

## Message from Chairman

On behalf of Organizing Committee, I would like to welcome you to the 6<sup>th</sup> *International Conference on Advances in Signal Processing and Artificial Intelligence (ASPAI '2024)*, 17-19 April 2024, Funchal (Madeira Island), Portugal.

Advances in artificial intelligence (AI) and signal processing are driving the growth of the artificial intelligence market as improved appropriate technologies is critical to offer enhanced drones, self-driving cars, robotics, etc. The two major factors enabling market growth are: emerging artificial intelligence technologies, and growth in intelligent signal processing. The artificial intelligence market size is projected to grow from US \$ 515.31 billion in 2023 to USD 2,025.12 billion by 2030, exhibiting a CAGR of 21.6 %.

The ASPAI Conference Series has been launched to provide a forum for open discussion and development of emerging artificial intelligence and appropriate signal processing technologies focused on real-world implementations. The goal of the conference is to provide an interactive environment for establishing collaboration, exchanging ideas, and facilitating discussion between researchers, manufacturers and users. The 1<sup>st</sup> *International Conference on Advances in Signal Processing and Artificial Intelligence (ASPAI '2019)* has taken place in Barcelona, Spain, the second ASPAI '2020 and the third ASPAI '2021 conferences where in the virtual format due to the COVID-19 pandemic. In 2022 we have returned to the in-person format with the traditional plenary and poster session, keynote presentations and social activities during the ASPAI' 2022 in Corfu, Greece. The fifth ASPAI' 2023 conference has taken place in Tenerife (Canary Islands), Spain

The ASPAI' 2024 is organized by IFSA – a professional, non-profit association serving for academy and industry since 1999, with the media partners: IOS Press (journal *Integrated Computer-Aided Engineering* (ISSN: 1069-2509, e-ISSN: 1875-8835)), World Scientific (*International Journal of Neural Systems* (ISSN: 0129-0657, e-ISSN: 1793-6462) and MDPI open access journals: *Algorithms* (ISSN: 1999-4893), *Electronics* (ISSN: 2079-9292) and '*Digital*' (ISSN: 2673-6470).

The conference is focusing any significant breakthrough and innovation in the mentioned field with a broadest concept.

We trust that you will find ASPAI' 2024 conference professionally rewarding and stimulating as well as enjoyable. Welcome to ASPAI' 2024 !

*Prof., Dr. Sergey Y. Yurish*  
*ASPAI' 2024 Conference Chairman*

## **Conferences Venue**

The Conference will take place on 17-19 April 2024 in the Pestana Casino Park Hotel, conference room *Caracas* (regular sessions) and *Rio de Janeiro* (poster session).

## **Registration**

The Registration Desk will be opened in the Pestana Casino Park Hotel:

- Tuesday, 16 April, 20:00-21:30 (in the Welcome Cocktail area)
- Wednesday, 17 April, 8:45-18:00 (near the conference room *Caracas*)
- Thursday, 18 April, 8:45-18:00 (near the conference room *Caracas*)
- Friday, 19 April, from 8:45-12:00 (near the conference room *Caracas*)

## **Language**

The official language of the Conferences is English. There will be no simultaneous interpretation.

## **Insurance and Liability**

The conferences organizers do not accept responsibility for any individual, medical, travel or personal insurance policies as necessary.

## **Conference Identification Tag**

The Organizing Committee request that you wear your identification tag (badge) at all times during the conference. Your conference identification tag will serve as your admission to all conference paper presentation sessions.

## **Welcome Cocktail**

16 April 2024, Tuesday (20:00-21:30), Pestana Casino Park Hotel, in the DOCKSIDE outside bar. Do not miss this opportunity to say the first "hello" to attendees and committee members.

## **Coffee/Tea Refreshment**

Coffee/tea will be served at the times indicated in the programme in front of the *Caracas* conference room.

## Gala Dinner

18 April 2023, Thursday (20:00-23:30). The Gala Dinner will take place in the Pestana Casino Park Hotel, *Sunset* restaurant.

## Local Time

The local time in Funchal (Madeira Island), Portugal is: GMT+1

## Conference web site:

<http://www.aspai-conference.com/>

## Post-Conference Publications

Selected papers presented at the conference can be published in the following journals:

- *Sensors & Transducers* (ISSN 2306-8515, e-ISSN 1726-5479) open access journal, Special Issue on '*Advances in Artificial Intelligence and Signal Processing*', by IFSA Publishing;
- *Integrated Computer-Aided Engineering* (ISSN: 1069-2509, e-ISSN: 1875-8835) by IOS Press;
- *International Journal of Neural Systems* (ISSN: 0129-0657, e-ISSN: 1793-6462) by World Scientific;
- *Algorithms* open access journal (ISSN: 1999-4893), Special Issue on '*Artificial Intelligence and Signal Processing: Circuits and Systems*', by MDPI;
- *Electronics* open access journal (ISSN: 2079-9292), Special Issue on '*Artificial Intelligence and Signal Processing: Circuits and Systems*', by MDPI;
- *Digital* open access journal (ISSN: 2673-6470), Special Issue on '*Hybrid Artificial Intelligence for Systems and Applications*' by MDPI.

Authors will be also invited to extend their paper or/and articles into the book chapters for the '*Advances in Signal Processing: Reviews*' Vol. 3, '*Advances in Artificial Intelligence: Reviews*', Vol. 3 or '*Advances in Intelligent Systems*' Book Series. These open access books will be published at the end of 2024 by IFSA Publishing, S.L. (Barcelona, Spain).

## Organizing Committee

### Chairman:

Prof., Dr. Sergey Y. Yurish (*IFSA, Spain*)

### Advisory Chairman:

Prof., Dr. Adeli Hojjat (*The Ohio State University, USA*)

### Steering Committee:

Dr. Mobyen Uddin Ahmed (*Mälardalen University, Sweden*)

Dr. Sergey Grosman (*Siemens PPAL, Germany*)

Prof. Sandeep Singh Sengar (*Cardiff Metropolitan University, UK*)

### Conference and Publication Manager:

Mrs. Tetyana Zakharchenko (*IFSA Publishing, S.L., Spain*)

### Organizing Committee:

Mr. Javier Cañete

(*Universitat Politecnica de Catalunya (UPC), Barcelona, Spain*)

Mr. Vyacheslav Mytsay

(*FSA Publishing, S.L., Spain*)

## Sponsors and Media Partners:



## Best Papers and Best Poster Awards

In this year, the following awards are established by the MDPI and co-sponsored by IFSA Publishing:

- The Best Paper Award by MDPI '*Electronics*' open access journal;
- The Best Poster Award by MDPI '*Electronics*' open access journal;
- The Best Paper Award by MDPI '*Algorithms*' open access journal.

All Awards include 250.00 EUR, trophy and certificate, and it will be given to the winners at the Gala Dinner.



## Keynote Speakers



**Prof., Dr. Sergey Y. Yurish**  
*International Frequency Sensor Association  
(IFSA), Barcelona, Spain*

### **Artificial Intelligence-based Sensors and Systems: Smart vs. Intelligent**

#### **Abstract**

Today, an increasing number of companies are fabricating smart sensors equipped with embedded machine learning capabilities. Nevertheless, these sophisticated sensors necessitate a heightened degree of integration. The abundance of analog constituents within these sensors, including operational amplifiers, analog filters, voltage and current references, ADCs, etc., substantially diminishes integration levels and escalates power consumption, particularly at low voltage power supplies, notably in standard CMOS technological processes below 50 nm. To increase the level of integration, an idea is to employ frequency output sensing elements alongside cutting-edge frequency-to-digital converters (fully digital components) grounded on an innovative, patented method of frequency-to-digital conversion. This design approach enables the elimination of intricate analog blocks such as signal conditioning circuits and ADCs, enhances metrological performance, robustness, electromagnetic noises immunity and markedly boosts the level of integration.

#### **Short Biography:**

Dr. Sergey Y. Yurish is a president of *International Frequency Sensor Association (IFSA)* – one of the major professional associations serving for sensor industry and academy since 1999. Dr. Yurish is a founder of three IFSA Group's companies. He is editor-in-chief of international peer-reviewed journal *Sensors & Transducers* and editor of open access multivolume Book Series on '*Advances in Artificial Intelligence*', '*Advances in Signal Processing*' and '*Advances in Intelligent Systems*'. He has published more than 190 articles and papers in international peer reviewed journals and conference proceedings. Sergey Yurish holds 9 patents and is an author and co-author of 12 books. He delivered more than 90 speeches, tutorials and keynotes presentations at industries, peer institutions, and professional conferences in over 30 countries.



**Prof., Dr. Len Gelman**  
*The University of Huddersfield,  
School of Computing and Engineering, UK*

## **Novel Higher Order Signal Processing for Condition Monitoring**

**Abstract**  
(will be published soon)

### **Short Biography:**

Len Gelman, PhD, Dr. of Sciences (Habilitation) joined University of Huddersfield as a Professor, Chair in Signal Processing/Condition Monitoring and Director of Centre for Efficiency and Performance Engineering, in 2017 from Cranfield University, where he worked as Professor and Chair in Vibro-Acoustical Monitoring since 2002. Dr. Gelman developed novel condition/health monitoring technologies for aircraft engines, gearboxes, bearings, turbines, compressors and composite/concrete materials and structures. He published more than 250 publications, 17 patents and is Co-Editor of 14 Springer books. Len is reviewer of numerous funding bodies, fellow of different scientific societies and associations, chair and co-chair various conferences and congresses, and Editor-in-Chief of several peer reviewed journals on engineering sciences and condition monitoring. Dr. Gelman is Member of ISO Technical Committee, Condition Monitoring. he given 45 plenary keynotes at major international conferences and more than 100 invited lectures and seminars in the UK, USA, France, Italy, Denmark, Switzerland, Holland, India and Israel during period 1996-2023. He was a Visiting Professor at ten Universities abroad.

Len received two Rolls-Royce (UK) Awards for Innovation, COMADIT Prize (by British Institute of NDT) for significant contribution through research/development in condition monitoring, Oxford Academic Health Science Network Award, William Smith Prize by UK Institution of Mechanical Engineers and USA Navy Award. He has managed as the Principal Investigator contributions to multiple EU funded programs, UK DTI programs (4 grants), multiple EPSRC grants, Royal Society grant, USA National Academy of Sciences grant, USA National Research Council grant, and multiple industrial contracts, including multiple contracts with Rolls-Royce (6 contracts), contracts with SKF, Shell, Scottish Southern Energy (two contracts), Caterpillar (USA, two contracts), London Underground (three contracts) and Cranfield Boeing Centre of Excellence (3 contracts).



**Prof., Dr. Manu Pratap Singh**  
*Department of Computer Science,  
DR. BR Ambedkar University, India*

## **Pattern Classification Using Quantum Neural Networks**

### **Abstract**

There are various methods have been proposed for pattern classifications with quantum neural networks. Mostly these methods are employing the Grover's iteration on Bell's MES in two-qubit system. Further has been demonstrated that for any pattern classification in a two-qubit system the maximally entangled states of Singh-Rajput eigen basis provide the most suitable choice of search states and in no case any of Bell's states is suitable for such pattern classifications. Here in this present work, we are employing the quantum perceptron architecture which incorporates entanglement of weights and states both for producing the required pattern classification. The quantum perceptron learning rule is presented to train the network for the given training set and convergence and normalization of weights have been observed. The simulation results show that the proposed quantum perceptron neural network is capable to classify all the kinds of patterns whether the patterns are linearly separable or not.

### **Short Biography:**

Prof. Manu Pratap Singh received his Ph.D. from Kumaun University Nainital, Uthrakhand, India, in 2001. He completed his Master of Science in Computer Science from Allahabad University, Allahabad in 1995. He is currently working as Professor in Department of Computer Science, Institute of Engineering and Technology, Dr. B.R. Ambedkar University, Agra, UP, India since 2014. He is engaged in teaching and research since last 20 years. He has published more than 90 research papers in journals of international and national repute. His work has been recognized widely around the world in the form of citations of his research papers. He also has received the Young Scientist Award in computer science by international Academy of Physical sciences, Allahabad in year 2005. He has guided 18 students for their doctorate in computer science. He is also referee of various international and national journals. His research interests are focused on Neural networks, pattern recognition and machine intelligence, soft-computing, quantum computing etc. He also has a patent on machine learning.



## Programme at Glance

Time/Date (GMT+1)	17.04.2024 Wednesday	18.04.2024 Thursday	19.04.2024 Friday
	<i>Conference Room Caracas</i>		
<b>8:45-9:00</b>	Registration	Registration	Registration
<b>9:00-9:15</b>	* Opening Session	* Daily announcements	* Daily announcements
<b>9:15-10:00</b>	Keynote Speaker I Sergey Y. Yurish <i>International Frequency Sensor Association (Spain)</i>	Keynote Speaker II Len Gelman <i>University of Huddersfield (UK)</i>	Keynote Speaker III Manu Pratap Singh <i>Kumaun University Nainital (India)</i>
<b>10:00-10:30</b>	<i>Coffee Break</i>	<i>Coffee Break</i>	<i>Coffee Break</i>
<b>10:30-12:30</b>	Regular Session: <i>Signal Processing: Theory &amp; Applications</i>	Regular Session: AI Algorithms & Applications	Virtual Session in Zoom (Live streams)
<b>12:30-13:30</b>	<i>Lunch on your own</i>	<i>Lunch on your own</i>	
<b>13:30-15:30</b>	Regular Session: <i>Image, Video &amp; Biomedical Signal Processing</i>	Regular Session: Applied Artificial Intelligence	<i>Poster Session &amp; Farewell Cocktail (Conference Room Rio de Janeiro)</i>
<b>15:30-16:00</b>	<i>Coffee Break</i>	-	* Closing Session Conference Room <i>Caracas</i>
<b>16:00-18:00</b>	Regular Session: Machine and Deep Learning: Theory & Applications	-	-
<b>19:00-20:00</b>	-	-	
<b>20:00-23:00</b>	-	<i>Gala Dinner</i>	

\* The must attend sessions. The time in the table and in the technical programme below is the local time in Funchal is: GMT+1.

# Technical Conference Programme

*Day 1*

*17 April 2024, Wednesday*

## **Regular Session: Signal Processing: Theory & Applications**

Chairman: Dr. Marek Franaszek  
National Institute of Standards and Technology, USA

- 1. Pressure Ulcers Monitoring with Combined Piezo- and Chemo-resistive Nanocomposite Sensors' Arrays**  
Jean-Francois Feller, Mickael Castro, Manh Trung Tran and Willy Allegre (*France*)
- 2. Application of Wavelet Transform to Identify Nonlinearity of Mechanical Systems**  
Andrzej Klepka (*Poland*)
- 3. Theoretical Approaches to Signal Processing for Optimizing Blade Tip Timing Probes Arrangement**  
Mohammed Lamine Mekhalfia, Pavel Procházka, Radislav Smid and Eder Batista Tchawou Tchuisseu (*Czech Republic*)
- 4. Dynamic Analysis of 1 MW Steam Turbine During Run-Up**  
Romuald Rzadkowski, Leszek Kubitz and Arkadiusz Koprowski (*Poland*)
- 5. Privacy-preserving Indoor Localization Based on Dummy Fingerprint and Homomorphic Encryption** (pre-recorded video)  
Haiyan Kang and Ying Li (*China*)

**Regular Session:**  
***Image, Speech, Video & Biomedical  
Signal Processing***

Chairman: Prof., Dr. Romuald Rzadkowski  
Polish Academy of Sciences, Poland

**1. Merging Outcomes of SAM Applied to RGB and Depth Images in Bin Picking Applications**

Marek Franaszek, Prem Rachakonda, Pavel Piliptchak and Kamel Saidi (*USA*)

**2. A Review of 3D Object Detection Methods for Autonomous Driving**

Haowei Yang, Yuanyao Lu and Haiyang Jiang (*China*)

**3. THz in Biology**

Janez Trontelj, Andrej Svigelj and Janez Trontelj Ml. (*Slovenia*)

**4. Identification of Patients with Congestive Heart Failure Using K-Nearest Neighbors Technique and Wavelet Packet Decomposition**

Abdulnasir Hossen (*Oman*)

**5. Generation of Synthetic EEG Signals for Testing Dynamic Brain Connectivity Estimation Methods**

Zoran Sverko, Sasa Vlahinic, Nino Stojkovic and Peter Rogelj (*Croatia, Slovenia*)

**6. Role of fMRI Denoising for Classification of Schizophrenia from Functional Brain Connectivity**

Jaroslav Hlinka, David Tomeček, Marian Kolenic, Barbora Reháková, Jaroslav Tintěra, Jiří Horáček and Filip Španiel (*Czech Republic*)

**Regular Session:**  
***Machine and Deep Learning:***  
***Theory and Applications***

Chairman: Dr. Jaroslav Hlinka  
Institute of Computer Science, Czech Academy of Sciences,  
Czech Republic

- 1. A General Framework for Reliability Assurance of Machine Learning-Based Driving Functions in Powertrain Software**  
Moatez Chehoudi (*Germany*)
- 2. Porting Large Language Models to Mobile Devices for Question Answering**  
Hannes Fassold (*Austria*)
- 3. Automated Segmentation of the Left Ventricle in Cardiac CT Angiography Using a 2.5 UNet**  
Francesca Lo Iacono, Juan F. Calderon, Gianluca Pontone and Valentina D. A. Corino (*Italy*)
- 4. An Image-Based Deep Learning Approach for the Automated Detection of Knee Arthroplasty Failure**  
Anna Corti, Mattia Loppini, Katia Chiappetta and Valentina Corino (*Italy*)
- 5. Deep Learning Based Detection of Concrete Cracks in Critical Underwater Infrastructure**  
Minvydas Ragulskis, Ugne Orinaite, Mayur Pal and Paulius Palevicius (*Lithuania*)

*Day 2*  
*18 April 2024, Thursday*

**Regular Session:**  
***AI Algorithms & Applications***

Chairman: Prof., Dr. Harald Schallner  
Jade Hochschule, University of Applied Sciences, Germany

**1. Effective Connectivity for Brain Network Identification in Parkinson's Disease**

Zheng Fang, Laurent Albera, Joan Duprez, Jean Francois Houvenaghel, Huazhong Shu, Yan Kang and Régine Le Bouquin Jeannès (*France, China*)

**2. Hacking Visual Positioning Systems to Optimize the Software Development of Augmented Reality Applications**

Alexandros Giannakidis and Moritz Häcker (*Germany*)

**3. Psychophysiological Signals Underlying Sexual Presence in VR: Case Study of an Atypical Arousal Pattern**

Patrice Renaud (*Canada*)

**4. Efficient Graph Embedding and Semantic Relationship Reconstruction in the WordNet Lexical Database**

(pre-recorded video)

Ailin Song, Mingkun Xu and Shuai Zhong (*China*)

**Regular Session:**  
***Applied Artificial Intelligence***

Chairman: Prof., Dr. Patrice Renaud  
Université du Québec en Outaouais, Canada

- 1. A Methodological Approach to Machine Learning for Forecasting Agricultural Commodity Prices**  
Harald Schallner (*Germany*)
  
- 2. Fuzzy Agent-based Simulation for Managing Battery Recharging for a Fleet of Autonomous Industrial Vehicles**  
Juliette Grosset, Alain-Jérôme Fougères, Moïse Djoko-Kouam and Jean-Marie Bonnin (*France*)
  
- 3. An Empirical Evaluation of Sliding Windows on Siren Detection Task using Spiking Neural Networks**  
Shreya Kshirasagar, Andre Guntoro and Christian Mayr (*Germany*)
  
- 4. GPU-Accelerated Inference Benchmarking for Boosting Models**  
(pre-recorded video)  
Jérémie Farret, Roghayeh Soleymani and Nitish Kumar Pilla (*Canada*)
  
- 5. Research on Adaptive Differential Privacy Preservation Method Based on Blockchain and Federated Learning** (pre-recorded video)  
Bing Wu and Haiyan Kang (*China*)

Day 3

19 April 2024, Friday

**Virtual Session in Zoom (live streams):  
Signal Processing and AI Applications**

Chairman: Prof., Dr. Sergey Y. Yurish

International Frequency Sensors Association (IFSA), Spain

- 1. Cuffless Estimation of Arterial Blood Pressure Based on Heart Pulse Transmission Parameters Determined from Multi-Channel PPG Signals**  
Jiri Pribil, Anna Pribilova and Ivan Frollo  
(Slovakia)
- 2. A Markov Chain-Based Data Augmentation for Balance and Postural Stability in Spinal Cord Injury Rehabilitation**  
V. Vibhuti, Neelesh Kumar and Chitra Kataria  
(India)
- 3. CARES-UNet: Contour-guided Attention-based RES-UNet for Optic Disc and Optic Cup Segmentation**  
Tewodros Gizaw Tohye, Zhiguang Qin and Habte Lejebo Leka  
(China)
- 4. A Multi-Class Classification for Reproduction of Non-Articulatory English Alphabets with Minimal Phonetic Combination Dictionary**  
Aprameya V. Madhwaraj, Ashish A Iyer, Mahitha M, Padmini Palli and Kaustav Bhowmick  
(India)
- 5. Complex Wavelet-Enhanced Convolutional Neural Networks for Electrocardiogram-Based Detection of Paroxysmal Atrial Fibrillation**  
Amjed Al Fahoum  
(Jordan)

**6. Approximate Entropy: An Algorithm for Quantifying Brain Complexity**

Juliana Knociková, (*Czech Republic*)

**7. Application Pre-trained Network – ResNet50 for the Classification of Electronic Components**

Pham Thi Lien, Nguyen Thu Huong and Nguyen The Long  
(*Vietnam, Russia*)



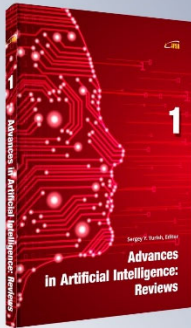
**Poster Session** (Conference Room *Rio de Janeiro*):  
*19 April 2024 (13:30-15:30)*

Chairman: Prof., Dr. Minvydas Ragulskis  
Kaunas University of Technology (Lithuania)

- 1. End-user Confidence in Artificial Intelligence Predictions**  
Zvi Kam, Lorenzo Peracchio and Giovanna Nicora  
(*Israel, Italy*)
  - 2. Assessing Chronic Wound Area Measurement with Machine Learning Techniques in a Single Center, Non-randomized Controlled Clinical Trial**  
Lorena Casanova Lozano  
(*Spain*)
  - 3. EEG Decoding with Conditional Identification Information**  
Pengfei Sun, Jorg De Winne, Paul Devos and Dick Botteldooren  
(*Belgium*)
  - 4. Investigating the Impact of Loop Closing on Visual SLAM Localization Accuracy in Agricultural Applications**  
Fabian Schmidt, Frank Holzmüller, Manuel Kaiser, Constantin Blessing and MarkusENZweiler  
(*Germany*)
  - 5. Detector with an RGB Sensor for Determining the Technical Condition of Motor Oil of Locomotive Diesel Engines**  
Denys Baranovskyj and Maryna Bulakh  
(*Poland*)
-

# Advances in Artificial Intelligence: Reviews

Sergey Y. Yurish, Editor



Artificial intelligence has been one of the fastest-growing technologies in recent years. The market growth is mainly driven by factors such as the increasing adoption of cloud-based applications and services, growing big data, and increasing demand for intelligent virtual assistants. Various end-use industries have also employed artificial intelligence such as retail and business analysis that has also boosted the demand in this market. The major restraint for the market is the limited number of artificial intelligence technology experts. The Book Series on 'Advances in Artificial Intelligence: Reviews' has been launched with the aim to fill-in this gap.

The first book volume from the 'Advances in Artificial Intelligence: Reviews' Book Series contains 11 chapters written by 21 contributors from academia and industry from 10 countries: Algeria, Germany, India, Iran, Israel, Russia, Slovenia, South Africa, Tunisia and USA.

# 1

## 10 Top Reasons to Publish Open Access Books with IFSA Publishing

- Indexed in Book Citation Index (Web of Science)
- Copyrights belong to Authors (CC-BY)
- The maximum number of pages is not limited
- Very reasonable publication fees
  - High visibility
- All book types accepted
- Available in different formats: electronic and print
  - Freely available online
  - High quality standards
- Authors benefit from IFSA Membership





