urbana-Champaign, United States

OMLSPa.PE.9 ITERATIVE SCHEDULING FOR CELL-EDGE IN MULTI-CELL MU-MIMO
Ganesh Venkatraman, Antti Tölli, Janne Janhunen, Markku Juntti, University of Oulu, Finland

OMLSPa.PE.10 ITERATIVE MULTIUSER JOINT DECODING BASED ON ADMM
Shunsuke Horii, Tota Suko, Toshiyasu Matsushima, Shigeichi Hirasawa, Waseda University, Japan

Tuesday, December 3		13:30 - 15:30
Poster Session	OMLSPb.PE	Poster Area E

Optimization in Machine Learning and Signal Processing II

OMLSPb.PE.1 A ROBUST SEMI-SUPERVISED BOOSTING METHOD USING LINEAR PROGRAMMING
Shaodan Zhai, Tian Xia, Ming Tan, Shaojun Wang, Wright State University, United States

OMLSPb.PE.2 GROUP SYMMETRY AND NON-GAUSSIAN COVARIANCE ESTIMATION
Ilya Soloveychik, Ami Wiesel, The Hebrew University of Jerusalem, Israel

OMLSPb.PE.3 REGULARIZED STOCHASTIC BFGS ALGORITHM
Aryan Mokhtari, Alejandro Ribeiro, University of Pennsylvania, United States

OMLSPb.PE.4 PHASE RETRIEVAL OF SPARSE SIGNALS FROM FOURIER TRANSFORM MAGNITUDE USING NON-NEGATIVE MATRIX FACTORIZATION
Mohammad Shukri Salman, Alaa Eleyan, Mevlana University, Turkey; Zeynel Deprem, A. Enis Cetin, Bilkent University, Turkey

OMLSPb.PE.5 EXACT OPTIMIZATION CONDITIONS FOR DISCRETE LINEAR INVERSE PROBLEMS
Ahmet Tuysuzoglu, Boston University, United States; Emre Yilmaz, Bilkent University, Turkey; W. Clem Karl, David Castanon, Boston University, United States

OMLSPb.PE.6 EXPLORING THE INTERSECTION OF ACTIVE LEARNING AND STOCHASTIC CONVEX OPTIMIZATION
Aaditya Ramdas, Aarti Singh, Carnegie Mellon University, United States

OMLSPb.PE.7 WHEN ARE OVERCOMPLETE REPRESENTATIONS IDENTIFIABLE? UNIQUENESS OF TENSOR DECOMPOSITIONS UNDER EXPANSION CONSTRAINTS
Animashree Anandkumar, University of California, Irvine, United States; Daniel Hsu, Microsoft Research, United States; Majid Janzamin, University of California, Irvine, United States; Sham Kakade, Microsoft Research, United States

OMLSPb.PE.8 A CONVEX METHOD FOR LEARNING D-VALUED MODELS
Amin Jalali, Maryam Fazel, University of Washington, United States

OMLSPb.PE.9 FROM COMPRESSION TO COMPRESSED SENSING
Shirin Jalali, New York University, United States; Arian Maleki, Columbia University, United States

OMLSPb.PE.10 LOW RANK APPROXIMATIONS FOR QUADRATIC MAXIMIZATION
Dimitris Papailiopoulos, University of Texas at Austin, United States; Alexandros Dimakis, The University of Texas at Austin, United States

OMLSPb.PE.11 ROBUST LARGE-SCALE NON-NEGATIVE MATRIX FACTORIZATION USING PROXIMAL POINT ALGORITHM
Jason Gejie Liu, Shuchin Aeron, Tufts University, United States

Signal and Information Processing in Finance and Economics - Keynotes

Sheridan Titman, *University of Texas at Austin*, **Can Risk Explain the Cross-Sectional Pattern of Stock Returns?**

There are a number of stock characteristics that have historically predicted stock returns. I will briefly describe these characteristics and discuss the extent to which the excess returns can be characterized as risk premia or mispricing that is due to either behavioral biases or incorrect priors.

Sheridan Titman holds the McAllister Centennial Chair in Financial Services at the University of Texas at Austin and is a Research Associate of the National Bureau of Economic Research. Prior to joining the faculty at the University of Texas, Sheridan was a Professor at UCLA, the Hong Kong University of Science and Technology and Boston College and spent the 1988-89 academic year in Washington D.C. as the special assistant to the Assistant Secretary of the Treasury for Economic Policy. Sheridan's academic publications include both theoretical and empirical articles on asset pricing, corporate finance, real estate and energy finance. He won the Smith-Breeden best paper award for the Journal of Finance, the GSAM best paper award for the Review of Finance and was a recipient of the Batterymarch Fellowship. Sheridan has served on the editorial boards of leading academic journals, including the Journal of Finance and the Review of Financial Studies. He has served as President of both the Western Finance Association and the American Finance Association and has served as a Director of the American Finance Association, the Western Finance Association, the Financial Management Association and the Asia Pacific Finance Association. He has also co-authored three finance textbooks, Financial Markets and Corporate Strategy, Valuation: The Art and Science of Corporate Investment Decisions, and Financial Management: Principles and Applications.

Sheridan has a B.S. from the University of Colorado and an M.S. and Ph.D. from Carnegie Mellon University.

Eran Fishler, *Pragma Securities LLC*, **Electrical Engineering and Quantitative Finance: A Tale of Two Seemingly Unrelated Disciplines**

Classically signal processing problems involved detection of targets using radar or sonar, separating speech from noise, and more. All these problems were solved under a wide array of assumptions driven by real-life engineering scenarios. In recent years we have witnessed the applications of these methods in the area of quantitative finance. In this talk we will examine a few areas where signal processing methods can be used to solve real-life problems. We will discuss several problems such as risk estimation, market impact, portfolio management, and optimal execution, and will demonstrate the relations between the two fields.

Eran Fishler joined Pragma in August of 2007. He leads the research and technology teams in the day-to-day operations of the company, as well as in developing new offerings to suit the current and future needs of traders. Previously, Eran worked at Hite Capital Management, where he developed an innovative research and trading platform for equity strategies and managed a long-short, market neutral, quantitative equity strategy. Eran holds a Ph.D. in Electrical Engineering from Israel's Tel Aviv University, and an MBA from the Stern School of Business at New York University. He is currently an adjunct professor at Courant Institute for Advanced Mathematics (NYU) and at Columbia University. Eran is an expert in the field of parameter estimation and detection theory and has published over 40 technical papers in the area of statistical signal processing.

Signal and Information Processing in Finance and Economics I

SIPFEa.PA.1 **EQUITY FACTOR ANALYSIS VIA COLUMN SUBSET SELECTION**
Christos Boutsidis, Dmitry Malioutov, IBM, United States

SIPFEa.PA.2 **FINPAGE: GENERATING HIGH PERFORMANCE FEED-SPECIFIC PARSER CIRCUITS**
Roger Moussalli, Bharat Sukhwani, Sameh Asaad, IBM Research, United States

SIPFEa.PA.3 **SYMMETRIC NASH EQUILIBRIUM IN A SECONDARY SPECTRUM MARKET**
Shang-Pin Sheng, Mingyan Liu, University of Michigan, United States

SIPFEa.PA.4 **QUANTILE REGRESSION FOR WORKFORCE ANALYTICS**
Karthikeyan Natesan Ramamurthy, Kush Varshney, Moninder Singh, IBM Thomas J. Watson Research Center, United States

SIPFEa.PA.5 **CHALLENGES IN SMARTPHONE-DRIVEN USAGE BASED INSURANCE**
Isaac Skog, Peter Händel, KTH Royal Institute of Technology, Sweden; Martin Ohlsson, Movelo AB, Sweden; Jens Ohlsson, Stockholm University, Sweden

SIPFEa.PA.6 **MODELING RISK OF LOW LATENCY TRADING STRATEGIES**
Yuri Balasanov, University of Chicago, United States; Alexander Doynikov, Victor Korolev, Leonid Nazarov, The Moscow State University, Russian Federation

SIPFEa.PA.7 **A DISTRIBUTED ALGORITHM FOR SYSTEMIC RISK MITIGATION IN FINANCIAL SYSTEMS**
Zhang Li, Xiaojun Lin, Ilya Pollak, Purdue University, United States

SIPFEa.PA.8 **AN EXACT TEST FOR ELLIPTICAL SYMMETRY**
Fang Han, Johns Hopkins University, United States

Signal and Information Processing in Finance and Economics II

SIPFEb.PA.1 **NON-PARAMETRIC PREDICTION IN A LIMIT ORDER BOOK**
Deepan Palguna, Ilya Pollak, Purdue University, United States

SIPFEb.PA.2 **BEYOND PCA FOR MODELING FINANCIAL TIME-SERIES**
Dmitry Malioutov, IBM Research, United States

SIPFEb.PA.3 **SPARSE SIMPLEX PROJECTIONS FOR PORTFOLIO OPTIMIZATION**
Anastasios Kyrillidis, École Polytechnique Fédérale de Lausanne, Switzerland; Stephen Becker, UPMC, Paris 6, France; Volkan Cevher, Christoph Koch, École Polytechnique Fédérale de Lausanne, Switzerland

SIPFEb.PA.4 **MULTIFACTOR SYSTEMATIC RISK ANALYSIS BASED ON PIECEWISE MEAN REVERTING MODEL**
Luan Vo, Xiao-Ping Zhang, Ryerson University, Canada; Fang Wang, Wilfrid Laurier University, Canada

SIPFEb.PA.5 **FACTOR MODEL ESTIMATION BY USING THE ALPHA-EM ALGORITHM**
Tengjie Jia, Stony Brook University, United States

SIPFEb.PA.6 **PIECEWISE CONSTANT MODELING AND KALMAN FILTER TRACKING OF SYSTEMATIC MARKET RISK**
Triloke Rajbhandary, Xiao-Ping Zhang, Ryerson University, Canada; Fang Wang, Wilfrid Laurier University, Canada

SIPFEb.PA.7 **AN ANALYSIS OF THE U.S. GROSS STATE PRODUCT CO-MOVEMENT USING THE MINIMUM DOMINATING SET**
Theophilos Papadimitriou, Periklis Gogas, Georgios Antonios Sarantitis, Democritus University of Thrace, Greece

Advancing Neural Engineering Through Big Data - Keynotes

Christopher Cieri, *The Linguistic Data Consortium, University of Pennsylvania*, **Data Center Models and Impact on Scientific Research Communities**

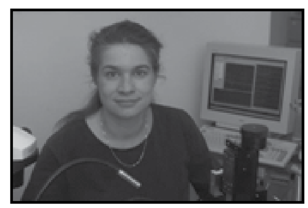
The Linguistic Data Consortium (LDC) has served, for more than two decades, as a center for the creation, distribution and archiving of language-related data. LDC employs a Consortium model in which members contribute to via fees and data donations and receive in turn ongoing access to a repository of their collected contributions whose value is several order of magnitude greater. This model, which might be described as stubbornly practical, has survived great economic upheaval and tidal shifts in attitude toward digital data – but not without change. This presentation will discuss the evolution of the LDC model in comparison with models adopted by other data centers. It will sketch the original plan, the decisions to expand into data collection and annotation, tool building and the distribution of specifications. It will outline and partially quantify the impact the Consortium has had on language related research and technology development. Finally it will discuss the new directions that LDC is pursuing in x-sourcing, web service grids, cloud distribution, and alternate incentives for contributors.

Christopher Cieri has been Executive Director of the Linguistic Data Consortium since January 1998, 15 of the organization's 20 years. He holds BA, MA and PhD in Linguistics from the University of Pennsylvania where he focused on sociolinguistics and language contact in terms of phonetics, phonology and morphology as well as historical and educational linguistics. Cieri's experience in data collection and research programming began in 1983 with his work for the Language Analysis Center at the University of Pennsylvania. Between that position and his current one, Cieri spent 8 years as an IT Director at the University. Since joining the LDC, Cieri has developed its annotation activities and a ten-fold increase in accompanying funding. Today he oversees all aspects of LDC work including research and research administration, project planning, data collection, annotation, archiving distribution and outreach as well as the technical infrastructure that enables that work. To date, LDC has distributed more than 90,000 copies of more than 1,700 datasets to 3,379 companies, universities, and government research laboratories in 70 countries. The bibliography of scientific and technical papers that rely on LDC datasets has reached more than 10,000 entries, after checking approximately 60% of our catalog.

Jack Judy, *University of Florida*, **Government and Academic Needs for Big Data in Neural Engineering**

Jack Judy joined the Electrical and Computer Engineering Department at University of Florida in 2013, where he serves as the Intel Nanotechnology Endowed Chair and Director of the Nanoscience Institute for Medical and Engineering Technology (NIMET). Dr. Judy was formerly a program manager in the Microsystems Technology Office (MTO) of the Defense Advanced Research Projects Agency (DARPA). While at DARPA he managed the Reliable Neural-Interface Technology Program (RE-NET), which he created to address the fundamental and yet largely overlooked reliability problem of chronic neural-recording interfaces. Without successfully developing and translating high-performance neural-recording interfaces that function for the life of the patient, many of the widely envisioned clinical applications for brain-machine interfaces will not be realized. Dr. Judy served at DARPA while on leave from his faculty position in the Electrical and Biomedical Engineering Departments at UCLA, where he also served as Director of the NeuroEngineering Program, the Nanoelectronics Research Facility, and the Microfabrication Laboratory. He has received the National Science Foundation Career Award and the Okawa Foundation Award. He received his B.S.E.E. degree with summa cum laude honors from the University of Minnesota in 1989, and an M.S. and Ph.D. from the University of California, Berkeley, in 1994 and 1996, respectively.

Karen Moxon, *Drexel University*, **Producing Large Sets of Neural Data with an Eye Towards Sharing**



Collecting data to answer a set of well defined, a priori scientific questions is difficult to do correctly and takes considerable planning but is standard practice in academia. How to collect data to share that it is useful to answer some potential as yet unknown questions is not well understood. For neural data this becomes especially challenging because there are critical trade-offs between the potentially enormous amount of data that is generated during an experiment and storage capacity with a relevant database. As an example, increasingly, epilepsy clinics are recording local field potentials with high frequency sampling in order to study changes in single neuron activity in the minutes leading up to the onset of a seizure. The amount of data generated prohibits storage of all the data and different clinics choose to save different pieces of the data depending on their primary interests. This ad hoc practice makes the sharing of data sets among investigators, who might want to test novel seizure detection algorithms, for example, impossible. Therefore, a valuable resource (e.g. continuous high sample-rate data from subjects undergoing spontaneous seizures) is forever lost, despite the fact that the data were initially recorded. Dr. Moxon will address some of the challenges underlying recording and sharing large sets of neural data.

Karen A. Moxon is a Professor of Biomedical Engineering and Associate Director for Research, Drexel University, School of Biomedical Engineering. She is an engineer by training with over 20 years of experience in computational neuroscience developing models to study how the brain represents sensorimotor information. Her experience ranges from using reductionist Hodgkin-Huxley type models of small numbers of neurons to simple integrate and fire models of large networks of neurons. Using an information theoretic approach she developed novel models of how variability in neuronal responses provides information about the type of stimulus. Due in part to the complexity involved in acquiring data from others for model development, she directs the NeuroRobotics Lab that performs basic science experiments, recording from large populations of neurons to gain insight into information representation. For example, she uses brain-machine interface paradigms to test hypothesis about neural encoding (Manohar et al.,2012). Applications of her work involve spinal cord injury (Kao et al., J Neurosci 2009), central neuropathic pain (Graziano et al., PLoS One, 2013) and epilepsy (Grasse et al., Exp Neurol. 2013). She is also involved in developing platform technologies to improve neuronal recording, holding two patents, one for the use of ceramic for microelectrodes (Moxon et al., IEEE-TBE, 2004) and the other for development of wirelessly controlled neuromodulation systems for neurological disorders such as epilepsy or Parkinson's disease (Foffani et al., Brain 2003). Dr. Moxon will address some of the challenges underlying recording and sharing large sets of neural data.

Advancing Neural Engineering Through Big Data I

ANEBDa.PE.1 HIERARCHICAL EVENT DESCRIPTOR (HED) TAGS FOR ANALYSIS OF EVENT-RELATED EEG STUDIES
Nima Bigdely-Shamlo, Kenneth Kreutz-Delgado, University of California, San Diego, United States; Kay Robbins, The University of Texas at San Antonio, United States; Makoto Miyakoshi, Marissa Westerfield, Tarik Bel-Bahar, Christian Kothe, Jessica Hsi, Scott Makeig, University of California, San Diego, United States

ANEBDa.PE.2 CTAGGER: SEMI-STRUCTURED COMMUNITY TAGGING FOR ANNOTATION AND DATA-MINING IN EVENT-RICH CONTEXTS
Thomas Rognon, Rebecca Strautman, Lauren Jett, The University of Texas at San Antonio, United States; Nima Bigdely-Shamlo, Scott Makeig, University of California, San Diego, United States; Tony Johnson, DCS Corporation, United States; Kay Robbins, The University of Texas at San Antonio, United States

ANEBDa.PE.3 EEG AND THE HUMAN PERCEPTION OF VIDEO QUALITY: IMPACT OF CHANNEL SELECTION ON DISCRIMINATION
Philip Davis, Charles Creusere, Jim Kroger, New Mexico State University, United States

ANEBDa.PE.4 A COMPRESSIVE SAMPLING APPROACH FOR BRAIN-MACHINE INTERFACES BASED ON TRANSCRANIAL DOPPLER SONOGRAPHY: A CASE STUDY OF RESTING-STATE MAXIMAL CEREBRAL BLOOD VELOCITY SIGNALS
Ervin Sejdic, Luis Chaparro, University of Pittsburgh, United States

ANEBDa.PE.5 CONTENT-BASED EEG DATABASE RETRIEVAL USING A MULTICLASS SVM CLASSIFIER
Kyungmin Su, Kay Robbins, The University of Texas at San Antonio, United States

ANEBDa.PE.6 USING FEEDBACK IN LONG TERM TRAJECTORY DECODING FROM LOCAL FIELD POTENTIALS
Kareem Shabaik, Vijay Tadipatri, Ahmed H. Tewfik, The University of Texas at Austin, United States

ANEBDa.PE.7 TOWARDS AN EEG SEARCH ENGINE
Nima Bigdely-Shamlo, Kenneth Kreutz-Delgado, Christian Kothe, Scott Makeig, University of California, San Diego, United States

ANEBDa.PE.8 THE TEMPLE UNIVERSITY HOSPITAL EEG CORPUS
Amir Harati, Sung Choi, Masih Tabrizi, Iyad Obeid, Temple University, United States; Mercedes Jacobson, Temple University Hospital, United States; Joseph Picone, Temple University, United States

ANEBDa.PE.9 A DEEP LEARNING METHOD FOR CLASSIFICATION OF IMAGES RSVP EVENTS WITH EEG DATA
Shaheen Ahmed, Mauricio Lenis, Zijing Mao, The University of Texas at San Antonio, United States; Jia Meng, Massachusetts Institute of Technology, United States; Kay Robbins, Yufei Huang, The University of Texas at San Antonio, United States

ANEBDa.PE.10 TWO-DIMENSIONAL SVD FOR EVENT DETECTION IN DYNAMIC FUNCTIONAL BRAIN NETWORKS
Arash Golibagh Mahyari, Selin Aviyente, Michigan State University, United States

Bioinformatics and Systems Biology - Keynotes

Trey Ideker, *University of California, San Diego*, **Network-based Stratification of Tumor Mutations**

Many forms of cancer have multiple subtypes with different causes and clinical outcomes. Somatic tumor genome sequences provide a rich new source of data for uncovering these subtypes but have proven difficult to compare, as two tumors rarely share the same mutations. Here we introduce network-based stratification (NBS), a method to integrate somatic tumor genomes with gene networks. This approach allows for stratification of cancer into informative subtypes by clustering together patients with mutations in similar network regions. We demonstrate NBS in ovarian, uterine and lung cancer cohorts from The Cancer Genome Atlas. For each tissue, NBS identifies subtypes that are predictive of clinical outcomes such as patient survival, response to therapy or tumor histology. We identify network regions characteristic of each subtype and show how mutation-derived subtypes can be used to train an mRNA expression signature, which provides similar information in the absence of DNA sequence.

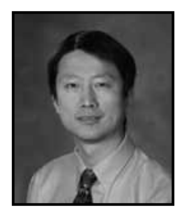
Trey Ideker is Chief of Genetics at the UCSD School of Medicine. He also serves as Professor of Bioengineering, Adjunct Professor of Computer Science and Member of the Moores UCSD Cancer Center. Ideker received Bachelor's and Master's degrees from MIT in Electrical Engineering and Computer Science and his Ph.D. from the University of Washington in Molecular Biology under the supervision of Dr. Leroy Hood. He is a pioneer in using genome-scale measurements to construct network models of cellular processes and disease. His recent research activities include assembly of networks governing the response to DNA damage, development of software for protein network cross-species comparisons, and network-based diagnosis of disease. Ideker serves on the Editorial Boards for Bioinformatics and PLoS Computational Biology, Board of Directors for US-HUPO and the Cytoscape Consortium, and is a regular consultant for companies such as Monsanto, Genstruct, and Mendel Biotechnology. He was named one of the Top 10 Innovators of 2006 by Technology Review magazine and the 2009 Overton Prize recipient from the International Society for Computational Biology. His work has been featured in news outlets such as The Scientist, the San Diego Union Tribune, and Forbes magazine.

David A. Wheeler, *Baylor College of Medicine*, **Bioinformatics Challenges and Opportunities in the Mutational Analysis of Cancer Genomes**

The establishment of a highly accurate human reference genome sequence in 2004 ushered in the "genomics era" and promised a genetic basis for disease diagnosis, prognosis and treatment tailored specifically to each patient. Cancer, often described as "a disease of the chromosomes", is under intense scrutiny of next generation sequencing technologies. Remarkable successes have emerged from recent large-scale studies, but significant challenges remain. This talk will review recent progress, and outline the challenges toward application of the evolving sequencing technologies to personalized treatment.

David A. Wheeler received his B.S. degrees in Biochemistry and Xoology from the University of Maryland, an M.S. in Biochemistry and Ph.D. in Molecular Genetics from the George Washington University. Dr. Wheeler did postdoctoral research in behavioral genetics at Brandeis University with Dr. Jeffrey Hall, where he participated in the cloning of the D. melanogaster period locus, the first gene with an established role in regulating behavior (circadian rhyhthms) in any organism. Through this work in the late 1980s, Dr. Wheeler became interested in the new area of computational biology. He joined the faculty at Baylor College of Medicine in 1991 to develop computational tools for moloecular biology. He was Director the Molecular Biology Computation Resource at Baylor College of Medicine for 10 years and in 2001 joined the Human Genome Sequencing Center at BCM where he guided the finishing of the D. melanogaster chromosome 3 and X genome sequence followed by the human genome sequence, chromosomes 3, and 12. Currently Dr. Wheeler is Director of Cancer Genomics in the Human Genome Sequencing Center, where he develops methods for discovery of genome variation in human and animal populations using DNA sequencing technologies with the goal of relating polymorphism and mutation to cancer.

Wei Li, *Baylor College of Medicine*



The dynamic usage of mRNA 3' untranslated region (3'UTR) resulting from alternative polyadenylation (APA) is emerging as a pervasive mechanism to regulate approximately 70% of human genes. The importance of APA in human diseases such as cancer is only beginning to be appreciated. Current APA profiling protocols use the partitioning and fragmentation of mRNA to enrich for polyA sites followed by high throughput sequencing (polyA-seq). These polyA-seq protocols, although powerful, have not been widely adopted. Therefore, global studies of APA in cancer are very limited. In contrast, whole transcriptome RNA-seq has been broadly employed in almost every large-scale genomics project, including The Cancer Genome Atlas (TCGA). We therefore developed a novel bioinformatics algorithm, termed Dynamic analysis of Alternative PolyAdenylation from RNA-Seq (DaPars), to directly infer dynamic APA events through standard RNA-seq. DaPars used a linear regression model to identify the exact location of the de novo APA site, and quantify the lengthening or shortening of 3'UTRs between different conditions.

When applied to 291 TCGA clinical samples across 6 tumor types, we discovered 416 genes with highly recurrent tumor-specific dynamic APAs. Most of these genes (94%) have shorter 3'UTRs and accordingly have higher expression in tumors than in matched normal tissues, likely through loss of microRNA-mediated repression. Interestingly, we found a novel link between APA regulation and cancer metabolism, and strong evidence that a critical component of the 3'-end processing machinery is a master activator of proximal APA usage in tumorigenesis. Together, through the reanalysis of TCGA RNA-seq data using DaPars, our work is the first to demonstrate the feasibility of APA analysis through standard RNA-seq, and expands our knowledge of the mechanisms and consequences of APA regulation during tumorigenesis.

Wei Li is an Associate Professor in the Dan L. Duncan Cancer Center and Department of Molecular and Cellular Biology at Baylor College of Medicine. He received his PhD in Bioinformatics from the Chinese Academy of Sciences and postdoctoral training in the Department of Biostatistics and Computational Biology at the Dana-Farber Cancer Institute and Harvard School of Public Health. Dr. Li's research is focused on the design and application of statistical and computational algorithms to elucidate epigenetic mechanisms in various disease models such as cancer.

Bioinformatics and Systems Biology I

BSBa.PA.1 **DIFFERENTIAL ANALYSIS OF RNA METHYLATION SEQUENCING DATA**
Xiaodong Cui, University of Texas at San Antonio, United States; Jia Meng, Massachusetts Institute of Technology, United States; Manjeet Rao, Yidong Chen, University of Texas Health Science Center at San Antonio, United States; Yufei Huang, University of Texas at San Antonio, United States

BSBa.PA.2 **METAPAR: METAGENOMIC SEQUENCE ASSEMBLY VIA ITERATIVE RECLASSIFICATION**
Minji Kim, Jonathan Ligo, Amin Emad, Farzad Farnoud, Olgica Milenkovic, Venugopal Veeravalli, University of Illinois at Urbana-Champaign, United States

BSBa.PA.3 **INTEGRATED GENOTYPING OF STRUCTURAL VARIATION**
Xian Fan, Luay Nakhleh, Rice University, United States; Ken Chen, The University of Texas MD Anderson Cancer Center, United States

BSBa.PA.4 **CLOUD PROCESSING OF 1000 GENOMES SEQUENCING DATA USING AMAZON WEB SERVICE**
Zhuoyi Huang, Jin Yu, Fuli Yu, Baylor College of Medicine, United States

BSBa.PA.5 **ANALYZING T CELL REPERTOIRE DIVERSITY BY HIGH-THROUGHPUT SEQUENCING**
Boris Grinshpun, Jennifer Sims, Peter Canoll, Jeffrey N. Bruce, Peter Sims, Yufeng Shen, Columbia University Medical Center, United States

BSBa.PA.6 **APPLICATION OF DOUBLE ASYMPTOTICS AND RANDOM MATRIX THEORY IN ERROR ESTIMATION OF REGULARIZED LINEAR DISCRIMINANT ANALYSIS**
Amin Zollanvari, Texas A&M University, United States; Edward R. Dougherty, Texas A&M University/ Translational Genomics Research Institute (TGEN), United States

BSBa.PA.7 **SECURITY STUDY OF KEYED DNA DATA EMBEDDING**
David Haughton, Felix Balado, University College Dublin, Ireland

BSBa.PA.8 **DETERMINISTIC SEQUENTIAL MONTE CARLO FOR HAPLOTYPE INFERENCE**
Soyeon Ahn, Haris Vikalo, University of Texas at Austin, United States

BSBa.PA.9 **OPTIMAL BAYESIAN FEATURE SELECTION**
Lori Dalton, The Ohio State University, United States

BSBa.PA.10 **EXPLORING RELATIONSHIPS BETWEEN MULTIVARIATE PHENOTYPE AND GENETIC FEATURES: A CASE-STUDY IN GIOBLASTOMA USING THE CANCER GENOME ATLAS**
Arvind Rao, UT MD Anderson Cancer Center, United States

BSBa.PA.11 **PREMIER TURBO: PROBABILISTIC ERROR-CORRECTION USING MARKOV INFERENCE IN ERRORED READS USING THE TURBO PRINCIPLE**
Xin Yin, Zhao Song, Karin Dorman, Aditya Ramamoorthy, Iowa State University, United States

BSBa.PA.12 **A SPARSE MULTI-CLASS CLASSIFIER FOR BIOMARKER SCREENING**
Tzu-Yu Liu, University of Michigan, United States; Ami Wiesel, The Hebrew University of Jerusalem, Israel; Alfred O. Hero, University of Michigan, United States

Bioinformatics and Systems Biology II

BSBb.PA.1 **PARTICLE FILTERING APPROACH TO STATE ESTIMATION IN BOOLEAN DYNAMICAL SYSTEMS**
Ulisses Braga-Neto, Texas A&M University, United States

BSBb.PA.2 **IDENTIFYING DEREGULATED TF/MIRNA NEGATIVE AND DOUBLE-NEGATIVE FEEDBACK LOOPS IN PROSTATE CANCER**
Ali Afshar, Joseph Xu, John Goutsias, The Johns Hopkins University, United States

BSBb.PA.3 **IDENTIFYING OVERLAPPING FUNCTIONAL MODULES IN BIOLOGICAL NETWORKS BY MARKOV RANDOM WALK**
Yijie Wang, University of South Florida, United States; Xiaoning Qian, Texas A&M University, United States

BSBb.PA.4 **A MODEL FOR CANCER TISSUE HETEROGENEITY**
Anwoy Mohanty, Aniruddha Datta, Jijayanagaram Venkatraj, Texas A&M University, United States

BSBb.PA.5 **FINDING ROBUST SUBNETWORK MARKERS THAT IMPROVE CROSS-DATASET PERFORMANCE OF CANCER CLASSIFICATION**
Navadon Khunlertgit, Byung-Jun Yoon, Texas A&M University, United States

BSBb.PA.6 **INFERENCE OF TUMOR INHIBITION PATHWAYS FROM DRUG PERTURBATION DATA**
Saad Haider, Ranadip Pal, Texas Tech University, United States

BSBb.PA.7 **ROBUST IDENTIFICATION OF MOLECULARLY TARGETED DRUG EFFECT COEFFICIENT USING $H_{\INFTY}$ FILTER**
Lijun Qian, Xiangfang Li, Prairie View A&M University, United States; Edward R. Dougherty, Texas A&M University, United States

BSBb.PA.8 **PARALLEL COMPUTING FOR ADAPTIVE MULTI-CELLULAR GENE NETWORK MODELING**
Yong-Jun Shin, University of Connecticut, United States

BSBb.PA.9 **OPTIMAL CONTROL OF GENE REGULATORY NETWORKS WITH UNCERTAIN INTERVENTION EFFECTS**
Mohammadmahdi Rezaei Yousefi, The Ohio State University, United States; Ivan Ivanov, Texas A&M University, United States

BSBb.PA.10 **IDENTIFICATION AND CHARACTERIZATION OF GENE FUSIONS IN BREAST CANCER – A NON-TRIVIAL PURSUIT**
Vinay Varadan, Vartika Agrawal, Philips Research, United States; Lyndsay Harris, Seidman Cancer Center, United States; Nevenka Dimitrova, Philips Research, United States

BSBb.PA.11 **A SPARSE BAYESIAN LEARNING BASED APPROACH TO INFERRING GENE REGULATORY NETWORKS**
Nitin Singh, Aishwarya Sundaresan, Mathukumalli Vidyasagar, University of Texas at Dallas, United States

Controlled Sensing For Inference: Applications, Theory and Algorithms - Keynotes

David Castañón, *Boston University*, **Scalable Controlled Sensing for Markov Tasks**

David Castañón is the Chair of the Electrical and Computer Engineering Department at Boston University. He received his Ph.D. in Applied Mathematics at Massachusetts Institute of Technology, and his B.S. in Electrical Engineering at Tulane University. Before joining Boston University, he was Chief Scientist of ALPHATECH, Inc. He has served in various executive positions for the IEEE Control Systems Society, including member of the Society's Board of Governors, Vice president for Finance, and President. He served as General Chair and Program Chair for the IEEE Control Systems Society's flagship conference, the IEEE Conference on Decision and Control, and received the Society's Distinguished Member Award in 2006. Prof. Castañón is a former member of the Air Force Scientific Advisory Board, and served as Deputy Director of the NSF Engineering Research Center for Subsurface Sensing and Imaging. He is the currently the co-director of the Center for Information and Systems Engineering at Boston University, and Associate Director of the ALERT Center of Excellence in Explosives Detection. His research interests include optimization, inverse problems, stochastic control and machine learning, with diverse applications such as target recognition, compressive sensing and tomographic image reconstruction.

Vikram Krishnamurthy, *University of British Columbia*, **Controlled Sensing and Social Learning**

This talk describes social learning in the context of controlled sensing. Individual agents perform social learning to estimate an underlying state of nature and thereby make local decisions. How can a global decision maker use these local decisions to optimize a utility function? Two examples are considered: The first example deals with the quickest detection/estimation problem when individual agents perform social learning. The second example deals with a global decision maker that optimizes a social utility function to delay herding amongst agents. In both examples, the optimal strategy of the global decision maker is unusual in that the the stopping set is non convex. In the context of controlled sensing, these results show that global decision making based on local decisions of sensors (rather than Bayesian posteriors) can result in unusual behaviour.

Vikram Krishnamurthy received his Ph.D from the Australian National University in 1992. He is a professor and Canada Research Chair at the Department of Electrical Engineering, University of British Columbia, Vancouver, Canada. His current research interests include computational game theory, stochastic control and applications in the dynamics of protein molecules in biophysical systems. He has served as Distinguished lecturer for the IEEE signal processing society and Editor in Chief of IEEE Journal Selected Topics in Signal Processing.

Lawrence Carin, *Duke University*, **Adaptive Compressive Sensing for Poisson Data**

Compressive sensing (CS) exploits redundancies in data to reduce the number of measurements that need be performed, relative to classic Nyquist sampling theory. Most previous CS research has assumed that the measurement noise is Gaussian, and that the projection measurements are defined at random. In this talk we reconsider both of these assumptions. First, in many sensing settings the data are Poisson, such as low-photon-count sensors, and the assumption of Gaussian noise is inappropriate. Secondly, by exploiting prior information about the statistics of the underlying data, one can use information theory to design optimal compressive measurements. In this talk we examine these issues, and demonstrate the theory on a real low-photon-count CS sensing system.

Lawrence Carin earned the BS, MS, and PhD degrees in electrical engineering at the University of Maryland, College Park, in 1985, 1986, and 1989, respectively. In 1989 he joined the Electrical Engineering Department at Polytechnic University (Brooklyn) as an Assistant Professor, and became an Associate Professor there in 1994. In September 1995 he joined the Electrical Engineering Department at Duke University, where he is now the William H. Younger Professor of Engineering. He is also now the Chairman of Electrical & Computer Engineering at Duke. He is a co-founder of Signal Innovations Group, Inc. (SIG), a small business, where he serves as the Director of Technology. His current research interests include applied statistics, information theory and machine learning. He has published over 250 peer-reviewed papers, he is an IEEE Fellow, and he is a member of the Tau Beta Pi and Eta Kappa Nu honor societies.

Controlled Sensing For Inference: Applications, Theory and Algorithms I

CSIa.PD.1 **LOCALIZATION OF A SINGLE SOURCE WITH ORIENTATION-AWARE SMART DEVICES**
Daniel Tunon, Travis Taghavi, Jean-Francois Chamberland, Gregory Huff, Texas A&M University, United States

CSIa.PD.2 **AUTONOMOUS CORRECTION OF SENSOR DATA APPLIED TO BUILDING TECHNOLOGIES USING FILTERING METHODS**
Charles Castello, Joshua New, Oak Ridge National Laboratory, United States; Matt Smith, The University of Alabama, United States

CSIa.PD.3 **CONTROLLED SENSING FOR SEQUENTIAL ESTIMATION**
George Atia, University of Central Florida, United States; Shuchin Aeron, Tufts University, United States

CSIa.PD.4 **ON OPTIMAL FUSION ARCHITECTURE FOR A TWO-SENSOR TANDEM DISTRIBUTED DETECTION SYSTEM**
Earnest Akofor, Biao Chen, Syracuse University, United States

CSIa.PD.5 **ADAPTIVE COMPRESSIVE SENSING IN THE PRESENCE OF NOISE AND ERASURE**
Lucas W. Krakow, Ramin Zahedi, Edwin K. P. Chong, Ali Pezeshki, Colorado State University, United States

CSIa.PD.6 **ON OPTIMAL PERIODIC SENSOR SCHEDULING FOR FIELD ESTIMATION IN WIRELESS SENSOR NETWORKS**
Sijia Liu, Makan Fardad, Syracuse University, United States; Engin Masazade, Yeditepe University, Turkey; Pramod K. Varshney, Syracuse University, United States

CSIa.PD.7 **CRB-OPTIMAL SENSOR PLACEMENT FOR MULTIPLE PASSIVE ACOUSTIC ARRAYS**
Chris Kreucher, Ben Shapo, Integrity Applications Incorporated, United States

CSIa.PD.8 **QUICKEST CHANGE DETECTION AND IDENTIFICATION ACROSS A SENSOR ARRAY**
Di Li, Texas A&M University, United States; Lifeng Lai, Worcester Polytechnic Institute, United States; Shuguang Cui, Texas A&M University, United States

CSIa.PD.9 **EXPLORATION WITH MASSIVE SENSOR SWARMS**
Stephan Schlupkothen, Guido Dartmann, Gerd Ascheid, RWTH Aachen University, Germany

CSIa.PD.10 **MC-MIMO RADAR: RECOVERABILITY AND PERFORMANCE BOUNDS**
Dionysios Kalogerias, Athina Petropulu, Rutgers, The State University of New Jersey, United States

CSIa.PD.11 **AN INCENTIVE-BASED MECHANISM FOR LOCATION ESTIMATION IN WIRELESS SENSOR NETWORKS**
Nianxia Cao, Swastik Brahma, Pramod K. Varshney, Syracuse University, United States

CSIa.PD.12 **BLIND COLLABORATIVE 20 QUESTIONS FOR TARGET LOCALIZATION**
Theodoros Tsiligkaridis, University of Michigan, Ann Arbor, United States; Brian Sadler, US Army Research Laboratory, United States; Alfred O. Hero, University of Michigan, Ann Arbor, United States

CSIa.PD.13 **THE PRICE OF ANARCHY IN ACTIVE SIGNAL LANDSCAPE MAP BUILDING**
Zaher Kassas, Todd Humphreys, The University of Texas at Austin, United States

Controlled Sensing For Inference: Applications, Theory and Algorithms II

CSIb.PD.1 **PATTERN-BASED COMPRESSED PHONE SENSING**
Shuangjiang Li, Hairong Qi, The University of Tennessee at Knoxville, United States

CSIb.PD.2 **CAPTURING HIGH FIDELITY IMAGES IN PTZ CAMERA NETWORKS**
Chong Ding, Jay A. Farrell, Amit K. Roy-Chowdhury, University of California, Riverside, United States

CSIb.PD.3 **REGULARIZATION TECHNIQUES FOR FLOOR PLAN ESTIMATION IN RADIO TOMOGRAPHIC IMAGING**
Brian Beck, Robert Baxley, Georgia Tech Research Institute, United States; Xiaoli Ma, Georgia Institute of Technology, United States

CSIb.PD.4 **THE VALUE OF SLEEPING: A ROLLOUT ALGORITHM FOR SENSOR SCHEDULING IN HMMS**
David Jun, Douglas Jones, University of Illinois, United States

CSIb.PD.5 **SENSOR SELECTION AND PLACEMENT IN ADVERSARIAL ENVIRONMENT**
Nithin Sugavanam, Emre Ertin, The Ohio State University, United States

CSIb.PD.6 **A PERFORMANCE GUARANTEE FOR ADAPTIVE ESTIMATION OF SPARSE SIGNALS**
Dennis Wei, Alfred O. Hero, University of Michigan, United States

CSIb.PD.7 **ON THE PROPERTIES OF NONLINEAR POMDPS FOR ACTIVE STATE TRACKING**
Daphney-Stavroula Zois, Urbashi Mitra, University of Southern California, United States

CSIb.PD.8 **CONTROL OF SENSING BY NAVIGATION ON INFORMATION GRADIENTS**
Sofia Suvorova, William Moran, University of Melbourne, Australia; Stephen Howard, Defence Science and Technology Organisation, Australia; Douglas Cochran, Arizona State University, United States

CSIb.PD.9 **DYNAMIC SEARCH UNDER FALSE ALARMS**
Yixuan Zhai, Qing Zhao, University of California, Davis, United States

CSIb.PD.10 **SOCIAL LEARNING AND CONTROLLED SENSING**
Vikram Krishnamurthy, University of British Columbia, Canada

CSIb.PD.11 **INFORMATION ACQUISITION AND UTILIZATION PROBLEMS**
Tara Javidi, University of California, San Diego, United States

CSIb.PD.12 **A FRAMEWORK FOR ADAPTIVE PARAMETER ESTIMATION WITH FINITE MEMORY**
Yue M. Lu, Harvard University, United States

Graph Signal Processing - Keynotes

Pierre Vandergheynst, *École Polytechnique Fédérale de Lausanne, Switzerland*, **Towards Multi-scale Signal Processing on Graphs**

It is no surprise that the recent surge in applications involving large amount of network data is a challenge for signal processing and an invitation to re-invent traditional methods. In this talk I will review recent constructions of wavelets and other multi-scale transforms for data defined at the vertices of, potentially large, graphs. I will highlight interesting similarities, but also differences, with traditional digital signal processing methods such as wavelets and discuss efficient algorithms and fundamental limits. I will also showcase applications such as inference on graphs and sub-network identification using these new methods.

Pierre Vandergheynst received the M.S. degree in physics and the Ph.D. degree in mathematical physics from the Université catholique de Louvain, Louvain-la-Neuve, Belgium, in 1995 and 1998, respectively. From 1998 to 2001, he was a Postdoctoral Researcher with the Signal Processing Laboratory, Swiss Federal Institute of Technology (EPFL), Lausanne,Switzerland. He was Assistant Professor at EPFL (2002-2007), where he is now an Associate Professor.

His research focuses on harmonic analysis, sparse approximations and mathematical data processing in general with applications covering signal, image and high dimensional data processing, sensor networks, computer vision.

He was co-Editor-in-Chief of Signal Processing (2002-2006) and Associate Editor of the IEEE Transactions on Signal Processing (2007-2011), the flagship journal of the signal processing community. He has been on the Technical Committee of various conferences, serves on the steering committee of the SPARS workshop and was co-General Chairman of the EUSIPCO 2008 conference.

Pierre Vandergheynst is the author or co-author of more than 70 journal papers, one monograph and several book chapters. He has received two IEEE best paper awards.

Professor Vandergheynst is a laureate of the Apple 2007 ARTS award and of the 2009-2010 De Boelpaepe prize of the Royal Academy of Sciences of Belgium.

Eric Kolaczyk, *Boston University, USA*, **Inference of Network Summary Statistics Through Network Denoising**

Consider observing an undirected network that is 'noisy' in the sense that there are Type I and Type II errors in the observation of edges. Such errors can arise, for example, in the context of inferring gene regulatory networks in genomics or functional connectivity networks in neuroscience. Given a single observed network then, to what extent are summary statistics for that network representative of their analogues for the true underlying network?

Can we infer such statistics more accurately by taking into account the noise in the observed network edges? In this talk I will describe work in which we answer both of these questions. In particular, we develop a spectral-based methodology using the adjacency matrix to 'denoise' the observed network data and produce more accurate inference of the summary statistics of the true network. We characterize performance of our methodology through bounds on appropriate notions of risk in the L2 sense, and conclude by illustrating the practical impact of this work on synthetic and real-world data.

Eric Kolaczyk is Professor of Statistics, and Director of the Program in Statistics, in the Department of Mathematics and Statistics at Boston University, where he also is an affiliated faculty member in the Program in Bioinformatics, the Program in Computational Neuroscience, and the Division of Systems Engineering. Prof. Kolaczyk's main research interests currently revolve around the statistical analysis of network-indexed data, and include both the development of basic methodology and inter-disciplinary work with collaborators in bioinformatics, computer science, geography, neuroscience, and sociology. Besides various research articles on these topics, he has also authored a book in this area – Statistical Analysis of Network Data: Methods and Models (Springer, 2009). He has given various short courses on material from his book in recent years, including for the Center for Disease Control (CDC) and the Statistical and Applied Mathematical Sciences Institute (SAMSI) in the US as well as similar venues in Belgium, England, and France. Prior to his working in the area of networks, Prof. Kolaczyk spent a decade working on statistical multi-scale modeling. Prof. Kolaczyk has served as associate editor on several journals, including currently the Journal of the American Statistical Association and previously the IEEE Transactions in Image Processing. He has also served as co-organizer for workshops focused on networks and network data. He is an elected fellow of the American Statistical Association (ASA), an elected senior member of the Institute for Electrical and Electronics Engineers (IEEE), and an elected member of the International Statistical Institute (ISI).

Mauro Maggioni, *Duke University, USA*, **Multiscale Analysis of Time-Varying Graphs**

Time series of graphs arise in many branches of sciences and applications. We discuss novel techniques for measuring distances between graphs, based on multiscale analysis of random walks, in a way that is both sensitive to localized changes and robust to "noisy" perturbations of the graph. From this we derive a framework for analyzing time series of graphs, together with fast algorithms. Finally, we discuss applications to families of graphs with multiscale structure, as well as real data mapped to dynamic graphs.

Mauro Maggioni works at the intersection between harmonic analysis, probability, machine learning, spectral graph theory, and signal processing. He received his B.Sc. in Mathematics summa cum laude at the Universitá degli Studi in Milan in 1999, the Ph.D. in Mathematics from the Washington University, St. Louis, in 2002. He then was a Gibbs Assistant Professor in Mathematics at Yale University till 2006, when he moved to Duke University, where is now Professor in Mathematics, Electrical and Computer Engineering, and Computer Science. He received the Popov Prize in Approximation Theory in 2007, a N.S.F. CAREER award and Sloan Fellowship in 2008, and was nominated Fellow of the American Mathematical Society in 2013. He is a member of the A.M.S. and S.I.A.M.

Graph Signal Processing I

GSPa.PC.1 **DIFFUSION ESTIMATION OVER COOPERATIVE NETWORKS WITH MISSING DATA**
Mohammad Reza Gholami, Erik G. Ström, Chalmers, Sweden; Ali H. Sayed, University of California, Los Angeles, United States

GSPa.PC.2 **A GENERAL FRAMEWORK FOR KERNEL SIMILARITY-BASED IMAGE DENOISING**
Amin Kheradmand, University of California, Santa Cruz, United States; Peyman Milanfar, University of California, Santa Cruz / Google, United States

GSPa.PC.3 **GRAPH DIFFUSION DISTANCE : A DIFFERENCE MEASURE FOR WEIGHTED GRAPHS BASED ON THE GRAPH LAPLACIAN EXPONENTIAL KERNEL**
David Hammond, University of Oregon, United States; Yaniv Gur, Chris Johnson, University of Utah, United States

GSPa.PC.4 **WAVELET-REGULARIZED GRAPH SEMI-SUPERVISED LEARNING**
Venkatesan Ekambaram, Giulia Fanti, Babak Ayazifar, Kannan Ramchandran, University of California, Berkeley, United States

GSPa.PC.5 **ADAPTIVE GRAPH FILTERING: MULTIRESOLUTION CLASSIFICATION ON GRAPHS**
Siheng Chen, Aliaksei Sandryhaila, José M. F. Moura, Jelena Kovacevic, Carnegie Mellon University, United States

GSPa.PC.6 **LIFTING SCHEME ON GRAPHS WITH APPLICATION TO IMAGE REPRESENTATION**
Moncef Hidane, Olivier Lézoray, Abderrahim Elmoataz, Normandie University., ENSICAEN, CNRS, France

GSPa.PC.7 **MULTISCALE GENE SETS FROM PROTEIN INTERACTION NETWORKS**
Shu Yang, Lisa Pham, Lisa Christadore, Scott Schaus, Eric Kolaczyk, Boston University, United States

GSPa.PC.8 **TRANSITIVITY BASED COMMUNITY ANALYSIS AND DETECTION**
Mohammad Aghagolzadeh, Hayder Radha, Michigan State University, United States

GSPa.PC.9 **NEAR-OPTIMAL AND COMPUTATIONALLY EFFICIENT DETECTORS FOR WEAK AND SPARSE GRAPH-STRUCTURED PATTERNS**
James Sharpnack, Aarti Singh, Carnegie Mellon University, United States

GSPa.PC.10 **DIVERGENCE BASED GRAPH ESTIMATION FOR MANIFOLD LEARNING**
Karim Abou-Moustafa, University of Alberta, Canada; Frank Ferrie, McGill University, Canada; Dale Schuurmans, University of Alberta, Canada

GSPa.PC.11 **GRAPH-BASED INTERPOLATION FOR DIBR-SYNTHESIZED IMAGES WITH NONLOCAL MEANS**
Yu Mao, the Graduate University of Advanced Studies, Japan; Gene Cheung, National Institute of Informatics, Japan; Yusheng Ji, National Institute of Inforamtics, Japan

GSPa.PC.12 **SPATIO-TEMPORAL ANALYSIS OF GAUSSIAN WSS PROCESSES VIA COMPLEX CORRELATION AND PARTIAL CORRELATION SCREENING**
Hamed Firouzi, Dennis Wei, Alfred O. Hero, University of Michigan, United States

Graph Signal Processing II

GSPb.PC.1 **NONLOCAL SEGMENTATION OF POINT CLOUDS WITH GRAPHS**
Francois Lozes, Moncef Hidane, Abderrahim Elmoataz, Olivier Lézoray, UNICAEN, France

GSPb.PC.2 **MULTISCALE COMMUNITY MINING IN NETWORKS USING THE GRAPH WAVELET TRANSFORM OF RANDOM VECTORS**
Nicolas Tremblay, Pierre Borgnat, Ecole Normale Supérieure de Lyon, France

GSPb.PC.3 **GRAPHICAL EVOLUTIONARY GAME THEORETIC FRAMEWORK FOR DISTRIBUTED ADAPTIVE FILTER NETWORKS**
Chunxiao Jiang, Yan Chen, K. J. Ray Liu, University of Maryland, United States

GSPb.PC.4 **INFERENCE IN TIME SERIES OF GRAPHS USING LOCALITY STATISTICS**
Heng Wang, Minh Tang, Carey E Priebe, Youngser Park, Johns Hopkins University, United States

GSPb.PC.5 **CRITICALLY-SAMPLED PERFECT-RECONSTRUCTION SPLINE-WAVELET FILTERBANKS FOR GRAPH SIGNALS**
Venkatesan Ekambaram, Giulia Fanti, Babak Ayazifar, Kannan Ramchandran, University of California, Berkeley, United States

GSPb.PC.6 **JOINT ESTIMATION OF MOTION AND ARC BREAKPOINTS FOR SCALABLE COMPRESSION**
Sean Young, Reji Mathew, David Taubman, University of New South Wales, Australia

GSPb.PC.7 **OPTIMIZATION OF WIRELESS NETWORKS VIA GRAPH INTERPOLATION**
Marco Levorato, University of California, Irvine, United States; Sunil K. Narang, Urbashi Mitra, Antonio Ortega, University of Southern California, United States

GSPb.PC.8 **PARAMETRIC DICTIONARY LEARNING FOR GRAPH SIGNALS**
Dorina Thanou, David Shuman, Pascal Frossard, École Polytechnique Fédérale de Lausanne, Switzerland

GSPb.PC.9 **LOCALIZED ITERATIVE METHODS FOR INTERPOLATION IN GRAPH STRUCTURED DATA**
Sunil K. Narang, Akshay Gadde, Eduard Sanou, Antonio Ortega, University of Southern California, United States

GSPb.PC.10 **CLASSIFICATION VIA REGULARIZATION ON GRAPHS**
Aliaksei Sandryhaila, José M. F. Moura, Carnegie Mellon University, United States

GSPb.PC.11 **GRAPHICAL MODELS FOR CONTEXT-AWARE ANALYSIS OF CONTINUOUS VIDEOS**
Yingying Zhu, K. Roy-Chowdhury Amit, University of California, Riverside, United States

Low-Dimensional Models and Optimization in Signal Processing - Keynotes

Piotr Indyk, *Massachusetts Institute of Technology*, **Approximation-Tolerant Model-Based Compressive Sensing**

The goal of sparse recovery is to recover a k-sparse signal x from (possibly noisy) linear measurements of the form y = A x, where A describes the measurement process. Standard results in compressive sensing show that it is possible to recover the signal x from m = O(k log (n/k)) measurements, and that this bound is tight. The framework of model-based compressive sensing (introduced by Baraniuk et al.) overcomes the lower bound and reduces the number of measurements further to O(k) by limiting the supports of x to a subset M of all possible supports. This has led to many measurement-efficient algorithms for a wide variety of signal models, including block-sparsity and tree-sparsity.

However, extending the framework to more general models has been stymied by a key obstacle: for the framework to apply, one needs an algorithm that given a signal x finds the *best* approximation to x that has its support in M (this procedure is often called the "model projection procedure"). An *approximation* algorithm for this optimization task is not sufficient. Since many problems of this form are not known to have exact polynomial-time algorithms, this requirement poses a fundamental obstacle for extending the framework to a richer class of models. Generalizing the model-based framework to approximate model projections has been a subject of a large body of research in the recent years.

In this talk, we show how to remove this obstacle and show how to extend the model-based compressive sensing framework so that it requires only approximate solutions to the aforementioned optimization problems. Interestingly, our extension requires the existence of *two* approximation algorithms, one for the maximization and one for the minimization variants of the optimization problem. We then show how this framework leads to improved model-based compressive sensing algorithms for some well-studied sparsity models.

Joint work with Chinmay Hegde and Ludwig Schmidt, to appear in SODA'14.

Piotr Indyk is a Professor of Electrical Engineering and Computer Science at MIT. He joined MIT in 2000, after earning PhD from Stanford University. Earlier, he received Magister degree from Uniwersytet Warszawski in 1995. Piotr's research interests lie in the design and analysis of efficient algorithms. Specific interests include: high-dimensional computational geometry, sketching and streaming algorithms, sparse recovery and compressive sensing. He has received the Sloan Fellowship (2003), the Packard Fellowship (2003) and the MIT Faculty Research Innovation Fellowship (2012). His work on sparse Fourier sampling has been named to Technology Review "TR10" in 2012, while his work on locality-sensitive hashing has received the 2012 Kanellakis Theory and Practice Award.

Benjamin Recht, *University of Wisconsin-Madison*, **Going Off the Grid**

We often model signals from the physical world with continuous parameterizations. Unfortunately, continuous models pose problems for the tools of sparse approximation, and popular discrete approximations are fraught with theoretical and algorithmic issues. In this talk, I will propose a general, convex-optimization framework - called atomic-norm denoising - that obviates discretization and gridding by generalizing sparse approximation to continuous dictionaries. As an extended example that highlights the salient features of the atomic-norm framework, I will highlight the problem of estimating the frequencies and phases of a mixture of complex exponentials from noisy, incomplete data. I will demonstrate that atomic-norm denoising outperforms state-of-the-art spectral and sparse-approximation methods in both theory and practice. I will then close with a discussion of additional applications of the atomic-norm framework including deconvolution, deblurring, and system identification. This is joint work with Badri Bhaskar, Parikshit Shah, and Gongguo Tang.

Benjamin Recht is an Assistant Professor in the Department of Computer Sciences at the University of Wisconsin-Madison and holds courtesy appointments in Electrical and Computer Engineering, Mathematics, and Statistics. He is a PI in the Wisconsin Institute for Discovery (WID), a newly founded center for research at the convergence of information technology, biotechnology, and nanotechnology. Ben received his B.S. in Mathematics from the University of Chicago, and received a M.S. and PhD from the MIT Media Laboratory. After completing his doctoral work, he was a postdoctoral fellow in the Center for the Mathematics of Information at Caltech. He is the recipient of an NSF Career Award, an Alfred P. Sloan Research Fellowship, and the 2012 SIAM/MOS Lagrange Prize in Continuous Optimization.

Low-Dimensional Models and Optimization in Signal Processing I

LDMOSPa.PB.1 RANDOM TRANSMITTANCE BASED FILTER ARRAY SPECTROMETERS: SPARSE SPECTRUM RECOVERY AND RESOLUTION IMPROVEMENT
Oliver James, Woong-Bi Lee, Heung-No Lee, Gwangju Institute of Science and Technology, Republic of Korea

LDMOSPa.PB.2 GENERALIZED SHRINKAGE AND PENALTY FUNCTIONS
Rick Chartrand, Los Alamos National Laboratory, United States

LDMOSPa.PB.3 NONLINEAR COMPRESSED SENSING WITH APPLICATION TO PHASE RETRIEVAL
Amir Beck, Yonina C. Eldar, Yoav Shechtman, Technion - Israel Institute of Technology, Israel

LDMOSPa.PB.4 SPARSE EXPANDER-LIKE REAL-VALUED PROJECTION (SERP) MATRICES FOR COMPRESSED SENSING
Abdolreza Abdolhosseini Moghadam, Hayder Radha, Michigan State University, United States

LDMOSPa.PB.5 OBJECT DETECTION AND RECOGNITION USING STRUCTURED DIMENSIONALITY REDUCTION
Ran Sharon, Joseph Francos, Rami Hagege, Ben Gurion University, Israel

LDMOSPa.PB.6 A SPARSE RANDOMIZED KACZMARZ ALGORITHM
Hassan Mansour, Mitsubishi Electric Research Laboratories, United States; Ozgur Yilmaz, University of British Columbia, Canada

LDMOSPa.PB.7 LOW-RANK MATRIX RECOVERY WITH POISSON NOISE
Yao Xie, Duke University, United States; Yuejie Chi, Ohio State University, United States; Robert Calderbank, Duke University, United States

LDMOSPa.PB.8 PROJECTIONS ONTO CONVEX SETS (POCS) BASED OPTIMIZATION BY LIFTING
A. Enis Cetin, Alican Bozkurt, Osman Gunay, Y. Hakan Habiboglu, Bilkent University, Turkey; Kivanc Kose, Memorial Sloan Kettering Cancer Center, United States; Ibrahim Onaran, R. Akin Sevimli, Mohammad Tofighi, Bilkent University, Turkey

LDMOSPa.PB.9 COMPRESSIVE TIME DELAY ESTIMATION USING INTERPOLATION
Karsten Fyhn, Aalborg University, Denmark; Marco F. Duarte, University of Massachusetts Amherst, United States; Søren Holdt Jensen, Aalborg University, Denmark

Low-Dimensional Models and Optimization in Signal Processing II

LDMOSPb.PB.1 EMBEDDING-BASED REPRESENTATION OF SIGNAL DISTANCES
Petros Boufounos, Shantanu Rane, Mitsubishi Electric Research Laboratories, United States

LDMOSPb.PB.2 DICTIONARY LEARNING VIA PROJECTED MAXIMAL EXPLORATION
Boris Mailhé, Mark D. Plumbley, Queen Mary, University of London, United Kingdom

LDMOSPb.PB.3 A TIGHTEST CONVEX ENVELOPE HEURISTIC TO ROW SPARSE AND RANK ONE MATRICES
Alireza Aghasi, Sohail Bahmani, Justin Romberg, Georgia Institute of Technology, United States

LDMOSPb.PB.4 RECONSTRUCTION OF GAUSSIAN MIXTURE MODELS FROM COMPRESSIVE MEASUREMENTS: A PHASE TRANSITION VIEW
Francesco Renna, Universidade do Porto, Portugal; Robert Calderbank, Lawrence Carin, Duke University, United States; Miguel R. D. Rodrigues, University College London, United Kingdom

LDMOSPb.PB.5 DISTRIBUTED COMPRESSED SENSING ALGORITHMS: COMPLETING THE PUZZLE
João Mota, Instituto Superior Tecnico / Carnegie Mellon University, Portugal; João Xavier, Pedro Aguiar, Institute of Systems and Robotics, Instituto Superior Tecnico, Technical University of Lisbon, Portugal; Markus Püschel, ETH Zurich, Switzerland

LDMOSPb.PB.6 USING THE COEFFICIENT OF VARIATION TO IMPROVE THE SPARSITY OF SEISMIC DATA
Hasan Al-Marzouqi, Ghassan AlRegib, Georgia Institute of Technology, United States

LDMOSPb.PB.7 GREED IS SUPER: A NEW ITERATIVE METHOD FOR SUPER-RESOLUTION
Armin Eftekhari, Michael Wakin, Colorado School of Mines, United States

LDMOSPb.PB.8 TRACTABILITY OF INTERPRETABILITY VIA SELECTION OF GROUP-SPARSE MODELS
Nirav Bhan, Luca Baldassarre, Volkan Cevher, École Polytechnique Fédérale de Lausanne, Switzerland

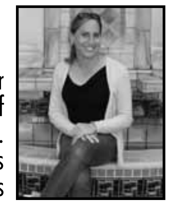
LDMOSPb.PB.9 A MATLAB TOOLBOX FOR VISUALIZATION OF IMAGE MANIFOLDS
Kevin Eykholt, Marco F. Duarte, University of Massachusetts Amherst, United States

Low-Power Systems and Signal Processing - Keynotes

Naveen Verma, *Princeton University*, **Making Sense of the World: Platforms for Analyzing Physically-complex Sensor Signals**

The applications driving computing are changing. Mostly, computing used to be about users entering inputs and expecting outputs. Today, computing is Increasingly faced with data generated, not by human users, but by complex processes, which might be sensed through physical transducers, derived from dynamic networks, etc. Generally, we would like to extract some high-value outputs. The problem is that often no tractable models exist for the inputs. Fortunately, algorithmic tools have emerged from the domains of machine learning and statistical signal processing to help analyze analytically-intractable data. While powerful algorithmically, these tools can be computationally intensive, exhausting the system resources available in very low-energy embedded platforms: an unfortunate scenario, considering that some of the most interesting data is available through low-power sensors. This talk looks at how these algorithmic tools utilize system resources and the opportunities that this raises for hardware-specialized platforms. But, increasingly, the platforms themselves are plagued by non-idealities, causing unpredictable behaviors in computation. Having made machine-learning and statistical-signal-processing tools available within the platform, we explore how these can address complex behaviors within the platform alongside complex application data.

Naveen Verma received the B.A.Sc. degree in Electrical and Computer Engineering from the University of British Columbia, Vancouver, Canada in 2003 and the M.S. and Ph.D. degrees in Electrical Engineering from Massachusetts Institute of Technology in 2005 and 2009 respectively. Since July 2009 he has been an Assistant Professor of Electrical Engineering at Princeton University. His research focuses on advanced sensing systems, including low-voltage digital logic and SRAMs, low-noise analog instrumentation and data-conversion, large-area sensing arrays based on flexible electronics, and low-energy algorithms for embedded inference, especially for medical applications. Prof. Verma is recipient or co-recipient of the 2006 DAC/ISSCC Student Design Contest Award, 2008 ISSCC Jack Kilby Paper Award, 2012 Princeton Innovation Forum 1st Prize, 2012 Alfred Rheinstein Princeton Junior Faculty Award, 2013 NSF CAREER Award, 2013 Intel Early Career Honor Award, and the Princeton Walter C. Johnson Prize for Teaching Excellence.



Jennifer Hasler, *Georgia Institute of Technology*, **Physics based Computing Enabling Energy Efficiency Past Moore's Law**

Physical computing techniques are fueled by recent advances in programmable and configurable large-scale analog circuits and systems enabling a typical factor of 1000 improvement in computational power (energy) efficiency over their digital counterparts. The challenge lies in engineering systems to utilize the physics of computing systems more efficiently. This talk presents advances in large-Scale Field Programmable Analog Arrays (FPAA) that enable configurable analog approaches. The ability for nonvolatile analog memory fuels all other innovations. At the same time, these advances have been building a framework to bring these techniques towards a systems perspective, undergoing a similar transformation seen in digital design through the early VLSI age. Taking inspiration from neurobiological systems further improves the resulting energy efficiency.

Jennifer Hasler is a Professor in the School of Electrical and Computer Engineering at Georgia Institute of Technology. Dr. Hasler received her M.S. and B.S.E. in Electrical Engineering from Arizona State University in 1991, and received her Ph.D. from California Institute of Technology in Computation and Neural Systems in 1997. Her current research interests include low power electronics, mixed-signal system ICs, floating-gate MOS transistors, adaptive information processing systems, “smart” interfaces for sensors, cooperative analog-digital signal processing, device physics related to submicron devices or floating-gate devices, and analog VLSI models of on-chip learning and sensory processing in neurobiology. Dr. Hasler received the NSF CAREER Award in 2001, and the ONR YIP award in 2002. Dr. Hasler received the Paul Raphorst Best Paper Award, IEEE Electron Devices Society, 1997, IEEE CICC best paper award, 2005, Best student paper award, IEEE Ultrasound Symposium, 2006, IEEE ISCAS Sensors best paper award, 2005, and best demonstration paper, ISCAS 2010. Dr. Hasler is a Senior Member of the IEEE.

Low-Power Systems and Signal Processing I

LPSSPa.PF.1 **MULTIRESOLUTION FOURIER DESCRIPTORS FOR MULTIRESOLUTION SHAPE ANALYSIS**
Yanjun Zhao, Saeid Belkasim, Georgia State University, United States

LPSSPa.PF.2 **WIDEBAND DOA ESTIMATION BASED ON BLOCK FOCUSS WITH LIMITED SAMPLES**
Jiawei Zhang, Institute of Acoustics, Chinese Academy of Sciences, China; Nan Hu, University of Science and Technology of China, China; Ming Bao, Xiaodong Li, Institute of Acoustics, Chinese Academy of Sciences, China; Wei He, Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences, China

LPSSPa.PF.3 **LOW POWER DETECTION ON CAPACITIVE TOUCH SCREENS**
Youngchun Kim, Ahmed H. Tewfik, The University of Texas at Austin, United States

LPSSPa.PF.4 **CONTEXT-AWARE SIGNAL PROCESSING IN MEDICAL EMBEDDED SYSTEMS: A DYNAMIC FEATURE SELECTION APPROACH**
Hassan Ghasemzadeh, University of California, Los Angeles, and Washington State University, United States; Behrooz Shirazi, Washington State University, United States

LPSSPa.PF.5 **SYNTHESIS OF GABOR FILTERED SIGNAL BY CONVOLVING LOW-Q FILTERED SIGNAL WITH GAUSSIAN FUNCTION FOR EFFICIENT COMPUTATION**
Shohei Inaba, Shuichi Arai, Tokyo City University, Japan

LPSSPa.PF.6 **STREAMING IMPLEMENTATION OF VIDEO ALGORITHMS ON A LOW-POWER PARALLEL ARCHITECTURE**
David Friedman, Coherent Logix, Inc., United States

LPSSPa.PF.7 **TOWARDS A SMART SENSOR INTERFACE FOR WEARABLE COUGH MONITORING**
Kofi Odame, Dingkun Du, Dartmouth College, United States

Low-Power Systems and Signal Processing II

LPSSPb.PF.1 **A FRAMEWORK TO IMRPOVE PROGRAMMABILITY OF LOW POWER MANY-CORE PROCESSOR FOR SCALABLE DSP APPLICATION**
Lin Tong, Martin Hunt, Coherent Logix, Inc., United States

LPSSPb.PF.2 **PATH PLANNING USING A NEURON ARRAY INTEGRATED CIRCUIT**
Scott Koziol, Stephen Brink, Jennifer Hasler, Georgia Institute of Technology, United States

LPSSPb.PF.3 **LOW OVERHEAD CORRECTION SCHEME FOR UNRELIABLE LDPC BUFFERING**
Amr Hussien, Wael Elsharkasy, Ahmed Eltawil, Fadi Kurdahi, University of California, Irvine, United States; Amin Khajeh, Intel Labs, United States

LPSSPb.PF.4 **DESIGNING A CLOCK CLEANER WITH AN ON-DEMAND DIGITAL SIGMA-DELTA MODULATOR**
Leung Kin Chiu, Peter Kavanagh, Texas Instruments Incorporated, United States

LPSSPb.PF.5 **OPTIMAL QUANTIZATION OF LIKELIHOOD FOR LOW COMPLEXITY SEQUENTIAL TESTING**
Diyan Teng, Emre Ertin, The Ohio State University, United States

LPSSPb.PF.6 **PHYSICS BASED COMPUTING ENABLING ENERGY EFFICIENCY PAST MOORE'S LAW**
Jennifer Hasler, Georgia Institute of Technology, United States

LPSSPb.PF.7 **CHEAP NOISY SENSORS CAN IMPROVE ACTIVITY MONITORING UNDER STRINGENT ENERGY CONSTRAINTS**
David Jun, Long Le, Douglas Jones, University of Illinois, United States

Cyber Security and Privacy - Keynotes

Wade Trappe, *Rutgers University*, **A Medium for Information Extraction and Exploitation**

Wireless networks are becoming prolific, and the implication is that they create imprints on our environment– new sources of information that can be examined to arrive at a variety of societal benefits and societal threats. The wireless medium allows for the creation of many new services, such location-based services as well as new forms of security services. On the other hand, it is now possible to examine the information traversing the wireless to infer information that might have previously been considered inaccessible. This talk will examine the broad implications associated with pervasive wireless connectivity, ranging from the new types of applications that can be created by tapping into the wireless fabric to new types of security and privacy threats unique to the wireless medium. After completing a high-level survey of such issues and opportunities, the talk will turn to a detailed examination of security solutions that may be devised at the physical layer. Such physical layer security activity has pulled from a broad variety of traditional research areas, ranging from traditional cryptographic security to information theoretic security, from theoretical efforts focused on understanding fundamental limits to systems efforts targeted at proving that the proposed theories can in fact be realized in real systems. The talk will examine how physical layer methods can be leveraged to develop authentication and confidentiality services. The talk will present some of the basic theories being used, as well as present systems-validation efforts that have been conducted. Lastly, we will comment on some of the potential weaknesses that exist in physical layer security and, by doing so, highlight directions for ongoing research.

Wade Trappe is a Professor in the Electrical and Computer Engineering Department at Rutgers University, and Associate Director of the Wireless Information Network Laboratory (WINLAB), where he directs WINLAB's research in wireless security. He has served as PI or co-PI on several NSF projects involving security and privacy for sensor networks, physical layer security for wireless systems, a security framework for cognitive radios, the development of wireless testbed resources (the ORBIT testbed, www.orbit-lab.org), and new RFID technologies. Prof. Trappe led a DARPA initiative into validating and prototyping physical layer security mechanisms, an Army Research Office project on the theory of physical layer security, and is currently leading an Army CERDEC project on cognitive radio networks and MIMO communications. He has developed several cross-layer security mechanisms for wireless networks, jamming detection and jamming defense mechanisms for wireless networks, and has investigated privacy-enhancing routing methods. He has published over 100 papers, including five best papers awards (two in media security, one in Internet design, one in cognitive radio systems and one in mobile computing). His papers have appeared in numerous IEEE/ACM journals and premier conferences, spanning the areas of signal processing and security. His experience in network security and wireless spans over 15 years, and he has co-authored a popular textbook in security, Introduction to Cryptography with Coding Theory, as well as several notable monographs on wireless security, including Securing Wireless Communications at the Physical Layer and Securing Emerging Wireless Systems: Lower-layer Approaches. Professor Trappe has served as an editor for IEEE Transactions on Information Forensics and Security (TIFS), IEEE Signal Processing Magazine (SPM), and IEEE Transactions on Mobile Computing (TMC). He served as the lead guest editor for September 2011 special issue of the Transactions on Information Forensics and Security on "Using the Physical Layer for Securing the Next Generation of Communication Systems." and also served IEEE Signal Processing Society as the SPS representative to the governing board of IEEE TMC.

Kannan Ramchandran, *University of California, Berkeley*, **Privacy and Security in the Big Data Era: A Signal Processing Perspective**

We will overview some of the exciting research challenges and opportunities related to privacy and security in this age of Big Data. Highlighted research areas will include distributed storage systems (the so-called storage cloud) and public databases used for private search and information retrieval. We will view these through a unique coding and signal processing lens, and highlight some interesting research challenges.

Kannan Ramchandran is a Professor of Electrical Engineering and Computer Science at the University of California at Berkeley, where he has been since 1999. He was on the faculty at the University of Illinois at Urbana-Champaign between 1993 and 1999. Prof. Ramchandran is a Fellow of the IEEE and has won numerous research awards. His research interests span the areas of signal and image processing, coding and information theory, and large-scale distributed systems.

Adam Smith, *Pennsylvania State University*, **Differential Privacy through the Lens of Information Theory (as seen by a cryptographer)**

Consider an agency holding a large database of sensitive personal information – medical records, census survey answers, web search records, or genetic data, for example. The agency would like to discover and publicly release global characteristics of the data (say, to inform policy and business decisions) while protecting the privacy of individuals' records. This problem is known variously as "statistical disclosure control", "privacy-preserving data mining" or simply "database privacy".

In this talk, I will describe differential privacy, a notion that seeks to formulate and satisfy rigorous definitions of privacy for such statistical databases. Satisfactory definitions had previously proved elusive largely because of the difficulty of reasoning about "side information" – knowledge available to an attacker through other channels. Differential privacy provides a meaningful notion of privacy in the presence of arbitrary side information. I will sketch some of the basic techniques for designing differentially private as well recent results on differentially private statistical analysis and learning.

Along the way, I will highlight how information-theoretic perspectives have informed research so far on this topic.

Adam Smith is an associate professor in the Department of Computer Science and Engineering at Penn State, currently on sabbatical at the Hariri Institute at Boston University. His research interests lie in cryptography, privacy and their connections to information theory, quantum computing and statistics. He received his Ph.D. from MIT in 2004 and was subsequently a visiting scholar at the Weizmann Institute of Science and UCLA. In 2009, he received a Presidential Early Career Award for Scientists and Engineers (PECASE).

Cyber-Security and Privacy I

CSPa.PA.1 **A COMBINED SYMMETRIC DIFFERENCE AND POWER MONITORING GNSS ANTI-SPOOFING TECHNIQUE**
Kyle Wesson, Brian Evans, Todd Humphreys, The University of Texas at Austin, United States

CSPa.PA.2 **OPTIMAL INDEX POLICIES FOR QUICKEST LOCALIZATION OF ANOMALY IN CYBER NETWORKS**
Kobi Cohen, Qing Zhao, University of California, Davis, United States; Ananthram Swami, U.S. Army Research Laboratory, United States

CSPa.PA.3 **THE SECURITY MARGIN: A MEASURE OF SOURCE DISTINGUISHABILITY UNDER ADVERSARIAL CONDITIONS**
Mauro Barni, Benedetta Tondi, University of Siena, Italy

CSPa.PA.4 **ON TRUSTING INTRODUCTIONS FROM A REPUTABLE SOURCE: A UTILITY-MAXIMIZING PROBABILISTIC APPROACH**
Richard Al-Bayaty, Patrick Caldwell, O. Patrick Kreidl, University of North Florida, United States

CSPa.PA.5 **MEET THE FAMILY OF STATISTICAL DISCLOSURE ATTACKS**
Simon Oya, University of Vigo, Spain; Carmela Troncoso, Gradiant, Spain; Fernando Pérez-González, University of Vigo, Spain

CSPa.PA.6 **DESIGNING SCALAR QUANTIZERS WITH SECRECY CONSTRAINTS**
João Almeida, Instituto de Telecomunicações, Portugal; Gerhard Maierbacher, Fraunhofer Institute for Embedded Systems and Communication Technologies ESK, Munich, Germany, Germany; João Barros, Instituto de Telecomunicações, Portugal

CSPa.PA.7 **ON UNCONDITIONALLY SECURE MULTIPARTY COMPUTATION FOR REALIZING CORRELATED EQUILIBRIA IN GAMES**
Ye Wang, Shantanu Rane, Mitsubishi Electric Research Laboratories, United States; Prakash Ishwar, Boston University, United States

CSPa.PA.8 **STOCHASTIC GRADIENT DESCENT WITH DIFFERENTIALLY PRIVATE UPDATES**
Shuang Song, Kamalika Chaudhuri, University of California, San Diego, United States; Anand Sarwate, Toyota Technological Institute at Chicago, United States

CSPa.PA.9 **AUDIO TAMPERING LOCALIZATION USING MODIFIED ISS WATERMARKING IN SPARSE-DOMAIN**
Yousof Erfani, Universite de sherbrooke, Canada; Ramin Pichevar, Communication Research Center Canada, Canada; Jean Rouat, Universite de sherbrooke, Canada

CSPa.PA.10 **FAIR RATE ALLOCATION FOR BROADCAST CHANNEL WITH CONFIDENTIAL MESSAGES**
Zhoujia Mao, C. Emre Koksal, Ness B. Shroff, The Ohio State University, United States

Cyber-Security and Privacy II

CSPb.PA.1 **SPLICING IMAGE FORGERY DETECTION BASED ON DCT AND LOCAL BINARY PATTERN**
Amani A. Alahmadi, Muhammad Hussain, Hatim Aboalsamh, Ghulam Muhammad, King Saud University, Saudi Arabia; George Bebis, University of Nevada, Reno, United States

CSPb.PA.2 **THE BIDIRECTIONAL POLYOMINO PARTITIONED PPUF AS A HARDWARE SECURITY PRIMITIVE**
James B. Wendt, Miodrag Potkonjak, University of California, Los Angeles, United States

CSPb.PA.3 **MALICIOUS DATA ATTACKS AGAINST DYNAMIC STATE ESTIMATION IN THE PRESENCE OF RANDOM NOISE**
Oliver Kosut, Arizona State University, United States

CSPb.PA.4 **PRACTICAL IMPROVEMENTS TO BUS-BASED STRATEGIES FOR RELIABLE ANONYMOUS NETWORKING**
Hari Ravi, Anoosheh Heidarzadeh, Tracey Ho, California Institute of Technology, United States

CSPb.PA.5 **HOW TO HIDE THE ELEPHANT– OR THE DONKEY– IN THE ROOM: PRACTICAL PRIVACY AGAINST STATISTICAL INFERENCE FOR LARGE DATA**
Salman Salamatian, École Polytechnique Fédérale de Lausanne, Switzerland; Amy Zhang, Technicolor, United States; Flavio du Pin Calmon, Massachusetts Institute of Technology, United States; Sandilya Bhamidipati, Nadia Fawaz, Branislav Kveton, Pedro Oliveira, Nina Taft, Technicolor, United States

CSPb.PA.6 **DEGREES OF FREEDOM OF THE SINGLE ANTENNA GAUSSIAN WIRETAP CHANNEL WITH A HELPER IRRESPECTIVE OF THE NUMBER OF ANTENNAS AT THE EAVESDROPPER**
Mohamed Nafea, Aylin Yener, The Pennsylvania State University, United States

CSPb.PA.7 **SECRET-KEY GENERATION WITH ARBITRARILY VARYING EAVESDROPPER'S CHANNEL**
Remi Chou, Matthieu Bloch, Georgia Institute of Technology, United States

CSPb.PA.8 **GEOMETRY OF PRIVACY AND UTILITY**
Bing-Rong Lin, Daniel Kifer, Penn State University, United States

CSPb.PA.9 **VULNERABILITY OF LTE TO HOSTILE INTERFERENCE**
Marc Lichtman, Jeffrey H. Reed, T. Charles Clancy, Virginia Polytechnic Institute and State University, United States; Mark Norton, Department of Defense, United States

Energy Harvesting and Green Wireless Communications - Keynotes

Roy Yates, *Wireless Information Networks Laboratory (WINLAB), Rutgers University*, **Energy Harvesting Receivers: Models and Policies**

When receivers rely on stochastic energy harvesting, the processes of sampling and decoding may be interrupted by power outages that limit the reliable communication rate. To model the receiver, we decompose the processing tasks in two parts: first is sampling or Analog-to-Digital Conversion (ADC) which includes all RF front-end processing, and second is decoding. We propose a model in which, for a given code rate, channel capacity, and battery size, the transmit packet timing and receiver sampling policy are optimized. Based on the relative energy costs of sampling and decoding, we then characterize the maximum reliable communication rate over the choice of code rate and sampling rate and we identify optimal receiver policies.

Roy Yates received the B.S.E. degree in 1983 from Princeton University and the S.M. and Ph.D. degrees in 1986 and 1990 from M.I.T., all in Electrical Engineering. Since 1990, he has been with the Wireless Information Networks Laboratory (WINLAB) and the ECE department at Rutgers University where he is currently a Distinguished Professor of ECE and Associate Director of WINLAB. In 1999-2000, he served as Director of WINLAB. An IEEE Fellow in 2011, Dr. Yates is a former associate editor of the IEEE Journal on Selected Areas of Communication Series in Wireless Communication and also a past Associate Editor for Communication Networks of the IEEE Transactions on Information Theory. He is an author of two editions of the text Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers published by John Wiley and Sons. Dr. Yates was a co-recipient of the Marconi Paper Prize for the best paper in the IEEE Transactions in Wireless Communication for 2002, and was awarded the Rutgers University Scholar-Teacher Award in 2011. His research interests include wireless resource allocation, information status updating, and spectrum regulation.

Gil Zussman, *Columbia University*, **Energy Harvesting Active Networked Tags (EnHANTs) – Measurements, Algorithms, and Prototyping**

We discuss a new type of wireless devices in the domain between RFIDs and sensor networks – Energy Harvesting Active Networked Tags (EnHANTs - http://enhants.ee.columbia.edu). Future EnHANTs will be small, flexible, and self-powered devices that can be attached to objects that are traditionally not networked (e.g., books, toys, clothing), thereby providing the infrastructure for various Internet-of-Things tracking applications. We describe the paradigm shifts associated with the underlying enabling technologies. Then, we present the results of an indoor light energy measurement campaign and of a kinetic energy study that have been conducted in order to characterize the energy availability for EnHANTs. We discuss low complexity energy-harvesting-adaptive algorithms which aim to allocate resources uniformly in respect to time and to determine energy and data rate allocations for a node and for a link. Finally, we present the design considerations for the EnHANT prototypes which harvest indoor light energy using custom organic solar cells, communicate and form multihop networks using ultralow-power Ultra-Wideband Impulse Radio (UWB-IR) transceivers, and adapt their communications and networking patterns to the energy harvesting and battery states. We also describe a small scale EnHANTs testbed that uniquely allows evaluating different algorithms with trace-based light energy inputs and discuss experimental results.

Based on joint works with A. Bernstein, M. Gorlatova, R. Margolies, A. Wallwater, and the groups of P. Kinget, J. Kymissis, D. Rubenstein, and L. Carloni (Columbia).

Gil Zussman received the B.Sc. degree in Industrial Engineering and Management and the B.A. degree in Economics (both summa cum laude) from the Technion – Israel Institute of Technology in 1995. He received the M.Sc. degree (summa cum laude) in Operations Research from Tel-Aviv University in 1999 and the Ph.D. degree in Electrical Engineering from the Technion – Israel Institute of Technology in 2004. Between 1995 and 1998, he served as an engineer in the Israel Defense Forces. Between 2004 and 2007 he was a Postdoctoral Associate in LIDS and CNRG at MIT.

In 2008 he joined the faculty of the Department of Electrical Engineering at Columbia University where he is now an Associate Professor. His research interests are in the area of networking, and in particular in the areas of wireless, mobile, and resilient networks. He has been an editor of IEEE Transactions on Wireless Communications and Ad Hoc Networks, the Technical Program Committee (TPC) co-chair of IFIP Performance 2011, and a member of a number of TPCs (including the INFOCOM, MobiCom, SIGMETRICS, and MobiHoc committees).

Gil received the Knesset (Israeli Parliament) award for distinguished students, the Marie Curie Outgoing International Fellowship, the Fulbright Fellowship, the DTRA Young Investigator Award, and the NSF CAREER Award. He was the PI of a team that won the 1st place in the 2009 Vodafone Foundation Wireless Innovation Project competition. He is a co-recipient of five best paper awards, including the ACM SIGMETRICS / IFIP Performance'06 Best Paper Award and the 2011 IEEE Communications Society Award for Advances in Communication.

Energy Harvesting and Green Wireless Communications I

EHGWCa.PB.1 OPTIMAL RESOURCE ALLOCATION FOR ENERGY HARVESTING TWO-WAY RELAY SYSTEMS WITH CHANNEL UNCERTAINTY
Imtiaz Ahmed, Aissa Ikhlef, University of British Columbia, Canada; Derrick Wing Kwan Ng, Robert Schober, Universität Erlangen-Nürnberg, Germany

EHGWCa.PB.2 BASE STATION ENERGY COOPERATION IN GREEN CELLULAR NETWORKS
Zheng Guo, Teng Joon Lim, Mehul Motani, National University of Singapore, Singapore

EHGWCa.PB.3 TRANSMISSION CAPACITY OF WIRELESS AD HOC NETWORKS WITH ENERGY HARVESTING NODES
Rahul Vaze, Tata Institute of Fundamental Research, India

EHGWCa.PB.4 OPTIMIZING FEEDBACK IN ENERGY HARVESTING MISO COMMUNICATION CHANNELS
Rajeev Gangula, David Gesbert, EURECOM, France; Deniz Gunduz, Imperial College London, United Kingdom

EHGWCa.PB.5 OPTIMAL RESOURCE ALLOCATION IN ENERGY HARVESTING AMPLIFY-AND-FORWARD RELAY NETWORKS
Arin Minasian, Raviraj Adve, University of Toronto, Canada; Shahram ShahbazPanahi, University of Ontario Institute of Technology, Canada

EHGWCa.PB.6 ENERGY HARVESTING RECEIVERS: OPTIMAL SAMPLING AND DECODING POLICIES
Roy Yates, Hajar Mahdavi-Doost, Rutgers University, United States

EHGWCa.PB.7 THE ENERGY HARVESTING TWO-WAY DECODE-AND-FORWARD RELAY CHANNEL WITH STOCHASTIC DATA ARRIVALS
Burak Varan, Aylin Yener, The Pennsylvania State University, United States

EHGWCa.PB.8 COMPETITIVE ANALYSIS OF ONLINE THROUGHPUT MAXIMIZATION SCHEMES FOR MULTIPLE ACCESS CHANNELS WITH A SHARED RENEWABLE ENERGY SOURCE
Dan Zhao, Queen Mary, University of London, United Kingdom; Chuan Huang, Arizona State University, United States; Yue Chen, Queen Mary, University of London, United Kingdom; Shuguang Cui, Texas A&M University, United States

Energy Harvesting and Green Wireless Communications II

EHGWCb.PB.1 OPTIMAL RESOURCE ALLOCATION FOR TYPE-II-HARQ-BASED OFDMA AD HOC NETWORKS
Nassar Ksairi, Philippe Ciblat, Telecom ParisTech, France; Christophe Le Martret, Thales Communications and Security, France

EHGWCb.PB.2 NETWORK-LEVEL COOPERATION IN ENERGY HARVESTING WIRELESS NETWORKS
Nikolaos Pappas, Marios Kountouris, SUPELEC, France; Jeongho Jeon, Anthony Ephremides, University of Maryland, United States; Apostolos Traganitis, University of Crete, Greece

EHGWCb.PB.3 MORE THAN MEETS THE EYE - A PORTABLE MEASUREMENT UNIT FOR CHARACTERIZING LIGHT ENERGY AVAILABILITY
John Sarik, Kanghwan Kim, Maria Gorlatova, Ioannis Kymissis, Gil Zussman, Columbia University, United States

EHGWCb.PB.4 OPTIMAL SINR BASED RESOURCE ALLOCATION FOR SIMULTANEOUS ENERGY AND INFORMATION TRANSFER
Ghada Saleh, C. Emre Koksal, Ness B. Shroff, The Ohio State University, United States

EHGWCb.PB.5 OPTIMAL COLLABORATIVE SENSING SCHEDULING WITH ENERGY HARVESTING NODES
Jing Yang, University of Arkansas, United States

EHGWCb.PB.6 TWO-HOP NETWORKS WITH ENERGY HARVESTING: THE (NON-)IMPACT OF BUFFER SIZE
Burak Varan, Aylin Yener, The Pennsylvania State University, United States

EHGWCb.PB.7 ENERGY-SPECTRAL EFFICIENT TRANSMISSION POLICY FOR ENERGY HARVESTING NODES WITH RATE REQUIREMENT
Bo Bai, Wei Chen, Zhigang Cao, Tsinghua University, China

EHGWCb.PB.8 ENERGY-EFFICIENT POWER CONTROL POLICIES IN FADING CHANNELS WITH MARKOV ARRIVALS AND QOS CONSTRAINTS
Mustafa Ozmen, M. Cenk Gursoy, Syracuse University, United States

Information Processing in the Smart Grid - Keynotes

Steven H. Low, *California Institute of Technology*, **Power System Dynamics as Primal-Dual Algorithm for Optimal Load Control**

We formulate an optimal load control (OLC) problem in power networks where the objective is to minimize the aggregate cost of tracking an operating point subject to power balance over the network. We prove that the swing dynamics and the branch power flows, coupled with frequency-based load control, serve as a distributed primal-dual algorithm to solve OLC. Even though the system has multiple equilibrium points, we prove that it nonetheless converges to an optimal point. This result implies that the local frequency deviations at each bus convey exactly the right information about the global power imbalance for the loads to make individual decisions that turn out to be globally optimal. It allows a completely decentralized solution without explicit communication among the buses. Simulations show that the proposed OLC mechanism can resynchronize bus frequencies with significantly improved transient performance.

Joint work with Changhong Zhao, Ufuk Topcu, and Na Li. (Zhao and Low are with Caltech; Li is with MIT/Harvard; Topcu is with UPenn.)

Steven H. Low is a Professor of the Computing & Mathematical Sciences and Electrical Engineering Departments at Caltech. Before that, he was with AT&T Bell Laboratories, Murray Hill, NJ, and the University of Melbourne, Australia. He was a co-recipient of IEEE best paper awards, the R&D 100 Award, and an Okawa Foundation Research Grant. He is a Senior Editor of the IEEE Journal on Selected Areas in Communications, a Senior Editor of the IEEE Trans. Control of Network Systems, a Steering Committee Member of the IEEE Trans. Network Science & Engineering, and on the editorial board of NOW Foundations and Trends in Networking. He is an IEEE Fellow and received his B.S. from Cornell and PhD from Berkeley, both in EE.

Lang Tong, *Cornell University*, **Man in the Middle Attacks on a Power Grid: Attack Mechanisms and Counter Measures**

A defining feature of a smart grid is its ability to adapt to changing operating conditions and contingencies by leveraging advanced sensing, communication, and networking capabilities. However, relying networking for grid monitoring and real time operation comes with increasing security risks of cyber-attacks.

In this talk, we consider man-in-the-middle attacks on the power grid where an adversary manipulates analog and digital data with the goal of misleading the control center with an incorrect network topology and operating state. Two types of attacks are considered. The first type of attacks avoid detection by the control center and covertly change the system operating state. The second type of attacks openly attack the control center but hide the actual source of attack. We discuss the impacts of man-in-the-middle attacks on market operations and possible counter measures of such attacks.

Lang Tong is the Irwin and Joan Jacobs Professor in Engineering at Cornell University and the Cornell site director of the Power Systems Engineering Research Center (PSERC). He received the B.E. degree from Tsinghua University, Beijing, China, and PhD degree in EE from the University of Notre Dame, Notre Dame. He was a Postdoctoral Research Affiliate at the Information Systems Laboratory, Stanford University. Lang's research interests lie in the general areas of statistical inference, decisions, communications, and complex networks. His current research focuses on energy and power systems and related data analytics. He received the 2004 Best Paper Award from the IEEE Signal Processing Society, the 2004 Leonard G. Abraham Prize Paper Award from the IEEE Communications Society, and the 1993 Outstanding Young Author Award from the IEEE Circuits and Systems Society. He is also a coauthor of seven student paper awards. He is a Fellow of IEEE.

Ram Rajagopal, *Stanford University*, **Tailoring Demand to Match Supply with Data: How Flexible is Residential Power Consumption?**

Ram Rajagopal is an Assistant Professor of Civil and Environmental Engineering at Stanford University, where he directs the Stanford Sustainable Systems Lab (S3L), focused on large scale monitoring, data analytics and stochastic control for infrastructure networks, in particular energy and transportation. His current research interests in power systems are in integration of renewables, smart distribution systems and demand-side data analytics. Prior to his current position he was a DSP Research Engineer at National Instruments and a Visiting Research Scientist at IBM Research. He holds a Ph.D. in Electrical Engineering and Computer Sciences and an M.A. in Statistics, both from the University of California Berkeley, Masters in Electrical and Computer Engineering from University of Texas, Austin and Bachelors in Electrical Engineering from the Federal University of Rio de Janeiro. He is a recipient of the Powell Foundation Fellowship, Berkeley Regents Fellowship and the Makhoul Conjecture Challenge award. He holds more than 30 patents from his work, and has advised or founded various companies in the fields of sensor networks, power systems and data analytics.

Thursday, December 5		13:30 - 15:30
Poster Session	IPSGa.PF	Poster Area F

Information Processing in the Smart Grid I

IPSGa.PF.1 **LEAST LAXITY FIRST SCHEDULING OF THERMOSTATICALLY CONTROLLED LOADS FOR REGULATION SERVICES**
Mahnoosh Alizadeh, Anna Scaglione, University of California, Davis, United States

IPSGa.PF.2 **CLUSTERING OF SMART METER DATA FOR DISAGGREGATION**
Vitaly Ford, Ambareen Siraj, Tennessee Technological University, United States

IPSGa.PF.3 **DATA RECOVERY USING SIDE INFORMATION FROM THE WIRELESS M-BUS PROTOCOL**
Rasmus Melchior Jacobsen, Kamstrup, Denmark; Petar Popovski, Aalborg University, Denmark

IPSGa.PF.4 **ROBUST OPTIMIZATION FOR ELECTRIC ENERGY SYSTEMS SCHEDULING**
Xu Sun, Georgia Institute of Technology, United States

IPSGa.PF.5 **DISTRIBUTED STATE ESTIMATION WITH LOSSY MEASUREMENT COMPRESSION IN SMART GRID**
Hang Ma, Yu-Han Yang, Qi Wang, Yan Chen, K. J. Ray Liu, University of Maryland, United States

IPSGa.PF.6 **SOLAR RADIATION FORECASTING USING ZENITH ANGLE**
Seyyed Abolhasan Fatemi, Anthony Kuh, University of Hawaii at Manoa, United States

Thursday, December 5		16:00 - 18:00
Poster Session	IPSGb.PF	Poster Area F

Information Processing in the Smart Grid II

IPSGb.PF.1 **ON THE ROLE OF POWER-GRID AND COMMUNICATION-SYSTEM INTERDEPENDENCIES ON CASCADING FAILURES**
Mahshid Rahnamay-Naeini, Majeed M. Hayat, University of New Mexico, United States

IPSGb.PF.2 **ELECTRIC LOAD FORECASTING USING PARALLEL RBF NEURAL NETWORK**
Feng Liu, Zhifang Wang, Virginia Commonwealth University, United States

IPSGb.PF.3 **LEARNING-BASED DISTRIBUTED LOAD FORECASTING IN ENERGY GRIDS**
Khalid Kalbat, Ali Tajer, Wayne State University, United States

IPSGb.PF.4 **PARTITION BASED CASCADED GENERATOR SCHEDULING WITH CONSTRAINTS FOR LARGE POWER NETWORKS**
Zakia Asad, University of Toronto, Canada; Mohammad Asad Rehman Chaudhry, IBM Research & Hamilton Institute, Ireland; Deepa Kundur, University of Toronto, Canada

IPSGb.PF.5 **A STUDY ON GROUP COMMUNICATION IN DISTRIBUTED WIDE-AREA MEASUREMENT SYSTEM NETWORKS IN LARGE POWER SYSTEMS**
Yufeng Xin, Renaissance Computing Institute, United States; Aranya Chakrabortty, North Carolina State University, United States

IPSGb.PF.6 **JOINT VOLTAGE AND PHASE UNBALANCE DETECTOR FOR THREE PHASE POWER SYSTEMS**
Ming Sun, University of Missouri, United States; Sefa Demirtas, Massachusetts Institute of Technology, United States; Zafer Sahinoglu, Mitsubishi Electric Research Labs, United States

Mobile Imaging - Keynotes

Bernd Girod, *Stanford University*, **Towards Mobile Augmented Reality**

Mobile augmented reality systems afford a host of intriguing engineering challenges and research problems at the intersection of distributed signal processing, coding, and system architecture. For object recognition on mobile devices, a visual data base is typically stored in the cloud. Hence, for a visual comparison, information must be either uploaded from, or downloaded to, the mobile over a wireless link. The response time of the system critically depends on how much information must be transferred in both directions, and efficient compression is the key to a good user experience. We review recent advances in mobile visual search, using compact feature descriptors, and show that dramatic speed-ups and power savings are possible by considering recognition, compression, and retrieval jointly. For augmented reality applications, where image matching is performed continually at video frame rates, interframe coding of SIFT descriptors achieves bit-rate reductions of 1-2 orders of magnitude relative to advanced video coding techniques. We will use real-time implementations for different example applications, such as recognition of landmarks, media covers or printed documents, to show the benefits of implementing computer vision algorithms on the mobile device, in the cloud, or both.

Bernd Girod is Professor of Electrical Engineering in the Information Systems Laboratory of Stanford University, California, since 1999. Previously, he was a Professor in the Electrical Engineering Department of the University of Erlangen-Nuremberg. His current research interests are in the area of networked media systems. He has published over 500 conference and journal papers and 6 books, receiving the EURASIP Signal Processing Best Paper Award in 2002, the IEEE Multimedia Communication Best Paper Award in 2007, the EURASIP Image Communication Best Paper Award in 2008, the EURASIP Signal Processing Most Cited Paper Award in 2008, as well as the EURASIP Technical Achievement Award in 2004 and the Technical Achievement Award of the IEEE Signal Processing Society in 2011. As an entrepreneur, Professor Girod has been involved in several startup ventures, among them Polycom, Vivo Software, 8x8, and RealNetworks. He received an Engineering Doctorate from University of Hannover, Germany, and an M.S. Degree from Georgia Institute of Technology. Prof. Girod is a Fellow of the IEEE, a EURASIP Fellow, and a member of the German National Academy of Sciences (Leopoldina). He currently serves Stanford's School of Engineering as Senior Associate Dean for Online Learning and Professional Development.

Kari Pulli, *NVIDIA*, **Mobile Visual Computing @ NVIDIA**

This talk gives an overview of some recent work at NVIDIA Research on mobile visual computing. We give an overview of Tegra, the NVIDIA family of mobile processors, and in particular look into its visual processing capabilities. We then discuss several recent research projects: 2D registration of moving scenes for computational photography, 3D tracking and modeling for augmented reality, a processing architecture for hierarchical image processing, and interactive editing of a live scene on a camera viewfinder which provides a WYSIWYG experience for computational photography.

Kari Pulli is a Senior Director at NVIDIA Research where he heads the Mobile Visual Computing Research team and works on topics related to cameras, imaging, and vision on mobile devices. Before NVIDIA he was at Nokia where he was the 6th Nokia Fellow and a Member of CEO's Technology Council. Kari has worked on standardizing mobile media APIs at Khronos and JCP and wrote a book on Mobile 3D Graphics. Kari was a visiting scientist at MIT and research associate at Stanford University. Kari has a B.Sc. from the University of Minnesota, M.Sc. and Lic. Tech. from the University of Oulu (Finland), and Ph.D. from the University of Washington (Seattle), all in Computer Science / Engineering; and an MBA from the University of Oulu.

Mobile Imaging I

MIa.PD.1 **ONLINE CALIBRATION AND SYNCHRONIZATION OF CELLPHONE CAMERA AND GYROSCOPE**
Chao Jia, Brian Evans, The University of Texas at Austin, United States

MIa.PD.2 **MOBILE-BASED HAZMAT SIGN DETECTION AND RECOGNITION**
Bin Zhao, Albert Parra, Edward Delp, Purdue University, United States

MIa.PD.3 **MULTI-CHANNEL HEART-BEAT DETECTION**
Narges Norouzi, Parham Aarabi, University of Toronto, Canada

MIa.PD.4 **COMPARISON OF TWO COMPUTATIONALLY FEASIBLE IMAGE DEBLURRING TECHNIQUES FOR SMARTPHONES**
Chih-Hsiang Chang, Srinivas Parthasarthy, Nasser Kehtarnavaz, The University of Texas at Dallas, United States

MIa.PD.5 **CORNER DETECTION FOR REAL-TIME MOBILE IMAGING APPLICATION**
Nusrat Habib, Martin Hunt, Coherent Logix, Inc., United States

MIa.PD.6 **COMPACT COLOR FEATURES WITH BITWISE QUANTIZATION AND REDUCED RESOLUTION FOR MOBILE PROCESSING**
Ponti Moacir, Escobar Luciana, Universidade de São Paulo, Brazil

MIa.PD.7 **SCRIBBLE2FOCUS: AN INTERACTIVE PHOTO REFOCUSING SYSTEM BASED ON MOBILE STEREO IMAGING**
Dung T. Vu, ADSC Illinois at Singapore, Singapore; Benjamin Chidester, University of Illinois at Urbana-Champaign, United States; Jiangbo Lu, ADSC Illinois at Singapore, Singapore; Minh N. Do, University of Illinois at Urbana-Champaign, United States

MIa.PD.8 **WORKLOAD ANALYSIS AND EFFICIENT OPENCL-BASED IMPLEMENTATION OF SIFT ALGORITHM ON A SMARTPHONE**
Guohui Wang, Blaine Rister, Joseph R. Cavallaro, Rice University, United States

MIa.PD.9 **SPATIALLY VARYING RADIOMETRIC CALIBRATION FOR CAMERA-DISPLAY MESSAGING**
Wenjia Yuan, Kristin Dana, Ashwin Ashok, Marco Gruteser, Narayan Mandayam, Rutgers University, United States

MIa.PD.10 **JOINT EDGE-DIRECTED INTERPOLATION AND ADAPTIVE SHARPENING FILTER**
Rahul Vanam, Yan Ye, Serhad Doken, InterDigital, Inc., United States

MIa.PD.11 **GLOBAL IMAGE EDITING USING THE SPECTRUM OF AFFINITY MATRICES**
Hossein Talebi, Peyman Milanfar, University of California, Santa Cruz, United States

MIa.PD.12 **IMPROVING CODING AND DELIVERY OF VIDEO BY EXPLOITING THE OBLIQUE EFFECT**
Yuriy Reznik, Rahul Vanam, InterDigital, Inc., United States

Millimeter Wave Imaging and Sensing - Keynotes

Gregory Wornell, *Massachusetts Institute of Technology*, **Intelligent Co-Design: Can Digitally-Enhanced Antenna Array Architectures Enable New Applications?**

With CMOS circuits now able to operate at millimeter wave frequencies, there is the potential to develop new low-cost coherent imaging technology that can enable a host of new applications. The degree to which this potential can be realized depends on how effectively some of the associated new technical challenges can be met. I will discuss some examples of these challenges, and describe a viewpoint that may be useful in addressing them–one that emphasizes tighter interaction between the digital and analog aspects of the system design and signal processing. As illustrations, I'll share a couple of recent but divergent examples of architectures inspired by this framework of thinking, including dense delta-sigma arrays, and sparse multi-coset ones.

Gregory Wornell received the B.A.Sc. degree from the University of British Columbia, Canada, and the S.M. and Ph.D. degrees from the Massachusetts Institute of Technology, all in electrical engineering and computer science, in 1985, 1987 and 1991, respectively.

Since 1991 he has been on the faculty at MIT, where he is the Sumitomo Professor of Engineering in the department of Electrical Engineering and Computer Science. At MIT he leads the Signals, Information, and Algorithms Laboratory within the Research Laboratory of Electronics. He is also chair of Graduate Area I (Information and System Science, Electronic and Photonic Systems, and Physical Science and Nanotechnology) within the EECS department's doctoral program. He has held visiting appointments at the former AT&T Bell Laboratories, Murray Hill, NJ, the University of California, Berkeley, CA, and Hewlett-Packard Laboratories, Palo Alto, CA.

His research interests and publications span the areas of signal processing, statistical inference, digital communication, and information theory, and include algorithms and architectures for wireless and sensor networks, multimedia applications, imaging systems, and aspects of computational biology and neuroscience. He has been involved in the Signal Processing and Information Theory societies of the IEEE in a variety of capacities, and maintains a number of close industrial relationships and activities. He has won a number of awards for both his research and teaching, and is an IEEE Fellow.

Payam Heydari, *University of California, Irvine*, **Fully Integrated Millimeter-Wave Imaging in Silicon: Challenges and Opportunities**

The millimeter-wave (MMW) frequency range from 30-300 GHz has been an active area of research in the field of active and passive imaging and sensing for several decades. Applications such as concealed weapon detection, airplane navigation in low visibility conditions, medical imaging, and satellite surveillance have been targeted for imaging systems at these frequencies. At MMW frequencies, black body radiation is emitted at a nearly constant power spectral density (i.e., white spectrum), which is directly proportional to the temperature and emissivity of the radiating object. In recent years, silicon technologies have achieved the required imaging system performance that had previously only been obtained using III-V technologies in a multi-chip module based system. This plenary talk will provide an overview of latest advances in silicon-based imaging integrated circuit design. The talk will then focus on three fully integrated imaging receivers in silicon technologies that have been designed, developed, and measured in Nanoscale Communication Integrated Circuits (NCIC) Labs at the University of California.

Payam Heydari is currently a Distinguished Professor of Electrical Engineering and Faculty Chair Secretary of the School of Engineering at the University of California, Irvine.

Dr. Heydari is the co-recipient of the 2009 Business Plan Competition First Place Prize Award and Best Concept Paper Award both from Paul Merage School of Business at UC-Irvine. He is the recipient of the 2010 Faculty of the Year Award from UC-Irvine's Engineering Student Council (ECS), the 2009 School of Engineering Fariborz Maseeh Best Faculty Research Award, the 2007 IEEE Circuits and Systems Society Guillemin-Cauer Award, the2005 IEEE Circuits and Systems Society Darlington Award, the 2005National Science Foundation (NSF) CAREER Award, the 2005 Henry Samueli School of Engineering Teaching Excellence Award, and the Best Paper Award at the 2000 IEEE Int'l Conference on Computer Design (ICCD). He was recognized as the 2004 Outstanding Faculty in the EECS Department of the University of California, Irvine. His research on novel low-power multi-purpose multi-antenna RF front-ends received the Low-Power Design Contest Award at the 2008 IEEE Int'l Symposium on Low-Power Electronics and Design (ISLPED).

Dr. Heydari is the Guest Editor of IEEE JOURNAL OF SOLID-STATE CIRCUITS (JSSC). He currently serves on the Technical Program Committees of Compound Semiconductor IC Symposium (CSICS),and ISLPED. He served as the Associate Editor of IEEE TRANS. ON CIRCUITS AND SYSTEMS - I from 2006 to 2008. He was the Local Arrangement Chair of the 2004-2005 ISLPED, and the Student Design Contest Judge for the 2003 DAC/ISSCC Design Contest Award. He served on the Technical Program Committees of andInt'l Symposium on Quality Electronic Design (ISQED), IEEE Design and Test in Europe (DATE) and International Symposium on Physical Design (ISPD). He is the director of the Nanoscale Communication IC (NCIC) Labs.

His research interests include design and analysis of THz/millimeter-wave/RF integrated circuits. He has published papers in premier conferences and journals on integrated circuit design including JSSC, ISSCC, CICC, and RFIC Symposium. Results of the research in the NCIC Labs have appeared in more than 110 peer-reviewed journal and conference papers.

Millimeter Wave Imaging and Communications I

MMWISa.PE.1 AN IMPROVEMENT ISAR RANGE ALIGNMENT ALOGRITHM
Sun Haibin, Sun Yi, Jing Xiaojun, Sun Songlin, Beijing University of Posts and Telecommunications, China

MMWISa.PE.2 A SIGNAL ADAPTIVE TIME OF ARRIVAL ESTIMATION ALGORITHM BASED ON POLYNOMIAL ROOTING
Gerrit Kalverkamp, Erwin Biebl, Technische Universität München, Germany

MMWISa.PE.3 MAP IMAGE RECONSTRUCTION FOR LAND MINE AND IED DETECTION USING GROUND PENETRATING RADAR
Oludotun Ode, John Anderson, Howard University, United States

MMWISa.PE.4 SPARSE MULTI-STATIC ARRAYS FOR NEAR-FIELD MILLIMETER-WAVE IMAGING
David Sheen, Pacific Northwest National Laboratory, United States

MMWISa.PE.5 SENSITIVITY ANALYSIS OF BEAMFORMING APPLIED TO COHERENT IMAGING SYSTEMS
Sujeet Patole, Murat Torlak, The University of Texas at Dallas, United States

MMWISa.PE.6 A FAST METHOD FOR RECONSTRUCTION OF TOTAL-VARIATION MR IMAGES WITH A PERIODIC BOUNDARY CONDITION
Yonggui Zhu, Communication University of China, China

MMWISa.PE.7 MICROMACHINED PROBES FOR ON-WAFER MEASUREMENT OF MILLIMETER- AND SUBMILLIMETER-WAVE DEVICES AND COMPONENTS
Robert Weikle, Scott Barker, Arthur Lichenberger, Matthew Bauwens, University of Virginia and Dominion Microprobes, United States

MMWISa.PE.8 MINIMUM BIAS DESIGN FOR A DISTRIBUTED APERTURE MILLIMETER WAVE IMAGER
Joseph Mait, US Army Research Laboratory, United States; Christopher Schuetz, Shouyuan Shi, Dennis Prather, University of Delaware, United States; Richard Martin, Phase Sensitive Innovations, Inc, United States; Petersen Curt, James Bonnett, EM Photonics, Inc., United States

MMWISa.PE.9 CMOS MM-WAVE TRANSCEIVER TECHNIQUES BEYOND 50 GHZ
Adrian Tang, Jet Propulsion Laboratory / UCLA, United States; Nacer Chahat, Jet Propulsion Laboratory, United States

MMWISa.PE.10 MILLIMETER WAVE BEAMFORMING FOR MULTIUSER DUAL-POLARIZED MIMO SYSTEMS
Jiho Song, Stephen Larew, David Love, Purdue University, United States; Timothy Thomas, Amitava Ghosh, Nokia Siemens Networks, United States

MMWISa.PE.11 3-D OBJECT TRACKING IN MILLIMETER-WAVE RADAR FOR ADVANCED DRIVER ASSISTANCE SYSTEMS
Muhammad Ikram, Murtaza Ali, Texas Instruments Incorporated, United States

MMWISa.PE.12 COVERAGE ANALYSIS FOR MILLIMETER WAVE CELLULAR NETWORKS WITH BLOCKAGE EFFECTS
Tianyang Bai, Robert Heath, The University of Texas at Austin, United States

Software Defined and Cognitive Radios - Keynotes

Alan Gatherer, *CTO for Baseband System on Chip, Huawei Technologies, USA*, **Bridging the Gap from SDR to Heterogeneous Baseband SoC**

Software Defined Radio (SDR) concepts have had some success in military radio with the development of the Software Communications Architecture (SCA) but have had limited use outside of military radio due to the high overhead. However, several factors in commercial cellular infrastructure wireless are causing people to take a fresh look at SDR concepts. These include the need for multimode radio on a single chip, a desire to reduce OPEX and R&D costs, the exponential increase in the number of use case scenarios for basestations with heterogeneous networks, dense networks, and "softer" approaches to network design with cloud RAN and Software Defined Networks (SDN). In this talk we look at these drivers for change in infrastructure radio to see what changes they imply, we take the SCA apart and examine how part of it may benefit commercial infrastructure and finally we look at how commercial wireless infrastructure hardware differs from the kind of platforms that the SCA was designed for and what difficulties that may imply for the adoption of SDR in wireless infrastructure.

Alan Gatherer is the CTO for Baseband System on Chip in Huawei Technologies, USA. He is responsible for R&D efforts in the US to develop next generation baseband chips and software for 3G and 4G basestation modems. His group is presently developing new technologies for baseband SoC in the areas of message passing hardware and middleware, isolation for multimode, interconnect fabric, CPU/DSP clusters and virtualization. Alan joined Huawei in January 2010. Prior to that he was a TI Fellow and CTO at Texas Instruments where he led the development of high performance, multicore DSP at TI and worked on various telecommunication standards. Alan has authored multiple journal and conference papers and is regularly asked to give keynote and plenary talks at communication equipment conferences. In addition, he holds over 60 awarded patents and is author of the book "The Application of Programmable DSPs in Mobile Communications." Alan holds a bachelor of engineering in microprocessor engineering from Strathclyde University in Scotland. He also attended Stanford University in California where he received a master's in electrical engineering in 1989 and his doctorate in electrical engineering in 1993.

fred harris, *San Diego State University, USA*, **The Physical Layer: The Neglected Stepchild in the Communication System**

Shannon's abstracted model of a communication channel is quite simple: Sample input values of ± 1 are randomly chosen and presented to the input port of an ideal channel at a given signaling rate. Sample output values are delivered to the output port with Gaussian conditional density functions with standard deviation σ [N(±1,σ)]. When this channel is followed by a binary decision block, the channel is modeled as a binary symmetric channel with crossover probabilities $\alpha(\sigma)$. Notice this model makes no mention of wave forms. We occasionally admit that waveforms are involved in the channel but we argue that the waveforms details are unimportant because the channel is linear and distortion free. The only thing the channel does to the waveform is add noise. In the non abstracted world, when we look inside the channel we find a shaping filter, a modulator, an output power amplifier, a multipath channel, a Doppler offset, an input low noise amplifier, a matched filter, an equalizer block, a timing recovery block, a carrier phase recovery block, an AGC block, and an SNR estimator block. Every one of these blocks and processes are imperfect and contribute various types of distortion and signal degradation. We can argue that the channel is certainly not linear.

Because Shannon did not mention waveforms, we somehow started thinking they were not very important, or that waveforms were a solved part of the problem, and started thinking that communications is simply the manipulation of bits by source coding, channel coding, and application codes. Not so! When we include the physical layer in Shannon's model we find the performance of real systems at low and at high SNR is significantly different from that of the binary symmetric linear channel model. It is time we gave the physical layer its due: nothing at the bit level works unless the physical layer works. The communication system uses waveforms and a significant fraction of the energy in a communication system is allocated to the care and feeding of these waveforms. We call it signal processing! We can't simple wash away the physical layer with comments such as "Let's assume the system is synchronized".

fred harris holds the Signal Processing Chair of the Communication Systems and Signal Processing Institute at San Diego State University where since 1967 he has taught courses in Digital Signal Processing and Communication Systems. He holds 20 patents on digital receiver and DSP technology and lecture throughout the world on DSP applications. He also consults for organizations requiring high performance, cost effective DSP solutions.

Prof. harris has written over 220 journal and conference papers, the most well known being his 1978 paper "On the use of Windows for Harmonic Analysis with the Discrete Fourier Transform". He is the author of a number of books on DSP applications. In 1990 and 1991 Prof. harris was the Technical and then the General Chair of the Asilomar Conference on Signals, Systems, and Computers and was Technical Chair of the 2003 Software Defined Radio Conference, of the 2006 Wireless Personal Multimedia Conference, and the 2013 DSP Conference. He became a Fellow of the IEEE in 2003, cited for contributions of DSP to communications systems. In 2006 he received the Software Defined Radio Forum's "Industry Achievement Award". His paper at the 2006 SDR conference was selected for the best paper award as was his paper at the 2010 Autotestcon conference and again my paper at the 2011 Wireless Personal Mobile Communications Conference and once again the 2011 SDR conference. He is the former Editor-in-Chief of the Elsevier DSP Journal.

Xiaolin Lu, *Texas Instruments, Inc.*, **Software Defined Radio for Smart Utility Networks**

Software Define Radio (SDR) technology is being deployed in wireless base stations to support growing number of wireless communication standards for cellular networks. With the new market developed for smart grid such as Smart Utility Network, the similar type of requirements for the reliability and flexibility of wireless band plans, digital signal processing algorithms used in the PHY layer gives the opportunity of applying SDR technology to command/control type networking applications. The SDR can be used for both Base Station side (and Data Concentrator side) as well as electricity meter side which plays the role of hub for Gas and Water meters in the customer premise. The IEEE 802.15.4g standard itself supports multiple frequency bands as well as PHY layer protocols such as FSK, OFDM and DSSS modes. In order to meet the requirements of transformation of communication infrastructure for smart grid, a new type of SDR architecture is defined to support multiple frequency band plans, multiple physical layer of communication standards, multiple network protocols and complemented with wired power line communications targeted for automated electricity metering in Smart Utility Network. Under the umbrella of programmability and flexibility, the low power consumption, and cost efficiency are also considered to achieve the ultimate goal of higher reliability and full network coverage. This talk will be focused on challenges encountered in the SoC architecture as well as tradeoffs among flexibility, programmability under the constraint of power and cost.

Xiaolin Lu is TI Fellow and manager of the Smart Grid R&D center at TI. She is responsible for driving various differentiated industrial- and energy-related software solutions using TI embedded processor and analog devices. Xiaolin has worked on various embedded system and software programs, including Narrow Band Power Line Communication Systems, Wireless and Wired Hybrid Sensor Network, Smart Power Software Framework, LTE/Wimax Prototypes, Wi-Fi/Bluetooth co-existence and digital mobile TV SoC, etc.

Xiaolin is well-known as an embedded system and software expert inside and outside TI and has given keynote and plenary talks or presentations at numerous technical conferences. In addition, she is the author/co-author of more than 22 U.S. patents and the recipient of the National Women of Color award in the Technical Innovation – Industry category. Xiaolin is the first TIer to co-chair the Industrial Advisory Board at the University of Texas at Dallas (UT Dallas). In her free time, Xiaolin enjoys piano classes with children, classical music and leisure travel.

Software Defined and Cognitive Radios I

SDCRa.PC.1 **ADAPTIVE DIGITAL PRE-DISTORTION FOR MULTIPLE ANTENNA TRANSMITTERS**
Padmanabhan Suryasarman, Andreas Springer, Johannes Kepler University, Austria

SDCRa.PC.2 **GAME THEORETIC APPROACH TO DYNAMIC SPECTRUM ACCESS WITH MULTI-RADIO AND QOS REQUIREMENTS**
Danda B. Rawat, Georgia Southern University, United States; Sachin Shetty, Tennessee State University, United States

SDCRa.PC.3 **IMPROVING THE INTERFERENCE TEMPERATURE ESTIMATION FOR DYNAMIC SPECTRUM ACCESS IN COGNITIVE RADIOS**
Francesco Benedetto, Gaetano Giunta, Elena Guzzon, University of Rome, Roma Tre, Italy; Markku Renfors, Tampere University of Technology, Finland; Matteo Arcangeli, University of Rome, Roma Tre, Italy

SDCRa.PC.4 **DIGITAL LINEARIZATION OF DIRECT-CONVERSION SPECTRUM SENSING RECEIVER**
Markus Allén, Jaakko Marttila, Mikko Valkama, Tampere University of Technology, Finland; Semu Mäkinen, Marko Kosunen, Jussi Ryynänen, Aalto University, Finland

SDCRa.PC.5 **AUGMENTED VOLTERRA PREDISTORTION FOR THE JOINT MITIGATION OF POWER AMPLIFIER AND I/Q MODULATOR IMPAIRMENTS IN WIDEBAND FLEXIBLE RADIO**
Benjamin Schubert, Fraunhofer Heinrich Hertz Institute, Germany; Ahmet Gökceoglu, Lauri Anttila, Mikko Valkama, Tampere University of Technology, Finland

SDCRa.PC.6 **SPECTRUM SENSING METHOD WITHOUT THE IMPACT OF NOISE UNCERTAINTY**
Zhe Sun, Weijia Han, Zan Li, Yan Zhang, Meilu Lin, Xidian University, China

SDCRa.PC.7 **SUB-NYQUIST POWER SPECTRUM RECONSTRUCTION AND SUPPORT DETECTION FOR COGNITIVE RADIOS**
Deborah Cohen, Yonina C. Eldar, Technion - Israel Institute of Technology, Israel

SDCRa.PC.8 **IMPROVED CARRIER FREQUENCY OFFSET ESTIMATOR FOR COMMON REFERENCED SAMPLING AND RF OSCILLATORS IN OFDM TRANSCEIVERS**
Jin Yuan, Murat Torlak, The University of Texas at Dallas, United States

SDCRa.PC.9 **HOW WIDEBAND RECEIVER NONLINEARITIES IMPACT SPECTRUM SENSING**
Eric Rebeiz, Danijela Cabric, University of California, Los Angeles, United States

SDCRa.PC.10 **STATISTICAL INTERFERENCE MAPS FOR OPPORTUNISTIC SPECTRUM ACCESS IN OFDMA CELLULAR NETWORKS**
Naeem Akl, Zaher Dawy, American University of Beirut, Lebanon

SDCRa.PC.11 **LOW-RANK MATRIX COMPLETION BASED MALICIOUS USER DETECTION IN COOPERATIVE SPECTRUM SENSING**
Zhijin Qin, Yue Gao, Mark D. Plumbley, Clive Parini, Laurie Cuthbert, Queen Mary, University of London, United Kingdom

SDCRa.PC.12 **SPOOFING OPTIMIZATION OVER NAKAGAMI-M FADING CHANNELS OF A COGNITIVE RADIO ADVERSARY**
Madushanka Soysa, Pamela Cosman, Laurence Milstein, University of California, San Diego, United States

SDCRa.PC.13 **SPECTRUM HANDOFFS WITH MIXED-PRIORITY QUEUEING MODEL OVER COGNITIVE RADIO NETWORKS**
Yeqing Wu, Fei Hu, University of Alabama, Tuscaloosa, United States; Sunil Kumar, San Diego State University, United States; Mengcheng Guo, Ke Bao, University of Alabama, Tuscaloosa, United States

SDCRa.PC.14 **TIME-DOMAIN COMPRESSION OF COMPLEX-BASEBAND LTE SIGNALS FOR CLOUD RADIO ACCESS NETWORKS**
Karl Nieman, Brian Evans, The University of Texas at Austin, United States

SDCRa.PC.15 **CYCLOSTATIONARITY-BASED WIDEBAND SPECTRUM SENSING USING RANDOM SAMPLING**
Lingchen Zhu, Chenchi Luo, James McClellan, Georgia Institute of Technology, United States

SDCRa.PC.16 **PROVIDING DISRUPTION QOS IN AN OFDM SYSTEM USING RESIDUAL IDLE TIME BASED OPPORTUNISTIC SPECTRUM ACCESS**
Anirudha Sahoo, Michael Souryal, Mudumbai Ranganathan, National Institute of Standards and Technology, United States

SDCRa.PC.17 **MMME AND DME: TWO NEW EIGENVALUE-BASED DETECTORS FOR SPECTRUM SENSING IN COGNITIVE RADIO**
Andreas Bollig, Rudolf Mathar, RWTH Aachen University, Germany

SDCRa.PC.18 **SUBCARRIER ALLOCATION AND POWER CONTROL WITH LTE-A CARRIER AGGREGATION**
Xiaojia Lu, Markku Juntti, Janne Janhunen, Jani Boutellier, University of Oulu, Finland; Mikko Valkama, Tampere University of Technology, Finland; Joseph R. Cavallaro, Rice University, United States; Shuvra S. Bhattacharyya, University of Maryland, United States

SDCRa.PC.19 **MITIGATION OF INTER-SYMBOL INTERFERENCE IN SINGLE-CARRIER FDMA VIA GROUP DETECTION**
Muhammet Fatih Bayramoglu, Markus Karjalainen, Markku Juntti, University of Oulu, Finland

SDCRa.PC.20 **A C-PROGRAMMABLE BASEBAND PROCESSOR WITH INNER MODEM IMPLEMENTATIONS FOR LTE CAT-4/5/7 AND GBPS 80MHZ 4X4 802.11AC**
Min Li, Amir Amin, Raf Appeltans, Andy Folens, Ubaid Ahmad, Hans Cappelle, Peter Debacker, Lieven Hollevoet, Andre Bourdoux, Praveen Raghavan, Antoine Dejonghe, Liesbet Van Der Perre, IMEC, Belgium

Software Defined and Cognitive Radios II

SDCRb.PC.1 **A GRAPHICAL APPROACH TO GPS SOFTWARE-DEFINED RECEIVER IMPLEMENTATION**
Zaher Kassas, Jahshan Bhatti, Todd Humphreys, The University of Texas at Austin, United States

SDCRb.PC.2 **A LABVIEW-BASED FAST PROTOTYPING SOFTWARE DEFINED GPS RECEIVER PLATFORM**
David Akopian, Arpine Soghoyan, The University of Texas at San Antonio, United States

SDCRb.PC.3 **EPUMA: A UNIQUE MEMORY ACCESS BASED PARALLEL DSP PROCESSOR FOR SDR AND CR**
Andréas Karlsson, Joar Sohl, Jian Wang, Dake Liu, Linköping University, Sweden

SDCRb.PC.4 **PERFORMANCE EVALUATION OF LDPC DECODING ON A GENERAL PURPOSE MOBILE CPU**
Stefan Grönroos, Jerker Björkqvist, Åbo Akademi University, Finland

SDCRb.PC.5 **PIPELINED FFT FOR WIRELESS COMMUNICATIONS SUPPORTING 128-2014 / 1536 -POINT TRANSFORMS**
Inkeun Cho, University of Maryland, United States; Tomasz Patyk, Dolby Laboratories, Poland; David Guevorkian, Nokia Siemens Networks, Finland; Jarmo Takala, Tempere University of Technology, Finland; Shuvra S. Bhattacharyya, University of Maryland, United States

SDCRb.PC.6 **SOFTWARE DEFINED FFT ARCHITECTURE FOR IEEE 802.11AC**
Peng Wang, John McAllister, Yun Wu, Queen's University Belfast, United Kingdom

SDCRb.PC.7 **HIGH PERFORMANCE REAL-TIME PRE-PROCESSING FOR FIXED-COMPLEXITY SPHERE DECODER**
Yun Wu, John McAllister, Peng Wang, Queen's University Belfast, United Kingdom

SDCRb.PC.8 **A PROCESSOR BASED MULTI-STANDARD LOW-POWER LDPC ENGINE FOR MULTI-GBPS WIRELESS COMMUNICATION**
Meng Li, Frederik Naessens, Min Li, Peter Debacker, Claude Desset, Praveen Raghavan, Antoine Dejonghe, Liesbet Van der Perre, IMEC, Belgium

SDCRb.PC.9 **HIGH THROUGHPUT LOW LATENCY LDPC DECODING ON GPU FOR SDR SYSTEMS**
Guohui Wang, Michael Wu, Bei Yin, Joseph R. Cavallaro, Rice University, United States

SDCRb.PC.10 **A CARRIER RECOVERY ARCHITECTURE FOR NEXT GENERATION WIDEBAND MODEMS**
Fred Harris, Xiaofei Chen, Elettra Venosa, San Diego State University, United States

SDCRb.PC.11 **A SDR ARCHITECTURE BASED ON FPGA FOR MULTI-STANDARD TRANSMITTER**
Benjamin Bautista Contreras, Ramon Parra Michel, CINVESTAV-GDL, Mexico; Roberto Carrasco Alvarez, Universidad de Guadalajara, Mexico; Eduardo Romero Aguirre, Instituto tecnologico de Sonora, Mexico

SDCRb.PC.12 **SELECTIVE DECODING IN ASSOCIATIVE MEMORIES BASED ON SPARSE-CLUSTERED NETWORKS**
Hooman Jarollahi, Naoya Onizawa, Warren J. Gross, McGill University, Canada

SDCRb.PC.13 **OPEN THE GATES: USING HIGH-LEVEL SYNTHESIS TOWARDS PROGRAMMABLE LDPC DECODERS ON FPGAS**
Frederico Pratas, INESC-ID, IST, Universidade de Lisboa, Portugal; Joao Andrade, Gabriel Falcao, Vitor Silva, Instituto de Telecomunicações, University of Coimbra, Portugal; Leonel Sousa, INESC-ID, IST, Universidade de Lisboa, Portugal

SDCRb.PC.14 **FROM OPENCL TO GATES: THE FFT**
Joao Andrade, Vitor Silva, Gabriel Falcao, Instituto de Telecomunicações, University of Coimbra, Portugal

SDCRb.PC.15 **SCALABLE SUCCESSIVE-CANCELLATION HARDWARE DECODER FOR POLAR CODES**
Alexandre J. Raymond, Warren J. Gross, McGill University, Canada

SDCRb.PC.16 **TOWARDS ELASTIC SDR ARCHITECTURES USING DYNAMIC TASK MANAGEMENT**
Oliver Arnold, Emil Matus, Benedikt Nöthen, Friedrich Pauls, Gerhard Fettweis, Technische Universität Dresden, Germany

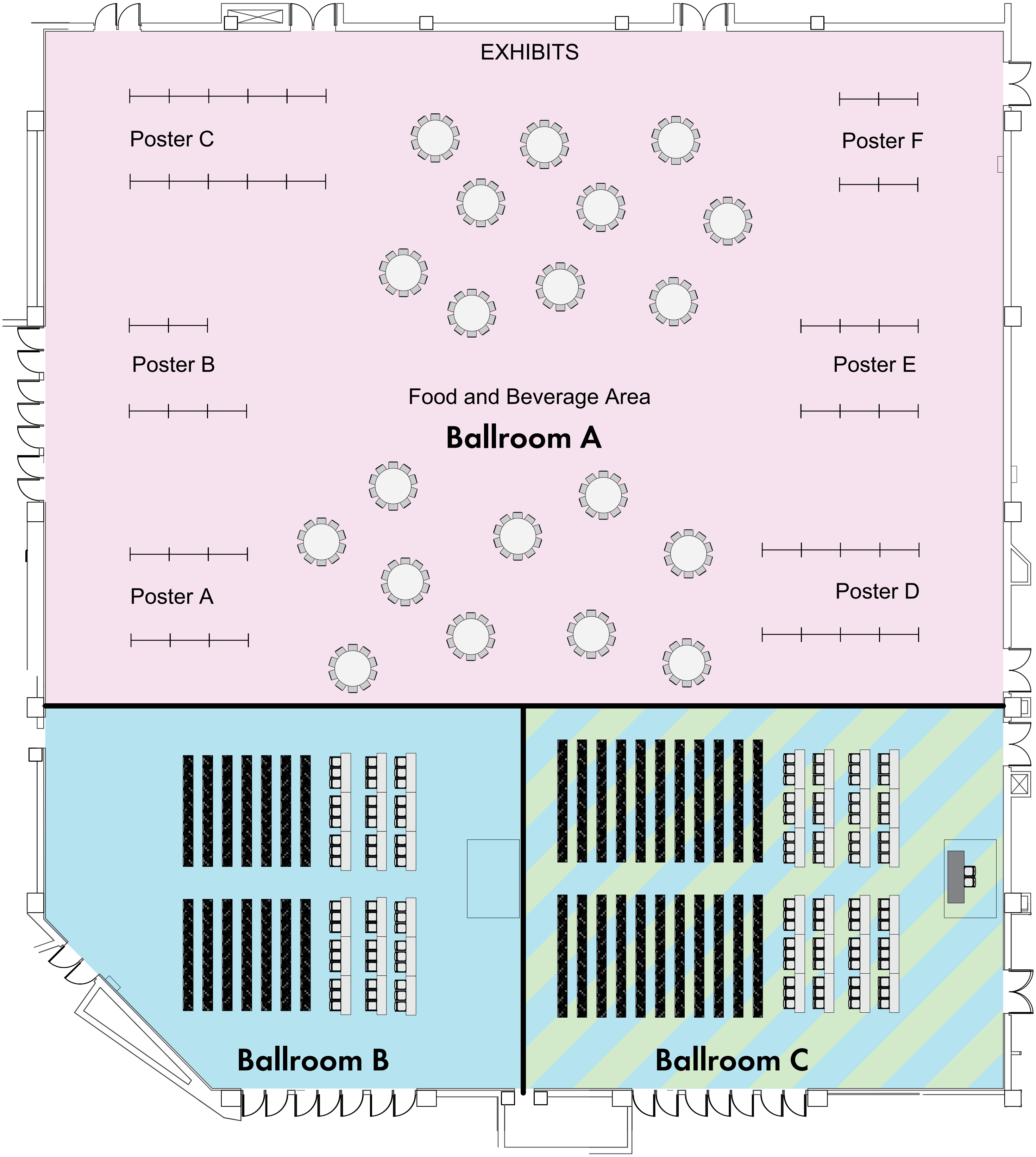
SDCRb.PC.17 **ENHANCED PERFORMANCE IN WIDEBAND COGNITIVE RADIOS VIA COMPRESSIVE SENSING**
Sk. Alam, Lucio Marcenaro, Carlo Regazzoni, University of Genoa, Italy

SDCRb.PC.18 **EFFICIENT RECONFIGURABLE SCHEME FOR THE RECOVERY OF SUB-NYQUIST SAMPLED SPARSE MULTI-BAND SIGNALS**
Anu Kalidas Muralidharan Pillai, Håkan Johansson, Linköping University, Sweden

A

B

C


EXHIBITS
Poster C
Poster F
Poster B
Poster E
Food and Beverage Area
Ballroom A
Poster A
Poster D
Ballroom B
Ballroom C

Time	Ballroom B	Ballroom C	Poster Area A	Poster Area B	Poster Area C	Poster Area D	Poster Area E	Poster Area F
Tue, Dec 3 08:00 - 08:30	Opening & State of the Society							Ballroom C
Tue, Dec 3 08:30 - 09:30	Plenary: Jelena Kovačević, *Carnegie Mellon University*, **Problems in Biological Imaging: Opportunities for Signal Processing**							Ballroom C
Tue, Dec 3 10:00 - 12:00	Network Theory Symposium - Keynotes	New Sensing and Statistical Inference Methods - Keynotes	SIPFEa.PA Signal and Information Processing in Finance and Economics I	IPNa.PB Information Processing over Networks I			OMLSPa.PE Optimization in Machine Learning and Signal Processing I	ECNSICa.PF Emerging Challenges in Network Sensing, Inference, and Communication I
Tue Dec 3 12:00 - 13:30	CEO Lunch with Dr. Jim Truchard, National Instruments							Ballroom C
Tue, Dec 3 13:30 - 15:30	Information Processing over Networks - Keynotes	Signal and Information Processing in Finance and Economics - Keynotes			NTa.PC Network Theory I	NSSIMa.PD New Sensing and Statistical Inference Methods I	OMLSPb.PE Optimization in Machine Learning and Signal Processing II	ECNSICb.PF Emerging Challenges in Network Sensing, Inference, and Communication II
Tue, Dec 3 16:00 - 18:00	Emerging Challenges in Network Sensing, Inference, and Communication - Keynotes	Optimization in Machine Learning and Signal Processing - Keynotes	SIPFEb.PA Signal and Information Processing in Finance and Economics II	IPNb.PB Information Processing over Networks II	NTb.PC Network Theory II	NSSIMb.PD New Sensing and Statistical Inference Methods II		
Wed, Dec 4 08:30 - 09:30	Plenary: Piotr Indyk, *Massachusetts Institute of Technology*, **Recent Developments in the Sparse Fourier Transform**							Ballroom C
Wed, Dec 4 10:00 - 12:00	Advancing Neural Engineering Through Big Data - Keynotes	Controlled Sensing For Inference: Applications, Theory and Algorithms - Keynotes	BSBa.PA Bioinformatics and Systems Biology I	LDMOSPa.PB Low-Dimensional Models and Optimization in Signal Processing I	GSPa.PC Graph Signal Processing I			LPSSPa.PF Low-Power Systems and Signal Processing I
Wed, Dec 4 12:00 - 13:30	Ari Gesher – **Big Data and Man-Machine Symbiosis**							Ballroom C
Wed, Dec 4 13:30 - 15:30	Bioinformatics and Systems Biology - Keynotes	Low-Dimensional Models and Optimization in Signal Processing - Keynotes			GSPb.PC Graph Signal Processing II	CSIa.PD Controlled Sensing For Inference: Applications, Theory and Algorithms I	ANEBDa.PE Advancing Neural Engineering Through Big Data I	LPSSPb.PF Low-Power Systems and Signal Processing II
Wed, Dec 4 16:00 - 18:00	Low-Power Systems and Signal Processing - Keynotes	Graph Signal Processing - Keynotes	BSBb.PA Bioinformatics and Systems Biology II	LDMOSPb.PB Low-Dimensional Models and Optimization in Signal Processing II		CSIb.PD Controlled Sensing For Inference: Applications, Theory and Algorithms II		
Thu, Dec 5 08:30 - 09:30	Plenary: David Haussler, *University of California, Santa Cruz*, **Cancer Genomics**							Ballroom C
Thu, Dec 5 10:00 - 12:00	Software Defined and Cognitive Radios - Keynotes	Information Processing in the Smart Grid - Keynotes	CSPa.PA Cyber-Security and Privacy I	EHGWCa.PB Energy Harvesting and Green Wireless Communications I		MIa.PD Mobile Imaging I	MMWISa.PE Millimeter Wave Imaging and Communications I	
Thu, Dec 5 12:00 - 13:30	Lunch Panel: **Speech for Games** - Mari Ostendorf and Dilek Hakkani-Tur							Ballroom C
Thu, Dec 5 13:30 - 15:30	Cyber Security and Privacy - Keynotes	Mobile Imaging - Keynotes		EHGWCb.PB Energy Harvesting and Green Wireless Communications II	SDCRa.PC Software Defined and Cognitive Radios I			IPSGa.PF Information Processing in the Smart Grid I
Thu, Dec 5 16:00 - 18:00	Energy Harvesting and Green Wireless Communications - Keynotes	Millimeter Wave Imaging and Sensing - Keynotes	CSPb.PA Cyber-Security and Privacy II		SDCRb.PC Software Defined and Cognitive Radios II			IPSGb.PF Information Processing in the Smart Grid II