

## Table of Contents

|  |    |
|--|----|
| General Chair Welcome Message .....                          | 2  |
| Technical Program Chair Welcome Message .....                | 4  |
| Organizing Committee .....                                   | 5  |
| Conference Sponsors .....                                    | 7  |
| Gold Patron .....  | 7  |
| Local Support .....  | 7  |
| Industry Forum Patrons .....                                 | 8  |
| Press Patron .....   | 8  |
| Special Sessions .....                                       | 9  |
| Technical Reviewers .....                                    | 10 |
| Keynote Speakers .....                                       | 12 |
| WICAS Event .....  | 14 |
| Young Professional Event .....                               | 15 |
| Program Grid: Monday, October 24 <sup>th</sup> .....         | 16 |
| Program Grid: Tuesday, October 25 <sup>th</sup> .....        | 17 |
| Program Grid: Wednesday, October 26 <sup>th</sup> .....      | 19 |
| Technical Program: Monday, October 24 <sup>th</sup> .....    | 20 |
| Technical Program: Tuesday, October 25 <sup>th</sup> .....   | 29 |
| Technical Program: Wednesday, October 26 <sup>th</sup> ..... | 43 |
| IEEE Policies .....  | 53 |

## General Chair Welcome Message

Dear Colleagues and Friends,

Welcome to Glasgow!

On behalf of the Organizing Committee of the 29th IEEE International Conference on Electronics Circuits and Systems (IEEE ICECS 2022), it is a great pleasure to welcome you to the UK and Glasgow, Scotland. IEEE ICECS is the Region 8 flagship conference of the IEEE Circuits and Systems. The Technology and Innovation Centre (TIC) is an ideal venue for this conference as it lies in the city centre and the financial, cultural and shopping districts. Glasgow is the largest city in Scotland, famous for its scientific and engineering heritage. The city showcases some of the most exemplary Victorian architecture, and some of the finest art nouveau buildings, including the Glasgow School of Art and House for an Art Lover, designed by Scotland's best-known architect Charles Rennie Mackintosh. The city is home to great inventions, from the development of penicillin to the first long-distance television transmission, and is a world-leading research city. Today it is considered one of the cultural capitals of Europe, with a wide range of excellent concert, entertainment and sports venues, and an array of attractions such as the Kelvingrove Art Gallery and Museum, the Riverside Museum, and the Glasgow Science Centre, all within easy reach. The city boasts vibrant nightlife, excellent shopping, and a diverse array of pubs, clubs, bars and restaurants. Glasgow is well situated, with world-renowned lochs, mountains, historic castles and championship golf courses reachable within 30 minutes of the city. We hope that you will learn more about the city while you are here and take away many fond memories.

In addition to the Technical Sessions, there will also be a Tutorial Day parallel to the Industry Day Session (Monday, 24 October). We have 2 exciting Events for Young Professionals and Women in Circuits and Systems (WiCAS): a Young Professionals Event and Luncheon, and a WiCAS Session and Reception on Tuesday, 25 October.

We recognise and thank all our Keynote Speakers for their contributions. Professor Themis Prodromakis (University of Edinburgh, UK) will present the development of metal-oxide Resistive Random-Access Memory technologies and related technologies. Our second Keynote is by Prof Elisabetta Chicca (the University of Groningen, The Netherlands), who will speak on CMOS models of cortical circuits for brain-inspired computation, learning in spiking CMOS neural networks and memristive systems, bio-inspired sensing and motor control. Professor Prof. Wouter Serdijn (TU Delft, The Netherlands), our third Keynote speaker, will present on electrochemicals or bioelectronic medicine. We appreciate their expertise and willingness to share their knowledge and time with us in Glasgow.

On Wednesday, 26 October afternoon, following the Keynote, a short Awards and Closing Ceremony concludes the IEEE ICECS 2022. The success of a conference depends not only on the technical program but also the social program. The City of Glasgow will host a Welcome Reception at the Glasgow City Chamber on Monday, 24 October, while our Gala Dinner will take place at The Oran Mor in what will be an evening of excellent dining, live music and Scottish dancing.

IEEE ICECS 2022 would not be successful without the support of the City of Glasgow, the Glasgow Convention Bureau and the TIC, and we thank them for all their contributions and assistance. We also sincerely appreciate the support received from our Sponsors (Cadence, EPSRC and Wiley) and Promotional Sponsors (University of Glasgow) and the support and participation of all our exhibitors and other sponsors.

The success of IEEE ICECS 2022 is due to the dedication of more than 350 volunteers comprising over 200 Reviewers together with the Organizing Committee, the Track Chairs (Regular and Special Sessions) and the YP/WiCAS organisers. Our gratitude goes to all the volunteers who have contributed, both directly and indirectly, to the numerous details and

tasks of the conference. We would like to thank the TPC chairs, Erika and Dimitri, for their hard work, dedication and initiative.

We would also like to record our thanks to the professional conference organisers, Conference Catalysts, LLC, under the leadership of Chris Dyer and Laura LeBlanc, who has been fantastic at efficiency, organisation, budgeting and selection, and to Tom Wehner of ePapers for providing the online conference paper submission portal, reviewing support and associated logistics.

Thank you for participating in IEEE ICECS 2022. We hope you will take back good memories, renew old friendships, and form new friendships in Glasgow, and we look forward to seeing you in Istanbul, Turkey, next year!

Start exploring!

Hadi Heidari & Elena Blokhina  
IEEE ICECS 2022 General Co-Chairs

## Technical Program Chair Welcome Message

This year 238 papers will be presented during the conference. Accepted papers are divided into 143 lecture and 95 poster presentations determined by author preference, suitability, session planning and other considerations. All accepted papers underwent an identical peer-review process and will be published in the conference proceedings on IEEE Xplore. Submissions are primarily from academia (~88%), with growing participation from industry (~7%) and research facilities and government laboratories (~5%). Submitted papers have come from all global regions, with about 59% from Europe, 24% from Asia/Pacific, 12% from North/Latin America and about 5% from Middle East/Africa.

We have created an exciting program and conference structure designed to stimulate discussion and participation of attendees from different corners of the world in a hybrid format (on-site and virtual). The Virtual Platform we are using has many features to allow virtual attendees to contact and network with other attendees. We hope virtual attendees engage with IEEE ICECS 2022 as fully as they would if they were in Glasgow in person.

With 13 tracks, including 11 Regular tracks, a new "Industry Forum" track to capture industrial contributions, 7 Special Sessions, 3 Keynote presentations, 3 Posters sessions, a Young Professionals Session, a Women in Circuits And Systems (WiCAS) Event, and a Live Demos session, the conference promises to be packed with exciting presentations, posters and demos highlighting all areas of electronic circuits and systems. The circuits and systems community proposed special sessions to the TPC, so the suggestions for topics came directly from you, our conference delegates. This year, the 7 Special Sessions are on Challenges and Requirements in Sensory Circuit Design, 5G advanced Radiofrequency Architectures, CMOS for Quantum Computing, Embedded and Intelligent Systems for Health Applications, Innovations in Memristor Modelling, Analysis, & Fabrication Toward a Systematic Approach to Circuit, Piezoelectric Transducers & Their Interface Circuits for Device Energy Harvesting & Remote Powering, and Wireless Energy Harvesting Circuits & Applications.

We would like to thank our Track Chairs proactively led the review process and submitted their decisions in a timely fashion. Our reviewers did an excellent job, and we thank them for performing this essential task. We would also like to thank our special session organizers, session chairs, and reviewers for making this conference memorable. Our biggest thanks go to the authors who took the time to write and now presenting their work and making this conference an unforgettable event.

Dimitri Galayko & Erika Covi  
IEEE ICECS 2022 Technical Program Chairs

## Organizing Committee

### General Chairs

Hadi Heidari  
*University of Glasgow, UK*

Elena Blokhina  
*UCD Dublin, Ireland*

### Technical Program Chairs

Dimitri Galayko  
*Sorbonne Université, France*

Erika Covi  
*NaMLab, Germany*

### Keynote Speaker Chairs

Kia Nazarpour  
*University of Edinburgh, UK*

Timothy Constantinou  
*Imperial College London, UK*

Andreas Demosthenous  
*University College London, UK*

### Special Session Chairs

Maurizio Valle  
*University of Genova, Italy*

Pantelis Georgiou  
*Imperial College London, UK*

Edoardo Bonizzoni  
*University of Pavia, Italy*

Rupam Das  
*University of Glasgow, UK*

Rishad Shafik  
*Newcastle University, UK*

Francois Rivet  
*University of Bordeaux, France*

Jens Trommer  
*NaMLab, Germany*

### Tutorial Chairs

Farshad Moradi  
*Aarhus University, Denmark*

Melika Payvand  
*ETHZ, Switzerland*

Xiao Liu  
*Fudan University, China*

### Awards Chairs

Marco Carminati  
*Politecnico di Milano, Italy*

Alex Casson  
*University of Manchester, UK*

Veeresh Deshpande  
*Helmholtz-Zentrum Berlin, Germany*

|                    |
|--------------------|
| <b>Demo Chairs</b> |
|--------------------|

Roberto Fallica  
*IMEC, Belgium*

Ka-Meng Lei  
*University of Macau, China*

|                       |
|-----------------------|
| <b>Finance Chairs</b> |
|-----------------------|

Rami Ghannam  
*University of Glasgow, UK*

Sara Ghoreishizadeh  
*University College London, UK*

|                     |
|---------------------|
| <b>WiCAS Chairs</b> |
|---------------------|

Giulia di Capua  
*University of Cassino and Southern Lazio,  
Italy*

Yoko Uwate  
*Tokushima University, Japan*

Eve McGlynn  
*University of Glasgow, UK*

|                                   |
|-----------------------------------|
| <b>Young Professionals Chairs</b> |
|-----------------------------------|

Nazila Fough  
*Robert Gordon University, UK*

Hamida Hallil Abbas  
*University of Bordeaux, France*

|                         |
|-------------------------|
| <b>Publicity Chairs</b> |
|-------------------------|

Finlay Walton  
*University of Glasgow, UK*

Maria Cerezo Sanchez  
*University of Glasgow, UK*

|  |
|--|
| <b>Professional Conference Organizer (PCO)</b> |
|--|

Laura LeBlanc  
*Conference Catalysts, LLC.*

Conference Sponsors



Gold Patron



Local Support



Industry Forum Patrons



**EPIQC**

**Empowering Practical Interfacing  
of Quantum Computing**



**Engineering and  
Physical Sciences  
Research Council**

Press Patron

**ADVANCED  
INTELLIGENT  
SYSTEMS**  
— **Open Access**



## Special Sessions

### Challenges and Requirements in Sensory Circuit Design

- **Antonio Aprile**, *University of Pavia, Italy*
- **Elisabetta Moisello**, *University of Pavia, Italy*
- **Malcovati Piero**, *University of Pavia, Italy*

### Innovations in Memristor Modelling, Analysis, and Fabrication Toward a Systematic Approach to Circuit and System Design

- **Ronald Tetzlaff**, *TU Dresden, Germany*
- **Alon Ascoli**, *TU Dresden, Germany*
- **Georgios Sirakoulis**, *Democritus University of Thrace, Greece*
- **Angela Slavova**, *Bulgarian Academy of Sciences, Bulgaria*

### Piezoelectric Transducers & Their Interface Circuits for Device Energy Harvesting & Remote Powering

- **Josep Maria Sánchez-Chiva**, *Omega Microelectronics Lab, France*

### 5G advanced Radiofrequency Architectures

- **François Rivet**, *Univ. Bordeaux, France*
- **Didier Belot**, *CEA-LETI, France*

### Wireless Energy Harvesting Circuits & Applications

- **Mahmoud Wagih**, *University of Southampton, UK*
- **Rupam Das**, *University of Glasgow, UK*

### CMOS in Quantum Computing

- **Christos Giagkoulouits**, *University of Glasgow, UK*
- **Meraj Ahmad**, *University of Glasgow, UK*

### Embedded and Intelligent Systems for Health Applications

- **Slavisa Jovanovic**, *Université de Lorraine, France*
- **Hassan Rabah**, *Université de Lorraine, France*
- **Naeem Ramzan**, *University of West of Scotland, UK*
- **Alex James**, *Digital University Kerala, India*
- **Deepu John**, *University College Dublin, Ireland*
- **Jian Zhao**, *Shanghai Jiao Tong University, China*
- **Wenfeng Zhao**, *Binghamton University, USA*

## Technical Reviewers

|                          |                           |                         |
|--------------------------|---------------------------|-------------------------|
| Prasanth A               | Erika Covi                | Daniel García-Lesta     |
| Mostafa Abdelrehim       | Dagnier A. Curra-Sosa     | Hugo García-Vázquez     |
| Arij Naser Abougreen     | Anselmo Luís da Silva     | Angelo Garofalo         |
| Tommaso Addabbo          | Júnior                    | Richard George          |
| Malik Adil               | Matteo Daddato            | Shahaboddin Ghajari     |
| El-Hassane Aglzim        | Francesco Daghero         | Abderrahmane Ghimouz    |
| Meraj Ahmad              | Simone Mattia Dartizio    | Gianluca Giustolisi     |
| Mohamed Ahmed            | Devarshi Das              | Bertrand Granado        |
| Orazio Aiello            | Rupam Das                 | Marco Grassi            |
| Aisha Alhussain          | Tapadhir Das              | Alfio Dario Grasso      |
| Dallia Ali               | Stanisa Dautovic          | Hugh Greatorex          |
| Zeeshan Ali              | Diana Ddawoud             | Victor Grimblatt        |
| Mohammad                 | Carlos A. de la Cruz-Blas | Matthias Grube          |
| Alibakhshikenari         | Marcello De Matteis       | yingjiang guo           |
| Federico Alimenti        | Carl Debono               | Deepti Gupta            |
| Iraklis Anagnostopoulos  | Francesco Della Corte     | Fayrouz Haddad          |
| Pietro Andreani          | Siamak Delshadpour        | Kambiz Hadipour         |
| Nadeem Anjum             | Ahmet Demirkol            | Amelie Hagelauer        |
| Antonio Aprile           | Marina Deng               | Hamida Hallil Abbas     |
| Aswani AR                | Julien Denoulet           | Pieter Harpe            |
| Miguel Arevalillo        | Bappaditya Dey            | Luc Hebrard             |
| Wanderson Roger          | Mauro Di Marco            | Hadi Heidari            |
| Azevedo Dias             | José Ángel Díaz-Madrid    | Luis Hernandez          |
| Masoud Babaie            | Giorgos Dimitrakopoulos   | Zeinab Hijazi           |
| Huda Badghaish           | Mehdi Dolatshahi          | Andras Horvath          |
| Nauman Baig              | Ginés Domenech-Asensi     | Xuan Hu                 |
| Farah Baracat            | Manuel Dominguez Pumar    | Bergoi Ibarlucea        |
| Edna Barros              | Juan P. Dominguez-        | Ali Ibrahim             |
| Laurent Beaulieu         | Morales                   | Fiheon Imroze           |
| Ons Benrhouma            | Elisa Donati              | Giacomo Indiveri        |
| Marc Berthel             | Siwan Dong                | Ali Rida Ismail         |
| Andrea Bevilacqua        | Praveen Kumar Donta       | Dan Istrate             |
| Abhishek Bhattacharjee   | Sijun Du                  | Jency Rubia J           |
| Hemlal Bhattarai         | Sylvain Durand-Chamotin   | Daniele Jahier Pagliari |
| Dalibor Bielek           | Lourdes Duran-Lopez       | Ghalib Janjua           |
| Sébastien Boisseau       | Omar Eldash               | Dainius Jenkus          |
| Andrea Bonfanti          | Alexander El-Kady         | Xiangliang Jin          |
| Edoardo Bonizzoni        | Nelly Elsayed             | Matthew Johnston        |
| Michele Bonnin           | Eric Elzenheimer          | Slavisa Jovanovic       |
| Shekhar S. Borah         | Manel Escudero            | Hari Kishore Kakarla    |
| Victor M. Brea           | Ludivine Fadel            | Somasundar Kannan       |
| Thanasin Bunnam          | Hua Fan                   | Emmanouil Kavourasanos  |
| Jinwook Burn             | Zhongyuan Fang            | Takanori Kawanaka       |
| Paulo Butzen             | Matteo Farronato          | Neil Kemp               |
| Alessandro Cabrini       | Luigi Fassio              | Kasem Khalil            |
| José Cano                | Plácido Fernandez-        | Mohammad Ehshan Khan    |
| Marco Carminati          | Cuevas                    | Mohammad Nasfikir Ra    |
| Juan M. Carrillo         | Giuseppe Ferri            | Khan                    |
| Matteo Cartiglia         | Laurent Fesquet           | Aasim khurshid          |
| Mikael Casse             | Igor Filanovsky           | Dima Kilani             |
| Marco Cavallaro          | Mauro Forti               | Dietmar Kissinger       |
| Francesco Centurelli     | Luigi Fortuna             | Paris Kitsos            |
| Junren Chen              | Faranak Fough             | Philipp Klein           |
| Yong Chen                | Nazila Fough              | Hamilton Klimach        |
| Yukai Chen               | Antoine Frappé            | Prakash Kodali          |
| Abdelkarim Cherkaoui     | W. Fung                   | Anthony Kolar           |
| Wichian Chutimaskul      | Samuele Fusetto           | Zdenek Kolka            |
| Jérôme cieslak           | Dimitri Galayko           | Dimitris Kompostiotis   |
| Fernando Corinto         | Gabriel Galeote Checa     | Inola Kopic             |
| Giulia Corninani         | Carlos Galup-Montoro      | Ioannis Kouretas        |
| Jordi Cosp               | Andrea Mattia Garavagno   | Shruti Kulkarni         |
| Henrique Cota de Freitas | Thomas Garbay             | Sayan Kumar             |

Hemanth Kumar M.B  
Raafat Lababidi  
Corey Lammie  
Estelle Lauga-Larroze  
Bertrand Le Gal  
Elie Lefeuve  
Gildas Legar  
Juan Antonio Leñero-  
Bardallo  
Salvatore Levantino  
Can Li  
Honggui Li  
Songlin Li  
Chung-Ching Lin  
Alessandro Liotta  
Alessandro Lo Schiavo  
Paula López  
Antonio J. López-Martín  
Marie-Minerve Louerat  
Nuno Lourenço  
Aruna M  
Sidharth Maheshwari  
Mervat Mahmoud  
Sohaib Majzoub  
Piero Malcovati  
Shiva Maleki  
Varnosfaderani  
Shahid Malik  
Leandro Tiago Manera  
Daniel Mannion  
Danilo Manstretta  
Xiangyu Mao  
BAUDOUIN Martineau  
Nicola Massari  
Michele Mastella  
Diana Mata-Hernandez  
Alejandro Medina-  
Santiago  
Nicolás Medrano  
Cristina Meinhardt  
Farhad Merchant  
Eter Mgeladze  
Matias Miguez  
Kyeong-Sik Min  
Kai Misselwitz  
UMAR MOHAMMAD  
Elisabetta Moisello  
Pietro Monsurrò  
Fernando Moraes  
Edward David Moreno  
Carlos Moreno-Garcia  
Riccardo Moretti  
Ademola Mustapha  
Rasika Naik  
Nobuhiko Nakano  
Jayant Nandwalkar  
Ettore Napoli  
Shyam Narayanan  
Seyedeh Masoumeh  
Navidi  
Masood Nayyer  
Jamel Nebhen  
Filippo Neri  
Thi-Mai-Trang Nguyen  
Lara Novaresi

Jari Nurmi  
Juan Oliver  
William Oswald  
Rene Otten  
Debajyoti Pal  
Vassilis Paliouras  
David Palomeque-Mangut  
Luca Pancioni  
Kleanthis  
Papachatzopoulos  
Christos Papavassiliou  
Fabio Pareschi  
Shashikant Patil  
Melika Payvand  
Valentino Peluso  
Salvatore Pennisi  
Óscar Pereira Rial  
Raquel Pérez-Aloe  
Guillaume PERRIN  
Rodrigo Picos Gayá  
Farshad Piri  
Tommaso Polonelli  
Harsha Prabakaran  
Sambhu N. Pradhan  
Costas Psychalinos  
Fernando Quintana  
Hassan Rabah  
Umair Rafique  
Fábio Ramos  
Fengbo Ren  
Adrian Rendon Nava  
Saverio Ricci  
Ole Richter  
Nicoletta Risi  
Roberto Rizzo  
Pieter Rombouts  
Enrique Romero  
Margherita Ronchini  
Felipe Rocha Rosa  
Jerôme Rossignol  
Arianna Rubino  
Marcel Runge  
Sanaz Sadeghi  
Vasileios Dionysios  
Sakellariou  
Natasa Samardzic  
Hao San  
Josep Maria Sánchez-  
Chiva  
Pablo Sanchez-Cuevas  
Ian Sandall  
María Teresa Sanz-  
Pascual  
Alhassan Sayed  
Wafaa Sayed  
Maarten Schelles  
Nicolas Schmitt  
Antonio Carlos Schneider  
Beck  
Richard Schroedter  
Franz Marcus Schüffny  
René Schüffny  
Catherine Schuman  
Giuseppe Scotti  
Abu Sebastian

Ndolane Sene  
Alexandre Jean Serres  
MirHojjat Seyedi  
Mohammad Shaeri  
Nima Shahpari  
Aatha Mohin Shaikh  
Bhagyashree Shendkar  
Hitesh Shrimali  
Khoirom Johnson Singh  
Arik Slepyan  
Stefan Slesazeck  
Willian Soares Girão  
Gerald Sobelman  
Robert Sobot  
Ahmed Soltan  
Matteo Sonza Reorda  
Thodoris Spanos  
Robert Staszewski  
Spyros Stathopoulos  
Stavros Stavrinides  
C. Stewart  
Péter Szolgay  
Mattia Tambaro  
Marco Tambussi  
Faisal Tariq  
Julian Teske  
Francesco Tesolin  
Mathieu Thevenin  
Roland Thewes  
Arnaud Tisserand  
Pedro Toledo  
Antonio Torralba  
Quang-Kien Trinh  
Jens Trommer  
Sana Ullah  
Seyedmohsen Vaziri  
Riccardo Vignali  
Dimitris Vordonis  
Mahmoud Wagih  
Chuang Wang  
Siqi Wang  
Serge Weber  
Annika Weisse  
David Wong  
Shifu Wu  
Qiangfei Xia  
Chen Xie  
Pengcheng Xu  
Thiagarajan Y  
Bhavani Yalagala  
Mustak Erhan Yalcin  
Fatih Yaman  
Douze Yann  
Mustafa Yelten  
Hamoud Younes Younes  
Khalil Yousef  
Shengqi Yu  
Muhammad Zada  
Sebastian Zaunseder  
Ming Zhang  
Ruoyu Zhao  
Yafan Zhao  
Alexandra Zimpeck  
Domenico Zito  
Gianluca Zop

## Keynote Speakers



**Prof. Wouter Serdijn**  
*TU Delft, Netherlands*

PhD, F-IEEE, Professor of Bioelectronics at Delft University of Technology and Medical Delta Honorary Professor at Delft University of Technology and Erasmus Medical Center, Rotterdam, Fellow of the IEEE, Distinguished Lecturer of the IEEE, Recipient of the IEEE Circuits and Systems Meritorious Service Award. Working on biomedical circuits and systems for interaction with the electrophysiology of cells, tissues, organs and the human body, by means of electrical, magnetic, optical and ultrasound stimulation, recording, sensing, communication and powering, for in-vitro, ex-vivo and in-vivo medical and clinical applications. In short, electroceuticals or bioelectronic medicine. <http://bioelectronics.tudelft.nl/~wout/>



**Prof. Themis Prodromakis**  
*School of Engineering |  
University of Edinburgh*

Themis holds the Regius Chair of Engineering at the University of Edinburgh and is Director of the Centre for Electronics Frontiers. His work focuses on developing metal-oxide Resistive Random-Access Memory technologies and related applications and is leading an interdisciplinary team comprising 30 researchers with expertise ranging from materials process development to electron devices and circuits and systems for embedded applications. He holds a Royal Academy of Engineering Chair in Emerging Technologies and a Royal Society Industry Fellowship. He is an Adjunct Professor at UTS Australia, visiting Professor at the Department of Microelectronics and Nanoelectronics at Tsinghua University, and Honorary Fellow at Imperial College London. He is Fellow of the Royal Society of Chemistry, the British Computer Society, the IET and the Institute of Physics and is also Senior Member of the IEEE. He served as the Director of the Lloyds Register Foundation International Consortium for Nanotechnology and Co-Director of the UKRI Centre for Doctoral Training in Machine Intelligence for Nano-Electronic Devices and Systems (MINDS). In 2015, he established ArC Instruments Ltd that delivers high-performance testing infrastructure for automating characterisation of novel nanodevices in over 21 countries and in 2019 he founded SoneT.ai that is building new power-efficient AI hardware solutions. His contributions in memristive technologies and applications have brought this emerging technology one step closer to the electronics industry for which he was recognised as a 2021 Blavatnik Award UK Honoree in Physical Sciences and Engineering.

## Keynote Speakers (continued)



**Prof. Dr. Elisabetta Chicca**  
*University of Groningen, The  
Netherlands*

Elisabetta Chicca is a full professor at the Zernike Institute for Advanced Materials (ZIAM) and the Groningen Cognitive Systems and Material Center (CogniGron), University of Groningen, The Netherlands. She is Chair of Bio-Inspired Circuit and Systems (BICS) since 2020. Her current interests are in the development of CMOS models of cortical circuits for brain-inspired computation, learning in spiking CMOS neural networks and memristive systems, bio-inspired sensing (vision, olfaction, audition, touch) and motor control. She combines these research approaches with the aim of understanding neural computation by constructing behaving agents which can robustly operate in real-world environments.

## WICAS Event



### WICAS BEST PAPER AWARD

WiCAS invites you to join the WiCAS Best Paper Award Competition.

#### **IMPORTANT CONDITION TO PARTICIPATE:**

*The first author & presenter of the paper must be a woman.*

The WiCAS award winner will be announced during the conference award ceremony.

### WICAS EVENT

25<sup>th</sup> October, 2022

*"Building Up Your Network: Academic Collaboration and Gender Balance"*

The **WiCAS Event** will include an amazing panel discussion on how to turn a career path into a success, with contributions from both academy and industry representatives, followed by a welcome cocktail.

1. **WiCAS Panel Discussion** - Time: 15:00 – 16:30
2. **WiCAS Cocktail** - Time: 16:30 – 18:00

Don't miss the chance to attend! All the participants will receive promotional items and gadgets during the WiCAS social event

### WICAS 2022 INVITED Panelists



**Elisabetta Chicca**  
University of  
Groningen,  
The Netherlands



**Lina Mohjazi**  
University of  
Glasgow,  
UK



**Ilke Ercan**  
TU Delft,  
The Netherlands



**Iana Dulaskaia**  
Eurokleis srl,  
Italy

### WICAS CHAIRS @ ICECS2022

Giulia Di Capua, *University of Cassino and Southern Lazio, Italy*  
Yoko Uwate, *Tokushima University, Japan*  
Eve McGlynn, *University of Glasgow, United Kingdom*

## Young Professional Event



### What's in the locker? Verification techniques for Interface Controller IP

**Speaker:** Ciaran Haughey from Cadence Design Systems Edinburgh IPG team will present at the event

**Abstract:** Cadence is a pivotal leader in electronic systems design, building upon more than 30 years of computational software expertise. The company applies its underlying Intelligent System Design strategy to deliver software, hardware, and IP that turn design concepts into reality for the most dynamic market applications including hyperscale computing, 5G communications, automotive, mobile, aerospace, consumer, industrial, and healthcare.

In this presentation we shall provide a high-level overview of the Verification Techniques employed by our research and development teams, in verifying complex Interface Controller IP. The presentation shall cover topics such as Code Coverage, UVM, Formal Verification, Verification IP and Gate Level simulations.

**cādence®**

## Program Grid: Monday, October 24<sup>th</sup>

|               | Auditoria                            | Breakout Room 2   | Breakout Room 6   | Breakout Room 7   | Breakout Room 8   |
|---------------|--------------------------------------|---|---|---|---|
| 8:00 – 9:00   | Industry Forum                       |   |   |   | Agile EDA Developments in Merristor Devices, Circuits, Systems, and Manufacturing |
| 9:00 – 10:00  |                                      | Tiny Energy-Harvesting Piezoelectric Chargers           | EDA Tools for Physical Design - Fundamentals and Challenges | Fundamental and Applications of Modern Single Photon Detector Circuits and Processing Systems |   |
| 10:00 – 10:30 |                                      | Coffee Break<br>(Level 2 Foyer)                         |   |   |   |
| 10:30 – 11:30 |                                      | Tiny Energy-Harvesting Piezoelectric Chargers           | EDA Tools for Physical Design - Fundamentals and Challenges | Fundamental and Applications of Modern Single Photon Detector Circuits and Processing Systems | Memristive Digital Processing-in-Memory   |
| 11:30 – 12:30 |                                      |   |   |   |   |
| 12:30 – 13:30 | Lunch<br>(Level 2 Foyer)             |   |   |   |   |
| 13:30 – 14:00 |                                      |   |   |   |   |
| 14:00 – 15:30 | Poster Session<br>(Virtual ONLY)     | Analog and Mixed Circuits and Systems<br>(Virtual ONLY) | Digital Circuits and Signal Processing<br>(Virtual ONLY)    | IOT and Smart Systems<br>(Virtual ONLY)   | RF and Wireless Circuits and Systems<br>(Virtual ONLY)                            |
| 15:30 – 17:30 |                                      |   |   |   |   |
| 17:30 - 19:00 | Welcome Reception<br>(City Chambers) |   |   |   |   |



## Program Grid: Tuesday, October 25<sup>th</sup>

|               | Auditoria   | Breakout Room 2  | Breakout Room 6                                       | Breakout Room 7   | Breakout Room 8   |
|---------------|---|--|---|---|---|
| 9:00 – 9:30   | Opening Session<br>(Auditoria)                                |  |   |   |   |
| 9:30 – 10:30  | Keynote Presentation: Prof. Themis Prodromakis<br>(Auditoria) |  |   |   |   |
| 10:30 – 11:00 | Coffee Break<br>(Level 2 Foyer)                               |  |   |   |   |
| 11:00 – 12:00 | Young Professional Session                                    | Analog Circuits and Systems                                  | Linear & Nonlinear Circuits & Systems                 | Digital Circuits & Embedded Systems I   | Innovations in Memristor Modelling, Analysis, & Fabrication Toward a Systematic Approach to Circuit |
| 12:00 – 12:30 | Young Professional Lunch<br>(Level 3 Mezzanine)               |  |   |   |   |
| 12:30 – 13:00 | Lunch<br>(Level 2 Foyer)                                      |  |   |   |   |
| 13:00 – 13:30 | Young Professional Session                                    | RF Building Blocks and Circuits for High-Speed Data Transfer | Bio-inspired and Bio-engineering Circuits and Systems | Piezoelectric Transducers & Their Interface Circuits for Device Energy Harvesting & Remote Powering | 5G advanced Radiofrequency Architectures  |
| 13:30 – 14:00 | Young Professional Poster Session<br>(Level 2 Foyer)          |  |   |   |   |
| 14:00 – 15:00 |   |  |   |   |   |

|               | Auditoria                              | Breakout Room 2                 | Breakout Room 6                                       | Breakout Room 7   | Breakout Room 8  |
|---------------|--|---------------------------------|---|---|--|
| 15:00 – 15:30 | WiCAS Session                          | Coffee Break<br>(Level 2 Foyer) |   |   |  |
| 15:30 – 16:30 |  | Oscillators and PLLs            | Challenges and Requirements in Sensory Circuit Design | Circuit Design, EDA, Optimization, Test and Reliability | Embedded and Intelligent Systems for Health Applications |
| 16:30 – 17:00 | WiCAS Reception<br>(Level 3 Mezzanine) |                                 |   |   |  |
| 17:00 – 18:00 |  |                                 |   |   |  |
| 18:00 – 18:30 |  |                                 |   |   |  |
| 18:30 – 22:30 | Conference Dinner<br>(Oran Mor)        |                                 |   |   |  |

## Program Grid: Wednesday, October 26<sup>th</sup>

|               | Breakout Room 2  | Breakout Room 6                                   | Breakout Room 7                        | Breakout Room 8                                    |
|---------------|--|---|--|--|
| 9:00 – 10:30  | Analog Integrated Circuits                                       | Energy Harvesting and Power Efficient Electronics | Digital Circuits & Embedded Systems II | Circuits and Systems for IOT                       |
| 10:30 – 11:00 | Coffee Break<br>(Level 2 Foyer)                                  |   |  |  |
| 11:00 – 12:00 | Keynote Presentation: Prof. Dr. Elisabetta Chicca<br>(Auditoria) |   |  |  |
| 12:00 – 13:30 | Lunch<br>(Level 2 Foyer)   |   | Poster Session<br>(Level 2 Foyer)      |  |
| 13:30 – 14:30 | Keynote Presentation: Prof. Wouter Serdijn<br>(Auditoria)        |   |  |  |
| 14:30 – 15:00 | Coffee Break<br>(Level 2 Foyer)                                  |   |  |  |
| 15:00 – 16:30 | MEMS & Sensory Circuits & Systems                                | Signal Image and Video Processing Architectures   | CMOS for Quantum Computing             | Wireless Energy Harvesting Circuits & Applications |
| 16:30 – 17:00 | Closing Session<br>(Auditoria)                                   |   |  |  |

## Technical Program: Monday, October 24<sup>th</sup>

8:00 – 10:00

### Agile EDA Developments in Memristor Devices, Circuits, Systems, and Manufacturing

Room: Breakout Room 8

**Abstract:** As the integrated circuit industry enters the post-Moore era, the development direction of chips is gradually shifting from computing performance to energy efficiency. However, in the traditional von Neumann architecture, the process of data transferring between computing units and storage units consumes a lot of energy, limiting the energy efficiency of the chip. Memristor is an emerging non-volatile memory device, which can reduce the transmission overhead between computing and storage units and improving energy efficiency. This provides a new paradigm in “in-memory computing”.

With the rapid increase in the scale of applications (e.g., neural networks) and the continuous innovation of material and fabrication process, memristor-based in-memory computing circuits and systems need to shorten the design cycle to achieve the co-optimization of devices, circuits, and systems. This tutorial presents a new way to further improve the current performance on Electronic Design Automation (EDA) software to handle large scale simulation and optimization problems with memristor devices. We first present the state-of-the-art EDA works in abstraction and optimization methods of memristor device, circuits, and systems. Then, we will present our contributions in these areas.



**Prof Yongfu Li**  
*Shanghai Jiaotong University,  
China*



**Prof Yuhang Zhang**  
*Pujiang National Laboratory,  
China*

9:00 – 10:00

### Tiny Energy-Harvesting Piezoelectric Chargers

Room: Breakout Room 2

*This tutorial will be presented in-person ONLY.*

**Abstract:** Wireless microsensors and other miniaturized electronics cannot only monitor and better-manage power consumption in emerging small- and large-scale applications (for space, military, medical, agricultural, and consumer markets) but also add energy-saving and performance-enhancing intelligence to old, expensive, and difficult-to-replace infrastructures and tiny contraptions in difficult-to-reach places (like the human body). The energy these smart devices store, however, is often insufficient to power the functions they incorporate (such as telemetry, interface, processing, and others) for extended periods. Still more, replacing or recharging the batteries of hundreds of networked nodes is costly, and invasive in the case of the human body. Harvesting ambient kinetic energy in motion to continually replenish a battery is therefore an appealing alternative, even if relevant technologies are still the subject of ardent research today. This talk illustrates, assesses, and compares the state of the art in miniaturized piezoelectric chargers that draw kinetic energy from motion to charge a battery.



**Prof Gabriel A. Rincón-Mora**  
*Georgia Institute of Technology*

9:00 – 10:00

## EDA Tools for Physical Design - Fundamentals and Challenges

Room: Breakout Room 6

**Abstract:** The development of any integrated circuit depends heavily on the quality of the EDA tools used in the design flow. Improved CAD tools and algorithms are needed to cope with new fabrication technology requirements, advanced performance constraints, or simply the enormous number of elements involved. In this tutorial, we will start by giving an overview of the importance of automation in the design process. Then some trends on EDA that are needed to deal with the evolution of manufacturing processes will be presented. Basic and advanced optimization algorithms will be presented for selected physical design problems (layout). An important aspect of the design is to reduce power consumption at all levels of abstraction. Power optimization is fundamental in nanoCMOS and in the IoT world. At logic and physical levels, one approach that can be used to optimize the circuit, specially reducing static leakage power and using the automatic generation of the cell layout. With on-the-fly cell generation, the same function can be implemented with a reduced number of transistors, requiring less area and significantly optimizing power and performance. A set of tools and algorithms for cell generation will be briefly discussed. Finally, the use of estimation and visualization tools is equally important. They can be applied either in the design flow or just in the tool's development and research environments as a way to observe and understand the behavior and interactions of algorithms and their operation on real designs and benchmarks. Keywords: EDA, VLSI Design, Physical Design, Optimization, Cell Synthesis, Placement, Routing



**Prof Ricardo Reis**  
*Federal University of Rio  
Grande do Sul*



**Prof Marcelo Johann**  
*Federal University of Rio  
Grande do Sul*

9:00 – 10:00

## Fundamental and Applications of Modern Single Photon Detector Circuits and Processing Systems

Room: Breakout Room 7

**Abstract:** This tutorial will present a comprehensive analysis of single-photon detector sensors and systems. The material will range from semiconductor structure, front-end and readout circuit architectures, to intellectual property. Specifically, we will cover device structures that are configured to yield high-performance single photon detection in CMOS platforms, and we will cover readout circuit architectures that allow complex photon counting applications. We will discuss several high-impact applications including silicon photomultiplier configurations for nuclear imaging/detection and integrated single photon arrays for computer vision. The tutorial has three main educational objectives. The first is to cover the fundamental aspects of single photon detector technology in circuits and systems. The second is to identify the latest research trends in the field. And the third is to situate the technology in the commercial landscape.



**Prof Marc Dandin**  
*Carnegie Mellon University*



**Prof Nicole McFarlane**  
*University of Tennessee*

9:30 – 12:30

**Industry Forum – Future of Quantum Computers**

*Room: Auditoria*

Session Chair: Prof Martin Weides

**Establishing a new National Laboratory: NQCC Purpose & Progress**

Michael Cuthbert, Director of NQCC, and Professor at the University of Bristol

**Deployment of UK cloud QPUs and FPGA Accelerated Error Mitigation**

Andy Patterson, Lead Quantum Engineer at Rigetti

**RF Measurements for Quantum Computing Technologies**

Nick Ridler, National Physical Laboratory

**Developing silicon-based quantum computing hardware at Quantum Motion**

Fernando Gonzalez Zalba, Quantum Motion Technologies

10:00 – 10:30

**Coffee Break**

*Room: Level 2 Foyer*

10:30 – 11:30

**Tiny Energy-Harvesting Piezoelectric Chargers (continued)**

*Room: Breakout Room 2*

10:30 – 11:30

**EDA Tools for Physical Design - Fundamentals and Challenges (continued)**

*Room: Breakout Room 6*

10:30 – 11:30

**Fundamental and Applications of Modern Single Photon Detector Circuits and Processing Systems (continued)**

*Room: Breakout Room 7*

10:30 – 12:30

### **Memristive Digital Processing-in-Memory**

*Room: Breakout Room 8*

**Abstract:** Memristive technologies are candidates to replace conventional memory technologies and storage class memories. They are also widely explored for neuromorphic applications. This tutorial focuses on a different attractive capability of memristors, their ability to perform logic and arithmetic operations using a technique called 'stateful logic.' Using stateful logic, data storage and computation can be combined in the memory array to enable a novel non-von Neumann architecture, where both the operations are performed within a memristive Memory Processing Unit (mMPU).

The mMPU relies on adding computing capabilities to the memristive memory cells without changing the basic memory array structure. The use of an mMPU alleviates the primary restriction on performance and energy in von Neumann machine, which is the data transfer between CPU and memory.

This tutorial focuses on the various aspects of mMPU. We start by describing memristors and memristive stateful logic. Then, the mMPU architecture and relevant implications on the computing system and software will be discussed, as well as the examination of the microarchitectural aspects. Examples of applications that can benefit from processing within memristive memory will be shown. Lastly, issues such as design automation and reliability of the mMPU will be presented.



**Prof Shahar Kvatinsky**

*Technion – Israel Institute of Technology*

12:30 – 13:30

### **Lunch**

*Room: Level 2 Foyer*

14:00 – 15:30

### **Analog and Mixed Circuits and Systems**

*Room: VIRTUAL*

*Session Chair: Zeinab Hijazi*

#### **A 10.8-to-37.4Gb/S Single-Loop Quarter-Rate BBCCR Without External Reference and Separate FD Featuring a Wide-Frequency-Acquisition Scheme**

Lin Wang{1}, Yong Chen{1}, Chaowei Yang{1}, Xiaoteng Zhao{1}, Pui-In Mak{1}, Franco Maloberti{2}, Rui P. Martins{1}

*{1}University of Macau, China; {2}University of Pavia, Italy*

#### **Mitigating the Impact of Variability in NCFET-Based Coupled-Oscillator Networks Applications**

Juan Nuñez{1}, Simon Thomann{2}, Hussam Amrouch{2}, María J. Avedillo{1}

*{1}Instituto de Microelectrónica de Sevilla, IMSE-CNM (CSIC/Universidad de Sevilla), Spain; {2}University of Stuttgart, Germany*

## **A Burst-Mode TIA with Automatic Power Saving and DC Wander Reduction in 65-nm CMOS**

Toshiyuki Inoue{2}, Akira Tsuchiya{2}, Keiji Kishine{2}, Daisuke Ito{1}, Yasuhiro Takahashi{1}, Makoto Nakamura{1}  
{1}Gifu University, Japan; {2}The University of Shiga Prefecture, Japan

## **Ring-VCO-Based ReLU Activation Function with Linearity Improvement for Pulsed Neuron Circuits**

Pitchayapatchaya Srikram{1}, Prasoon Ambalathankandy{2}, Yuri Kanazawa{2}, Masato Motomura{3}, Masayuki Ikebe{2}  
{1}Hokkaido University, Japan; {2}Hokkaido University, Japan; {3}Tokyo Institute of Technology, Japan

## **Analysis and Comparison of Two- and Four-State Operation Modes of Parallel-Hybrid Multi-Path Buck DC-DC Converter**

Jin hao Zhang{2}, Rami Ghannam{4}, Jinwei Zhao{3}, Yuanjie Xia{4}, Chuang Wang{1}, Hadi Heidari{4}  
{1}Beijing University of Posts and Telecommunications, China; {2}Beijing University of Technology, China; {3}QV Bioelectronics, United Kingdom; {4}University of Glasgow, United Kingdom

## **140 Frames-per-Second Ionoacoustic Imaging Detector for Real-Time Particle Therapy Monitoring**

Elia Arturo Vallicelli  
University of Milano-Bicocca, Italy

14:00 – 15:30

### **Digital Circuits and Signal Processing**

Room: VIRTUAL

Session Chairs: Finlay Walton & Stavroula Kapouleas

## **Unified Lightweight Authenticated Encryption for Resource-Constrained Electronic Control Unit**

Chunxu Guo{2}, Yi Wang{1}, Fupeng Chen{3}, Yajun Ha{2}  
{1}Continental Automotive Singapore, Singapore; {2}ShanghaiTech University, China; {3}Synopsys, China

## **An Efficient Exponential Unit Designed in VLSI CMOS with Custom Operators**

Patrícia Da Costa{3}, Morgana Da Rosa{2}, Guilherme Paim{3}, Eduardo Da Costa{1}, Rafael Soares{2}, Sergio Bampi{3}  
{1}UCPel, Brazil; {2}UFPel, Brazil; {3}UFRGS, Brazil

## **A Robust and Energy-Efficient Discrete Haar Wavelet Transform for Image Watermarking**

Morgana Macedo Azevedo Da Rosa{2}, Rafael Soares{2}, Eduardo Costa{1}, Guilherme Paim{3}, Sergio Bampi{3}  
{1}Universidade Católica de Pelotas, Brazil; {2}Universidade Federal de Pelotas, Brazil; {3}Universidade Federal do Rio Grande do Sul, Brazil

## **A Hardware-Friendly and Configurable Heuristic Targeting VVC Inter-Frame Prediction**

Marta Loose{2}, Ramiro Viana{2}, Fernando Sagrilo{3}, Gustavo Sanchez{1}, Guilherme Corrêa{2}, Luciano Agostini{2}  
{1}IFSertaoPE, Brazil; {2}UFPel, Brazil; {3}UNIPAMPA, Brazil



## **VVC Interpicture Prediction Using SAD with Imprecise Subtractors: A Quantitative Analysis**

Rafael Dos Santos Ferreira<sup>{1}</sup>, Lucas Santos<sup>{1}</sup>, Luciano Agostini<sup>{1}</sup>, Claudio Diniz<sup>{2}</sup>  
*{1}UFPEL-Federal University of Pelotas, Brazil; {2}UFRGS-Federal University of Rio Grande do Sul, Brazil*

## **Virtual and Augmented Reality As Educational Tools for Modern Quantum Applications**

Connor Maclean<sup>{2}</sup>, Austin Wolfe<sup>{1}</sup>, Satyam Bhatti<sup>{2}</sup>, Anthony Centino<sup>{2}</sup>, Rami Ghannam<sup>{2}</sup>  
*{1}Glasgow School of Art, United Kingdom; {2}University of Glasgow, United Kingdom*

14:00 – 15:30

### **IOT and Smart Systems**

Room: VIRTUAL

Session Chair: Alex James

## **Digital Realization of Conductance-Based Adaptive Exponential Integrate-and-Fire Neuron Model**

Mahsasadat Seyedbarhagh, Narjes Zamani, Arash Ahmadi, Majid Ahmadi  
*University of Windsor, Canada*

## **Leveraging NoC-Based Many-Core Performance Through Runtime Mapping Defragmentation**

Angelo Dalzotto, Caroline Borges, Marcelo Ruaro, Fernando Moraes  
*PUCRS, Brazil*

## **Hardware Implementation of an Efficient FIR Filter for ECG Signal Denoising Application**

Ajaydas U.R., Naresh Kumar Reddy, Alex P James  
*Digital University Kerala, India*

## **Towards Smart Sensor Systems for Precision Farming: Electrode Potential Energy Harvesting from Plants' Soil**

Alfiero Leoni<sup>{2}</sup>, Giuseppe Ferri<sup>{2}</sup>, Daniele Ursini<sup>{2}</sup>, Alessandro Zompanti<sup>{1}</sup>, Anna Sabatini<sup>{1}</sup>, Vincenzo Stornelli<sup>{2}</sup>  
*{1}Università Campus Bio-Medico di Roma, Italy; {2}University of L'Aquila, Italy*

## **GLAAPE: Graph Learning Assisted Average Power Estimation for ASIC RTL Designs**

Rakesh M B, Sai Pranav K R, Pabitra Das, Amit Acharyya  
*IIT Hyderabad, India*

## **Effects of Adaptive Memristor Crossbar Arrays on Chimera States of Fitzhugh-Nagumo Networks**

Georgios Delaroudis, Karolos-Alexandros Tsakalos, Georgios Sirakoulis  
*Democritus University of Thrace, Greece*

14:00 – 15:30

## **RF and Wireless Circuits and Systems**

Room: VIRTUAL

Session Chair: Rupam Das

### **Localization Using Wireless Sensing for Future Healthcare**

Muhammad Zakir Khan, Muhammad Farooq, Ahmad Taha

*UNIVERSITY OF GLASGOW, United Kingdom*

### **Highly Efficient Smart 3-Coil Wireless Power Transfer System with Automatic Tracking**

Xingxiao Chen, Dai Jiang, Andreas Demosthenous

*University College London, United Kingdom*

### **Design Strategies for High-Resolution High-Speed Flash-Assisted Pipelined SAR ADCs**

Mustafa Oz{3}, Alper Akdikmen{2}, Edoardo Bonizzoni{3}, Franco Maloberti{3}, Yao Liu{1}  
{1}Microtera Semiconductor Co. Ltd., China; {2}Microtera-M2, Italy; {3}University of Pavia, Italy

### **A Fine-Tuning Phase Shifter with Vector Synthesizer Using 65-nm CMOS for Beamforming in 24-GHz Band**

Masataka Inoue, Shinya Nakashioya, Toshiyuki Inoue, Akira Tsuchiya, Keiji Kishine

*The University of Shiga Prefecture, Japan*

### **A Fully-Integrated 40nm CMOS 58.1% PAE Push-Pull Class E/Fodd Power Amplifier for NB-IoT Applications**

Moataz Medhat{1}, Faisal Hussien{1}, Mohammad El-Ghoneimy{1}, Ahmed Mohieldin{2}  
{1}Cairo University, Egypt; {2}Galala University, Egypt

14:00 – 15:30

## **Virtual Poster Session**

Room: VIRTUAL

Session Chair: Finlay Walton

### **Impedance Measurement Using Wide-Band Signals**

Mohammed El-Badi, Ahmed Elwakil, Sohaib Majzoub

*University of Sharjah, U.A.E.*

### **A 18.05 ppm/oC, 38.5 $\mu$ W Bandgap Reference Based on Weak Inversion Region Operation Design**

Seyed Ali Asghar Hosseini Asl, Kang-Yoon Lee

*Department of Electrical and Computer Engineering Sungkyunkwan University, Korea*

### **A Novel Low Power Single Bit SRAM Cell Using Quasi-Adiabatic Logic**

Mohammad Redwan Islam{2}, Susmita Karmaker{1}, Md.Abrar Ibtesham{2}, Irfan Rahman{2}

{1}Synapse Design Inc., Bangladesh; {2}ULKASEMI Pvt. Limited, Bangladesh

### **A Power-Efficient Magnetic Actuator Driver Design**

Berkay Kebapcioğlu, Onur Ferhanoğlu, Mustafa Berke Yelten

*Istanbul Technical University Electronics and Communications Engineering Department, Turkey*

### **Novel Design Partitioning Technique for ASIC Prototyping on multi-FPGA Platforms Using Graph Deep Learning**

Divyasree Tummalapalli, Chiranjeevi Kunapareddy, Vikas Akalwadi, Rahul Govindan, Balaji G  
*Intel Corporation, India*

### **Unified Inductance Calculations for On-Chip Planar Spirals**

Shuangwen Xie, Jun Fu  
*Tsinghua University, China*

### **Fault-Tolerant Core Mapping for NoC Based Architectures with Improved Performance and Energy Efficiency**

Naresh Kumar Reddy{1}, Alex P James{1}, Aruru Sai Kumar{2}  
{1}Digital University Kerala, India; {2}VNR Vignana Jyothi College of Engineering and Technology, India

### **An Embodied Approach for Teaching Advanced Electronics in Metaverse Environment**

Fengyi Wu{1}, Waqas Javed{2}, Olaoluwa R. Popoola{2}, Qammer Abbasi{2}, Muhammad Imran{2}  
{1}University of Electronic Science and Technology of China, China; {2}University of Glasgow, United Kingdom

### **Moving Receiver Tracking in Wireless Power Transfer Systems**

Zhenzhe Han{2}, Dai Jiang{1}, Andreas Demosthenous{1}  
{1}University College London, United Kingdom; {2}University of Cambridge, United Kingdom

### **Pruning-Based Neural Network Reduction for Faster Profiling Side-Channel Attacks**

Rodrigo Lellis{1}, Rafael Soares{1}, Guilherme Perin{2}  
{1}Federal University of Pelotas (UFPEL), Brazil; {2}Radboud University, Netherlands

### **A Comparative Study of Fault Diagnosis Methods of Photovoltaic Cells**

Jinwei Zhao{3}, Jiahao Zhang{2}, Finlay Walton{4}, Rami Ghannam{4}, Chuang Wang{1}, Hadi Heidari{4}  
{1}Beijing University of Posts and Telecommunications, China; {2}Beijing University of Technology, China; {3}QV Bioelectronics, United Kingdom; {4}University of Glasgow, United Kingdom

### **A Physical Reservoir Computing Model Based on Volatile Memristor for Temporal Signal Processing**

Xiangpeng Liang{2}, Yanan Zhong{1}, Xinyi Li{1}, Heyi Huang{1}, Jianshi Tang{1}, Bin Gao{1}, He Qian{1}, Huaqiang Wu{1}, Hadi Heidari{2}  
{1}Tsinghua University, China; {2}University of Glasgow, United Kingdom

### **A 0.46 nV/ $\sqrt{\text{Hz}}$ JFET Low-Noise Amplifier for Characterization of Nanoelectrode Coating Materials**

Elia Arturo Vallicelli  
*University of Milano-Bicocca, Italy*

### **Low-Cost PVDF High-Frequency Ultrasound Sensor Design and Manufacturing for Thermoacoustic Imaging Applications**

Elia Arturo Vallicelli  
*University of Milano-Bicocca, Italy*

### **Exploring Approximate Arithmetic Units for a Power-Efficient Kalman Gain VLSI Design**

Pedro Pereira{2}, Guilherme Paim{2}, Eduardo Da Costa{1}, Sérgio Almeida{1}, Sergio Bampi{2}

*{1}Universidade Católica de Pelotas (UCPel), Brazil; {2}Universidade Federal do Rio Grande do Sul (UFRGS), Brazil*

### **A Wearable and Smart System for Diaper Change Identification**

Bixun Chen, Muhammad Usman, Rami Ghannam, Muhammad Ali, Muhammad Imran, Qammer Abbasi

*University of Glasgow, United Kingdom*

### **Analysis of an Inverter-Based CMOS Envelope Detector**

Jack Ou{1}, Pietro Ferreira{2}

*{1}California State University Northridge, United States; {2}University Paris-Saclay, France*

17:30 – 19:00

#### **Welcome Reception**

*Room: City Chambers (Glasgow City Chambers, George Square, G2 1DU)*

## Technical Program: Tuesday, October 25<sup>th</sup>

9:00 – 9:30

### **Opening Session**

*Room: Auditoria*

9:30 – 10:30

### **Keynote Presentation: Prof. Themis Prodromakis**

*Room: Auditoria*

Session Chair: Dimitri Galayko & Hadi Heidari

10:30 – 11:00

### **Coffee Break**

*Room: Level 2 Foyer*

11:00 – 12:30

### **Analog Circuits and Systems**

*Room: Breakout Room 2*

Session Chair: Juan M. Carrillo

### **A 10-Bit 4 MS/s SAR ADC with Fully-Dynamic Duty-Cycled Input Driver**

Hanyue Li, Yuting Shen, Eugenio Cantatore, Pieter Harpe

*Eindhoven University of Technology, Netherlands*

### **Analog/Mixed-Signal Classification for Voice Activity Detection**

Prashant Kurrey, Mihir Kavishwar, Rajesh Zele

*IIT Bombay, India*

### **A Schmitt Trigger to Benchmark the Performance of a New zero-Cost Transistor**

Paul Devoge{3}, Hassen Aziza{1}, Philippe Lorenzini{4}, Pascal Masson{4}, Alexandre Malherbe{2}, Franck Julien{2}, Abderrezak Marzaki{2}, Arnaud Regier{2}, Stephan Niel{2}

*{1}Aix-Marseille University, France; {2}STMicroelectronics, France;*

*{3}STMicroelectronics/Aix-Marseille University, France; {4}University of Côte d'Azur, France*

### **Time-Mode z-1 Programmable Multiplier**

Orfeas Panetas-Felouris, Spyridon Vlassis

*University of Patras, Greece*

### **Simultaneous Pixel Calibration for Global Shutter THz Imager**

Yuri Kanazawa, Prasoon Ambalathankandy, Masayuki Ikebe

*hokkaido university, Japan*

### **Fast Over-Voltage and Surge Detector**

Siamak Delshadpour

*NXP Semiconductors, United States*

11:00 – 12:30

**Linear & Nonlinear Circuits & Systems**

*Room: Breakout Room 6*

*Session Chairs: Meraj Ahmad & Stavroula Kapoulea*

**State-Space Modeling of a Novel 2-output, single-L Driver for PZT Actuators with Charge Recovery**

Matteo Gianollo<sup>{1}</sup>, Raffaele Enrico Furceri<sup>{2}</sup>, Marco Zamprogno<sup>{2}</sup>, Giacomo Langfelder<sup>{1}</sup>

*{1}Politecnico di Milano, Italy; {2}STMicroelectronics, Italy*

**Generalized Non-Integer Order Multi-Phase Sinusoidal Oscillator Designs**

Stavroula Kapoulea<sup>{2}</sup>, Costas Psychalinos<sup>{3}</sup>, Ahmed Elwakil<sup>{4}</sup>, Brent Maundy<sup>{1}</sup>

*{1}University of Calgary, Canada; {2}University of Glasgow, United Kingdom; {3}University of Patras, Greece; {4}University of Sharjah, U.A.E.*

**Effect of Equalization Bandwidth and Linearity on NRZ and PAM4 Eye Diagram**

Siamak Delshadpour

*NXP Semiconductors, United States*

**Fast Solving Complete 2000-Node Optimization Using Stochastic-Computing Simulated Annealing**

Kota Katsuki, Duckgyu Shin, Naoya Onizawa, Takahiro Hanyu

*Tohoku University, Japan*

**Analysis and Design of Oscillator Coupling for Solving Combinatorial Optimization Problems**

Markus Graber, Klaus Hofmann

*Technical University of Darmstadt, Germany*

**Analysis of the Manhattan Update Rule Algorithm**

Lylia Thiziri Chabane, Dang-Kiên Germain Pham, Patricia Desgreys

*Télécom Paris, France*

11:00 – 12:30

**Digital Circuits & Embedded Systems I**

*Room: Breakout Room 7*

*Session Chairs: Maurizio Valle & Edoardo Ragusa*

**An Efficient Low Cost FPGA MIMO Channel Model**

Andrew Slaney<sup>{1}</sup>, Yichuang Sun<sup>{2}</sup>, Oluyomi Simpson<sup>{2}</sup>

*{1}BiTronix Pty Ltd, Australia; {2}University of Hertfordshire, United Kingdom*

**Accelerated Piece-Wise-Linear Implementation of Floating-Point Power Function**

Nandagopal R, Rajashree V, Madhav Rao

*IIITB, India*

**Total Dose Tolerance Analysis of an Optically Reconfigurable Gate Array VLSI**

Kaho Yamada, Takeshi Okazaki, Minoru Watanabe, Nobuya Watanabe

*Okayama University, Japan*

**Efficient LoRa-Like Transmitter Stacks for SDR Applications**

Léa Volpin, Bertrand Le Gal, Guillaume Ferre

*IMS Laboratory, CNRS UMR 5218, France*

### **Hardware-Software Co-Design of BIKE with HLS-Generated Accelerators**

Gabriele Montanaro{1}, Andrea Galimberti{1}, Ernesto Colizzi{2}, Davide Zoni{1}  
{1}Politecnico di Milano, Italy; {2}SIAE MICROELETTRONICA, Italy

### **A Trusted Communication Unit for Secure Tiled Hardware Architectures**

Sebastian Haas, Nils Asmussen  
Barkhausen Institut, Germany

11:00 – 12:30

### **Innovations in Memristor Modelling, Analysis, & Fabrication Toward a Systematic Approach to Circuit**

Room: Breakout Room 8

Session Chairs: Ronald Tetzlaff & Alon Ascoli

### **Memristor Based Integrated System for the long-Term Analysis of Chronic wounds: Design and Clinical Trial**

Jacopo Secco{3}, Monica Pittarello{1}, Filippo Begarani{2}, Fedrica Sartori{2}, Fernando Corinto{3}, Elia Ricci{1}  
{1}Clinica San Luca, Italy; {2}OmniDermal Biomedics, Italy; {3}Politecnico di Torino, Italy

### **Decision Making by a Neuromorphic Network of Volatile Resistive Switching Memories**

Saverio Ricci{2}, David Kappel{3}, Christian Tetzlaff{3}, Daniele Ielmini{3}, Erika Covi{1}  
{1}NaMLab gGmbH, Germany; {2}Politecnico di Milano, Italy; {3}University of Göttingen, Germany; {3}University of Göttingen, Germany

### **Analytical Study of the Fading Memory Phenomenon in a TaOx Memristor Model**

Ioannis Messaris, Alon Ascoli, Ahmet Samil Demirkol, Vasileios Ntinis, Ronald Tetzlaff  
Technische Universität Dresden, Germany

### **A Ferroelectric Tunnel Junction-Based Integrate-and-Fire Neuron**

Paolo Gibertini{3}, Luca Fehlings{3}, Suzanne Lancaster{3}, Quang Duong{3}, Thomas Mikolajick{4}, Catherine Dubourdieu{2}, Stefan Slesazek{3}, Erika Covi{3}, Veeresh Deshpande{1}  
{1}Helmholtz Zentrum Berlin, Germany; {2}Helmholtz Zentrum Berlin, Free University Berlin, Germany; {3}NaMLab gGmbH, Germany; {4}NaMLab gGmbH, Technical University of Dresden, Germany

### **Synthesis of Nonlinear Impedance Converters for Emulating Memory Elements**

Dalibor Biolek{2}, Zdenek Biolek{1}, Viera Biolkova{1}, Zdenek Kolka{1}  
{1}BUT, Czech Rep.; {2}Univ. of Defence/BUT, Czech Rep.

### **Reliability Analysis of Memristor Crossbar Routers: Collisions and On/Off Ratio Requirement**

Junren Chen, Chenxi Wu, Giacomo Indiveri, Melika Payvand  
Institute of Neuroinformatics, University of Zurich and ETH Zurich, Switzerland

11:00 – 12:00

**Young Professional Session**

*Room: Auditoria*

Session Chairs: Hamida Hallil Abbas & Nazila Fough

**Solving Boolean Satisfiability with Stochastic Nanomagnets**

Amit Ranjan Trivedi<sup>{1}</sup>, Maeesha Binte Hashem<sup>{1}</sup>, Nastaran Darabi<sup>{1}</sup>, Supriyo Bandyopadhyay<sup>{2}</sup>

<sup>{1}</sup>University of Illinois at Chicago, United States; <sup>{2}</sup>Virginia Commonwealth University, United States

**A Switched-Capacitor Hybrid Quadratic Buck Converter for 48V-Input Wide-Range Conversion**

Ruijie Zhao, Xiongjie Zhang, Xuchu Mu, Huihua Li, Yang Jiang, Man-Kay Law, Pui-In Mak, Rui Martins

University of Macau, Portugal; University of Macau, Macau; University of Macau, China

12:00 – 13:00

**Young Professional Lunch**

*Room: Level 3 Mezzanine*

12:30 – 13:30

**Lunch**

*Room: Level 2 Foyer*

13:00 – 14:00

**Young Professional Session (continued)**

*Room: Auditoria*

Session Chairs: Hamida Hallil Abbas & Nazila Fough

**Single Photon Avalanche Diode Circuits for Ultra-Violet Imaging**

Zhenjie Wang, Ivor Fleck, Bhaskar Choubey

University of Siegen, Germany

**A Delay-Based Reservoir Computing Model for Chaotic Series Prediction**

Antonia Pavlidou, Xiangpeng Liang, Hadi Heidari

University of Glasgow, United Kingdom

13:30 – 15:00

**RF Building Blocks and Circuits for High-Speed Data Transfer**

*Room: Breakout Room 2*

Session Chair: Mahmoud Wagih

**Simple Expression of the Thermal Noise Excess Factor for LNA Design**

Christian Enz

EPFL, Switzerland

**A 100-GHz-RF-Bandwidth Up-Conversion Mixer in 130 nm SiGe BiCMOS**

Luca Steinweg, Corrado Carta, Frank Ellinger

TU Dresden, Germany



**A 40 GHz Varactor-Less Class-C VCO with 17.1% Tuning Range and Long-Term Reliability in 28nm FD-SOI for Satellite Communications**

Ayoub Ait Ihda{2}, Yann Deval{3}, Hervé Lapuyade{3}, François Rivet{3}, Matthieu Gastaldi{1}, Stéphane Rochette{4}  
{1}CNES, France; {2}IMS Lab, Univ. Bordeaux, CNES., France; {3}IMS Lab., Univ. Bordeaux, Bordeaux INP, CNRS UMR 5218, France; {4}Thales Alenia Space, France

**A 224Gbit/S Transceiver Front-End Design for Next Generation Data Centers**

Enne Wittenhagen{3}, Urs Hecht{3}, Halil Cirit{2}, Saman Behtash{1}, Srinivas Venkataram{2}, Friedel Gerfers{3}  
{1}Exsilica Corp., United States; {2}Meta Inc., United States; {3}TU-Berlin, Germany

**An 8th-Order Butterworth Filter Employing Source Follower Based bi-Quad Sections Capable of Realizing high-Q Pole Pairs**

Sakthidasan Kalidasan, Ross Walker  
University Of Utah, United States

**An Equalization Technique for Reducing Ringing in High-Speed Can Bus Transceivers**

Andrea Gallone, Piero Malcovati  
University of Pavia, Italy

13:30 – 15:00

**Bio-inspired and Bio-engineering Circuits and Systems**

Room: Breakout Room 6

Session Chairs: Rupam Das & Roghaieh Parvizi

**TinyStat: a Miniaturised Potentiostat for Portable Electrochemical Measurements**

Dean Corva{1}, Scott Adams{1}, Egan Doeven{1}, Parastoo Hashemi{2}, Abbas Kouzani{1}  
{1}Deakin University, Australia; {2}Imperial College London, United Kingdom

**A servo-loop-Free Charge Sharing Technique to Mitigate Electrode DC Offsets in Biomedical Multiplexed Interfaces**

Marco Francesco Carlino, Georges Gielen  
KU Leuven, Belgium

**An Accurate and Flexible Analog Emulation of AdEx Neuron Dynamics in Silicon**

Sebastian Billaudelle, Johannes Weis, Philipp Dauer, Johannes Schemmel  
Kirchhoff-Institute for Physics, Heidelberg University, Germany

**Investigating Volume Conduction Effect in MMG and EMG During Action Potential Recording**

Negin Ghahremani Arekhloo{2}, Siming Zuo{2}, Huxi Wang{2}, Muhammad Imran{2}, Thomas Klotz{3}, Kianoush Nazarpour{1}, Hadi Heidari{2}  
{1}University of Edinburgh, United Kingdom; {2}University of Glasgow, United Kingdom; {3}University of Stuttgart, Germany

**Mixing Integrator for Compact Electrochemical Impedance Spectroscopy**

Kerim Ture, Sara Seyedeh Ghoreishizadeh  
University College London, United Kingdom

**Microfabrication of Implantable, Flexible Neural Probes Towards Bidirectional Interfacing in the Deep Brain**  
Eve McGlynn, Bhavani Yalagala, Hadi Heidari  
*University of Glasgow, United Kingdom*

13:30 – 15:00

**Piezoelectric Transducers & Their Interface Circuits for Device Energy Harvesting & Remote Powering**

*Room: Breakout Room 7*

Session Chairs: Josep Maria Sánchez-Chiva & Maurizio Valle

**A 2-Mode Reconfigurable SSHI Rectifier with 3.2X Lower Cold-Start Requirement for Piezoelectric Energy Harvesting**

Xinling Yue, Sijun Du

*Delft University of Technology, Netherlands*

**Piezoelectric Transducers for Energy Harvesting: Electromechanical Model, Ambient Motion, and Electrical Loads**

Michael Isaf, Gabriel Rincon-Mora

*Georgia Institute of Technology, United States*

**Magnetoelectric Wireless Power Receiver for a Wearable non-Enzymatic Lactic Acid Sensor**

Shih-Hao Lin{3}, Hsiang-Yu Wang{2}, Emile Martincic{1}, Elie Lefeuvre{1}

{1}Centre for Nanoscience and Nanotechnology, Univ. Paris-Saclay - CNRS, Palaiseau, France; {2}Department of Engineering and System Science, National Tsing Hua University, Taiwan; {3}Université Paris-Saclay and National Tsing Hua University, Taiwan

**Piezoelectric Transducers Energy Extraction for Device Remote powering: state-of-the-Art Review**

Josep Maria Sánchez-Chiva{2}, Hakeim Talleb{1}, Dimitri Galayko{2}

{1}Laboratoire Génie électrique et électronique de Paris - GeePs UMR 8507 CNRS, France; {2}Sorbonne Université, CNRS, LIP6, UMR7606, France

**Origin of Capacitance in Perovskite Solar Cells: Insight Vision on the Energy Band Diagram**

Sameh Abdellatif, Monica Roman, Ziad Khalifa

*The British university in Egypt, Egypt*

13:30 – 15:00

**5G Advanced Radiofrequency Architectures**

*Room: Breakout Room 8*

Session Chairs: Didier Belot & François Rivet

**Channel Bonding Transceivers for Efficient 100 Gb/s and Beyond Wireless and Plastic Waveguide Communications**

Jose Luis Gonzalez-Jimenez, Alexandre Siligaris, Abdelaziz Hamani, Cedric Dehos, Francesco Foglia Manzillo, Antonio Clemente, Nicolas Cassiau  
*Université Grenoble-Alpes, CEA-Leti, France*

**D-Band Channel Aggregation Receiver Architecture Based on IF Analog Processing Using Digital Wavelet**

Cedric Dehos, Jorge-Luis Monsalve Gulfo, David Lachartre, Didier Belot, Pierre Courouve, Michael Pelissier  
*CEA Leti, France*

**A 24-31GHz 28nm FD-SOI CMOS Power Amplifier Supporting 5G NR FR2 64-QAM Signals**

Gwennaël Diverrez{1}, Eric Kerhervé{1}, Andreia Cathelin{2}  
{1}IMS Laboratory, France; {2}STMicroelectronics Crolles, France

**A PAE-Controlled Wideband Power Amplifier for Sub-6GHz 5G Applications in 28nm FDSOI Technology**

Remi Queheille, Maxandre Fellmann, Yann Deval, Eric Kerherve, Francois Rivet, Nathalie Deltimple  
Univ Bordeaux IMS Lab, France

**RF to Bits Highly Tunable Sub-1 pJ/Bit Digital Beamforming Receiver Architectures for 5G Applications**

Ahmed Ghoniem{2}, Alhassan Sayed{3}, Ziad Saeed{1}, Bahy Yehia{1}, Abdelrahman Emad{2}, Marco Saif{2}, Mahmoud Tarek{2}, Mohamed Abdelmaksoud{2}, Hassan Aboushady{3}  
{1}Cairo Univeristy, Egypt; {2}Insspectrum, Egypt; {3}Seamless Waves, France

**A 0.8-6 GHz True-Time-Delay Beam-Nulling Receiver Front-End**

Kalle Spoof{2}, Miikka Tenhunen{2}, Vishnu Unnikrishnan{3}, Kari Stadius{1}, Marko Kosunen{1}, Jussi Ryyanen{1}  
{1}Aalto University, Finland; {2}Saab Finland, Finland; {3}Tampere University, Finland

14:00 – 15:00

**Young Professional Poster Session**

Room: Level 2 Foyer

Session Chairs: Nazila Fough & Hamida Hallil Abbas

**33: A Comparative Study of Deep-Learning Object Detectors for Semiconductor Defect Detection**

Enrique Dehaerne{2}, Bappaditya Dey{1}, Sandip Halder{1}  
{1}Interuniversity Microelectronics Centre (IMEC), Belgium; {2}KU Leuven, Belgium

**34: Accurate Reconstruction of ECG Signals Using Chebyshev Polynomials**

Maryam Saeed, Deepu John, Barry Cardiff  
University College Dublin, Ireland

**35: Cryogenic Transistor Confinement Well Simulation Through Material and Carrier Transport Decoupling**

Conor Power, Robert Bogdan Staszewski, Elena Blokhina  
University College Dublin, Ireland

**36: CMOS PPG Sensor with Correcting Feedback for Effects of Skin Pigmentation**

Hedayatipour, Bazurto

**37: Smart Shoe Insole with Flexible Pressure and Temperature Sensor Using Additive Manufacturing**

Ava Hedayatipour, Eric Garcia, Adam Saied  
CalState Long Beach, United States

15:00 – 15:30

**Coffee Break**

Room: Level 2 Foyer

15:00 – 16:30

**WiCAS Session - Building Up Your Network: Academic Collaboration and Gender Balance**

*Room: Auditoria*

Session Chairs: Giulia di Capua, Yoko Uwate & Eve McGlynn

15:30 – 17:00

**Oscillators and PLLs**

*Room: Breakout Room 2*

Session Chair: Edoardo Bonizzoni

**Design of Hexagonal Oscillator for True Random Number Generation**

Krishan Mehra, Dharendra Kumar, Kavindra Kandpal, Prasanna Kumar Misra, Manish Goswami

*IIIT Allahabad, India*

**A Divider-Less General PLL Lock Assist and Automatic Frequency Calibration System for Millimeter-Wave Sub-Sampling Phase-Locked Loops**

Patrick Kurth, Philipp Nickel, Urs Hecht, Friedel Gefers

*Technische Universität Berlin, Germany*

**A K-Band Wide-Tuning-Range Low-Phase-Noise Digitally Controlled Oscillator in 22 nm FD-SOI for Automotive Radars**

Zhigang Li<sup>{1}</sup>, David Cordeau<sup>{1}</sup>, Jean-Marie Paillot<sup>{1}</sup>, Sébastien Charpentier<sup>{2}</sup>, Matthieu Lécuyer<sup>{2}</sup>, Francis Huin<sup>{2}</sup>

*{1}CNRS-XLIM, UMR 7252, University of Poitiers, France; {2}IDDO-IC Company, France*

**A 55nm CMOS Linearized Oscillator for Audio VCO-ADCs Achieving 78dBA of SNDR with 153 $\mu$ W**

Ruben Garvi, Javier Granizo, Angel Salvador, Luis Hernandez

*Carlos III University, Spain*

**Evaluation of the Frequency Response of Electro-Mechanical Actuators with a Zero-IF 24-GHz Doppler Vibrometer**

Giordano Cicioni, Raffaele Salvati, Roberto Vincenti Gatti, Valentina Palazzi, Paolo Mezzanotte, Luca Roselli, Federico Alimenti

*University of Perugia, Italy*

**A Low-Power RFID with 100kbps Data Rate Employing High-Speed Power Clock Generator for Complementary Pass-Transistor Adiabatic Logic**

Saito Shibata, Yoshiki Sawabe, Kota Shiba, Atsutake Kosuge, Mototsugu Hamada, Tadahiro Kuroda

*The University of Tokyo, Japan*

15:30 – 17:00

**Challenges and Requirements in Sensory Circuit Design**

*Room: Breakout Room 6*

Session Chairs: Antonio Aprile & Roghaieh Parvizi

**A Fast Offset Reduction Loop Based on a Bilinear Integrator for Sensor Readout Circuits**

Robbe Riem, Johan Raman, Pieter Rombouts

*Ghent University, Belgium*

### **Performance Comparison of BJT and MOS Devices as Temperature Sensing Elements**

Antonio Aprile, Elisabetta Moisello, Edoardo Bonizzoni, Piero Malcovati  
*Università degli Studi di Pavia, Italy*

### **A General-Purpose CMOS Vision Sensor with In-Pixel 5-Bit Convolutional Layer Computation**

Daniel García Lesta, Óscar Pereira Rial, Víctor Manuel Brea Sánchez, Paula López Martínez, Diego Cabello Ferrer  
*Universidade de Santiago de Compostela, Spain*

### **Preamplifier Design Strategies for Capacitive Sensing of Electrophysiological Signals**

Yijing Zhang<sup>{1}</sup>, Sotir Ouzounov<sup>{2}</sup>, Mohammed Meftah<sup>{2}</sup>, Eugenio Cantatore<sup>{1}</sup>, Pieter Harpe<sup>{1}</sup>  
*{1}Eindhoven University of Technology, Netherlands; {2}Philips Research, Netherlands*

### **Complexity Reduction of CNNs Using Multi-Scale Group Convolution for IoT Edge Sensors**

Qingyuan Wang<sup>{2}</sup>, Antoine Frappé<sup>{1}</sup>, Benoit Larras<sup>{1}</sup>, Barry Cardiff<sup>{2}</sup>, Deepu John<sup>{2}</sup>  
*{1}Univ. Lille, CNRS, Centrale Lille, Junia, Univ. Polytechnique Hauts-de-France, UMR 8520 - IEMN, France; {2}University College Dublin, Ireland*

### **CMOS/STT-MRAM Based Ascon LWC: a Power Efficient Hardware Implementation**

Nathan Roussel<sup>{1}</sup>, Olivier Potin<sup>{1}</sup>, Gregory Di Pendina<sup>{2}</sup>, Jean-Max Dutertre<sup>{1}</sup>, Jean-Baptiste Rigaud<sup>{1}</sup>  
*{1}Mines Saint-Etienne, France; {2}Spintec, France*

15:30 – 17:00

**Circuit Design, EDA, Optimization, Test and Reliability**

*Room: Breakout Room 7*

*Session Chairs: Stavroula Kapoulea & Meraj Ahmad*

### **A Methodology for Defect Detection in Analog Circuits Based on Causal Feature Selection**

Gildas Leger<sup>{1}</sup>, Antonio Gines<sup>{1}</sup>, Valentin Gutierrez<sup>{1}</sup>, Manuel Barragan<sup>{2}</sup>  
*{1}IMSE-CNM, Spain; {2}TIMA, France*

### **Effectiveness of Control Flow Checking Algorithms Using a Model-Based Software Design Approach: an Empirical Study**

Mohammadreza Amel Solouki, Jacopo Sini, Massimo Violante  
*Politecnico di Torino, Italy*

### **Investigation of Pass Transistor Logic in a 12nm FinFET CMOS Technology**

André Lucas Chinazzo<sup>{2}</sup>, Jan Lappas<sup>{2}</sup>, Christian Weis<sup>{2}</sup>, Qinhui Huang<sup>{1}</sup>, Zhihang Wu<sup>{1}</sup>, Leibin Ni<sup>{1}</sup>, Norbert Wehn<sup>{2}</sup>  
*{1}Huawei Technologies Co., China; {2}TU Kaiserslautern, Germany*

### **A Comparative Overview of ATPG Flows Targeting Traditional and cell-Aware Fault Models**

Nunzio Mirabella<sup>{1}</sup>, Andrea Floridia<sup>{2}</sup>, Riccardo Cantoro<sup>{1}</sup>, Michelangelo Grosso<sup>{2}</sup>, Matteo Sonza Reorda<sup>{1}</sup>  
*{1}Politecnico di Torino, Italy; {2}STMicroelectronics S.R.L., Italy*

### **Soft Error Assessment of CNN Inference Models Running on a RISC-V Processor**

Jonas Gava{3}, Guilherme Dorneles{3}, Ricardo Reis{3}, Rafael Garibotti{2}, Luciano Ost{1}

{1}Loughborough University, United Kingdom; {2}PUCRS, Brazil; {3}UFRGS, Brazil

### **Neural Network's Reliability to Permanent Faults: Analyzing the Impact of Performance Optimizations in GPUs**

Juan David Guerrero, Josie E. Rodriguez, Matteo Sonza Reorda  
Politecnico di Torino, Italy

15:30 – 17:00

#### **Embedded and Intelligent Systems for Health Applications**

Room: Breakout Room 8

Session Chairs: Slavisa Jovanovic & Hassan Rabah

### **ECG Signal Classification Using Temporal Convolutional Network**

Ali Rida Ismail{1}, Slavisa Jovanovic{1}, Hassan Rabah{1}, Naeem Ramzan{2}

{1}Université de Lorraine, France; {2}University of West of Scotland, United Kingdom

### **An Explainable and Reliable Facial Expression Recognition System for Remote Health Monitoring**

Mohammad Mahdi Deramgozin{1}, Slavisa Jovanovic{1}, Miguel Arevalillo-Herraez{2}, Hassan Rabah{1}

{1}Université de Lorraine, CNRS, IJL, France; {2}University of Valencia, Valencia, Spain

### **Stroke Prediction in Elderly Persons Using Remote**

Nagina Razzaq{1}, Nayyer Masood{1}, Saba Nawaz{1}, Nadeem Anjum{1}, Naeem Ramzan{2}

{1}Capital University of Science and Technology, Pakistan; {2}University of West Scotland, United Kingdom

### **NC-Emotions: Neuromorphic Hardware Accelerator Design for Facial Emotion Recognition**

Ajay B S{3}, Sumedh R Risbud{2}, Madhav Rao{1}

{1}IIT Bangalore, India; {2}Intel Labs, Intel Corporation, United States; {3}Intel Technology India Pvt. Ltd., India

### **MMG/EMG Mapping with Reservoir Computing**

Yuqi Ding{1}, Xiangpeng Liang{1}, Thomas Middelmann{2}, Justus Marquetand{2}, Hadi Heidari{1}

{1}University of Glasgow, United Kingdom; {2}University of Tübingen, Germany

### **Employing a Wearable Eye-Tracker to Observe Mind-Wandering in Dynamic Stimuli**

Sara Khosravi, Ahsan Raza Khan, Ahmed Zoha, Rami Ghannam  
University of Glasgow, United Kingdom

16:30 – 18:00

#### **WiCAS Reception**

Room: Level 3 Mezzanine

17:00 – 18:00

**Poster Session #1**

*Room: Level 2 Foyer*

**1: CMOS FD-SOI Technologies Ruggedness for Millimeter Wave Power Amplifier Design**

Baudouin Martineau{1}, Alice Bossuet{1}, Alexis Divay{1}, Benjamin Blampey{1}, Yvan Morandini{2}

*{1}CEA Leti, France; {2}SOITEC, France*

**2: Hardware Acceleration of a Fully Parallel Viterbi Decoder Architecture for Narrow Band IOT**

Mamdouh Ellamei, Mohamed Abd El Ghany

*German University in Cairo, Egypt*

**3: Digital Approaches on Frequency Tuning for Magnetoelectric Sensors**

Johanna Munoz{1}, Johan Arbustini{2}, Eric Elzenheimer{2}, Michael Höft{2}, Andreas Bahr{2}

*{1}Instituto Tecnológico de Costa Rica, Costa Rica; {2}Kiel University, Germany*

**4: A Dynamically Reconfigurable Column Streaming-based Convolution Engine for Edge AI Accelerators**

Weison Lin, Yajun Zhu, Tughrul Arslan

*The University of Edinburgh, United Kingdom*

**5: PUF-Entropy Extraction of DAC Intersymbol-Interference Using Continuous-Time Delta-Sigma ADCs**

Bjoern Driemeyer, Holger Mandry, David-Peter Wiens, Joachim Becker, Maurits Ortmanns

*University of Ulm, Germany*

**6: A Ti 12 GS/S Sampled Beam-Forming Receiver for a 2x2 Antenna-Array with 69dBc SFDR**

Enne Wittenhagen, Patrick Kurth, Tobias Kaiser, Friedel Gerfers

*TU-Berlin, Germany*

**7: A Novel Design Methodology for Low-Power, Low-Noise LC-Based Digital-Controlled Oscillators**

Pablo Jiménez-Fernández{2}, Alberto Rodríguez-Pérez{2}, Enrique Prefasi{2}, Óscar Guerra{1}, Rocío Del Río{1}

*{1}IMSE-CNM, Spain; {2}KDROC, Spain*

**8: First-Order Hold DAC Reconstruction Filtering for Efficient Image Rejection**

Robbe Riem, Tobias Cromheecke, Johan Raman, Pieter Rombouts

*Ghent University, Belgium*

**9: A -102dB PSRR 1.2V Bandgap Voltage Reference for Use in a Standalone MPPT Boost Converter for Solar Submodules**

Léon Weihs{2}, Michael Hanhart{2}, Jan Grobe{1}, Jonas Zoche{2}, Ralf Wunderlich{2}, Stefan Heinen{2}

*{1}IAS RWTH Aachen, Germany; {2}IAS RWTH Aachen, Germany*

**10: Delta-Sigma Modulator Design Using a Memristive FIR DAC**

Danyu Wang{3}, Shiwei Wang{2}, Themis Prodromakis{2}, Christos Papavassiliou{1}

*{1}Imperial College London, United Kingdom; {2}The University of Edinburgh, United Kingdom; {3}University College London, United Kingdom*

**11: A 7 Gb/S Micro Rotatable Transmission Line Coupler with Deep Proximity Coupling Mode and Ground Shield Vias**

Ximing Wang, Atsutake Kosuge, Yasuhiro Hayashi, Mototsugu Hamada, Tadahiro Kuroda  
*The University of Tokyo, Japan*

**12: Low-Power Techniques on a CMOS Vision Sensor Chip for Event Generation by Frame Differencing with High Dynamic Range**

Marko Jaklin, Daniel García-Lesta, Victor Manuel Brea Sánchez, Paula López Martínez  
*CiTIUS, Universidade de Santiago de Compostela, Spain*

**13: Automated Synthesis of Asynchronous Tsetlin Machines on FPGA**

Gang Mao, Alex Yakovlev, Fei Xia, Tian Lan, Shengqi Yu, Rishad Shafik  
*Newcastle University, United Kingdom*

**14: A 1.2 V to 3 V Low Power Resistor-Less All-MOSFET Voltage Reference Generator**

Durgham Al-Shebanee, Ralf Wunderlich, Stefan Heinen  
*Institute of Integrated Analog Circuits and RF Systems, RWTH Aachen University, Germany*

**15: Stability-Area Trade-Off in Static CMOS PUF Based on 4T Subthreshold Voltage Divider**

Massimo Vatalaro, Raffaele De Rose, Marco Lanuzza, Felice Crupi  
*University of Calabria, Italy*

**16: Ka-Band 4-Bit Phase Shifter for SATCOM Active Electronically Scanned Array**

Anael Lohou{1}, Julien Lintignat{2}  
*{1}Safran Data Systems, France; {2}Université de Limoges, France*

**17: Low-Noise Ku-Band Receiver Frontend with Switchable SIW Filters for Cubesat Applications**

Giulia Orecchini{2}, Giacomo Schiavolini{2}, Paolo Mezzanotte{2}, Federico Dogo{1}, Simone Pauletto{1}, Guendalina Simoncini{2}, Anna Gregorio{1}, Mario Fragiaco{1}, Federico Alimenti{2}  
*{1}Picosats, Italy; {2}University of Perugia, Italy*

**18: A Modular Electronic Unit for Water Monitoring in Plastic Pipes with Leakage Detection**

Daniele Crafa, Christian Riboldi, Marco Carminati  
*Politecnico di Milano, Italy*

**19: Position Sensing of Electrostatic MEMS Actuator**

Zdenek Kolka{1}, Viera Biolkova{1}, Dalibor Bielek{2}  
*{1}Brno University of Technology, Czech Rep.; {2}University of Defence, Czech Rep.*

**20: Study of Chopping Magnetic Flux Modulation on Surface Acoustic Wave Magnetic Sensor**

Huxi Wang{2}, Johan Arbustini{1}, Eric Elzenheimer{1}, Viktor Schell{1}, Michael Höft{1}, Eckhard Quandt{1}, Gerhard Schmidt{1}, Hadi Heidari{2}, Andreas Bahr{1}  
*{1}Kiel University, Germany; {2}University of Glasgow, United Kingdom*



**21: A Low-Cost Visible-Light-Communication-Enhancing Downlink Relay for Future Ultra-Massive IoT Networks**

Dayu Shi{1}, Xun Zhang{1}, Lianxin Hu{3}, Zefeng Wang{3}, Wenjun Hu{4}, Andrei Vladimirescu{2}  
{1}Institut supérieur d'électronique de Paris, France; {2}University of California, Berkeley, United States; {3}University of Huzhou, China; {4}University of Huzhou, China

**22: E-RVP: an Initial Design Rule Violation Predictor Using Placement Information**

Sheiny Fabre Almeida{1}, Aysa Fakheri Tabrizi{2}, Erfan Aghaeekiasaraee{2}, Renan Netto{1}, Tiago Augusto Fontana{1}, Upma Gandhi{2}, José Luís Güntzel{1}, Laleh Behjat{2}, Cristina Meinhardt{1}  
{1}Dept. of Computer Science and Statistics (INE/PPGCC), Federal University of Santa Catarina (UFSC), Brazil; {2}Dept. of Electrical and Software Engineering, University of Calgary, Canada

**23: Design and Equivalent Circuit Analysis of Tunable FBAR Resonators by Using Finite Element Method and Butterworth-Van Dyke Model**

Yang Yang, Corinne Dejous, Hamida Hallil  
IMS, France

**24: Binary ECG Classification Using Explainable Boosting Machines for IoT Edge Devices**

Xiaolin Li{2}, Qingyuan Wang{2}, Rajesh Panicker{1}, Barry Cardiff{2}, Deepu John{2}  
{1}National University of Singapore, Singapore; {2}University College Dublin, Ireland

**25: RF Power Transmission for Self-Sustaining Miniaturized IoT Devices**

Lukas Schulthess, Federico Villani, Philipp Mayer, Michele Magno  
ETH Zürich, Switzerland

**26: An Analog Memristive and Memcapacitive Device for Neuromorphic Computing**

Eter Mgeladze{2}, Melanie Herzig{2}, Richard Schroedter{1}, Ronald Tetzlaff{1}, Thomas Mikolajick{3}, Stefan Slesazeck{2}  
{1}Chair of Fundamentals of Electrical Engineering, Technische Universität Dresden, Germany; {2}NaMLab gGmbH, Germany; {3}NaMLab gGmbH and Chair of Nanoelectronics, Technische Universität Dresden, Germany

**27: CAD Modeling of mm-Wave Circuits Incorporating Avalanche Noise Diodes**

Guendalina Simoncini, Valentina Palazzi, Giulia Orecchini, Paolo Mezzanotte, Luca Roselli, Federico Alimenti  
University of Perugia, Italy

**28: A Locally Active Device Model Based on a Minimal 2T1R Circuit**

Ahmet Samil Demirkol{1}, Mohamad Moner Al Chawa{1}, Alon Ascoli{1}, Daniel Bedau{2}, Michael Grobis{2}, Ronald Tetzlaff{1}  
{1}Technische Universität Dresden, Germany; {2}Western Digital, United States

**29: Efficient Association of Low and High RF Power Rectifiers for Powering Ultra-Low Power Devices**

Jesus Argote Aguilar{2}, Florin Doru Hutu{1}, Guillaume Villemaud{1}, Olivier Berder{2}, Matthieu Gautier{2}  
{1}University of Lyon, France; {2}University of Rennes 1, France

### **30: CryoCMOS Characterization Strategies and Challenges**

Christos Giagkoulouits, Meraj Ahmad, Fatemeh Nikbakhtnasrabadi, Fiheon Imroze, Martin Weides, Hadi Heidari  
*University of Glasgow, United Kingdom*

### **31: Packaged CMOS Cryogenic Characterization for Quantum Computing Applications**

Fiheon Imroze{2}, Fatemeh Nikbakhtnasrabadi{2}, Sergey Danilin{2}, Muhammad Ali{1}, Meraj Ahmad{2}, Christos Giagkoulouits{2}, Hadi Heidari{2}, Martin Weides{2}  
{1}Oxford Instruments Nano Science, United Kingdom; {2}University of Glasgow, United Kingdom

17:00 – 18:00

#### **Demo Session**

*Room: Level 2 Foyer*

Session Chairs: Roberto Fallica & Ka-Meng Lei

### **Towards Solution-Processed RF Rectennas: Experimental Characterization and Non-Linear Modelling Based on ZnO Nanogap Diodes**

Mahmoud Wagih{1}, Dimitra Georgiadou{2}  
{1}University of Glasgow, United Kingdom; {2}University of Southampton, United Kingdom

### **Ultrasound Non-Destructive Evaluation/Testing Using Capacitive Micromachined Ultrasound Transducer (CMUT)**

Mohamed Abdalla, Meraj Ahmad, James Windmill, Sandy Cochran, Hadi Heidari  
*University of Glasgow, United Kingdom*

### **Wireless Impedance Platform for Autonomous Vascular Implantable Devices**

Jungang Zhang, Daniel Hoare, Rupam Das, Michael Holsgrove, Jakub Czyzewski, Nosrat Mirzai, John Mercer, Hadi Heidari  
*University of Glasgow, United Kingdom*

18:30 – 22:30

#### **Conference Dinner**

*Room: Oran Mor*

Shuttle buses will run from the Technology and Innovation Centre to the Oran Mor from 18:15 – 18:45.

Shuttle buses back to the Technology and Innovation Centre will run from 21:00 – 22:30.

## Technical Program: Wednesday, October 26<sup>th</sup>

9:00 – 10:30

### **Analog Integrated Circuits**

*Room: Breakout Room 2*

Session Chairs: Juan M. Carrillo & Antonio Aprile

### **An Analog Driver Compliant with Supply Voltages Exceeding the Ratings of Standard CMOS Processes**

Francesco Gagliardi{2}, Mattia Cicalini{2}, Andrea Ria{1}, Massimo Piotto{2}, Paolo Bruschi{2}

{1}IEIIT - National Research Council (CNR), Pisa, Italy, Italy; {2}University of Pisa, Italy

### **A Calibration-Free 96.7 dB SNDR 4 MS/S CT I-SD Modulator with Single Feedback DAC**

Kai Misselwitz, Marcel Runge, Friedel Gerfers

*Technische Universität Berlin, Germany*

### **Analysis and Effects of Aging and Electromigration on Mixed-Signal ICs in 22nm FDSOI Technology**

Leila Sharara{3}, Seyedeh Masoumeh Navidi{3}, Hamza Al Maharmeh{3}, Mohammed Ismail{3}, Mohamad Alhawari{3}, Samad Parekh{2}, Ali Wehbi{1}

{1}Global Foundry, United States; {2}synopsys, United States; {3}wayne state university, United States

### **Compact Fully-Differential CMOS Current Driver for Bioimpedance Measurements**

Israel Corbacho, Juan M. Carrillo, José L. Ausín, Miguel Á. Domínguez, Raquel Pérez-Aloe, J. Francisco Duque-Carrillo

*Universidad de Extremadura, Spain*

### **Design of an Analog and of a Digital-Based OTA in Flexible Integrated Circuit Technology**

Sogand Adibi{1}, Roberto Rubino{1}, Pedro Toledo{2}, Paolo Crovetto{1}

{1}Politecnico di Torino, Italy; {2}Synopsys, Portugal

### **An all-MOSFET 69 ppm/°C Wide Range Programmable Current Reference with PV Insensitive Temperature Compensation**

Vidushi Gaur, Surya Varchasvi Devaraj, Laxmeesha Somappa, Maryam Shojaei Baghini  
*IIT Bombay, India*

9:00 – 10:30

### **Energy Harvesting and Power Efficient Electronics**

*Room: Breakout Room 6*

Session Chairs: Rami Ghannam & Sijun Du

### **A 6.78 MHz Dual-Output Reconfigurable Rectifier with Hysteretic Output Regulation for Wireless Power Transfer Systems**

Tianqi Lu, Sijun Du

*Delft University of Technology, Netherlands*

**A 6.78 MHz Maximum Efficiency Tracking Active Rectifier with Load Modulation Control for Wireless Power Transfer to Implantable Medical Devices**

Tommaso Rizzo{2}, Alessandro Catania{2}, Gabriele Bertolacci{1}, Sebastiano Strangio{2},  
Giuseppe Iannaccone{2}  
{1}Quantavis s.r.l., Italy; {2}Università di Pisa, Italy

**A Dual-Mode 2:1 Switched Capacitor Converter with >65% Efficiency over 1000x Load Current Range and One Clock Cycle Transient Response**

Yi Tan, Hiroki Ishikuro  
Keio University, Japan

**Evaluation of DrMOS-Based Buck Converter Operating in Diode Emulation Mode**

Franjo Mikic, Josip Bacmaga, Adrijan Baric  
University of Zagreb, Croatia

**Predicting Renewable Energy Resources Using Machine Learning for Wireless Sensor Networks**

Satyam Bhatti, Ahsan Raza Khan, Sajjad Hussain, Rami Ghannam  
University of Glasgow, United Kingdom

**Predictive Energy-Aware Adaptive Sampling with Deep Reinforcement Learning**

Seonyeong Heo, Philipp Mayer, Michele Magno  
ETH Zürich, Switzerland

9:00 – 10:30

**Digital Circuits & Embedded Systems II**

Room: Breakout Room 7

Session Chairs: Stavroula Kapoulea & Meraj Ahmad

**A Multibit Mac Scheme Using Switched Capacitor Based 3C Multiplier for Analog Compute In-Memory Architecture**

Neha Gupta{1}, Ashish Joshi{2}, Dinesh Kushwaha{1}, Vinod Menezes{3}, Rashmi Sachan{3}, Sudeb Dasgupta{1}, Anand Bulusu{1}  
{1}IIT Roorkee, India; {2}Intel, Bangalore, India; {3}Texas Instruments, India

**Design-Time Scheduling of Periodic, Hard Real-Time Flows for NoC-Based Systems**

Anderson Domingues{2}, Sergio Filho{2}, Luciano Ost{1}, Alexandre Amory{2}, Fernando Moraes{2}  
{1}Loughborough University, United Kingdom; {2}PUCRS, Italy; {2}PUCRS, Brazil

**Accurate Energy Modelling on the Cortex-M0 Processor for Profiling and Static Analysis**

Kris Nikov{2}, Kyriakos Georgiou{2}, Zbigniew Chamski{2}, Jose Nunez-Yanez{1}, Kerstin Eder{2}  
{1}Linköping University, Sweden; {2}University of Bristol, United Kingdom

**A Pipelined Implementation of the n-Mode Tensor-Matrix Multiplication**

Edoardo Ragusa, Christian Gianoglio, Rodolfo Zunino, Maurizio Valle, Paolo Gastaldo  
Università degli studi di Genova, Italy

**Neural Network Characteristics-Aware Proactive Boost for Heterogeneous Computing to Improve Energy Efficiency**

Jungho Kim, Hoon Choi, Insang Cho, Youngchan Cho  
Samsung Electronics, Korea

### **Balanced Ternary Logic Gates with Memristors**

Moin Diwan{2}, Zidu Li{2}, Gregor Schiele{1}, Bhaskar Choubey{2}  
{1}Universität Duisburg Essen, Germany; {2}Universität Siegen, Germany

9:00 – 10:30

#### **Circuits and Systems for IOT**

Room: Breakout Room 8

Session Chairs: Rupam Das & Christos Giakoulouvis

### **An Integrated Low-Power 802.11ba Wake-Up Radio for IoT with Embedded Microprocessor**

Marco Ronchi{1}, Francesco Malena{2}, Michele Caselli{2}, Devis Gatti{1}, Ermano Picco{1}, Elena Salurso{1}, Marco Sosio{1}, Lucio Tici{1}, Alessandro Tomasoni{1}, Eusebio Di-Cola{1}, Tommaso Majo{1}, Fabio Osnato{1}, Guidetti Elio{1}, Andrea Boni{2}  
{1}STMicroelectronics, Italy; {2}University of Parma, Italy

### **FPGA Implementation of IEEE 1588 Protocol for Bluetooth-Based Distributed Wireless Systems**

Aamir Nagra, Muhammad Pasha, Shahid Masud  
Lahore University of Management Sciences, Pakistan

### **Automatic Detection of People Getting Into a Bus in a Smart Public Transportation System**

Roya Alizadeh, Yvon Savaria, Chahe Nerguizian  
Ecole Polytechnique Montreal, Canada

### **Detection-Based Video Surveillance Using Deep Neural Networks on STM32 Microcontroller**

Alessio Canepa, Edoardo Ragusa, Rodolfo Zunino, Paolo Gastaldo  
Universita degli studi di Genova, Italy

### **Ground Based Inspection for Overhead Transmission Line Sag**

Daniel Mitchell{2}, Jamie Blanche{2}, Marc Desmulliez{1}, Sumanth Pavuluri{1}, David Flynn{2}  
{1}Heriot-Watt University, United Kingdom; {2}University of Glasgow, United Kingdom

### **Variable Length Quantization Based Design of Polar Codes Decoder for Resource-Limited IoT Devices**

Arslan Hassan{2}, Muhammad Adeel Pasha{1}, Momin Uppal{2}  
{1}EE Department, SBASSE, LUMS, Pakistan; {2}Lahore University of Management Sciences (LUMS), Pakistan

10:30 – 11:00

#### **Coffee Break**

Room: Level 2 Foyer

11:00 – 12:00

#### **Keynote Presentation: Prof. Dr. Elisabetta Chicca**

Room: Auditoria

Session Chair: Erika Covi

12:00 – 13:30

#### **Lunch**

Room: Level 2 Foyer

12:00 – 13:30

**Poster Session #2**

*Room: Level 2 Foyer*

**1: Real-Time Contactless WiFi Based Room Detection of Sitting and Standing Human Motions**

William Taylor{2}, Ahmad Taha{2}, Ahsen Tahir{1}, Qammer H Abbasi{2}, Muhammad Imran{2}

*{1}University of Engineering and Technology, Pakistan; {2}University of Glasgow, United Kingdom*

**2: DRX Mode Implementation Based on Virtual Machine**

Boyoun Park, Chungwoo Park, Gang Li

*Samsung Electronics, China; Samsung Electronics, Korea*

**3: 2D-Motion Detection Using SNNs with Graphene-Insulator-Graphene Memristive Synapses**

Shubham Pande{1}, Karthi Srinivasan{1}, Suresh Balanethiram{2}, Bhaswar Chakrabarti{1}, Anjan Chakravorty{1}

*{1}IIT Madras, India; {2}NIT Karaikal, India*

**4: Tracking the Effects of Tumor Treating Fields on Human Breast Cancer Cells in vitro Using a Capacitance Sensing Lab-on-CMOS Microsystem**

Yann Gilpin, Ching-Yi Lin, Mats Forssell, Siyang Zheng, Pulkit Grover, Marc Dandin

*Carnegie Mellon University, United States*

**5: High-Level Early Power Estimation of FPGA IP Based on Machine Learning**

Majdi Richa{1}, Jean-Christophe Prévotet{1}, Mickaël Dardaillon{1}, Mohamad Mroué{2}, Abed Ellatif Samhat{2}

*{1}INSA Rennes, France; {2}Lebanese University - FoE, Lebanon*

**6: Partial 8-Bit Magnitude Comparator Based on Gate Diffusion Input Logic Gates for Leaky Integrate-and-Fire Spiking Neuron Model**

Philippe-Olivier Beaulieu{1}, Frederic Nabki{1}, Mounir Boukadoum{2}

*{1}École de technologie supérieure, Canada; {2}Université du Québec à Montréal, Canada*

**7: Adaptive J-Wave Detection Architecture for Online BCG-Complex Recognition on FPGA**

Ulf Kulau{2}, Christoph Richter{1}, Jochen Rust{1}

*{1}DSI Aerospace Technologie GmbH, Germany; {2}Hamburg University of Technology, Germany*

**8: Ultra-Low-Power PPG Analog Signal Processing Circuit for Continuous Blood Pressure Estimation**

Ruben Ruiz-Mateos Serrano{2}, Dai Jiang{1}, Andreas Demosthenous{1}

*{1}University College London, United Kingdom; {2}University of Cambridge, United Kingdom*

**9: Systematic Analogue Realisation Strategy of Exact Hodgkin-Huxley Dynamics in MOS weak-Inversion**

Ruben Ruiz-Mateos Serrano{2}, Olaf Sikorski{1}, E.M. Drakakis{1}

*{1}Imperial College London, United Kingdom; {2}University of Cambridge, United Kingdom*

**10: Approximate Logarithmic Multiplier for Convolutional Neural Network Inference with Computational Reuse**

Biyanu Zerom, Mohammed Tolba, Huruy Tesfai, Hani Saleh, Baker Mohammad, Mahmoud Al-Qutayri, Thanos Stouraitis, Ghada Alsuhli  
*Khalifa University, U.A.E.*

**11: Spiking Neural Network Based on Threshold Encoding for Texture Recognition**

Haydar Al Haj Ali{2}, Ali Dabbous{2}, Ali Ibrahim{1}, Maurizio Valle{2}  
*{1}Lebanese International University, Lebanon; {2}University of Genoa, Italy*

**12: An Integrated Circuit for Galvanostatic Electrodeposition of on-Chip Electrochemical Sensors**

Minghao Li{2}, Atal Anudeep Singh Gill{2}, Anne Vanhoestenbergh{1}, Sara S. Ghoreishizadeh{2}  
*{1}King's College London, United Kingdom; {2}University College London, United Kingdom*

**13: Architecture for 3D Convolutional Neural Networks Based on Temporal Similarity Removal**

Udari De Alwis, Massimo Alioto  
*National University of Singapore, Singapore*

**14: Feasibility of a Neural Network with Linearly Approximated Functions on Zynq FPGA**

Miroslav Skrbek, Pavel Kubalík  
*Faculty of information technology, Czech Technical University in Prague, Czech Rep.*

**15: An Improved Codec Design Architecture for Irregular LDPC Codes Applicable to WiMAX**

Divita Shri, Arijit Mondal, Shayan Srinivasa Garani  
*Indian Institute of Science, India*

**16: Optimization of Deep-Learning Detection of Humans in Marine Environment on Edge Devices**

Mostafa Rizk{3}, Dominique Heller{4}, Ronan Douguet{4}, Amer Baghdadi{2}, Jean-Philippe Diguët{1}  
*{1}CNRS IRL CROSSING, Australia; {2}IMT Atlantique, France; {3}Lab STICC CNRS 6285, France; {4}Université de Bretagne-Sud, France*

**17: DVFS Method of Memory Hierarchy Based on CPU microarchitectural Information**

Bumgyu Park, Jonglae Park, Hyunwook Joo, Choonghoon Park, Daeyeong Lee, Chulmin Jo, Woonhaing Hur  
*Samsung Electronics, Korea*

**18: Fan Speed Control Based Defence for Thermal Covert Channel Attacks in Multi-Core Systems**

Parisa Rahimi{2}, Amit Kumar Singh{2}, Xiaohang Wang{1}  
*{1}South China University of Technology, China; {2}University of Essex, United Kingdom*

**19: Blood Pressure Estimation from ECG Data Using XGBoost and ANN for Wearable Devices**

Sourav Banerjee{2}, Binod Kumar{2}, Alex P James{1}, Jai Narayan Tripathi{2}  
*{1}DUK, India; {2}IIT Jodhpur, India*

**20: Computation Complexity Reduction Technique for Accurate Seizure Detection Implants**

Keyvan Farhang Razi, Alexandre Schmid

*Swiss Federal Institute of Technology Lausanne, Switzerland*

**21: Hodgkin-Huxley Verilog-a Electrical Neuron Membrane Model**

Andrea La Gala{1}, Lorenzo Stevenazzi{1}, Elia Arturo Vallicelli{1}, Mattia Tambaro{2}, Stefano Vassanelli{2}, Andrea Baschirotto{1}, Marcello De Matteis{1}

*{1}University of Milano-Bicocca, Italy; {2}University of Padova, Italy*

**22: Neuromorphic Analog Implementation of Reservoir Computing for Machine Learning**

Avi Hazan{2}, Elishai Ezra Tsur{1}

*{1}Open University of Israel, Israel; {2}The Open University of Israel, Israel*

**23: Flexible Neural Probe Modelling for Optimal Microelectrode-Tissue Interaction**

Maria Cerezo-Sanchez, Bhavani Yalagala, Eve McGlynn, Ewan Russell, Finlay Walton, Hadi Heidari

*University of Glasgow, United Kingdom*

**24: Orientationally Selective micro-Coil Design of Intracortical Magnetic Neurostimulation**

Changhao Ge, Finlay Walton, Wenhao Xu, Hadi Heidari

*University of Glasgow, United Kingdom*

**25: A Bidirectional ASIC for Active Microchannel Neural Interfaces**

Maryam Habibollahi, Dai Jiang, Henry Lancashire, Andreas Demosthenous

*University College London, United Kingdom*

**26: Low Cost Real-Time Eye Tracking System for Motorsports**

Yuanjie Xia, Andrew Lunardi, Hadi Heidari, Rami Ghannam

*University of Glasgow, United Kingdom*

**27: Wireless Impedance Platform for Autonomous Vascular Implantable Devices**

Jungang Zhang, Daniel Hoare, Rupam Das, Michael Holsgrove, Jakub Czyzewski, Nosrat Mirzai, John Mercer, Hadi Heidari

*University of Glasgow, United Kingdom*

**28: High-Throughput FFT Architectures Using HLS Tools**

Hugues Almorin{1}, Bertrand Le Gal{2}, Jeremie Crenne{2}, Christophe Jegou{2}, Vincent Kissel{1}

*{1}ARELIS - LGM Group, France; {2}IMS Laboratory (CNRS UMR 5218), Bordeaux-INP, Univ. of Bordeaux, France*

**29: FedClamp: an Algorithm for Identification of Anomalous Client in Federated Learning**

Habib Ullah Manzoor{2}, Muhammed Shahzeb Khan{1}, Ahsan Raza Khan{3}, Fahad Ayaz{3}, David Flynn{3}, Muhammad Ali Imran{3}, Ahmed Zoha{3}

*{1}Muhammad Ali Jinnah University, Pakistan, Pakistan; {2}University of Glasgow, UK, United Kingdom; {3}University of Glasgow, United Kingdom, United Kingdom*



**30: A Low Power, Low THD Current Driver with Discrete Common-Mode Feedback for EIT Applications**

Jiayang Li{2}, Yu Wu{2}, Richard Bayford{1}, Dai Jiang{2}, Andreas Demosthenous{2}  
{1}Department of Natural Sciences, Middlesex University, United Kingdom; {2}University College London, United Kingdom

**31: Feature Selection Mechanism for Attention Classification Using Gaze Tracking Data**

Ahsan Raza Khan, Syed Mohsin Bokhari, Sara Khosrav, Sajjad Hussain, Rami Ghannam, Muhammad Ali Imran, Ahmed Zoha  
University of Glasgow, United Kingdom

**32: Development and Evaluation of a Contactless Heart Rate Measurement Device Based on rPPG**

Nur Ahmadi{1}, Muhammad Salman Al Farisy{1}, Muhammad Dzaky Prihatmoko{1}, Muhammad Heronan Hyanda{1}, Habibur Muhaimin{1}, Rahmat Mulyawan{1}, Peter H Charlton{2}, Trio Adiono{1}  
{1}Bandung Institute of Technology, Indonesia; {2}University of Cambridge, United Kingdom

**33: Psychophysiological Approach for Measuring Social Presence in A Team-Based Activity: a Comparison Between Real and Virtual Environments**

Xunan Wang, Xi Li, Bixun Chen, Rami Ghannam  
University of Glasgow, United Kingdom

**34: Light Weight RL Based Run Time Power Management Methodology for Edge Devices**

Ratnala Vinay{1}, Pradip Sasmal{1}, Chandrajit Pal{1}, Toshihisa Haraki{2}, Kazuhiro Tamura{2}, Chirag Juyal{2}, Mohamed Amir Gabir Elbakri{2}, Sumohana Channappayya{1}, Amit Acharyya{1}  
{1}IIT Hyderabad, India; {2}SMC Japan, Japan

**35: In-Body Energy Harvesting Power Management Interface for Post Heart Transplantation Monitoring**

Noora Almarri, Dai Jiang, Andreas Demosthenous  
University College London, United Kingdom

**36: Visualising Climate Change Using Extended Reality: a Review**

Noor Alqallaf{3}, Satyam Bhatti{3}, Rachael Suett{1}, Sherif G. Aly{2}, Rami Ghannam{3}  
{1}Glasgow School of Art, United Kingdom; {2}The American University in Cairo, Egypt; {3}University of Glasgow, United Kingdom

**37: The Memristive Pupil: a Memristive Circuit Model of the Eye's Response to Illumination Fluctuations**

David Sheppard  
Rowan University, United States

**38: A multi-Parametric Finite Element Analysis of Heat Distributions in Implanted micro-LEDs**

Finlay Walton, Maria Cerezo-Sanchez, Changhao Ge, Hadi Heidari  
University of Glasgow, United Kingdom

### **39: Plasmon-Activated Gas Sensor Based on Lossy MoS<sub>2</sub>/Au Coated Optical Fibre**

Zohreh Teymoordel{2}, Roghaieh Parvizi{2}, Hadi Heidari{1}  
{1}Glasgow University, United Kingdom; {2}Yasouj university, Iran

13:30 – 14:30

#### **Keynote Presentation: Prof. Wouter Serdijn**

Room: Auditoria

Session Chair: Andreas Demosthenous

14:30 – 15:00

#### **Coffee Break**

Room: Level 2 Foyer

15:00 – 16:30

#### **MEMS & Sensory Circuits & Systems**

Room: Breakout Room 2

Session Chair: Josep Maria Sánchez-Chiva

### **Perimeter-Gated Single-Photon Avalanche Diode Imager with Vanishing Room Temperature Dark Count Probability**

Md. Sakibur Sajal{1}, Kai-Chun Lin{1}, Bathiya Senevirathna{2}, Sheung Lu{2}, Marc Dandin{1}  
{1}Carnegie Mellon University, United States; {2}University of Maryland, United States

### **Full-Digital Output ASIC for Lissajous Frequency Modulated MEMS Gyroscopes**

Marco Bestetti{1}, Matteo Gianollo{1}, Andrea Giovanni Bonfanti{1}, Christian Padovani{1}, Luca Falorni{2}, Giacomo Langfelder{1}  
{1}Politecnico di Milano, Italy; {2}STMicroelectronics, Italy

### **Ultrasound Non-Destructive Evaluation/Testing Using Capacitive Micromachined Ultrasound Transducer (CMUT)**

Mohamed Abdalla, Meraj Ahmad, James Windmill, Sandy Cochran, Hadi Heidari  
University of Glasgow, United Kingdom

### **Humidity and Temperature Dual Flexible Microwave Sensor**

Bernard Bobby Ngoune{2}, Hamida Hallil{2}, Stéphane Bila{4}, Dominique Baillargeat{4}, Benoit Bondu{1}, Eric Cloutet{3}, Corinne Dejous{2}  
{1}ISORG, France; {2}Univ. Bordeaux, Bordeaux INP, CNRS, IMS, UMR 5218, France;  
{3}University of Bordeaux, LCPO, UMR 5629, France; {4}University of Limoges, CNRS, XLIM UMR 7252, France

### **A 54.8-nW, 256-Bit Codeword Temperature-Robust Wake-Up Receiver Minimizing False Wake-Ups for Ultra-Low-Power IoT Systems**

Matteo D'Addato{2}, Alessia Maria Elgani{2}, Luca Perilli{2}, Eleonora Franchi Scarselli{2}, Antonio Gnudi{2}, Roberto Canegallo{1}, Giulio Ricotti{1}  
{1}STMicroelectronics, Italy; {2}University of Bologna, Italy

### **Contact-Free Vital Sign Estimation Using UWB Radar**

Fahad Ayaz{2}, Muhammad Shahzeb{1}, Sajjad Hussain{2}, Waseem Ahmad{2}, Fahim Kawsar{2}, Muhammad Imran{2}, Ahmed Zoha{2}  
{1}Muhammad Ali Jinnah University, Pakistan; {2}University of Glasgow, United Kingdom

15:00 – 16:30

### **Signal Image and Video Processing Architectures**

*Room: Breakout Room 6*

*Session Chair: Nazila Fough*

#### **Fast Time-Domain Super-Resolution for Single-Shot Multi-Path ToF Imaging**

Peyman Fayyaz Shahandashti{1}, Paula López Martínez{1}, Victor Manuel Brea{1}, Daniel Garcia Lesta{1}, Miguel Heredia Conde{2}  
*{1}University of Santiago de Compostela, Spain; {2}University of Siegen, Germany*

#### **High Quality and Low Latency Interpolation Filters for Fpga-Based Audio Digital-to-Analog Converters**

Samuel Piché, Manouane Caza-Szoka, Messahoud Ahmed Ouameur, Daniel Massicotte  
*University of Quebec at Trois-Rivières, Canada*

#### **SemiSegPolyp: Semi-Supervised Polyp Segmentation Using Graph Signals**

Marwa Chendeb El Rai, Muna Darweech, Mina Al-Saad, Wathiq Mansour, Hussain Al-Ahmad  
*University of Dubai, U.A.E.*

15:00 – 16:30

### **CMOS for Quantum Computing**

*Room: Breakout Room 7*

*Session Chairs: Christos Giakoulouits & Meraj Ahmad*

#### **Modelling of Electron Injection and Confinement in Cryogenic 22-nm FD-SOI Quantum Dot Arrays**

Conor Power{2}, Dennis Andrade-Miceli{1}, Imran Bashir{1}, Mike Asker{1}, Dirk Leipold{1}, Robert Bogdan Staszewski{2}, Elena Blokhina{2}  
*{1}Equal1 Labs, United States; {1}Equal1 Labs, Ireland; {2}University College Dublin, Ireland*

#### **Characterisation and Modelling of 22-nm FD-SOI Transistors Operating at Cryogenic Temperatures**

Dennis Andrade-Miceli{1}, Conor Power{2}, Ali Esmailiyan{1}, Teerachot Siriburanon{2}, Imran Bashir{1}, Mike Asker{1}, Dirk Leipold{1}, Robert Bogdan Staszewski{2}, Elena Blokhina{1}  
*{1}Equal1 Labs, United States; {1}Equal1 Labs, Ireland; {2}University College Dublin, Ireland*

#### **Control of Quantum Systems: Comparison of Different Techniques by the Example of Charge and Spin Semiconductor Qubits**

Xutong Wu{2}, Panagiotis Giounanlis{1}, Elena Blokhina{2}, R.Bogdan Staszewski{2}  
*{1}Equal1 Labs, Ireland; {2}University College Dublin, Ireland*

#### **Spin-Based Quantum Computing in silicon: Scaling with CMOS**

Miguel Fernando Gonzalez Zalba  
*Quantum Motion Technologies, United Kingdom*

#### **Qubit Bias Using a CMOS DAC at mK Temperatures**

René Otten{1}, Lea Schreckenberger{1}, Patrick Vliex{1}, Julian Ritzmann{2}, Arne Ludwig{2}, Andreas Wieck{2}, Hendrik Bluhm{1}  
*{1}Forschungszentrum Jülich GmbH, Germany; {2}Ruhr-Universität Bochum, Germany*

### **Reproducing Aplysia R-15 Bursting Neurodynamics on a Neuromorphic Microchip**

Paolo Cachi{3}, Soumil Jain{2}, Sebastian Ventura{1}, Gert Cauwenberghs{2}, Krzysztof Cios{3}

{1}Universidad de Córdoba, Spain; {2}University of California at San Diego, United States;  
{3}Virginia Commonwealth University, United States

15:00 – 16:30

#### **Wireless Energy Harvesting Circuits & Applications**

Room: Breakout Room 8

Session Chairs: Mahmoud Wagih & Rupam Das

### **Towards Solution-Processed RF Rectennas: Experimental Characterization and Non-Linear Modelling Based on ZnO Nanogap Diodes**

Mahmoud Wagih{1}, Dimitra Georgiadou{2}

{1}University of Glasgow, United Kingdom; {2}University of Southampton, United Kingdom

### **Novel Energy Harvesting Antennas and Circuits for On-Body Stretchable and Flexible Electronics**

Chaoyun Song{2}, Zhensheng Chen{3}, Jia Zhu{4}, Yalan Yang{1}

{1}Donghua University, China; {2}Heriot-Watt University, United Kingdom; {3}KU LEUVEN, Belgium; {4}Pennsylvania State University, United States

### **A Flexible Metamaterial Based on Split-Ring Resonator Design**

Mengyao Yuan, Rupam Das, Rami Ghannam, Hadi Heidari

University of Glasgow, United Kingdom

### **A Wearable Backscattering Modulator and RF Energy Harvester for UHF RFID Applications**

Irfan Ullah{2}, Mahmoud Wagih{1}, Steve Beeby{2}

{1}University of Glasgow, United Kingdom; {2}University of Southampton, United Kingdom

### **Solar Energy Systems Design in 2D and 3D: a Comparison of User Vital Signs**

Noor Alqallaf, Fahad Ayaz, Satyam Bhatti, Sajjad Hussain, Ahmed Zoha, Rami Ghannam

University of Glasgow, United Kingdom

### **A 6-20 GHz 400-MHz Modulation-Bandwidth CMOS Transmitter IC**

Ali Raza Saleem{1}, Saeed Naghavi{1}, Mahwish Zahra{1}, Kari Stadius{1}, Marko

Kosunen{1}, Lauri Anttila{2}, Mikko Valkama{2}, Jussi Ryynanen{1}

{1}Aalto University, Finland; {2}Tampere University, Finland

16:30 – 17:00

#### **Closing Session**

Room: Auditoria

## IEEE Policies

### IEEE Code of Ethics

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members, and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree:

1. to hold paramount the safety, health, and welfare of the public, to strive to comply with ethical design and sustainable development practices, and to disclose promptly factors that might endanger the public or the environment;
2. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
3. to be honest and realistic in stating claims or estimates based on available data;
4. to reject bribery in all its forms;
5. to improve the understanding by individuals and society of the capabilities and societal implications of conventional and emerging technologies, including intelligent systems;
6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
7. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;
8. to treat fairly all persons and to not engage in acts of discrimination based on race, religion, gender, disability, age, national origin, sexual orientation, gender identity, or gender expression;
9. to avoid injuring others, their property, reputation, or employment by false or malicious action;
10. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics.

Changes to the IEEE Code of Ethics will be made only after the following conditions are met:

- Proposed changes shall have been published in THE INSTITUTE at least three (3) months in advance of final consideration by the Board of Directors, with a request for comment, and
- All IEEE Major Boards shall have the opportunity to discuss proposed changes prior to final action by the Board of Directors, and
- An affirmative vote of two-thirds of the votes of the members of the Board of Directors present at the time of the vote, provided a quorum is present, shall be required for changes to be made.

### IEEE Code of Conduct

ICECS 2022 is committed to providing an inclusive and harassment-free environment in all interactions regardless of gender, sexual orientation, disability, physical appearance, race, or religion. This commitment extends to all ICECS 2022 sponsored events and services (webinars, committee meetings, networking functions, online forums, chat rooms, and social media) and any interaction regardless of affiliation or position. As a community that aims to share ideas and freedom of thought and expression, it is essential that the interaction between attendees take place in an environment that recognizes the inherent worth of every person by being respectful of all. ICECS 2022 does not tolerate harassment in any form. Harassment is any form of behavior intended to exclude, intimidate, or cause discomfort. Harassment includes, but is not limited to, the use of abusive or degrading language, intimidation, stalking, harassing photography or recording, inappropriate physical contact, and unwelcome sexual attention.

Anyone who experiences, observes, or has knowledge of threatening behavior is encouraged to immediately report the incident to the Conference Manager. All information shared will be kept confidential. In cases where a public response is deemed necessary, the identities of victims and reporters will remain confidential unless those individuals consent otherwise.

ICECS 2022 reserves the right to take appropriate action to foster an inclusive and respectful environment. Attendees violating these rules may be asked to leave the conference without a refund, at the sole discretion of the conference organizers. In addition, attendees are subject to the IEEE Code of Ethics.

Please contact the Conference Manager if you experience, observe, or have knowledge of behavior in violation of the Code of Conduct.

Please contact the Conference Manager with any questions about the Code of Conduct and Inclusivity & Diversity at ICECS 2022.

### **Event Conduct and Safety Statement**

IEEE believes that science, technology, and engineering are fundamental human activities, for which openness, international collaboration, and the free flow of talent and ideas are essential. Its meetings, conferences, and other events seek to enable engaging, thought provoking conversations that support IEEE's core mission of advancing technology for humanity. Accordingly, IEEE is committed to providing a safe, productive, and welcoming environment to all participants, including staff and vendors, at IEEE-related events.

IEEE has no tolerance for discrimination, harassment, or bullying in any form at IEEE-related events. All participants have the right to pursue shared interests without harassment or discrimination in an environment that supports diversity and inclusion.

Participants are expected to adhere to these principles and respect the rights of others. IEEE seeks to provide a secure environment at its events. Participants should report any behavior inconsistent with the principles outlined here, to on site staff, security or venue personnel, or to [eventconduct@ieee.org](mailto:eventconduct@ieee.org).

### **IEEE Non-discrimination Policy**

IEEE prohibits Discrimination, Harassment and Bullying against any person for any reason, for example, because of age, ancestry, color, disability or handicap, national origin, race, religion, gender, sexual or affectional orientation, gender identity, appearance, matriculation, political affiliation, marital status, veteran status or any other characteristic protected by law. IEEE employees, volunteers, members, and other constituents of the IEEE, when and wherever those individuals are conducting IEEE business or participating in IEEE events or activities, shall maintain an environment free of Discrimination, including Harassment, Bullying, and Retaliation. Discrimination or harassment of ICECS 2022 participants will not be condoned or tolerated in any form. Conference participants violating this rule may be sanctioned or expelled from the conference without a refund at the discretion of the conference committee.

See [IEEE Policies, Section 9.26 - IEEE Policy Against Discrimination and Harassment \(PDF, 45 KB\)](#) for the complete Policy.

### **IEEE Privacy Policy**

At IEEE, we respect your privacy. We want to ensure that you get the information, content, and experiences that matter most to you. IEEE is committed to protecting the privacy of its members, customers, volunteers, and other contacts. This privacy policy applies to all personal data processed by full-time and part-time employees, volunteers when acting on behalf of IEEE, contractors and partners doing business on behalf of IEEE, as well as all legal entities, all operating locations in all countries, and all business processes conducted by IEEE. For more information, please visit <https://www.ieee.org/security-privacy.html>