2016 ICSEE International Conference on the Science of Electrical Engineering- EILAT Israel

November 16 – 18, 2016
Hilton Queen of Sheba, Eilat, Israel

IEEE

Preliminary Program

2016 ICSEE
Welcome Message

Dear Colleagues,

As part of the activities of the Israeli section of IEEE, we will be holding our 29th biennial convention in Eilat during November 16-18, 2016. This year we have changed the name of the conference to "The International Conference on the Science of Electrical Engineering" (ICSEE), in order to better reflect our commitment to contributing to and keeping abreast of the latest developments in the science and technology of electrical engineering.

The 2016 convention will feature over 220 presentations in a wide spectrum of disciplines such as signal processing, control theory, circuits and systems, energy, power electronics, computers, communications, antennas, and electro-optics. We therefore expect the convention to be conducive to the exchange of knowledge and ideas between different areas, thereby serving to advance each of the individual disciplines.

This year we are proud to introduce special full-day symposia that will complement the traditional sessions and will include longer and more detailed talks on specific subject areas. Many internationally renowned keynote and invited speakers will present their work and talk about their views on their respective branches of science. The three symposia that will take place this year will be on the topics of Speech and Audio Processing, Information Theory, and Control Theory and Power Engineering. In addition to the symposia, the conference will also feature several special sessions on a variety of topics, with the participation of key researchers from around the globe.

I would like to use this opportunity to express my deepest gratitude to the many individuals who have been contributing much of their time to the organization and planning of this convention. I am in particular indebted to Dr. Yuval Beck, the secretary of the IEEE Israel Section, Prof. Uri Erez, the program chair, and to the organizers of the symposia and special sessions. The conference would not have been possible without their dedication. I would also like to thank the authors, the session chairs, and all those who have invested efforts into ensuring the success of this convention.

Respectfully yours,
Prof. Mark Shtaif
Chair of the Israel IEEE Section

Abbreviations

SY- Symposium

SX- Special Session

SP- Signal Processing

IMP- Image Processing

COM- Communications

IT- Information Theory

POW- Power

COD- Coding

CP- Computers

OPD- Optical Devices

SCN- Systems and Control

Wednesday, November 16th 2016

– 17:00 10:00	**Registration**						
17:00 – 19:00 **Session 1**	**COM1** Routing and Scheduling	**SCN1** Systems and control 1	**CP** Computers	**IT1** Information Theory	**NA**	**POW1** Power Systems and Smart Grid	**SX1** **Special Session** Information Theoretical Applications to Industry
19:00 – 20:00	**Dinner at the hotels**						
20:00 – 20:30	**Opening Ceremony & Greetings**						
20:30 – 22:00	**Poster session and cocktail**						

Thursday, November 17th 2016

8:30 – 10:30 **Session 1**	**SY1** **Symposium on Control Theory and Power** **Part 1** **Engineering Control**	**SY2** **Symposium on Information Theory**	**SY3** **Symposium on Speech and Audio Processing**	**COM2** Optical communications	**COM3** Communications general 1	**IMP1** Image Processing 1	**SP1** Bio Applications
– 11:00 **10:30**	**Coffee Break**						
11:00 – 13:00 **Session 2**	**SY1** **Symposium on Control Theory and Power** **Part 2** **Power Engineering**	**SY2** **Symposium on Information Theory**	**SY3** **Symposium on Speech and Audio Processing**	**OPD** Optical Devices	**COM4** Communications general 2	**IMP 2** Image Processing 2	**SCN2** Systems and control 2
13:00 – 14:00	**Lunch break**						
14:00 – 16:00 **Session 3**	**Symposium on Control**	**SY2**	**SY3**	**POW**2 Power systems 1	**SX2** **Special Session**	**ML1**	**SCN3**

	Theory and Power Part 3 Engineering Control	**Symposium on Information Theory**	**Symposium on Speech and Audio Processing**		Advanced Topics in Nanoscaled Integrated Circuits and Systems 1	Image & Machine Learning	Systems and control 3
16:00 – 16:20	**Coffee Break**						
16:20 – 18:20 Session 4	**MNA** Microwaves and Antennas	**SY2** **Symposium on Information Theory**	**SY3** **Symposium on Speech and Audio Processing**	**POW3** Power Conversion	**SX2** **Special Session** Advanced Topics in Nanoscaled Integrated Circuits and Systems 2	**ML2** Machine Learning	**SCN4** Systems and control 4

Friday, November 18th 2016

8:30 – 10:30 **Session 1**	**SX3** **Special Session** Optical Communications	**IT2** Information Theory 2	**SX4** **Special Session** on Image Analysis and Processing	**COD** Coding	**POW4** Power Electronics and Renewables	**CIR1** Circuits and Devices	**SP2** Signal Processing
10:30 – 11:00	**Coffee Break**						
11:00 – 13:20 **Session 2**	**SX3** **Special Session** Optical Communications **(cont.)**	**IT3** Information theoretic signal processing	**SX4** **Special Session** on Image Analysis and Processing (cont.)	**SX5** **Special Session** Deep Learning	**POW5** Power Electronics	**CIR2** Circuits and Devices (cont.)	**SP3** Audio and Speech Processing
13:20 – 14:20	**Lunch**						
14:20 – 15:00	**Closing Session**						

Detailed Schedule of ICSEE Sessions

(For Symposia see pages 35 and further)

Wednesday, November 16th , 2016

Session 1: 17:00-19:00

COM1: Chair – Anatoly Khina - Caltech

Routing and Scheduling

17:00 – 17:20 **Routing Algorithms for Cognitive Networks – 42**
Itai Dabran and Danny Raz- *Computer Science Department, Technion- Israel*

17:20 – 17:40 **Performance Evaluation of CoMP Coordinated Scheduling over Different Backhaul Infrastructures: a Real Use Case Scenario – 191**
Andrea Marotta[1], Koteswararao Kondepu[2], Francesco Giannone[2], Swapna Doddikrinda[3], Dajana Cassioli[1], Cristian Antonelli[1], Luca Valcarenghi[2] and Piero Castoldi[2]— (1)*University of L'Aquila- Italy (2) [2]Scuola Superiore Sant'Anna (3) Tata Consultancy Services*

17:40 – 18:00 **Optimal and Suboptimal Routing in Random Ad-hoc Networks Based on Local Knowledge – 195**
Yiftach Richter and Itsik Bergel- *Bar- Ilan University- Israel*

18:00 – 18:20 **Optimal control of VNF deployment and scheduling – 198**
Mark Shifrin- *Ben Gurion University- Israel*

SCN1: Chair – Emilia Fridman-Tel Aviv University
Systems and Control 1

17:00 – 17:20 **Least Mean Squares Error based Filter of Linear System with Prescribed Convergence Rate - 8**
Ilan Rusnak - *Rafael- Israel*

17:20 – 17:40 **Real-Time Implementation of Simple Adaptive Control Algorithm to Two Axes Gimbal - 10**
Ilan Rusnak, Ohad Hertz, and Yotam Dana- *Rafael- Israel*

17:40 – 18:00 **State-Multiplicative Noisy Systems – H Infinity Measurement-feedback Tracking with Preview - 155**
Eli Gershon[1] and Uri Shaked[2]- *(1) Holon Institute of Technology- Israel (2) Tel-Aviv University- Israel*

18:00 – 18:20 **A One Step Stochastic Pursuer--Evader Game- 197**
Gyorgy Hexner, Ilan Rusnak and Haim Weiss- *Rafael- Israel*

CP: Chair - Yitzhak Birk- Technion

Computers

17:00 – 17:20 **If It Spreads You Can Catch It: Localized Epidemic Detection with Overwhelming Noise – 49**
Eli Meirom[1], Constantine Caramanis[2], Shie Manor[1], Sanjay Shakkottai[2] and Ariel Orda[1]- *(1) Technion-Israel (2) University of Texas at Austin-USA*

17:20 – 17:40 **Mending the Big-Data Missing Information – 146**
Hadassa Daltrophe, Shlomi Dolev and Zvi Lotker- *Ben- Gurion University- Israel*

17:40 – 18:00 **Memristive Memory Processing Unit (MPU) Controller for In-Memory Processing - 119**
Rotem Ben-Hur and Shahar Kvatinsky - *Technion-Israel*

18:00 – 18:20 **SDSM: Fast and Scalable Security Support for Directory-Based Distributed Shared Memory** –20
Ofir Shwartz and Yitzhak Birk- *Technion-Israel*

18:20 – 18:40 **Storage Becomes First Class Memory - 71**
Netanel Katzburg[1], Amit Golander[2] and Shlomo Weiss[1]- *(1) Tel-Aviv University- Israel (2) Plexistor- Israel*

IT1: Chair - Ram Zamir-Tel Aviv University

Information Theory 1

17:00 – 17:20 **The Gaussian state-dependent channel with rate-limited decoder state-information – 18**
Shraga Bross[1] and Amos Lapidoth[2]- *(1) Bar-Ilan University- Israel (2) ETH-Switzerland*

17:20 – 17:40 **Semi-deterministic relay channels with non-causal states only at the transmitter and receiver- 162**
Ido Gattegno[1], Haim H. Permuter[1], Shlomo Shamai[2] and Ayfer Ozgur[3]- *(1) Ben- Gurion University- Israel (2) Technion – Israel (3) Stanford- USA*

17:40 – 18:00 **On the Capacity of the Gaussian Broadcast Channel with States Known at the Transmitter – 46**
Leila Ghabeli and Stefano Rini- *National Chiao Tung University- Taiwan*

18:00 – 18:20 **The Gaussian Wiretap Channel with Correlated Sources at the Terminals: Secret Communication and Key Generation – 22**
Alexander Bunin[1], Pablo Piantanida[2] and Shlomo Shamai[1]- *(1) Technion- Israel (2) CentraleSupélec-CNRS-Université Paris-Sud- France*

18:20 – 18:40 **Oblivious Processing in a Fronthaul Constrained Gaussian Channel - 25**
Adi Homri, Michael Peleg and Shlomo Shamai – *Technion-Israel*

18:40 – 19:00 **On the Capacity of the Carbon Copying onto Dirty Paper Channel – 33**
Stefano Rini and Shlomo Shamai- *(1) National Chiao Tung University- Taiwan (2) Technion- Israel*

POW1: Chair: Yoash Levron- Technion
Power Systems and Smart Grid
Sponsored by: solaredge

17:00 – 17:20 **Observable Canonical Forms of Multi-Machine Power Systems using dq0 Signals – 9**
Yoash Levron and Juri Belikov- *Technion - israel*

17:20 – 17:40 **Electricity cost minimization in cooling systems with storage – 11**
Eyal Solomon Shimony- *Ben-Gurion University- Israel*

17:40 – 18:00 **Three-Phase State Estimation Model for Distribution Grids - 141**
Pavel Chusovitin, Ilya Polyakov and Andrey Pazderin- *Ural Energy Institute of Ural Federal University- Russia*

18:00 – 18:20 **Estimation PSS Tuning Quality Basded on Low-Frequency Oscillation Damping - 177**
Valeriy Tashchilin, Pavel Chusovitin, Andrey Pazderin and Rinat Idrisov- *Ural Energy Institute of Ural Federal University- Russia*

18:20 – 18:40 **Fragility of the Semidefinite Relaxation for the Optimal Power Flow Problem - 184**
Ivan Zorin, Sergey Vasilyev and Elena Gryazina- *(1) National Research University "Higher School of Economics"- Russia (2) Institute for Control Sciences RAS, Skoltech, Center for Energy Systems - Russia*

18:40 – 19:00 **A warning about the use of reduced models of synchronous generators m - 81**
Elad Venezian and George Weiss- *Tel-Aviv University- Israel*

SX1 : Chairs – Irad Ben-Gal[1] and Eugene Kagan[2]- (1) Ariel University (2) Tel Aviv University

Information theoretical applications to industry

17:00 – 17:20 **Subspace Selection for Anomaly Detection: An Information Theory Approach – 16**
Marcelo Bacher, Irad Ben-Gal and Erez Shmueli- *Tel-Aviv University- Israel*

17:20 – 17:40 **VolleyBot: A Competative Framework for AI and UAV Research and Development – 76**
Shraga Shoval- *Ariel University Isreal*

17:40 – 18:00 **Sonar-based Flocking in the Robot's Team with Radio Communication– 129**
Eugene Kagan[1], Mor Kaizer[1], Sharon Makmal[1] and Irad Ben-Gal[2]- *(1) Ariel University – Israel (2) Tel-Avivi University- Israel*

18:00 – 18:20 **Uninorm-based Neural Network and its Application for Control of Mobile Robots – 128**
Eugene Kagan[1], Alexander Rybalov[2] and Hodaya Ziv[1]- *(1) Ariel University- Israel (2) Machine Learning Institute, New York*

18:20 – 18:40 **Why Spending More Might Get You Less, Dynamic Selection of Influencers in Social Networks – 161**
Alon Sela, Erez Shmueli, Dima Goldenberg and Irad Ben-Gal- *Tel-Aviv University- Israel*

Wednesday, November 16th , 2016

Poster Session: 20:30-22:00

- **Law and Technology– 233**
  Dov Greenbaum- *Zvi Meitar Institute for Legal Implications of Emerging Technologies- Israel*
- **Comparing Passive and Active Biasing Networks for a Photomultiplier Tube Sensor using SPICE – 72**
  Natan Krihely- *Applied Materials- Israel*
- **Enrich the Data Density of Cluster for Imbalanced Learning Using Immune Representatives – 5**
  Xusheng Ai[1], Jian Wu[1], Zhiming Cui[2], Xuefeng Xian[3] and Yufeng Yao[1]- (*1) Soochow University (2) Suzhou University of Science and Technology (3) Suzhu Vacational University*
- **On the Real-Time Power Sharing Problem – 7**
  Ido Avraham, Leonid Mirkin and Yoash Levron- *Technion-Israel*
- **A Matlab-Simulink Model of Network Reactive Power Compensation Based on Binary Switchable Capacitors and Thyristor-Controlled Reactor – 34**
  Yuval Beck[1], Yefim Berkovich[1], Zdenek Muller[2] and Josef Tlusty[2]- (1) Holon Institute of Technology- Israel (2) CTU in Prague- Czech Republic
- **Speaker Diarization Based on Locally Linear Embedding – 55**
  Ori Shahar, Lee Twito, Nurit Spingarn and Israel Cohen- *Technion- Israel*
- **Voiced-Unvoiced-Silence Classification via Hierarchical Dual Geometry Analysis – 75**
  Maya Harel, David Dov, Israel Cohen, Ronen Talmon and Ron Meir- *Technion- Israel*
- **Traveling Wave Ring Oscillator – a New Architecture of Transmission Line Based Oscillator – 121**
  Boris Likhterov and Belenky Alexander- *Ben- Gurion University- Israel*
- **Analog Filter Realization for Human - Machine Interaction in Aerospace – 151**
  Jan Boril, Karel Zaplatilek and Rudolf Jalovecky- *Univeristy of Defence, Faculty of Military Technology- Czech Republic*
- **Digital predistortion using piecewise memory polynomial for 802.11 WiFi applications – 165**
  Tomer Gidoni[1], Emanuel Cohen[2] and Eran Socher[1]- (*1) Tel-Aviv University- Israel (2) Technion- Israel*
- **Wideband Demodulator for Optical Waveforms – 168**
  Omri Lev, Tal Wiener, Deborah Cohen and Yonina C. Eldar- *Technion- Israel*
- **Autonomous Robot for Tunnel Mapping – 199**
  Tom Erez and Aviv Rubinstein- *Technion- Israel*
- **Distorting Regimes and Their Measurement Systems for The Diagnosis Purposes in Three-Phase Systems – 205**
  Petre-Marian Nicolae, Ileana-Diana Nicolae and Marian-Stefan Nicolae- *University of Craiova- Romania*
- **Optimal encoding and decoding for point process observations of dynamic processes—a closed-form approximation – 208**
  Yuval Harel[1], Ron Meir[1] and Manfred Opper[2]- *(1) Technion- Israel (2) Technical University Berlin- Germany*
- **Adaptive Weighting Parameter in Audio-Visual Voice Activity Detection – 212**
  Matar Buchbinder, Yaakov Buchris and Israel Cohen- *Technion- Israel*
- **Control Room Anywhere - By DSW – 116**
  Dvir Tvizer and Adi Babayof- *ICL- Israel*

Thursday, November 17th , 2016

Session 1: 8:30-10:30

COM2: Chair – Mark Shtaif – Tel-Aviv University

Optical Communication

8:30 - 8:50	**Shaping the input in nonlinear fiber systems for mitigation of inter-channel nonlinear phase-noise – 31** Omri Geller[1], Ronen Dar[2], Meir Feder[1] and Mark Shtaif[1]- (*1) Tel-Aviv University – Israel (2) Bell Laboratories- USA*
8:50 - 9:10	**Induced mode mixing in SDM networks for reduced computation complexity – 211** Miri Blau and Dan M. Marom- *Hebrew University- Israel*
9:10 - 9:30	**Wavelength demultiplexing operating over mode division multiplexed signals on ribbon fiber – 209** Miri Blau and Dan M. Marom- *Hebrew University- Israel*
9:30 - 9:50	**Enhanced Detection vs. Digital Compensation for IQ Imbalance in Coherent Fiber-Optic Communication Systems – 232** Roi Rath, Dennis Clausen Clausen and Werner Rosenkranz Rosenkranz- *University of Kiel- Germany*
9:50 - 10:10	**A Novel Low Resolution ADC-DSP Optimization Based on Non-Uniform Quantization and MLSE for PAM-4 Data Centers Optical Connections – 30** Yaron Yoffe and Dan Sadot- *Ben-Gurion University- Israel*
10:10 - 10:30	**Predistortion of Mach-Zehnder Modulator using Symmetric Imbalance – 174** Gil Paryanti and Dan Sadot- *Ben-Gurion University- Israel*

COM3: Chair – Tsvi Dvorkind- Rafael

Communications 1

8:30 - 8:50	**Power allocation for covert communication, with application to underwater acoustic channel – 56** Tsvi G. Dvorkind- *RAFAEL- Israel*
8:50 - 9:10	**Secure communication systems based on chaotic synchronization of time-delayed feedback oscillators – 147** Mikhail Prokhorov, Vladimir Ponomarenko and Danil Kulminskiy- *Institute of Radio Engineering and Electronics- Russia*
9:10 - 9:30	**Improved GNSS Velocity Estimation using Sensor Fusion – 149** Roman Morer, Shlomi Hacohen, Boaz Ben Moshe, Nir Shvalb and Roi Yozevitch- *Ariel University- Israel*
9:30 - 9:50	**Composite Measurement From Asynchronous LOS and Unknown Sensor Position – 64** Itzik Klein[1], Yeshaya Lipman[1] and Yaakov Bar-Shalom[2]- *(1) RAFAEL- Israel (2) University of Connecticut- USA*
9:50 - 10:10	**VISION: Video-oriented UWB-based Intelligent Ubiquitous Sensing- 189**

Dajana Cassioli[1], Antinisca Di Marco[1], Francesco Gallo[1], Stefano Pace[2], Luigi Pomante[1] and Claudia Rinaldi[1]- (1) *University of L'Aquila- Italy (2) SMARTLY: Natives of Smart Living s.r.l.- Italy*

IMP1: Chair TBA

Image Processing 1

8:30 - 8:50 **Navigation Using Image Tracking - 123**
Stephen Stubberud[1], Kathleen Kramer[2] and Allen Stubberud[3]- (*1) Oakridge Technology- USA (2) University of San Diego- USA (3) University of California Irvine- USA*

8:50 - 09:10 **Point Cloud Registration Using A Viewpoint Dictionary - 58**
David Avidar, David Malah and Meir Barzohar- *Technion- Israel*

09:10 - 09:30 **Performance Boosting of a Pedestrian Detector using Multiple Cameras - 77**
Oded Yechiel, Assaf Livne, Rami R. Hagege and Hugo Guterman- *Ben-Gurion University- Israel*

9:30 - 9:50 **Using Improved Outlier Estimation for Hyperspectral Target Detection - 86**
Sagiv Dvash and Stanley Rotman- *Ben-Gurion University- Israel*

9:50 - 10:10 **Frame Rate Reduction of Depth Cameras by RGB-Based Depth Prediction – 38**
Daniel Rotman, Omer Cohen and Guy Gilboa- *Technion- Israel*

10:10 - 10:30 **Natural Contrast Enhancement for Dichromats using Similarity Maps- 73**
Guy Tennenholtz and Ido Zachevsky- *Technion- Israel*

SP1: Chair, Yiftach Richter – Bar Ilan University

Signal Processing 1: Bio Applications

8:30 - 8:50 **Alternating Diffusion Maps for Dementia Severity Assessment – 98**
Maya Rapaport, Noga Cohen, Tal Shnitzer, Natalya Yarovinsky, Ronen Talmon and Judith Aharon-Peretz- *Technion- Israel*

8:50 - 09:10 **Characterization and Simulation of Atrial Arrhythmogenic Sources Using Induced Spatial Temperature Variations – 152**
Guy Malki and Sharon Zlochiver- *Tel-Aviv University- Israel*

09:10 - 09:30 **In-Vivo Energy Harvesting Nano Robots - 194**
Shlomi Dolev[1], Sergey Frenkel[2], Michael Rosenblit[1], Ram Prasadh Narayanan[1] and Muni Venketeswarlu K[1] – (1) *Ben-Gurion University- Israe (2) Russian Academy of Sciences - Russia*

9:30 - 9:50 **Enhancement Of BCI Classifiers Through Domain Adaptation - 167**
Hadas Benisty, Daniel Furman, Talor Abramovich, Amir Ivry and Hillel Pratt- *Technion- Israel*

Thursday, November 17th , 2016

Session 2: 11:00-13:00

OPD: Chair – Dan Marom- Hebrew University

Optical Devices:

11:00 – 11:20 **ANALYTICAL APPROXIMATION FOR PHOTONIC ARRAY MODES IN 2D PHOTONIC DEVICES – 47**

Lidor Giladi[1], Elena Smith[2], Vladislav Shteeman[3] and Amos Hardy[2]- *(1) IDF- Israel (2) Tel-Aviv University- Israel (3) Braude College of Engineering - Israel*

11:20 – 11:40 **Slot Silicon-Gallium Nitride Waveguide Realizing 1x4 Optical Power Splitter - 136**

Dror Malka, Yossef Danan and Zeev Zalevsky- *(1) Holon Institute of Technology – Israel (2) Bar-Ilan University- Israel*

11:40 – 12:00 **ANALYSIS OF OPTICAL CHARACTERISTICS OF HOLEY PHOTONIC CRYSTALS WITH EXTENDED COUPLED-MODE FORMALISM -79**

Lidor Giladi[1], Elena Smith[2], Vladislav Shteeman[2] and Amos Hardy[1]- *(1) Tel-Aviv University- Israel (2) Braude College of Engineering- Israel*

12:00 – 12:20 **Printable Grating Patterns of PDMS by Dip-Pen Nanolithography - 59**

Zeev Fradkin, Dima Bykhovsky, Moshe Zohar, Almog Azulay and Saad Tapuchi- *Shamoon College of Engineering- Israel*

12:20 – 12:40 **Nonlinear Waveguide with CdSe &PFCB nanocomposite core - 216**

Moran Bin Nun, Yedidya Lior and Dan Marom – *Hebrew University- Israel*

12:40 – 13:00 **Dual FSR Silicon Racetrack Resonator Based on Double Injection – 234**

Roei Aviram Cohen, Ofer Amrani and Shlomo Ruschin- *Tel-Aviv University - Israel*

COM4: Chair: Arie Reichman- Ariel University

Communications 2

11:00 – 11:20 **On Digital Post-Distortion Techniques– 60**

Ziv Alina and Ofer Amrani- *Tel-Aviv University- Israel*

11:20 – 11:40 **Asymptotic Performance Analysis of Zero Forcing DSL Systems– 62**

S.M. Zafaruddin, Udi Klein, Itsik Bergel and Amir Leshem- *Bar-Ilan University- Israel*

11:40 – 12:00 **Optimization of OFDM System with Nonlinear Power Amplifier and Modified Iterative Receiver- 87**

Noam Davidovitz, Ilia Iofedov and Dov Wulich - *Ben-Gurion University- Israel*

12:00 – 12:20 **Energy Efficient Bidirectional Massive MIMO Relay Beamforming-193**

Michal Yemini[1], Alessio Zappone[2], Eduard Jorswieck[3] and Amir Leshem[1]- *(1) Bar-Ilan University- Israel (2) University of Cassino and Southern Lazio- Italy (3) Communications Laboratory TU Dresden- Germany*

12:20 – 12:40 **Rate Analysis of Distributed Multiuser MIMO Protocols for the 802.11ac-183**

Joseph Kampeas, Asaf Cohen and Omer Gurewitz- *Ben-Gurion University- Israel*

12:40 – 13:00 **Coexistence Mechanisms in Ultra-Wideband Body Area Network-124**
Natan Keren and Arie Reichman- *Ariel University- Israel*

IMP2: Chair -- Emanuele Rodolà - Universita' della Svizzera Italiana
Image Processing 2

11:00 – 11:20 **Eye movements as a marker for visual prosthesis spatial mapping – 204**
Avi Caspi[1], Jessy Dorn[2], John Helder[3], Kapil Katyal[3] and Arup Roy[2]- (*1) Jerusalem College of Technology- Israel (2) Second Sight Medical Products, Inc.- USA (3) The Johns Hopkins University Applied Physics Laboratory- USA*

11:20 – 11:40 **Gaussian Mixture Diffusion – 61**
Jeremias Sulam, Yaniv Romano and Michael Elad- *Technion- Israel*

11:40 – 12:00 **Exploiting Spatial Phase in Deconvolution of Structured Stochastic Textures – 134**
Ido Zachevsky and Yehoshua Zeevi- *Technion- Israel*

12:00 – 12:20 **Improved Covariance Matrix for Target Detection in Hyperspectral Imaging – 235**
Ilan Schvartzman, Shimrit Maman, Dan G. Blumberg and Stanley R. Rotman- *Ben-Gurion University- Israel*

12:20 – 12:40 **A total variation scale-space and image resizing- 144**
Yedidya Hyams and Moshe Porat- *Technion- Israel*

SCN2: Chair – Eli Gershon- Holon Institute of Technology
Systems and Control 2

11:00 – 11:20 **Comparison of JML, EKF and SDDRE Filters of Nonlinear Dynamic Systems – 51**
Ilan Rusnak- *RAFAEL-Israel*

11:20 – 11:40 **Multi-Rate Control over AWGN Channels via Analog Coding – 97**
Anatoly Khina, Babak Hassibi and Victoria Kostina- *California Institute of Technology- USA*

11:40 – 12:00 **Analysis of Feedback Networks with Multiple Dependent Sources by Superposition – 112**
Pavel Shanin[1] and Liron Allerhand[2]- *(1) Intel- Israel (2) Tel-Aviv University- Israel*

12:00 – 12:20 **Regulation of Discrete Event Dynamic Systems via an Adjustable-Gain Integrator – 181**
Yorai Wardi[1] and Carla Seatzu[2]- *(1) Georgia Tach- USA (2) University of Cagliari- Italy*

12:20 – 12:40 **Frequency Domain methods for PFC and Model Reference Design in Adaptive Control – 218**
Liron Allerhand and Dieter Schwarzmann- *IAV GmbH- germany*

12:40 – 13:00 **Analytic Steady-State Solution of Fine Alignment with Velocity Measurements – 84**
Alexander Tsukerman and Itzik Klein- *Technion- Israel*

Thursday, November 17th , 2016

Session 3: 14:00-16:00

POW2: Chair Doron Shmilovitz- Tel-Aviv University
Power Systems
Sponsored by: solaredge

14:00 – 14:20 **Performance Analysis of Empirical Fourier Transform based Power Transformer Differential Protection – 36**
Sishaj P Simon[1], Senthil Kumar Murugan[1], Sundareswaran K[1] and C Christopher Columbus[2]- *(1) National Institute of Technology Tiruchirappalli- India (2) PSN College of Engineering and Technology, Tirunelveli- India*

14:20 – 14:40 **Voltage stability analysis using quadratic objective function taking into account equality constraints – 53**
Grigory Shabalin, Pavel Chusovitin, Andrei Pazderin and Eduard Balakh- *UrFU- Russia*

14:40 – 15:00 **An alternative approach about fault location on AC and DC cables during commissioning and operation – 96**
Kay Leiteritz[1] ,Bruno Fainaru[2] and Frank Böhme[1]- *(1) HIGHVOLT Prüftechnik Dresden GmbH- Germany (2) Consultant- Israel*

15:00 – 15:20 **Novel Method of Optimition of Losses in Power Grid – 117**
Zdenek Muller[1], Josef Tlusty[1], Miroslav Muller[1], Yuval Beck[2], Martin Cernan and Gady Golan[3]- *(1) CTU in Prague- Czech Republic (2) Holon Institute of Technology- Israel (3) HIT and Ariel University- Israel*

15:20 – 15:40 **The algorithms behind development of operational benefits for smart grid in Israel –230**
Netzah Calamaro[1], Doron Shmilovitz[2] and Yuval Beck[3] – *(1) Tel-Aviv University- Israel (2) Holon Institute of Technology- Israel*

SX2: Advanced Topics in Nanoscaled Integrated Circuits and Systems 1
Chairs: Alex Fish and Adam Teman

14:00 – 14:20 **A new Selective State Retention Power Gating approach for low power VLSI design - 361**
Dr. Shlomo Greenberg- *Ben-Gurion University- Israel*

14:20 – 14:40 **FPGA Design of Numerical Methods for the Robotic Motion Control Task exploiting High-Level Synthesis-156**
Prof. Michael Huebner- *Ruhr Universität Bochum- Germany*

14:40 – 15:00 **Ultra low-voltage SRAM design in 28nm FD-SOI- 363**
Prof. Joachim Rodrigues- *Lund University- Sweden*

15:00 – 15:20 **Sub-pj per Operation Scalable Computing – the PULP experience- 364**

Dr. Davide Rossi- *University of Bologna- Italy*

15:20 – 15:40 **DynOR: Cycle-by-cycle dynamic clock adjustment for energy-efficient processor operation- 362**
Prof. Andreas Burg, *EPFL*

15:40 – 16:00 **Efficient Implementation of Latch-based Standard Cell Memory arrays in 28nm CMOS-366**
Dr. Adam Teman-*Bar-Ilan University-Israel*

ML1: Chair TBA

Machine Learning & Image Processing

14:00 – 14:20 **Visual Reinforcement Learning for Object Recognition in Robotics – 35**
Dan Malowany and Hugo Guterman- *Ben-Gurion University- Israel*

14:20 – 14:40 **Light Invariant Video Camera - Making Faces Appear the Same Under any Light Conditions – 163**
Amir Kolaman, Rami Hagege and Hugo Guterman- *Ben-Gurion University- Israel*

14:40 – 15:00 **Automated Supervised Segmentation of Anatomical Fiber Tracts Using an AdaBoost Framework – 132**
Michal Heker, Rula Amer, Guy Alexandroni and Hayit Greenspan- *Tel-Aviv University- Israel*

15:00 – 15:20 **Graph-Constrained Supervised Dictionary Learning for Multi-Label Classification – 143**
Yael Yankelevsky and Michael Elad- *Technion- Israel*

15:20 – 15:40 **Reducing Artifacts of Intra-Frame Video Coding via Sequential Denoising – 67**
Yehuda Dar[1], Alfred M. Bruckstein[1], Michael Elad[1] and Raja Giryes[2]-
(1) Technion- Israel (2) Tel-Aviv University- Israel

SCN3: Chair – Hugo Guterman- Ben-Gurion University

Systems and Control 3

14:00 – 14:20 **Stability of the SDDRE based Estimator for Stochastic Nonlinear Systems – 2**
Ilan Rusnak- *RAFAEL-Isarel*

14:20 – 14:40 **Guidance Law against Spiraling Target: Constant Velocity Amplitude – 3**
Ilan Rusnak and Liat Peled-Eitan- *RAFAEL-Israel*

14:40 – 15:00 **RobIL – Israeli Program for research and development of Autonomous UGV: performance evaluation methodology – 43**
Daniel Meltz and Hugo Guterman- *Ben-Gurion University- Israel*

15:00 – 15:20 **Optimal pursuit and rendezvous guidance with obstacle avoidance – 70**
Martin Weiss and Tal Shima- *Technion- Israel*

15:20 – 15:40 **GNSS Denial of Service and the Preparation for Tomorrows Threats – 164**
Nir Flysher, Roi Yozevitch and Boaz Ben Moshe- *Ariel University- Israel*

15:40 – 16:00 **Automatic Parking Identification and Vehicle Guidance with Road Awareness – 228**
Guy Krasner and Eyal Katz- *Afeka College of Engineering- Israel*

Thursday, November 17th , 2016

Session 4: 16:20-18:20

MNA: Chair – Shmuel Auster - Elta
Microwave and Antennas

16:20 - 16:40 **Relativistic Lateral wave – 45**
Timor Melamed and Tatiana Danov- *Ben-Gurion University- Israel*

16:40 - 17:00 **Simulation and theory of TEM transmission lines radiation losses – 52**
Reuven Ianconescu[1] and Vladimir Vulfin[1]- (*1) Shenkar College of Engineering and Design – Israel (2) Ben-Gurion University- Israel*

17:00 – 17:20 **Quantum Entanglement in Electric Circuits: from Anomalous Crosstalk to Electromagnetic Compatibility in Nano-Electronics – 63**
Gregory Slepyan1, Amir Boag[1], Vladimir Mordachev[2], Eugene Sinkevich[2], Sergey Maksimenko[2], Polina Kuzhir[2], Giovanni Miano[3], Misha Portnoi[4] and Antonio Maffucci[5]- (1) *Tel-Aviv University- Israel (2) Belarus State University of Informatics and Radioelectronics- Belarus (3) University of Naples Federico II- Italy (4) University of Exeter- United Kingdom (5) University of Cassino- Italy*

17:20 – 17:40 **Analytical model for absorption by lossy finite-length dipole antennas – 66**
Ofer Markish and Yehuda Leviatan- *Technion- Israel*

17:40 – 18:00 **Sectorial Antenna Based on Vertical Microstrip Elements – 95**
Ynon Gabbai[1], Ely Levine[2] and Haim Matzner[1]- *(1) Holon Institute of Technology- Israel (2) Afeka College of Engineering- Israel*

18:00 – 18:20 **Design of Reflectarray Antenna Based on Fresnel Zone Plates with AMC Structure–102**
Sason Dan[1], Vladimir Vulfin[2] and Reuven Shavit[2]- (1) *Shamoon College of Engineering- Israel (2) Ben-Gurion University- Israel*

18:20 – 18:40 **Long Distance Wireless Power Feeding to High-altitude Platforms- 153**
Motti Haridim[1], Jacob Gavan[1], Boris Kalendarov[1] and Tchanguiz Razban[2]- *(1) Holon Institute of Technology- Isreal (2) University of nantes- France*

POW3: Chair : Alon Kuperman- Ben-Gurion University
Power conversion
Sponsored by: solaredge

16:20 - 16:40 **Control of a virtual infinite capacitor used to stabilize the output voltage of a PFC – 48**
Shuyue Lin[1], Jun Lin[2], George Weiss[2] and Xiaowei Zhao[1]- (*1)University of Warwick- United Kingdom (2) Tel Aviv University- Israel*

16:40 - 17:00 **Infinite Virtual Capacitor Realization for Grid-Connected Power Converters – 85**
Martin Mellincovsky[1], Vladimir Yuhimenko[2], Mor Mordechai Pertz[1] and Alon Kuperman[1]- (1) *Ben-Gurion University- Israel (2) Ariel University- Israel*

17:00 – 17:20 **The Virtual Infinite Capacitor-Based Active Submodule for MMC – 109**
Jun Lin and George Weiss- *Tel-Aviv University- Israel*

17:20 – 17:40 **Energy Storage Systems – Grid Connection Using Synchronverters – 182**
Gal Barzilai, Lior Marcus and George Weiss- *Tel-Aviv University- Israel*

SX2: Advanced Topics in Nanoscaled Integrated Circuits and Systems 2
Chairs: Alex Fish and Adam Teman

16:20 - 16:40 **Effect of metal buffer layer and thermal annealing on HfOx-based ReRAMs-188**
Prof. Yusuf Leblebici - *EPFL*

16:40 - 17:00 **Benefits of asynchronous control for analog electronics: a case study for multiphase buck-367**
Dr. Danil Sokolov - *Newcastle University - United Kingdom*

17:00 – 17:20 **Programmable Output Multi-phase Switched Capacitor Step-up DC-DC Converter with SAR-based Regulation**
Prof. Subhajit Sen - *IIIT Bangalore*

17:20 – 17:40 **Memristor-based circuits and architectures**
Prof. Shahar Kvatinsky - *Technion- Israel*

17:40 – 18:00 **Ultra low area, 10 bit, First Order Sigma Delta Modulator with improved PSRR**
Prof. Joseph Shor - *Bar-Ilan University – Israel*

18:00 – 18:20 **Self-timed control of two-phase Switched Capacitor Converters**
Serhii Mileiko - *Newcastle University- United Kingdom*

ML2: Chair – Ofir Lindenbaum – Tel Aviv University
Machine Learning

16:20 - 16:40 **Multi-View Kernel-based Data Analysis – 78**
Moshe Salhov[1], Amir Averbuch[1], Ofir Lindenbaum[1], Yoel Shkolnisky[1] and Avi Silberschatz[2]- *(1) Tel-Aviv University- Israel (2) Yale University- USA*

16:40 - 17:00 **Bandwidth Selection for Kernel Based Classification – 176**
Ofir Lindenbaum, Arie Yeredor and Amir Averbuch- *Tel-Aviv University- Israel*

17:00 – 17:20 **Improvements to PLDA i-vector Scoring for Short Segments – 196**
Itay Salmun, Irit Opher and Itshak Lapidot- *Afeka Tel-Aviv Academic College of Engineering-Israel*

17:20 – 17:40 **Learning an Attention Model in an Artificial Visual System – 202**
Alon Hazan, Yuval Harel and Ron Meir- *Technion-Israel*

17:40 – 18:00 **ACK Utilization for Traffic Classification – 225**
Joseph Kampeas, Asaf Cohen and Omer Gurewitz- *Ben-Gurion University- Israel*

SCN4: Chair – Huacheng Zhou- Tel-Aviv University

Systems and Control 4

16:20 - 16:40 **Predictor-based dynamic output stabilization of networked systems with large time-varying delays - 169**
Anton Selivanov and Emilia Fridman- *Tel-Aviv University- Israel*

16:40 - 17:00 **The regulation problem for the one-dimensional Schrödinger equation via the backstepping approach – 26**
Hua-Cheng Zhou and George Weiss- *Tel-Aviv University- Israel*

17:00 – 17:20 **L1/L-infinity Control of Delayed and Quantized Systems Without State Information – 229**
Anatoly Khina, Yorie Nakahira and Babak Hassibi- *California Institute of Technology- USA*

17:20 – 17:40 **Robust Simple Adaptive Control of Linear Systems with Saturation – 103**
Isaac Yaesh[1] and Uri Shaked[2]- *(1) IMI=Israel (2) Tel-Aviv University- Israel*

17:40 – 18:00 **Navigation Approaches fo Hovering Autonomous Underwater Vehicles – 104**
Alon Baruch, Eran Kamber, Itay Arbel, Boris Braginsky and Hugo Guterman- *Ben-Gurion University- Israel*

Friday, November 18th , 2016

Session 1: 8:30-10:30

SX3: Chairs – Mark Shtaif[1] and Dan Marom[2]- (1) Tel-Aviv University (2) Hebrew University

Special Session on Optical Communications Part 1

8:30 - 8:50 **Energy and Entropy Conservation for Optical Fiber Channels- 402**
Gerhard Kramer, *Technical University of Munich, Germany*

8:50 - 09:10 **Nonlinear Fourier transform: recent progress and challenges**
Sergei K. Turitsyn – *Aston University (UK)*

9:10 - 09:30 **Optical transmission based on the nonlinear Fourier transform: estimating the capacity limits- 138**
Stanislav Derevyanko[1], Jaroslaw Prilepsky[2] and Sergei Turitsyn[2]– *(1) Ben Gurion University, Israel, (2) Aston University (UK)*

9:30 – 9:50 **What challenges the optical fiber channel brings to information theory**
René-Jean Essiambre – *Nokia Bell Labs- Israel*

9:50 - 10:10 **Space-division multiplexed transmission over multimode and coupled-core fibers**
Roland Ryf – *Nokia Bell Labs, NJ, USA*

10:10 - 10:30 **Planning of SDM networks utilizing different types of SDM switching schemes and SDM transmission fibers**
Ioannis Tomkos – *AIT, Greece*

IT2: Chair – Shlomo Shamai- Technion

Information Theory 2

8:30 - 8:50 **f-Divergence Inequalities via Functional Domination- 1**
Igal Sason and Sergio Verdu- *Technion- Israel*

8:50 - 09:10 **Wiretap Channel with Random States Non-Causally Available at the Encoderer - 89**
Ziv Goldfeld[1], Paul Cuff[2] and Haim Permuter[1]- (*1) Ben-Gurion University- Israel (2) Princeton University- USA*

09:10 - 09:30 **Single-Letter Bounds on the Feedback Capacity of Unifilar Finite-State Channels - 92**
Oron Sabag[1], Haim Permuter[1] and Henry Pfister[2]- (*1) Ben-Gurion University- Israel (2) Duke University- USA*

9:30 - 9:50 **The Resolution of Binary Hypothesis Testings – 113**
Michael Bell and Yuval Kochman- *Hebrew University- Israel*

9:50 - 10:10 **Two Measures of Dependence – 106**
Amos Lapidoth and Christoph Pfister- *ETH Zurich- Switzerland*

10:10 - 10:30 **Conditional and Relevant Common Information – 101**
Amos Lapidoth and Michele Wigger- (1) *ETH Zurich- Switzerland (2) Telecom Paristech- France*

SX4: Chair – Ron Kimmel **- Technion**

Special Session on Image Analysis & Processing

8:30 - 8:50	**Partial Functional Correspondence - 4** *Emanuele Rodolà - USI Lugano / Intel- Switzerland*
8:50 - 09:10	**Fast Geometric Embedding - 17** Gil Shamai and Ron Kimmel- *Technion- Israel*
09:10 - 09:30	**On improvement of Maps between Shapes - 23** Danielle Ezuz - *Technion- Israel*
9:30 - 9:50	**Subspace LS MDS - 24** Amit Boyarski[1], Alex Bronstein[1] and Michael Bronstein[2]-(1) *Tel-Aviv University- Israel (2) University of Lugano- Switzerland*
9:50 - 10:10	**An Alternating Direction Method for Optical Flow Estimation with l_p Regularization - 44** Naftali Zon and Nahum Kiryati- *Tel-Aviv University- Israel*
10:10 - 10:30	**Wide Baseline Stereo Matching with Convex Bounded-Distortion Constraints** Tal Amir and Ronen Basri - Weizmann Institute of Science - Israel

COD: Chair – Yuval Cassuto - Technion

Coding

8:30 - 8:50	**Designing and Encoding QC-LDPC Codes using Matrices over Commutative Rings - 39** Ishai Ilani- *SanDisk - Israel*
8:50 - 09:10	**On Iterative Decoding of Short Codes - 111** Nimrod Shacham and Dr. Ofer Amrani- *Tel-Aviv University- Israel*
09:10 - 09:30	**Adaptive Threshold Read Algorithms in Multi-level Non-Volatile Memories with Uncertainty - 173** Amit Solomon and Yuval Cassuto- *Technion- Israel*
9:30 - 9:50	**Robust Error Detecting Codes for Multilevel Memories - 210** Yaara Neumeier and Osnat Keren- *Bar-Ilan University- Israel*

POW4: Chair : Alon Kuperman- Ben-Gurion University
Power electronics and renewables
Sponsored by: solaredge

8:30 - 8:50	**Enhancing the Power Production of PV Modules by Rearranging the Solar-Cells Interconnections - 29** Assaf Peled and Joseph Appelbaum- *Tel-Aviv University- Israel*
8:50 - 09:10	**The Effect of Interconnecting Solar Cells in the PV module on the Power Output - 130** Yehya Massalha and Joseph Appelbaum- *Tel-Aviv University- Israel*
09:10 - 09:30	**Electricity Quality Estimation in Consequence of PV Power Penetration into Israeli Grid - 150** Daniel Kurtz[1] and Moshe Averbukh[2] *(1) IEC- Israel (2) Ariel University- Israel*
9:30 - 9:50	**Technical and Economic Comparison between Fixed and Sun-tracking PV Power Plants in the Negev Region, Israel - 186** Marcos Roitman, Itai Shimon Zitan and Dmitri Zaharin- *Shamoon College of Engineering- Israel*
9:50 - 10:10	**Robust Droop Control of Grid-Connected Inverters - 157** Moria Elkayam[1], Josep M. Guerrero[2], Alon Kuperman[3] and Alex Belenky[3]- *(1) Ariel University- Israel (2) Aalborg University- Denmark (3) Ben-Gurion* (2) *University- Israel*

CIR1: Chair - Shahar Kvatinsky - Technion
Circuits and devices

8:30 - 8:50	**CMOS-SOI-NEMS Uncooled Infrared Presence Sensor – 105** Alex Zviagintsev, Tanya Blank, Sharon Bar-Lev, Igor Brouk, Ilan Bloom and Yael Nemirovsky- *Technion-Israel*
8:50 - 09:10	**Design Methodology for Stateful Memristive Logic Gates – 40** Nimrod Wald and Shahar Kvatinsky- *Technion-Israel*
09:10 - 09:30	**Magneto-lithography, a simple and inexpensive method for high-throughput, surface patterning – 74** Amos Bardea[1] and Alexander Yoffe[2]- (*1) Holon Institute of Technology-Israel (2) Weizmann Institute of Science- Israel*
9:30 - 9:50	**Device for Cardiovascular System Monitoring Based on Estimation of Synchronization between its Low-Frequency Rhythms – 125** Vladimir Ponomarenko[1], Mikhail Prokhorov[1], Anatoly Karavaev[1], Danil Kulminskiy[1], Anton Kiselev[2] and Vladimir Gridnev[2]- (*1) Saratov Branch of Kotel'nikov Institute of Radio Engineering and Electronics of Russian Academy of Sciences- Russia (2) Saratov State Medical University n.a. V.I. Razumovsky- Russia*
9:50 - 10:10	**Modeling and Simulations of MOSQWell Transistor future Building Block for Optical Communication – 126** T Michael Bendayan[1], Avraham Chelly[2] and Avi Karsenty[3]- (*1) RAFAEL- Israel (2) Bar-Ilan University-Israel (3) Lev Academic Center- Israel*

10:10 - 10:30 **A multi-turn twisted inductor for on-chip cross-talk reduction – 239**
Kobi Ben-Atar[1], Peter Martin[2] and Richard Horn[2]- (*1) Tel-Aviv University-Israel (2) Sequans Communications- United Kingdom*

SP2: Chair – Boaz Rafaely- Ben Gurion University

Signal Processing

8:30 - 8:50 **Spatio-Spectral Masking for Spherical Array Beamforming – 15**
Uri Abend and Boaz Rafaely- *Ben-Gurion University- Israel*

8:50 - 09:10 **Blind Deconvolution Via Maximum Kurtosis Adaptive Filtering –19**
Deborah Pereg[1] and Doron Benzvi[2]- *(1) Technion- Israel (2) jerusalem college of engineering- Israel*

09:10 - 09:30 **A Real-Life Experimental Study on Semi-Supervised Source Localization Based on Manifold Regularization** –27
Bracha Laufer-Goldshtein[1], Ronen Talmon[2] and Sharon Gannot[1] – *(1) Bar-Ilan University-Israel (2) Technion- Israel*

9:30 - 9:50 **Comparison of binaural multichannel Wiener filters with binaural cue preservation of the interferer ing source - 90**
Elior Hadad[1], Daniel Marquardt[2], Simon Doclo[2] and Sharon Gannot[1]- *(1) Bar-Ilan University-Israel (2) Technion- Israel (2) University of Oldenburg- Germany*

9:50 - 10:10 **Multiple DoA Estimation and Blind Source Separation Using Expectation-Maximization Algorithm - 145**
Yuval Dorfan, Ofer Shwartz, Boaz Shwartz, Emanuel Habets and Sharon Gannot – *(1) Bar-Ilan University-Israel (2) International Audio Laboratories Erlangen - Germany*

10:10 - 10:30 **A statistical model for room impulse responses encompassing early and late reflections -222**
Dovid Y. Levin and Sharon Gannot- *Bar-Ilan University-Israel*

Friday, November 18th , 2016

Session 2: 11:00-13:20

SX3: Chairs – Mark Shtaif[1] and Dan Marom[2]- (1) Tel-Aviv University (2) Hebrew University

Special Session on Optical Communications Part 2

11:00 – 11:20 **The Kramers Kronig receiver: a coherent receiver scheme based on direct-detection**
Antonio Mecozzi – *University of L'Aquila- Italy*

11:20 – 11:40 **Digital Signal Processing for Access and Short Reach Optical Networks**
Werner Rosenkrantz, Christian-Albrechts-*Universität zu Kiel- Germany*

11:40 – 12:00 **On the Statistics of Nonlinear Interference Noise- 118**
Ori Golani[(1)], Mark Shtaif[(1)], Meir Feder[(1)] and Antonio Mecozzi[(2)] – *(1) Tel Aviv University- Israel, (2) L'Aquila University- Italy*

12:00 – 12:20 **Real-Time Implementation of DFT-S OFDM Receiver Based on Digital Sub-banding- 200**
Alexander Tolmachev[1], Maxim Meltsin[1], Rolf Hilgendorf[1], Mordechay Orbach[1], Yitzhak Birk[1], Shalva Ben-Ezra[2], and Moshe Nazarathy[1] – *(1) Technion- Israel (2) Finisar- Israel*

12:20 – 12:40 **Visible light communication or Li-Fi**
Shlomi Arnon – *Ben-Gurion University- Israel*

IT3: Chair – Yuval Kochman- Hebrew University

Information Theoretic Signal Processing

11:00 – 11:20 **Low-Redundancy Bit Interleaving – 140**
Alon Klein-Orbach and Yuval Kochman- *Hebrew University- Israel*

11:20 – 11:40 **A Diversity Multiplexing Tradeoff Under Generalized Sampling Expansion – 172**
Nir Hadas and Meir Feder- *Tel-Aviv University- Israel*

11:40 – 12:00 **Universal Outage Behavior of Rate-Optimized Precoded Integer Forcing Over MIMO Channels - 238**
Elad Domanovitz and Uri Erez- *Tel-Aviv University- Israel*

12:00 – 12:20 **Two Asymmetric Descriptions Based on Many Symmetric Descriptions – 201**
Adam Mashiach[1], Ram Zamir[1], Jan Østergaard[2] and Yuval Kochman[3]- *(1) Tel-Aviv University- Israel (2) Aalborg University- Denmark (3) Hebrew University - Israel*

12:20 – 12:40 **Regularization Parameter Estimation for Ridge and LASSO Regressions Using Bayesian Interpolation - 178**
Naor Huri and Meir Feder- *Tel-Aviv University- Israel*

12:40 – 13:00 **The typical subset from many deterministic frames exhibits limiting random-like MANOVA behavior** – 214
Marina Haikin[1], Ram Zamir[1] and Matan Gavish[2]- *(1) Tel-Aviv University- Israel*

(2) Hebrew University- Israel

SX4 : Chair - Ron Kimmel- Technion

Special Session on Image Analysis & Processing

11:00 – 11:20 **Learning to stereo - 65**
Ron Slossberg, Aaron Wetzler and Ron Kimmel- Technion - Israel

11:20 – 11:40 **Deep Neural Networks with Random Gaussian Weights: A Universal Classification Strategy? - 115**
Alexander Bronstein – *Technion - Israel*

11:40 – 12:00 **Empirical Analysis of Dynamical Systems with Informed Geometry Learning - 6**
Or Yair and Ronen Talmon – *Technion - Israel*

12:00 – 12:20 **Randomized Independent Component Analysis - 68**
Matan Sela and Ron Kimmel - *Technion – Israel*

12:20 – 12:40 **Understanding Geometry**
Ron Kimmel - Technion – Israel

12:40 – 13:00 **Multiscale non-rigid point cloud registration**
Hongkai Zhao – *University of California, Irvine – USA*

13:00 - 13:20 **Geodesic curves for region-based segmentation**
Laurent D. Cohen, Da Chen, Jean-Marie Mirebeau - Paris-Dauphine University - France

SX5: Chair - Raja Giryes – Tel-Aviv University

Special Session on Deep Learning

11:00 – 11:20 **On the generalization error of Deep Neural Networks - 342**
Miguel Rodrigues – *University College London- UK*

11:20 – 11:40 **Learning to Decode Linear Codes Using Deep Learning**
Eliya Nachmani, Yair Beery and David Burstein – *Tel Aviv University - Israel*

11:40 – 12:00 **Deep learning in medical imaging- 344**
Hayit Greenspan, *Tel Aviv University- Israel*

12:00 – 12:20 **Learning to Count with CNN Boosting- 343**
Lior Wolf – *Tel Aviv University- Israel*

12:20 – 12:40 **Deep learning by contrastive measures- -341**
Elad Hoffer and Nir Ailon – *Technion- Israel*

12:40 – 13:00 **Solving Inverse Problems With Deep Learning -345**
Raja Giryes – *Tel Aviv University- Israel*

POW5: Chair : Sigmond Singer- Tel-Aviv University

Power Electronics

Sponsored by: solaredge

11:00 – 11:20 **A Novel Approach to Arc Flash Mitigation Using Passive Series Filters – 69**
Amir Khan and Nagy Bengiamin- *California State University Fresno-USA*

11:20 – 11:40 **Digital Control of a High Voltage Power Supply – 80**
Liran Katzir and Doron Shmilovitz- *Tel-Aviv University- Israel*

11:40 – 12:00 **Control and Voltage Regulation of General Transposed Series-Parallel Converter – 122**
Yuval Beck[1] and Sigmond Singer[2]- *(1) Holon Institute of Technology- Israel (2) Tel-Aviv University- Israel*

12:00 – 12:20 **Optimal Switching in a Three-Level Inverter: an Analytical Approach – 215**
Almog Salman, Yair Cohen, Tirza Routtenberg, Lior Simchon and Rual Rabinovici- *Ben-Gurion University- Israel*

12:20 – 12:40 **Tracking Performance Oriented Design of Proportional-Resonant Controllers under Finite Control Bandwidth and Actuator Delay – 160**
Yeshialeka Basha[1], Alex Belenky[2] and Alon Kuperman[2]-
(1) Ariel University-Israel (2) Ben-Gurion University- Israel

12:40 – 13:00 **Estimation of Harmonic Disturbances with Time Delay UDE Based Controller – 236**
Nir Alshek[1], Moria Elkayam[1] and Alon Kuperman[2]-*(1) Ariel University-Israel (2) Ben-Gurion University- Israel*

CIR2: Chair – Joseph Shor, Bar Ilan University
Circuits and devices Cont.

11:00 – 11:20 **Low Temperature Poly-Silicon Thin Film Transistor Flexible Sensing Circuit – 217**
Dana Keren[1], Avi Efrati[1], Francesco Maita[2], Luca Maiolo[2], Antonio Minotti[2], Alessandro Pecora[2], Guglielmo Fortunato[2], Mario Zajac[1] and Yosi Shacham-Diamand[1]- (*1) Tel-Aviv University- Israel (2) IMM-CNR-Italy*

11:20 – 11:40 **Electrostatically Formed Nanowire based Silicon-on-Insulator tri-gate Field Effect Transistor for effective sensing of temperature – 220**
Klimentiy Shimanovich[1], Yonatan Vaknin[1], Tom Coen[1], Gil Shalev[1], Yakov Roizin[2] and Yossi Rosenwaks[1]- (*1) Tel-Aviv University- Israel (2) TowerJazz - Israel*

11:40 – 12:00 **Analysis of conversion time in asynchronous successive charge redistribution ADC with varying rate of charge transfer – 223**
Dariusz Kościelnik[1], Miroslaw Pawlak[2] and Marek Miśkowicz[1]- *(1) AGH University of Science and Technology- Poland (2) University of Manitoba- Canada*

12:00 – 12:20 **Differential sub-harmonic injection lock VCO with fast start up – 180**
Nitzan Oz and Emanuel Cohen- *Technion- Israel*

12:20 – 12:40 **Digital Multi-Level Closed Loop Design for Wideband Envelope Tracking Systems – 185**

Elinor Kashani[1], Emanuel Cohen[2] and Eran Socher[3]- *(1) Intel-Israel (2) Technion-Israel (3) Tel-Aviv University- Israel*

SP3: Chair – David Dov- Technion

Signal Processing 3: Audio and Speech

11:00 – 11:20 **Kernel Method for Speech Source Activity Detection in Multi-modal signals – 14**
David Dov, Ronen Talmon and Israel Cohen- *Technion-Israel*

11:20 – 11:40 **Speech Quality Assessment Using EEG Signals – 50**
Omri Bar and Ilan D. Shallom- *Ben-Gurion University- Israel*

11:40 – 12:00 **Real-Time Cochlear Noise Reduction Algorithm For Embedded Platforms – 91**
Uriya Saroussi, Miriam Furst and Shlomo Weiss- *Tel-Aviv University- Israel*

12:00 – 12:20 **Estimation of Speaker Individual Spectral Envelope for Pitch Tracking Improvement**
Yaniv Zonis, Yaakov Buchris and Israel Cohen- *Technion-Israel*

12:20 – 12:40 **A Dynamic TF-GSC Beamformer for Distributed Arrays with Dual-Resolution Speech-Presence-Probability Estimators – 187**
Anna Barnov[1], Alejandro Cohen[1], Morag Agmon[1], Vered Bar Bracha[1], Shmulik Markovich-Golan[1] and Sharon Gannot[2] – *(1) Intel-Israel (2) Bar-Ilan University- Israel*

Special ICSEE 2016 Symposia

Thursday Nov. 17 2016

SY 1: Sapphire Hall

Symposium on Control Theory and Power Engineering

Organizers: George Weiss and Michael Margaliot

Sponsored by: solaredge

(see abstracts on page 41)

Welcome note (8:20 – 8:30)

George Weiss and Michael Margaliot, Tel Aviv University

Session 1 (8:30 – 10:30) – Engineering Control

8:30 – 9:15 Miroslav Krstic, UCSD. **Keynote Lecture**
Control of PDE-ODE cascades,

9:15 – 9:40 Michael Margaliot, Tel Aviv University
Modeling and analyzing ribosome flow

9:40 – 10:05 Emilia Fridman, Tel Aviv University
Networked control systems: a time delay approach

9:40 – 10:05 Daniel Zelazo, Technion, Israel
Fekete points, formation control, and the balancing problem

Session 2 (11:00 – 13:00) – Power Electronics

11:00 – 11:45 Josep Guerrero, Univ. of Aalborg, Denmark, **Keynote Lecture**
Advanced control architectures for AC and DC micro grids

11:45 – 12:10 Yoash Levron, Technion, Israel
Reduction of power system dynamic models using sparse representations

12:10 – 12:35 Bernhard Maschke, Univ. Claude Bernard, Lyon, France
Thermodynamics and control

12:35 – 13:00 Li Ran, Univ. of Warwick, UK
Mitigation of network fault level constraint for distributed generation

Session 3 (14:00 – 16:00) – Engineering Control

14:00 – 14:45 Vivek Borkar, IIT Bombay, India
Concentration effects in stochastic algorithms

14:45 – 15:10 George Weiss, Tel Aviv University
Stability of the integral control of stable nonlinear systems

15:10 – 15:35 Nikita Barabanov, North Dakota State University
Stability and control of hybrid infinite dimensional systems

15:35 – 16:00 Izhar Or, Technion, Israel
Dynamics and control of robotic locomotion

SY 2

Symposium on Information Theory

Organizer: Anelia Somekh-Baruch

(see abstracts and bios on page 45)

Welcome note (8:30 – 8:40)

Anelia Somekh-Baruch

Session 1 (8:40 – 10:30)

8:40 – 9:20 Amos Lapidoth, ETH Zurich, Switzerland
Fun with Feedback and Various Notions of Channel Capacity

9:20 – 10:00 Tsachy Weissman, Stanford University, USA
Chained Relative Entropy and Mutual Information

10:00 – 10:30 Meir Feder, Tel-Aviv University, Israel
A Mixture Approach for On-Line Learning under the Log-Loss

Session 2 (11:00 – 13:00)

11:00 – 11:30 Albert Guillén i Fàbregas, ICREA and Universitat Pompeu Fabra, Spain
From the Meta-Converse Bound to Perfect Codes

11:30 – 12:00 Shlomo Shamai, Technion, Israel
Information Theory: Some Old and Some New

12:00 – 12:30 Haim Permuter, Ben-Gurion University, Israel
A New Coding Scheme for Cooperation in Semi-Deterministic Channels

12:30 – 13:00 Shraga Bross, Bar-Ilan University, Israel
The Rate-and-State Capacity with Feedback

Session 3 (14:30 – 16:30)

14:30 – 15:00 Giuseppe Caire, TU Berlin, Germany
Efficient Channel Covariance Estimation in Massive MIMO

15:00 – 15:30 Gerhard Kramer, Technical University of Munich, Germany
Capacity of Cloud-RAN Downlink Channels

15:30 – 16:00 Neri Merhav, Technion, Israel
Lower Bounds on Parameter Modulation–Estimation Under Bandwidth Constraints

16:00 – 16:30 Joseph Boutros, Texas A&M University, Qatar
Construction-A Lattices with Number Fields

Session 4 (17:00 – 18:00)

17:00 – 17:30 Emre Telatar, EPFL, Switzerland
Approximation of Output Statistics

17:30 – 18:00 Ioannis Kontoyiannis, Department of Informatics, Athens University of Economics & Business. Greece
Context-Tree Weighting for Bayesian Inference

SY 3: Opal Hall

Symposium on Speech and Audio Processing

Sponsored by: , and

Organizers: Israel Cohen and Sharon Gannot

(see speaker details on page 53)

Welcome note (8:30 – 8:40)

Israel Cohen, Technion, and Sharon Gannot, Bar Ilan University

Session 1 (8:40 – 10:30)

8:40-9:40 **Keynote,** Walter Kellermann, Friedrich-Alexander-University, Erlangen, Germany
Current Challenges in Acoustic Signal Processing for Natural Human/Machine Interfaces

9:40-10:30 Emanuël A.P. Habets, International Audio Laboratories Erlangen, Erlangen, Germany
Sound Acquisition using Parametric Sound Field Models: Classical and Bayesian Approaches

Session 2 (**11:00 – 12:50**)
11:00 – 12:00 **Keynote,** Jingdong Chen, Northwestern Polytechnical University (NPU), Xi'an, China
Differential and Superdirective Beamforming with Small Linear and Circular Microphone Arrays
12:00 – 12:50 Simon Doclo **,** University of Oldenburg, Oldenburg, Germany
Incorporating sparsity into multi-microphone speech dereverberation techniques

Session 3 (14:00 – 15:50)
14:00 – 15:00 **Keynote,** Chandra Sekhar Seelamantula**,** Indian Institute of Science, Bangalore, India
A New Tool for Spectro-Temporal Analysis of Speech Signals

15:00 – 15:50 Karen Livescu**,** Toyota Technological Institute at Chicago, Chicago, USA
Multi-view representation learning for speech

Session 4 (16:10 – 18:00)

16:10 – 17:10 **Keynote,** Paris Smaragdis**,** University of Illinois at Urbana-Champaign, USA
Machine Learning Approaches for Speech Enhancement
17:10 – 18:00 Richard C. Hendriks, Delft University of Technology, Delft, The Netherlands
Optimizing Speech Intelligibility Using a Simple Model of Communication

SY 1: Sapphire Hall

Symposium on Control Theory and Power Engineering

Organizers: George Weiss and Michael Margaliot

Sponsored by: solaredge

Detailed Program

Welcome note (8:20 – 8:30)

George Weiss and Michael Margaliot

Welcome note

8:20 – 8:30

George Weiss and Michael Margaliot

Session 1 - Engineering Control

8:30 – 10:30

- **Keynote: Control of PDE-ODE cascades**
  Miroslav Krstic (Univ. Calif. San Diego)
  8:30 - 9:15

  Abstract: In this talk I will review control designs for cascades of transport, wave, and heat equations into ODE systems. The transport-ODE cascade represents the classical problem of input delay, whereas the other PDE-ODE cascades arise in systems such as oil drilling and melting/crystallization.

- **Modeling and analyzing ribosome flow**
  Michael Margaliot (Tel Aviv Univ.)
  9:15 - 9:40

  Coauthors: Yoram Zarai, Tamir Tuller and Eduardo D. Sontag
  Abstract: A crucial stage in the production of proteins from the information encoded in the genes is called translation. During this stage, complex molecular machines, called ribosomes, bind to the mRNA and "read" it in a sequential manner. In 2011, Reuveni et al. suggested a nonlinear model for this process called the Ribosome Flow Model (RFM). The RFM can be derived as a mean-field approximation of an important model from non-equilibrium statistical physics called the Totally Asymmetric Simple Exclusion Process (TASEP).

  In this talk, we analyze the RFM using various tools from systems and control theory including contraction theory, monotone systems theory, the analytic theory of continued fractions, and convex analysis. We detail several biological implications of the analysis and compare them to known experimental results.

- **Networked control systems: a time delay approach**
  Emilia Fridman (Tel Aviv Univ.)
  9:40 – 10:05

  Abstract: Networked control systems (NCSs) are systems with spatially distributed sensors, actuators and controller nodes which exchange data via a communication network. Compared to

traditional feedback control systems, where the components are connected via point-to-point cables, the introduction of communication network media brings great advantages, such as low cost, reduced weight, simple installation/maintenance and long distance control. There are three main approaches to NCSs: the discrete-time, the hybrid system and the time-delay approaches.

Recent results on NCSs via the time-delay approach will be presented. These results take into account variable sampling intervals, communication delays and scheduling protocols. Unlike other approaches, the time-delay approach allows treating large communication delays (that may be larger than the sampling intervals). Extensions of the results to large-scale NCSs with asynchronous networks and to parabolic PDEs will be mentioned.

- **Fekete points, formation control, and the balancing problem**
  Daniel Zelazo (Technion, Haifa)
  10:05 – 10:30

  Abstract: In this talk, we explore a particular formation control problem, where a team of dynamical systems are tasked with balancing their spatial configuration on a given submanifold that determines the shape of the formation. The control algorithm comprises of two parts: the first is a decentralized control that asymptotically drives each agent in a stable fashion to the desired submanifold, and the second is a distributed control law that works to maximize the pairwise distances between connected agents on the submanifold. It turns out that our approach has a connections to the study of *Fekete points* along with graph theoretic interpretations for the equilibrium points of the dynamical system.

Session 2 - Power Electronics
11:00 – 13:00

- **Keynote: Advanced control architectures for AC and DC micro grids**
  Josep Guerrero (Univ. of Aalborg, Denmark)
  11:00 – 11:45

  Abstract: A Micro grid is an electrical distribution network consisted of distributed generators, local loads, and energy storage systems that can operate in grid-connected or islanded modes. Different technologies are combined together, such us power converters, control, communications, optimization, and so on. This way the energy can be generated and stored near to the consumption points, improving the stability and reducing the losses produced by the large power lines. The keynote will cover not only AC micro grids of conventional islanded systems to support AC loads are demanded in several areas such as islands, rural and remote areas, but also DC micro grids that may conform next low-voltage distribution systems and micro grids will be based on DC, since many generators, storages and loads operate in DC, such photovoltaics, batteries, supercapacitors, LEDs, laptops, and electronic equipment. Important aspect on micro grid research will be presented like modelling, control and operation, energy storage, standard-based ICT and smart-metering, including wireless communications, power line communications, bus signaling, and so on. The application of smart meters in micro grids will be highlighted. Energy Management Systems and Optimization: Online and offline optimization systems are required to enhance micro grid operation regarding energy price, power losses, and economical aspects. Advanced technologies like Multi-Agent Systems (MAS) will be presented as powerful tool for distributed energy systems. Previous experiences in Danish electrical system like the Cell Controller project used MAS technologies to balance dispersed energy generation and consumption. Power quality aspects will be introduced, such as voltage and current harmonics and unbalances that have to be taken into account in a micro grid due to the existence of nonlinear and/or single-phase loads. In such a case, the coordination between power electronics converters is needed in order to enhance system power quality in a cooperative way. Finally, the integration within the Internet of Things (IoT) and the Energy Internet concepts will be introduced for micro grid clusters solutions. Many examples of real micro grid systems will be presented, such a demo

site in Shanghai, China, a Smart Home living lab in Denmark, and so on. Finally, one important application in micro grids is maritime power systems, which include seaports, all and hybrid electrical ships, ferries and vessels.

- **Reduction of power system dynamic models using sparse representations**
  Yoash Levron (Technion, Haifa)
  11:45 – 12:10

  Abstract: Large-scale integration of renewable sources in power grids requires accurate and reliable analysis of dynamic phenomena in large power systems. Toward this end, this talk presents a model reduction technique that simplifies the dynamic equations of complex power networks, using sparse representations of the system matrices. Standard model reduction techniques are based on the idea of removing components from the state vector. Instead, we propose to eliminate elements from the system matrices, such that these matrices become sparse. This is achieved by three different numeric algorithms that approximate the initial system model using a minimal number of nonzero elements. These algorithms lead to simplified dynamic models, since the complexity of operations involving sparse matrices is primarily affected by the matrices density. Furthermore, this approach enables to identify significant dynamic relations between units in the network, and may simplify the analysis of complex dynamic phenomena in power systems.

- **Thermodynamics and control**
  Bernhard Maschke (Univ. Claude Bernard, Lyon, France)
  12:10 – 12:35

  Abstract: The intrinsic description of open irreversible thermodynamic systems has given rise to the definition of control Hamiltonian systems defined on contact manifolds, which have been called input-output contact systems. In this talk, we shall analyze some system-theoretic properties of such systems. We shall, in particular, analyze their structure preserving feedback, characterize a class of contact forms achievable in closed-loop and consider the (partial) stabilization of these systems.

- **Mitigation of network fault level constraint for distributed generation**
  Li Ran (Univ. of Warwick, UK), coauthors:
  Ahmad Mohamed Abdel Motalab Ali Sol, Han Qin, and Robert Wu (Warwick)
  12:35 – 13:00

  Abstract: In this work we analyse the trend of change of system fault level and explain under which condition the increase of fault level would become a constraint limiting further increase of distributed generation. We will focus on how power electronics could be used to mitigate the problem without overly increasing the cost and losses in the system.

Session 3- Engineering Control
14:00 – 16:00

- **Concentration effects in stochastic algorithms**
  Vivek Borkar (IIT Bombay, India)
  14:00 – 14:45

  Abstract: This talk will describe concentration of suitably interpolated iterates of a stochastic approximation algorithm around a limiting differential equation trajectory with high probability. As a consequence, we get sample complexity results as well as bounds on `trapping probability' of a stable but possibly undesired equilibrium.

- **Stability of the integral control of stable nonlinear systems**
  George Weiss (Tel Aviv Univ.)
  Coauthor: Vivek Natarajan (IIT Bombay)
  14:45 – 15:10

  Abstract: PI controllers are the most widespread type of controllers and there is an intuitive Understanding that if their gains are sufficiently small and of the correct sign, then they “always” work. In this research we try to give some rigorous backing to this claim, under specific assumptions. Let P be a nonlinear system described by $\dot{x} = f(x;u)$, $y = g(x)$, where the state trajectory x takes values in R^n, u and y are scalar and $f;g$ are of class C^1. We assume that there is a Lipschitz function Xi : $[u_{min}; u_{max}] \to R^n$ such that for every constant input $u_0 \in [u_{min}; u_{max}]$, Xi($u_0$) is an exponentially stable equilibrium point of P. We also assume that $G(u) = g(\text{Xi}(u))$, which is the steady state input-output map of P, is strictly increasing. Denoting $y_{min} = G(u_{min})$ and $y_{max} = G(u_{max})$, we assume that the reference value r is in $(y_{min}; y_{max})$. Our aim is that y should track r, i.e., $y \to r$ as t tends to infinity, while the input of P is only allowed to be in $[u_{min}; u_{max}]$. For this, we introduce a variation of the integrator, called the saturating integrator, and connect it in feedback with P in the standard way, with gain $k > 0$. We show that for any small enough k, the closed-loop system is (locally) exponentially stable around an equilibrium point (X(u_r);u_r), with a “large” region of attraction $X_T \subset R^n \times [u_{min}; u_{max}]$. When the state ($x(t);u(t)$) of the closed-loop system converges to (X(u_r);u_r), then the tracking error $r-y$ tends to zero. The compact set X_T can be made larger by choosing a larger parameter $T > 0$, resulting in smaller k.

- **Stability and control of hybrid infinite dimensional systems**
  Nikita Barabanov (Fargo, North Dakota)
  15:10 – 15:35

  Abstract TBA

- **Dynamics and control of robotic locomotion**
  Izhar Or (Technion, Haifa)
  15:35 – 16:00

  Abstract: Locomotion of mobile robots or moving creatures is generated by internal actuation of shape changes combined with physical interaction with the surrounding environment. The mechanics of locomotion typically gives rise to nonlinear control systems which are governed by nonholonomic constraints. In this talk, two examples of (bio-)robotic locomotion systems will be overviewed: microswimmers and underactuated vehicles. Swimming microorganisms and micro-robotic swimmers whose motion is governed by low-Reynolds-number hydrodynamics, in which inertial effects are negligible, can be controlled by internal motors or by actuation of a time-varying external magnetic field. It will be shown how optimal control theory can be used in order to obtain optimal gaits for maximizing net displacement of Purcell's three-link microswimmer model. Underactuated vehicles are governed by nonholonomic mechanics due to no-slip constraints of wheels, combined with momentum evolution. Analysis of a simple model of the Twistcar toy vehicle will be presented. It will be shown how explicit solutions obtained via asymptotic approximations can be used in order to study the effect of actuation type and physical parameters of the vehicle on its performance, as well as convergence properties of the motion.

Symposium on Information Theory

Organizer: Anelia Somekh-Baruch

Detailed Program

Session 1

8:40 – 10:30

8:40 – 9:20 Amos Lapidoth, ETH Zurich, Switzerland

Fun with Feedback and Various Notions of Channel Capacity

Abstract: Shannon's classical channel capacity is not the only notion of capacity to have been studied by information theorists. Others include, inter alia, the zero-error capacity, the zero-undetected-error capacity, and the mismatch capacity. In this talk I shall survey some of these capacities with special emphasis on their behavior in the presence of a feedback link from the channel output to the encoder.

The relationship, first observed by Csiszár and Narayan, between the mismatch capacity and the zero-undetected-error capacity, will allow us to use the results on the latter's feedback behavior to study the former's. With this approach we will show that feedback can increase the mismatch capacity; we will derive conditions that guarantee that the feedback mismatch capacity equals Shannon's capacity; and we will derive new achievable rates for the cases where these conditions are not satisfied.

Bio: Amos Lapidoth received the B.A. degree in Mathematics, the B.Sc. degree in Electrical Engineering, and the M.Sc. degree in Electrical Engineering (1990) all from the Technion-Israel Institute of Technology. He received the Ph.D. degree in Electrical Engineering from Stanford University in 1995. In the years 1995-1999 he was an Assistant and Associate Professor at the department of Electrical Engineering and Computer Science at the Massachusetts Institute of Technology, and was the KDD Career Development Associate Professor in Communications and Technology. He is now Professor of Information Theory at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland. Dr. Lapidoth's research interests are in Digital Communications and Information Theory. He is the author of the textbook "A Foundation in Digital Communication", published by Cambridge University Press in 2009.

9:20 – 10:00 Tsachy Weissman, Stanford University, USA

Chained Relative Entropy and Mutual Information

Abstract: We study the "k-step chained relative entropy", which emerges in a large deviations analysis of the Wright-Fisher model of neutral genetic drift: a population with allele distribution q produces offspring with allele distribution w, which then produce offspring with allele distribution p, and so on, for k steps. The chained relative entropies enjoy some of the same properties as the relative entropy (such as joint convexity in the arguments) and appear in k-step versions of some of the same settings as the relative entropy (such as information projections and a conditional limit theorem). We further characterize the associated optimal k-step "path" of distributions appearing in the definition and apply our findings in a large deviations analysis of the Wright-Fisher process. We make a connection to information geometry via the continuum limit, where the number of steps tends to infinity, and the limiting path turns out to be a geodesic in the Fisher information metric. Finally, we state some natural extensions and applications (such as a k-step mutual information and a k-step maximum likelihood inference). We release code for computing the objects we study. Based on joint work with Dmitri Pavlichin.

Bio: Tsachy Weissman graduated summa cum laude with a B.Sc. in electrical engineering from the Technion, where he also earned his Ph.D. in 2001.
He then worked with the information theory group at HP Labs until 2003, when he joined Stanford University, where he is currently Professor of electrical engineering and incumbent of the STMicroelectronics chair in the school of engineering. He has spent leaves at the Technion, and at ETH Zurich. Tsachy's research is focused on information theory, compression, communication, statistical signal processing, the interplay between them,

and their applications. He is an IEEE fellow and recipient of several best paper awards as well as prizes for excellence in research and teaching. He served on the editorial board of the IEEE Transactions on Information Theory, and currently serves on the editorial board of Foundations and Trends in Communications and Information Theory. He is Founding Director of the Stanford Compression Forum.

10:00 – 10:30 Meir Feder, Tel-Aviv University, Israel
A Mixture Approach for On-Line Learning under the Log-Loss

Abstract: A mixture approach for the problem of on-line learning under the logarithmic loss function is proposed and analyzed, both by theoretic upper bound and simulation. In this problem there is a sequence of input vectors $\underline{x}_1, \underline{x}_2, ..., \underline{x}_t, ...$ and a sequence of output classes $y_1, y_2, ..., y_t, ...$, where $y_t \in [1, ..., K]$ and the learner provides at each time given the past $\underline{x}^{t-1}, y^{t-1}$ and the current $\underline{x}_t$, a weight, or probability distribution $p_t(1), ..., p_t(K)$ for the K classes.

The methods uses a mixture approach and extends a similar approach used for universal prediction with log-loss. It is shown that for the 1-d barrier classification problem, on-line learning is possible for a constrained adversary, and that the normalized regret for different problems of finite Vapnik-Chervonenkis (VC) dimension may also tend to zero with data size, depending on the sequence of features given to the learner.

*Joint work with Yaniv Fogel.

Bio: Professor Meir Feder received the Sc.D. degree from the Massachusetts Institute of Technology (MIT) in 1987. After being a lecturer in MIT, in 1990 he joined the school of electrical engineering, Tel-Aviv University (TAU), where he is now a Professor and the holder of the Information Theory chair. From 2010-2013 he was the head of the EE school at TAU.

While serving in the Israeli defense Forces, he was awarded the 1978 “creative mind” award. He received several paper awards including the 1993 best paper award of the Information Theory Society. He was the recipient of the 1994 prize of Tel-Aviv University for excellent young scientists, the 1994 award of the Electronic Industry in Israel (awarded by the president of Israel), and the 1995 research prize in applied electronics awarded by Ben-Gurion University. He was a visiting professor in MIT and a visiting scientist in Bell Laboratories, Woods Hole Oceanographic Institution and Scripps Oceanography Institution. He is a Fellow of the IEEE for his contribution to communication, universal data prediction and universal compression.

In parallel to his academic career he is closely involved with the high-tech industry. In 1998 he co-founded Peach Networks, acquired in 2000 by Microsoft. He then co-founded Bandwiz, to provide massive content delivery systems using rateless codes. He was on the founding team of Final Inc., a high frequency trading firm. In 2004 he co-founded Amimon, a provider of wireless high-definition A/V connectivity solutions for the consumer, professional and medical markets. Currently he is an angel investor and serves on the board and advisory board of several US and Israeli based companies.

Session 2
11:00 – 13:00

11:00 – 11:30 Albert Guillén i Fàbregas, ICREA and Universitat Pompeu Fabra, Spain
From the Meta-Converse Bound to Perfect Codes

Abstract: This talk studies lower bounds to the channel coding error probability. For a family of symmetric channels, block lengths and coding rates, the error probability of the best code is shown to coincide with that of a binary hypothesis test with certain parameters. The points in which they coincide, are precisely the points at which perfect or quasi-perfect codes exist.

Bio: Albert Guillén i Fàbregas received the Telecommunication Engineering Degree and the Electronics Engineering Degree from Universitat Politècnica de Catalunya and Politecnico di Torino, respectively in

1999, and the Ph.D. in Communication Systems from École Polytechnique Fédérale de Lausanne (EPFL) in 2004.

Since 2011 he has been an ICREA Research Professor at Universitat Pompeu Fabra. He is also an Adjunct Researcher at the University of Cambridge. He has held appointments at the New Jersey Institute of Technology, Telecom Italia, European Space Agency (ESA), Institut Eurècom, University of South Australia, University of Cambridge, as well as visiting appointments at EPFL, École Nationale des Télécommunications (Paris), Universitat Pompeu Fabra, University of South Australia, Centrum Wiskunde & Informatica and Texas A&M University in Qatar. His research interests are in the areas of information theory, coding theory and communication theory.

Dr. Guillén i Fàbregas is a Member of the Young Academy of Europe, and received the Starting Grant from the European Research Council, the Young Authors Award of the 2004 European Signal Processing Conference, the 2004 Best Doctoral Thesis Award from the Spanish Institution of Telecommunications Engineers, and a Research Fellowship of the Spanish Government to join ESA. He is also an Associate Editor of the IEEE TRANSACTIONS ON INFORMATION THEORY, an Editor of the Foundations and Trends in Communications and Information Theory, Now Publishers and was an Editor of the IEEE TRANSACTIONS ON WIRELESS COMMUNICATIONS.

11:30 – 12:00 Shlomo Shamai, Technion, Israel
Information Theory: Some Old and Some New

Abstract: The presentation starts by demonstrating in a descriptive way the origin of information theory in Shannon's 1948 monumental work, and pointing some interdisciplinary aspects within general areas of electrical engineering and beyond. A change of paradigms in information theory from being a pure mathematical theory of communications to a theory with wide scope direct practical implications and applications is overviewed. To demonstrate the rich aspects of the problems considered and their implications as well as some inter-disciplinary connections, we focus on a simple matrix based linear additive Gaussian model. From a personal viewpoint, we elaborate on the information-estimation intimate connection, mentioning its impact on non-linear filtering and on recent views of efficient coding in single and multi-terminal channels. Possible extensions and a short outlook conclude the presentation.

Bio: Shlomo Shamai (Shitz) received the B.Sc., M.Sc., and Ph.D. degrees in electrical engineering from the Technion---Israel Institute of Technology, in 1975, 1981 and 1986 respectively.

During 1975-1985 he was with the Communications Research Labs, in the capacity of a Senior Research Engineer. Since 1986 he is with the Department of Electrical Engineering, Technion---Israel Institute of Technology, where he is now a Technion Distinguished Professor, and holds the William Fondiller Chair of Telecommunications. His research interests encompasses a wide spectrum of topics in information theory and statistical communications.

Dr. Shamai (Shitz) is an IEEE Fellow, a member of the Israeli Academy of Sciences and Humanities and a foreign member of the US National Academy of Engineering. He is the recipient of the 2011 Claude E. Shannon Award and the 2014 Rothschild Prize in Mathematics/Computer Sciences and Engineering.

He has been awarded the 1999 van der Pol Gold Medal of the Union Radio Scientifique Internationale (URSI), and is a co-recipient of the 2000 IEEE Donald G. Fink Prize Paper Award, the 2003, and the 2004 joint IT/COM societies paper award, the 2007 IEEE Information Theory Society Paper Award, the 2009 and 2015 European Commission FP7, Network of Excellence in Wireless COMmunications (NEWCOM++, NEWCOM#) Best Paper Awards, the 2010 Thomson Reuters Award for International Excellence in Scientific Research, the 2014 EURASIP Best Paper Award (for the EURASIP Journal on Wireless Communications and Networking), and the 2015 IEEE Communications Society Best Tutorial Paper Award. He is also the recipient of 1985 Alon Grant for distinguished young scientists and the 2000 Technion Henry Taub Prize for Excellence in Research. He has served as Associate Editor for the Shannon Theory of the IEEE Transactions on Information Theory, and has also served twice on the Board of Governors of the Information Theory Society. He has served on the Executive Editorial Board of the IEEE Transactions on Information Theory.

12:00 – 12:30 Haim Permuter, Ben-Gurion University, Israel
A New Coding Scheme for Cooperation in Semi-Deterministic Channels

Abstract: One of the main challenges in modern communication systems is how to generate efficient and optimal cooperation between users. In general, this problem is widely open however for some particular cases such as semi-deterministic relay channel and the multiple accesses channel with cribbing optimal coding scheme that achieve the capacity has been found. Thesecoding schemes are based on partial-decode-and-forward, where the main idea is that one user decodes part of the message of the other user. However, if the users have different side information the partial-decode-and-forward coding scheme can no longer be applied.

In this talk we present an alternative and new optimal scheme, called cooperative binning, in which users cooperatively bin their received signals and forward the information to the next user, without attempting to explicitly recover any part of the message. The main advantage of this scheme is illustrated by considering state-dependent extensions of the aforementionedsemi-deterministic setups.

During the talk I present a new open-source software that we developed, http:www.ee.bgu.ac.il/ fmeit that does Fourier-Motzkin elimination for information theoretic inequalities, and can be very useful for researchers.

Bio: Haim Permuter received his B.Sc. (summa cum laude) and M.Sc. (summa cum laude) degrees in Electrical and Computer Engineering from the Ben-Gurion University, Israel, in 1997 and 2003, respectively, and the Ph.D. degree in Electrical Engineering from Stanford University, California in 2008.

Between 1997 and 2004, he was an officer at a research and development unit of the Israeli Defense Forces. Since 2009 he is with the department of Electrical and Computer Engineering at Ben-Gurion University where he is currently an associate professor.

Prof.. Permuter is a recipient of several awards, among them the Fullbright Fellowship, the Stanford Graduate Fellowship (SGF), Allon Fellowship, and and the U.S.-Israel Binational Science Foundation Bergmann Memorial Award and the ERC grant. Haim is currently serving on the editorial boards of the IEEE Transactions on Information Theory.

12:30 – 13:00 Shraga Bross, Bar-Ilan University, Israel
The Rate-and-State Capacity with Feedback

Abstract: The Rate-and-State capacity of a state-dependent channel with a state-cognizant encoder is the highest possible rate of communication over the channel when the decoder—in addition to reliably decoding the data—must also reconstruct the state sequence with some required fidelity. Feedback from the channel output to the encoder is shown to increase this capacity even for channels that are memoryless with memoryless states. This capacity is calculated here for such channels with feedback when the state reconstruction fidelity is measured using a single-letter distortion function and the state sequence is revealed to the encoder in one of two different ways: strictly-causally or causally. In case that the state sequence is revealed to the encoder noncausally we provide bounds on the capacity and identify a condition under which the bounds coincide.

Feedback does not increase the Rate-and-State capacity when the decoder must reconstruct the state sequence perfectly or, in some settings, when the channel is Gaussian and fidelity is measured in terms of mean squared-error.

- Joint work with Amos Lapidoth

Bio: Shraga I. Bross received the B.Sc. and M.Sc. degrees from the Technion---Israel Institute of Technology, Haifa, in 1978 and 1983, and the Ph.D. degree from the University of Maryland, College Park in 1991, all in electrical engineering. During the 1991-1992 academic year he was a Post-doctoral Fellow in the ECE Department at the University of Waterloo, Canada. During 1992--1998 he was with Orckit Communications Ltd., Tel-aviv, Israel, in the capacity of a Senior Scientist. From 1998 to 2006 he was a Senior Research Fellow

at the EE Department, Technion. Since 2007 he is with the Engineering Department, Bar-Ilan University, Israel, where he is now an associate professor. His research interests are in Digital Communications and Information Theory.

Session 3
14:30 – 16:30

14:30 – 15:00 Giuseppe Caire, TU Berlin, Germany
Efficient Channel Covariance Estimation in Massive MIMO

Abstract: A way to reduce the complexity of a massive MIMO front-end consists of hybrid digital analog beamforming, where the analog part operates on the RF signal and projects the very high dimensional signal at the antenna ports onto a much slower dimensional space, which is then demodulated and sampled by a reduced number of RF chains. Joint Space Division and Multiplexing (JSDM) yields a powerful paradigm to design such digital/analog partition, but it requires the knowledge of the user channel covariance information. In this talk, we discuss efficient schemes to recover such covariance information from the low-dimensional projections of the channel vectors operated by the analog beamforming network. We show that three alternative formulations of the problem, maximum-likelihood estimation, compressed sensing with multiple measurement vectors, and super-resolution, yield essentially to very similar Semi-Definite Programs and yield similar performance. Furthermore, we present also low-complexity algorithms that are suitable for a practical FPGA/DSP implementation and can work in real time. The effectiveness of the proposed algorithms is demonstrated by comparing the system performance with that of a JSDM system with ideal covariance information.

Bio: Giuseppe Caire was born in Torino, Italy, in 1965. He received the B.Sc. in Electrical Engineering from Politecnico di Torino (Italy), in 1990, the M.Sc. in Electrical Engineering from Princeton University in 1992 and the Ph.D. from Politecnico di Torino in 1994. He has been a post-doctoral research fellow with the European Space Agency (ESTEC, Noordwijk, The Netherlands) in 1994-1995, Assistant Professor in elecommunications at the Politecnico di Torino, Associate Professor at the University of Parma, Italy, Professor with the Department of Mobile Communications at the Eurecom Institute, Sophia-Antipolis, France, and he is currently an Alexander von Humboldt Professor with the Electrical Engineering and Computer Science Department of the Technical University of Berlin, Germany, and an adjunct professor with the Viterbi School of Engineering, University of Southern California, Los Angeles.

He served as Associate Editor for the IEEE Transactions on Communications in 1998-2001 and as Associate Editor for the IEEE Transactions on Information Theory in 2001-2003. He received the Jack Neubauer Best System Paper Award from the IEEE Vehicular Technology Society in 2003, the IEEE Communications Society & Information Theory Society Joint Paper Award in 2004 and in 2011, the Okawa Research Award in 2006, the Alexander von Humboldt Professorship in 2014, and the Vodafone Innovation Prize in 2015. Giuseppe Caire is a Fellow of IEEE since 2005. He has served in the Board of Governors of the IEEE Information Theory Society from 2004 to 2007, and as officer from 2008 to 2013. He was President of the IEEE Information Theory Society in 2011. His main research interests are in the field of communications theory, information theory, channel and source coding with particular focus on wireless communications.

15:00 – 15:30 Gerhard Kramer, Technical University of Munich, Germany
Capacity of Cloud-RAN Downlink Channels

Abstract: The downlink of a cloud radio access network (C-RAN) architecture can be modeled as a diamond network. The baseband unit (BBU) is connected to remote radio heads (RRHs) via fiber links that are modeled as rate-limited bit pipes. Bounds on the rates for reliable communication are evaluated for single-antenna RRHs. The bounds are also evaluated for an abstract model: a noise-free binary adder channel (BAC). The capacity of the BAC is established for all ranges of bit-pipe capacities, which seems to yield a new combinatorial result on sum sets.

Bio: Gerhard Kramer is Alexander von Humboldt Professor at the Technical University of Munich (TUM). His research interests are primarily in information theory and communications theory, with applications to wireless, copper, and optical fiber networks. He is an IEEE Fellow and served as the 2013 President of the IEEE Information Theory Society.

15:30 – 16:00 Neri Merhav, Technion, Israel

Lower Bounds on Parameter Modulation–Estimation Under Bandwidth Constraints

Abstract: We consider the problem of modulating a parameter value onto a band-limited signal to be transmitted over a continuous-time, additive white Gaussian noise (AWGN) channel, and estimating this parameter at the receiver. The performance is measured by the mean power-α error (MPαE), namely, the worst-case α-th order moment of the absolute estimation error. The fastest exponential decay rate of the MPαE as a function of the transmission time, is investigated. Two different mechanisms are developed, for transforming upper (converse) bounds on the MPαE exponents of the unlimited bandwidth case, to corresponding bounds for the band-limited case. The bounds are computed for typical values of the error moment and the signal-to-noise ratio (SNR), and the SNR asymptotics of the different bounds are analyzed. The new bounds are compared to known converse and achievability bounds, which were derived from channel coding considerations.

- Joint work with Nir Weinberger

Bio: Neri Merhav was born in Haifa, Israel, on March 16, 1957. He received the B.Sc., M.Sc., and D.Sc. degrees from the Technion, Israel Institute of Technology, in 1982, 1985, and 1988, respectively, all in electrical engineering.

From 1988 to 1990 he was with AT&T Bell Laboratories, Murray Hill, NJ, USA. Since 1990 he has been with the Electrical Engineering Department of the Technion, where he is now the Irving Shepard Professor. During 1994--2000 he was also serving as a consultant to the Hewlett--Packard Laboratories -- Israel (HPL-I). His research interests include information theory, statistical communications, and statistical signal processing. He is especially interested in the areas of lossless/lossy source coding and prediction/filtering, relationships between information theory and statistics, detection, estimation, as well as in the area of Shannon Theory, including topics in joint source--channel coding, source/channel simulation, and coding with side information with applications to information hiding and watermarking systems. Another recent research interest concerns the relationships between Information Theory and statistical physics.

Dr. Merhav was a co-recipient of the 1993 Paper Award of the IEEE Information Theory Society and he is a Fellow of the IEEE since 1999. He also received the 1994 American Technion Society Award for Academic Excellence and the 2002 Technion Henry Taub Prize for Excellence in Research. From 1996 until 1999 he served as an Associate Editor for Source Coding to the IEEE TRANSACTIONS ON INFORMATION THEORY. He also served as a co--chairman of the Program Committee of the 2001 IEEE International Symposium on Information Theory. He is currently on the Editorial Board of FOUNDATIONS AND TRENDS IN COMMUNICATIONS AND INFORMATION THEORY.

16:00 – 16:30 Joseph Boutros, Texas A&M University, Qatar

Construction-A Lattices with Number Fields

Abstract: Lattices are discrete sets of points in real or complex Euclidean spaces with a group structure. Lattices are an important tool for information processing in many areas such as cryptography, vector quantization, and channel coding. The recent success of building high-dimensional fast-decodable lattices from non-binary codes motivated us to investigate methods for building full-diversity lattices via Construction A (Leech & Sloane 1971). On the Gaussian channel, in absence of fading, low-density lattices from Construction A (LDA) can achieve Shannon capacity under lattice decoding (di Pietro 2014).
Generalized low-density (GLD) lattices and LDA lattices are built from an error-correcting code over a finite field which is embedded and shifted in all directions in the Euclidean space to create a discrete group structure. Under iterative decoding, the finite field size is selected large enough to guarantee that the LDA/GLD lattice is not perturbed by its integer cubic sub-lattice. In presence of fading, cubic integer lattices are replaced by lattices from number fields. The LDA/GLD lattice for diversityforms a partition chain starting with the lattice from

the ring of integers in the number field and ending with a lattice from an ideal in the ring of integers. The lattice diversity order is directly related to the signature of the number field. For fields of degree two and above, we show how to select the number field and the ideal for Construction A in order to make lattices that are good for both Gaussian and fading channels. This is a joint work with Dr Fanny Jardel from Nokia Bell-Labs at Stuttgart.

Bio: Joseph Jean Boutros received the M.S. degree in electrical engineering in 1992 and the Ph.D. degree in 1996, both from Ecole Nationale Superieure des Telecommunications (ENST, Telecom ParisTech), Paris, France. From 1996 to 2006, he was with the Communications and Electronics Department at ENST as an Associate Professor. Also, Dr Boutros was a member of the research unit UMR-5141 of the French National Scientific Research Center (CNRS) in Paris. In July 2007, Doctor Boutros joined Texas A&M University at Qatar as a full
Professor in the electrical engineering program. Doctor Boutros teaches courses in signal processing, communication theory, information theory, and wireless communications. His mathematical approach for teaching communication theory is combined with a strong practical computing component. Doctor Boutros has been a scientific consultant for Alcatel Space, Philips Research, and Motorola Semiconductors, and member of the Digital Signal Processing team at Juniper Networks Cable. His fields of research are codes on graphs, lattice sphere packings, iterative decoding, joint source-channel coding, compressive sensing, space-time coding, physical-layer security, and physical-layer network coding. Doctor Boutros' citations score is more than 5000 according to Google Scholar. His research is mainly performed under grants and tight collaboration with private companies and public institutions such as Mitsubishi Electric Europe, Ooredoo, and the Qatar National Research Fund. Dr Boutros is a senior member of the IEEE society. He is active in technical and organization committees of numerous IEEE events, such as the International Symposium on Information Theory (ISIT), the Information Theory Workshop (ITW), the International Symposium on Turbo Codes and related topics, etc. Doctor Boutros is co-inventor of 13 industrial patents including algorithms and techniques in channel coding and digital communications.

Session 4
17:00 – 18:00

17:00 – 17:30 Emre Telatar, EPFL, Switzerland
Approximation of Output Statistics

Abstract and bio have not been received yet

17:30 – 18:00 Ioannis Kontoyiannis, Department of Informatics, Athens University of Economics & Business. Greece
Context-Tree Weighting for Bayesian Inference

Abstract: We consider the problem of hierarchical Bayesian inference and model selection, for discrete time series. We define a new class of prior distributions (on models and on parameters) and consider a number of statistical problems for such data, including online prediction, estimation, classification, anomaly detection, and so on.
As with any Bayesian procedure, the main goal is to determine the associated posterior distributions. We observe that the Context Tree Weighting (CTW) and related algorithms -- initially developed in the context of universal data compression by Willems, Shtarkov, Tjalkens and their collaborators since the early 1990s -- can be generalized and applied in this setting, to give exact solutions to some difficult problems. We describe how the resulting methods can be extended is several directions, both algorithmically and theoretically, to provide effective tools for statistical inference in general settings. Our results are illustrated by extensive computational experiments on both synthetic and real data.

Bio: Ioannis Kontoyiannis was born in Athens, Greece, in 1972. He received the B.Sc. degree in mathematics in 1992 from Imperial College (University of London), U.K., and in 1993 he obtained a distinction in Part III of the Cambridge University Pure Mathematics Tripos. He received the M.S. degree in statistics and the Ph.D. degree in electrical engineering, both from Stanford University, Stanford, CA, in 1997 and 1998, respectively. Between 1998 and 2001 he was an Assistant Professor with the Department of Statistics, Purdue University,

West Lafayette, IN (and also, by courtesy, with the Department of Mathematics, and the School of Electrical and Computer Engineering). From 2000 until 2005 he was an Assistant, then Associate Professor, with the Division of Applied Mathematics and with the Department of Computer Science, Brown University, Providence, RI.

Since March 2005, he has been with the Department of Informatics, Athens University of Economics and Business, where he is currently a Professor. Dr. Kontoyiannis was awarded the Manning endowed Assistant Professorship in 2002, and was awarded an honorary Master of Arts degree Ad Eundem, in 2005, both by Brown University. In 2004, he was awarded a Sloan Foundation Research Fellowship. He has served two terms as an Associate Editor for the IEEE Transactions on Information Theory, and he is a Fellow of the IEEE. His research interests include data compression, applied probability, information theory, statistics, simulation, and mathematical biology.

SY 3: Opal Hall

Symposium on Speech and Audio Processing

Sponsored by: , and

Organizers: Israel Cohen and Sharon Gannot

Program including speaker bios

Welcome note
8:30 – 8:40
Israel Cohen, Technion, and Sharon Gannot, Bar Ilan University

Session 1

8:40 – 10:30

Keynote talk: **Walter Kellermann** (8:40-9:40)
"Current Challenges in Acoustic Signal Processing for Natural Human/Machine Interfaces"

Walter Kellermann received the Dipl.-Ing. (univ.) degree in electrical engineering from the University of Erlangen-Nuremberg, in 1983, and the Dr.-Ing. degree from the Technical University Darmstadt, Germany, in 1988. He is a Professor for communications at the University of Erlangen-Nuremberg, Germany, since 1999. From 1989 to 1990, he was a postdoctoral Member of Technical Staff at AT&T Bell Laboratories, Murray Hill, NJ. In 1990, he joined Philips Kommunikations Industrie, Nuremberg, Germany, to work on hands-free communication in cars. From 1993 to 1999, he was a Professor at the Fachhochschule Regensburg, where he also became Director of the Institute of Applied Research in 1997. In 1999, he cofounded DSP Solutions, a consulting firm in digital signal processing, and he joined the University Erlangen-Nuremberg as a Professor and Head of the Audio Research Laboratory. He authored or coauthored 16 book chapters, 250+ refereed papers in journals and conference proceedings, as well as 50+ patents, and is a co-recipient of nine best paper awards. His current research interests include speech signal processing, array signal processing, adaptive filtering, and its applications to acoustic human machine interfaces. Dr. Kellermann served as an Associate Editor and Guest Editor to various journals, including the IEEE TRANSACTIONS ON SPEECH AND AUDIO PROCESSING from 2000 to 2004, the IEEE Signal Processing Magazine in 2015, and presently serves as Associate Editor to the EURASIP Journal on Applied Signal Processing. He was the General Chair of seven mostly IEEE-sponsored workshops and conferences. He served as a Distinguished Lecturer of the IEEE Signal Processing Society (SPS) from 2007 to 2008. He was the Chair of the IEEE SPS Technical Committee for Audio and Acoustic Signal Processing from 2008 to 2010, a Member of the IEEE James L. Flanagan Award Committee from 2011 to 2014, a Member of the SPS Board of Governors (2013–2015), and is currently Vice President Technical Directions of the IEEE Signal Processing Society (2016–2018). He was awarded the Julius von Haast Fellowship by the Royal Society of New Zealand in 2012 and the Group Technical Achievement Award of the European Association for Signal Processing (EURASIP) in 2015. He is an IEEE Fellow.

Invited talk: **Emanuël A.P. Habets** (9:40-10:30)
"Sound Acquisition using Parametric Sound Field Models: Classical and Bayesian Approaches"

Emanuël A.P. Habets received the B.Sc. degree in electrical engineering from the Hogeschool Limburg, The Netherlands, in 1999, and the M.Sc. and Ph.D. degrees in electrical engineering from the Technische Universiteit Eindhoven (TU/e), The Netherlands, in 2002 and 2007, respectively. From March 2007 until February 2009, he was a postdoctoral fellow at the Technion - Israel Institute of Technology and at the Bar-Ilan University, Israel. In 2009, he was awarded a Marie Curie Intra-European Fellowship for Career Development. From February 2009 until November 2010, he was a Member of the Research Staff in the Communication and Signal Processing Group at Imperial College London, United Kingdom. In November 2010, he joined the International Audio Laboratories Erlangen (a joint institution of Fraunhofer IIS and the University of Erlangen-Nuremberg, Germany) as an Associate Professor for Perception-based Spatial Audio Signal Processing at the University of Erlangen-Nuremberg and Chief Scientist for Spatial Audio Processing at Fraunhofer IIS. Since 2013 he is also Head of the Spatial Audio Research Group at Fraunhofer IIS. His research activities center around audio and acoustic signal processing, and include spatial audio signal processing, spatial sound recording and reproduction, speech enhancement (dereverberation, noise reduction, echo reduction), and sound localization and tracking. Dr. Habets was a member of the organization committee of the 2005 International Workshop on Acoustic Echo and Noise Control (IWAENC) in Eindhoven, The Netherlands, a general co-chair of the 2013 International Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA) in New Paltz, New York, and general co-chair of the 2014 International Conference on Spatial Audio (ICSA) in Erlangen, Germany. He was a member of the IEEE Signal Processing Society Standing Committee on Industry Digital Signal Processing Technology (2013-2015), and a Guest Editor of the IEEE Journal of Selected Topics in Signal Processing and the EURASIP Journal on Advances in Signal Processing. He is the recipient, with S. Gannot and I. Cohen, of the 2014 IEEE Signal Processing Letters Best Paper Award. He is a Senior Member of the IEEE, a member of the Audio Engineering Society, a member of the IEEE Signal Processing Society Technical Committee on Audio and Acoustic Signal Processing (2011-2016), vice-chair of the EURASIP Special Area Team on Acoustic, Sound and Music Signal Processing, an Associate Editor of the IEEE Signal Processing Letters, and Editor in Chief of the EURASIP Journal on Audio, Speech, and Music Processing.

Session 2

11:00 – 12:50

Keynote talk: **Jingdong Chen** (11:00-12:00)
"Differential and Superdirective Beamforming with Small Linear and Circular Microphone Arrays"

Jingdong Chen received the Ph.D. degree in pattern recognition and intelligence control from the Chinese Academy of Sciences, Beijing, China, in 1998. From 1998 to 1999, he was with the ATR Interpreting Telecommunications Research Laboratories, Kyoto, Japan, where he conducted research on speech synthesis, speech analysis, as well as objective measurements for evaluating speech synthesis. He then joined the Griffith University, Brisbane, Australia, where he was engaged in research on robust speech recognition, and signal processing. From 2000 to 2001, he worked at the ATR Spoken Language Translation Research Laboratories on robust speech recognition and speech enhancement. From 2001 to 2009, he was a Member of Technical Staff at Bell Laboratories, Murray Hill, NJ, USA, working on acoustic signal processing for telecommunications. He subsequently joined WeVoice Inc., New Jersey, serving as the Chief Scientist. He is currently a Professor at the Northwestern Polytechnical University, Xi'an, China.

His research interests include acoustic signal processing, adaptive signal processing, speech enhancement, adaptive noise/echo control, microphone array signal processing, signal separation, and speech communication. Dr. Chen served as an Associate Editor of the IEEE TRANSACTIONS ON AUDIO, SPEECH, AND LANGUAGE PROCESSING from 2008 to 2014 and as a Technical Committee (TC) member of the IEEE Signal Processing Society (SPS) TC on Audio and Electroacoustics from 2007 to 2009. He is currently a Member of the IEEE SPS TC on Audio and Acoustic Signal Processing, and a Member of the editorial advisory board of the Open Signal Processing Journal. He was the Technical Program Chair of the IEEE TENCON 2013, a Technical Program CoChair of the IEEE WASPAA 2009, the IEEE ChinaSIP 2014, the IEEE ICSPCC 2014, and the IEEE ICSPCC 2015, and helped organize many other conferences. He co-authored the books Design of Circular Differential Microphone Arrays (Springer, 2015), Study and Design of Differential Microphone Arrays (Springer, 2013), Speech Enhancement in the STFT Domain (Springer, 2011), Optimal Time-Domain Noise Reduction Filters: A Theoretical Study (Springer, 2011), Speech Enhancement in the Karhunen-Loeve Expansion Domain (Morgan&Claypool, 2011), Noise Reduction in Speech Processing (Springer, 2009), Microphone Array Signal Processing (Springer, 2008), and Acoustic MIMO Signal Processing (Springer, 2006). Dr. Chen received the 2008 Best Paper Award from the IEEE Signal Processing Society (with Benesty, Huang, and Doclo), the Best Paper Award from the IEEE Workshop on Applications of Signal Processing to Audio and Acoustics in 2011 (with Benesty), the Bell Labs Role Model Teamwork Award twice, respectively, in 2009 and 2007, the NASA Tech Brief Award twice, respectively, in 2010 and 2009, the Young Author Best Paper Award from the 5th National Conference on Man-Machine Speech Communications in 1998. He also received the Japan Trust International Research Grant from the Japan Key Technology Center in 1998 and the "Distinguished Young Scientists Fund" from the National Natural Science Foundation of China in 2014.

Invited talk: **Simon Doclo** (12:00-12:50)
"Incorporating sparsity into multi-microphone speech dereverberation techniques"

Simon Doclo received the M.Sc. degree in electrical engineering and the Ph.D. degree in applied sciences from the Katholieke Universiteit Leuven, Belgium, in 1997 and 2003. From 2003 to 2007 he was a Postdoctoral Fellow with the Research Foundation – Flanders at the Electrical Engineering Department (Katholieke Universiteit Leuven) and the Adaptive Systems Laboratory (McMaster University, Canada). From 2007 to 2009 he was a Principal Scientist with NXP Semiconductors at the Sound and Acoustics Group in Leuven, Belgium. Since 2009 he is the head of the Signal Processing Group at the University of Oldenburg, Germany, and scientific advisor for the project group Hearing, Speech and Audio Technology of the Fraunhofer Institute for Digital Media Technology. His research activities center around signal processing for acoustical applications, more specifically microphone array processing, active noise control, acoustic sensor networks and hearing aid processing. Prof. Doclo received the Master Thesis Award of the Royal Flemish Society of Engineers in 1997 (with Erik De Clippel), the Best Student Paper Award at the International Workshop on Acoustic Echo and Noise Control in 2001, the EURASIP Signal Processing Best Paper Award in 2003 (with Marc Moonen) and the IEEE Signal Processing Society 2008 Best Paper Award (with Jingdong Chen, Jacob Benesty, Arden Huang). He was secretary of the IEEE Benelux Signal Processing Chapter (1998-2002), member of the IEEE Signal Processing Society Technical Committee on Audio and Acoustic Signal Processing (2008-2013), and Technical Program Chair for the IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA) in 2013. Prof. Doclo has served as guest editor for several special issues (IEEE Signal Processing Magazine, Elsevier Signal Processing) and is associate editor for IEEE/ACM Transactions on Audio, Speech and Language Processing and EURASIP Journal on Advances in Signal Processing.

Session 3

14:00 – 15:50

Keynote talk: **Chandra Sekhar Seelamantula** (14:00-15:00)

"A New Tool for Spectro-Temporal Analysis of Speech Signals"

Chandra Sekhar Seelamantula was born in 1976 in Gollepalem, Andhra Pradesh, India. He obtained a Bachelor of Engineering degree in 1999 with a Gold Medal and Best Thesis Award from the University College of Engineering, Osmania University, India, with a specialization in electronics and communication engineering. He obtained a direct Ph.D. degree in 2005 from the Indian Institute of Science (IISc.), Department of Electrical Communication Engineering. During April 2005–March 2006, he worked as a Technology Consultant for M/s. ESQUBE Communication Solutions Private Limited, Bangalore, and developed proprietary audio coding solutions. In April 2006, he joined the Biomedical Imaging Group, Ecole Polytechnique Federale de Lausanne, Switzerland, as a postdoctoral fellow and specialized in the field of Image Processing, OpticalCoherence Tomography, Holography, Splines, Sparse Signal Processing, and Sampling Theories. In 2009, he joined the Department of Electrical Engineering, IISc., Bangalore, where he is currently Associate Professor and directs the Spectrum Lab. He is also Associate Faculty at the Centre for Neuroscience, IISc. In 2013, he received the Prof. Priti Shankar Teaching Award from IISc. He is currently also the Vice-Chair of the IEEE Signal Processing Society Bangalore Chapter, and an Associate Editor of IEEE SIGNAL PROCESSING LETTERS and SPIE Journal of Electronic Imaging

Invited talk: **Karen Livescu** (15:00-15:50)

"Multi-view representation learning for speech"

Karen Livescu is an Assistant Professor at TTI-Chicago, where she has been since 2008. She completed her PhD and post-doc in EECS at MIT and her AB in Physics at Princeton University. Karen's main research interests are in speech and language processing, with a slant toward combining machine learning with linguistic structure. Her recent work has included multi-view learning of speech and text representations, segmental neural models, and automatic sign language recognition. She is a member of the IEEE Spoken Language Technical Committee and an associate editor for IEEE Transactions on Audio, Speech, and Language Processing. She has organized/co-organized a number of recent workshops, including the ISCA SIGML workshops on Machine Learning in Speech and Language Processing, the Midwest Speech and Language Days, and the Interspeech Workshop on Speech Production in Automatic Speech Recognition.

Session 4

16:10 – 18:00

Keynote talk: **Paris Smaragdis** (16:10-17:10)

"Machine Learning Approaches for Speech Enhancement"

Paris Smaragdis is an associate professor at the CS and ECE depts. at the University of Illinois at Urbana-Champaign. His primary research interests revolve around making machines that can listen. He has been very active in the fields of signal processing, machine learning and statistics as they relate to artificial perception, and in particular computational audition. The bulk of his work on audio is on source separation, and various machine learning approaches to traditional signal processing problems. He is a descendant of a long music lineage dating to the early

1600s. His Erdös number is 4. Prof. Smaragdis has been associated with several research labs. He completed his masters, Ph.D. and a postdoc at the Machine Listening Group at the MIT Media Lab under the supervision of Barry Vercoe. He works with Adobe Systems' Advanced Technology Labs, used to be at MERL, and have spent some time at Interval Research and Starlab. He was also a visiting scientist at MIT's McGovern Institute for Brain Research. In 2006, he was selected by MIT's Technology Review as one of the year's top young technology innovators. Prof. Smaragdis is an IEEE fellow.

Invited talk: **Richard C. Hendriks** (17:10-18:00)
"Optimizing Speech Intelligibility Using a Simple Model of Communication"

Richard C. Hendriks was born in Schiedam, The Netherlands. He received the B.Sc., M.Sc. (cum laude) and Ph.D. (cum laude) degrees in electrical engineering from the Delft University of Technology, Delft, The Netherlands, in 2001, 2003 and 2008, respectively. Currently, he is an assistant professor in the multimedia signal processing group of the faculty of Electrical Engineering, Mathematics and Computer Science at Delft University of Technology. In March 2010 he received a VENI grant for his proposal "Intelligibility Enhancement for Speech Communication Systems". His main research interests are digital speech and audio processing, including single- and multi-microphone acoustical noise reduction, speech enhancement and intelligibility of speech in noise.