

Bi+CAS 2018

Biomedical Circuits and Systems Conference

Advanced Systems for Enhancing Human Health

Cleveland, Ohio, USA | October 17-19, 2018



2018 CONFERENCE PROGRAM

Please visit website for more information!

www.biocas2018.org

SPONSORS AND ORGANIZERS



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WELCOME MESSAGE FROM THE GENERAL CHAIR

Dear Friends and Colleagues:

On behalf of the Organization Committee, we are delighted to welcome you to the 2018 IEEE BioCAS conference in Cleveland, OH, USA.

The conference theme in 2018 is “*Advanced Systems for Enhancing Human Health*”. Through a combination of oral and poster sessions as well as invited keynote and tutorial talks, we will cover a wide range of topics synergistic with this theme, including point-of-care technologies for health and disease, printable/flexible/wearable sensors and devices for health monitoring, artificial intelligence/machine learning for patient-specific healthcare, implanted sensors for management of chronic diseases e.g. diabetes, and emerging technologies for food and drug authentication.

Immediately after the conference, we will have a 1.5-day collaborative workshop, NeuroCAS’18, which will bring together neurotechnologists to explore challenges from across the areas of central and peripheral/autonomic nervous system interfaces through a mixture of structured discussions followed by brainstorming and informal networking.

In line with the past BioCAS conferences and IEEE guidelines, we have not printed a conference program in order to be “green” and friendly with our lovely environment. Continuing the conference tradition to develop the scientific program in a single-track mode, you can review the printed daily program present in front of the session room, as well as download our Final Program from the link: <http://www.biocas2018.org/pages/program>.

Similarly, we have not printed the book of the abstracts either. However, we will provide full access to the papers via a Dropbox download link that will be sent to you via email at the start of the conference. You will have one week to download and save the Conference Proceedings.

You will also have access to the Whova App, which will contain up-to-date conference program details, papers, and messaging tools to connect and interact with conference organizers and other attendees. Details on accessing the event through Whova App can be found later in this program and on the conference website.

On behalf of all the members of our outstanding Organization Committee, we cordially invite you to follow and contribute to the scientific program and make possible the full success of our conference! We are all very excited to welcome you to Cleveland!

Sincerely yours,



Pedram Mohseni, PhD
Dustin Tyler, PhD
BioCAS 2018 General Co-Chairs
BioCAS 2018

Bi+CAS 2018
Biomedical Circuits and Systems Conference
Advanced Systems for Enhancing Human Health
Cleveland, Ohio, USA | October 17-19, 2018

neuroCAS 2018
cleveland, ohio
Circuits and Systems for Neurotechnology
A post-conference workshop of BioCAS 2018

WELCOME MESSAGE FROM THE TECHNICAL PROGRAM COMMITTEE

Dear members of the BioCAS community,

We are delighted to join general co-chairs Pedram Mohseni and Dustin Tyler in welcoming you to what promises to be a most exciting BioCAS conference yet, the BioCAS-2018! We received a total of 270 paper submissions, which is 13% less than last year, most likely due to travel restrictions to the US, but well within the norm for BioCAS. We are pleased to observe an increase in the quality of the submitted papers, a sign of deeper and broader participation by members of the BioCAS community, underscoring the important role of the synergy between technology advances in circuits and systems, and applications to biomedicine, healthcare, and clinical practice, allowing our growing community to impact health and wellness globally.

The technical program that you are about to enjoy is the result of dedicated work by an increasing number of volunteers, in addition to the contributing authors. A total of 58 Review Committee Members (RCMs), listed below, meticulously coordinated the peer review of all submitted papers by recruiting a total of 454 reviewers, covering expertise across all areas of BioCAS and beyond. A total of 1117 reviews were conducted and received, an average of over four reviews per paper. A total of 182 paper submissions were accepted into the BioCAS 2018 program, which represent an acceptance rate of 67 percent. Accepted papers were grouped in 8 lecture sessions totaling 38 papers, and 13 poster sessions (including the live demonstrations session) totaling 144 papers. Decisions on acceptance were made based on RCM recommendations, and a weighted score of reviewer recommendations according to criteria of overall quality, originality, relevance, and clarity. Decisions on presentation type (lecture or poster) were made using the same criteria, in addition to presentation preference by the authors. It is important to point out that, as it has traditionally been the case at BioCAS, there is no difference between the average qualities of the papers selected for oral vs. poster presentation.

BioCAS 2018 continues the tradition of maintaining the single-track structure with an integrated tutorial program and offering a range of exciting ways for authors to present their work to the entire audience. This includes not only conventional poster and lecture presentation but also through more interactive live demonstration. The theme for the 2018 conference is: “Advanced Systems for Enhanced Human Health,” based on which the keynote talks, tutorials, and special sessions have been organized.

The conference this year will additionally feature a post-conference workshop – NeuroCAS 2018. This will be a collaborative effort bringing together our members interested in neurotechnology, and key experts invited from the wider community, for example, neuroscience, neurosurgery, medical devices, and industry. Participants will explore challenges in neurotechnology from across the areas of central and peripheral nervous system interfaces. The 2018 workshop will in particular focus on ECoG and peripheral/autonomic nervous systems interfaces and prostheses.

We look forward to seeing you in Cleveland, OH, and invite you to actively participate in all aspects of this year’s conference, and enjoy!

Timothy Constandinou, Maysam Ghovanloo and Jun Ohta
Technical Program Chairs

PROGRAM AT A GLANCE

PROGRAM SCHEDULE - Wednesday, October 17, 2018	
7:00 – 18:30	REGISTRATION
8:00 – 8:30	Introduction and Welcome – Salon ED
8:30 – 9:30	<i>Keynote: Chemistry-free microfluidic technologies to sort cells for health and disease</i> Utkan Demirci Stanford University School of Medicine Room: Salon ED
9:30 – 10:30	<i>Coffee Break & Poster Session: "Assistive, Rehabilitation & Quality of Life Technologies" and "Biosensors & Interface Circuits I"</i> Room: Salon ABC
10:30 – 12:00	<i>Tutorial: Neuromorphic Artificial Intelligence (AI)</i> Tobi Delbruck ETH Zurich Room: Salon ED
12:00 – 13:00	LUNCH – Salon FGH
13:00 – 14:30	<i>Tutorial: Printed Flexible Medical Devices: From Materials to Systems</i> Ana Claudia Arias University of California–Berkeley & Berkeley Wireless Research Center (BWRC) Room: Salon ED
14:30 – 16:00	<i>Tutorial: Semiconductor-Integrated Biosensing: The Good, The Bad, and The Hype</i> Arjang Hassibi InSilixa Room: Salon ED
16:00 – 17:00	<i>Coffee Break & Poster Session: "Biomedical Imaging & Image Processing" and "Body Area/Sensor Networks & Wireless/Wearable Health Monitoring"</i> Room: Salon ABC
17:00 – 18:30	<i>Tutorial: On-Chip Epilepsy Detection: Where Machine Learning Meets Patient-Specific Wearable Healthcare</i> Jerald Yoo National University of Singapore Room: Salon EG=D
19:30	WELCOME RECEPTION – Salon FGH Live Interactive Demonstrations

PROGRAM SCHEDULE - Thursday, October 18, 2018	
7:30 – 18:00	REGISTRATION
8:00 – 9:30	Lecture Session - Salon ED Circuits & Systems for Smart-Connected Health
9:30 – 10:30	<i>Coffee Break & Poster Session: "Biosignal Recording, Processing, & Machine Learning I" and "Biosensors & Interface Circuits II AND B2P-D. SPECIAL SESSION: Implantable Systems for Neural Interfaces"</i> Room: Salon ABC
10:30 – 12:00	Lecture Session – Salon ED SPECIAL SESSION - On-Chip Machine Learning Design & Applications
12:00 – 13:00	LUNCH – Salon FGH
13:00 – 14:00	<i>Keynote: From Sensors to Wearables to Health Monitoring</i> Mehran Mehregany Case Western Reserve University, USA Room: Salon ED
14:00 – 15:30	Lecture Session – Salon ED Biosensors, Biotelemetry & Neural Interface Circuits
15:30 – 16:30	<i>Coffee Break & Poster Session: "Biotelemetry & Energy Harvesting Circuits & Systems" and "Implantable Medical Electronics"</i> Room: Salon ABC
16:30 – 18:00	Lecture Session - Salon ED Lab-on-Chip, Point-of-Care Technologies & CAS for Neuroscience
19:30	Gala Dinner – Salon ED

PROGRAM SCHEDULE - Friday, October 19, 2018	
7:30 – 18:00	REGISTRATION
8:00 – 9:30	Lecture Session – Salon ED Bio-Inspired & Neuromorphic Human Machine Interfaces
9:30 – 10:30	<i>Coffee Break & Poster Session: “Biosignal Recording, Processing, & Machine Learning II” and “Biofeedback, Neuromodulation, & Closed-Loop Systems” and “Medical Information Systems, Genomics & Bioinformatics”</i> Room: Salon ABC
10:30 – 12:00	Lecture Session – Salon ED Implantable Medical Devices
12:00 – 13:00	LUNCH – Salon FGH
13:00 – 14:00	<i>Keynote: Advanced development for long-term, fully implantable glucose sensors</i> Andrew DeHennis Senseonics, Incorporated, USA Room: Salon ED
14:00 – 14:36	<i>Keynote: Authentication of Consumables Using Low-Field and Zero-Field Magnetic Resonance Spectroscopy</i> Soumyajit Mandal Case Western Reserve University Room: Salon ED
14:36 – 15:30	Lecture Session – Salon ED SPECIAL SESSION - Circuits & Systems for Food Chain
15:30 – 16:30	<i>Coffee Break & Poster Session: “Bio-Inspired & Neuromorphic Circuits & Systems” and “Lab-on-Chip & Point-of-Care Technologies”</i> Room: Salon ABC
16:30 – 18:00	Lecture Session – Salon ED Biomedical Imaging, Image Guided Therapy, & Assistive Technologies
19:00 – 19:30	Buses to Farewell Event
19:30 – 23:00	FAREWELL EVENT – Rock and Roll Hall of Fame

PROGRAM SCHEDULE – Saturday, October 20, 2018 – NeuroCAS Day 1	
Sessions will take place in Salon ABC	
8:00 – 16:00	REGISTRATION
8:30 – 8:50	Welcome to NeuroCAS
8:50 – 9:00	Facilitators Introduction
9:00 – 9:30	Participant Introduction
9:30 – 10:00	<p><i>Invited Talk: Neural Co-processors: Getting from Theory to Practice</i> Tim Denison Oxford University, UK</p> <p><i>Invited Talk: Closed-Loop Neural Interfaces</i> Andrew Jackson Newcastle University, UK</p>
10:00 – 10:25	Table Discussions – Mapping the Challenge
10:25 – 10:40	Share Highlights
10:40 – 11:10	BREAK
11:10 – 11:40	<p><i>Invited Talk: System Design for High Fidelity Mapping</i> Jeffrey L. Ardell UCLA Cardiac Arrhythmia Center, USA</p> <p><i>Invited Talk: Technical Challenges in Electroceuticals - an industry perspective</i> Brian Pepin Verily Life Sciences, USA / Galvani Bioelectronics, UK</p>
11:40 – 12:05	Table Discussions – Mapping the Challenge
12:05 – 12:20	Share Highlights
12:20 – 12:30	Forum
12:30 – 13:30	LUNCH
13:30 – 13:40	Reflections
13:40 – 14:10	<p><i>Invited Talk: Electrocorticographic neural interfaces: The challenges ahead</i> Gerwin Schalk Wadsworth Center, New York State Dept. of Health, USA</p> <p><i>Invited Talk: Engineering the next generation of peripheral & cortical electrodes</i> Joern Rickert CorTec GmbH, Germany</p>
14:10 – 14:35	Table Discussions – Mapping the Challenge
14:35 – 14:50	Share Highlights
14:50 – 15:10	BREAK
15:10 – 15:40	Cluster the Challenges
15:40 – 15:50	Review Clusters
15:50 – 16:00	Wrap-Up Day One
18:30 – 21:30	Reception – St. Clair Ballroom

PROGRAM SCHEDULE – Sunday, October 21, 2018 – NeuroCAS Day 2	
Sessions will take place in Salon ABC	
8:00 – 14:00	REGISTRATION
8:30 – 8:45	Welcome Back
8:45 – 9:00	Review of Themes
9:00 – 9:20	Reframe
9:20 – 9:40	Share Reframed Challenges
9:40 – 10:40	Developing Ideas for Collaborative Research
10:40 – 10:50	Introduction to Feedback Process
10:50 – 11:20	Share and Feedback
11:20 – 12:00	Review Feedback & Refine Ideas
12:00 – 12:45	LUNCH
12:45 – 13:45	Final Presentations
13:45 – 14:00	Plenary Reflections & Next Steps
14:00	CLOSE

GENERAL INFORMATION

Registration & Information Desk

The Registration and Information Desk will be open during the following times:

Wednesday, October 17	7:00 – 18:30
Thursday, October 18	7:30 – 18:00
Friday, October 19	7:30 – 18:00
Saturday, October 20	8:00 – 16:00
Sunday, October 21	8:00 – 14:00

Meeting Room Locations

Lecture Sessions: Salon ED

Lunches: Salon FGH

Keynotes: Salon ED

NeuroCAS Workshop: Salon ABC

Poster Sessions & Coffee Breaks: Salon ABC

Welcome Reception: Salon FGH

Live Demos: During the Welcome Reception in Salon FGH

Name Badges

All attendees must wear their name badges at all times to gain admission to all Conference events.

Electronic Proceedings

The Electronic Proceedings will be provided to you via Dropbox with login and password.

Conference Attire

Attire during the duration of the Conference is business casual.

Cellular Phones

As a courtesy to your fellow attendees, please turn off your cell phone ringer during the conference.

Conference App - Whova

A BioCAS 2018 conference app is available for download:

<http://biocas2018.org/sites/biocas2018.org/files/2018-10/Whova%20Sign.pdf>

SOCIAL PROGRAM

Wednesday, October 17

Event: Wednesday Lunch

Time: 12:00 – 13:00

Location: Salon FGH

Your paid registration fee includes one Wednesday lunch ticket. Guest tickets can be purchased for \$25.00 USD each at the Registration Desk.

Event: Welcome Reception

Time: 19:30

Location: Salon FGH, Marriott

Join us for the Welcome Reception on Wednesday, October 17 in Salon FGH at the Cleveland Marriott Downtown at Key Center. Live Demonstrations will be presented. Cocktails and hors d'oeuvres will served. Your paid registration fee includes one Welcome Reception ticket.

Thursday, October 18

Event: Thursday Lunch

Time: 12:00 – 13:00

Location: Salon FGH

Your paid registration fee includes one Thursday lunch ticket. Guest tickets can be purchased for \$25.00 USD each at the Registration Desk.

Event: Gala Dinner

Time: 19:30

Location: Salon ED, Marriott

Our Conference Banquet will be held at the Cleveland Marriott Downtown at Key Center! Come and join us for an elegant dinner, awards presentation, and a celebration of the 14th BioCAS Conference! Your paid registration fee includes one banquet ticket. Guest tickets can be purchased for \$95.00 USD each at the Registration Desk.

Friday, October 19

Event: Friday Lunch

Time: 12:00 – 13:00

Location: Salon FGH

Your paid registration fee includes one Friday lunch ticket. Guest tickets can be purchased for \$25.00 USD each at the Registration Desk.

Event: Farewell Event

Time: 19:30 – 23:00

Location: Rock & Roll Hall of Fame

Join us for a reception at the Rock and Roll Hall of Fame! Transportation: Shuttle buses will be provided. Attendees should meet in the hotel lobby at 19:00 to board the buses. Your paid registration fee includes one farewell event ticket. Guest tickets can be purchased for \$75.00 USD each at the Registration Desk.

Saturday, October 20 – NeuroCAS Attendees Only

Event: Saturday Lunch

Time: 12:30 – 13:30

Location: Marriott

Your paid NeuroCAS fee includes one Saturday lunch ticket. Guest tickets can be purchased for \$25.00 USD each at the Registration Desk.

Event: NeuroCAS Reception

Time: 18:30 – 21:30

Location: St. Clair Ballroom (Inside Key Tower)

Join us for a reception and poster session at the St. Clair Ballroom. The St. Clair Ballroom is accessible through the same building as the Marriott, the Key Tower, and is located on the 4th floor. Your paid NeuroCAS fee includes one reception ticket.

Sunday, October 21 – NeuroCAS Attendees Only

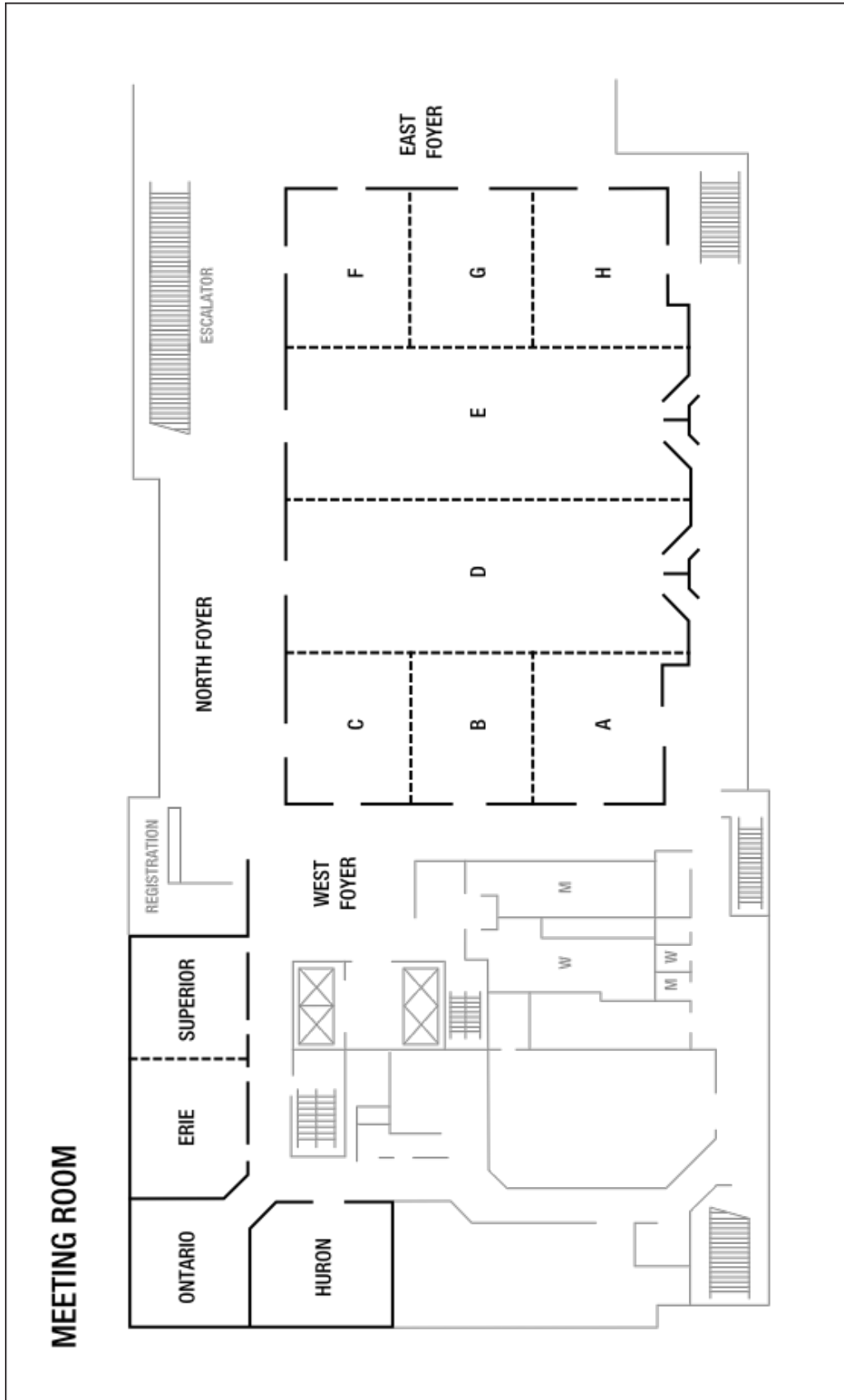
Event: Sunday Lunch

Time: 12:00 – 12:45

Location: Marriott

Your paid NeuroCAS fee includes one Sunday lunch ticket. Guest tickets can be purchased for \$25.00 USD each at the Registration Desk.

CONFERENCE VENUE MAP



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Official Event App

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IEEE Engineering in Medicine and Biology Society (EMBS) is the world's largest international society of biomedical engineers. The organization's 9,100 members reside in some 97 countries around the world. EMBS provides its members with access to the people, practices, information, ideas and opinions that are shaping one of the fastest growing fields in science.

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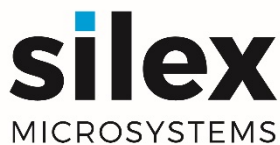
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Exhibitors



KEYNOTE SPEAKERS

Wednesday, October 17th – Utkan Demirci, Ph.D., *Stanford University School of Medicine, USA*

"Chemistry-free microfluidic technologies to sort cells for health and disease"



Dr. Utkan Demirci, UofM'99, Stanford'01'05, is a Professor of Radiology (with tenure) and of Electrical Engineering (by courtesy) at the Canary Center at Stanford for Cancer Early Detection, Stanford University School of Medicine, where he leads a productive group of ~20 researchers. Dr. Demirci's lab is focused on creating micro- and nano-scale technologies that manipulate cells to enable solutions for real world problems in medicine. His group has pioneering contributions in multiple fields including infectious diseases, fertility, cancer diagnostics, cell encapsulation, cryobiology, and biofabrication. His research interests involve the application of microfluidics, nanoscale technologies and acoustics in medicine as it pertains to portable, inexpensive, disposable viral load technology platforms for HIV in resource-constrained settings for global health problems, as well as 3-D bioprinting and tissue models, including 3-D cancer and neural cultures. He has earned many awards including IEEE EMBS Early Career, NSF Career, MIT TR-35, and fellow-elect AIMBE. He holds over 20 patents, provisional, and disclosures and his patents have been translated into products through multiple start-up companies including DxNOW, Koek Biotechnology and LEVITAS. Some of the technologies developed in his lab are now clinically available across the globe, with over 10,000 live births in the US, Europe and Turkey being attributed to the sperm selection technology that came out of Dr. Demirci's lab.

Thursday, October 18th – Mehran Mehregany, Ph.D., *Case Western Reserve University, USA*

"From Sensors to Wearables to Health Monitoring?"



Mehran Mehregany is an innovator, researcher, educator, and an entrepreneur. His interests are in sensors, micro/nano-electro-mechanical systems, silicon carbide microsystems, wearables, wireless health, and enterprise innovation models. He has made notable contributions in these areas.

He received his M.S. and Ph.D. in Electrical Engineering from Massachusetts Institute of Technology in 1986 and 1990, respectively. He joined Case Western Reserve University in 1990 as an assistant professor in the Electrical Engineering. He is currently the Veale Professor of Wireless Health Innovation and the Founding Director of Case School of Engineering San Diego, where he has developed graduate programs in wireless health and wearable computing.

As a consultant at AT&T Bell Laboratories (1986-1990), he was a key contributor to groundbreaking research in micro-electro-mechanical systems (MEMS). From November 2009 through August 2010 (taking a leave from Case), Mehregany was the founding Executive Vice President of Engineering, Chief of Engineering Research, and the Gary and Mary West Endowed Chair of Wireless Health Technology at the West Health Institute. During this period, he formulated the Institute's engineering program, recruited the initial talent and launched the initial research activities and product developments, including Sense4Baby, which was the opening demo of the Apple September 2015 event.

Mehregany is well known for research, education and commercialization in his areas of interest. He has 400+ publications describing his work, holds 30 U.S. patents and is the recipient of a number of awards/honors. He is the editor of the first Wireless Health textbook titled "Wireless Health: Remaking of Medicine by Pervasive Technologies" (2014) and the author of the book titled "Innovation for Engineers" (2017). He has founded, financed and managed a number of technology startups since 1990.

Friday, October 19th – Andrew DeHennis, Ph.D., Senseonics, Incorporated, USA

“Advanced development for long-term, fully implantable glucose sensors”



Dr. DeHennis has achieved degrees in both Physics and Electrical Engineering with focuses on Solid-State Devices as well as Micro-Electro Mechanical Systems (MEMS). His Ph.D. from the University of Michigan in 2004 focused on wireless sensors that spanned applications in biomedical as well as environmental monitoring systems. He has spent his professional career working to make long-term implantable analyte sensing a reality in achieving the launch of the Eversense Continuous Glucose Monitoring (CGM) system. His team's current work focuses on scale-up and support of the Eversense system, continued R&D in system architecture and algorithm development, as

well as clinical evaluation and regulatory strategy for next-generation CGM systems. Spanning his academic and professional career, he has over two dozen published papers and patents in the field of sensors, which span the technological building blocks and long-term in vivo performance and characterization of the Eversense CGM system.

Friday, October 19th – Soumyajit Mandal, Ph.D., Case Western Reserve University, USA

“Authentication of Consumables Using Low-Field and Zero-Field Magnetic Resonance Spectroscopy”



Soumyajit Mandal received his B. Tech degree in Electronics and Electrical Communications Engineering from the Indian Institute of Technology, Kharagpur, India in 2002 with top honors. He received his M.S. and Ph.D. degrees in Electrical Engineering from MIT in 2004 and 2009, respectively. His doctoral thesis on “Collective Analog Bioelectronic Computation” was awarded the MIT Microsystems Technology Laboratories (MTL) Doctoral Dissertation Award in recognition of outstanding research of interest to a broad audience. From 2010-2014 he was a Research Scientist at the Schlumberger-Doll Research Center in Cambridge, MA. He is currently the T. and A. Schroeder

Assistant Professor at Case Western Reserve University (CWRU) in Cleveland, OH. His research interests include integrated circuits and systems, magnetic resonance (MR) sensors, and biomedical imaging. He has worked on bio-inspired (neuromorphic and cytomorphic) integrated circuits, biomedical circuits and systems, integrated structural health monitoring systems, MEMS/NEMS interface circuits, RF energy harvesting, low-power RF systems, low-field and zero-field magnetic resonance, and other topics. He was awarded the Mentor, Learning, and T. Keith Glennan Fellowships by the CWRU University Center for Innovation in Teaching and Education (UCITE), as well as Nord and ACES grants by CWRU for innovations in teaching and course development. He has published over 85 papers in international journals and conferences, and has been awarded 10 patents.

TUTORIAL SPEAKERS

October 17, 10:30 – 12:00 – Tobi Delbruck, Ph.D.

“Neuromorphic Artificial Intelligence (AI)”



With hundreds of millions of dollars flowing this year into silicon developments for training and running artificial intelligence (AI) deep neural networks (DNNs) via Nvidia, Intel, Nervana, Qualcomm, Graphcore, SambaNova, ARM and dozens of others, it is worthwhile asking what is left to be done. Won't silicon AI follow the same course as GPUs and become more and more tailored to efficiently compute industrial AI?

This tutorial addresses this question from the context of neuromorphic engineering, which takes its inspiration from the brain's organizing principles. What have these principles of using sparsity, local memory, time, and physics brought to the table? I will describe recent developments of neuromorphic silicon from IBM, Intel, Zurich, Stanford, and others. I will also compare these with upcoming industrial AI accelerators, and then show that principles of sparsity and local memory reuse can bring immediate benefit to both convolutional and recurrent DNNs implemented in synchronous logic without requiring a new memory hierarchy. Finally, I will relate these ideas to event sensors, which our group has specialized in developing. I plan to include a live demonstration of some of these ideas.

October 17, 13:00 – 14:30 – Ana Claudia Arias, Ph.D.

“Printed Flexible Medical Devices: From Materials to Systems”



Wearable noninvasive medical sensing is extremely promising for monitoring human performance during physically demanding tasks. Printed sensors provide a distinct advantage over rigid sensors at establishing high-fidelity sensor-skin interfaces due to their inherently flexible material systems and form-factors. These sensors are suitable for monitoring vital signs as well as analytes in bodily fluids. We have demonstrated an integrated wearable and flexible multi-sensor platform capable of simultaneous bioelectronic and biophotonic sensing for better understanding of physiological state of the human body. The sensor platform is composed of printed photoplethysmography (PPG) and sweat sensors. The sweat sensor is comprised of printed sodium, ammonium, and lactate sensors. The complete system is powered by two flexible printed batteries at 8V with 40mAh of capacity. This integrated platform can provide meaningful data to the end users or healthcare professionals, stretching the application domain of this wearable sensing platform beyond the fitness domain to medical diagnostics. In this tutorial, I will give an introduction to printable electronic materials and printing techniques as tools to deposit and pattern sensors and electronic devices. The sensor design and requirements will also be covered along with implementation considerations. A short discussion on power consumption and flexible power sources will be also included.

The tutorial will conclude with a discussion of recent work on integrated ultrasound systems from industry and leading academic labs, emerging techniques such as photoacoustic imaging, ultrasound imaging with molecular contrast and challenges ahead for this important imaging modality.

October 17, 14:30 – 16:00 – Arjang Hassibi, Ph.D.

"Semiconductor-Integrated Biosensing: The Good, The Bad, and The Hype"



In the past two decades, there have been multiple attempts to leverage IC technologies, particularly VLSI fabrication processes, to develop integrated and miniaturized biosensing devices. The motivation has been to create technologies to enable cost-effective, easy-to-use, robust, and mass-deployable molecular analyzers for point-of-care diagnostics, high-throughput screening, and life-science research. However, the results have been mixed and many unexpected technical challenges mitigated the anticipated growth of this field. In this tutorial, I will discuss the reasons behind this, while providing a historical perspective and a review of the state-of-the-art integrated biosensors and biochips in the field.

October 19, 17:00 – 18:30 – Jerald Yoo, Ph.D.

"On-Chip Epilepsy Detection: Where Machine Learning Meets Patient-Specific Wearable Healthcare"



Epilepsy is a severe and chronic neurological disorder that affects over 65 million people worldwide. Yet current seizure/epilepsy detection and treatment largely relies on a physician interviewing the subject, which is not effective in infant/children group. Moreover, patient-to-patient and age-to-age variation on seizure pattern make such detection particularly challenging. To expand the beneficiary group to even infants, and also to effectively adapt to each patient, a wearable form-factor, a patient-specific system with machine learning is of crucial. However, the wearable environment is challenging for circuit designers due to unstable skin-electrode interface, huge mismatch, and static/dynamic offset.

This tutorial will cover the design strategies of patient-specific epilepsy detection System-on-Chip (SoC). We will first explore the difficulties, limitations and potential pitfalls in wearable interface circuit design, and strategies to overcome such issues. Starting from a single op-amp instrumentation amplifier (IA), we will cover various IA circuit topologies and their key metrics to deal with offset compensation. Several state-of-the-art instrumentation amplifiers that emphasize on different parameters will also be discussed. Moving on, we will look into the feature extraction and the patient-specific classification using Machine Learning technique. Three different classifiers will be introduced, and mapped into hardware. Finally, an on-chip epilepsy detection and recording sensor SoC will be presented, which integrates all the components covered during the lecture. The lecture will conclude with interesting aspects and opportunities that lie ahead.

BioCAS 2018 – Wednesday, OCTOBER 17th

7:00 – 18:30
REGISTRATION

8:00 - 8:30
INTRODUCTION AND WELCOME
Room: Salon ED

8:30 – 9:30
KEYNOTE 1: UTKAN DEMIRCI
Room: Salon ED

9:30 – 10:30
COFFEE BREAK
Room: Salon ABC

9:30 – 10:30
POSTER SESSION: A1P-B - Assistive, Rehabilitation & Quality of Life Technologies AND A1P-C - Biosensors & Interface Circuits I
Room: Salon ABC
Chairs: Sameer Sonkusale and Vasiliki Giagka

1: 6008
Muscle Synergy Adaptation During a Complex Postural Stabilization Task
Rajat Singh, Kamran Iqbal, Gannon White
University of Arkansas at Little Rock, United States

2: 6029
Flex Force Smart Glove Prototype for Physical Therapy Rehabilitation
Lloyd Emokpae, Roland Emokpae Jr., Brady Emokpae
Lasarrus Clinic and Research Center, United States

3: 6085
Smart Prosthesis System: Continuous Automatic Prosthesis Fitting Adjustment and Real-Time Stress Visualization
Yi Cai^{1}, Jia Chen^{1}, Diliang Chen^{1}, Guanzhou Qu^{1}, Hongping Zhao^{2}, Rahila Ansari^{3}, Ming-Chun Huang^{1}
^{1}Case Western Reserve University, United States; ^{2}Ohio State University, United States; ^{3}V.A. Medical Center, United States

4: 6157

Towards Phoneme Landmarks Identification for American-English Using a Multimodal Speech Capture System

*Nordine Sebkhii{1}, Yana Yunusova{2}, Maysam Ghovanloo{1}
{1}Georgia Institute of Technology, United States; {2}University of Toronto, Canada*

5: 6158

Preliminary Test of a Wireless Magnetic Tongue Tracking System for Silent Speech Interface

*Myungjong Kim{2}, Nordine Sebkhii{1}, Beiming Cao{2}, Maysam Ghovanloo{1}, Jun Wang{2}
{1}Georgia Institute of Technology, United States; {2}University of Texas at Dallas, United States*

6: 6164

A Mixed-Reality Training Environment for Upper Limb Prosthesis Control

*Avinash Sharma{2}, Christopher Hunt{2}, Asheesh Maheshwari{5}, Luke Osborn{2}, György Lévy{1},
Rahul Kaliki{1}, Alcimar Soares{4}, Nitish V. Thakor{3}
{1}Infinite Biomedical Technologies, LLC, United States; {2}Johns Hopkins University, United States;
{3}Johns Hopkins University / Singapore Institute for Neurotechnology, National University of Singapore,
Singapore; {4}Universidade Federal de Uberlândia, Brazil; {5}Vellore Institute of Technology, India*

7: 6183

Standalone Assistive System to Employ Multiple Remaining Abilities in People with Tetraplegia

*Md Nazmus Sahadat, Nordine Sebkhii, Fanpeng Kong, Maysam Ghovanloo
Georgia Institute of Technology, United States*

8: 6248

Predicting Intention Through Eye Gaze Patterns

*Fatemeh Koochaki, Laleh Najafizadeh
Rutgers University, United States*

9: 6251

Predictive Trajectory Estimation During Rehabilitative Tasks in Augmented Reality Using Inertial Sensors

*Christopher Hunt{2}, Avinash Sharma{2}, Luke Osborn{2}, Rahul Kaliki{1}, Nitish V. Thakor{3}
{1}Infinite Biomedical Technologies, LLC, United States; {2}Johns Hopkins University, United States;
{3}Johns Hopkins University / Singapore Institute for Neurotechnology, National University of Singapore,
United States*

10: 6257

Slip Suppression in Prosthetic Hands Using a Reflective Optical Sensor and MPI Controller

*Andrei Nakagawa-Silva{5}, Sai Praneeth Reddy Sunkesula{1}, Anna Prach{3}, John-John Cabibihan{4},
Nitish V. Thakor{2}, Alcimar Soares{5}
{1}Indian Institute of Technology Bombay, India; {2}Johns Hopkins University / Singapore Institute for
Neurotechnology, National University of Singapore, Singapore; {3}Middle East Technical University,
Turkey; {4}Qatar University, Qatar; {5}Universidade Federal de Uberlândia, Brazil*

11: 6199

Highly-Stretchable Biomechanical Strain Sensor Using Printed Liquid Metal Paste

*Callen Votzke, Uranbileg Daalkhaijav, Yigit Mengüç, Matthew Johnston
Oregon State University, United States*

12: 6242

Enabling Communication for Locked-in Syndrome Patients Using Deep Learning and an Emoji-Based Brain Computer Interface

Alexandra Comaniciu^{1}, Laleh Najafizadeh^{2}

^{1}Lawrenceville School, United States; ^{2}Rutgers University, United States

13: 6041

Energy-Optimal Gesture Recognition Using Self-Powered Wearable Devices

Jaehyun Park^{3}, Ganapati Bhat^{1}, Cemil Geyik^{1}, Hyung Gyu Lee^{2}, Umit Ogras^{1}

^{1}Arizona State University, United States; ^{2}Daegu University, Korea; ^{3}University of Ulsan, Korea

14: 6017

A Low Distortion Continuous Time Sigma Delta Modulator Using a High Input Impedance Instrumentation Amplifier for Neural Recording

Antonios Nikas^{1}, Sreenivas Jambunathan^{1}, Leonhard Klein^{1}, Matthias Voelker^{1}, Maurits Ortmanns^{2}

^{1}Fraunhofer Institute for Integrated Circuits, Germany; ^{2}Universitat Ulm, Germany

15: 6040

A 0.5V PPG-Based Heart Rate and Variability Detection System

Wala Saadeh, Shah Zaib Aslam, Aminah Hina, Fakeha Asghar

Lahore University of Management Sciences, Pakistan

16: 6051

Gaussian Monocycle Pulse Generator with Calibration Circuit for Breast Cancer Detection

Yoshihiro Masui^{2}, Akihiro Toya^{3}, Mitsutoshi Sugawara^{4}, Tomoaki Maeda^{1}, Masahiro Ono^{1}, Yoshitaka Murasaka^{1}, Atsushi Iwata^{1}, Takamaro Kikkawa^{4}

^{1}A-R-Tec Corporation, Japan; ^{2}Hiroshima Institute of Technology, Japan; ^{3}National Institute of Technology, Kure College, Japan; ^{4}Research Institute for Nanodevice and Bio Systems, Hiroshima University, Japan

17: 6060

A Low-Power Low-Noise Biomedical Instrumentation Amplifier Using Novel Ripple-Reduction Technique

Yizhao Zhou, Menglian Zhao, Yangtao Dong, Xiaobo Wu, Lihan Tang

Zhejiang University, China

18: 6066

Low-Power, Low-Noise Epileptic-Seizure Detection System with High Accuracy Using EEG Signals

Mohammad Tohidi, Jens Kargaard Madsen, Farshad Moradi

Aarhus University, Denmark

19: 6113

Trapped Charge Cancellation for CMOS ISFET Sensors via Direct Tunnelling

Yuanqi Hu^{1}, Pantelis Georgiou^{2}

^{1}Beihang University, China; ^{2}Imperial College London, United Kingdom

20: 6114

A Fully-Digital ISFET Front-End with in-Pixel $\hat{\epsilon}$ Modulation

*Miguel Cacho-Soblechero^{1}, Tor Sverre Lande^{2}, Pantelis Georgiou^{1}
{1}Imperial College London, United Kingdom; {2}University of Oslo, Norway*

21: 6140

Direct Digital Wavelet Synthesis for Embedded Biomedical Microsystems

*Lieuwe Leene, Timothy G. Constandinou
Imperial College London, United Kingdom*

22: 6151

Monolithic CMOS-Based Neurotransmitter Detector for 1024-ch Simultaneous Recordings

*Kevin White, Geoffrey Mulberry, Matthew Crocker, Brian Kim, Jonhoi Smith, Kiminobu Sugaya
University of Central Florida, United States*

23: 6148

Bootstrapped Non-Inverting Front-End Amplifier for Capacitive Electrocardiogram Measurement

*Hajime Nakamura, Akinori Ueno
Tokyo Denki University, Japan*

10:30 – 12:00

TUTORIAL 1 – TOBI DELBRUCK

Room: Salon ED

12:00 – 13:00

LUNCH

Room: Salon FGH

13:00 – 14:30

TUTORIAL 2 – ANA CLAUDIA ARIAS

Room: Salon ED

14:30 – 16:00

TUTORIAL 3 – ARJANG HASSIBI

Room: Salon ED

16:00 – 17:00

COFFEE BREAK

Room: Salon ABC

16:00 – 17:00

POSTER SESSION: A2P-B. Biomedical Imaging & Image Processing AND A2P-C. Body Area/Sensor Networks & Wireless/Wearable Health Monitoring

Room: Salon ABC

Chairs: Maurizio Valle and Konstantin Nikolic

24: 6038

A Portable Thermogram Based Non-Contact Non-Invasive Early Breast-Cancer Screening Device

Bilal Majeed, Hafiz Talha Iqbal, Uzair Khan, Muhammad Awais Bin Altaf

Lahore University of Management Sciences, Pakistan

25: 6053

The Spectral Calibration of Swept-Source Optical Coherence Tomography Systems Using Unscented Kalman Filter

Amir Tofighi Zavareh, Sebastian Hoyos

Texas A&M University, United States

26: 6070

Multilevel Interpolation for Feature-Based Motion Correction in Neurosurgery

Fang Chen, Jan Müller, Jens Müller, Elisa BÄ¶hl, Nico Hoffmann, Matthias Kirsch, Ronald Tetzlaff

Technische Universitat Dresden, Germany

27: 6074

Lung Nodule Segmentation Using Pleural Wall Shape

Yunfei Li, Xiang Xie, Guolin Li, Zhihua Wang

Tsinghua University, China

28: 6115

A CMOS Perimeter Gated SPAD Based Digital Silicon Photomultiplier with Asynchronous AER Readout for PET Applications

Mst Shamim Ara Shawkat, Nicole McFarlane

University of Tennessee , United States

29: 6127

Image Enhancement Method Based on Adaptive Fraction Gamma Transformation and Color Restoration for Wireless Capsule Endoscopy

Mingzhu Long^{1}, Zehua Lan^{2}, Xiang Xie^{1}, Guolin Li^{1}, Zhihua Wang^{1}

^{1}Tsinghua University, China; ^{2}University of Electronic Science and Technology of China, China

30: 6146

A Portable Three-Dimensional Image Reconstruction System for Breast Tumor Detection

Wen-Jun Wu, Jia-Jun Guo, Wai-Chi Fang

National Chiao Tung University, United States; National Chiao Tung University, Taiwan

31: 6188

Automated Tracking System for Identification of Tagged Mice for Automatic Social Behavior Analysis

Fabio Marcuccio^{3}, Alena Savonenko^{2}, Ralph Etienne-Cummings^{1}

^{1}Johns Hopkins University, United States; ^{2}Johns Hopkins University School of Medicine, United States; ^{3}Politecnico di Torino, Italy

32: 6194

Deep Convolutional Neural Networks for Automated Convulsion Scoring Using RGB-D Images

Zheyuan Wang^{1}, Azizi Ray^{2}, Kevin S. Murnane^{2}, Maysam Ghovanloo^{1}

^{1}Georgia Institute of Technology, United States; ^{2}Mercer University, United States

33: 6218

Computational Stereo-Vision Model of Proto-Object Based Saliency in Three-Dimensional Space

Elena Mancinelli^{2}, Ernst Niebur^{1}, Ralph Etienne-Cummings^{1}

^{1}Johns Hopkins University, United States; ^{2}Politecnico di Torino, Italy

34: 6233

Missing Structural and Clinical Features Imputation for Semi-Supervised Alzheimer's Disease Classification Using Stacked Sparse Autoencoder

Emimal Jabason, M. Omair Ahmad, M.N.S. Swamy

Concordia University, Canada

35: 6235

Early Diagnosis of Mild Cognitive Impairment Using Random Forest Feature Selection

Parisa Forouzannezhad, Alireza Abbaspour, Mercedes Cabrerizo, Malek Adjouadi

Florida International University, United States

36: 6044

IMU-Based Real-Time Acetabular Prosthesis Implant Angles Measurement in Total Hip Replacement Surgeries

Jie Liu, Hong Chen, Zhihua Wang

Tsinghua University, China

37: 6046

ECG Signal Compression for Low-Power Sensor Nodes Using Sparse Frequency Spectrum Features

Hui Huang, Shiyan Hu, Ye Sun

Michigan Technological University, United States

38: 6062

Framework of Applying Independent Component Analysis After Compressed Sensing for Electroencephalogram Signals

Daisuke Kanemoto, Shun Katsumata, Masao Aihara, Makoto Ohki

University of Yamanashi, Japan

39: 6075

Multipoint Supported OFDM-Based System for High Robust Body Channel Communication

Wenyu Sun, Jian Zhao, Yuxuan Huang, Jingna Mao, Yinan Sun, Huazhong Yang, Yongpan Liu

Tsinghua University, China

40: 6076

A Low-Power High-Input-Impedance 70-dB Gain ECG Readout System with High Interference Tolerance

Chinnatip Ratametha^{1}, Chanoknan Buaban^{1}, Bhirawich Pholpoke^{1}, Tanachai Limpisawas^{1},

Pakorn Prasopsin^{2}, Samattachai Tepwimonpetkun^{2}, Woradorn Wattanapanitch^{1}

^{1}Kasetsart University, Thailand; ^{2}Silicon Craft Technology Co. Ltd., Thailand

41: 6099

Extracting the Cole-Cole Model Parameters of Tissue-Mimicking Materials

*Mohammed Fouda, Ahmed Khorshid, Ibrahim Alquaydheb, Ahmed Eltawil, Fadi Kurdahi
University of California, Irvine, United States*

42: 6102

Wireless Power and Data Link for Ensembles of Sub-mm Scale Implantable Sensors Near 1GHz

*Jihun Lee^{1}, Farah Laiwalla^{1}, Joonsoo Jeong^{1}, Chester Kilfoyle^{1}, Lawrence Larson^{1}, Arto Nurmikko^{1}, Siwei Li^{2}, Siyuan Yu^{2}, Vincent Leung^{2}
^{1}Brown University, United States; ^{2}University of California, San Diego, United States*

43: 6125

Cross-Body UWB Radar Sensing of Arterial Pulse Propagation and Ventricular Dynamics

*Timo Lauteslager^{1}, Mathias Tømmer^{2}, Tor Sverre Lande^{2}, Timothy G. Constandinou^{1}
^{1}Imperial College London, United Kingdom; ^{2}University of Oslo, Norway*

44: 6176

An Improved Update Rate Baud Rate CDR for Integrating Human Body Communication Receiver

*Shovan Maity, Parikha Mehrotra, Shreyas Sen
Purdue University, United States*

17:00 – 18:30

TUTORIAL 4 – JERALD YOO

Room: Salon ED

19:30

WELCOME RECEPTION & LIVE DEMOS

Room: Salon FGH

Chairs: Michael Suster and Steve Majerus

6266

Live Demonstration: SeizelT - a Wearable Multimodal Epileptic Seizure Detection Device

*Steven Boeckx^{1}, Wim van Paesschen^{3}, Brecht Bonte^{2}, Jonathan Dan^{1}
^{1}Byteflies, Belgium; ^{2}Pilipili, Belgium; ^{3}Universitaire ziekenhuizen Leuven, Belgium*

6267

Live Demonstration: a Soft Thermal Modulation System with Embedded Fluid Channels for Neuro-Vascular Assessment

*Nil Z. Gurel, Donald Ward, Frank L. Hammond III, Omer T. Inan
Georgia Institute of Technology, United States*

6273

Live Demonstration: System Based on Electronic Skin and Cutaneous Electrostimulation for Sensory Feedback in Prosthetics

*Mohamad Alameh^{3}, Moustafa Saleh^{3}, Flavio Ansovini^{3}, Hoda Fares^{3}, Ali Ibrahim^{3}, Marta Franceschi^{3}, Lucia Seminara^{3}, Maurizio Valle^{3}, Strahinja Dosen^{1}, Dario Farina^{2}
^{1}Aalborg University, Denmark; ^{2}Imperial College London, United Kingdom; ^{3}University of Genoa, Italy*

6274

Live Demonstration: Sensor Automation Platform and Multi-Sensor Badge for the Sensory Impaired

*Yousef Gtat, Sylmarie Dávila-Montero, Andrew J. Mason
Michigan State University, United States*

6275

Live Demonstration of Portable Systems Based on Silicon Sensors for the Monitoring of Physiological Parameters of Driver Drowsiness and Pulse Wave Velocity

*Sabrina Conoci^{2}, Francesco Rundo^{2}, Giorgio Fallica^{2}, Davide Lena^{2}, Irene Buraioli^{1}, Danilo Demarchi^{1}
^{1}Politecnico di Torino, Italy; ^{2}STMicroelectronics, Italy*

6276

Live Demonstration: 385 x 385 μm^2 0.165V 270pW Fully-Integrated Supply-Modulated OOK Tx in 65nm CMOS for Glasses-Free, Self-Powered, and Fuel-Cell-Embedded Continuous Glucose Monitoring Contact Lens

*Kenya Hayashi, Shigeki Arata, Ge Xu, Shunya Murakami, Cong Dang Bui, Atsuki Kobayashi, Kiichi Niitsu
Nagoya University, Japan*

6277

Live Demonstration: an Open-Source Test-Bench for Autonomous Ultrasound Imaging

*Vida Pashaei, Alex Roman, Soumyajit Mandal
Case Western Reserve University, United States*

- 6278**
Like Kleenex for Wearables: a Soft, Strong and Disposable ECG Monitoring System
Yusuf Bhagat{2}, Patrick Verdon{2}, Sai Avuthu{1}, Daniel Parsons{2}, Mark Sussman{1}, Girish Wable{1}, Ralph Hugeneck{2}
{1}JABIL, United States; {2}Nypro, United States
- 6279**
Live Demonstration: a Bluetooth Low Energy (BLE)-Enabled Wireless Link for Bidirectional Communications with a Neural Microsystem
Nicholas Vitale, Meysam Azin, Pedram Mohseni
Case Western Reserve University, United States
- 6280**
Live Demonstration: Augmented Reality Prosthesis Training with Real-Time Hand Trajectory Prediction and Neuromorphic Tactile Encoding
Christopher Hunt{1}, Avinash Sharma{1}, Mark Iskarous{1}, Nitish V. Thakor{2}
{1}Johns Hopkins University, United States; {2}Johns Hopkins University / Singapore Institute for Neurotechnology, National University of Singapore, United States
- 6281**
Live Demonstration: Miniaturized Compact NIRS Probe Based on SiPM and Pulsed VCSEL Diode Routes to Wearable Devices
Sreenil Saha{1}, Frederic Lesage{1}, Mohamad Sawan{2}
{1}Ecole Polytechnique de Montreal, Canada; {2}Polytechnique Montreal, Canada
- 6283**
Live Demonstration: HemeChip - a Portable Microchip Electrophoresis Technology for Point-of-Care Sickle Cell Disease Screening
Muhammad Noman Hasan, Arwa Fraiwan, Umut Gurkan, Jane Little
Case Western Reserve University, United States

7:30 – 18:00
REGISTRATION

8:00 – 9:30
LECTURE SESSION: B1L-A. Circuits & Systems for Smart-Connected Health
Room: Salon ED
Chairs: Pamela Abshire and Yong Lian

A Wearable Device for Minimally-Invasive Behind-the-Ear EEG and Evoked Potentials

*Marco Guermandi^{2}, Simone Benatti^{2}, Victor Javier Kartsch Morinigo^{2}, Luca Benini^{1}
{1}ETH Zurich, Switzerland; {2}University of Bologna, Italy*

StethoVest: a Simultaneous Multichannel Wearable System for Cardiac Acoustic Mapping

*Christos Sapsanis^{2}, Nathaniel Welsh^{2}, Michael Pozin^{2}, Guillaume Garreau^{1}, Gaspar Tognetti^{2},
Hani Bakhshae^{4}, Philippe O. Pouliquen^{2}, Rajat Mittal^{2}, William R. Thompson^{3}, Andreas G.
Andreou^{2}
{1}IBM, United States; {2}Johns Hopkins University, United States; {3}Johns Hopkins University School
of Medicine, United States; {4}L.E.K. Consulting, United States*

An Ultra-Low-Power 28nm CMOS Dual-Die ASIC Platform for Smart Hearables

*Yu Pu, Danny Butterfield, Jorge Garcia, Jing Xie, Mark Lin, Rohit Sauhta, Rick Farley, Steve
Shellhammer, Moses Derkalousdian, Adam Newham, Chunlei Shi, Ravi Shenoy, Evgeni Gousev,
Rashid Attar
Qualcomm Research, United States*

A Wetness Detection Technique Towards Scalable, Array-Based, Fully-Textile Sensing

*Rachel White, Michael McKnight, Jordan Tabor, Talha Agcayazi, Tushar Ghosh, Alper Bozkurt
North Carolina State University, United States*

**Rakeness-Based Compressed Sensing of Surface Electromyography for Improved Hand
Movement Recognition in the Compressed Domain**

*Alex Marchioni^{2}, Mauro Mangia^{2}, Fabio Pareschi^{2}, Riccardo Rovatti^{2}, Gianluca Setti^{1}
{1}Politecnico di Torino, Italy; {2}University of Bologna, Italy*

9:30 – 10:30
COFFEE BREAK
Room: Salon FGH

9:30 – 10:30

POSTER SESSION: B2P-B – Biosignal Recording, Processing, & Machine Learning I AND B2P-C – Biosensors & Interface Circuits II AND B2P-D – SPECIAL SESSION: Implantable Systems for Neural Interfaces

Room: Salon FGH

Chairs: Timothy Constandinou, Kea-Tiong (Samuel) Tang, Sudip Nag, and Soumyajit Mandal

1: 6013

A Lightweight Deep Compressive Model for Large-Scale Spike Compression

Tong Wu^{2}, Wenfeng Zhao^{2}, Edward Keefer^{1}, Zhi Yang^{2}

^{1}Nerves Incorporated, United States; ^{2}University of Minnesota, United States

2: 6014

ECG Arrhythmia Classification Using Transfer Learning from 2-Dimensional Deep CNN Features

Milad Salem, Shayan Taheri, Jiann-Shiun Yuan

University of Central Florida, United States

3: 6015

A High Performance Approach for Classification of Motor Imagery EEG

Waseem Abbas, Nadeem Khan

Lahore University of Management Sciences, Pakistan

4: 6018

Bowel Sound Detection Based on MFCC Feature and LSTM Neural Network

Juzheng Liu^{3}, Yue Yin^{3}, Hanjun Jiang^{3}, Huili Kan^{2}, Zongwang Zhang^{2}, Ping Chen^{1}, Binjie Zhu^{1}, Zhihua Wang^{3}

^{1}Beijing YieMed Medical Technology Co., Ltd, China; ^{2}Liaocheng People's Hospital, China; ^{3}Tsinghua University, China

5: 6021

Block-Sparse Compressive Sensing for High-Fidelity Recording of Photoplethysmogram

Hossein Zamani, Fatemeh Marefat, Pedram Mohseni

Case Western Reserve University, United States

6: 6026

Hybrid IIR/FIR Wavelet Filter Banks for ECG Signal Denoising

Yaprak Eminaga, Adem Coskun, Izzet Kale

University of Westminster, United Kingdom

7: 6030

Imbalance Learning Using Neural Networks for Seizure Detection

Javad Birjandtalab^{1}, Vipul Jarmale^{1}, Mehrdad Nourani^{1}, Jay Harvey^{2}

^{1}University of Texas at Dallas, United States; ^{2}UT Southwestern Medical Center, United States

8: 6035

Automatic Artifact Reduction Based on MEMD-ICA for Seizure Prediction

Lihan Tang, Menglian Zhao, Yizhao Zhou, Xiaobo Wu

Zhejiang University, China

9: 6036

Registration of EMG Electrodes to Reduce Classification Errors Due to Electrode Shift

*Cynthia Steinhardt^{1}, Joseph Betthausen^{1}, Christopher Hunt^{1}, Nitish V. Thakor^{2}
{1}Johns Hopkins University, United States; {2}Johns Hopkins University / Singapore Institute for
Neurotechnology, National University of Singapore, United States*

10: 6032

A Compact, Low-Noise, Chopped Front-End for Peripheral Nerve Recording in 180 nm CMOS

*Jialin Liu, Ross Walker
University of Utah, United States*

11: 6186

Exploring Mental State Changes During Hypnotherapy Using Adaptive Mixture Independent Component Analysis of EEG

*Sheng-Hsiou Hsu, Yihan Zi, Ying Wu, Paula Jackson, Tzyy-Ping Jung
University of California, San Diego, United States*

12: 6079

Continuous Blood Pressure Monitoring Using Wrist-Worn Bio-Impedance Sensors with Wet Electrodes

*Bassem Ibrahim, Roozbeh Jafari
Texas A&M University, United States*

13: 6171

A Half-Shared Transimpedance Amplifier Architecture for High-Throughput CMOS Bioelectronics

*Geoffrey Mulberry, Kevin White, Brian Kim
University of Central Florida, United States*

14: 6180

High pH Resolution Extended Gate Type pH Image Sensors with the Charge Accumulation Circuit

*Yoshitaka Arimi^{2}, Yasuyuki Kimura^{2}, Toshiki Wakamori^{1}, Hiroo Yamamoto^{1}, Seiichiro Mizuno^{1},
Tatsuya Iwata^{2}, Kazuhiro Takahashi^{2}, Kazuaki Sawada^{2}
{1}Hamamatsu Photonics, Japan; {2}Toyohashi University of Technology, Japan*

15: 6191

Toward an Energy-Efficient Bridge-to-Digital Intracranial Pressure Sensing Interface

*Ahmad Rezvanitabar, Gwangrok Jung, F. Levent Degertekin, Maysam Ghovanloo
Georgia Institute of Technology, United States*

16: 6192

A 3.51 μ W 0.31 μ Vrms Biofuel Cell Enabled Integrated Analog CMOS Front-End in 130 nm CMOS

*Huan Hu, Tanzila Islam, Chung-Ching Lin, Alla Kostyukova, Su Ha, Subhanshu Gupta
Washington State University, United States*

17: 6203

A Bio-Impedance Measurement IC for Neural Interface Applications

*Ajinkya Munge^{1}, Varsha Sankar^{1}, Mohammad S.E. Sendi^{1}, Maysam Ghovanloo^{1}, Ulkuhan
Guler^{2}
{1}Georgia Institute of Technology, United States; {2}Worcester Polytechnic Institute, United States*

18: 6225

3D-Printed Electrocardiogram Electrodes for Heart Rate Detection in Canines

Marc Foster{2}, Patrick Erb{2}, Brenna Plank{1}, Helen West{1}, Jane Russenberger{1}, Margaret Gruen{2}, Michael Daniele{2}, David Roberts{2}, Alper Bozkurt{2}
{1}Guiding Eyes for the Blind, United States; {2}North Carolina State University, United States

19: 6232

An Asynchronous Auto-Biasing Circuit for Wearable Electrochemical Sensors

Matthew Douthwaite, Pantelis Georgiou
Imperial College London, United Kingdom

20: 6243

Circuit Implementation of Fluorescence Lifetime Measurement Using Direct Exponential-to-Linear Conversion

Meera Punjiya, Sameer Sonkusale
Tufts University, United States

21: 6250

Low-Cost, Implantable Wireless Sensor Platform for Neuromodulation Research

Ian McAdams{4}, Hannah Kenyon{4}, Dennis Bourbeau{3}, Margot Damaser{4}, Christian Zorman{2}, Steve Majerus{1}
{1}Advanced Platform Technology Center Louis Stokes Veterans Affairs Medical Center, United States; {2}Case Western Reserve University, United States; {3}Functional Electrical Stimulation Center, United States; {4}Lerner Research Institute, United States

22: 6112

Capacitive Wireless Power and Data Transfer for Implantable Medical Devices

Asish Koruprolu{2}, Reza Erfani{1}, Pedram Mohseni{1}, Sudip Nag{2}
{1}Case Western Reserve University, United States; {2}Indian Institute of Technology Kharagpur, India

23: 6226

Integrated Devices for Micro-Package Integrity Monitoring in mm-Scale Neural Implants

Federico Mazza{1}, Yan Liu{1}, Nick Donaldson{2}, Timothy G. Constandinou{1}
{1}Imperial College London, United Kingdom; {2}University College London, United Kingdom

24: 6234

High-Speed Communication Up to 600 Mbps Over FDA-Cleared Implantable Wirelines

Taufiq Ahmed, Naila Tasneem, Ross Walker
University of Utah, United States

10:30 – 12:00

LECTURE SESSION: B3L-A. SPECIAL SESSION - On-Chip Machine Learning Design & Applications

Room: Salon ED

Chairs: Mingoo Seok and Mahsa Shoaran

Minimum Precision Requirements for Deep Learning with Biomedical Datasets

Charbel Sakr^{2}, Naresh Shanbhag^{1}

^{1}Univeristy of Illinois at Urbana-Champaign, United States; ^{2}University of Illinois at Urbana-Champaign, United States

High-Capacity Fingerprint Recognition System Based on a Dynamic Memory-Capacity Estimation Technique

Pavan Kumar Chundi, Ajay Kumar Sridhar, Saarthak Sarup, Mingoo Seok

Columbia University, United States

Inference and Learning Hardware Architecture for Neuro-Inspired Sparse Coding Algorithm

Chester Liu, Zhengya Zhang

University of Michigan, United States

Resting Tremor Detection in Parkinson's Disease with Machine Learning and Kalman Filtering

Lin Yao^{1}, Peter Brown^{2}, Mahsa Shoaran^{1}

^{1}Cornell University, United States; ^{2}University of Oxford, United Kingdom

Deep Learning Based Reliable Early Epileptic Seizure Predictor

Hisham Daoud, Magdy Bayoumi

University of Louisiana at Lafayette, United States

12:00 – 13:00

LUNCH

Room: Salon FGH

13:00 – 14:00

KEYNOTE 2: MEHRAN MEHREGANY

Room: Salon ED

14:00 – 15:30

LECTURE SESSION: B4L-A – Biosensors, Biotelemetry & Neural Interface Circuits

Room: Salon ED

Chairs: Roman Genov and Maysam Ghovanloo

Miniaturized Probe for Time-Domain Near-Infrared Spectroscopy

*Sreenil Saha^{1}, Yuankang Lu^{1}, Sascha Weyers^{2}, Frederic Lesage^{1}, Mohamad Sawan^{1}
^{1}Ecole Polytechnique de Montreal, Canada; ^{2}IMS, Fraunhofer, Germany*

Towards Low-Cost Cell Culturing Platforms with Integrated Sensing Capabilities

*Panagiotis Kassanos, Salzitsa Anastasova, Guang-Zhong Yang
Imperial College London, United Kingdom*

Toward a Robust Multi-Antenna Receiver for Wireless Recording from Freely-Behaving Animals

*Byunghun Lee^{3}, Yaoyao Jia^{2}, Fanpeng Kong^{2}, Mark Connolly^{1}, Babak Mahmoudi^{1}, Maysam Ghovanloo^{2}
^{1}Emory University, United States; ^{2}Georgia Institute of Technology, United States; ^{3}Incheon National University, Korea*

A Miniature Wireless Neural Recording System for Chronic Implantation in Freely Moving Animals

*Mustafa Kanchwala, Grant McCallum, Dominique Durand
Case Western Reserve University, United States*

A 6.25 Mbps, 12.4 pJ/Bit DQPSK Backscatter Wireless Uplink for the NeuroDisc Brain-Computer Interface

*James Rosenthal, Eleftherios Kampianakis, Apoorva Sharma, Matt Reynolds
University of Washington, United States*

15:30 – 16:30

COFFEE BREAK

Room: Salon FGH

15:30 – 16:30

POSTER SESSION: B5P-B - Biotelemetry & Energy Harvesting Circuits & Systems AND B5P-C – Implantable Medical Electronics

Room: Salon FGH

Chairs: Manuel Delgado-Restituto and Mehdi Kiani

25: 6039

600mW Active Rectifier with Shorting-Control for Wirelessly Powered Medical Implants

*Robert Gallichan, David Budgett, Daniel McCormick
University of Auckland, New Zealand*

26: 6047

An Ultrawideband Microwave Transceiver System for Breast Tumor Detection

*Lin Sun^{2}, Zhenhua Hu^{2}, Huihai Wang^{2}, Dan Pan^{1}, Xiaofeng Zhang^{1}, Rui Wu^{1}, Fan Yang^{1}
^{1}Shenzhen ET Medical Technology Co., Ltd., China; ^{2}Shenzhen THz Technology Co., Ltd., China*

27: 6065

An Ultra-Wideband-Inspired System-on-Chip for an Optical Bidirectional Transcutaneous Biotelemetry

Andrea De Marcellis^{2}, Guido Di Patrizio Stanchieri^{2}, Elia Palange^{2}, Marco Faccio^{2}, Timothy G. Constandinou^{1}

^{1}Imperial College London, United Kingdom; ^{2}University of L'Aquila, Italy

28: 6078

Biosafety Considerations of a Capacitive Link for Wireless Power Transfer to Biomedical Implants

Reza Erfani, Fatemeh Marefat, Pedram Mohseni

Case Western Reserve University, United States

29: 6138

An Investigation on Inter-Degeneration Effect in Body Channel Based Multi-Node Wireless Power Transfer

Yuxuan Huang, Jian Zhao, Wenyu Sun, Jingna Mao, Huazhong Yang, Yongpan Liu

Tsinghua University, China

30: 6142

Robust Wireless Power Transfer to Multiple mm-Scale Freely-Positioned Neural Implants

Peilong Feng, Timothy G. Constandinou

Imperial College London, United Kingdom

31: 6178

A Sub-nW Wake-Up Receiver for Human Body Communication

Shovan Maity, David Yang, Baibhab Chatterjee, Shreyas Sen

Purdue University, United States

32: 6184

A Bluetooth Low Energy (BLE)-Enabled Wireless Link for Bidirectional Communications with a Neural Microsystem

Nicholas Vitale, Meysam Azin, Pedram Mohseni

Case Western Reserve University, United States

33: 6204

Battery-Free, Sticker-Like, Device for Health Monitoring, Operated by Optical Power Transfer

Nattakarn Wuthibenjaphonchai^{2}, Makito Haruta^{2}, Toshihiko Noda^{2}, Kiyotaka Sasagawa^{2}, Takashi Tokuda^{2}, Mohamad Sawan^{3}, Sandro Carrara^{1}, Jun Ohta^{2}

^{1}École polytechnique fédérale de Lausanne, Switzerland; ^{2}Nara Institute of Science and Technology, Japan; ^{3}Polytechnique Montreal, Canada

34: 6237

A 385 μ m \times 385 μ m 0.165 V 0.27 nW Fully-Integrated Supply-Modulated OOK CMOS TX in 65nm CMOS for Glasses-Free, Self-Powered, and Fuel-Cell-Embedded Continuous Glucose Monitoring Contact Lens

Kenya Hayashi, Shigeki Arata, Ge Xu, Shunya Murakami, Cong Dang Bui, Takuyoshi Doike, Maya

Matsunaga, Atsuki Kobayashi, Kiichi Niitsu

Nagoya University, Japan

35: 6024

Injection-Locked Power Oscillator for Resonance Frequency Tracking in Wireless Power Transfer

Guangyin Feng, Ji-Jon Sit

Nanyang Technological University, Singapore

36: 6130

The Challenges of Designing an Inductively Coupled Power Link for μm -Sized on-Chip Coils

Adam Khalifa^{1}, Yasha Karimi^{2}, Yuanfei Huang^{2}, Milutin Stanaćević^{2}, Ralph Etienne-Cummings^{1}

^{1}Johns Hopkins University, United States; ^{2}Stony Brook University, United States

37: 6050

Design of Multiple-Charge-Pump System for Implantable Biomedical Applications

Shiau-Pin Lin, Ming-Dou Ker

National Chiao-Tung University, Taiwan

38: 6063

Excitation and Emission Filters for Implantable Fluorescence Imaging Devices by Laser Lift-Off Process

Kiyotaka Sasagawa, Yasumi Ohta, Makito Haruta, Toshihiko Noda, Takashi Tokuda, Jun Ohta
Nara Institute of Science and Technology, Japan

39: 6090

An Ultrasonically Powered and Controlled Ultra-High-Frequency Biphasic Electrical Neurostimulator

Lucia Tacchetti, Wouter A. Serdijn, Vasiliki Giagka

Delft University of Technology, Netherlands

40: 6103

Multi-Coil High Efficiency Wireless Charger System for Hermetically Sealed Biomedical Implants

Jihun Lee, Arto Nurmikko

Brown University, United States

41: 6128

Two-Port Networks to Model Galvanic Coupling for Intrabody Communications and Power Transfer to Implants

Laura Becerra-Fajardo, Marc Tudela-Pi, Antoni Ivorra

Universitat Pompeu Fabra, Spain

42: 6155

Online Predictive Modeling for the Thermal Effect of Implantable Devices

Ruizhi Chai^{1}, Yen-Pang Lai^{1}, Wen Sun^{2}, Maysam Ghovanloo^{1}, Ying Zhang^{1}

^{1}Georgia Institute of Technology, United States; ^{2}Tianjin University, China

43: 6219

Flexible Ultra-Resolution Subdermal EEG Probes

Zabir Ahmed, Jay Reddy, Kaustubh Deshpande, Ashwati Krishnan, Praveen Venkatesh, Shawn Kelly, Pulkit Grover, Maysamreza Chamanzar

Carnegie Mellon University, United States

44: 6238

ECoG Electrode Array with Embedded Coupling Capacitors for Area Efficient Neural Recording

*Ehsan Ashoori, Heyu Yin, Sina Parsnejad, Joseph W Salatino, Erin K Purcell, Andrew J. Mason
Michigan State University, United States*

16:30 – 18:00

LECTURE SESSION: B6L-A - Lab-on-Chip, Point-of-Care Technologies & CAS for Neuroscience

Room: Salon ED

Chairs: Jennifer Blain Christen and Roland Thewes

Monitoring Red Blood Cell Aggregation Dynamics in Stasis and Under Flow Using a Microfluidic Dielectric Sensor

*Debnath Maji, Michael Suster, Pedram Mohseni
Case Western Reserve University, United States*

Toward Point-of-Care Assessment of Platelet Count-Induced Changes in Whole Blood Coagulation with a Dielectric Microsensor

*Debnath Maji, Ujjal Sekhon, Anirban Sen Gupta, Michael Suster, Pedram Mohseni
Case Western Reserve University, United States*

Manipulating and Patterning Micro/Nanoparticles in Liquid Using Multimode Membrane Resonators

*Hao Jia, Xia Liu, Philip Feng
Case Western Reserve University, United States*

Dual-Mode Microelectrode Array Featuring 20k Electrodes and High SNR for Extracellular Recording of Neural Networks

*Xinyue Yuan^{1}, Vishalini Emmenegger^{1}, Marie Engelene J. Obien^{2}, Andreas Hierlemann^{1}, Urs Frey^{2}
^{1}ETH Zurich, Switzerland; ^{2}ETH Zurich, MaxWell Biosystems AG, Switzerland*

Energy-Efficient Architecture for Neural Spikes Acquisition

*Dmitry Osipov, Steffen Paul, Heiko Stemmann, Andreas K. Kreiter
University of Bremen, Germany*

19:30

GALA DINNER

Location: Salon ED

BioCAS 2018 - FRIDAY, OCTOBER 19th

7:30 – 18:00
REGISTRATION

8:00 – 9:30
LECTURE SESSION: C1L-A. Bio-Inspired & Neuromorphic Human Machine Interfaces
Room: Salon ED
Chairs: Gert Cauwenberghs and Andrew Mason

TruffleBot: Low-Cost Multi-Parametric Machine Olfaction

Jason Webster, Pratistha Shakya, Eamonn Kennedy, Michael Caplan, Christopher Rose, Jacob Rosenstein
Brown University, United States

Unsupervised Synaptic Pruning Strategies for Restricted Boltzmann Machines

Surabhi Kalyan, Siddharth Joshi, Sadique Sheik, Bruno U. Pedroni, Gert Cauwenberghs
University of California, San Diego, United States; University of California, San Diego, United States

Power-Law Compression Expands the Dynamic Range of a Neuromorphic Echolocation System

Chenxi Wen, Timothy Horiuchi
University of Maryland, College Park, United States

Processing EMG Signals Using Reservoir Computing on an Event-Based Neuromorphic System

Elisa Donati^{2}, Melika Payvand^{2}, Nicoletta Risi^{2}, Renate Krause^{2}, Karla Burelo^{2}, Thomas Dalgaty^{1}, Elisa Vianello^{1}, Giacomo Indiveri^{2}
^{1}CEA-Leti, France; ^{2}University of Zurich / ETH Zurich, Switzerland

A Real-Time Surface EMG Decomposition System for Non-Invasive Human-Machine Interfaces

Deren Barsakcioglu, Dario Farina
Imperial College London, United Kingdom

9:30 – 10:30
COFFEE BREAK
Room: Salon FGH

9:30 – 10:30
POSTER SESSION: C2P-B - Biosignal Recording, Processing, & Machine Learning II AND C2P-C - Biofeedback, Neuromodulation, & Closed-Loop Systems AND C2P-D - Medical Information Systems, Genomics & Bioinformatics
Room: Salon FGH
Chairs: Takashi Tokuda and Laleh Najafizadeh

1: 6059

An Efficient Hardware Architecture Design of EEMD Processor for Electrocardiography Signal

I-Wei Chen, Shang-Yi Chuang, Wen-Jun Wu, Wai-Chi Fang
National Chiao Tung University, Taiwan

2: 6069

User Adaptive QRS Detection Based on One Target Clustering and Correlation Coefficient

*Yang Zhao, Zhongxia Shang, Yong Lian
York University, Canada*

3: 6077

Continuous Peripheral Blood Pressure Measurement with ECG and PPG Signals at Fingertips

*Kar Mun Lee^{4}, Zhengyang Qian^{4}, Ryosuke Yabuki^{4}, Bang Du^{3}, Hisashi Kino^{1}, Takafumi Fukushima^{4}, Koji Kiyoyama^{2}, Tetsu Tanaka^{4}
^{1}Frontier Research Institute for Interdisciplinary Sciences, Japan; ^{2}Nagasaki Institute of Applied Science, Japan; ^{3}School of Engineering, Japan; ^{4}Tohoku University, Japan*

4: 6087

One-Shot Learning for iEEG Seizure Detection Using End-to-End Binary Operations: Local Binary Patterns with Hyperdimensional Computing

*Alessio Burrello^{1}, Kaspar Schindler^{2}, Luca Benini^{1}, Abbas Rahimi^{1}
^{1}ETH Zurich, Switzerland; ^{2}Inselspital Bern, Switzerland*

5: 6106

High Frequency Oscillations Detection in Patients Combining Wavelet Decomposition and Back Propagation Neural Network

*Dakun Lai^{1}, Zenghui Kan^{1}, Wenjing Chen^{2}, Heng Zhang^{2}
^{1}University of Electronic Science and Technology of China, China; ^{2}West China Hospital of Sichuan University, China*

6: 6116

Learning from Non-Seizure Clusters for EEG Analytics

*Javad Birjandtalab^{1}, Melvin James^{1}, Mehrdad Nourani^{1}, Jay Harvey^{2}
^{1}University of Texas at Dallas, United States; ^{2}UT Southwestern Medical Center, United States*

7: 6121

Real-Time Spike Sorting for Multi-Electrode Arrays with Online Independent Component Analysis

*Alessio Paolo Buccino^{2}, Sheng-Hsiou Hsu^{1}, Gert Cauwenberghs^{1}
^{1}University of California, San Diego, United States; ^{2}University of Oslo, Norway*

8: 6129

A Clockless Method of Flicker Noise Suppression in Continuous-Time Acquisition of Biosignals

*Michal Maslik^{1}, Tor Sverre Lande^{2}, Timothy G. Constandinou^{1}
^{1}Imperial College London, United Kingdom; ^{2}University of Oslo, Norway*

9: 6162

A MVDR- MWF Combined Algorithm for Binaural Hearing Aid System

*Zhuoyi Sun^{2}, Yingdan Li^{1}, Hanjun Jiang^{2}, Fei Chen^{1}, Zihua Wang^{2}
^{1}Tianjin University, China; ^{2}Tsinghua University, China*

10: 6229

Energy Efficient Convolutional Neural Networks for EEG Artifact Detection

*Mohit Khatwani^{2}, Morteza Hosseini^{2}, Hiren Paneliya^{2}, W. David Hairston^{1}, Nicholas Waytowich^{1}, Tinoosh Mohsenin^{2}
^{1}United States Army Research Laboratory, United States; ^{2}University of Maryland - Baltimore County, United States*

11: 6236

Early Detection of Epileptic Activity on EEG Signals Using Phase-Preserving Quantization Method

*Sylmarie Davila-Montero, Ehsan Ashoori, Andrew J. Mason
Michigan State University, United States*

12: 6037

A Patient-Specific Machine Learning Based EEG Processor for Accurate Estimation of Depth of Anesthesia

*Fatima Hameed Khan, Usman Ashraf, Muhammad Awais Bin Altaf, Wala Saadeh
Lahore University of Management Sciences, Pakistan*

13: 6043

Embedded Classification of Local Field Potentials Recorded from Rat Barrel Cortex with Implanted Multi-Electrode Array

*Xiaying Wang^{1}, Michele Magno^{1}, Lukas Cavigelli^{1}, Mufti Mahmud^{3}, Claudia Cecchetto^{2}, Stefano Vassanelli^{3}, Luca Benini^{1}
^{1}ETH Zurich, Switzerland; ^{2}OIST Graduate University, Japan; ^{3}University of Padova, Italy*

14: 6048

Microscopic Ultrasound Stimulation of Neural Tissue

*Hesam Sadeghi Gougheri, Mehdi Kiani
Pennsylvania State University, United States*

15: 6061

Efficient Implementation and Stability Analysis of a HV-CMOS Current/Voltage Mode Stimulator

*Michael Haas^{2}, Maurits Ortmanns^{1}
^{1}Universitat Ulm, Germany; ^{2}University of Ulm, Germany*

16: 6086

Embedding Adaptive Stimulation Algorithms for a New Implantable Deep-Brain Stimulation Research Tool

*Jeffrey Herron, David Linde, Tom Chouinard, Benjamin Isaacson, Scott Stanslaski, Duane Bourget, Tom Adamski, Timothy Denison
Medtronic, United States*

17: 6108

Embedded Phase-Amplitude Coupling Based Closed-Loop Platform for Parkinson's Disease

*Molly Alexandre^{2}, Song Luan^{2}, Zoltan Mari^{1}, William Anderson^{3}, Yousef Salimpour^{3}, Timothy G. Constandinou^{2}, Laszlo Grand^{2}
^{1}Cleveland Clinic Lou Ruvo Center for Brain Health, United Kingdom; ^{2}Imperial College London, United Kingdom; ^{3}Johns Hopkins University, United States*

18: 6122

Spatiotemporal Analysis of Simultaneous Repetitive Electrical Stimulation with Voltage Sensitive Dye

*Lucas de Levy Oliveira, Naofumi Suematsu, Tetsuya Yagi
Osaka University, Japan*

19: 6197

Do Single Neuron Models Exhibit Temporal Interference Stimulation?

Jiaming Cao, Pulkit Grover

Carnegie Mellon University, United States

20: 6073

Guided Frequency Filter for Block-DCT Compressed Capsule Endoscopic Images

Jiawen Xue, Xiang Xie, Guolin Li, Zhihua Wang

Tsinghua University, China

21: 6193

GPU-Accelerated Parameter Selection for Neural Connectivity Analysis Devices

Gerard O'Leary^{3}, Ian Taras^{3}, Dylan Malone Stuart^{3}, Jamie Koerner^{3}, David Groppe^{1}, Taufik Valiante^{2}, Roman Genov^{3}

^{1}Krembil Research Institute, Canada; ^{2}Toronto Western Hospital, Canada; ^{3}University of Toronto, Canada

22: 6227

Links Between DNA-Based Diet and Salivary Leptin Hormone Concentration

Francesca Cavallo, Khalid Mirza, Christofer Toumazou

Imperial College London, United Kingdom

23: 6252

Predicting Drug-Target Interaction Using Deep Matrix Factorization

Hafez Eslami Manoochehri, Mehrdad Nourani

University of Texas at Dallas, United States

10:30 – 12:00

LECTURE SESSION: C3L-A – Implantable Medical Devices

Room: Salon ED

Chairs: Wouter Serdijn and Mehdi Kiani

A 0.0094mm²/Channel Time-Based Beat Frequency ADC in 65nm CMOS for Intra-Electrode Neural Recording

Luke Everson, Somnath Kundu, Gang Chen, Zhi Yang, Timoth Ebner, Chris Kim

University of Minnesota, United States

A Charge Balanced Neural Stimulator with 3.3V to 49V Supply Compliance and Arbitrary Programmable Current Pulse Shapes

Armin Taschwer^{1}, Natalie Butz^{2}, Manuel Kahler^{2}, Daniel Roszbach^{1}, Yiannos Manoli^{2}

^{1}Hahn-Schickard, Germany; ^{2}University of Freiburg - IMTEK, Germany

Design Considerations for Ground Referencing in Multi-Module Neural Implants

Dorian Hacı, Yan Liu, Sara Ghoreishizadeh, Timothy G. Constandinou

Imperial College London, United Kingdom

A Fully Wireless Implantable Multi-Channel Muscle Stimulator with Closed-Loop Feedback Control

Li Jing Ong^{3}, Shih-Chiang Liu^{3}, Marshal Dian Sheng Wong^{3}, Tafadzwa Sibindi^{3}, Gil Gerald Lasam Gammad^{3}, Chne-Wuen Tsai^{3}, Astrid Rusly^{3}, Kian Ann Ng^{3}, Camilo Libedinsky^{2}, Sudip Nag^{1}, Shih-Cheng Yen^{2}

{1}Indian Institute of Technology Kharagpur, India; {2}National University of Singapore, Singapore; {3}NUS Sinapse Insitute, Singapore

Preliminary Evaluation of an Injectable Sensor for Subcutaneous Photoplethysmography in Animals

*James Reynolds, Parvez Ahmmed, Alper Bozkurt
North Carolina State University, United States*

12:00 – 13:00

LUNCH

Room: Salon FGH

13:00 – 14:00

KEYNOTE 3: ANDREW DEHENNIS

Room: Salon ED

14:00 – 15:30

LECTURE SESSION: C4L-A. SPECIAL SESSION - Circuits & Systems for Food Chain

Room: Salon ED

Chairs: Mohamad Sawan and Danilo Demarchi

New System for Nitrites and Nitrates Detection from Natural Water Sources

Carmen Moldovan^{2}, Marian Ion^{2}, Silviu Dinulescu^{2}, Mihaela Savin^{2}, Costin Brasoveanu^{2}, Bogdan Firtat^{2}, Mariuca Gartner^{1}, Cecilia Lete^{1}, Susana Mihaiu^{1}, Marin Gheorghe^{3}, Simona Gheorghe^{3}

{1}ICF Ilie Murgulescu, Romania; {2}IMT-Bucharest, Romania; {3}NANOM MEMS, Romania

Objective Human Gustatory Sensitivity Assessment Through a Portable Electronic Device

*Eleonora Sulas, Alice Evelina Martis, Piero Cosseddu, Andrea Achilli, Giorgia Sollai, Iole Tomassini
Barbarossa, Luigi Raffo, Annalisa Bonfiglio, Danilo Pani
University of Cagliari, Italy*

A Capsule Endoscope System for Wide Visualization Field and Location Tracking

*Jaeun Jang, Hoi-Jun Yoo
KAIST, Korea*

15:30 – 16:30

COFFEE BREAK

Room: Salon FGH

15:30 – 16:30

POSTER SESSION: C5P-B - Bio-Inspired & Neuromorphic Circuits & Systems and C5P-C - Lab-on-Chip & Point-of-Care Technologies

Room: Salon FGH

Chairs: Yan Liu and Kiichi Niitsu

24: 6034

Implementation of the Neural Engineering Framework on the TrueNorth Neurosynaptic System

Kate Fischl^{2}, Terrence Stewart^{3}, Kaitlin Fair^{1}, Andreas G. Andreou^{2}

^{1}Air Force Research Laboratory, United States; ^{2}Johns Hopkins University, United States;

^{3}University of Waterloo, Canada

25: 6057

Small-Footprint Spiking Neural Networks for Power-Efficient Keyword Spotting

Bruno U. Pedroni^{2}, Sadique Sheik^{2}, Hesham Mostafa^{2}, Somnath Paul^{1}, Charles Augustine^{1}, Gert Cauwenberghs^{2}

^{1}Intel Corporation, United States; ^{2}University of California, San Diego, United States

26: 6131

Word2vec Word Similarities on IBM's TrueNorth Neurosynaptic System

Daniel Mendat^{2}, Andrew Cassidy^{1}, Guido Zarrella^{3}, Andreas G. Andreou^{2}

^{1}IBM Research-Almaden, United States; ^{2}Johns Hopkins University, United States; ^{3}MITRE

Corporation, United States

27: 6153

Proto-Object Based Saliency Model with Second-Order Texture Feature

Takeshi Uejima, Ernst Niebur, Ralph Etienne-Cummings

Johns Hopkins University, United States

28: 6177

Odor Source Localization on a Nano Quadcopter

Alexander Castro, Nevo Magnezi, Biruk Sintayehu, Alexander Quinto, Pamela Abshire

University of Maryland, United States

29: 6179

A Soft-Matter Biomolecular Memristor Synapse for Neuromorphic Systems

Ryan Weiss^{2}, Joseph Najem^{1}, Sakib Hasan^{2}, Catherine Schuman^{1}, Alex Belianinov^{1}, Patrick Collier^{1}, Stephen Sarles^{2}, Garrett Rose^{2}

^{1}Oak Ridge National Laboratory, United States; ^{2}University of Tennessee, United States

30: 6205

Design and Analysis of Staged Mutual Inhibition to Implement Bi-Stable Neuronal Toggle Switch

Farimah Mapar^{2}, Ron Weiss^{1}

^{1}Massachusetts Institute of Technology, United States; ^{2}Northeastern University, United States

31: 6210

A Neuromorphic Computing System for Bitwise Neural Networks Based on ReRAM Synaptic Array

Pin-Yi Li, Cheng-Han Yang, Wei-Hao Chen, Jian-Hao Huang, Wei-Chen Wei, Je-Syu Liu, Wei-Yu Lin, Tzu-Hsiang Hsu, Chih-Cheng Hsieh, Ren-Shuo Liu, Meng-Fan Chang, Kea-Tiong Tang

National Tsing Hua University, Taiwan

32: 6216

Unsupervised Learning and Adaptive Classification of Neuromorphic Tactile Encoding of Textures

*Mark Iskarous^{1}, Harrison Nguyen^{1}, Luke Osborn^{1}, Joseph Betthausen^{1}, Nitish V. Thakor^{2}
^{1}Johns Hopkins University, United States; ^{2}Johns Hopkins University / Singapore Institute for
Neurotechnology, National University of Singapore, United States*

33: 6217

A Compact and Accelerated Spike-Based Neuromorphic VLSI Chip for Pattern Recognition

*Cheng Li, Yuan Wang, Jin Zhang, Xiaoxin Cui, Ru Huang
Peking University, China*

34: 6055

Dynamic Texture Decoding Using a Neuromorphic Multilayer Tactile Sensor

*Harrison Nguyen^{1}, Luke Osborn^{1}, Mark Iskarous^{1}, Christopher Shallal^{1}, Christopher Hunt^{1},
Joseph Betthausen^{1}, Nitish V. Thakor^{2}
^{1}Johns Hopkins University, United States; ^{2}Johns Hopkins University / Singapore Institute for
Neurotechnology, National University of Singapore, United States*

35: 6006

No Touch Vitals: a Pilot Study of Non-Contact Vital Signs Acquisition in Exercising Volunteers

*Geoffrey Capraro^{1}, Cameron Etebari^{2}, Katherine Luchette^{2}, Laura Mercurio^{1}, Derek Merck^{1},
Ihor Kirenko^{3}, Marek Bartula^{3}, Christine Swisher^{3}, Haibo Wang^{3}, Leo Kobayashi^{1}
^{1}Alpert Medical School of Brown University, United States; ^{2}Brown University, United States;
^{3}Philips Research, Netherlands; ^{3}Philips Research, United States*

36: 6068

Development of a Portable Intraoral Camera and a Smartphone Application for Oral Cancer PDT Treatment Guidance and Monitoring

*Paola Leon^{2}, Grant Rudd^{2}, Liam Daly^{2}, Hui Liu^{2}, Jonathan Celli^{2}, Tayyaba Hasan^{1}, Filip
ÄŒevÄŒkov^{2}
^{1}Massachusetts General Hospital, United States; ^{2}University of Massachusetts Boston, United
States*

37: 6110

Low-Power Hardware-Based Deep-Learning Diagnostics Support Case Study

*Khushal Sethi, Vivek Parmar, Manan Suri
Indian Institute of Technology Delhi, India*

38: 6167

Spur Gears and Leadscrew Based, Efficient and Flexible Infusion System Design

*Muhammad Rizwan Khan, Muhammad Talha Tariq, Farasat Munir, Muhammad Awais Bin Altaf
Lahore University of Management Sciences, Pakistan*

39: 6253

Considerations for Low-Cost Reader Design and Label Selection for Lateral Flow Assays

*Uwadiae Obahiagbon, Jennifer Blain Christen
Arizona State University, United States*

40: 6259

A Compact Continuous Non-Invasive Glucose Monitoring System with Phase-Sensitive Front End

*Soumyasanta Laha, Savas Kaya, Nikhil Dhinagar, Yunus Kelestemur, Vishawajeet Puri
Ohio University, United States*

41: 6215

Thermally Controlled Lab-on-PCB for Biomedical Applications

*Dorian Hacı{1}, Yan Liu{1}, Konstantin Nikolic{1}, Danilo Demarchi{2}, Timothy G. Constandinou{1},
Pantelis Georgiou{1}
{1}Imperial College London, United Kingdom; {2}Politecnico di Torino, Italy*

42: 6025

A μ Radio CMOS Device for Real-Time in-Tissue Monitoring of Human Organoids

*Gian Nicola Angotzi, Marco Crepaldi, Aziliz Lecomte, Lidia Giantomasi, Silvia Rancati, Davide Depietri
Tonelli, Luca Berdondini
Fondazione Istituto Italiano di Tecnologia, Italy*

43: 3D-Printed Cross-Flow Mixer Gradient Within Minutes for Microfluidic Applications

*Shilpa Sivashankar{2}, Hend Mkaouar{1}, Yousof Mashraei{1}, Kholod Alamoudi{1}, Niveen M.
Khashab{1}, Khaled Nabil Salama{1}
{1}King Abdullah University of Science and Technology, Saudi Arabia; {2}North Carolina State
University, United States*

44: 6143

Design and Custom Fabrication of a Smart Temperature Sensor for an Organ-on-a-Chip Platform

*Ronaldo Ponte, Vasiliki Giagka, Wouter A. Serdijn
Delft University of Technology, Netherlands*

16:30 – 18:00

LECTURE SESSION: C6L-A - Biomedical Imaging, Image Guided Therapy, & Assistive Technologies

Room: Salon ED

Chairs: Jun Ohta and Nitish Thakor

Development and Preliminary Assessment of an Arch-Shaped Stand-Alone Intraoral Tongue Drive System for People with Tetraplegia

*Fanpeng Kong, Md Nazmus Sahadat, Maysam Ghovanloo
Georgia Institute of Technology, United States*

Ultra-High-Resolution Millimeter-Wave Imaging: a New Promising Skin Cancer Imaging Modality

*Amir Mirbeik-Sabzevari^{2}, Negar Tavassioian^{2}, Robin Ashinoff^{1}
^{1}Hackensack University Medical Center, United States; ^{2}Stevens Institute of Technology, United States*

Conformal Ultrasound Transducer Array for Image-Guided Neural Therapy

*Vida Pashaei, Alex Roman, Soumyajit Mandal
Case Western Reserve University, United States*

A Nano-Filter-Integrated CMOS Image Sensor for Fluorescent Biomedical Imaging

*Yu Jiang^{1}, Hao Yu^{3}, Xiaojian Fu^{2}, Chathuranga Hettiarachchi^{1}, He Xu^{2}, Ye Li^{2}, Tien Hoa Nguyen^{1}, Longtao Dong^{3}, Cuong Dang^{1}, Qing Zhang^{1}
^{1}Nanyang Technological University, Singapore; ^{2}Southeast University, Singapore; ^{3}Southern University of Science and Technology, Singapore*

A 120 dB, Asynchronous, Time-Domain, Multispectral Imager for Near-Infrared Fluorescence Image-Guided Surgery

*Steven Blair^{1}, Missael Garcia^{1}, Nan Cui^{2}, Viktor Gruev^{1}
^{1}University of Illinois at Urbana-Champaign, United States; ^{2}Washington University in St. Louis, United States*

19:00 – 19:30

Bus Transportation to FAREWELL EVENT

19:30 – 23:00

FAREWELL EVENT

Rock and Roll Hall of Fame

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Nara Institute of Science & Technology, Japan



IMPORTANT DATES

TENTATIVE

Monday, April 22, 2019

Special Session Proposal Deadline

Monday, June 10, 2019

Regular Paper Submission Deadline

Monday, July 15, 2019

Live Demo Submission Deadline

Monday, August 12, 2019

Author Notification Date

Friday, August 30, 2019

Final Paper Submission Deadline

BioCAS 2019 is a premier international forum for presenting the interdisciplinary research and development activities at the crossroads of medicine, life sciences, physical sciences and engineering that shape tomorrow's medical devices and healthcare systems.

This conference brings together members of our communities to broaden their knowledge in emerging areas of research at the interface of the life sciences and the circuits and systems engineering. The three-day single-track program for BioCAS 2019 is multidisciplinary in topics including but not limited to:

Biomedical Technologies

- Assistive, Rehabilitation, and Quality of Life Technologies
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- Bio-Inspired and Neuromorphic Circuits and Systems
- Biosensor Devices and Interface Circuits
- Biotelemetry and Energy Harvesting/Scavenging Circuits and Systems
- Body Area/Sensor Network and Wireless/Wearable Health Monitoring
- Electronics for Neuroscience
- Implantable Medical Electronics
- Lab-on-Chip and BioMEMS
- Point-of-Care Technologies for Healthcare

Biomedical Applications

- Biomedical Imaging and Image Processing
- Biosignal Recording, Processing, and Machine Learning
- Genomics and Systems Biology
- Human-Machine Interfaces
- Medical Information Systems and Bioinformatics

Submission Guidelines

The complete 4-page paper (in standard IEEE double-column format), including the title, authors' names, affiliations and e-mail addresses, as well as a short abstract and an optional demonstration video link (3 minute max) are requested. Papers must be submitted electronically in PDF format through www.biocas2019.org.



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