# Table of Contents

Student Paper Contest .................................................................................................................. xxix  
Foreword ........................................................................................................................................... xxx  

MAb-1: Securing Crowded and Open Networks: Physical-Layer Security in 5G (Invited)  
MAb-1.1: Physical Layer Security in Massive MIMO Systems .......................................................... 3  
   Rafael F. Schaefer, Technische Universität Berlin, Germany; Gayan Amarasuriya, Southern Illinois University, United States, H. Vincent Poor, Princeton University, United States  
MAb-1.2: Implementing a Real-Time Capable WPLS Testbed for Independent Performance and Security Analyses  
   Christian Zenger, Ruhr Universität Bochum, Germany; Mario Pietersz, Andreas Rex, PHYSEC GmbH, Germany; Jeremy Brauer, Falk-Peter Dressler, Christian Baiker, Daniel Theis, Christof Paar, Ruhr Universität Bochum, Germany  
MAb-1.3: Stealthy Keyless Secret Key Generation from Degraded Sources ........................................ 14  
   Pin-Hsun Lin, Carsten R. Janda, Eduard A. Jorswieck, TU Dresden, Germany; Rafael F. Schaefer, Technische Universität Berlin, Germany  

MAb-2: Dirty-RF for Multi-User Massive-MIMO (Invited)  
MAb-2.1: On Out-of-Band Emissions of Quantized Precoding in Massive ......................................... 21  
   MU-MIMO-OFDM  
   Sven Jacobsson, Giuseppe Durisi, Chalmers University of Technology, Sweden; Mikael Coldrey, Ericsson, Sweden; Christoph Studer, Cornell University, United States  
MAb-2.2: Per-Antenna Hardware Optimization and Mixed Resolution ADCs in Uplink ............................ 27  
Massive-MIMO  
   Daniel Verenzuela, Emil Björnson, Linköping University, Sweden; Michail Matthaiou, Queen’s University Belfast, United Kingdom  
MAb-2.3: Predistortion Techniques for Vector Perturbation Precoding of One-Bit .................................... 32  
   Massive-MIMO  
   Inbar Fijalkow, ETIS, Université Paris Seine, Université de Cergy-Pontoise, ENSEA, CNRS, France; A. Lee Swindlehurst, University of California, Irvine, United States  
MAb-2.4: Directional Timing Synchronization in Wideband Millimeter Wave Cellular ............................. 37  
   Systems with Low-Resolution ADCs  
   Dalin Zhu, Robert W. Heath Jr, University of Texas at Austin, United States  

MAb-3: Graph Signal Processing (Invited)  
MAb-3.1: Analyzing the Approximation Error of the Fast Graph Fourier Transform .............................. 45  
   Luc Le Magoarou, b<>com, France; Nicolas Tremblay, CNRS, France; Rémi Gribonval, INRIA Rennes Bretagne-Atlantique, France  
MAb-3.2: Tropical Graph Signal Processing .......................................................................................... 50  
   Vincent Gripon, IMT Atlantique, France  
MAb-3.3: Tree-structured filter banks for M-block cyclic graphs ............................................................. 55  
   Aamir Anis, University of Southern California, United States; David B. H. Tay, Deakin University, Australia; Antonio Ortega, University of Southern California, United States  
MAb-3.4: Predicting the Evolution of Stationary Graph Signals .............................................................. 60  
   Andreas Loukas, École Polytechnique Fédérale de Lausanne, Switzerland; Elvin Isufi, Delft University of Technology, Netherlands; Nathanael Perraudin, Swiss Data Science Center, Switzerland  

MAb-4: Nonconvex Optimization (Invited)  

MAb-5: Theory for Next Generation Radar Systems (Invited)  
MAb-5.1: Joint Radar-Communications Waveform Multiple Access and Synthetic Aperture .................. 69  
   Radar Receiver  
   Andrew Herschfelt, Daniel Bliss, Arizona State University, United States
MAb-5.2: Demonstrating Significant Passive Radar Performance Increase Through using Known Communication Signal Format
Yonggang Wu, Qian He, Jianbin Hu, University of Electronic Science and Technology of China, China; Rick Blum, Lehigh University, United States

MAb-5.3: MIMO Radar Using Sparse Sensing: A Weighted Sparse Bayesian Learning (WSBL) Approach
Ahmed Al Hilli, Rutgers University, USA and Al furat Al Awsat Technical Collage, Iraq; Athina Petropulu, Rutgers, The State University of New Jersey, United States

MAb-5.4: Through-The-Wall Radar Imaging Using a Distributed Quasi-Newton Method
Haroon Raja, Waheed U. Bajwa, Rutgers University, United States; Fauzia Ahmad, Temple University, United States

MAb-6: Signal Processing-Enhanced Biomedical Instrumentation
MAb-6.1: A Real-Time Rodent Neural Interface for Deciphering Acute Pain Signals from Neuronal Ensemble Spike Activity
Sile Hu, Zhejiang University, China; Qiaosheng Zhang, Jing Wang, Zhe Chen, New York University School of Medicine, United States

MAb-6.2: Real-Time, Data-Driven Algorithm and System to Learn Parameters for Pacemaker Beat Detection
Yamin Arefeen, Philip Taffet, Daniel Zdeblick, Jorge Quintero, Greg Harper, Behnaam Aazhang, Joseph R. Cavallaro, Rice University, United States; Mehdi Razavi, Texas Heart Institute, United States

MAb-6.3: On Developing an FPGA Based System for Real Time Seizure Prediction
Sarah Hooper, Erik Biegert, Marissa Levy, Justin Pensock, Luke Van der Spoel, Xiaoran Zhang, Tianyi Zhang, Rice University, United States; Nitin Tandon, University of Texas Health Science Center; United States; Behnaam Aazhang, Rice University, United States

MAb-6.4: Use of Adaptive Filtering for Improved Performance in Digital Stethoscopes
Donald Hall, Mathew Mctaggart, William Jenkins, Pennsylvania State University, United States

MAb-7: Dynamically Scheduled High-Level Synthesis (Invited)
Jordi Cortadella, Jordi Petit, Universitat Politècnica de Catalunya, Spain

MAb-7.2: From C to Elastic Circuits
Lana Josipovic, École Polytechnique Fédérale de Lausanne, Switzerland; Philip Brisk, University of California, Riverside, Switzerland; Paolo Ienne, École Polytechnique Fédérale de Lausanne, Switzerland

MAb-7.3: Run Fast When You Can: Loop Pipelining with Uncertain and Non-uniform Memory Dependencies
Junyi Liu, John Wickerson, Imperial College London, United Kingdom; Samuel Bayliss, Xilinx, United States; George Constantinides, Imperial College London, United States

MAb-7.4: Enabling Adaptive Loop Pipelining in High-Level Synthesis
Steve Dai, Gai Liu, Ritchie Zhao, Zhiru Zhang, Cornell University, United States

MAb-8: Detection, Classification, and Tracking
MAb-8.2: Automatic Modulation Classification Via Symbolic Representations of Complex Time Series Data
Eric J. Ruzomberka, Purdue University, United States; Gary H. Whipple, Laboratory for Telecommunication Sciences, United States; Catherine M. Keller, R. Bruce MacLeod, MIT Lincoln Laboratory, United States

MAb-8.3: Resolving Occlusion Ambiguity by Combining Kalman Tracking with Feature Tracking for Image Sequences
Mark Heimbach, Kamak Ebadi, Sally Wood, Santa Clara University, United States

MAb-8.5: Efficient and Robust Classification of Seismic Data using Nonlinear Support Vector Machines
Kyle Hickmann, Jeffrey Hyman, Gowri Srinivasan, Los Alamos National Laboratory, United States
MAb-8.6: Feature Based Order Recognition of Continuous-Phase FSK using Principal Component Analysis

Ambaw Ambaw, Miloš Doroslovacki, George Washington University, United States

MAb-8.7: Nonstationary Linear Discriminant Analysis

Shuilian Xie, Mahdi Imani, Edward Dougherty, Ulisses Braga-Neto, Texas A&M University, United States

MAb-8.8: Bayesian Kalman Filtering in the Presence of Unknown Noise Statistics Using Factor Graphs

Roozbeh Dehghannasiri, Texas A&M University, United States; Mohammad Shahrokh Esfahani, Stanford School of Medicine, United States; Xiaoning Qian, Edward Dougherty, Texas A&M University, United States

MAb-8: Video and Image Processing

MAb-8.1: Adaptive Search Pattern for Fast Motion Estimation in HD Video

Pavel Arnaudov, Tokunbo Ogunfunmi, Santa Clara University, United States

MAb-8.2: Monocular Vehicle Distance Sensor Using HOG and Kalman Tracking

Robert Christiansen, Jerry Hsu, Marcos Gonzalez, Sally Wood, Santa Clara University, United States

MAb-8.3: Human Activity Classification from Wearable Devices with Cameras

Yantao Lu, Senem Velipasalar, Syracuse University, United States

MAb-8.4: Bayer Feature Map Approximations through Spatial Pyramid Convolution

Allen Rush, Sally Wood, Santa Clara University, United States

MAb-8.5: Photometric Warp-based SFSR with Application to Infrared Image Processing

James Glenn-Anderson, Supercomputer Systems, Inc., United States

MAb-8.6: Fast and Compact Kronecker-structured Dictionary Learning for Classification and Representation

Ishan Jindal, Matthew Nokleby, Wayne State University, United States

MAb-8.7: Automatic Fog Detection in Day and Night Images to Improve Highway Driving Conditions

Victor DeBrunner, Jigar Patel, Florida State University, United States

MAb-8.8: Superpixels Based Marker Tracking Vs. Hue Thresholding In Rodent Biomechanics Application

Omid Haji Maghsoudi, Annie Vahedipour Tabrizi, Benjamin Robetrson, Andrew Spence, Temple University, United States

MAb-8: Multimedia Processing Systems

MAb-8.1: 3D Mesh Robust Watermarking Technique for Ownership Protection

Farhan Alenizi, Prince Sattam bin Abdulaziz University, Saudi Arabia; Fadi Kurdahi, Ahmed Eltawil, University of California, Irvine, United States

MAb-8.2: Fast Stochastic Hierarchical Bayesian MAP for Tomographic Imaging

John McKay, Pennsylvania State University, United States; Raghu Raj, Naval Research Laboratory, United States; Vishal Monga, Pennsylvania State University, United States

MAb-8.3: Nonlinear Image Interpolation via Deep Neural Network

Wentian Zhou, Xin Li, Daryl Reynolds, West Virginia University, United States

MAb-8.4: On the Effects of Windowing on the Discretization of the Fractional Fourier Transform

Balu Santhanam, University of New Mexico, United States; Thalanayar Santhanam, Saint Louis University, United States; Satish Mandal, University of New Mexico, United States

MAb-8.6: Effect of Random Vertical Orientation for Mobile Users in Visible Light Communication

Yusuf Said Eroglu, Yavuz Yapici, Ismail Guvenc, North Carolina State University, United States

MAb-8.7: A Best-Features based Digital Rotoscope

Jain J. Murphy, Tyler B. Norlund, Vivek K. Pallipuram, University of the Pacific, United States

MAb-8.8: Automatic Blind Source Separation of Speech Sources in an Auditory Scene

Kenneth Faller II, Jason Riddley, Elijah Grubbs, California State University, Fullerton, United States
MPa-1: Network Inference (Invited)
MPa-1.1: Seeded Graph Matching: Efficient Algorithms and Theoretical Guarantees ........................................253
Farhard Shirani, Siddharth Garg, Elza Erkip, NYU Tandon School of Engineering, United States
MPa-1.2: Towards Provably Invisible Network Flow Fingerprints ..............................................................258
Ramin Soltani, Dennis Goeckel, Donald Towsley, Amir Houmansadr, University of Massachusetts
Amherst, United States
MPa-1.3: Efficient Neighborhood Selection for Walk Summable Gaussian Graphical Models .................263
Yingxang Yang, Jalal Etesami, Negar Kiyavash, UIUC, United States

MPa-2: Massive MIMO: Vision and Reality (Invited)
MPa-2.1: Scaling Up Distributed Massive MIMO: Why and How ..............................................................271
Cheng-Ming Chen, Andrea P. Guevara, KU Leuven, Belgium; Sofie Pollin, KU Leuven, Belgium
MPa-2.2: mmWave Massive MIMO with Simple RF and Appropriate DSP ........................................277
Amine Mezghani, University of Texas at Austin, United States; A. Lee Swindlehurst, University of
California, Irvine, United States
MPa-2.3: Analysis of Nonlinear Low-Noise Amplifiers in Massive MIMO Base Stations ......................285
Christopher Mollén, Linköpings Universitet, Sweden; Ulf Gustavsson, Ericsson, Sweden; Thomas
Eriksson, Chalmers, Sweden; Erik G. Larsson, Linköpings Universitet, Sweden

MPa-3: Distributed Methods for Large-scale Optimization (Invited)
MPa-3.2: Beyond Consensus and Synchrony in Decentralized Online Optimization using Saddle Point Method
Amrit Singh Bedi, Indian Institute of Technology Kanpur, India; Alec Koppel, University of
Pennsylvania, United States; Ketan Rajawat, Indian Institute of Technology Kanpur, India
MPa-3.3: A Primal-Dual Quasi-Newton Method for Consensus Optimization ........................................298
Mark Eisen, University of Pennsylvania, United States; Aryan Mokhtari, University of California,
Berkeley, United States; Alejandro Ribeiro, University of Pennsylvania, United States

MPa-4: Low-dimensional Models for Big Data (Invited)
MPa-4.4: Convex and Nonconvex Geometries of Symmetric Tensor Factorization ....................................305
Qiuwei Li, Gongguo Tang, Colorado School of Mines, United States

MPa-5: Mathematics of Super-Resolution (Invited)
MPa-5.1: Information and Resolution ........................................................................................................313
Albert Fannjiang, University of California, Davis, United States
MPa-5.3: Sampling Patterns for Off-The-Grid Spectral Estimation ................................................................318
Maxime Ferreira Da Costa, Wei Dai, Imperial College London, United Kingdom
MPa-5.4: A Super-Resolution Algorithm for Multiband Signal Identification ........................................323
Zhihui Zhu, Dehui Yang, Michael Wakin, Gongguo Tang, Colorado School of Mines, United States

MPa-6: Identification and Control of Neural Dynamics (Invited)
MPa-6.1: Latent Variable Models for Uncovering Motor Cortical Ensemble Dynamics .................................331
Zhe Chen, New York University School of Medicine, United States; Shizhao Liu, Tsinghua University,
China; Jose Iriarte-Diaz, University of Illinois at Chicago, United States; Nicholas Hatsopoulos,
Callum Ross, Kazutaka Takahashi, University of Chicago, United States
MPa-6.2: System Identification for Sleep-Mediated, Stimulation-Enhanced Memory ..................................336
Kyle Lepage, Sujith Vijayan, Virginia Tech, United States
MPa-6.4: Identifying Disruptions in Intrinsic Brain Dynamics due to Severe Brain Injury ..........................344
Sina Khanmohammadi, Terrance Kummer, ShiNung Ching, Washington University in St. Louis, United
States

MPa-7: Machine Learning for Information Retrieval, Speech, and Image Processing (Invited)
MPa-7.1: Using Information Theoretic Learning Techniques to Train Neural Networks ..............................351
Manas Deb, Tokunbo Ogunfunmi, Santa Clara University, United States
MPa-7.2: What to Play Next? A RNN-Based Music Recommendation System
Miao Jiang, Ziyi Yang, Indiana University, United States; Chen Zhao, University of Tsukuba, Japan

MPa-7.4: Personalized Preference Elicitation in Recommender Systems using Matrix Factorization
Kirk Iserman, Yuhong Liu, Santa Clara University, United States

MPa-8: Message Passing and Matrix Factorization Algorithms

MPa-8.1: Recovery Conditions and Sampling Strategies for Network Lasso
Alexandru Mara, Alexander Jung, Aalto University, Finland

MPa-8.2: Sketched Clustering via Hybrid Approximate Message Passing
Evan Byrne, The Ohio State University, United States; Rémi Gribonval, INRIA, France; Philip Schniter, The Ohio State University, United States

MPa-8.3: Robust Matrix Factorization for Collaborative Filtering in Recommender Systems
Christos Bampis, University of Texas at Austin, United States; Cristian Rusu, University of Edinburgh, United Kingdom; Hazem Hajj, American University of Beirut, Lebanon; Alan Bovik, University of Texas at Austin, United States

MPa-8.4: Target-Based Hyperspectral Demixing via Generalized Robust PCA
Sirisha Rambhatla, Xingguo Li, Jarvis Haupt, University of Minnesota-Twin Cities, United States

MPa-8.5: Iterative Re-weighted L1-Norm Principal-Component Analysis
Ying Liu, State University of New York at Buffalo, United States; Dimitris A. Pados, Stella N. Batalama, Florida Atlantic University, United States; Michael Medley, AFRL / RITE, United States

MPa-8.6: Conditional Approximate Message Passing with Side Information
Dror Baron, North Carolina State University, United States; Anna Ma, Claremont Graduate University, United States; Deanna Needell, UCLA, United States; Cynthia Rush, Columbia University, United States; Tina Woolf, Claremont Graduate University, United States

MPa-8.7: A GAMP Based Algorithm with Hierarchical Priors for Recovering Non-Negative Sparse Signals
Maher Al-Shoukairi, Bhaskar D. Rao, University of California, San Diego, United States

MPa-8.8: Radix-4 Modular Pipeline Fast Fourier Transform Algorithm
Alekhya Lakkadi, Linda S. DeBrunner, Florida State University, United States

MPa-8: Computer Arithmetic II

MPa-8.1: Hyper-Threaded Multiplier for HECC
Gabriel Gallin, Arnaud Tisserand, CNRS, France

MPa-8.2: An Efficient Software Implementation of Correctly Rounded Operations Extending FMA: a + b + c and a * b + c * d
Christoph Lauter, Sorbonne Universités, France

MPa-8.4: Truncated Multiply-and-Accumulate Units for FIR Filter Implementation with Reduced Coefficient Length
Linda S. DeBrunner, Dewey Williams, Christopher Riker, Florida State University, United States

MPa-8.6: Digital Predistortion with Low-Precision ADCs
Chance Tarver, Joseph R. Cavallaro, Rice University, United States

MPa-8.7: Computation Limited Matrix Inversion Using Neumann Series Expansion for Massive MIMO
Erik Bertilsson, Oscar Gustafsson, Johannes Klasson, Erik G. Larsson, Linkoping University, Sweden

MPa-8: Computer Architecture II

MPa-8.1: A Comparison of Efficient First Stage Decimation Filters for Continuous Time
Christopher Felton, Barry Gilbert, Clifton Haider, Mayo Clinic, United States

MPa-8.2: Molecular Computation of Complex Markov Chains with Self-Loop State Transitions
Sayeed Ahmad Salehi, Utah Valley University, United States; Marc Riedel, Keshab K. Parhi, University of Minnesota, United States

MPa-8.4: Functional Encryption of Integrated Circuits by Key-Based Hybrid Obfuscation
Sandhya Koteshwara, Chris H. Kim, Keshab K. Parhi, University of Minnesota, United States
MPa-8.5: MIMO Detector Implementations Using High-level Synthesis Tools from Different Generations

Tuomo Hänninen, Muhammad Saad Saud, Hamid Yadegar Amin, Markku Juntti, University of Oulu, Finland

MPa-8.6: Execution Trace Graph based interface synthesis of signal processing datflow programs for heterogeneous MPSoCs

Endri Bezati, Simone Casale Brunet, SIB Vital-IT, Switzerland; Marco Mattavelli, École Polytechnique Fédérale de Lausanne, Switzerland

MPa-8.7: Wideband Spectrum Sensing Measurement Results using Tunable Front-End and FPGA Implementation

Xusong Wang, Shailesh Chaudhari, Mihir Laghate, Danijela Cabric, University of California, Los Angeles, United States

MPa-8.8: Profiling of dynamic dataflow programs on MPSoC multi-core architectures

Simone Casale Brunet, Endri Bezati, Swiss Institute of Bioinformatics, Switzerland; Aurelien Bloch, Marco Mattavelli, École Polytechnique Fédérale de Lausanne, Switzerland

MPa-8: Large-Scale Data

MPa-8.1: The Case for Spatial Pooling in Deep Convolutional Sparse Coding

Maya Kabkab, University of Maryland, College Park, United States

MPa-8.2: Grid-less Estimation of Saturated Signals

Filip Elvander, Johan Swärd, Andreas Jakobsson, Lund University, Sweden

MPa-8.4: Transform-Based Compression for Quadratic Similarity Queries

Hanwei Wu, Markus Flierl, KTH Royal Institute of Technology, Sweden

MPa-8.5: Geometric Description and Characterization of Time Series Signals

Lauren Crider, Douglas Cochran, Arizona State University, United States

MPa-8.6: Bayesian Top Scoring Pairs for Feature Selection

Emre Arslan, Ulisses Braga-Neto, Texas A&M University, United States

MPa-8.7: Random and Localized Random Projections for Radar: Statistical and Performance Analysis

Pawan Setlur, Air Force Research Lab., United States; Tariq Qureshi, WSRI, United States; Muralidhar Rangaswamy, Air Force Research Lab., United States

MPa-8.8: Cache-Aided Private Information Retrieval

Minchul Kim, Heecheol Yang, Jungwoo Lee, Seoul National University, Republic of Korea

MPb-1: DNA Storage (Invited)

MPb-1.3: Novel Combinatorial Coding Results for DNA Sequencing and Data Storage

Clayton Schoeny, University of California, Los Angeles, United States; Frederic Sala, Stanford University, United States; Lara Dolecek, University of California, Los Angeles, United States

MPb-2: Cloud and Fog-Assisted 5G (Invited)

MPb-2.1: Cloud and Fog-Assisted 5G (Invited)

Hao Feng, University of Southern California, United States; Jaime Llorca, Nokia Bell Labs, United States; Antonia Tulino, Bell Labs & Università di Napoli Federico II, United States; Andreas Molisch, University of Southern California, United States

MPb-2.2: Cache-Aided Content Delivery in Fog-RAN Systems with Topological Information

Wei-Ting Chang, Ravi Tandon, University of Arizona, United States; Osvaldo Simeone, King’s College, United Kingdom

MPb-2.3: Wireless Multicast for Cloud Radio Access Network with Heterogeneous Backhaul

Ya-Feng Liu, Chinese Academy of Sciences, China; Wei Yu, University of Toronto, Canada

MPb-2.4: Coding for Edge-Facilitated Wireless Distributed Computing with Heterogeneous Users

Mehrdad Kiamari, University of Southern California, United States; Chenwei Wang, DOCOMO Labs, United States; Salman Avestimehr, University of Southern California, United States
MPb-3: Dynamic Control in Wireless Networks (Invited)
MPb-3.1: Contextual Combinatorial Bandits in Wireless Distributed Computing .................................................................543
   Pranav Sakulkar, Bhaskar Krishnamachari, University of Southern California, United States
MPb-3.3: Active Spectrum Sensing with Sequential Sub-Nyquist Sampling .................................................................548
   Lorenzo Ferrari, Anna Scaglione, Arizona State University, United States
MPb-3.4: Topology-Agnostic Average Consensus in Sensor Networks with Limited Data Rate .................................553
   Chang-Shen Lee, Nicolo Michelusi, Gesualdo Scutari, Purdue University, United States

MPb-4: High-dimensional Estimation: Theory and Algorithms (Invited)

MPb-5: Waveform and Array Optimization for Multistatic/MIMO Radar (Invited)
MPb-5.1: Antenna and Pulse Selection for Colocated MIMO Radar .................................................................563
   Ehsan Tohidi, Hamid Behroozi, Sharif University of Technology, Iran; Geert Leus, Delft University of Technology, Netherlands
MPb-5.2: Joint Design for Co-existence of MIMO Radar and MIMO Communication .................................................................568
   Junhui Qian, University of Electronic Science and Technology of China, China; Marco Lops, University of Cassino and Southern Latium, Italy; Le Zheng, Xiaodong Wang, Columbia University, United States
MPb-5.3: Adaptive Sequential Refinement: A Tractable Approach for Ambiguity Function .................................................................573
   Shaping in Cognitive Radar
   Omar Aldayel, Tiantong Guo, Vishal Monga, Pennsylvania State University, United States; Muralidhar Ragaswamy, Air Force Research Laboratory, United States
MPb-5.4: MIMO Radar Beampattern Optimization with Ripple Control Using Sum-of-squares Representation .................................578
   Tuomas Aittomaki, Visa Koivunen, Aalto University, Finland

MPb-6: Statistical Signal Processing and Learning in Neuroscience (Invited)
MPb-6.3: Primacy Coding in Dual Olfactory Networks .....................................................................................................587
   Daniel Kepple, Hamza Giaffar, Cold Spring Harbor Laboratory, United States; Dima Rinberg, New York University, United States; Alexei Koulakov, Cold Spring Harbor Laboratory, United States
MPb-6.4: A clustering neural network model of insect olfaction ........................................................................................593
   Cengiz Pehlevan, Flatiron Institute, United States; Alexander Genkin, NYU Langone Medical Center, United States; Dmitri Chklovskii, Flatiron Institute, United States

MPb-7: Testbed-Based 5G Research (Invited)
MPb-7.1: Building and Operating a Real-Time Massive MIMO Testbed - Lessons Learned .................................................................603
   Steffen Malkowsky, Liang Liu, Viktor Öwall, Ove Edfors, Lund University, Sweden
MPb-7.4: From massive MIMO to C-RAN: the OpenAirInterface 5G testbed .........................................................................................................608
   Florian Kaltenberger, Xiwen Jiang, Raymond Knopp, Eurecom, France
MPb-7.5: Scalable 5G MPSoC Architecture ..............................................................................................................................613
   Gerhard P. Fettweis, Emil Matus, TU Dresden, Germany

TAA-1: Interface of Communications and Control (Invited)
TAA-1.3: Rationally Inattentive Markov Decision Processes over a Finite Horizon .................................................................621
   Ehsan Shafieepoorfard, Maxim Raginsky, University of Illinois at Urbana-Champaign, United States

TAA-2: Video Delivery Over Wireless Caching Networks: Theory and Practice (Invited)
TAA-2.1: A Unified Ruzsa-Szemeredi Framework for Finite-Length Coded Caching .................................................................631
   Karthikeyan Shanmugam, IBM Research, T. J. Watson Research Center, United States; Alexandros G. Dimakis, University of Texas at Austin, United States; Jaime Llorca, Bell Labs, United States; Antonia Tulino, Bell Labs & Università di Napoli Federico II, United States
TAA-2.2: Algorithms for Asynchronous Coded Caching ..............................................................................................................................636
   Hooshang Ghasemi, Aditya Ramamoorthy, Iowa State University, United States
TAa-2.3: State-of-the-art in Cache-aided Combination Networks

Kai Wan, Laboratoire des Signaux et Systèmes, France; Daniela Tuninetti, University of Illinois at Chicago, United States; Mingyue Ji, University of Utah, United States; Pablo Piantanida, Laboratoire des Signaux et Systèmes, France

TAa-2.4: State-Adaptive Coded Caching for Symmetric Broadcast Channels

Shirin Saeedi Bidokhti, University of Pennsylvania, United States; Michele Wigger, Telecom ParisTech, France; Aylin Yener, The Pennsylvania State University, United States; Abbas El Gamal, Stanford University, United States

Taa-3: Smart Networked Infrastructure (Invited)

Taa-3.1: Wholesale Electricity Pricing in the Presence of Geographical Load Balancing

Mohammed A. Abdelghany, University of California, Santa Barbara, United States; Hamed Mohsenian-Rad, University of California, Riverside, United States; Mahnoosh Alizadeh, University of California, Santa Barbara, United States

Taa-3.2: Distribution System Voltage Control under Uncertainties

Pan Li, Baosen Zhang, University of Washington, United States

Taa-3.4: Online Learning for “Thing-Adaptive” Fog Computing in IoT

Tianyi Chen, Yanning Shen, University of Minnesota, United States; Qing Ling, University of Science and Technology of China, China; Georgios B. Giannakis, University of Minnesota, United States

Taa-4: Structured and Covariance Matrix Recovery (Invited)

Taa-4.1: Learning the Second-Moment Matrix of a Smooth Function From Point Samples

Armin Eftekhari, Alan Turing Institute, United Kingdom; Michael Wakin, Colorado School of Mines, United States; Ping Li, Rutgers University, United States; Paul Constantine, University of Colorado at Boulder, United States; Rachel Ward, University of Texas at Austin, United States

Taa-4.2: Sketched Covariance Testing: A Compression-Statistics Tradeoff

Gautam Dasarathy, Rice University, United States; Parikshit Shah, Yahoo Research, United States; Richard Baraniuk, Rice University, United States

Taa-4.3: Performance Limits of Covariance-Driven Super Resolution Imaging

Heng Qiao, Piya Pal, University of California, San Diego, United States

Taa-4.4: Compressive Spectrum Estimation using Quantized Measurements

Haoyu Fu, Yuejie Chi, The Ohio State University, United States

TA-5: Tensor Methods (Invited)

TA-5.1: Kullback-Leibler Principal Component for Tensors is not NP-hard

Kejun Huang, University of Minnesota, United States; Nicholas D. Sidiropoulos, University of Virginia, United States

TA-5.2: Directed Network Topology Inference via Sparse Joint Diagonalization

Yanning Shen, University of Minnesota, United States; Xiao Fu, Oregon State University, United States; Georgios B. Giannakis, University of Minnesota, United States; Nicholas D. Sidiropoulos, University of Virginia, United States

TA-5.4: Analytical Performance Analysis of the Semi-Algebraic Framework for Approximate CP Decompositions via Simultaneous Matrix Diagonalizations (SECSI)

Sher Ali Cheema, Emilio Rafael Balda, Technical University Ilmenau, Germany; Amir Weiss, Arie Yeredor, Tel-Aviv University Israel, Israel; Martin Haardt, Technical University Ilmenau, Germany

TA-5.5: Balancing Interpretability and Predictive Accuracy for Unsupervised Tensor Mining

Ishmam Zabir, Evangelos Papalexakis, University of California, Riverside, United States

TA-5.6: Coupled Matrix-Tensor Factorizations - The Case of Partially Shared Factors

Lieven De Lathauwer, KU Leuven, Belgium; Eleftherios Kofidis, University of Piraeus, Greece

Taa-6: Signal Processing for Neuroimaging (Invited)

Taa-6.2: Multiscale modeling of dependencies between spikes and fields

Hamidreza Abbaspourazad, Han-Lin Hsieh, Maryam Shanechi, University of Southern California, United States
TAa-6.3: Latent Variable Models for Hippocampal Sequence Analysis

Etienne Ackermann, Caleb Kemere, Rice University, United States; Kourosh Maboudi, Kamran Diba, University of Wisconsin-Milwaukee, United States

TAa-6.4: On Robust Detection of Brain Stimuli with Ramanujan Periodicity Transforms

Pouria Saidi, George Atia, Azadeh Vosoughi, University of Central Florida, United States

TAa-7: Computer Arithmetic (Invited)

TAa-7.1: On the Relative Error of Computing Complex Square Roots in Floating-Point Arithmetic

Claude-Pierre Jeannerod, Inria, laboratoire LIP, Universite de Lyon, France; Jean-Michel Muller, CNRS, laboratoire LIP, Universite de Lyon, France

TAa-7.2: Optimized Leading Zero Anticipators for Faster Fused Multiply-Adds

David Lutz, ARM, United States

TAa-7.3: The Future of Computing - Arithmetic Circuits Implemented with Memristors

Nagaraja Revanna, Lauren Guckert, Earl Swartzlander, University of Texas at Austin, United States

TAa-7.4: On Left-to-Right Arithmetic

Milos Ercegovac, University of California, Los Angeles, United States

TAa-8: Statistical Signal Processing

TAa-8.1: Spectrum-Based Comparison of Multivariate Complex Random Signals of Unequal Lengths

Jitendra Tugnait, Auburn University, United States

TAa-8.2: SNR Threshold Region Prediction via Singular Value Decomposition of the Barankin Bound Kernel

John Kota, Systems & Technology Research, United States; Antonia Papandreou-Suppappola, Arizona State University, United States

TAa-8.3: Period Estimation with Linear Complexity of Sparse Time Varying Point Processes

Hans-Peter Berndt, Bernhard Etzlinger, Andreas Springer, Johannes Kepler University Linz, Austria

TAa-8.4: Estimation of Real Valued Impulse Responses based on Noisy Magnitude and Phase Measurements

Oliver Lang, Johannes Kepler University, Austria; Victor Elvira, IMT Lille Douai, France; Mario Huemer, Johannes Kepler University, Austria

TAa-8.5: On the Theoretical Analysis of Box-Constrained Adaptive Filters

Leilson Araujo, Vitor Nascimento, University of Sao Paulo, Brazil; Yuriy Zakharov, University of York, United Kingdom

TAa-8.6: Distribution Results for a Multi-Rank Version of the Reed-Yu Detector

Pooria Pakrooh, Louis Scharf, Colorado State University, United States; Ronald Butler, Southern Methodist Univeristy, United States

TAa-8.7: Statistical Two-Dimensional Edge Linear Prediction With Fast Algorithm

Lawrence Marple, Signal Research, United States

TAa-8.8: An Objective-Based Experimental Design Framework for Signal Processing in the Context of Canonical Expansions

Roozbeh Dehghannasiri, Xiaoning Qian, Edward Dougherty, Texas A&M University, United States

TAa-8: Adaptive Signal Processing II

TAa-8.1: On the use of Spectro-Temporal Modulation in Assisting Adaptive Feedback Cancellation for Hearing Aid Applications

Meng Guo, Oticon A/S, Denmark; Bernhard Kuenzle, Bernafon AG, Switzerland

TAa-8.2: Nonlinear Least-Mean-Squares Type Algorithm for Second-Order Interference Cancellation in LTE-A RF Transceivers

Andreas Gebhardt, Christian Motz, Johannes Kepler University, Austria; Ram Sunil Kanumalli, Harald Pretl, Danube Mobile Communications Engineering GmbH & Co KG, Austria; Mario Huemer, Johannes Kepler University, Austria

TAa-8.3: Acoustic Echo Cancellation Using Deep Cerebellar Model Articulation Controller

Lan Shih-Wei, Yuan Ze University, Taiwan; Yu Tsao, Academia Sinica, Taiwan; Junghsi Lee, Yuan Ze University, Taiwan
TAa-8.4: Adaptive Algorithm Based on a New Hyperbolic Sine Cost Function .......................................................... 812
Ahmad Khalifi, Qadri Mayyala, Naveed Iqbal, Azzedine Zerguine, King Fahd University of Petroleum & Minerals, Saudi Arabia; Karim Abed-Meraiam, University of Orléans, PRISME Lab, France

TAa-8.5: Adaptive Digital Filtering using the Bio-Inspired Firefly Algorithm .......................................................... 816
Magni Hussain, William Jenkins, Pennsylvania State University, United States

TAa-8.6: Optimal Blind-Adaptive Compensator for Time-Varying Frequency Selective IQ ............................. 820
Durga Laxmi Narayana Swamy Inti, A. A. (Louis) Beex, Virginia Tech, United States

TAa-8.7: On Quaternion Kernel Adaptive Filtering of Nonwhite, Noncircular, and Non-Gaussian Inputs ................. 825
Thomas Paul, Orbital ATK Inc., United States; Tokunbo Ogunfunmi, Santa Clara University, United States

TAa-8.8: Learning Robust General Radio Signal Detection using Computer Vision Methods .......................... 829
Timothy O’Shea, Tamoghna Roy, T. Charles Clancy, Virginia Tech, United States

TAa-8: Compressed Sensing
TAa-8.1: Efficient Online Dictionary Adaptation and Image Reconstruction for Dynamic MRI ................................. 835
Saiprasad Ravishankar, Brian E. Moore, Raj Rao Nadakuditi, Jeffrey A. Fessler, University of Michigan, United States

TAa-8.2: Modified Orthogonal Matching Pursuit for Multiple Measurement Vector with Joint Sparsity in Super-Resolution Compressed Sensing .......................... 840
Xuan Vinh Nguyen, Klaus Hartmann, Wolfgang Weihs, Otmar Loffeld, University of Siegen, Germany

TAa-8.3: Sparse Recovery With Quantized Multiple Measurement Vectors .......................................................... 845
Yacong Ding, Sung-En Chiu, Bhaskar D. Rao, University of California, San Diego, United States

TAa-8.4: Designing Optimal Sampling Schemes for Multi-Dimensional Data .......................................................... 850
Johan Swärd, Filip Elvander, Andreas Jakobsson, Lund University, Sweden

TAa-8.5: Hyperparameter-Selection for Sparse Regression: A Probabilistic Approach ................................. 853
Ted Kronvall, Andreas Jakobsson, Lund University, Sweden

TAa-8.6: Sparse Bayesian Learning using Variational Bayes Inference Based on a Greedy Criterion .......................... 858
Mohammad Shekaramiz, Todd Moon, Jacob Gunther, Utah State University, United States

TAa-8.7: Reconstruction from Periodic Nonlinearities, With Applications to HDR Imaging ..................................... 863
Vijay Shah, Mohammadreza Soltani, Chinmay Hegde, Iowa State University, United States

TAa-8.8: Non-tensor Wavelet Sparse Basis for Random Hirschman Sensing Matrices ........................................ 868
Peng Xi, Victor DeBrunner, Florida State University, United States

TAa-8: Information Theoretic and Networked Signal Processing
TAa-8.1: Improved Finite-Sample Estimate of a Nonparametric f-Divergence .................................................... 875
Prad Kadambi, Alan Wisler, Visar Berisha, Arizona State University, United States

TAa-8.2: Target Tracking via Recursive Bayesian State Estimation in Radar Networks ........................................... 880
Yijian Xiang, Washington University in St. Louis, United States; Murat Akcakaya, University of Pittsburgh, United States; Satyabrata Sen, Oak Ridge National Laboratory, United States; Deniz Erdogmus, Northeastern University, United States; Arye Nehorai, Washington University in St. Louis, United States

TAa-8.3: Exploration and Data Refinement via Multiple Mobile Sensors Based on Gaussian Processes ............. 885
Mohammad Shekaramiz, Todd Moon, Jacob Gunther, Utah State University, United States

TAa-8.4: Robust Estimation of the Magnitude Squared Coherence based on Kernel Signal Processing .................. 890
Ferran de Cabrera Estanyol, Jaume Riba Sagarra, Gregori Vázquez Grau, Technical University of Catalonia, Spain

TAa-8.5: Multilevel Group Testing via Sparse-Graph Codes .................................................................................. 895
Pedro Abdalla, Amirhossein Reisizadeh, Ramtin Pedarsani, University of California, Santa Barbara, United States

TAa-8.6: Multipulse Subspace Detectors ........................................................................................................... 900
Louis Scharf, Pooria Pakrooh, Colorado State University, United States
TAb-1: Cognitive Networks (Invited)
TAb-1.1: Deep Neural Network Architectures for Modulation Classification
Xiaoyu Liu, Diyu Yang, Aly El Gamal, Purdue University, United States
TAb-1.2: Non-parametric Learning to Infer Wireless Relays, Routes and Traffic Patterns
from Time Series of Spectrum Activity
Silvija Kokalj-Filipovic, Vencore Labs, Inc., United States; Predrag Spasojevic, Winlab, Rutgers University, United States; Alex Poylisher, Vencore Labs, Inc., United States
TAb-1.3: Intelligent Data Filtering in Constrained IoT Systems
Igor Burago, Davide Callegaro, Marco Levorato, Sameer Singh, University of California, Irvine, United States
TAb-1.4: Modulation Classification using Convolutional Neural Networks and Spatial Transformer Networks
Moein Mirmohammadsadeghi, Samer Hanna, Danijela Cabric, University of California, Los Angeles, United States

TAb-2: Millimeter-Wave MIMO Wireless Systems (Invited)
TAb-2.1: Multi-Aperture Phased Arrays Versus Multi-beam Lens Arrays for mmW Multiuser MIMO
Akbar Sayeed, University of Wisconsin, United States
TAb-2.3: milliProxy: a TCP Proxy Architecture for 5G mmWave Cellular Systems
Michele Polese, University of Padova, Italy; Marco Mezzavilla, Menglei Zhang, New York University, United States; Jing Zhu, Intel, United States; Sundeep Rangan, Shivendra Panwar, New York University, United States; Michele Zorzi, University of Padova, Italy
TAb-2.4: Non-Orthogonal Multiple Access for mmWave Drones with Multi-Antenna Transmission
Nadisanka Rupasinghe, Yavuz Yapici, Ismail Guvenc, North Carolina State University, United States; Yuichi Kakishima, Docomo Innovations, Inc., United States

TAb-3: Networks and Society (Invited)
TAb-3.1: Estimation of Vertex Degrees in a Sampled Network
Apratim Ganguly, Eric D. Kolaczyk, Boston University, United States
TAb-3.2: Joint Inference of Networks from Stationary Graph Signals
Santiago Segarra, Yuhao Wang, Caroline Uhler, Massachusetts Institute of Technology, United States; Antonio Marques, King Juan Carlos University, Spain
TAb-3.3: Soft Unveiling of Communities via Egonet Tensors
Fatemeh Sheikholeslami, Georgios B. Giannakis, University of Minnesota, United States
TAb-3.4: Aggregate Learning in Networks of Strategic Agents
Amir Ajorlou, Ali Jadbabaie, Munther Dahleh, Massachusetts Institute of Technology, United States

TAb-4: Adaptive Sensing (Invited)
TAb-4.1: Enhanced Online Subspace Estimation via Adaptive Sensing
Greg Ongie, David Hong, Dejiao Zhang, Laura Balzano, University of Michigan, United States

TAb-6: Computational Ultrasound Imaging (Invited)
TAb-6.1: Image Reconstruction from Coded Excitation Transmit Schemes Using a Linear Model Approach
John Flynn, Lauren Pflugrath, Ron Daigle, Verasonics, Inc., United States
TAb-6.2: Inverse Problem Approaches for Coded High Frame Rate Ultrasound Imaging
Denis Bujoreanu, Barbara Nicolas, Denis Friboulet, Hervé Liebgott, University of Lyon, CREATIS, France
TAb-6.3: Physics and Data Driven Models for Ultrasound Image Reconstruction
Brett Byram, Kazuyuki Dei, Adam Luchies, Vanderbilt University, United States

TAb-6.4: Spatial Compression in Ultrasound Imaging
Pim van der Meulen, Delft University of Technology, Netherlands; Pieter Kruizinga, Johannes G. Bosch, Erasmus MC, Netherlands; Geert Leus, Delft University of Technology, Netherlands

TAb-7: Computer Arithmetic Algorithms
TAb-7.1: Complex Block Floating-Point Format with Box Encoding For Wordlength Reduction in Communication Systems
Yeong Foong Choo, Brian L. Evans, University of Texas at Austin, United States; Alan Gatherer, Huawei Technologies, United States

TAb-7.2: Parallel GF(2n) Multipliers
Trenton Grale, Earl Swartzlander, The University of Texas at Austin, United States

TAb-7.3: Twiddle Factor Complexity Analysis of Radix-2 FFT Algorithms for Pipelined Architectures
Fahad Qureshi, Jarmo Takala, Tampere University of Technology, Finland

TAb-7.4: A Combined IEEE Half and Single Precision Floating Point Multipliers for Deep Learning
Tuan Nguyen, James Stine, Oklahoma State University, United States

TAb-8: Massive MIMO Communication Systems
TAb-8.2: A Joint Combiner and Bit Allocation Design for Massive MIMO Using Genetic Algorithm
Sirra I. Zakir Ahmed, Hamid Sadjadipour, University of California, Santa Cruz, United States; Shahram Yousefi, Queen’s University, Canada

TAb-8.3: Sectoring in Multi-cell Massive MIMO Systems
Shahram Shahsavari, Parisa Hassanzadeh, New York University, United States; Alexei Ashikhmin, Nokia Bell Labs, United States; Elza Erkip, New York University, United States

TAb-8.4: On Angular-Domain Channel Estimation for One-Bit Massive MIMO Systems with Fixed and Time-Varying Thresholds
Pu Wang, Mitsubishi Electric Research Laboratories, United States; Jian Li, University of Florida, United States; Milutin Pajovic, Petros Boufounos, Philip Orlik, Mitsubishi Electric Research Laboratories, United States

TAb-8.6: Proof-of-Concept of Flexible Massive MIMO Beamforming at 2.4 GHz
Thomas Wirth, Matthias Mehlhose, Lars Thiele, Thomas Haustein, Fraunhofer Heinrich Hertz Institute, Germany

TAb-8.7: Pilot Decontamination Under Imperfect Power Control
Jitendra Tugnait, Auburn University, United States

TAb-8.8: Large-Scale Antenna-Assisted Grant-Free Non-Orthogonal Multiple Access via Compressed Sensing
Hanyu Wang, Yanlun Wu, Jun Fang, Gang Wu, University of Electronic Science and Technology, China

TAb-8: Issues in MIMO System Design
TAb-8.1: Delay-Aware Routing and Data Transmission for Multi-Hop D2D Communications Under Stochastic Interference Constraints
Sireesha Madabhushi, Chandra Murthy, Indian Institute of Science, India

TAb-8.2: Layered Graph-Merged Detection and Decoding of Non-Binary LDPC Coded Massive MIMO Systems
Shusen Jing, Junmei Yang, Huayi Zhou, Southeast University, China; Yeong-Luh Ueng, National Tsing Hua University, Taiwan; Xiaohu You, Chuan Zhang, Southeast University, China

TAb-8.3: A Greedy Approach for mmWave Hybrid Precoding with Subarray Architectures
Marcin Iwanow, Nikola Vucic, Samer Bazzi, Jian Luo, Huawei Technologies, Germany; Wolfgang Utschick, Technical University of Munich, Germany

TAb-8.4: Criterion of Adaptively Scaled Belief for PDA in Overloaded MIMO Channels
Takumi Takahashi, Shinsuke Ibi, Seiichi Sampei, Osaka University, Japan
TAB-8.5: Joint User Scheduling and Power optimization in Full-Duplex Cells with Successive Interference Cancellation
Shahram Shahsavari, David Ramirez, New York University, United States; Elza Erkip, NYU Tandon School of Engineering, United States

TAB-8.6: On beam design for sparse arrays of subarrays using multi-objective optimization and estimation-theoretic criteria
Anant Gupta, Upamanyu Madhow, University of California, Santa Barbara, United States; Amin Arbabian, Stanford University, United States; Ali Sadri, Intel Corporation, United States

TAB-8.7: Single Carrier; Frequency Domain Equalizers; Adaptive Equalizers; Adaptive Signal Processing
Baki Berkay Yilmaz, Georgia Institute of Technology, United States; Alper T. Erdogan, Koc University, Turkey

TAB-8.8: Impact of Interference Correlation on the Decoding Error Statistics
Fernando Rosas, Imperial College London, United Kingdom; Konstantinos Manolakis, Huawei Technologies, Germany; Christian Oberli, Pontificia Universidad Catolica de Chile, Chile; Mahdi Azari, Marian Verhelst, Sofie Pollin, KU Leuven, Belgium

TAB-8: Array Processing Algorithms for Radar

TAB-8.1: Time and Frequency Corrections in a Distributed Radio Network
Sam Whiting, Dana Soenssen, Todd Moon, Jacob Gunther, Utah State University, United States

TAB-8.2: Joint Radar-Communications System Implementation Using Software Defined Radios: Feasibility and Results
Richard M. Gutierrez, Andrew Herschfelt, Hanguang Yu, Hyunseok Lee, Daniel Bliss, Arizona State University, United States

TAB-8.3: Frequency Invariant Beamforming for Arbitrary Planar Arrays
Alessio Medda, Georgia Tech Research Institute, United States; Arjun Patel, Georgia Institute of Technology, United States

TAB-8.4: Time-Decentralized DOA Estimation for Electronic Surveillance
Songsri Sirianunpiboon, Stephen D. Howard, Stephen D. Elton, Defence Science & Technology Group, Australia

TAB-8.5: One-Bit Digital Radar
Jiaying Ren, Jian Li, University of Florida, United States

TAB-8.6: Analysis of Sparse Co-Prime Sensing Array Performance Using Wideband Noise Signals
David Alexander, Ram Narayanan, The Pennsylvania State University, United States; Braham Himed, US Air Force Research Laboratory, United States

TAB-8.7: Joint Transmit-Receive Beamspace Design for Colocated MIMO Radar in the Presence of Deliberate Jammers
Jiawei Liu, Mohammad Saquib, University of Texas at Dallas, United States

TAB-8.8: Radar Detection in K-Distributed Clutter Plus Noise using L-Statistics
James A. Ritcey, University of Washington, United States

TAB-8: Source Localization

TAB-8.1: Distributed Beamforming with High Altitude Balloon Relays
Ameya Agaskar, Keith Forsythe, Navid Yazdani, MIT Lincoln Laboratory, United States

TAB-8.2: On the Accuracy of Array Manifold Models
Benjamin Friedlander, University of California, Santa Cruz, United States

TAB-8.3: The Role of Difference Coarrays in Correlation Subspaces
Chun-Lin Liu, P. P. Vaidyanathan, California Institute of Technology, United States

TAB-8.4: A Newton-type Forward Backward Greedy Method for Multi-Snapshot Compressed Sensing
Ahmad Bazzi, RivieraWaves-CEVA and EURECOM, France; Dirk Slock, Lisa Meilhac, EURECOM, France

TAB-8.5: DOA Estimation with k-times Extended Co-prime Arrays
Xiaomeng Wang, Xin Wang, Stony Brook University, United States
TAb-8.6: Cumulant-Based Direction-of-Arrival Estimation Using Multiple Co-Prime Frequencies
Ammar Ahmed, Yimin D. Zhang, Temple University, United States; Braham Himed, Air Force Research Laboratory, United States

TAb-8.7: Analog Beam Tracking in Linear Antenna Arrays: Convergence, Optimality, and Performance
Jiahui Li, Tsinghua University, China; Yin Sun, Auburn University, United States; Limin Xiao, Shidong Zhou, Tsinghua University, China; C. Emre Koksal, The Ohio State University, United States

TAb-8.8: Array Calibration in the Presence of Linear Manifold Distortion
Benjamin Friedlander, University of California, Santa Cruz, United States

TPa-1: Fundamentals of mmWave Communications
TPa-1.1: Rate-Optimal Power and Bandwidth Allocation in an Integrated Sub-6 GHz –
Morteza Hashemi, C. Emre Koksal, Ness B. Shroff, The Ohio State University, United States

TPa-1.2: Managing Analog Beams in mmWave Networks
Yasaman Ghasempour, Rice University, United States; Narayan Prasad, Futurewei, United States; Mohammad Khojastepour, Sampath Rangarajan, NEC Labs, United States

TPa-1.3: Energy Efficient Beam-Alignment in Millimeter Wave Networks
Muddassar Hussain, Nicolo Michelusi, Purdue University, United States

TPa-1.4: 5G Millimeter Wave Cellular System Capacity with Fully Digital Beamforming
Souriya Dutta, C. Nicolas Barati, Aditya Dhananjay, Sundeep Rangan, New York University, Tandon School of Engineering, United States

TPa-2: Noncoherent Wireless Communications (Invited)
TPa-2.1: Direction Finding Using Non-coherent Measurements in Large Antenna Arrays
Mainak Chowdhury, Milind Rao, Andrea Goldsmith, Stanford University, United States

TPa-2.2: Design and Analysis of a Practical Codebook for Non-Coherent Communications
Khac-Hoang Ngo, Alexis Decurninge, Maxime Guillaud, Huawei Technologies France SASU, France; Sheng Yang, LSS, CentraleSupelec, France

TPa-2.3: Hierarchical Coherent and Non-coherent Communication
Kareem Attiah, University of Alexandria, Egypt; Karim Seddik, American University in Cairo, Egypt; Ramy Gohary, Carleton University, Canada

TPa-2.4: Noncoherent Multi-User MIMO Communications using Covariance CSIT
Christo Thomas Kurisummoottil, Wassim Tabikh, Dirk Slotk, EURECOM, France; Yi Yuan-Wu, Orange Labs, France

TPa-3: Medical Image Acquisition and Reconstruction (Invited)
TPa-3.1: Reconstructing High-Resolution Cardiac MR Movies from Under-Sampled Frames
Liam Cattell, Craig H. Meyer, Frederick H. Epstein, Gustavo K. Rohde, University of Virginia, United States

TPa-3.2: Whole Brain Reconstruction from Multilayered Sections of a Mouse Model of Status Epilepticus
Haoyi Liang, Natalia Dabrowska, Jaideep Kapur, Daniel Weller, University of Virginia, United States

TPa-3.3: Improved Efficiency for Microstructure Imaging using High-Dimensional MR Correlation Spectroscopic Imaging
Daesun Kim, University of Southern California, United States; Jessica L. Wisnowski, Children’s Hospital Los Angeles, United States; Justin P. Haldar, University of Southern California, United States

TPa-4: Crowdsourcing (Invited)
TPa-4.2: A Game-Theoretic Approach to a Task Delegation Problem
Donya Ghavidel Dobakhshari, University of Notre Dame, United States; Lav Varshney, University of Illinois at Urbana-Champaign, United States; Vijay Gupta, University of Notre Dame, United States
TPa-4.3: Mismatched Crowdsourcing: Mining Latent Skills to Acquire Speech Transcriptions
Mark Hasegawa-Johnson, University of Illinois at Urbana-Champaign, United States; Preethi Jyothi, Indian Institute of Technology Bombay, United States; Wenda Chen, University of Illinois at Urbana-Champaign, United States; Van Hai Do, Thuyloi University, Viet Nam

TPa-5: Array Processing for Spectrum Sharing (Invited)
TPa-5.1: Spectrum Sharing Between Radar and Communication systems: Can The Privacy Of the Radar Be Preserved?
Anastasios Dimas, Bo Li, Rutgers, The State University of New Jersey, United States; Matthew Clark, Konstantinos Psounis, University of Southern California, United States; Athina Petropulu, Rutgers, The State University of New Jersey, United States
TPa-5.2: Interference Alignment Based Precoder-Decoder Design for Radar-Communication Co-Existence
Yuanhao Cui, Aalto University and Beijing University of Posts and Telecommunications, Finland; Visa Koivunen, Aalto University, Finland; Xiaojun Jing, Beijing University of Posts and Telecommunications, China
TPa-5.3: Multiple-Antenna Multiple-Access Joint Radar and Communications Systems
Yu Rong, Alex Chiriyath, Daniel Bliss, Arizona State University, United States
TPa-5.4: Robust Astronomical Imaging under Coexistence with Wireless Communications
Shuimei Zhang, Yujie Gu, Ben Wang, Yimin D. Zhang, Temple University, United States

TPa-6: Biomedical Signal Processing and Information Extraction (Invited)
TPa-6.1: Brain Language: Uncovering Functional Connectivity Codes
Victor Vergara, Vince Calhoun, The Mind Research Network, United States
TPa-6.2: Predicting Postoperative Delirium in Patients Undergoing Deep Hypothermia: Circulatory Arrest
Owen Ma, Arindam Dutta, Daniel Bliss, Arizona State University, United States; Amy Crepeau, Mayo Clinic, United States
TPa-6.3: Analysis of Fetal Heart Rate Series by Nonparametric Hidden Markov Models
Kezi Yu, J. Gerald Quirk, Petar Djuric, Stony Brook University, United States
TPa-6.4: Multiple Interface Brain and Head Models for EEG: A Surface Charge Approach
Francisco J. Solis, Antonia Papandreou-Suppappola, Arizona State University, United States

TPa-7: Computer Architecture
TPa-7.1: Performance Comparison of AES-GCM-SIV and AES-GCM Algorithms for Authenticated Encryption on FPGA Platforms
Sandhya Koteshwara, University of Minnesota, United States; Amitabh Das, Intel Corporation, United States; Keshab K. Parhi, University of Minnesota, United States
TPa-7.2: An Efficient Reconfigurable Hardware Accelerator for Convolutional Neural Networks
Anaam Ansari, Kiran Gunnam, Tokunbo Ogunfunmi, Santa Clara University, United States
TPa-7.3: A Low-Power Digital ASIC for Detecting Heart-rate and Missing Beat
Sepideh Nouri, Behnaam Aazhang, Rice University, United States; Mehdi Razavi, Texas Heart Institute, United States; Joseph R. Cavallaro, Rice University, United States
TPa-7.4: An Effective Hardware Implementation of 1024-point Linear Convolution Based on Hirschman Optimal Transform
Dingli Xue, Linda S. DeBrunner, Florida State University, United States

TPa-8: Networks and Graphs
TPa-8.1: Distributed Convergence Verification for Gaussian Belief Propagation
Jian Du, Soumya Kar, Jose’ M. F. Moura, Carnegie Mellon University, United States
TPa-8.3: Control of Networked Systems in the Graph-Frequency Domain
Juan Andres Bazerque, Pablo Monzon, Universidad de la Republica - Uruguay, Uruguay
TPa-8.4: Broadcast Caching Networks with Two Receivers and Multiple Correlated Sources
Parisa Hassanzadeh, New York University, Tandon School of Engineering, United States; Antonia Tulino, Nokia, Bell Labs & University of Naples Federico II, United States; Jaime Llorca, Nokia, Bell Labs, United States; Elza Erkip, New York University, Tandon School of Engineering, United States

TPa-8.6: Consensus State Gram Matrix Estimation for Stochastic Switching Networks from Spectral Distribution Moments
Stephen Kruzick, Jose’M. F. Moura, Carnegie Mellon University, United States

TPa-8.8: Representation of Positive Alpha-Stable Network Traffic Through Levy Mixtures
Chad Bollmann, Murali Tummala, John McEachen, Naval Postgraduate School, United States

TPa-8: Biomedical Signal Processing
TPa-8.1: Toward Depth Estimation using Mask-Based Lensless Camera
M. Salman Asif, University of California, Riverside, United States

TPa-8.2: Glaucoma Detection using Texture Features Extraction
Kavya N, Dr Padmaja K V, RV College of Engineering, India

TPa-8.5: ECG Segmentation Using Adaptive Hermite Functions
Péter Kovács, Eötvös L. University, Hungary; Carl Böck, Johannes Kepler University, Austria; Jens Meier, Kepler University Hospital, Austria; Mario Huemer, Johannes Kepler University, Austria

TPa-8.6: Optimal Finite-Horizon Sensor Selection for Boolean Kalman Filter
Mahdi Imani, Ulisses Braga-Neto, Texas A&M University, United States

TPa-8.7: Variational Principle for Ultrasonic Artifact Correction and Signal Segmentation
Jue Wang, Union College, United States; Yongjian Yu, University of Virginia, United States

TPa-8.8: Model-Based Decoding of Time-Varying Visual Information during Saccadic Eye Movements using Population-Level Information
Kaiser Niknam, Amir Akbarian, Behrad Noudoost, Neda Nategh, University of Utah, United States

TPa-8: Networks and Applications
TPa-8.1: Distributed Center and Coverage Region Estimation in Wireless Sensor Networks
Sai Zhang, Cihan Tepedelenlioglu, Andreas Spanias, Arizona State University, United States

Using Diffusion Adaptation

TPa-8.2: Load Forecasting Based Distribution System Network Reconfiguration–A Distributed Data-Driven Approach
Yi Gu, University of Denver, United States; Huaiguang Jiang, National Renewable Energy Laboratory, United States; Jun Jason Zhang, University of Denver, United States; Yingchen Zhang, Eduard Muljadi, National Renewable Energy Laboratory, United States; Francisco J. Solis, Arizona State University, United States

TPa-8.3: Chance-Constrained Day-Ahead Hourly Scheduling in Distribution System Operation
Yi Gu, University of Denver, United States; Huaiguang Jiang, National Renewable Energy Laboratory, United States; Jun Jason Zhang, University of Denver, United States; Yingchen Zhang, Eduard Muljadi, National Renewable Energy Laboratory, United States; Francisco J. Solis, Arizona State University, United States

TPa-8.4: Modeling and Optimization of Complex Building Energy Systems with Deep Neural Networks
Yize Chen, Yuanyuan Shi, Baosen Zhang, University of Washington, United States

TPa-8.5: Optimal Measurement Policy for Predicting UAV Network Topology
Abolfazl Razi, Fatemeh Afghah, Northern Arizona University, United States; Jacob Chakareski, University of Alabama, United States

TPa-8.6: Sensor Selection and Power Allocation via Maximizing Bayesian Fisher Information for Distributed Vector Estimation
Mojtaba Shirazi, Alireza Sani, Azadeh Vosoughi, University of Central Florida, United States

TPa-8.7: Detecting Adversaries in Distributed Estimation
Yuan Chen, Soumya Kar, Jose’M. F. Moura, Carnegie Mellon University, United States

TPa-8.8: Authentication of Parties in Piggy Bank Cryptography
Prashanth Busireddygari, Subhash Kak, Oklahoma State University, United States
TPa-8: Networks for Communication Systems
TPa-8.1: A Distributed Admission Control Algorithm for Multicell MISO Downlink Systems .................................................. 1397
Shashika Manosha Kapurushamy Badalge, Satya Joshi, Marian Codreanu, Nandana Rajatheva, Matti Latva-aho, University of Oulu, Center for Wireless Communications, Finland
TPa-8.2: Fractional Frequency Reuse Scheme for Interference Mitigation in ................................................................. 1402
Devarani Ningombam, Jae-Young Pyun, Suk-Seung Hawng, Seokjoo Shin, Chosun University, Republic of Korea
TPa-8.3: Semi-distributed Conflict-free Multichannel TDMA Link Scheduling for 5G ................................................................. 1407
Zahra Naghsh, Shahrokh Valaee, University of Toronto, Canada
TPa-8.4: Trajectory Optimization for Mobile Access Point .............................................................................................. 1412
Rajeev Gangula, Paul de Kerret, Omid Esrafilian, David Gesbert, EURECOM, France
TPa-8.5: Identifying Coverage Holes: Where To Density? ................................................................. 1417
Rebal Jurdi, Jeffrey Andrews, University of Texas at Austin, United States; Dave Parsons, Crown Castle, United States; Robert W. Heath Jr, University of Texas at Austin, United States
TPa-8.6: Optimal Power Control and Scheduling under Hard Deadline Constraints for ......................................................... 1422
Continuous Fading Channels
Ahmed Ewaisha, Cihan Tepedelenlioglu, Arizona State University, United States
TPa-8.7: The Role of Transmitter Cooperation in Linear Interference Networks with Block Erasures
Yasemin Karacora, Tolunay Seyfi, Aly El Gamal, Purdue University, United States
TPa-8.8: Exploring Spatial Motifs for Device-to-Device Network Analysis (DNA) in 5G ......................................................... 1432
Networks
Tengchan Zeng, Virginia Tech, United States; Omid Semiari, Georgia Southern University, United States; Walid Saad, Virginia Tech, United States

TPb-1: Hardware Designs for 5G Wireless Systems (Invited)
TPb-1.1: Adaptive and Multi-Mode Baseband Systems for Next Generation Wireless .......................................................... 1499
Communication
Farhana Sheikh, Ankit Sharma, Oskar Andersson, Mehnaz Rahman, Dongmin Yoon, Alexios Balatsoukas-Stimming, Deepak Dasalukunte, Anthony Chun, Intel Corporation, United States
TPb-1.2: VLSI Design of a Nonparametric Equalizer for Massive MU-MIMO ................................................................. 1504
Charles Jeon, Gulnar Mirza, Ramina Ghods, Arian Maleki, Christoph Studer, Cornell University, United States
TPb-1.4: Segmented Successive Cancellation List Polar Decoding with Joint BCH-CRC ......................................................... 1509
Codes
Xiao Liang, Huayi Zhou, Southeast University, China; Zhongfeng Wang, Nanjing University, China; Xiaohu You, Chuan Zhang, Southeast University, China

TPb-2: Massive MIMO Systems
TPb-2.1: Cell-Free Massive MIMO Systems Utilizing Multi-Antenna Access Points ................................................................. 1517
Ahmad Ibrahim, Purdue University, United States; Alexei Ashikhmin, Bell Labs, United States; Thomas Marzetta, New York University, United States; David J. Love, Purdue University, United States
TPb-2.2: Greed is Good: Leveraging Submodularity for Antenna Selection in Massive ......................................................... 1522
MIMO
Aritra Konar, Nicholas D. Sidiropoulos, University of Minnesota-Twin Cities, United States
TPb-2.3: Massive MIMO Functionality Splits based on Hybrid Analog-Digital Precoding ......................................................... 1527
in a C-RAN Architecture
Dong Min Kim, Jihong Park, Elisabeth De Carvalho, Carles Navarro Manchón, Aalborg University, Denmark
TPb-2.4: Decentralized Equalization for Massive MU-MIMO on FPGA ............................................................................... 1532
Kaipeng Li, Rice University, United States; Charles Jeon, Cornell University, United States; Joseph R. Cavallaro, Rice University, United States; Christoph Studer, Cornell University, United States
TPb-3: Networks of the Brain (Invited)
TPb-3.1: Graph Slepians to Probe Into Large-Scale Network Organization of Resting-State .................1539
Functional Connectivity
   Maria Giulia Preti, Dimitri Van De Ville, Ecole Polytechnique Fédérale de Lausanne and University of Geneva, Switzerland
TPb-3.2: Robust Tensor Decomposition of Resting Brain Networks in Stereotactic EEG .........................1544
   Jian Li, University of Southern California, United States; John Mosher; Dileep Nair; Jorge Gonzalez-Martinez, Cleveland Clinic, United States; Richard Leahy, University of Southern California, United States
TPb-3.3: Multiscale network analysis through tail-greedy bottom-up approximation, with .....................1549
   applications in neuroscience
   Xinyu Kang, Boston University, United States; Piotr Fryzlewicz, London School of Economics, United Kingdom; Catherine Chu, Massachusetts General Hospital, United States; Mark Kramer; Eric D. Kolaczyk, Boston University, United States
TPb-3.4: Multi-kernel Change Detection for Dynamic Functional Connectivity Graphs .........................1555
   Georgios Vasileios Karamanakis, University of Minnesota, United States; Olaf Sporns, Indiana University, United States; Georgios B. Giannakis, University of Minnesota, United States

TPb-4: Adaptive Signal Processing I
TPb-4.1: Using Random Matrix Theory to Improve Radar Space-Time Adaptive Processing .....................1563
   Peter Tuuk, James McClellan, Georgia Institute of Technology, United States
TPb-4.2: Conjugate Gradients Based Stochastic Adaptive Filters ..........................................................1569
   Chandrasekhar Radhakrishnan, Andrew Singer, University of Illinois at Urbana-Champaign, United States
TPb-4.3: Invariance and the Bayesian Approach to Generalized Coherence Tests .................................1573
   Stephen D. Howard, Songsri Sirianunpiboon, Defence Science & Technology Group, Australia;
   Douglas Cochran, Arizona State University, United States
TPb-4.4: Hilbert Space Geometry of Quadratic Covariance Bounds .......................................................1578
   Stephen Howard, Defence Science and Technology Group, Australia; William Moran, Royal Melbourne Institute of Technology, Australia; Pooria Pakrooh, Louis Scharf, Colorado State University, United States

TPb-5: Sparsity and Structure in Human Bio-Imaging (Invited)
TPb-5.3: Spike Localization in Zero Time of Echo (ZTE) Magnetic Resonance Imaging ..........................1585
   Ali Koochakzadeh, Piya Pal, Eric Ahrens, University of California, San Diego, United States
TPb-5.4: SPECT Image Reconstruction under Imaging Time Constraints ..............................................1590
   Igor Fedorov, Sebastian Obrzut, Bongyong Song, Bhaskar D. Rao, University of California, San Diego, United States

TPb-6: Asynchronous and Neural Computing (Invited)
TPb-6.1: How to Think About Self-Timed Systems .................................................................................1597
   Marly Roncken, Ivan Sutherland, Chris Chen, Yong Hei, Portland State University, United States;
   Warren Hunt, Cuong Chau, The University of Texas, United States; Swetha Mettala Gilla, Hoon Park,
   Xiaoyu Song, Portland State University, United States; Anping He, Lanzhou University, China; Hong
   Chen, Tsinghua University, China
TPb-6.3: Real-Time, Data-Driven System to Learn Parameters for Multisite Pacemaker ..........................1610
   Beat Detection
   Yu Chen, Yannis Tsividis, Columbia University, United States
TPb-6.5: Efficient online learning with low-precision synaptic variables ...............................................1610
   Marcus K. Benna, Stefano Fusi, Columbia University, United States
TPb-7: Optimization Methods for Image Processing (Invited)

TPb-7.1: PhasePack: A Phase Retrieval Library

Rohan Chandra, University of Maryland, United States; Ziyuan Zhong, Columbia University, United States; Justin Hontz, University of Maryland, United States; Val McCulloch, Smith College, United States; Christoph Studer, Cornell University, United States; Tom Goldstein, University of Maryland, United States

TPb-7.2: Convex Inversion of the Entrywise Product of Real Signals with Known Signs

Alireza Aghasi, Georgia State University, United States; Ali Ahmed, Information Technology University, Pakistan; Paul Hand, Rice University, United States

TPb-7.4: Partial Differential Equations for Training Deep Neural Networks

Pratik Chaudhari, University of California, Los Angeles, United States; Adam Oberman, McGill University, United States; Stanley Osher, Stefano Soatto, University of California, Los Angeles, United States; Guillaume Carlier, Universite Paris IX Dauphine, United States

TPb-8: Privacy, Secrecy and Channel Capacity

TPb-8.1: Detection and Mitigation of Pilot Spoofing Attack

Jitendra Tugnait, Auburn University, United States

TPb-8.2: Function Computation with Privacy Constraints

Wenwen Tu, Lifeng Lai, University of California, Davis, United States

TPb-8.3: Bayesian Time Series Matching and Privacy

Ke Li, Hossein Pishro-Nik, Dennis Goeckel, University of Massachusetts Amherst, United States

TPb-8.4: Full-Duplex Communications for Wireless Links with Asymmetric Capacity

Requirements

Orion Afisiadis, École Polytechnique Fédérale de Lausanne, Switzerland; Andrew C. M. Austin, University of Auckland, New Zealand; Alexis Balatsoukas-Stimming, Andreas Burg, École Polytechnique Fédér de Lausanne, Switzerland

TPb-8.5: MIMO Wiretap Channel with ISI Heterogeneity– Achieving Secure DoF with no CSI

Jean Mutangana, Deepak Kumar, Ravi Tandon, University of Arizona, United States

TPb-8.6: Covert Active Sensing of Linear Systems

Dennis Goeckel, University of Massachusetts, United States; Boulat Bash, Raytheon BBN Technologies, United States; Azadeh Sheikholeslami, University of Massachusetts, United States; Saikat Guha, University of Arizona, United States; Donald Towsley, University of Massachusetts, United States

TPb-8.7: Covert Communications on Continuous-Time Channels in the Presence of Jamming

Tamara Sobers, The MITRE Corporation, United States; Boulat Bash, Raytheon BBN Technologies, United States; Saikat Guha, University of Arizona Tuscon, United States; Donald Towsley, Dennis Goeckel, University of Massachusetts Amherst, United States

TPb-8.8: On the Combined Effect of Directional Antennas and Imperfect Spectrum Sensing upon Ergodic Capacity of Cognitive Radio Systems

Hassan Yazdani, Azadeh Vosoughi, University of Central Florida, United States

TPb-8: Communication System Design and Resource Allocation

TPb-8.1: Underwater Acoustic Communications Using Quasi-Orthogonal Chirps

Song-Wen Huang, George Sklivanitis, State University of New York at Buffalo, United States; Dimitris A. Pados, Stella N. Batalama, Florida Atlantic University, United States

TPb-8.2: Pulse Design for Spectrally Efficient Transmissions Assuming Maximum Likelihood Detection

Baptiste Cavarec, Mats Bengtsson, Royal Institute of Technology, Sweden

TPb-8.3: Path-Based Channel Estimation for Acoustic OFDM Systems: Real Data Analysis

Amir Tadayon, Milica Stojanovic, Northeastern University, United States

TPb-8.4: On the Performance of Polar Codes for 5G eMBB Control Channel

Seyyed Ali Hashemi, Carlo Condo, Furkan Ercan, Warren Gross, McGill University, Canada

TPb-8.5: Multiple Transmitter Localization using Clustering by Likelihood of Transmitter Proximity

Marjan Saadati, Jill Nelson, George Mason University, United States
TPb-8.6: Kolkata Paise Restaurant Game for Resource Allocation in the Internet of Things .............................................1774
Taehyeun Park, Walid Saad, Virginia Tech, United States

TPb-8.7: Implementation Approaches for 512-tap 60 GSa/s Chromatic Dispersion FIR Filters ........................................1779
Anton Kovalev, Oscar Gustafsson, Mario Garrido, Linköping University, Sweden

TPb-8.8: Brain-Aware Wireless Networks: Learning and Resource Management ..............................................................1784
Ali Taleb Zadeh Kasgari, Walid Saad, Virginia Tech, United States; Merouane Debbah, CentraleSupelec, Université Paris-Saclay, France

TPb-8: Coding Theory and Sequences
TPb-8.1: Zero-Forcing Precoding Using Generalized Inverses for G.fast DSL Systems ..........................................................1709
Andreas Barthelme, Michael Joham, Technische Universität München, Germany; Rainer Strobel, Intel, Germany; Wolfgang Utschick, Technische Universität München, Germany

TPb-8.2: A Coding Scheme for Reliable In-Memory Hamming Distance Computation .........................................................1713
Zehui Chen, Clayton Schoeny, University of California, Los Angeles, United States; Yuval Cassuto, Technion - Israel Institute of Technology, Israel; Lara Dolecek, University of California, Los Angeles, United States

TPb-8.3: Polar Coding for the Large Hadron Collider: Challenges in Code Concatenation ..................................................1718
Alexios Balatsoukas-Stimming, Tomasz Podzorny, Jan Uythoven, European Laboratory for Particle Physics (CERN), Switzerland

TPb-8.4: A Block-Based Tomlinson-Harashima Precoder for Wireless Uplink ........................................................................1723
Ismaïl Mohamed, Vaughan Clarkson, University of Queensland, Australia

TPb-8.5: Joint Constellation and Code Design for the Gaussian Multiple Access Channel ......................................................1728
Yu-Chung Liang, Stefano Rini, National Chiao Tung University, Taiwan; Joerg Kliewer, New Jersey Institute of Technology, United States

TPb-8.6: Pseudorandom Tableau Sequences ..........................................................................................................................1733
Prashanth Busireddygari, Subhash Kak, Oklahoma State University, United States

TPb-8.7: Effect of Inter-User Delay and Channel Phase Response on MC-CDMA using .......................................................1737
WBE Codes with Application to Lower VHF
Fikadu Daggefu, Army Research Laboratory, United States; Predrag Spasojevic, Oak Ridge Associated Universities / Rutgers University, United States; Gunjan Verma, Brian Sadler, Army Research Laboratory, United States

TPb-8.8: Uniquely Generated Paraunitary-Based Complementary QAM Sequences ......................................................................1742
Predrag Spasojevic, Rutgers University, United States; Srdjan Budišin, RT-RK, Yugoslavia

TPb-8: Detection Methods and mmWave Systems
TPb-8.1: Detection of Almost-Cyclostationarity: An Approach Based on a Multiple Hypothesis ...............................................1635
Test
Stefanie Horstmann, Universität Paderborn, Germany; David Ramirez, Universidad Carlos III de Madrid, Spain; Peter J. Schreier, Universität Paderborn, Germany

TPb-8.3: Multi-scale Spectrum Sensing in Millimeter Wave Cognitive Networks .................................................................1640
Nicolo Michelusi, Purdue University, United States; Matthew Nokleby, Wayne State University, United States; Urbashi Mitra, University of Southern California, United States; Robert Calderbank, Duke University, United States

TPb-8.4: CA-CFAR Detection Based on an AWG Interference Model in a Low-Complexity WCP-OFDM Receiver ......................1645
Steven Mercier, Stéphanie Bidon, Damien Roque, Univ. Toulouse, France

TPb-8.5: Synchronization Signal Design and Hierarchical Detection for the D2D Sidelink .......................................................1650
Konstantinos Manolakis, Wen Xu, Huawei Technologies, Germany; Giuseppe Caire, Technische Universität Berlin, Germany

TPb-8.6: 60 GHz Blockage Study Using Phased Arrays .............................................................................................................1655
Christopher Slezak, Aditya Dhananjay, Sundeepp Rangan, New York University, United States

TPb-8.7: Two-Stage LASSO ADMM Signal Detection Algorithm For Large Scale MIMO ......................................................1660
Anis Elgabli, Purdue University, United States; Ali Elghariani, University of Tripoli, Libyan Arab Jamahiriya; Abubakr O. Al-Abbasi, Mark Bell, Purdue University, United States
WAA-1: Theory of Wireless Systems
WAA-1.1: On Deep Learning-Based Communication Over the Air .................................................................1791
  Sebastian Dörner, Sebastian Cammerer, University of Stuttgart, Germany; Jakob Hoydis, Nokia Bell
  Labs, France; Stephan ten Brink, University of Stuttgart, Germany
WAA-1.2: Energy Optimization for Hybrid-ARQ and AMC ...........................................................................1796
  Bentao Zhang, Pamela Cosman, Larry Milstein, University of California, San Diego, United States
WAA-1.3: Age Minimization in Energy Harvesting Communications: Energy-Controlled Delays ...............1801
  Ahmed Arafa, Sennur Ulukus, University of Maryland, College Park, United States
WAA-1.4: Interference in Wireless Networks with Rate Difference User Utilities ..............................................1806
  Eric J. Ruzomboberka, David J. Love, Purdue University, United States

WAA-2: MIMO Channel Estimation
WAA-2.1: The Impact of Impedance Matching on Channel Estimation in Compact MIMO ...............................1813
  Receivers
  Wuyuan Li, Brian Hughes, North Carolina State University, United States
WAA-2.2: Affine Precoding-based Superimposed Training for Semi-Blind Channel Estimation in ......................1819
  OSTBC MIMO-OFDM Systems
  Himanshu B. Mishra, Indian Institute of Technology Kanpur, India; Naveen K. D. Venkategowda,
  Korea University, Republic of Korea; Aditya K. Jagannatham, Indian Institute of Technology Kanpur,
  India
WAA-2.3: Joint Channel-Estimation/Decoding with Frequency-Selective Channels and Few-Bit .......................1824
  ADCs
  Peng Sun, The Ohio State University, United States; Zhongyong Wang, Zhengzhou University, China;
  Robert W. Heath Jr, University of Texas, United States; Philip Schniter, The Ohio State University,
  United States
WAA-2.4: Frequency-domain Wideband Channel Estimation and Tracking for Hybrid MIMO .......................1829
  Systems
  Javier Rodriguez-Fernandez, Nuria Gonzalez-Prelcic, Universidade de Vigo, Spain; Robert W. Heath
  Jr, University of Texas at Austin, United States

WAA-3: Wireless Networks
WAA-3.1: Analysis of Dense Cellular Networks with Stretched Exponential Path Loss ......................................1837
  Ahmad AlAmmouri, Jeffrey Andrews, Francois Baccelli, University of Texas at Austin, United States
WAA-3.2: On the Sum Capacity of Many-to-one and One-to-many Gaussian Interference ..............................1842
  Channels.
  Abhiram Gnanasambandam, Ragini Chaluvadi, Srikrishna Bhaskham, IIT Madras, India
WAA-3.3: Energy-optimal Computational Offloading for Simplified Multiple Access Schemes .........................1847
  Mahsa Salmani, Timothy Davidson, McMaster University, Canada
WAA-3.4: Echo State Transfer Learning for Data Correlation Aware Resource Allocation in .......................1852
  Wireless Virtual Reality
  Mingzhe Chen, Beijing University of Posts and Telecommunications, France; Walid Saad, Virginia
  Tech, United States; Changchuan Yin, Beijing University of Posts and Telecommunications, China;
  Me’rouane Debbah, Huawei France R & D, France

WAA-4: Computational Imaging (Invited)
  Reconstruction
  Saiprasad Ravishankar, Il Yong Chun, Jeffrey A. Fessler, University of Michigan, United States
WAA-4.2: Model-based Iterative Reconstruction for Neutron Laminography .................................................1864
  Singanallur Venkatakrishnan, Ercan Cakmak, Hassina Billheux, Philip Bingham, Richard Archibald,
  Oak Ridge National Laboratory, United States
WAA-4.3: Computational Imaging with LORAKS: Reconstructing Linearly Predictable ...............................1870
  Signals using Low-Rank Matrix Regularization
  Justin P. Haldar, Tae Hyung Kim, University of Southern California, United States
WAa-4.4: Physics Based Modeling for the Development of Soft Segmentation and Reconstruction Algorithms
Amirkoushyar Ziabari, Purdue University, United States; Jeffrey Rickman, Lehigh University, United States; Jeffrey Simmons, Air Force Research Laboratory, United States; Charles Bouman, Purdue University, United States

WAa-5: Information Limits and Signals Representations (Invited)

WAa-6: Signal Processing for Hearing Aids (Invited)
WAa-6.1: A Robust Adaptive Binaural Beamformer for Hearing Devices
Jinjun Xiao, Zhi-Quan Luo, Ivo Merks, Tao Zhang, Starkey Hearing Technologies, United States

WAa-6.2: Noise Suppression and Speech Enhancement for Hearing Aid Applications using Smartphones
Issa M.S. Panahi, Chandan K. A. Reddy, Linda Thibodeau, University of Texas at Dallas, United States

WAa-6.3: Improving Auditory Externalization for Hearing-Aid Remote Microphones
James Kates, Kathryn Arehart, University of Colorado, Boulder, United States

WAa-6.4: A Realtime, Open-Source Speech-Processing Platform for Research in Hearing Loss Compensation
Harinath Garudadri, University of California, San Diego, United States; Arthur Boothroyd, San Diego State University, United States; Ching-Hua Lee, Swaroop Gadiyaram, Justyn Bell, Dhiman Sengupta, Sean Hamilton, Krishna Chaitanya Vastare, Rajesh Gupta, Bhaskar D. Rao, University of California, San Diego, United States

WAa-7: Hardware Design for Machine Learning (Invited)
WAa-7.1: Minimizing Area and Energy of Deep Learning Hardware Design Using Collective Low Precision and Structured Compression
Shihui Yin, Gaurav Srivastava, Shreyas K. Venkataramanaiah, Chaitali Chakrabarti, Visar Berisha, Jae-sun Seo, Arizona State University, United States

WAa-7.2: Sub-uJ Deep Neural Networks for Embedded Applications
Paul Whatmough, Arm Research / Harvard University, United States; Sae Kyu Lee, Gui-Yeon Wei, David Brooks, Harvard University, United States

WAa-7.3: A Method to Estimate the Energy Consumption of Deep Neural Networks
Tien-Ju Yang, Yu-Hsin Chen, Massachusetts Institute of Technology, United States; Joel Emer, Massachusetts Institute of Technology/Nvidia, United States; Vivienne Sze, Massachusetts Institute of Technology, United States

WAa-7.4: Minimum Energy Quantized Neural Networks
Bert Moons, Koen Goetschalckx, Nick Van Berckelaer, Marian Verhelst, KU Leuven, Belgium

WAb-1: Theory of Structured Waveforms
WAb-1.1: HiHTP: A Custom-Tailored Hierarchical Sparse Detector for Massive MTC
Gerhard Wunder, Ingo Roth, Rick Fritschek, Jens Eisert, FU Berlin, Germany

WAb-1.2: Lossless Natural Sampling for PWM Generation
Noyan Sevuktekin, Andrew Singer, University of Illinois at Urbana-Champaign, United States

WAb-1.3: Dimension Spreading for Coherent Opportunistic Communications
Jordi Borras, Technical University of Catalonia, Spain; Josep Font-Segura, Universitat Pompeu Fabra, Spain; Jaume Riba Sagarra, Gregori Vázquez Grau, Technical University of Catalonia, Spain

WAb-2: Speech Processing
WAb-2.1: Real-World Evaluation of Multichannel Audio Enhancement Using Acoustic Pilot Signals
Ryan Corey, Andrew Singer, University of Illinois at Urbana-Champaign, United States

WAb-2.2: Robust Real-time Sound Pressure Level Stabilizer for Multi-Channel Hearing
Aids Compression for Dynamically Changing Acoustic Environment
Yiya Hao, Ram Charan Chandra Shekar, Gautam Shreedhar Bhat, Issa M.S. Panahi, University of Texas at Dallas, United States
WAb-2.3: A Framework for Speech Enhancement Using Extreme Learning Machines
Babafemi Odelowo, David Anderson, Georgia Institute of Technology, United States

WAb-3: Signal Processing over Graphs and Networks
WAb-3.1: Time Estimation for Heat Diffusion on Graphs
Oguzhan Teke, P. P. Vaidyanathan, California Institute of Technology, United States
WAb-3.2: Partial Embedding Distance for Networks
Wei Yu Huang, Alejandro Ribeiro, University of Pennsylvania, United States
WAb-3.3: A Graph Diffusion LMS Strategy for Adaptive Graph Signal Processing
Roula Nassif, Cédric Richard, Université Nice Sophia Antipolis, France; Jie Chen, Northwestern Polytechnical University, China; Ali H. Sayed, University of California, United States

WAb-4: Deep Learning and Applications
WAb-4.1: Interleaver Design for Deep Neural Networks
Sourya Dey, Peter A. Beerel, Keith M. Chugg, University of Southern California, United States
WAb-4.2: On Noise Reduction for Handwritten Writer Identification
Karl Ni, Patrick Callier, Bradley Hatch, Jonathan Mastarone, James Cline, In-Q-Tel, United States
WAb-4.3: Association of Emitter and Emission Using Deep Learning
Trevor Landeen, Jake Gunther, Todd Moon, Utah State University, United States; David Ohm, Robert North, KickView, United States

WAb-5: Array Signal Processing Algorithms
WAb-5.1: MUSIC and Ramanujan: MUSIC-like Algorithms for Integer Periods Using Nested-Periodic-Subspaces
Srikanth V. Tenneti, P. P. Vaidyanathan, California Institute of Technology, United States
WAb-5.2: Underwater Acoustic Source Localization using Unimodal-constrained Matrix Factorization
Junting Chen, Urbashi Mitra, University of Southern California, United States
WAb-5.3: Leveraging Massive MIMO Spatial Degrees of Freedom to Reduce Random Access Delay
Fatima Ahsan, Ashutosh Sabharwal, Rice University, United States

WAb-6: Neural Signal Processing
WAb-6.1: Data-Driven Estimation of Mutual Information using Frequency Domain and its Application to Epilepsy
Rakesh Malladi, LinkedIn and Rice University, United States; Don Johnson, Rice University, United States; Giridhar Kalamangalam, Nitin Tandon, University of Texas Health Science Center, United States; Behnaam Aazhang, Rice University, United States
WAb-6.2: An Autoregressive Approach to Inference in Populations of Correlated Stochastic Neurons
Alireza Sheikhattar, University of Maryland, College Park, United States; Siamak Sorooshayari, Ellipsis Health, United States; Behtash Babadi, University of Maryland, College Park, United States
WAb-6.3: Multiplicative Updates for Optimization Problems with Dynamics
Abbas Kazemipour, Behtash Babadi, Min Wu, University of Maryland, United States; Kaspar Podgorski, Shaul Druckmann, Janelia Research Campus, United States

WAb-7: Video Processing
WAb-7.1: Multi-Object Detection and Tracking via Kernel Covariance Factorization in Thermal Video
Guohua Ren, Ioannis Schizas, University of Texas at Arlington, United States
WAb-7.2: Interactive Image and Video Classification using Compressively Sensed Images
Jaclynn Stubbs, Sandia National Laboratories, University of New Mexico, United States; Marios Pattichis, University of New Mexico, United States; Gabriel Birch, Sandia National Laboratories, United States
WAb-7.3: Motion-Aware Video Quality Assessment
Marina Georgia Arvanitidou, Thomas Sikora, Technische Universität Berlin, Germany
AS16-: Presented at Asilomar 2016
AS16-.1: Flash Memories in High Radiation Environments: LDPC Decoder Study .............................................2049
  Frederic Sala, Clayton Schoeny, Shahroze Kabir, University of California, Los Angeles, United States;
  Dariush Divsalar, Lara Dolecek, Jet Propulsion Laboratory, California Institute of Technology, United States
AS16-.2: On Spatial Security Outage Probability Derivation of Exposure Region Based ...........................................2054
  Beamforming with Randomly Located Eavesdroppers
  Yuanrui Zhang, Youngwook Ko, Roger Woods, Queen’s University Belfast, United Kingdom; Alan Marshall, University of Liverpool, United Kingdom; Joseph R. Cavallaro, Kaipeng Li, Rice University, United States