IEEE Circuits and Systems Society
Sensory Systems Technical Committee

Annual Report 2019
(Activities for May 2018 through May 2019)

Officers
Chair: Timothy Constandinou, Imperial College London, t.constandinou@imperial.ac.uk
Chair-Elect: Amine Bermak, HKUST, Hong Kong, eebermak@ece.ust.hk
Secretary: Shoushun Chen, Nanyang Technological University, Singapore, eechenss@ntu.edu.sg
Secretary Elect: Ricardo Carmona-Galán, Sevilla Microelectronics Institute, rcarmona@imse-cnm.csic.es
Past Chair: Piotr Dudek, University of Manchester, UK, p.dudek@manchester.ac.uk

Website
http://ieee-cas.org/community/technical-committees/sensory-systems-technical-committee-sstc

Annual Meeting
2018 Meeting: Was at ISCAS 2018, Florence, Italy
VV1.8, Firenze Fiera Congress and Exhibition Center, Tuesday 29th May, 13:15 – 14:15

2019 Meeting: Will be at ISCAS 2019, Sapporo, Japan
Seminar Room 2 (Sapporo City Industrial Promotion Center, 3F), Wednesday 29 May 11:30-12:45
1. Introduction

The goal of the IEEE Circuits and Systems Society (CASS) Sensory Systems Technical Committee (SSTC) is to foster research, development, education and industrial dissemination of knowledge relating to the emerging field of sensors and associated processing systems. The activity is multidisciplinary, drawing upon knowledge and expertise from fields such as biology, physics, mechanics and chemistry, in addition to areas more traditionally associated with the IEEE such as electrical and computer engineering, computer science and information technology.

2. Technical Committee Membership

Committee members are experts, who are active within the field and who contribute to the committee activities. We have recruited a group of TC members that cover all aspects of our TC. The committee has members from academia, national/international labs and industry.

The SSTC presently has 75 active members (see Appendix A). Four new members joined the committee in 2018. 42 people attended the 2018 annual meeting including 38 current members and 4 new members.

3. Participation in ISCAS

ISCAS 2019, SS Track – Best Paper Award

- The top 6 ranked papers in review (minus conflict-of-interest) were ranked by 6 volunteer best paper judges: Jorge Fernández Berni, Tobi Delbruck, Paula López Martínez, Ibrahim (Abe) Elfadel, Shih-Chii Liu, Ricardo Carmona Galán. Each volunteer ranked the papers and the paper with the highest average score was selected.
- Best Paper Award 2019 of the IEEE CAS Society - Sensory Systems Technical Committee (SSTC)
  - "A Compact 4-Decade Dynamic Range Readout Module for Gamma Spectroscopy and Imaging"
  - Giovanni L. Montagnani, Luca Buonanno, Davide Di Vita, Carlo Fiorini, Marco Carminati
- Best Paper Runner Up 2019 of the IEEE CAS Society - Sensory Systems Technical Committee (SSTC)
  - "Temperature sensors incorporated into a CMOS image sensor with column zoom ADCs"
  - Shuang Xie, Xiaoliang Ge, Albert Theuwissen

ISCAS 2019, SS Track – Review Committee and Participation

- SS Track received 43 submissions for ISCAS 2019 (compared to 65 in 2018), 20 papers accepted (46%).
- 2 track chairs and 22 RCMs participated in the review process. Thanks to all RCM members for their great effort and help with review assignment, namely: Tim Constandinou, Themis Prodromakis, Paula Lopez, Pantelis Georgiou, Gert Cauwenberghs, Venkat Rangan, Nicole McFarlane, Milutin Stanecevic, Juan Leñero-Badallo, Maurizio Valle, Ibrahim Elfadel, Ricardo Carmona, Shoushun Chen, Matthew Law, Nicola Massari, Christoph Posch, Christos Papavassiliou, Timir Datta-Chaudhuri, Iraklis Anagno, Victor Brea, Shii-Chii Liu, Piotr Dudek, Alex Serb
- SSTC organized a total of 4 sessions at ISCAS 2019 (3 oral, 1 poster).
  - Oral sessions: Image Sensors, Sensory Systems, Chemical & Mechanical Sensors
  - Poster sessions: Sensory Circuits & Systems

IEEE Circuits and Systems Society
4. Distinguished Lecturer Program

SSTC currently has four Distinguished Lecturers:

- Pantelis Georgiou (2018-19 roster)
- Andrew Mason (2019-20 roster)
- Man-Kay (Matthew) Law (2019-20 roster)
- Andreas Andreou (2019-20 roster)

5. New IEEE Fellows

One committee member was elevated to IEEE Fellow status in 2019:

- Maysam Ghovanloo

6. Committee Member Activities

In addition to their research and scientific activities, the Committee members are contributing to the development of the field of Sensory Systems through the organisation of many conferences & workshops, and other dissemination activities, including delivering numerous invited lectures and seminars. They are serving on Editorial Boards of many journals and are active in a number of committees within IEEE and beyond.

Many are also active in knowledge transfer and commercialisation activities, including publication of patents. Their work has been recognised by various awards.

Below is a summary of individual member activities (24 members responded to requests for this information).

Short Courses, Plenary Sessions, Keynote Speakers, Invited Lectures

Alejandro Linares-Barranco

Alexander Serb
- Invited lecture: Huawei professors’ day, Moscow, Nov. 2018.

Sandro Carrara
- “Neuromorphic Silicon Learning Machines,” Colloquium, Naval Research Laboratory, Washington DC, April 1, 2019.
Gert Cauwenberghs
- “Neuromorphic Silicon Learning Machines,” Colloquium, Naval Research Laboratory, Washington DC, April 1, 2019.

Ibrahim (Abe) M. Elfadel

Man-Kay Law

Pantelis Georgiou

Ricardo Carmona-Galán
- "Feature extraction at sensor level in CMOS vision chips", ACM International Conference on Distributed Smart Cameras (ICDSC’18), Eindhoven (Netherlands), Sept. 3-4, 2018.
- "Efficient low-level feature extraction in smart CMOS image sensors", Third Barcelona Technoweight: Course on Semiconductor Detectors. Institut de Ciencies del Cosmos, Universitat de Barcelona, Spain, July 2-6, 2018.

Shih-Chii Liu
Timir Datta-Chaudhuri

Timothy Constandinou

Tobi Delbruck
- Why we stopped working on hardware SNNs (for now), CapoCaccia Neuromorphic Cognition Workshop, Sardinia, May 2018.
- Quick visual robotics with event cameras, 32nd International Congress on High-Speed Imaging and Photonics (ICHSP-32), Twente, Netherlands, Oct. 2018.
- Neuromorphic AI Tutorial, AICAS, Hsinshu, Taiwan, Mar. 2019.

CONFERENCES

Alejandro Linares-Barranco
- RCM ISCAS 2019.

Sandro Carrara
- IEEE BioCAS 2019 (Publicity Co-Chair).
- IEEE ISCAS2019 (Tutorial Chair).
- PRIME 2019 (General Chair).
- IEEE MeMeA (General Co-Chair).

Gert Cauwenberghs
- Organizational Committee (Special Sessions), IEEE BioCAS’2019.

Ibrahim (Abe) M. Elfadel
- CAD Track Co-chair, Technical Program Committee, 26th IEEE/IFIP International Conference on Very Large Scale Integration (VLSI-SoC 2018), Verona, Italy, Oct 8-10, 2018.
- Member of Organizing Committee, SRC/Mubadala Forum on Future AI Hardware Systems, Khalifa University, Abu Dhabi, UAE, April 15 – 16. 2019.

Kea-Tiong (Samuel) Tang
Technical Program Committee, IEEE Life Sciences Conference (LSC), Tutorial co-Chair (2018).
General Vice Co-Chair, Taiwan and Japan Conference on Circuits and Systems (TJCAS), 2018.
Local Arrangement Co-Chair (2019), IEEE International Conference on Artificial Intelligence Circuits and Systems (AICAS).
Technical Program Committee, the 18th International Symposium on Olfaction and Electronic Nose (ISOEN 2019).

Man-Kay Law

Nicola Massari
- TPC of PRIME conference.
- TPC of ICECS conference: organized special session for ICECS 2018.

Nicole McFarlane
- Member of the Technical sub-Committee ICECS 2018.

Orly Yadid-Pecht
- Member of the Technical Committee for the IEEE Workshop on CCDs and Advanced Image Sensors (2016-).
- Member of the IEEE CAS Analog Signal Processing, Neural Networks and Sensors Technical Committees (1996-Present).
- Member of the Steering Committee for the IEEE ICECS (2003-present).

Pantelis Georgiou
- IEEE BioCAS 2018 Conference, Special Sessions Chair (Cleveland, US).
- IEEE Sensors 2018 Conference, Live Demo Chair (New Delhi, India).

Paula López Martínez
- Co-Chair of the Women in CAS Committee of the ISCAS 2020.

Shih-Chii Liu
- Review member of IEEE ISCAS 2018.

Timir Datta-Chaudhuri
- Member of the CAS BIOCAS TC.
- Member of the CAS SS TC.

Timothy Constandinou
- IEEE NeuroCAS 2018 Workshop, General Chair.

Tobi Delbruck
- Co-organizer AICAS 2019 (Demos and Jeopardy Event), Hsinshu City, Taiwan.
Víctor Manuel Brea
• Program Chair of 12th International Conference on Distributed Smart Cameras (ICDSC 2018), Eindhoven, Netherlands, Sept. 3rd-4th 2018 (ACM).

EDITORIAL BOARDS

Alejandro Linares-Barranco
• AE – IEEE TCAS II – Express Briefs.
• AE – Frontiers on Neuromorphic Engineering.

Amine Bermak
• IEEE transactions on Electron Devices.
• Nature Scientific Reports.

Sandro Carrara
• ExCom of the IEEE Sensors Council.
• AdCom of the IEEE Sensors Council.
• Scientific Board of the Swiss Integrative Center for Human Health (2019-).

Gert Cauwenberghs
• IEEE Transactions on Biomedical Circuits and Systems.
• IEEE Transactions on Biomedical Engineering.
• Frontiers in Neuroscience (Frontiers in Neuromorphic Engineering)

Ibrahim (Abe) M. Elfadel
• Associate Editor: IEEE Transactions on VLSI.
• Guest Editor: Micromachines, Special Issue on MEMS Accelerometers, April 2019.
• Editor Board: Microelectronics Journal (Elsevier).

Iraklis Anagnostopoulos
• Reviewer IEEE Transactions on Computers, IEEE Transactions on Very Large Scale Integration Systems, IEEE Embedded System Letters

Kea-Tiong (Samuel) Tang
• Associate Editor of IEEE Transactions on Biomedical Circuits and Systems (2014 – present).

Nicole McFarlane
• Associate Editor TBioCAS (2019-present).

Orly Yadid-Pecht
• Member of the Editorship Board, International Journal Information Models and Analysis, 2013 – present.
• Associate Editor, Journal for Low Power Engineering Applications January 2011 – Present.

Pantelis Georgiou
• IEEE Transactions on Biomedical Circuits and Systems, Associate Editor.
• IEEE Sensors, Associate Editor.

Ricardo Carmona-Galán
• Associate Editor, Journal of Real-Time Image Processing, Springer (ISSN 1861-8200).
Shih-Chii Liu
- IEEE Trans. on Biomedical Circuits and Systems, Associate Editor.
- Frontiers in Neuromorphic Engineering, Associate Editor.
- Neural Networks Journal, Associate Editor.

Shoushun Chen
- Associate Editor, IEEE Sensors Journal.

Timir Datta-Chaudhuri
- Associate Editor – Bioelectronic Medicine (Springer Nature).

Timothy Constandinou
- IEEE Transactions on Biomedical Circuits and Systems.

Tobi Delbruck
- Frontiers in Neuromorphic Engineering, Associate Editor.

Víctor Brea
- Advisory board of Workshop of Architecture of Smart Cameras (WASC).

Awards, Honors

Amine Bermak
- Best Researcher Award at HBKU, College of Science and Engineering, for 2018.

Ibrahim (Abe) M. Elfadel
- Board of Directors Award from the Semiconductor Research Corporation, USA, for “Pinoneering Semiconductor Research in Abu Dhabi.” Jointly with Prof. Mohammad Ismail, September 2018.
- A. Richard Newton Young Student Fellow Award from the Design Automation Conference, San Francisco, CA, June 2018, for my Research Engineer and former MSc student Hector Gonzalez Diaz.

Kea-Tiong (Samuel) Tang
- Bronze Award, the 18th Golden Silicon Award, 2018.
- Outstanding Electrical Engineering Professor Award, the Chinese Institute of Electrical Engineering, 2018.

Orly Yadid-Pecht
- 2018 ASTech Technology Leadership Award.
- 2018 AIMBE Fellowship.

Pantelis Georgiou
- The Rosetrees Trust Interdisciplinary Award 2018.

Wei Tang
• Teaching-Research-Service Synergy Award, College of Engineering, New Mexico State University 2019.

**PATENTS**

**Alexander Serb**

**Amine Bermak**

**Gert Cauwenberghs**

**Ibrahim (Abe) M. Elfadel**

**Orly Yadid-Pecht**

**Paula López Martínez**
• Title: Energy harvesting System with integrated Power Management Unit and solar cell in the same silicon substrate. Inventors: Esteban Ferro Santiago, Paula López Martínez, Víctor M. Brea Sánchez, Diego Cabello Ferrer. Nº: T201730001 (Spanish Office of Patents and Marks).

**Ricardo Carmona-Galán**
• I. Vornicu, R. Carmona Galán, Á. Rodríguez Vázquez, "Método y dispositivo de detección de pico del histograma comprimido de los valores de pixel en sensores de tiempo de vuelo de alta resolución". CSIC-Universidad de Sevilla. Núm. P201830870, 05-SEP-2018. OEPM (España).

**Shih-Chii Liu**
• Patent No. 15/347,501 "Memory cell unit and recurrent neural network including multiple memory cell units”.

**Shoushun Chen**

**Wei Tang**
8. SELECTED REPRESENTATIVE PUBLICATIONS

In order to provide a “curated” list of publications, the members were asked to highlight their three most important publications of the past year (31 members responded to requests for this information).

**Alejandro Linares-Barranco**

**Alexander Serb**
- Seamlessly fused digital-analogue reconfigurable computing using memristors, Nature Communications.
- Practical Implementation of Memristor-Based Threshold Logic Gates, IEEE TCAS I.

**Amine Bermak**
- Fang Tang ; Zhou Shu ; Mingdong Li ; Yi Hu ; Xichuan Zhou ; Shengdong Hu ; Zhi Lin ;Ping Gan ; Tiancong Huang ; Amine Bermak, “A Low Power and Fast Tracking Light-to-Frequency Converter With Adaptive Power Scaling for Blood SpO2 Sensing” IEEE Transactions on Biomedical Circuits and Systems, Volume: 13 , Issue: 1, 2019.

**Fernando Perez-Peña**

**Gert Cauwenberghs**

Ibrahim (Abe) M. Elfadel

Iraklis Anagnostopoulos

Jorge Fernández-Berni
• D. Velasco-Montero, J. Fernández-Berni, R. Carmona-Galán and Á. Rodríguez-Vázquez, “Demo: Deployment of DNNs on Heterogeneous Hardware in a Low-Cost Smart Camera,” in ACM Int. Conf. on Distributed Smart Cameras (ICDSC), Eindhoven, Netherlands, September 2018.

Kea-Tiong (Samuel) Tang

Man-Kay Law

Nicola Massari
• Tomasi, Alessandro; Meneghetti, Alessio; Massari, Nicola; Gasparini, Leonardo; Rucatti, Daniele; Xu, Hesong, “Model, Validation, and Characterization of a Robust Quantum Random Number Generator Based on Photon Arrival Time Comparison”, in «JOURNAL OF LIGHTWAVE TECHNOLOGY», vol. 36, n. 18, 2018, pp. 3843 -3854.
• Xu, Hesong; Perenzoni, Daniele; Tomasi, Alessandro; Massari, Nicola, “A 16x16 Pixel Post-Processing Free Quantum Random Number Generator Based on SPADs”, in «IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS. II, EXPRESS BRIEFS», vol. 65, n. 5, 2018, pp. 627 -631.
• Alberini, Giacomo; Gottardi, Massimo; Massari, Nicola; Passerone, Roberto, “A Low-Power Clock-Less Pulse Width Modulator Architecture for Smart Imaging”, in «JOURNAL OF LOW POWER ELECTRONICS», vol. 14, n. 1, 2018, pp. 118 -128.

Nicole McFarlane

Orly Yadid-Pecht
• J. Yang, A. Hore, O. Yadid-Pecht, “A local tone mapping algorithm and hardware implementation” Electronics Letters, Vol. 54, no. 9, pp 560-562, May 2018

Pantelis Georgiou

Paula López Martínez
• Esteban Ferro Santiago, Víctor Manuel Brea, Paula López, D. Cabello, Micro-energy harvesting system including a PMU and a solar cell on the same substrate with cold start-up from 2.38 nW and input power range up to 10µW using continuous MPPT, IEEE Transactions on Power Electronics (Early access), DOI: 10.1109/TPEL.2018.2877105

**Ricardo Carmona-Galán**


**Sandro Carrara**


• Tugba Kilic, Valerie Brunner, Laurent Audoly, Sandro Carrara, A novel psychoanalytical approach: an electrochemical ligand-binding assay to screen antipsychotics, Biosensors and Bioelectronics 100(2018) 139-147.

• Ioulia Tzouvadaki, Abduwaili Tuoheti, Séverine Lorrain, Manfredo Quadroni, Marie-Agnès Doucey, Giovanni De Micheli, Danilo Demarchi, Sandro Carrara, Multi-panel, on-single-chip Memristive Biosensing, accepted for Publication in IEEE Sensors Journal, 2019.

**Shih-Chii Liu**


**Shoushun Chen**


Timir Datta-Chaudhuri


Timothy Constandinou


Tobi Delbruck


Víctor Manuel Brea


Wei Tang

### APPENDIX A. MEMBERSHIP LIST

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