



**Automation, Robotics & Communications  
for Industry 4.0 (ARCI' 2021):  
1<sup>st</sup> IFSA Winter Conference**

# **Conference Programme**

**3-5 February 2021**

**Organized by:**



## Message from Chairman

On behalf of Organizing Committee I would like to welcome you to the First IFSA Winter Conference on (ARCI '2021), 3-5 February 2021.

According to the modern market study, the global Industry 4.0 market will reach US\$ 155.30 Billion by 2024 growing at the CAGR of slightly above 14.9% between 2018 and 2024. The Industry 4.0 means the usage of an integrated system, which consists of an automation tool, robotic control, communications and big data analytics. The Industry 4.0 holds a lot of potentials and is expected to register a substantial growth in the near future. There are several conferences on automation, robotics and communications, but they are not meet the Industry 4.0 challenges. The series of annual ARCI Winter IFSA conferences have been launched to fill-in this gap and provide a forum for open discussion of state-of-the-art technologies related to control, automation, robotics and communication - three main components of Industry 4.0.

The ARCI' 2021 conference are covering research and development in a broader range in automation, robotics and communication, and united by the Industry 4.0 challenges. However it will be not a conference only about the future concepts and new visions. It will be also to discuss how to adopt the current R&D results for the Industry 4.0 and to customize products under the conditions of highly flexible (mass-) production. The ARCI' 2021 conference is organized by the IFSA - one of the major professional, non-profit association serving for sensor industry and academy more than 20 years.

The purpose of ARCI' 2021 is bring together leading international researchers, developers and practitioners to attain synergetic exchanges of ideas and practices. We trust that you will find the ARCI 2021 conference professionally rewarding and stimulating as well as enjoyable. Welcome to ARCI' 2021 !

*Prof., Dr. Sergey Y. Yurish*  
*ARCI' 2021 Conference Chairman*

### Conference web site:

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



## Language

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

## Post-Conference Publications

Selected and extended papers presented at the conference will be published in different open access journals on a payment as well as free of charge basis. The presenters will be able to select appropriate open access journals (including indexed journals) for the post-conference publication immediately after the event.

Authors of full-page articles published in journals will be invited to extend their articles into the book chapters for the open access Book Series '*Advances in Robotics and Automatic Control: Reviews*', Vol. 2 or '*Advances in Networks, Security and Communications: Reviews*', Vol. 3. Both books will be submitted to the Book Citation Index by Clarivate Analytics. These open access books will be published in 2021. The first volumes of these Book Series were published in 2017-2019, and have been accepted by all scientific community with a great enthusiasm.

Conference proceedings and books published by IFSA Publishing, S.L. are indexed in the Conference Proceedings Citation Index (CPCI) and Book Citation Index respectively by Clarivate Analytics (former Thomson Reuters).



## Sponsors and Media Partners:



## Organizing Committee

### Chairman

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

### Advisory Chairman:

**Prof., Dr. Vijayakumar Varadarajan**  
*(The University of New South Wales, Australia)*

### Conference and Publication Manager:

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

### Organizing Committee:

**Mr. Javier Cañete**  
*(Universitat Politècnica de Catalunya (UPC), Barcelona, Spain)*

**Mr. Luis Morey**  
*(Universitat Politècnica de Catalunya (UPC), Barcelona, Spain)*

**Mr. Sergey Garmash**  
*(IFSA Publishing, S.L., Spain)*

## Keynote Speaker I



**Prof., Dr. Björn Johansson**  
*Chalmers University of Technology,  
Sweden*

### **Sustainable Development with Industry 4.0 and the Potential for Increased Performance on Economy and Social Aspects**

#### **Abstract**

In order to achieve and maintain a sustainable society, the manufacturing research and development efforts performed needs to aim for sustainable solutions. The only path to a more sustainable society is to enable humans to think and act more sustainably, and industry 4.0 provides excellent opportunities. However, this is only possible if awareness of how our actions influence the sustainability balance of the world. With this in mind, we can also recognize that industry 4.0 is becoming reality today and it is time to reap the many benefits available. The digital analyses need to aim for holistic solution, not sub-optimization, and take heed of impact on cost, people and the planet. This talk will mainly focus on how Industry 4.0 can utilize digitalization to facilitate sound social and economic effects on production systems development. Recent research on sustainability awareness shows that it is essential to change mindset and educate researchers on how to cognitively be aware on sustainability aspects in the context of their own research in order to develop sound solutions for industrial practitioners. The number of digital solutions addressing sustainability aspect more holistically is growing ever faster, but they only matter if we go beyond awareness and start to act, Avancez !

**Short Biography:** Dr. Björn Johansson holds a chair as Professor in Sustainable Production at Industrial and Materials Science, Chalmers University of Technology, Sweden. His research is applied and focuses on utilization of virtual tools for sustainable production system development. Specific areas of interest are: Industry 4.0, digitalization, 5G Enabled manufacturing, discrete event simulation, input data management, scheduling, layout planning, balancing, 3D-Visualisation, AR/VR applications, sustainability measures of production operations, lifecycle assessment and circular economy. Björn Johansson is the immediate past president of The Society for Modeling and Simulation International with approximately 3000 members in around 100 countries. Dr. Björn is also an active lifetime member of AAAS and ASME. He involved in internal EU reviews of proposals as well as monitoring of large EU and national research efforts.

## Keynote Speaker II



**Mr. George Salazar**  
*NASA's Johnson Space Center,  
Houston, TX, USA*

### **Challenges of Implementing Automation, Robotics, and Communications in Future Space Missions**

#### **Abstract**

Since the Mercury Program, the intricacy of human spaceflight has increased considerably. As we venture further into space with humans, the complexity of spacecraft systems required to support human missions to the Moon and Mars will increase dramatically. Automation, robotics, and communications will be critical to ensuring mission success, and keeping the astronauts both physiologically and psychologically healthy will be of utmost importance. This presentation provides an overview of the evolution of human spaceflight, system complexity, and many of the challenges for future deep space mission success — including automation, robotics, and communications technology. The importance of sound systems engineering and human systems integration critical for these future missions will also be covered.

**Short Biography:** Mr. George Salazar received his Bachelors of Science in Electrical Engineering from the University of Houston and his Masters of Science in Systems Engineering from Southern Methodist University. He has over 35 years of experience in telemetry, communications, speech control, command and data handling, audio, displays and controls, intelligent lighting, project management, and systems engineering. He has been involved with the design of advanced telemetry, speech recognition and intelligent systems of which he has received various patents. He is currently serving at NASA's Johnson Space Center as the Human-Computer Interface Technical Discipline Lead to develop advanced human interfaces as well as serving as the Displays and Controls Subsystem Manager for the Commercial Crew Program. He is the co-founder of the Human System Integration (HSI) Employee Resource Group with the goal of infusing HSI into the NASA technical processes. He is a Senior-Life IEEE member, a registered professional engineer in the state of Texas, and an Expert Systems Engineer Professional certification through the International Council on Systems Engineering.

## Keynote Speaker III



**Prof.. Dr. Abdel-Nasser Sharkawy**  
*South Valley University*  
*Egypt*

### Human-Robot Interaction: Applications

#### Abstract

Recently, human-robot interaction (HRI) is an extensive research topic and theme which gained importance and significance. HRI aims at the complementary combination between the robot capabilities and human skills. The robots assist humans in terms of precision, speed, and force. The humans contribute in terms of the experience, knowledge of executing the task, intuition, and easy adaptation and learning, and understanding of control strategies. In this work, the applications of human-robot interaction are reviewed. These applications could be industrial, medical, agricultural, servical, and educational. HRI can be found in industrial applications in picking and placing in the production lines, welding processes, parts assembly, and painting. Assistive robotics are one from the highest profile areas in HRI. For people with the physical and the mental challenges, the robots can provide the opportunity of interaction and therapy. In addition, HRI can be widely applied in hospitals. Nowadays, HRI is very important for facing the new coronavirus (COVID-19) pandemic. In agriculture, the cooperation between human and the robot helps with many tasks including harvesting, seeding, fertilizing, spraying, weed detection, hauling, and mowing. HRI can also be found in other applications such as education, mining, and home use.

**Short Biography:** Dr. Abdel-Nasser Sharkawy has received his Ph.D. degree from Robotics Group, Department of Mechanical Engineering and Aeronautics, University of Patras, Patras, Greece. His PhD was about 'Intelligent Control and Impedance Adjustment for Efficient Human-Robot Cooperation'. Currently, Dr. Sharkawy is a lecturer (Assistant Professor) at Mechanical Engineering department (Mechatronic Engineering), SVU, Egypt. Sharkawy has published numerous papers in international scientific journals, book chapters and international scientific conferences, which attracted more than 120 citations (h-index: 7). His research areas of interest include mechatronic systems, neural networks, robotics, human - robot interaction, robot control, and ergonomics.

## Keynote Speaker IV



**Dr. Dr. Dominique Blouin**

*Telecom Paris, Institut Polytechnique de Paris,  
France*

### **Model Management for Architecture-Centric Development of Cyber-Physical Systems with Multi-Paradigm Modeling**

#### **Abstract**

Multi-Paradigm Modeling (MPM) is an approach to tackle the complexity of Cyber-Physical Systems (CPS) by modeling every aspects of a system explicitly using the most appropriate formalism(s) at the most appropriate level(s) of abstraction. With this approach, several modeling paradigms and their supporting formalism must be jointly employed to cover the heterogeneity of domains of CPSs. Managing these models is therefore essential to ensure that their interplay and the activities performed on them do not lead to inconsistencies, which can be the source of costly errors introduced during concurrent engineering. Despite its importance, model management is not yet well addressed. In this presentation I will introduce multi-paradigm modeling, our current effort on providing a formal definition for it and our research on model management applied to the Architecture-Centric Virtual Integration development Process (ACVIP) centered on the SAE AADL architecture description language. I will focus on the challenges faced when applying model management techniques to industrial modeling settings and present our ongoing work to address these problems.

**Short Biography:** Dr Blouin obtained his MSc in physics from the University of British Columbia (Canada) and PhD in computer science from the University of South-Brittany (France). He worked in industry before he joined the Lab-STICC at the University of South-Brittany in 2008. After a post doc in the system analysis and modeling group of the Hasso Plattner Institute in Germany, he joined Telecom Paris, Institut Polytechnique de Paris as a permanent research engineer in 2016. He was the vice-chair of working group 1 on foundations for Multi-Paradigm Modeling for Cyber-Physical Systems during the European COST action IC 1404. He has been a member of the SAE AADL standardization committee since 2010 where he proposed the RDAL language, which inspired the ALISA (Architecture-led Incremental System Assurance) framework. His research interests are multi-paradigm modeling, model management, domain-specific languages and requirements engineering applied to cyber-physical systems development.

## Keynote Speaker V



**Dr. Hamed Fazlollahtabar**  
*Damghan University, Damghan, Iran*

### **Robotic Manufacturing Systems Using Internet of Things: New Era of Facing Pandemics**

#### **Abstract**

Robotics made a tremendous transformation in manufacturing by facilitating manufacturing operations. By evolution of Industry 4.0 and its related technologies, a new trend of digitalization in advanced manufacturing systems occurred. Internet of Things (IoT) in manufacturing environments, enables manufacturing related devices to communicate with each other and with the control unit to send data and receive manufacturing rules accordingly. Cooperation between robots and IoT provides new opportunities to streamline the production processes in an efficient and cost-effective manner. The integration of robotic agents with IoT provide the novel concept of the Internet of Robotic Things developing new possibilities in various industrial fields specifically in facing new pandemics. Human operators are not efficient anymore in pandemics leading to stoppage of production systems and a huge amount of lost sale, back orders, and economic loss. Here we emphasize on the new era of IoT robotic manufacturing in pandemics and inauguration of modern aspects modeling and decision making.

**Short Biography:** Hamed Fazlollahtabar earned a BSc and an MSc in Industrial Engineering from Mazandaran University of Science and Technology, Iran, in 2008 and 2010, respectively. He received his PhD in Industrial and Systems Engineering from Iran University of Science and Technology in 2015, and completed a postdoctoral research fellowship at Sharif University of Technology, Iran, in the area of reliability engineering for complex systems in 2017. He currently works in the Department of Industrial Engineering at Damghan University, Iran, and is on the editorial boards of several journals and on the technical committees of several conferences. His research interests are robotic production systems, reliability engineering, supply chain planning, and business intelligence and analytics. He has published more than 280 research papers and eight books.

## Programme at Glance

Date Time (GMT+1)	3.02.2021 Wednesday	4.02.2021 Thursday	5.02.2021 Friday
9:00-9:15	<b>Opening Session</b> (Sergey Y. Yurish, Chairman)	-	-
9:15-9:45	<b>Keynote Speaker I</b>	<b>Keynote Speaker III</b>	<b>Keynote Speaker V</b>
9:45-12:00	<b>Regular Session 1:</b> <i>Artificial Intelligence in Control</i>	<b>Regular Session 3:</b> <i>Industrial Robots: Control and Learning</i>	<b>Regular Session 5:</b> <i>Sensors, Measurements and Data Analysis</i>
12:00-13:30	<i>Break</i>	<i>Break</i>	<i>Break</i>
13:30-14:00	<b>Keynote Speaker II</b>	<b>Keynote Speaker IV</b>	<b>Special Session 1:</b> <i>Soft Measurements and Artificial Intelligent Technologies to Industrial 4.0</i>
14:00-16:30	<b>Regular Session 2:</b> <i>Industrial Communication Technologies and Systems</i>	<b>Regular Session 4:</b> <i>Process Control and Monitoring</i>	
16:30-17:30	-	-	<b>Panel Discussion:</b> <i>Sensors and Measurements in Industry 4.0: Evolution or Revolution ?</i>
17:30-17:45	-	-	<b>Closing Session</b> (Sergey Y. Yurish, Chairman).

The time in the table and in the technical programme below is the local time in Barcelona (Spain): CET — Central European Time, UTC/GTM+1.

# Technical Conference Programme

*Day 1*

*3 February 2021, Wednesday*

## **Regular Session 1: Artificial Intelligence in Control**

- 1. Recurrent neural network structures for learning control valve behavior**  
*Camilla Sterud, Signe Moe, Mads Valentin Bram, Stephen Roberts and Jan Calliess (Norway, Denmark, UK)*
- 2. Predictive control with energy efficiency enabled by real-time machine learning**  
*Gaoyong Luo, Yaqing Luo and Huaguo Gan (China, UK)*
- 3. Condition monitoring of drive trains by data fusion of acoustic emission and vibration sensors**  
*Oliver Mey, André Schneider, Olaf Enge-Rosenblatt, Dirk Mayer, Christian Schmidt, Samuel Klein and Hans-Georg Herrmann (Germany)*
- 4. Existence of periodic solutions to a modified Elman neural network**  
*Zlatinka Kovacheva and Valery Covachev (Bulgaria)*
- 5. A modified reinitialization mechanism for particle swarm optimization based control, case study: PV system**  
*Tamir Shaqarin (Jordan)*

## **Regular Session 2:** **Industrial Communication Technologies and Systems**

- 1. Model driven engineering of gateways for industrial automation**  
*Patrick Denzler, Daniel Ramsauer and Wolfgang Kastner (Austria)*
- 2. Turbo coded single user massive MIMO with precoding**  
*Kasturi Vasudevan, Gyanesh Kumar Pathak and A. Phani Kumar Reddy (India)*
- 3. Formation control of five vehicles for load transportation under randomly-switching communication topology**  
*Abbes Tahri and Lakhdar Guenfaf (Algeria)*
- 4. Internet video traffic classification with convolutional neural networks**  
*Elans Grabs, Ernests Petersons, Dmitry Efrosinin, Aleksandrs Ipatovs and Valentin Sturm (Latvia, Austria)*
- 5. Automation of distributed computing in a P2P network**  
*Y. Shichkina, M. Kupriyanov, K.Krinkin and S. Moldachev (Russia)*

*Day 2*  
*4 February 2021, Thursday*

## **Regular Session 3:** **Industrial Robots: Control and Learning**

- 1. Learning from demonstration for collaborative robots**  
*Rizzotti-Kaddouri Aïcha, Kunze Marc, Jeanneret Loïck, Luc Depierraz and Nabil Ouerhani (Switzerland)*
- 2. Robot-robot cooperation for efficient drilling of soft materials**  
*Janez Gotlih (Slovenia)*

- 3. Velocity planning of a robotic task enhanced by fuzzy logic and dynamic movement primitives**  
*Beatrice Maggioni, Elia Marescotti, Andrea Maria Zanchettin, Dario Piga and Loris Roveda (Italy, Switzerland)*
- 4. From hand to brain and back: Grip forces deliver insight into the functional plasticity of somatosensory processes**  
*Birgitta Dresp (France)*
- 5. On Brain and Cognitive Intelligence Based Control in Robotics**  
*Bin Wei (Canada)*

## **Regular Session 4: Process Control and Monitoring**

- 1. Asymptotic Random Distortion Testing for Anomaly Detection**  
*Dominique Pastor and Guillaume Ansel (France)*
- 2. EEG based BCI system for driver's arm movements identification**  
*Chiara Bersani, Roberto Sacile and Enrico Zero (Italy)*
- 3. Pulse averaging primary converters for monitoring systems**  
*O. Bureneva, P. Bondarenko and N. Safyannikov (Russia)*
- 4. Experimental validation of regulation control for Petri nets in a small-scale manufacturing system**  
*José Manuel Chávez, Anibal Cid Gaona, Carlos Renato Vázquez and Antonio Ramírez-Treviño (Mexico)*
- 5. Comparison study of two recent metaheuristic with application to high efficiency induction motor design**  
*Hania Ladaycia (Algeria)*

*Day 3*  
*5 February 2021, Friday*

**Regular Session 5:**  
**Sensors, Measurements and Data Analysis**

- 1. Wearable sensor technology for individual grip force profiling**  
*Rongrong Liu, Florent Nageotte, Philippe Zanne, Michel de Mathelin and Birgitta Dresch-Langley (France)*
- 2. The Pulse Project: a framework for supervising data exchanges in an IoT system**  
*Jannik Laval (France)*
- 3. Important data quality accents for data analytics and decision making**  
*Ina Naydenova, Zlatinka Kovacheva and Kalinka Kaloyanova (Bulgaria)*
- 4. A new diagnostic marker for endometriosis – kisspeptin evaluated in endometrium with algorithms of computer vision and machine learning**  
*O. Drobintseva, A. S. Krasichkov, M. S. Kupriyanov, V. O. Polyakova (Russia)*
- 5. Age changes in the expression level of dense contact markers in women after myomectomy**  
*V. O. Polyakova, T. S. Kleimenova, A. I. Shapovalova, D. S. Medvedev, A. S. Krasichkov, M. S. Kupriyanov (Russia)*
- 6. Experimental result and computer modelling of fabricated PVDF-TrFE piezoelectric polymer for force/pressure sensing**  
*Saman Namvarrechi, Javad Dargahi and Mojtaba Kahrizi (Canada)*

## Special Session:

### Soft Measurements and Artificial Intelligent Technologies to Industrial 4.0

**Organizer:** Prof. Prokopchina Svetlana, *Moscow State University and Financial University of Government of Russian Federation, Russia*

- 1. Bayesian intelligent technologies as the bridge between artificial intelligence and measurement theory. Applications to Industrial 4.0**  
*Prokopchina S. (Russia)*
- 2. Provision of measurement trustworthiness is the key to Industry 4.0 realisation**  
*K. Sapozhnikova, A. Pronin and R. Taymanov (Russia)*
- 3. Intelligent monitoring as a unity of the measurement, value, reasoning and computing processes. Conceptual approach for Industrial 4.0**  
*M. Koroleva, Y. Korolev and A. Efremova (Russia)*
- 4. Intelligent measurement technologies and sensors for water supplying systems management**  
*Prokopchina S. (Russia)*
- 5. Modern methods for determining emotional stress based on physiological signals and machine learning**  
*Pustozerov Evgeniy and Uvarov Roman (Russia)*

## **Panel Discussion:**

### **Sensors and Measurements in Industry 4.0: Evolution or Revolution ?**

#### ***Moderator:***

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

#### ***Panelists:***

Prof., Dr. Svetlana V. Prokopchina  
*Moscow State University and Financial University of Government  
of Russian Federation (Russia)*

Dr. Kseniya V. Sapozhnikova  
*D. I. Mendeleev Institute for Metrology (Russia)*

Dr. Roald E. Taymanov  
*D. I. Mendeleev Institute for Metrology (Russia)*

---

# Sponsors:

