ISOEN

International Symposium on Olfaction and Electronic Nose

May 12-15, 2024 | Grapevine, Texas

CONFERENCE PROGRAM

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iSOCS
International Society for
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IEEE Sensors Council

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Welcome Message

Dear International Symposium on Olfaction and Electronic Nose (ISOEN) 2024 Participants: Welcome to Grapevine, Texas, U.S.A.! On behalf of the Organizing Committee, it is our great pleasure to welcome you to the charming historic old town of Grapevine, Texas right in the middle of the hustle and bustle of Dallas – Fort Worth metroplex.

ISOEN brings together experts in various fields of engineering, from biomedical to environmental to materials engineering to the artificial intelligence community, from all over the world, to discuss and exchange knowledge on how to build the next generation of electronic instruments for machine olfaction and gustation, either mimicking nature or introducing novel sensing concepts.

Following previous ISOENs in Montreal, Canada (2017), Fukuoka, Japan (2019) and Aveiro, Portugal (2022), ISOEN 2024 is also co-sponsored by International Society of Olfaction and Chemical Sensing (ISOCS) and Institute of Electrical and Electronic Engineers (IEEE) Sensors Council (SC), and most of the accepted papers will be published in the conference proceedings in the IEEE Xplore, which enables many researchers to access them anytime and anywhere.

We have received 94 submissions that were reviewed with the aid of external reviewers and a member of the Technical Program Committee (TPC) to ensure the quality. The review process was double-blind and identical for all submissions. As a result, 73 papers were accepted for presentation (78% acceptance rate), 36 and 37 of which were assigned as oral papers and posters, respectively. Accepted papers came from 20 different countries from Europe (60.3%), Asia/Pacific (30.1%), North/South America (8.2%), and Africa and Middle East (1.4%). There were 3 late news submissions which were accepted as posters.

ISOEN 2024 will include a total of 8 oral sessions including one special session and 2 poster sessions. These sessions cover a wide range of topics: odor sampling (headspace analysis, dynamic sampling, pre-concentration and storage), new detection principles and materials for sensors for gases, odors and liquids, sensors with multiple responses (known as multivariable or multiparameter sensors, virtual sensor arrays), odor and taste analysis devices including electronic noses and electronic tongues, new data analytics (machine learning) for immunity to interferences, improved stability of baseline and sensitivity, applications (medical, industrial, environmental, air quality, and food safety), IoT and robotic systems with chemical and biological sensors, odor and gustatory perception and olfactory display, bioengineering (cell-based olfactory sensors, receptor-based sensors, bioinspired algorithms).

Three keynotes will be made by Prof. Andreas Schütze (University of Applied Sciences, Krefeld, Germany) on High performance gas measurement systems, Prof. Ping Wang (Zhejiang University, Hangzhou, China) on progress of bioelectronic nose and bioelectronic tongue in vitro and in vivo for

odor and taste perception and by Prof. Yogesh Gianchandani (University of Michigan, Ann Arbor, Michigan, U.S.A.) on on-chip sampling and analysis. One special session will be dedicated to optical sensors and arrays.

The tutorial session on Sunday, May 12 is composed of two blocks: Topic 1 - Innovative sensors and sensor technologies and Topic 2 - development of biomedical devices based on chemical sensing. In the Topic 1, there are three tutorials: Next generation gas sensors: surprising advantages over last-century designs drive societal impact by Dr. Radislav A. Potyrailo (GE Research, U.S.A.), olfactory biosensors and biomimetic electronic noses by Dr. Yanxia Hou-Broutin (French National Center for Scientific Research, France) and from graphene to beyond - unveiling the potential of 2D materials in gas sensing application by Dr. Shirong Huang (TU Dresden, Germany). In the Topic 2, there are also three tutorials: Challenges in the clinical evaluation of breath sensing for diagnostic purposes by Prof. Mārcis Leja (University of Latvia, Riga, Latvia), translating technologies to biomedical applications by Prof. Chiara Veneroni (Politecnico di Milano, Italy) and cost-efficient calibration techniques for gas chemical sensor arrays by Prof. Jordi Fonollosa (Universitat Politècnica de Catalunya, Barcelona, Spain).

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Jeong Bong (JB) Lee

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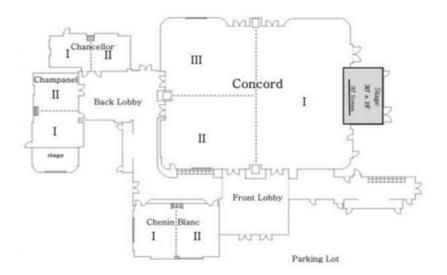Conference Catalysts LLC, USA

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Conference Venue

Venue: The Grapevine Convention Center
1209 S. Main St.
Grapevine, Texas, 76051, USA

The Grapevine Convention Center (GCC) is the chosen venue for the ISOEN 2024 Conference. This state-of-the-art facility is located in the heart of Grapevine, Texas, offering a convenient and dynamic setting for our event.

We are excited to welcome you to the GCC, where groundbreaking research and collaboration will take center stage during the ISOEN 2024 Conference. We look forward to a successful and inspiring event.

Social Events

Welcome Reception
Venue: The Grapevine Convention Center
       Chenin Blanc I and II, Back Lobby, Champanel I and II, Chancellor I and II
Address: 1209 S. Main St. Grapevine, TX, 76051, USA
Date: Sunday, May 12, 2024
Time: 6:00 PM – 8:00 PM

Join us at the conference venue for a Welcome Reception. This is a great time to network and meet other professionals in the field. All participants must pick up their badge prior to the Welcome Reception to participate. Appetizers and drinks will be available.

Sniffest
Venue: The Grapevine Convention Center
       Concord II and III
Address: 1209 S. Main St. Grapevine, TX, 76051, USA
Date: Tuesday, May 14, 2024
Time: 5:00 PM – 6:00 PM

What's that smell? Watch the demonstration as students and participants test their machine olfaction and electronic tongue sensors. They will be testing their machines on a Texas fan favorite – Barbecue Sauce!

Conference Dinner
Venue: The Grapevine Convention and Visitors Bureau
Address: 636 S Main St, Grapevine, TX 76051
Date: Tuesday, May 14, 2024
Time: 6:00 PM – 9:00 PM

Come and celebrate The International Symposium on Olfaction and Electronic Nose 2024! There will be delicious appetizers, a buffet dinner, and exciting programming to showcase the conference. Plus, you will not want to miss out on a live performance by a country singer and our very own cowboy! Yeehaw!

The Grapevine Convention and Visitors Bureau is just a .5 mile walk from the venue. No conference transportation will be provided.

General Information

Registration

The registration desk will be open throughout the conference in the front lobby. Main registration hours are:

Sunday, May 12, 2024: 8:30 AM – 5:30 PM
Monday, May 13, 2024: 8:30 AM – 6:00 PM
Tuesday, May 14, 2024: 8:30 AM – 5:00 PM
Wednesday, May 15, 2024: 8:30 AM – 12:00 PM

You will pick up your badge and other registration materials at the registration table. All participants are required to wear their badges for the duration of the conference.

Onsite Payment

Should you need to make any onsite payments, they must be paid via credit or debit card at the registration table only. Please note that cash payments will not be accepted.

Posters

ALL poster presenters should hang their posters on Monday morning and should remain up during the conference so that people may view the posters during breaks. The poster boards will be labeled with the name of your paper; please put your poster where the name of your paper is. There are two poster sessions. Authors are required to stand by their poster during their designated poster presentation session to answer any questions people might have.

Exhibitors

The exhibitors can set up on Monday morning at 8:00 Am in Concord II and III. All tables will be labeled with the company name. Exhibitor space includes a table, linen, two chairs, and access to power along the wall. Exhibitors should remain set up until Wednesday morning.

Parking

Parking is available near the conference venue. No parking payments are required.

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Baylor University is a private Christian University and a nationally ranked Research 1 institution in Waco, Texas. The University provides a vibrant campus community for more than 20,000 students.

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Tutorials – Topic I

Topic I: Innovative sensors and sensor technologies

Tutorial 1: Next generation gas sensors: surprising advantages over last-century designs drive societal impact

Speaker: Radislav A. Potyrailo
GE Research, Niskayuna, NY, USA

Sunday, May 12, 2024, 9:00 AM – 10:10 AM
Champanel I and II

Abstract: It is conventionally expected that the performance of existing gas sensors may degrade in the field compared to lab conditions because (i) a sensor may lose its accuracy in the presence of chemical interferences and (ii) variations of ambient conditions over time may induce sensor-response drift. Breaking this status quo in poor sensor performance requires understanding the origins of design principles of existing sensors and bringing new principles to sensor designs. Existing gas sensors are single-output (e.g., resistance, electrical current, light intensity) sensors, also known as zero-order sensors. Any zero-order sensor is undesirably affected by variable chemical background and sensor drift that cannot be distinguished from the response to an analyte. In this tutorial, we will demonstrate that to address these limitations, multivariable gas sensors are emerging as the next generation reliable analytical instruments. The tutorial will be structured as three segments that will cover the fundamental and practical aspects of design rules of multivariable sensors, sensor requirements for emerging applications, and comparison of performance of conventional and multivariable sensors with traditional analytical instruments. Multivariable gas sensors (also known as high-order sensors, intelligent sensors, multiparameter sensors, and virtual sensor arrays) are individual sensors that are designed with several independent responses and operate as the first-order analytical instruments. We will present results from our numerous projects and from other research teams that demonstrate three-dimensional, four-dimensional, and even five-dimensional dispersion of individual sensors, differentiation of complex odors and closely related volatiles, and quantification of analytes in mixtures. Next, we will discuss recent reported methodologies to improve stability of multivariable sensors. Design principles of electrical and photonic types of first-order sensors open opportunities for diverse emerging monitoring applications that cannot afford relatively high electrical power demands, relatively high instrument acquisition cost, and frequent periodic maintenance, typical of traditional analytical instruments.

Short Bio: Radislav Potyrailo is a Principal Scientist at GE Research leading the growth of GE's industrial, consumer, and homeland security sensing technologies for gas, chemical, and biological detection. He has an Optoelectronics degree from Kyiv Polytechnic Institute (1985) and a PhD in Analytical Chemistry from Indiana University, Bloomington, IN (1998). At GE Dr. Potyrailo has been directing programs on designs of physical transducers, materials with multi-response mechanisms to ambient environments, data analytics, and system engineering. Dr. Potyrailo has been serving as a technical lead on GE R&D programs transitioned to GE businesses or GE partners for commercialization. Examples include optical multi-parameter chemical sensor for GE Water, wireless gas sensors for GE Oil & Gas, multi-parameter oil sensor for GE Renewable Energy, and GE Ventures start-up company on radio-frequency sensors. Dr. Potyrailo has been serving as a PI on

programs funded by AFRL, ARPA-E, DARPA, DHS, DOE, DTRA, JPEO, NIH, NIOSH, NETL, and TSWG. Dr. Potyrailo is the initiator of the First Gordon Research Conference on Combinatorial and High Throughput Materials Science and serves as an editor of the Springer-Nature book series "Integrated Analytical Systems". He is the North America Chair of International Society for Olfaction and Chemical Sensing and is the Chair of the Device Working Group of the MEMS and Sensors Industry Group. Dr. Potyrailo has 150+ granted US Patents and many publications (Google Scholar h-index 50+). He has delivered 15+ keynote/plenary lectures and numerous invited talks at National and International Meetings. He is a recipient of the Prism Award by SPIE/Photonics Media (2011) and the AMA Innovation Award (2021). Dr. Potyrailo is SPIE Fellow (2011) and recent IEEE Fellow (2023), covering the whole electromagnetic spectrum of his sensors. Dr. Potyrailo has been appointed as a Distinguished Lecturer of the IEEE Sensors Council for the period 2024-2026.

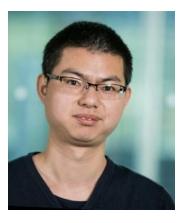**Tutorial 2: Olfactory biosensors and biomimetic electronic noses**

Speaker: Yanxia HOU-BROUTIN
French National Center for Scientific Research, France

Sunday, May 12, 2024, 10:30 AM – 11:40 AM
Champanel I and II

Abstract: Nowadays, there is an increasing demand for reliable analysis of volatile organic compounds (VOCs) in various fields. Sensor-based artificial olfaction is considered as a promising alternative for the standard analytical method such as gas chromatography coupled to mass spectrometry. In such a context, two families of sensor-based systems including olfactory biosensors and electronic noses have been extensively developed in the last four decades. This tutorial will give an overview on olfactory biosensors based on biological materials such as olfactory neurones, olfactory cells, and biomolecules such as olfactory receptors (ORs), odorant binding proteins (OBPs). The main challenge is how to conserve their sensing properties and stability. Herein, the immobilization strategies employed for such a purpose are highlighted. In the second part, the design and the use of more stable biological molecules such as DNA and peptides for the development of biomimetic electronic nose will be presented.

Short Bio: Y. Hou obtained her PhD in Analytical Chemistry at Ecole Centrale de Lyon in France in 2005. In 2006, she did her first postdoc at University of California San Francisco and Touro University (USA), followed by a second postdoc at CEA-LETI, Grenoble (France). Since 2008, she has been employed by French National Center for Scientific Research (CNRS) as permanent scientific researcher. Since 2022, she is research director at CNRS. She has strong expertise on surface chemistry, surface functionalization and characterization, biosensors and biochips for the biomedical applications. Since 2008, she leads the development of novel optoelectronic noses and tongues based on surface plasmon resonance imaging (SPRi) at the laboratory of SyMMES, Grenoble (France). Her research interests include also nanotechnology such as the elaboration and engineering of hybrid multifunctional micro/nanoparticles for nanomedicine. Today, her research activities focus on the development of novel electronic noses by designing novel sensing materials and exploration of their potential applications in diverse fields. She is one of the co-founders and scientific counselor of the company Aryballe, created in 2014 in Grenoble (France) for the miniaturization of the optoelectronic nose for digital olfaction. Today, she is the head of a research group of 24 persons at the laboratory of SyMMES.

Tutorial 3: From graphene to beyond: unveiling the potential of 2D materials in gas sensing application

Speaker: Shirong Huang
TU Dresden, Germany

Sunday, May 12, 2024, 11:40 AM – 12:50 PM
Champanel I and II

Abstract: Gas sensors play a pivotal role in monitoring air quality, ensuring public safety, and detecting trace gases in various industrial sectors. The demand for highly efficient, sensitive, selective, reliable, low-power-consumption, and cost-effective gas sensors is paramount. While traditional metal oxide semiconductor (MOS) materials-based gas sensors have been widely employed in various applications, their selectivity and power consumption remain unsatisfactory. Graphene, as the earliest discovered two-dimensional (2D) material, has gained significant attention for gas sensing application owing to its large specific surface area and high charge carrier mobility. In the past decade, a number of novel 2D nanomaterials, including transition metal dichalcogenides (TMDs, e.g., MoS_2), Mxenes (e.g., Ti_3C_2), and metal-organic frameworks (MOFs), have emerged as promising alternatives. In addition to a large surface-to-volume ratio akin to graphene, these layered materials exhibit semiconducting properties with an adjustable bandgap, offering potential for enhancing gas sensing performance. In this talk, the application of 2D materials in gas sensing will be presented and their working mechanisms will be discussed. The discussion encompasses the unique attributes of each material and their role in modulating transport characteristics to elevate gas sensing capabilities. Lastly, the future prospects of layered materials in gas sensing applications will be presented.

Short Bio: Dr. Shirong Huang has been a group leader in the field of digital olfaction sensor development at TU Dresden, Germany, since 2024. He obtained his doctoral degree in 2022 under the supervision of Prof. Gianaurelio Cuniberti at TU Dresden and continued to work as a postdoctoral researcher afterwards. Prior to joining TU Dresden, his research mainly focused on carbon nanomaterial synthesis and their application as thermal management materials in high power electronic packaging field at Shanghai University, China, where he got his master degree in 2014. He obtained his bachelor degree on Mechanical Engineering in 2011 at Northwest A&F University, China. Currently, his research interest includes: novel low dimensional materials (LDM) synthesis, AI-enabled LDM-based smart gas sensors and electronic nose development, and their applications in emerging fields (e.g., gas detection, VOCs identification, breath analysis, disease diagnosis, etc.), sensing signal processing, gas recognition, understanding of gas sensing mechanism, etc. He serves as the Youth Board Member of journal Applied Research and Brain-X, as well as member of IEEE Sensors Council Young Professional Committee, member of the Technical Program Committee (TPC) of ISOEN 2024 conference. He is reviewer of several peer-reviewed journals, such as Biosensors and Bioelectronics, Small, Sensors and Actuators A: Physical, Advanced Intelligent Systems, Journal of Materials Chemistry, etc. He also serves as guest editor for several journals, such as Advanced Sensor Research, Analysis & Sensing, Small, etc. So far, He has published more than 30 scientific papers in peer-reviewed journals and conference proceeds, such as Applied Physics Reviews, Small, Nano Research, Carbon, Advanced Intelligent Systems, Physical Chemistry Chemical Physics, etc., and 1 book chapter.

Tutorial 4: Challenges in the clinical evaluation of breath sensing for diagnostic purposes

Speaker: Mārcis Leja
University of Latvia, Riga, Latvia

Sunday, May 12, 2024, 2:00 PM – 3:10 PM
Champanel I and II

Abstract: The lessons learned from clinical studies on breath volatile organic marker (VOC) testing will be discussed by focusing on cancer detection. Cancer screening is an attractive use-case for breath analysis, however, new test evaluation for screening is a long-lasting and expensive process since it is requiring very large study group with low pre-testing probability of the disease, therefore, the method has to be evaluated in diagnostic settings first. The steps for a new screening test development are best described in colorectal cancer. A survey conducted in medical specialists has suggested high interest in VOCs as a potential screening test for gastric cancer – 52.2% considered this approach feasible in public health programs, nevertheless, the majority (60.7%) elucidated insufficient evidence to introduce the method to clinical practice. Pre-analytical factors, sampling, sample storage, transportation and pre-processing are important factors in breath analysis that should not be underestimated. Stability of the technology, day to day variability of the test results, but more importantly, – instrument to instrument variability are essential issues for the success of a clinical study and further implementation. Calibration of the instruments may solve these issues. Proper data analysis with the input from multiple sensors could be another important challenge. Finally, the role of confounding factors and mechanistic study experience on the origin of VOCs will be briefly discussed. The potential role of microbiome will be addressed.

Short Bio: Mārcis Leja is a Professor of Medicine, Director of the Institute of Clinical and Preventive Medicine, University of Latvia, Head of the Dept. of Research, Riga East University hospital, and a consulting gastroenterologist at the Digestive Diseases Centre 'Gastro', Riga, Latvia. He serves as an external advisor to the Minister of health of Latvia in oncology and cancer prevention. Dr. Leja was holding a position of a member of the European Cancer Mission Board from 2019 to 2021. His special interest lies in the prevention and early detection of gastrointestinal cancer as well as cancer screening in general. He is the principal investigator of the population-based gastric cancer prevention study GISTAR (www.gistar.eu) and research coordinator of TOGAS (www.togas.lu.lv) project (EU4HEALTH) aimed to develop guidelines for gastric cancer screening in the European Union. He has published more than 200 research papers (out of these at least 120 Scopus or WoSCC), 6 book chapters. HI=32. He is a Fellow of Latvian Academy of Sciences, Fellow of American Gastroenterological Association (AGA), and member of the European Helicobacter and Microbiota Study group (EHMG). The other areas of research interest are related to the use of volatile organic marker (VOC) diagnostic concept in gastrointestinal cancer detection as well as for other conditions, the role of microbiota in health and disease as well as the use of large data for prevention and early detection.

Tutorial 5: Translating technologies to biomedical applications

Speaker: Chiara Veneroni
Politecnico di Milano, Italy

Sunday, May 12, 2024, 3:10 PM – 4:20 PM
Champanel I and II

Abstract: This tutorial will provide an overview of the several critical steps required for translating new technologies for diagnosis to a commercial medical device, focusing on the identification of needs and specific requirements for diagnostic devices, on their scientific and clinical validation by designing an performing the required clinical trials, and on the certification procedures for medical devices.

Short Bio: Chiara Veneroni received a Ph.D. in Biomedical Engineering in 2014 and is an Assistant Professor at Politecnico di Milano University, Department of Electronics, Information, and Bioengineering. Her research activity is at the Technologies for Respiration (TechRes) Laboratory (www.techres.polimi.it). Her interest is in medical technologies and respiratory physiology. Her research focuses on advancing our understanding of respiratory physiology and mechanics, modeling the respiratory system, and developing new methods and technologies for evaluating respiratory function and optimizing respiratory treatments. She collaborates with clinical institutes in several countries to study different respiratory pathologies and conditions. She co-authored over 35 peer-reviewed publications in peer-reviewed international journals

Tutorial 6: Cost-efficient calibration techniques for gas chemical sensor arrays

Speaker: Jordi Fonollosa
Universitat Politècnica de Catalunya, Barcelona, Spain

Sunday, May 12, 2024, 4:50 PM – 6:00 PM
Champanel I and II

Abstract: Heterogeneous gas sensor arrays coupled with machine learning algorithms have been proposed for a wide range of applications. However, inherent sensor variability degrades the performance of calibration models when directly transferred to new replicates of the original system. As a result, in order to fulfill industry requirements, very often, calibration needs to be performed individually for each unit, limiting mass-deployment. In this tutorial I will present calibration methodologies proposed to reduce calibration costs and extend lifetime of the models. Briefly, these strategies make use of calibration models built for a primary system (calibration transfer) or incorporate new information to a calibration model (calibration update). Also, in the field, one can use nearby, collocated units and node redundancy to improve system performance. I will discuss the suitability of each method, which depends on the sensor technology and the required task.

Short Bio: Jordi Fonollosa (PhD, 2009) is Associate Professor at the Universitat Politècnica de Catalunya (UPC). His research efforts have been mainly focused on the integration and processing of sensor signals for the development of Machine Learning algorithms for biomedical applications. In particular, an active research line is the development of algorithms to reduce calibration costs of chemo-sensory systems. Dr. Fonollosa has proposed to apply redundant algorithms to sensory system replicates, calibration transfer techniques, and smart selection of calibration signals for cost-efficient calibration and industrial applications. During his career, Dr Fonollosa has co-authored 37 papers in peer-reviewed international journals and has acted as Principal Investigator in 6 research projects. He is currently the vice-dean of International Relations and Research at the Barcelona School of Nautical Studies at the UPC.

Keynote Speakers

High performance gas measurement systems – bridging the gap between sensors and analytics

Keynote Speaker: Prof. Andreas Schütze
Saarland University, Saarbrücken, Germany

Monday, May 13, 2024, 9:30 AM – 10:30 AM
Main Hall, Concord I

Abstract: Since the introduction of metal oxide semiconductor (MOS) gas sensors by Taguchi in the 1960s these sensors have evolved to the digital MEMS sensors available today, which combine multisensory platforms with integrated electronics for dynamic operation and sensor read-out. Due to their broad response spectrum and combined with machine learning for interpretation of the high-dimensional output data these sensors can address various applications ranging from indoor air quality (IAQ) monitoring, industrial monitoring and safety, food quality control to breath analysis to mention only a few. By utilizing comprehensive calibration advanced sensor systems based on digital MOS sensors can be programmed to address these and other applications and have already demonstrated high performance comparable to analytical systems.

This now opens a path for new gas measurement systems by combining the advantages of sensors (online, mobile, pervasive) and analytical systems (selectivity, reliability), not only in terms of technology but also in terms of quality control. The talk will first outline the state-of-the-art of MOS sensor systems with emphasis on VOC monitoring, identification, and quantification. Then it will present opportunities and challenges for systems combining sensor and analytical technology.

Short Bio: Prof. Andreas Schütze, a distinguished academic in the field of applied physics, obtained his Ph.D. from Justus-Liebig-Universität in Gießen, Germany, in 1994. His research journey has primarily revolved around micro gas sensor systems, and he has garnered extensive experience during his tenure in the industry and as a Professor of Microsystems Technology at the University of Applied Sciences, Krefeld, Germany. Since 2000, he has been a Full Professor of Measurement Science and Technology at Saarland University, Germany. His core area of expertise lies in microsensors and microsystems, with a specific emphasis on advanced chemical sensor systems tailored for gas and liquid phase analysis.

On-chip sampling and analysis — a selective view

Keynote Speaker: Dr. Yogesh Gianchandani
University of Michigan, USA

Tuesday, May 14, 2024, 9:00 AM – 10:00 AM
Main Hall, Concord I

Short Bio: Yogesh B. Gianchandani is a Professor at the University of Michigan, Ann Arbor, with a primary appointment in the Electrical Engineering and Computer Science Department and a courtesy appointment in the Mechanical Engineering Department. Since 2010 Dr. Gianchandani has served as the Director for the Center for Wireless Integrated MicroSensing and Systems (wims2.org) at the University of Michigan.

Dr. Gianchandani's research interests include microsystems for environmental monitoring and healthcare (web.eecs.umich.edu/~yogesh/). He has graduated 48 doctoral students, and contributed to more than 50 US patents and 350 papers in journals and conferences. From 2007 to 2009 he served at the National Science Foundation, as the program director for Micro and Nano Systems within the Electrical, Communication, and Cyber Systems Division (ECCS). Since 2016 he has also served as the CTO of Omniscent, Inc., which develops high performance microfabricated sensors for air quality monitoring.

Progress of Bioelectronic Nose and Bioelectronic Tongue in vitro and in vivo for Odor and Taste Perception

Keynote Speaker: Dr. Ping Wang
Biosensor National Special Lab, Department of Biomedical Engineering, Zhejiang University, Hangzhou, China

Wednesday, May 15, 2024, 9:00 AM – 10:00 AM
Main Hall, Concord I

Abstract: Electronic nose (e-Nose) and electronic tongue (e-Tongue) belong to these technologies, which mimic animal olfactory and gustatory systems to detect odor and taste by exploiting sensitive materials. Bioelectronic nose (Bioe-Nose) and bioelectronic tongue (Bioe-Tongue) based on natural olfactory and gustatory structure of creatures has optimized processing system which has advantages of quick response time, self-updating and fast recovery etc.

The challenges in Bioe-Nose and Bioe-Tongue are obtaining signals from the biological system and understanding the information. The Bioe-Nose and Bioe-Tongue as smell and taste sensors uses olfactory and gustatory living cell, tissue or receptors on the surface of electronic chips in vitro and while they will also could be completed through implanting the microelectrodes into the olfactory or gustatory nerve center in vivo and controlled by brain computer interface (BCI).

This paper reviews the research progress of Bioe-Nose and Bioe-Tongue technology in vitro and in vivo from our group and their recent application in health, disease and food safety monitoring fields etc.

Short Bio: Ping Wang is a full Professor of Biomedical Engineering of Zhejiang University, while he is Director of Biosensor National Special Laboratory and Vice Director of Academic Committee of Key Lab for Biomedical Engineering of National Education Ministry of China, Zhejiang University. He is a member of The International Society for Olfaction and Chemical Sensing (ISOCS), member of Asia-Pacific Regional Steering Committee of International Meeting on Chemical Sensors (IMCS) a member of International Steering Committee of Asian Conference on Chemical Sensors (ACCS). He is also a Director of Biomedical Measurement Society of China, Vice-Director of Ion & Biosensor Society and Vice-Director of Biomedical Sensors Technique Society of China.

Program at a Glance – Sunday

5/12/24 - Sunday		
8:30 AM	Registration Main Lobby	Tutorials Champanel I and II
9:00 AM		
9:30 AM		
10:00 AM		
10:30 AM		
11:00 AM		
11:20 AM		
12:00 PM		
12:30 PM	Lunch Chenin Blanc I and II	
1:00 PM		
1:30 PM		
2:00 PM		
2:30 PM		
3:00 PM		
3:30 PM		
4:00 PM		
5:00 PM		
5:30 PM		
6:00 PM	Welcome Reception Back Lobby	
6:30 PM		
7:00 PM		
7:30 PM		
8:00 PM		

Program at a Glance – Monday

5/13/24 - Monday	
8:30 AM	Registration
9:00 AM	Opening Main Hall, Concord I
9:30 AM 10:00 AM	Keynote Speaker: Andreas Schütze (Saarland University, Germany) Main Hall, Concord I
10:30 AM	Coffee Break Chenin Blanc I and II
11:00 AM 11:20 AM 12:00 PM 12:30 PM	Session: Electronic Noses Main Hall, Concord I
1:00 PM 1:30 PM	Lunch Chenin Blanc I and II, Concord II and III TPC Meeting - Chancellor II and II
2:00 PM 2:30 PM 3:00 PM	Session: Chemical Sensors Main Hall, Concord I
3:40 PM 4:00 PM 4:40 PM	Coffee Break and Poster Session I Chenin Blanc I and II, Lobby
5:00 PM 5:30 PM	Session: Biosensors Main Hall, Concord I
6:00 PM 6:30 PM 7:00 PM	ISOCS General Assembly Main Hall, Concord I

Program at a Glance – Tuesday

5/14/24 - Tuesday	
8:30 AM	Registration
9:00 AM	Keynote Speaker: Yogesh Gianchandani (University of Michigan, USA) Main Hall, Concord I
9:30 AM	
10:00 AM	Session: Data Processing Main Hall, Concord I
10:30 AM	
11:00 AM	Coffee Break Chenin Blanc I and II
11:20 AM	Session: IoT & Robotics Main Hall, Concord I
12:00 PM	
12:30 PM	
1:10 PM	Lunch Chenin Blanc I and II, Concord II and III
1:30 PM	
2:00 PM	Session: Applications Main Hall, Concord I
2:30 PM	
3:00 PM	
3:30 PM	
4:00 PM	
4:40 PM	Coffee Break and Poster Session II Chenin Blanc I and II, Lobby
5:00 PM	Sniffest Concord
5:30 PM	
6:00 PM	Conference Dinner The Grapevine Convention and Visitors Bureau
6:30 PM	
7:00 PM	
7:30 PM	
8:00 PM	
8:30 PM	
9:00 PM	

Program at a Glance – Wednesday

5/15/24 - Wednesday	
8:30 AM	Registration
9:00 AM	Keynote Speaker: Ping Wang (Zhejiang University, Hangzhou, China) Main Hall, Concord I
9:30 AM	
10:00 AM	Special Session - Optical Sensors and Arrays for Taste and Odor Assessment Main Hall, Concord I
10:30 AM	
11:00 AM	Coffee Break Chenin Blanc I and II
11:20 AM	Session: Electronic Tongues Main Hall, Concord I
12:00 PM	
12:30 PM	
1:10 PM	Lunch Chenin Blanc I and II, Concord II and III
1:30 PM	
2:00 PM	Closing Ceremony Main Hall, Concord I
2:30 PM	

Tutorials: Sunday, May 12, 2024

9:00 AM – 10:10 AM
Tutorial 1: Next generation gas sensors: surprising advantages over last-century designs drive societal impact
Speaker: Radislav A. Potyrailo, GE Research, Niskayuna, NY, USA
Champanel I and II

10:10 AM – 10:30 AM
Coffee Break
Chenin Blanc I

10:30 AM – 11:40 AM
Tutorial 2: Olfactory biosensors and biomimetic electronic noses
Speaker: Yanxia HOU-BROUTIN, French National Center for Scientific Research, France
Champanel I and II

11:40 AM – 12:50 PM
Tutorial 3: From graphene to beyond: unveiling the potential of 2D materials in gas sensing application
Speaker: Shirong Huang, TU Dresden, Germany
Champanel I and II

12:50 PM – 2:00 PM
Lunch
Chenin Blanc I

2:00 PM – 3:10 PM
Tutorial 4: Challenges in the clinical evaluation of breath sensing for diagnostic purposes
Speaker: Mārcis Leja, University of Latvia, Riga, Latvia
Champanel I and II

3:10 PM – 4:20 PM
Tutorial 5: Translating technologies to biomedical applications
Speaker: Chiara Veneroni, Politecnico di Milano, Italy
Champanel I and II

4:20 PM – 4:50 PM
Coffee Break
Chenin Blanc I

4:50 PM – 6:00 PM
Tutorial 6: Cost-efficient calibration techniques for gas chemical sensor arrays
Speaker: Jordi Fonollosa, Universitat Politècnica de Catalunya, Barcelona, Spain
Champanel I and II

6:00 PM – 8:00 PM
Welcome Reception
Grapevine Convention Center

Technical Program: Monday, May 13, 2024

9:00 AM – 9:30 AM
Opening Session
Main Hall, Concord I

9:30 AM – 10:30 AM
Keynote Speaker: Andreas Schutze, Saarland University, Germany
Main Hall, Concord I

10:30 AM – 11:00 AM
Coffee Break
Chenin Blanc I and II

11:00 AM – 1:00 PM
Session: Electronic Noses
Main Hall, Concord I

11:00 AM
Novel High-Affinity Peptides Selected by Phage Display for Selective Detection of Aromatic VOCs
Vanessa Escobar[1], Sophie Brenet[1], Charlotte Hurot[1], Marielle El Kazzy[1], Arnaud Buhot[1], Natale Scaramozzino[2], Yanxia Hou[1]
[1]Grenoble Alpes University, CEA, CNRS, IRIG-SyMMES, France; [2]Grenoble Alpes University, CNRS, LIPhy, France

11:20 AM
A Biomimetic Genetically Engineered Rats-Based Biosensor for the Detection of Dangerous Acid Odorants
Yating Chen, Miaomiao Wang, Zhiyao Wang, Minggao Liu, Shuge Liu, Liping Du, Chunsheng Wu
Xi'an Jiaotong University, China

11:40 AM
Identification of Volatile Organic Compound Mixtures with a Micromachined Quartz Resonator Through Temperature Modulation with On-Chip Integrated Heater
Jiayuan Zhang[1], Nishit Goel[2], Stephen Bart[2], Srinivas Tadigadapa[1]
[1]Northeastern University, United States; [2]TDK Invensense, United States

12:00 PM
Hybrid ZnO-Phthalocyanine Nanostructured Sensitive Films for Virtual Sensor Arrays
Julia Burlachenko, Ivanna Kruglenko, Eduard Manoylov, S. Kravchenko, Iryna Krishchenko, Boris Snopok
V.E. Lashkaryov Institute of Semiconductor Physics NAS of UKraine, Ukraine

12:20 PM
DronE-Nose: Drone-Embedded Measurement Platform for Odour Monitoring
Javier Alonso-Valdesueiro[2], Santiago Marco Colàs[1], Agustín Gutiérrez-Gálvez[2]
[1]Institute for Bioengineering of Catalonia, Spain; [2]Universitat de Barcelona, Spain

12:40 PM
Low-Dimensional Nanomaterials-Based Smart Gas Sensors for Odor Identification
Shirong Huang, Gianaurelio Cuniberti
Technische Universität Dresden, Germany

1:00 PM – 2:00 PM
Lunch
Chenin Blanc I and II, Concord II and III

2:00 PM – 3:40 PM
Session: Chemical Sensors
Main Hall, Concord I

2:00 PM
A Miniaturized Electrochemical Gas Sensor Utilizing Ionic Liquid/Polymeric Ionic Liquid-Based Solid-State Electrolyte
Zhuoru Huang{2}, Zhejia Li{2}, Ping Wang{1}, Hao Wan{1}
{1}Biosensor National Special Laboratory, Zhejiang University, China; {2}Zhejiang University, China

2:20 PM
Dielectric Excitation of Metal Oxide Semiconductor Sensors: An Exploratory Performances Analysis
Stefano Robbiani{2}, Alessandro Andrea Benegiamo{1}, Laura Maria Teresa Capelli{2}, Santiago Marco Colàs{1}, Raffaele Dellacà{2}
{1}Institute for Bioengineering of Catalonia, Spain; {2}Politecnico di Milano, Italy

2:40 PM
Optimizing Gas Sensing Properties of Nanoporous Cu2O Thin Films
Tesfalem Welearegay{3}, Zouhair Haddi{1}, Xavier Blanch Martinez{2}, Eduard Llobet{2}, Lars Österlund{3}
{1}Nvsion, Spain; {2}Universitat Rovira i Virgili, Spain; {3}Uppsala University, Sweden

3:00 PM
Advancements in Drug Monitoring: A GC-MOS Approach for Propofol Measurement
Oliver Brieger{2}, Dennis Arendes{1}, Christian Bur{1}
{1}Lab for Measurement Technology, Saarland University, Germany; {2}Saarland University, Germany

3:20 PM
Sensitive Membrane Resonator Sensor for Sub-Micron Diameter Particle Counting
Adam Jaafar{1}, Zhenming Liu{1}, Xinyu Jiang{1}, Daniel Struk{1}, Peter Hesketh{1}, Farrokh Ayazi{1}, Abhilash Ojha{2}, Christopher Hogan{2}
{1}Georgia Institute of Technology, United States; {2}University of Minnesota, United States

Manufacture of Monolayer and Multilayer Graphene Sensors for NO2 Gas Detection
Dong Hyuk Jeong, Suji Choi, Jin Beom Kwon, Dong Gun Jung, Daewoong Jung
Korea Institute of Industrial Technology, Korea

Polysilicon-Based Thermopile with SU-8 Infrared Absorption Layer for CO_2 Detection
Junyeop Lee, Seongpil Hwang, Untae Ha, Uksu Han, Daewoong Jung
Korea Institute of Industrial Technology, Korea

Experimental Study of Gas Propagation: Parameter Identification and Analysis in a Wind Tunnel
Patrick Hinsen[1], Thomas Wiedemann[1], Victor Scott Prieto Ruiz[1], Dmitriy Shutin[1], Achim J. Lilienthal[2]
[1]DLR German Aerospace Center, Germany; [2]Technische Universität München, Germany

Metal Oxide Semiconductor Sensors for Acetone Detection with Hot Wire Type Structure
Tatsuya Ohishi[2], Shoichiro Nakao[2], Takafumi Taniguchi[2], Hirokazu Mitsuhashi[2], Takeshi Eda[1], Tomohiro Kawaguchi[1]
[1]Figaro Engineering Inc., Japan; [2]New Cosmos Electric Co., Ltd., Japan

Mass-Producible CuBr Thick Film Gas Sensors and its Highly Selective Ammonia Sensing Properties
Tsuyoshi Ueda, Shoichiro Nakao, Hiroshi Miyazaki, Takafumi Taniguchi, Hiromasa Takashima
New Cosmos Electric Co., Ltd., Japan

Discrimination of Methanol from Ethanol Using Graphene-Based Smart Gas Sensors
Shirong Huang, Bergoi Ibarlucea, Gianaurelio Cuniberti
Technische Universität Dresden, Germany

Miniaturized Electrochemical Gas Sensors Based on Room Temperature Ionic Liquids and Wearable Systems for Rapid Gas Sensing
Hao Wan[1], Zhuoru Huang[2], Guangqing Ren[2], Ping Wang[1]
[1]Biosensor National Special Laboratory, Zhejiang University, China; [2]Zhejiang University, China

Real-Time Monitoring of Odour Concentration at Emission Sources by IOMS: Comparison of Different Regression Models
Stefano Prudenza, Carmen Bax, Laura Maria Teresa Capelli
Politecnico di Milano, Italy

Research on Thermal Field Coupling Simulation of Silicon-Based Micro-Hotplate CO Sensor
Tianjun Ma[1], Na Li[3], Yinghao Liu[3], Wenjing Yue[3], Jianhai Sun[2]
[1]Quanzhou University of Information Engineering, China; [2]State Key Laboratory of Transducer Technology, Institute of Electronics, Chinese Academy of Science, China; [3]University of Jinan, China

Non-Invasive Detection of Corrosion Through Odour Emissions: Sniffing Out Rust
Ines Carotti, David Hutchins, Duncan Billson, James Covington
University of Warwick, United Kingdom

Real-Time Monitoring of Bread Baking in Ovens by Smart Odour Sensors: Focus on Calibration Transfer

Beatrice Julia Lotesoriere, Lorenzo Viareggi, Carmen Bax, Laura Maria Teresa Capelli
Politecnico di Milano, Italy

Electronic Tongue (E-Tongue) for Toxic Bioamine Determination in Food Quality Analysis Using Polymerized Gold Electrode with Poly Toluidine Blue

Tanzila Noushin{1}, Muhammad Luqman Haider{2}, Jinwon Jeong{1}, Jeong Bong Lee{1}
{1}Baylor University, United States; {2}University of Texas at Dallas, United States

Colorectal Cancer Diagnosis by the Breath Analysis with a QMB-Based Electronic Nose

Rosamaria Capuano, Alexandro Catini, Roberto Paolesse, Giovanna Del Vecchio Blanco, Francesco Torino, Federica Sangiuolo, Corrado Di Natale
Università degli Studi di Roma Tor Vergata, Italy

Discriminating Artificial Cancer Breath Using an Electronic Nose : K-Nearest Neighbors Versus Long-Short Term Memory Network

Justin Martin, Claudia Falzone, Anne-Claude Romain
University of Liège, Belgium

A Hybrid Metal-Oxide Conductive Polymer Electronic Nose

Valerio Allegra, Rosamaria Capuano, Alexandro Catini, Roberto Paolesse, Corrado Di Natale
Università degli Studi di Roma Tor Vergata, Italy

Odour Monitoring in a Wastewater Treatment Plant by Portable Ion Mobility Spectrometry

Veronica Villa{3}, Luis Fernández Romero{4}, Beatrice Julia Lotesoriere{3}, Javier Alonso-Valdesueiro{4}, Agustín Gutiérrez-Gálvez{4}, Lara Terrén{1}, Lidia Sauco{1}, Laura Maria Teresa Capelli{3}, Santiago Marco Colàs{2}
{1}DAM Depuración de Aguas del Mediterráneo, Spain; {2}Institute for Bioengineering of Catalonia, Spain; {3}Politecnico di Milano, Italy; {4}Universitat de Barcelona, Spain

Assessment of Roasted Coffee Adulteration with Coffee Husks by Electronic Tongue and Gas Chromatography

Maria Loura, Cláudia P. Passos, Manuel A. Coimbra, Sílvia Petronilho, Alisa Rudnitskaya
Universidade de Aveiro, Portugal

Inkjet-printed sensor array for the simultaneous detection of adulterants present in drugs of abuse

Xavier Cetó{2}, Dionisia Ortiz-Aguayo{2}, Gemma Gabriel{1}, Manel del Valle{2}
{1}Institute of Microelectronics of Barcelona, Spain; {2}Universitat Autonoma de Barcelona, Spain

5:00 PM – 6:00 PM
Session: Biosensors
Main Hall, Concord I

5:00 PM
Biomimetic Olfactory Sensor Based on Uniform OE Organoids
Nan Jiang{2}, Mengxue Liu{2}, Qunchen Yuan{2}, Liujing Zhuang{2}, Ping Wang{1}
{1}Biosensor National Special Laboratory, Zhejiang University, China; {2}Zhejiang University, China

5:20 PM

Response Evaluation of Mold Odorant Mixture Using a Sensor Array of Cell-Based Odorant Sensor Based on Multiple Insect Olfactory Receptors

Yuji Sukekawa, Sawako Niki, Eri Kuroda, Ryohei Kanzaki, Hidefumi Mitsuno

University of Tokyo, Japan

5:40 PM

The Love-SAW Sensor Array for Rapid and Automatic Detection of Haptoglobin in Saliva

Xiaojing Zhang[1], Hangming Xiong[1], Jiaying Sun[1], Yanjie Hu[3], Yong Zhou[3], Hao Wan[1], Tianxing Wang[2], Ping Wang[1]

[1]Biosensor National Special Laboratory, Zhejiang University, China; [2]e-LinCare Meditech Co.,Ltd, China; [3]Sir Run Run Shaw Hospital, Zhejiang University, China

6:00 PM – 7:00 PM
ISOCS General Assembly
Main Hall, Concord I

Technical Program: Tuesday, May 14, 2024

9:00 AM – 10:00 AM
Keynote Speaker: Yogesh Gianchandani, University of Michigan, USA
Main Hall, Concord I

10:00 AM – 11:00 AM
Session: Data Processing
Main Hall, Concord I

10:00 AM
Transfer Learning Between Two Different Datasets of MOS Gas Sensors
Dennis Arendes, Yannick Robin, Johannes Amann, Annika Petto, Andreas Schütze, Christian Bur
Lab for Measurement Technology, Saarland University, Germany

10:20 AM
Identification of Gas Mixtures with Few Labels Using Graph Convolutional Networks
Han Fan{1}, Erik Schaffernicht{1}, Achim J. Lilienthal{2}
{1}Örebro University, Sweden; {2}Technische Universität München, Germany

10:40 AM
Domain Knowledge Assisted Gas Tomography
Thomas Wiedemann{1}, Patrick Hinsen{1}, Victor Scott Prieto Ruiz{1}, Dmitriy Shutin{1}, Achim J. Lilienthal{2}
{1}DLR German Aerospace Center, Germany; {2}Technische Universität München, Germany

11:00 AM – 11:20 AM
Coffee Break
Chenin Blanc I and II

11:20 AM – 1:00 PM
Session: IoT and Robotics
Main Hall, Concord I

11:20 AM
Multifunctional Electronic Tongue Based on Taste Organoids for Practical Application
Jianguo Wu{2}, Changming Chen{2}, Liubing Kong{2}, Shichao Tian{2}, Mengxue Liu{2}, Liujing Zhuang{2}, Ping Wang{1}
{1}Biosensor National Special Laboratory, Zhejiang University, China; {2}Zhejiang University, China

11:40 AM
Custom Design of Electronic Tongues Based on Electropolymerized Molecularly Imprinted Polymers
Xavier Cetó, Mingyue Wang, Manel Del Valle
Universitat Autonoma de Barcelona, Spain

12:00 PM
An Intelligent Multi-Electrode Array for Label-Free Detection of Oxidative Stress
Anat Tzur{1}, Avia Lavon{1}, Assaf Barel{2}, Gal Markel{3}, Hadar Ben-Yoav{1}
{1}Ben-Gurion University of the Negev, Israel; {2}Sheba Medical Center, Israel; {3}Tel Aviv University, Israel

12:20 PM
Microfluidic Electronic Tongue for Marine Toxin Detection
Paul Wittendorp{1}, Catarina Moreirinha{2}, Mariana Raposo{2}, Maria Teresa Gomes{2}, Michal Melnik{1}, Alisa Rudnitskaya{2}, Froydis Sved Skottvoll{1}
{1}SINTEF, Norway; {2}Universidade de Aveiro, Portugal

12:40 PM
Data Fusion of E-Senses Signals to Enhance the Detection of Prostate Cancer
Cristhian Manuel Durán Acevedo{1}, Jeniffer Katerine Carrillo Gómez{2}, Carlos Alberto Cuastumal Vasquez{1}, Jesus Brezmes Lecha{3}, Maria Llambrich{3}, Raquel Cumeras{3}, Rocío López Rubio{3}
{1}Universidad de Pamplona, Colombia; {2}Universidad de Pamplona, Universitat Rovira i Virgili, Colombia; {3}Universitat Rovira i Virgili, Spain

1:00 PM – 2:00 PM
Lunch
Chenin Blanc I and II, Concord II and III

2:00 PM – 4:00 PM
Session: Applications
Main Hall, Concord I

2:00 PM
Detection of Acetone in Milk Through Odor Towards Monitoring of Ketosis in Dairy Cows
Kosuke Minami{2}, Masaaki Matoba{2}, Ryoh Nakakubo{1}, Genki Yoshikawa{2}
{1}National Agriculture and Food Research Organization, Japan; {2}National Institute for Materials Science, Japan

2:20 PM
Development of a Miniaturised Electronic Nose Integrated Into a Smartwatch
Victor González, Felix Meléndez, Patricia Arroyo, José Ignacio Suárez, Juan Álvaro Fernández, José Luis Herrero, Fernando Díaz, Angel López, Jesus Lozano
Universidad de Extremadura, Spain

2:40 PM
Body Volatolome Sampling: Deciphering the Matrix for Improved Health Monitoring
Elsa Boudard{2}, Nabil Moumane{3}, José Dugay{1}, Isabelle Rivals{1}, Jérôme Vial{1}, Didier Thiébaut{1}
{1}ESPCI, France; {2}ESPCI / SenseDetect Health-Care, France; {3}SenseDetect Health-Care, France

3:00 PM
Monitoring of Propofol in an Ex Vivo Lung Model
Christian Bur{1}, Ksenia Karst{2}, Felix Maurer{3}, Stefan Radermacher{3}, Sascha Kreuer{3}, Andreas Schütze{1}
{1}Lab for Measurement Technology, Saarland University, Germany; {2}Saarland University, Germany; {3}Saarland University Medical Center, Germany

3:20 PM
An Electronic Nose for Characterising the Aroma Profile of Whisky Obtained by a Novel Accelerated Aging Process
Stefano Prudenza, Riccardo Foschi, Carmen Bax, Laura Maria Teresa Capelli
Politecnico di Milano, Italy

3:40 PM

Simulating Olfactory System In Vitro Based on a Transwell Co-Culture Model

Mengxue Liu{2}, Nan Jiang{2}, Qifei Wang{2}, Yajie Zhang{2}, Shunuo Shang{2}, Liujing Zhuang{2}, Ping Wang{1}

{1}Biosensor National Special Laboratory, Zhejiang University, China; {2}Zhejiang University, China

4:00 PM – 5:00 PM

Session: Poster Session II and Coffee Break

Grapevine Convention Center Hallway, Chenin Blanc I and II

Outdoor Gas Plume Reconstructions: A Field Study with Aerial Tomography

Patrick P. Neumann{1}, Dino Hüllmann{1}, Nicolas Winkler{1}, Heiko Lohrke{1}, Achim J. Lilienthal{2}

{1}Bundesanstalt für Materialforschung und -prüfung, Germany; {2}Technische Universität München, Germany

Selectivity Gain in Olfactory Receptor Neuron at Optimal Odor Concentration

Alexander Vidybida

Bogolyubov Institute for Theoretical Physics, Ukraine

A Low-Cost Air Quality Sensor Calibration Algorithm Using Self-Attention Network

Pang-Chun Liu{2}, Ting-I Chou{2}, Shih-Wen Chiu{1}, Kea-Tiong Tang{2}

{1}Enosim Bio-tech Co., Ltd., Taiwan; {2}National Tsing Hua University, Taiwan

Biomimetic Enhancement of Robustness in E-Nose Systems: Addressing Noise and Sensor Damage

Hantao Li, Siyuan Deng, Fengchun Tian, Lei Zhang, Leilei Zhao, Zhiyuan Wu, Yue Liu

Chongqing University, China

Creating Linguistic Embedding Space for Odors

Toshiki Kawamoto, Masaki Tashiro, Takamichi Nakamoto, Manabu Okumura

Tokyo Institute of Technology, Japan

Mondrian Inductive Conformal Classifier for the Quantitative Structure–Odor Relationship to Estimate Prediction Confidence

Tanoy Debnath, Kenji Oishi, Akio Nakabayashi

Yokogawa Electric Corporation, Japan

Interference Separation Using Improved Nonnegative Matrix Factorization for Odor Reproduction Analysis in Mass Spectrum Space

Dani Prasetyawan, Hanqing Zhao, Takamichi Nakamoto

Tokyo Institute of Technology, Japan

Data Acquisition System for AI-Based Odor Classification at the Edge

Silvio Emmenegger, Raphael Kummer, Thomas Gisler, Christoph Zumbühl, Jürgen Wassner, Armin Taghipour

Lucerne School of Engineering and Architecture, Hochschule Luzern, Switzerland

Droplet Formation Analysis for Multi-Component Olfactory Display Using Inkjet Devices

Nilava Debabhuti, Dani Prasetyawan, Takamichi Nakamoto

Tokyo Institute of Technology, Japan

Drone-Based Localization of Hazardous Chemicals by Passive Smart Dust
Tino Nerger, Patrick P. Neumann, Michael Weller
Bundesanstalt für Materialforschung und -prüfung, Germany

Classification of Fish Freshness and Prediction of Mesophilic Aerobic Microbial Count with an Electronic Nose
Ramiro Sánchez{1}, Maria Alejo{1}, Patricia Escribano{1}, Patricia Arroyo{2}, Felix Meléndez{2}, Jesus Lozano{2}
{1}Centro de Investigaciones Científicas y Tecnologicas de Extremadura, Spain; {2}Universidad de Extremadura, Spain

Gas Source Localization Using Physics-Guided Neural Networks
Victor Scott Prieto Ruiz{1}, Patrick Hinsen{1}, Thomas Wiedemann{1}, Constantin Christof{2}, Dmitriy Shutin{1}
{1}DLR German Aerospace Center, Germany; {2}Technische Universität München, Germany

A Spiking Bout Algorithm Based on Gas Sensor Signals for the Distance Estimation from Gas Source
Yingying Xue{2}, Changming Chen{2}, Shimeng Mou{2}, Xiaojing Zhang{1}, Hao Wan{1}, Ping Wang{1}
{1}Biosensor National Special Laboratory, Zhejiang University, China; {2}Zhejiang University, China

Five Challenges for Developing E-Nose Standards for Annoyance and Health Complaints from Environmental Odors
Susan Schiffman{2}, Ehsan Danesh{1}, H. Troy Nagle{2}
{1}Advanced Sensing Technologies, United Kingdom; {2}North Carolina State University, United States

A Multi-Scent Olfactory Display for Smell Identification Testing
Chuhong Wang, Sammy Hassan, James Covington
University of Warwick, United Kingdom

Monitoring Atmospheric Ammonia with Satellite and On-Field Gas Sensor Array Measurement Techniques
Mauri Rosiers{2}, Claudia Falzone{2}, Justin Martin{2}, Lieven Clarisse{1}, Martin van Damme{1}, Pierre Coheur{1}, Anne-Claude Romain{2}
{1}Université Libre de Bruxelles, Belgium; {2}University of Liège, Belgium

On Line Monitoring of Odour Emissions (OU) and Odour Sources Identification by Using a New Generation of IOMS Analyzers Around an Animal Feed Production Plant
Jean-Christophe Mifsud, Fatma Ayouni
ELLONA, France

Design of an Olfactory Robotic Assistance Dog
Laurie Bilton, Upasana Dingari Acharya, Jack Harrap, Daniel Latigo Lam, Andy Lin, Rob Sleet, Lucy Tam, Shen Yeo, James Covington
University of Warwick, United Kingdom

Investigating CO2 Sensor Configurations for Effective Ventilation Control in Educational Environments

Daniel Marín López{1}, Alba Alegria-Sala{2}, Lluc Canals Casals{2}, Jordi Fonollosa{1}, Marcel Macarulla{2}

{1}B2Slab, Department of Automatic Control (ESAII) Universitat Politècnica de Catalunya (UPC), Spain; {2}Department of Project and Construction Engineering Universitat Politècnica de Catalunya (UPC), Spain

5:00 PM – 6:00 PM
Sniffest
Main Hall, Concord I

6:00 PM – 9:00 PM
ISOEN 2024 Conference Dinner
The Grapevine Convention and Visitors Bureau

Technical Program: Wednesday, May 15, 2024

9:00 AM – 10:00 AM
Keynote Speaker: Ping Wang, Zhejiang University, Hangzhou, China
Main Hall, Concord I

10:00 AM – 11:00 AM
Special Session: Optical Sensors and Arrays for Taste and Odor Assessment
Main Hall, Concord I

10:00 AM
A Fluorescent Sensor Array for Ketoprofen Assessment
Pierangela Di Menna[2], Giammarco Maria Romano[1], Andrea Bencini[1], Roberto Paolesse[2], Corrado Di Natale[2], Larisa Lvova[2]
[1]Università degli Studi di Firenze, Italy; [2]Università degli Studi di Roma Tor Vergata, Italy

10:20 AM
Towards Selective Detection of "Forever Chemicals": Development of Opto-Electrochemical Sensor Array for Perfluorooctanoic Acid (PFOA)
Francesco Pizzoli, Fabrizio Caroleo, Sara Nardis, Roberto Paolesse, Laura Micheli, Rocco Cancelliere, Corrado Di Natale, Larisa Lvova
Università degli Studi di Roma Tor Vergata, Italy

10:40 AM
Multi-Gas Differentiation Using an Individual Optical Fiber Sensor with a Chemically Modified Cladding
Radislav Potyrailo
GE Research, United States

11:00 AM – 11:20 AM
Coffee Break
Chenin Blanc I and II

11:20 AM – 1:00 PM
Session: Electronic Tongues
Main Hall, Concord I

11:20 AM
Gas Distribution Mapping with Radius-Based, Bi-Directional Graph Neural Networks (RABI-GNN)
Nicolas Winkler[1], Patrick P. Neumann[1], Erik Schaffernicht[2], Achim J. Lilienthal[3]
[1]Bundesanstalt für Materialforschung und -prüfung, Germany; [2]Örebro University, Sweden; [3]Technische Universität München, Germany

11:40 AM
Remote Calibration Strategies for Low Cost Air Quality Multisensors: A Performance Comparison
Saverio De Vito, Gerardo D' Elia, Sergio Ferlito, Elena Esposito, Gabriele Piantadosi, Girolamo Di Francia
ENEA, Italy

12:00 PM

Robotic Scanning Absorption Spectroscopy for Methane Leak Detection: The Virtual Gas Camera

Heiko Lohrke, Harald Kohlhoff, Patrick P. Neumann

Bundesanstalt für Materialforschung und -prüfung, Germany

12:20 PM

An Inkjet-Printed rGO-PEI Composite for CO_2 Monitoring Working at Room Temperature

Shirin Afyouni, Antoine Enel, Gaël Hamoir, Yann Danlée

VOCSens, Belgium

12:40 PM

Gas Source Localization in Outdoor Environment Using Deep Learning: Data Augmentation by Gas Dispersion Simulator

Gao-Ju Zhao{1}, Haruka Matsukura{2}, Motoki Sakaue{1}, Takumi Haratsu{1}, Hiroshi Ishida{1}

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

1:00 PM – 2:00 PM
Lunch
Chenin Blanc I and II, Concord II and III

2:00 PM – 3:00 PM
Closing Ceremony
Main Hall, Concord I

Author Index