

# **2022 IEEE International Symposium on Olfaction and Electronic Nose (ISOEN 2022)**

**Aveiro, Portugal  
29 May – 1 June 2022**



**IEEE Catalog Number: CFP22F92-POD  
ISBN: 978-1-6654-5861-0**

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IEEE Catalog Number:	CFP22F92-POD
ISBN (Print-On-Demand):	978-1-6654-5861-0
ISBN (Online):	978-1-6654-5860-3

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## Technical Program: Sunday, 29 May 2022

*\*All times stated are local time of Aveiro, Portugal*

9:15 – 9:30

**Registration**

Entrance Hall, ground floor

9:30 – 10:30

**Tutorial: Voltammetric Electronic Tongues: Sensors, Materials and Applications**

Manel del Valle, *Autonomous University of Barcelona*

Small Auditorium, 1<sup>st</sup> floor

10:30 – 10:50

**Coffee Break**

Foyer, 1<sup>st</sup> floor

10:50 – 11:50

**Tutorial: Chemical Sensors for E-Tongue Applications: Working Principles, Advantages and Drawbacks**

Larisa Lvova, *University of Rome Tor Vergata*

Small Auditorium, 1<sup>st</sup> floor

11:50 – 12:50

**Tutorial: Artificial Intelligence Techniques for the Electronic Tongue Data Processing**

Luca Gerevini, *University of Cassino and Southern Lazio*

Small Auditorium, 1<sup>st</sup> floor

12:50 – 14:00

**Lunch**

Foyer, 2<sup>nd</sup> floor

14:00 – 15:00

**Tutorial: Environmental Odour Monitoring. Sensorial Techniques Vs. Artificial Olfaction: Current Status and Future Perspectives**

Laura Capelli, *Politecnico di Milano, Italy*

Small Auditorium, 1<sup>st</sup> floor

15:00 – 16:00

**Tutorial: Field Calibration and Beyond for Air Quality Multisensors Systems**

Saverio de Vito, *ENEA, Italy*

Small Auditorium, 1<sup>st</sup> floor

16:00 – 16:20

**Coffee Break**

Foyer, 1<sup>st</sup> floor

16:20 – 17:20

**Tutorial: Low Cost Sensors and Data Analysis for Indoor Air Quality Monitoring**

Nathalie Redon, *IMT Lille Douai, France*

Small Auditorium, 1<sup>st</sup> floor

## Technical Program: Sunday, 29 May 2022

18:00 - 22:00

**Conference Social Event**

Foyer, 2<sup>nd</sup> floor

## Technical Program: Monday, 30 May 2022

All times stated are local time of Aveiro, Portugal

8:30 – 9:00

### Registration

Entrance hall, ground floor

9:00 – 9:20

### Opening Ceremony

Small Auditorium, 1<sup>st</sup> floor

9:20 – 10:20

### Keynote: Tailoring Proteins for a Bioelectronic Nose

Krishna Persaud, *University of Manchester*

Small Auditorium, 1<sup>st</sup> floor

Session Chair: James Covington, *University of Warwick*

10:20 - 11:00

### Electronic Tongues 1

Small Auditorium, 1<sup>st</sup> floor

Session Chairs: Larisa Lvova, *University of Rome Tor Vergata*

Manel del Valle, *Universitat Autònoma de Barcelona*

10:20

#### [8021 Impedimetric Bio-Electronic Tongue Based on Silver Nanoparticles for the Analysis of Milk...1](#)

Clara Pérez-González, Coral Salvo-Comino, Jose Luis Pura, Fernando Martin-Pedrosa, Cristina García-Cabezón, María Luz Rodríguez-Méndez  
University of Valladolid, Spain

10:40

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Gianmarco Gabrieli, Michal Muszynski, Patrick Ruch  
IBM Research, Switzerland

11:00 – 11:20

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Foyer, 1<sup>st</sup> floor

11:20 - 12:20

### Electronic Tongues 1 cont.

Small Auditorium, 1<sup>st</sup> floor

Session Chairs: Larisa Lvova, *University of Rome Tor Vergata*

Manel del Valle, *Universitat Autònoma de Barcelona*

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Universitat Autònoma de Barcelona, Spain

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<sup>{1}</sup>IPMA, CIIMAR, University of Porto, Portugal; <sup>{2}</sup>University of Aveiro, Portugal

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<sup>{1}</sup>Università degli Studi di Cagliari, Italy; <sup>{2}</sup>Università di Roma Tor Vergata, Italy

12:20 – 13:50

#### **Lunch**

Foyer, 2<sup>nd</sup> floor

13:50 - 15:10

#### **Electronic Noses 1**

Small Auditorium, 1<sup>st</sup> floor

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<sup>{1}</sup>Università di Roma Tor Vergata, Italy; <sup>{2}</sup>University of Bologna, Italy

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<sup>{1}</sup>Fraunhofer-Institute for Process Engineering and Packaging, Germany; <sup>{2}</sup>Friedrich-Alexander-University Erlangen-Nuremberg, Germany; <sup>{3}</sup>Saarland University, Germany

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<sup>{1}</sup>3S GmbH, Germany; <sup>{2}</sup>Saarland University, Germany

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{1}JLM Innovation GmbH, Germany; {2}JLM-Innovation GmbH, Germany; {3}Universitat Rovira i Virgili, Spain; {4}University of Navarra, Spain

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{1}Université Catholique de Louvain, Belgium; {2}Université Catholique de Louvain / VOCSens, Belgium; {3}University of Liège, Belgium; {4}VOCSens, Belgium

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{1}Institute of Nano- and Biotechnologies, Aachen University of Applied Sciences, Germany; {2}Laboratory for Soft Matter and Biophysics, Katholieke Universiteit Leuven, Belgium; {3}MicroNanoBio, Germany

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<sup>{1}</sup>Quantum Design Latin America, Brazil; <sup>{2}</sup>São Paulo State University, Brazil;

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Faculdade de Ciências e Tecnologia Universidade Nova de Lisboa, Portugal

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<sup>{1}</sup>AtmoNormandie, France; <sup>{2}</sup>IMT Nord Europe, France; <sup>{3}</sup>Université Le Havre Normandie, France

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<sup>{1}</sup>Institute of Medical Engineering, Xi'an Jiaotong University, China; <sup>{2}</sup>Zhejiang University, Chile

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<sup>{1}</sup>Institute of Bioengineering of Catalonia, University of Barcelona, Spain; <sup>{2}</sup>University of Barcelona, Spain

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<sup>{1}</sup>3S GmbH, Germany; <sup>{2}</sup>Olfasense GmbH, Germany; <sup>{3}</sup>Saarland University, Germany

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Benamar Bouyeddou<sup>{1}</sup>, Fouzi Harrou<sup>{2}</sup>, Abdelkader Dairi<sup>{3}</sup>, Ying Sun<sup>{2}</sup>

<sup>{1}</sup>Abou Bekr Belkaid University, Algeria; <sup>{2}</sup>King Abdullah University of Science and Technology, Saudi Arabia; <sup>{3}</sup>University of Science and Technology of Oran-Mohamed Boudiaf, Algeria

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<sup>{1}</sup>AMPLIA, Spain; <sup>{2}</sup>DAM, Spain; <sup>{3}</sup>ESAMUR, Spain; <sup>{4}</sup>KUNAK, Spain

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Small Auditorium, 1<sup>st</sup> floor

Session Chair: Yanxia Hou, CEA

17:00

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{1}INRA, CNRS, Université de Bourgogne – Franche Comté, Centre des Sciences du Goût et de l'Alimentation, France; {2}Université Grenoble Alpes, CEA, CNRS, IRIG-SyMMES, France

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18:30 – 19:30

#### **ISOCS General Assembly**

Small Auditorium, 1<sup>st</sup> floor

## Technical Program: Tuesday, 31 May 2022

All times stated are local time of Aveiro, Portugal

9:00 – 10:00

### **Keynote: Lifelong Sensors for Overall Health Monitoring and Prevention**

Hossam Haick, *Israel Institute of Technology*

Small Auditorium, 1<sup>st</sup> floor

Session Chair: Corrado di Natale, *University of Rome Tor Vergata*

10:00 - 10:40

### **Sensors**

Small Auditorium, 1<sup>st</sup> floor

Session Chairs: Krishna Persaud, *University of Manchester*

Julian Gardner, *University of Warwick*

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<sup>{1}</sup>Aachen University of Applied Sciences, Germany; <sup>{2}</sup>Institute of Nano- and Biotechnologies, Aachen University of Applied Sciences, Germany; <sup>{3}</sup>SKAN Deutschland GmbH, Germany

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<sup>{1}</sup>Faculdade de Ciências e Tecnologia Universidade Nova de Lisboa, Portugal; <sup>{2}</sup>Institute for Systems and Robotics, Instituto Superior Técnico, University of Lisbon, Portugal

10:40 – 11:00

### **Coffee Break**

Foyer, 1<sup>st</sup> floor

11:00 - 12:00

### **Sensors cont.**

Small Auditorium, 1<sup>st</sup> floor

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Debangana Das<sup>{2}</sup>, Shreya Nag<sup>{1}</sup>, Shubham De<sup>{1}</sup>, Ajanto Kr. Hazarika<sup>{3}</sup>, Santanu Sabhapondit<sup>{3}</sup>, Bipan Tudu<sup>{1}</sup>, Rajib Bandyopadhyay<sup>{1}</sup>, Runu Banerjee Roy<sup>{1}</sup>  
{1}Jadavpur University, India; {2}Silicon Institute of Technology, Jadavpur University, India; {3}Tocklai Tea Research Institute, India

12:00 – 13:20

### **Lunch**

Foyer, 2<sup>nd</sup> floor

13:20 - 14:20

### **Air Quality**

Small Auditorium, 1<sup>st</sup> floor

Session Chair: Nathalie Redon, *IMT Lille Douai*

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ENEA, Italy

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Youbin Zheng, Jing Wang, Rawan Omar, Hossam Haick  
Technion - Israel Institute of Technology, Israel

## Technical Program: Tuesday, 31 May 2022

### **8027 Sensitive Electrochemical Detection of Carvacrol Using Carbon Paste Electrode...N/A**

Sounak Banerjee{1}, Hemanta Naskar{1}, Barnali Ghatak{1}, Shreya Nag{1}, Debangana Das{3}, Runu Banerjee Roy{1}, Nityananda Das{2}, Bipan Tudu{1}, Rajib Bandyopadhyay{1}  
{1}Jadavpur University, India; {2}Jagannath Kishore College, India; {3}Silicon Institute of Technology, Jadavpur University, India

### **8029 A Gold Nanoparticle Decorated Carbon Paste Based Electrochemical Sensor for Enhanced Vanillin Detection...N/A**

Shreya Nag{1}, Debangana Das{2}, Dipan Bandyopadhyay{1}, Bipan Tudu{1}, Rajib Bandyopadhyay{1}, Runu Banerjee Roy{1}  
{1}Jadavpur University, India; {2}Silicon Institute of Technology, Jadavpur University, India

### **8030 Determination of Epicatechin Content in Green Tea Samples Using Near Infrared Spectroscopy...N/A**

Debangana Das{2}, Shreya Nag{1}, Sawon Bhowmik{1}, Ajanto Kr. Hazarika{3}, Santanu Sabhapondit{3}, Bipan Tudu{1}, Rajib Bandyopadhyay{1}, Runu Banerjee Roy{1}  
{1}Jadavpur University, India; {2}Silicon Institute of Technology, Jadavpur University, India; {3}Tocklai Tea Research Institute, India

### **8037 An e-Tongue with Flexible Nanostructured Sensors for Impedimetric Detection of Ibuprofen in Water...N/A**

Ítalo Costa{2}, Leonardo Paterno{2}, Olfa Kanoun{1}, Ammar Al-Hamry{1}  
{1}Technische Universität Chemnitz, Germany; {2}Universidade de Brasília, Brazil

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Aleksandra Kalinowska, Patrycja Agata Matusiak, Patrycja Ciosek-Skibińska  
Warsaw University of Technology, Poland

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{1}FH Aachen – Aachen University of Applied Sciences, Germany; {2}Institute of Nano- and Biotechnologies, Aachen University of Applied Sciences, Germany; {3}MicroNanoBio, Germany; {4}Philipps University Marburg, Germany; {5}University of Stuttgart, Germany

### **8135 Shiga Toxin-Producing E.coli (STEC) ss-DNA Detection by Silve-Chitosan SERS Substrate...N/A**

Yuqing Yang, Luiza Adela Wasiewska, Alan O'Riordan, Pierre Lovera  
Tyndall National Institute, Ireland

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Maria João Santos<sup>{2}</sup>, Elisete Correia<sup>{3}</sup>, Gonçalo Rijo<sup>{1}</sup>, Alice Vilela<sup>{2}</sup>  
{1}Neoception, Portugal; {2}University of Trás-os-Montes e Alto Douro, Portugal; {3}UTAD, Portugal

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Chunsheng Wu  
Institute of Medical Engineering, Xi'an Jiaotong University, China

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{1}Sir Run Run Shaw Hospital, Zhejiang University, China; {2}Zhejiang University, China

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{1}Sir Run Run Shaw Hospital, Zhejiang University, China; {2}Zhejiang University, China

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{1}CICYTEX, Spain; {2}Institute of Physics Technology and Information, ITEFI-CSIC, Spain; {3}Universidad de Extremadura, Spain

### 8070 Prediction of Intrinsic Quality Parameters of Cardamom Using an Electronic Nose...N/A

Alokesh Ghosh<sup>{1}</sup>, Devdulal Ghosh<sup>{1}</sup>, Tarun Kanti Ghosh<sup>{1}</sup>, Madhurima Ghosh<sup>{4}</sup>, Hena Ray<sup>{1}</sup>, Amitava Akuli<sup>{1}</sup>, Om Krishan Singh<sup>{3}</sup>, Nabarun Bhattacharyya<sup>{1}</sup>, Rajib Bandyopadhyay<sup>{2}</sup>  
{1}Centre for Development of Advanced Computing, India; {2}Jadavpur University, India; {3}Ministry of Electronics and Information Technology, India; {4}St. Thomas' College of Engineering and Technology, India

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<sup>{1}</sup>Electrolux Italia S.p.A., Italy; <sup>{2}</sup>Politecnico di Milano, Italy

### **8005 People Stink: Towards Identification of People from Breath Samples...208**

Katri Salminen<sup>{2}</sup>, Jussi Rantala<sup>{1}</sup>, Philipp Müller<sup>{1}</sup>  
<sup>{1}</sup>Tampere University, Finland; <sup>{2}</sup>Tampere University of Applied Sciences, Finland

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University Campus Bio-Medico di Roma, Italy

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Yuxin Xing, Julian Gardner  
Warwick University, United Kingdom

### **8044 Discrimination of Indian Cardamom Using an Array of QCM Sensors...N/A**

Nilava Debabhuti<sup>{3}</sup>, Sumani Mukherjee<sup>{5}</sup>, Subhojit Malik<sup>{2}</sup>, Sourav Manna<sup>{4}</sup>, Prolay Sharma<sup>{3}</sup>, Bipan Tudu<sup>{3}</sup>, Nabarun Bhattacharyya<sup>{1}</sup>, Rajib Bandyopadhyay<sup>{3}</sup>  
<sup>{1}</sup>Centre for Development of Advanced Computing, India; <sup>{2}</sup>Hooghly Engineering & Technology, India; <sup>{3}</sup>Jadavpur University, India; <sup>{4}</sup>Presidency University, Kolkata, India; <sup>{5}</sup>St. Thomas' College of Engineering and Technology, India

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Institute of Synthetic Polymeric Materials, Russian Academy of Science, Russia

### **8067 Identification of Aromatic Rice Varieties Using Machine Learning Enabled Electronic Nose...N/A**

Arun Jana<sup>{1}</sup>, Om Krishan Singh<sup>{2}</sup>, Amitava Akuli<sup>{1}</sup>, Tapas Sutradhar<sup>{1}</sup>, Sibani Das<sup>{1}</sup>, Souvagya Chatterjee<sup>{1}</sup>, Nabarun Bhattacharyya<sup>{1}</sup>  
<sup>{1}</sup>Centre for Development of Advanced Computing, India; <sup>{2}</sup>Ministry of Electronics and Information Technology, India



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Malgorzata Labanska{1}, Sascha Jenkins{2}, Sarah van Amsterdam{2}, John Clarkson{2}, James Covington{2}

{1}Plant Breeding and Acclimatization Institute - National Research Institute, Poland;

{2}University of Warwick, United Kingdom

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Hui En Lee{4}, Zehnder Mercer{1}, Sing Muk Ng{2}, Mahnaz Shafiei{3}, Hong Siang Chua{4}

{1}Malaysian Pepper Board, Malaysia; {2}Sarawak Energy Berhad, Malaysia;

{3}Swinburne University of Technology, Australia; {4}Swinburne University of Technology Sarawak Campus, Malaysia

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José Pedro Santos{1}, Carlos Sánchez Vicente{1}, Isabel Sayago{1}, Jesús Lozano{2}, Patricia Arroyo{2}

{1}Institute of Physics Technology and Information, ITEFI-CSIC, Spain; {2}Universidad de Extremadura, Spain

### 8071 In-Situ Breath Analysis for Non-Invasive Diabetes Detection...N/A

Tarun Kanti Ghosh{1}, Alokesh Ghosh{1}, Hena Ray{1}, Angshuman Chakraborty{1}, Ravi Sankar{1}, Om Krishan Singh{3}, Nabarun Bhattacharyya{1}, Rajib Bandyopadhyay{2}

{1}Centre for Development of Advanced Computing, India; {2}Jadavpur University, India;

{3}Ministry of Electronics and Information Technology, India

### 8087 Electronic Nose for Stress Detection in Engineering Students During Covid-19 Pandemic...N/A

Cristhian Manuel Durán Acevedo, Jeniffer Katherine Carrillo Gómez, Camilo Andrés Albarracín Rojas

University of Pamplona, Colombia

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{1}Sir Run Run Shaw Hospital, Zhejiang University, China; {2}Zhejiang University, China

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Mengxue Liu, Changming Chen, Qunchen Yuan, Liuqing Zhuang, Ping Wang  
Zhejiang University, China

### 8110 Design of Breath Sampling Device and Procedure for Volatile Organic Compounds and Exhaled Breath Condensate...245

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{1}Sir Run Run Shaw Hospital, Zhejiang University, China; {2}Zhejiang University, China

16:20 – 16:40

**Coffee Break**

Foyer, 1<sup>st</sup> floor

## Technical Program: Tuesday, 31 May 2022

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### Healthcare Applications

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<sup>{1}</sup>JLM-Innovation GmbH, Germany; <sup>{2}</sup>Technion - Israel Institute of Technology, Israel; <sup>{3}</sup>Technion Israel Institute of Technology, Israel; <sup>{4}</sup>Ulm University, Germany; <sup>{5}</sup>Uppsala University, Sweden

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#### **8025 A Novel Approach for the Non-Invasive Diagnosis of Prostate Cancer Based on Urine Odour Analysis...252**

Carmen Bax<sup>{2}</sup>, Laura Capelli<sup>{2}</sup>, Fabio Grizzi<sup>{1}</sup>, Stefano Prudenza<sup>{2}</sup>, Gianluigi Taverna<sup>{1}</sup>  
<sup>{1}</sup>IRCCS Humanitas Research Hospital, Italy; <sup>{2}</sup>Politecnico di Milano, Italy

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Yolande Christelle Ketchanji Mougang, Lorena Di Zazzo, Rosamaria Capuano, Marilena Minieri, Corrado Di Natale  
Università di Roma Tor Vergata, Italy

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Small Auditorium, 1<sup>st</sup> floor

Session Chair: Achim Lilienthal, *Örebro University*

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University of Málaga, Spain

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<sup>{1}</sup>Tokyo University of Agriculture and Technology, Japan; <sup>{2}</sup>University of Electro-Communications, Japan

20:00 – 23:00

### Conference Dinner

Hotel Meliã, Banquet Hall

## Technical Program: Wednesday, 1 June 2022

All times stated are local time of Aveiro, Portugal

9:00 – 10:00

### **Experiences in the Detection of Drugs of Abuse in Smuggling Seizures and Forensic Samples Using Electronic Tongue Principles**

Manel Del Valle, Universitat Autònoma de Barcelona  
Small Auditorium, 1<sup>st</sup> floor  
Session Chair: Sandrine Isz, *Alpha MOS*

10:00 - 12:20

### **Signal Processing 1**

Small Auditorium, 1<sup>st</sup> floor  
Session Chair: Santiago Marco, *Institute for Bioengineering of Catalonia*

10:00

### **8011 Global Calibration Models Match Ad-Hoc Calibrations Field Performances in Low Cost Particulate Matter Sensors...270**

Saverio De Vito, Gerardo D' Elia, Girolamo Di Francia  
ENEA, Italy

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### **8017 Regression Model for the Prediction of Pollutant Gas Concentrations with Temperature Modulated Gas Sensors...274**

Arne Kobald, Udo Weimar, Nicolae Bârsan  
University of Tuebingen, Germany

10:40 – 11:00

### **Coffee Break**

Foyer, 1<sup>st</sup> floor

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### **Signal Processing 1 cont.**

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Session Chair: Santiago Marco, *Institute for Bioengineering of Catalonia*

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### **8035 Transfer Learning to Significantly Reduce the Calibration Time of MOS Gas Sensors...277**

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Örebro University, Sweden

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<sup>{1}</sup>Bundesanstalt für Materialforschung und -prüfung, Germany; <sup>{2}</sup>Örebro University, Sweden; <sup>{3}</sup>Tokyo University of Agriculture and Technology, Japan; <sup>{4}</sup>University of Electro-Communications, Japan

12:00

### **8024 Separation of Pure Perfume Mass Spectrum from Interferences Using ICA...288**

Dani Prasetyawan, Takamichi Nakamoto  
Tokyo Institute of Technology, Japan

12:20 – 12:30

#### **Presentation by the Sniffest Competition Winner**

Small Auditorium, 1st floor

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#### **Lunch**

Foyer, 2<sup>nd</sup> floor

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#### **Closing and Award Ceremony**

Small Auditorium, 1<sup>st</sup> floor