

**Industrial Electronics for Better Life!**



# **32nd International Symposium on Industrial Electronics**

Aalto University, Helsinki-Espoo, Finland,  
June 19th - June 21st, 2023

in cooperation



**IEEE**



**FINNISH SOCIETY OF AUTOMATION**  
SUOMEN AUTOMAATIOSEURAY

# Message from the General and Program Chairs

Dear delegates and authors of the IEEE International Symposium on Industrial Electronics 2023 (ISIE 2023), welcome to Finland in mid-summer! This time, the 32nd edition of ISIE is hosted by the Aalto University, a relatively young institution, but with more than 100 years of history.

The slogan of this ISIE 2023 is “Industrial Electronics for Better Life”. This implies many things: cleaner, safer, healthier, and merrier life. The Industrial Electronics Society of IEEE is at the very centre for technology innovation that aims achieving these goals. We are at the forefront of energy transition, sustainable manufacturing, intelligent automation and robotics, artificial intelligence, smarter cities, and digital health.

ISIE 2023 attempts to fully return to the onsite mode, without online presentations. During the COVID time we have changed our habits to the online mode of teaching and presenting. While it is convenient, we lose the

enjoyment of the live communication. That is why we insisted on live presentations this time, to help the community return to the normal mode of operation and accelerate our progress.

The Industrial Electronics Society works hard on continuously improving the quality of its conferences. One way to achieve that is to nurture scientific communities behind technical tracks, to continue from edition to edition. Technical Program Committees stand behind all ISIE Technical Tracks. Their members provided thorough reviews and selection of papers.

Technical committees of IES played great role in this edition of ISIE having led the technical tracks and contributing to track program committees.

The conference offers a very vibrant technical and social program. There are four keynote talks by great speakers from both industry and academia. Besides, there are two industry forum sessions and industrial exhibitions. The students and young professional forum



# Content

on Monday will give the stage to the future of our society, students, young engineers and researchers who will talk about their current research and development challenges.

Last but not least, we would like to thank all reviewers who have dedicated time to assess and ensure that the papers in the conference are of high quality. The ISIE 2023 conference provides an opportunity to experience the vibrant (but still relaxed) capital of Finland and feel the spirit and culture of this country, voted the world's happiest nation many times in a row. We do hope you will spend four exciting days in Helsinki and Espoo!

**General Chairs:** Valeriy Vyatkin<sup>1</sup>, Milos Manic<sup>2</sup>, Roberto Oboe<sup>3</sup> and Juan Jose Rodriguez-Andina<sup>4</sup>;

**Technical Program Chairs:** Mahdi Pourakbari-Kasmaei<sup>5</sup>, Wenbin Dai<sup>6</sup>, Lucia Lo Bello<sup>7</sup>, Michael Ruderman<sup>8</sup> and Yang Shi<sup>9</sup>



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# General information

## OFFICIAL LANGUAGE

Presentation and conference activities will be conducted in English language. In the capital area of Helsinki-Espoo one can expect most of the local residents to be able to understand and speak English. Do not hesitate to ask for help if you are lost!

## CURRENCY

The currency in Finland is Euro.

## CONFERENCE LOCATION

The conference location is the Aalto University at the following address: Otakaari 1, 02150, Espoo, Finland. The closest metro station is Aalto University (Exit A).

## WIRELESS INTERNET ACCESS

There is "aalto open" network freely available to the Aalto University visitors. Another option is to use the "eduroam" network if you have the corresponding account from your institute. For wireless connectivity outside of the campus one can purchase SIM card of a local operator. R-Kioski is the shop where SIM cards are sold, they exist in airport, on campus, central station and scattered around the city.

## REGISTRATION

The registration desk is located in the central hall right near the building main entrance. Registration will be open from 8:00 (monday 8:30) in the morning till 18:00 in the evening.

## NAME BADGES

Please wear your name badges at all times to allow entry to all the sessions and coffee breaks. You will find dinner ticket in your delegate package.

## PROCEEDINGS

Conference proceedings will be available for download in advance via a web-link. No USB dongles will be provided.

## PRESENTATION INSTRUCTIONS

Please prepare presentation slides in Powerpoint and upload to the presentation computer before your session (either using USB drive, or download from your private repository). The presentation time is 15 minutes, and 5 more minutes is allocated to questions and change of the presenter.

## TIME ZONE

The time zone in Finland currently is Eastern European Summer Time (EEST), which is UTC+3.



# ISIE 2023 Organising committee

## HONORARY CHAIRS

- ▶ Toshio Fukuda, Japan
- ▶ Heikki Koivo, Finland
- ▶ Kim Fung Man, Hong Kong
- ▶ Maria Valla, Argentina

## GENERAL CHAIRS

- ▶ Milos Manic, USA
- ▶ Roberto Oboe, Italy
- ▶ Juan Jose Rodriguez-Andina, Spain
- ▶ Valeriy Vyatkin, Sweden/Finland

## TECHNICAL PROGRAM CHAIRS

- ▶ Wenbin Dai, China
- ▶ Lucia Lo Bello, Italy
- ▶ Mahdi Pourakbari, Finland
- ▶ Michael Ruderman, Norway
- ▶ Yang Shi, Canada

## SPECIAL SESSIONS CHAIRS

- ▶ Gabor Sziebig, Norway
- ▶ Larisa Dunai, Spain

## TUTORIAL AND WORKSHOP CHAIRS

- ▶ Marina Indri, Italy
- ▶ Morgan Kiani, USA

## PUBLICATION CHAIRS

- ▶ Udayanto Dwi Atmojo, Finland
- ▶ Antonio Luque, Spain

## FINANCE CHAIRS

- ▶ Peter Palensky, Netherlands
- ▶ Seppo Sierla, Finland

## WEB AND PUBLICITY CHAIRS

- ▶ Magda Janeiro, Finland
- ▶ Sandeep Patil, Sweden
- ▶ Chen-Wei Yang, Sweden

## INDUSTRY CHAIRS

- ▶ Tommi Karhela, Finland
- ▶ Michael Condry, USA
- ▶ Toni Mattila, Finland
- ▶ Raine Viitala, Finland

## STUDENT & YOUNG PROFESSIONALS (S&YP) FORUM CHAIR

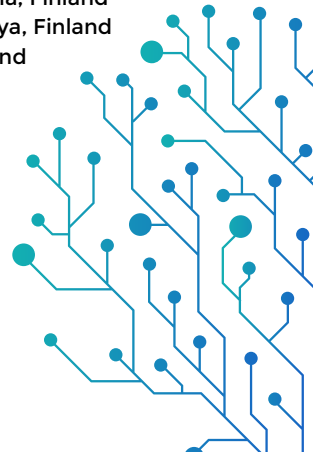
- ▶ Marek Jasinski, Poland

## EXHIBITION CHAIRS

- ▶ Seppo Borenius, Finland
- ▶ Tuomo Lindh, Finland
- ▶ Seppo Sierla, Finland
- ▶ Kari Tammi, Finland
- ▶ Raine Viitala, Finland

## LOCAL ORGANISING COMMITTEE

- ▶ Anu Randén-Siippainen, Finland
- ▶ Mikhail Kolesnikov, Finland
- ▶ Tuojian Lyu, Finland
- ▶ Pranay Jhunjhunwala, Finland
- ▶ Rakshith Subramanya, Finland
- ▶ Ilkka Seilonen, Finland



# Program at glance

Monday through Wednesday lunches will be served in the Dipoli building, Room Sief. Monday 11:30-13:00, Tuesday and Wednesday 11:30-13:30. To avoid queues, delegates are advised to have lunch outside of the midday peak hour. Coffee Breaks are in the second floor hall of the conference site 10:30-11:00 and 15:30-16:00.

## MONDAY

<b>Registration desk open</b>	08:30-18.00.
<b>Tutorials:</b>	09:00-10:45
<b>Sessions:</b>	09:00-10:45, 11:00-12:00 and 16:00-18:00
<b>Students and Young Professionals forum</b>	09:30-12:30, Hall B.
<b>Opening session:</b>	13:10-13:30
<b>Keynote 1:</b>	“Real time data, privacy, profit, and the distributed grid” by <b>Liana Jo Ault</b> , Venture General Manager for Energy Innovation, Nokia, UK: 13:30-14:30, Hall A (Aalto).
<b>Industry forum session 1:</b>	14:30-15:30, Hall A (Aalto).
<b>Welcome Reception at Hanasaari Hotel</b>	19:00

## TUESDAY

<b>Registration desk opens at</b>	08:00
<b>Industry visits (book in advance at the registration desk):</b>	09:00-12:00.
<b>Sessions:</b>	09:00-10:45, 14:30-15:30 and 16:00-18:00
<b>Keynote talk 2a:</b>	“The intelligent automation experience” by <b>Rikard Franz</b> , Head of development department of Processing Automation, Tetra Pak, Sweden, 11:00-12:00, Hall A (Aalto).
<b>Keynote talk 2b:</b>	“The digital twin: The why and the how” by <b>Alexander Fay</b> , Professor and Head of the Institute of Automation Technology, Helmut Schmidt University, Germany. 13:30-14:30, Hall A (Aalto).
<b>Gala dinner:</b>	19:00 at Pikku Finlandia, Helsinki <a href="https://2023.ieee-isie.org/gala-dinner">https://2023.ieee-isie.org/gala-dinner</a>

## WEDNESDAY

<b>Registration desk opens at</b>	08:00
<b>Industry visits (book in advance at the registration desk):</b>	09:00-12:00.
<b>Sessions:</b>	09:00-10:45, 14:30-15:30 and 16:00-18:00
<b>Keynote 3:</b>	“Industry 4.0 on Shoestring: The Case for Low-Cost Digitalisation?” by <b>Duncan McFarlane</b> , Professor of Industrial Information Engineering / Head of Distributed Information & Automation Lab, University of Cambridge, UK, 13:30-14:30, Hall A (Aalto).
<b>Industry forum session 2:</b>	14:30-15:30, Hall A (Aalto).
<b>Closing ceremony:</b>	17:40-18:00, Hall A (Aalto).







# Sessions at glance

WEDNESDAY 21, JUNE 2023

	A	B	C	E	M1	M240	Y228a	Y228b	Y229a	Y229c	Y307	Y307a	Y313	Y346	Y347	Y405	Lunch / Coffee / Evening Event
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Lunch /  
Coffee /  
Evening  
Event

10:30 - 11:00  
Coffee

11:30 - 13:30  
Lunch

15:30 - 16:00  
Coffee

# Keynote talks

## KEYNOTE 1

### REAL TIME DATA, PRIVACY, PROFIT, AND THE DISTRIBUTED GRID

**Liana Jo Ault**

Venture General Manager for Energy Innovation, Nokia, UK

#### **Abstract:**

In this topic we will investigate how distributed generation has changed the way we use data. We will discuss the impact privacy and profit have on the use of our data, the pitfalls and successes of existing solutions and challenges yet to be resolved.

#### **Speaker Bio:**

Liana is a Venture General Manager for Energy Innovation at Nokia. Leading a new Nokia venture focused on digital platforms supporting optimization of flexible and renewable assets, her team focuses on commercialization in start-up environment.

Liana has extensive experience working with power utilities and industrial customers on new business models and industry trends. She likes to ask 'What If?' and is passionate about encouraging the next generation of sustainable engineers to challenge the status quo, ask the tough questions and find new innovative solutions.

## KEYNOTE 2

### THE INTELLIGENT AUTOMATION EXPERIENCE

**Rikard Franz**

Head of development department of Processing Automation, Tetra Pak, Sweden

#### **Abstract:**

Over the years, automation has improved performance in most production sites in the world and is actually seen as the 3rd revolution in the industry. The addition of the digitalization, has further improved the value of automation. As most people are currently wondering about how to make the best use of this we are thinking of how

we can make the journey easier for people working with these solutions.

How can we make life easier for operators, maintenance people and managers. We have to add a new level to automation solutions, where things like UX and UI, linked to artificial intelligence will even further enhance the operations at production sites. Also, how can we make sure that Cyber Security threats does not put an abrupt end to this journey.

#### **Speaker Bio:**

With a long experience in Process Automation and manufacturing, Rikard is now heading the development department of Processing Automation at Tetra Pak, being an expert in plant control, monitoring, and automation services. After finalizing his master's degree at Lund University, Rikard started to work with Automation as a programmer. Over the years, various positions in Project Management, automation sales and management has taken Rikard to the senior expert position he is having today.

## KEYNOTE 3

### INDUSTRY 4.0 ON SHOESTRING: THE CASE FOR LOW-COST DIGITALISATION?

**Duncan McFarlane**

Professor of Industrial Information Engineering / Head of Distributed Information & Automation Lab, University of Cambridge, UK

#### **Abstract:**

This talk will review the original intent of Industry 4.0 and some of its limitations when being applied in small companies. A systematic template for supporting digitalisation for small manufacturers will be presented and the Digital Manufacturing on a Shoestring programme introduced as a means of addressing key aspects of this template. The key features of the Shoestring programme will be presented along with results of numerous developments and deployments in the last 2-3 years. Future industrial developments and research challenges in this area will be presented.

**Speaker Bio:**

Duncan McFarlane is Professor of Industrial Information Engineering at the University of Cambridge and Head of Distributed Information & Automation Lab and a visiting Professor at University of Melbourne. He began his career as an engineering cadet with BHP in Melbourne and has worked in the industrial automation area for over 25 years joining Cambridge in 1995. He was Research Director of the Auto ID Centre in 2000-3 and subsequently co-founder and Chairman of RedBite Solutions Ltd - an industrial RFID/IoT based asset management solutions company. He is Principal Investigator on the Digital Manufacturing on a Shoestring programme developing low cost digital solutions for small manufacturers with more recent spin-outs into construction, logistics and medical systems. The Shoestring approach is currently being rolled-out with SMEs across several regions in the UK and overseas. From March to July 2020 he led a team which won the RAE Presidents Award for providing Industrial Engineering support to local hospitals managing the Covid-19 Epidemic and from September 2020 to July 2021 was Operations Logistics lead at Cambridge University for its Asymptomatic Covid-19 Student Testing Programme.

**KEYNOTE 4**

## THE DIGITAL TWIN: THE WHY AND THE HOW

**Alexander Fay**

Professor and Head of the Institute of Automation Technology, Helmut Schmidt University, Germany

**Abstract:**

Digital Twins have gained increasing interest during the last years. Various concepts and technologies exist for the implementation of Digital Twins, and their possible applications are multifold. Beyond promising perspectives, companies long for advice where they should start with applying Digital Twins: should they build Digital Twins to support their development processes, or their production? Or rather Digital Twins of their products, for better maintenance and update services? Should they restrict

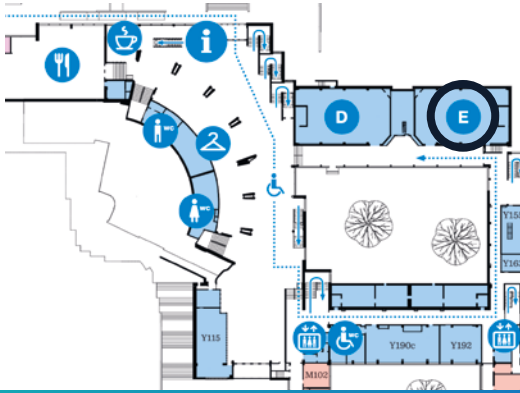
access to these Digital Twins to own staff, or can Digital Twins offer new perspectives also for their customers? Furthermore, Digital Twins will be gamechangers for lifecycle services. New business opportunities arise, and thus, new players. Who will be the owner of the Digital Twin and the data it comprises and generates? Which capabilities are required to make use out of it? How will this change the value chain of engineering and operation of systems in production, logistics, transport and energy distribution? These questions are the subject of this keynote, and methods how to find answers, individually for one's business: How to position in future in the value chain, how to identify attractive applications of the Digital Twin, how to identify which information is required to set up a Digital Twin, and how to make best use of standards and existing information.

**Speaker Bio:**

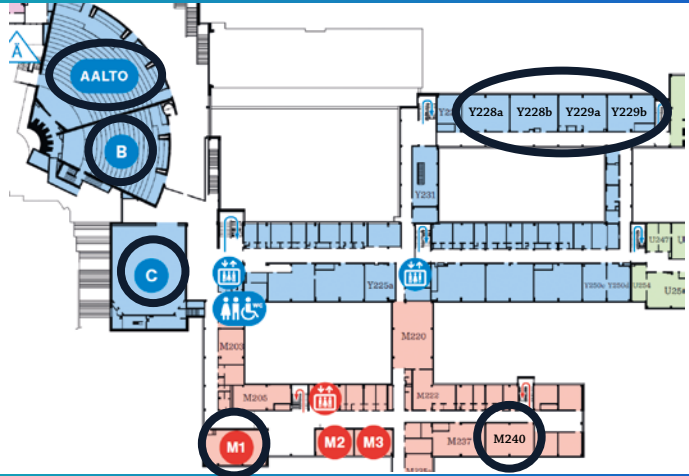
Alexander Fay (IEEE Member'02, Senior Member '07) is Full Professor and Head of the Institute of Automation Technology at the Helmut-Schmidt-University in Hamburg, Germany. His main research interests are models and methods for the engineering of large automated systems, especially in the process and manufacturing industries, in buildings and transportation systems. With his research team, he develops and employs knowledge-based methods, ontologies, autonomous systems and other AI techniques. The aim of his team is to develop models, methods and tools to increase engineering efficiency and to assist in the engineering and operation of industrial plants. He is member of the Scientific Board of the German Society for Measurement and Automation (GMA) and Head of its Department "Methods of Automation". He was a member of the IEEE Industrial Electronics Society Administration Committee between 2009 and 2011. Between 2009 and 2017, he served as an Associate Editor of IEEE Transactions on Industrial Informatics. Alexander Fay is a member of acatech, the German Academy of Engineering Sciences. Since 2014, he has been a member of the Scientific Advisory Board and of the WC 2 "Research and Innovation" of the German "Industrie 4.0" initiative.

# Maps

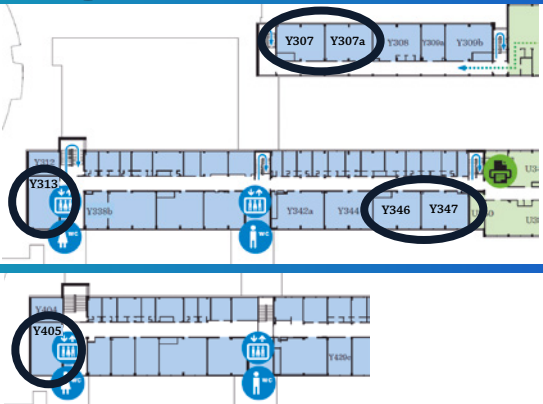
## FLOOR 1



## FLOOR 2



## FLOOR 3



## FLOOR 4



# Industry Forum and Exhibition

## SESSION 1

MONDAY, JUNE 19TH

Time: 14:30 - 15:30

Session Chair: Seppo Borenus

	Speaker	Company	Title
14:30-14:50	Mikko Heikkilä	Beckhoff Automation	The importance of services in the success of automation product development projects
14:50-15:10	Mika Skarp	Cumucore Oy	Software defined factory - requirements to industrial communication infrastructure
15:10-15:30	Greg Boucaud	Universal Automation. Org	Unleashing industry 4.0 thanks to hardware independent automation apps

## SESSION 2

WEDNESDAY, JUNE 21ST

Time: 14:30 - 15:30

Session Chair: Raine Viitala

	Speaker	Company	Title
14:30-14:50	Jouni Aro	Prosyst OPC Ltd	OPC UA based data harmonization
14:50-15:10	Gerardo Santillan	Semantum Oy	Experiences with industrial interoperability standards and Model Broker
15:10-15:30	Veikka Pirhonen	Siemens	Energy Flexibility Management - Platform, Solutions and Services

## **Y229a Tutorial 3 - Advanced optimal feedforward torque control and operation management of electrical drives**

**Monday, 19 June 2023, 09:00-10:30**

**Organizer(s) and Presenter(s): Christoph Hackl, Hochschule München (HM) University of Applied Sciences, Germany**

In this tutorial, a unified theory for generic loss minimization by optimal feedforward torque control (OFTC) of electrical machines is presented which allows to analytically compute (i) the optimal direct and quadrature reference currents for all operating strategies, such as MTPC, MC, FW, MTPV [or MTPF], and, in particular, Maximum Torque per Losses (MTPL, minimizing copper & iron losses), (ii) the transition points indicating when to switch between the operating strategies due to speed, voltage and/or current constraints. The unified theory is applicable for all operation modes and allows to consider copper and iron losses and arbitrary machine nonlinearities. The analytical solutions allow for an (almost) instantaneous selection of the actual operation strategy and the computation of its corresponding optimal reference currents. Numerical methods (approximating these solutions only) are no longer required. All optimization problems, their respective constraints, and the computation of the intersection point(s) of voltage ellipse, current circle, or torque, MTPL, MTPC, MTPV, MTPF hyperbolas are reformulated implicitly as quadrics (quadratic surfaces). The proposed theory is suitable for any electrical machine. Most recent results are presented which utilize artificial neural networks (ANN) which allow to solve the OFTC problem also analytically but even faster.

## **E Hall TC Meeting - Electrical Machines**

**Monday, 19 June 2023, 09:00-10:30**

## **Y228a Tutorial 1 - State Space based Control as an Alternative to Conventional Loop Design in Power Converters**

**Monday, 19 June 2023, 09:00-10:30**

**Organizer(s) and Presenter(s): Dorin O. Neac u, Technical University of Iasi, Romania**

Since most dc/dc power stages for computer or telecom applications are currently optimized as modules by manufacturers, the effort in development moves towards controller implementation. While conventional feedback control design methods in frequency domain (lead-lag, or PI-D) are well mastered in industry, with numerous digital or power IC implementation options, this tutorial proposes and demonstrates a major leap forward with the use of State Space based design. The tutorial demonstrates that a State Space based controller is physically equivalent to a series cascaded control set up with an outer voltage loop and an inner either peak or average current loop. An in-depth presentation of the method's actual simplicity, rich in worked examples for either analog or digital implementation, opens this topic to any introductory to intermediate audience.

## **Y229c Tutorial 4 - Multiple Active Bridge Converters for flexible DC grids**

**Monday, 19 June 2023, 09:00-10:30**

**Organizer(s) and Presenter(s): Sandro Guenter, The University of Nottingham, Ningbo, China**

Multiple-Active-Bridge converters are an interesting device to interlink several sources/sinks or busses within complex power networks. For instance, they could be used in solid state transformers or More Electric Aircraft DC-microgrids. However, modeling and control are more difficult than for the dual active bridge due to the more complex structure. Thus, this tutorial aims to guide attendees through the build process of an impedance model of a quadruple-active bridge converter and the related control. Attendees will learn how to derive the mathematical model of the converter and how to implement the control.

## **Y228b Tutorial 2 - Multi-phase Electrical Drives: New outlook and expectation from the Industries**

**Monday, 19 June 2023, 09:00-10:30**

**Organizer(s) and Presenter(s): Mohan V. Aware, Visvesvaraya National Institute of Technology, Nagpur, India**

Multi-phase motor drive systems have attracted much attention in recent years due to some inherent advantages which they offer when compared to the three-phase counterpart. The new developments in areas such as electric ship propulsion, more-electric aircraft, electric and hybrid electric vehicles, electric locomotive traction and renewable electric energy generation has invoked the interest amongst the researchers. These applications invariably require the electric machine, which is traditionally a three-phase motor. The multi-phase machines with power electronic based converters along with advanced control strategies are creating niche technological advancement to improve reliability and energy efficiency of these energy conversion systems. This tutorial provides new outlook and expectation from the industrial point of view.

### **Y313 Tutorial 7 Z-Source DC Solid-State Circuit Breakers**

**Monday, 19 June 2023, 09:00-10:30**  
**Organizer(s) and Presenter(s):** Fang Peng, FAMU-FSU College of Engineering, US, Keith Corzine, University of California Santa Cruz, US, Jinyeong Moon, FAMU-FSU College of Engineering, US

Dc power systems have become extremely popular as compared to ac systems due to a reduction in power conversion steps required and elimination of low-frequency transformers. Examples of dc microgrids include ship power and propulsion systems, renewable energy power systems, computer data centers, aircraft power and drivetrains, etc. In the dc microgrid, all components are well defined except for the dc circuit breaker. Options include using oversized ac breakers, solid-state dc breakers, and hybrid breakers. This tutorial covers the Z-source dc circuit breaker which is a variation of the solid-state circuit breaker. The Z-source breaker was first introduced in 2010 at ISIE. It features a resonant Z-source impedance network which causes the source current to go to zero in response to a low-impedance fault. Since its introduction, many researchers have presented variations on the Z-source breaker including broad technical improvements, bi-directional versions, etc. This tutorial summarizes this Z-source breaker research. It will first review the fundamental Z-source circuits introduced approximately

15 years ago, including the coupled inductor Z-source circuits and utilization of the circuits in the Z-source inverter. Subsequently, the fundamental Z-source breaker idea will be described, followed by a number of variations on the Z-source breaker, including bi-directional topologies. Finally, incorporating the Z-source breaker within DC-DC power converters will be presented. Selected examples of Z-source breakers will be utilized throughout the tutorial to illustrate various practical concepts, with simulations of these examples being made available to the tutorial participants.

### **Y307a Tutorial 6 Blockchain DApps with AI and Cyber Security: A Comprehensive Guide to Development and Implementation**

**Monday, 19 June 2023, 09:00-10:30**  
**Organizer(s) and Presenter(s):** Alex Norta, Tallinn University, Estonia, Vimal Dwivedi, University of Tartu, Estonia and Queens University, Belfast, UK, Raimundas Matulevičius, University of Tartu, Estonia, Mubashar Iqbal, University of Tartu, Estonia

The tutorial will cover the intersection of blockchain DApp development, artificial intelligence (AI), and cyber security. It is offered to academic researchers, practicing engineers, and professionals in the industry who want to learn about the latest advances in these three areas and how they can be combined to create cutting-edge solutions. The fundamental concepts of blockchain, DApps, AI and cyber security will be introduced, explaining how these technologies work and how they can be integrated to build secure and efficient systems. The tutorial will delve also into the practical aspects of developing blockchain DApps with AI and cyber security, discussing the challenges of integrating AI into blockchain DApps and how to overcome them. It will explore the best practices for ensuring the cyber security of blockchain DApps and how to avoid common security pitfalls. Real-world examples and case studies will be used throughout the tutorial to illustrate concepts and techniques.

## **Y346 Tutorial 8 ChatGPT, Generative AI and Prompt Engineering for Industrial Applications**

**Monday, 19 June 2023, 09:00-10:30**

**Organizer(s) and Presenter(s):** Daswin De Silva, La Trobe University, Victoria, Australia, Nishan Mills, La Trobe University, Victoria, Australia, Gihan Gamage, La Trobe University, Victoria, Australia

Artificial Intelligence (AI) is coming of age. It is gradually becoming embedded in industrial systems and settings. Following several decades of expedient development and adoption of Artificial Narrow Intelligence (ANI); an intelligence that is domain-specific and requires technical operating expertise, we are now witnessing the rise of Artificial General Intelligence (AGI), in what is termed generative AI. Although these early developments of generative AI are far from the original definition of AGI, they represent a paradigm shift in the intelligence of machines, a transition from narrow to general. This disruptive force of AI is manifested in the current wave of Generative AI models, such as ChatGPT, LLaMA, Bard and Sparrow. ChatGPT is the fastest-growing consumer application in human history, reaching a hundred million active users just two months after its launch. In this tutorial, participants will learn the theory and practice of using generative AI models and libraries for the development of industrial applications and solutions. The tutorial begins by exploring the structural elements of Generative AI models, transformers, hyper-parameters, transfer learning and comparison to standard machine learning algorithms, followed by the application of generative AI for the design, development and evaluation of industrial applications. Participants will develop hands-on skills in using generative AI libraries and acquire a practical understanding of "prompt engineering" for diverse industrial settings. The learning outcomes of this workshop are; the theoretical foundations of Generative AI - when to use and in which settings, the design and development of Generative AI models, prompt engineering for diverse use cases and rapid prototyping to evaluation of a suitable Generative AI solution.

### **Requirements:**

Participants will access Google Collaboratory using a Gmail account. A laptop with an Internet browser and a stable Internet connection is mandatory.

## **C Hall TT 05-1 Power Electronics & Energy Conversion**

**Monday, 19 June 2023, 09:00-10:45**

**Chairs:** Christoph Hackl, Sertac Bayhan

### **PAPERS**

**09:00-09:20**

ISIE23-000026 Analysis and Modeling of Switched-Capacitor Converters with Parasitic Inductance

**Yuhang Yang, Zheng Dengke, Ranyu Yao, Yan Deng**

**09:20-09:40**

ISIE23-000040 Artificial Neural Network Based Thermal Model for a Three-Phase Medium Frequency Transformer

**David Molinero, Daniel Santamargarita, Emilio Bueno, Marta Marrón, Miroslav Vasic**

**09:40-10:00**

ISIE23-000043 Three-phase EV Charging System Based on Matrix Converters with Improved Current Commutation

**Yuxin Liu, Wusen Wang, Rundong Huang, Senyi Liu, Hao Wen, Chunhua Liu**

**10:00-10:20**

ISIE23-000044 A Novel Sensorless Control Method for Three-Phase Active Front End Rectifiers

**Ali Sharida, Haitham Abu-Rub, Sertac Bayhan**

**10:20-10:40**

ISIE23-000367 Fuzzy Inferenced Impedance Matching for the SIMO-WPT Scheme

**Jamie Yang, Chun-Liang Lin**

## **Y307 Tutorial 5 Information Processing for Industrial Cyber-physical Systems - A Complex Systems Science Approach**

**Monday, 19 June 2023, 09:15-10:45**

**Organizer(s) and Presenter(s):** Pedro H. J. Nardelli, Lappeenranta-Lahti University of Technology, Finland, Daniel C. Rojas, Lappeenranta-Lahti University of Technology, Finland, Nicola Marchetti, Trinity College Dublin, Ireland, Harun Siljak, Trinity College Dublin, Ireland, Indrakshi Dey, Walton Institute for Information and Communications Science, Ireland

Agent based modelling (ABM) is a method of implementing computational models for a collection of relatively autonomous and



heterogeneous nodes, whose behavior can be defined with a limited number of simple rules. ABM can account for a massive number of communicating nodes with a potentially infinite number of physical and logical interactions between them. However, ABM always looks for a realistic way to define interactions among the nodes, and we can indeed consider the agents as part of a given cyberphysical system (CPS) characterized by three constitutive layers. If both nodes and links are considered as agents, each of them will have their own behavioral pattern and will provide information about the dynamics of the formed network. Agent-based models can also characterize interactions between the heterogeneous agents and generate effects like clustering, coalition, communication or opportunistic resource access. Using the network effects generated, the analysis of Industrial CPSs based on ABM has the potential of establishing itself as one of the most efficient tools for extracting network topologies using physical, functional and resource-based inter-relationships between the agents at much lower complexity and energy requirements than either ML-based techniques or traditional statistical modeling. This tutorial will present a detailed theoretical conceptualization of the application of ABM for modelling the dynamics of industrial CPSs, and enabling information processing and decision-making. It will serve as a key knowledge-transfer tool for mitigating the risks of the cyber-enabled dynamics that are reaching several domains like energy and infrastructure, construction and manufacturing industries, and transportation.

## B Hall IEEE IES SYP (Student and Young Professional)

**Monday, 19 June 2023, 09:30-10:30**

**Chairs:** Pranay Jhunjunwala, Edivan Laercio Carvalho

### PAPERS

**9:30-9:35**

Welcome Words from IES SYP-AC  
Pranay Jhunjunwala, Edivan Laercio Carvalho

**9:35-10:00**

Keynote 1: Edivan Laercio Carvalho

**10:00-10:05**

MLINK: A Scalable and Robust Communication Network for Autonomous Drone Swarms

**Wen Chun Huang**

**10:05-10:10**

Capacitive Sensor-based Smart Water Tap: A Feasibility Study

**Kazi Javed Akram**

**10:10-10:15**

Fruit Detection and Classification Using Computer Vision and Machine Learning Techniques

**Victor Zárate**

**10:15-10:20**

Attack prevention and detection for cyber-physical systems based on coprime factorization technique

**Shimeng wu**

**10:20-10:25**

On LinDistFlow Model Congestion Pricing: Bounding the Changes in Power Tariff

**Shourya Bose**

## Coffee break

**Monday, 19 June 2023, 10:30-11:00**

## Y405 TT 04-1 Electrical Machines and Drives

**Monday, 19 June 2023, 11:00-12:00**

**Chairs:** Claude Delpha, Yannick Karekezi

### PAPERS

**11:00-11:20**

ISIE23-000004 Stator Intermittent Ground Fault Detection in High-Impedance Grounded Generators

**Nader Safari-Shad, Russ Franklin**

**11:20-11:40**

ISIE23-000020 Development of High Voltage Switched Reluctance Starter/Generator System for More Electric Aircraft

**Yang Chenyi, Shoujun Song, ChaoYang Liu, JiXi Zhong, Sun Guilin**

**11:40-12:00**

ISIE23-000027 A Novel Indicator-Based Online Diagnosis Technique of Inter-Turn Short Circuit Faults in Asymmetrical Six-Phase Induction Machines, Adopting a Model Predictive Controller  
**Khaled Laadjal, João Serra, Antonio J. Marques Cardoso**

## **Y228a SS 02-1 Machine Vision**

**Monday, 19 June 2023, 11:00-12:00**

**Chairs:** Ahmad Hably, Huei-Yung Lin

### **PAPERS**

**11:00-11:20**

ISIE23-000075 Online Object Tracking on Multiple Cameras with Completely Overlapping Views  
**Jan-Philip Richter, Sebastian Flores, Oliver Urbann**

**11:20-11:40**

ISIE23-000086 Design and characterization of an EOG signal acquisition system based on the programming of saccadic movement routines  
**Alfredo Frem, Monica Valenzuela Delgado, Wendy Flores-Fuentes, Julio Rodriguez, Oleg Sergiyenko, daniel Hernandez-Balbuena, Fabian N. Murrieta-Rico, Jesus Miranda-Vega, Paolo Mercorelli**

**11:40-12:00**

ISIE23-000334 Using object detection for a robust SLAM in dynamic environments  
**Youssef EL GAOUTI, Fouad Khenfri, Mehdi Mcharek, Cherif Larouci**

## **C Hall TT 05-2 Power Electronics & Energy Conversion**

**Monday, 19 June 2023, 11:00-12:00**

**Chairs:** David Molinero, Arun Nayanan

### **PAPERS**

**11:00-11:20**

ISIE23-000045 A generic Lyapunov-based Observer for Double-Star-Chopper-Cell/Bridge-Cell Modular-Multilevel-Cascade-Converters  
**Leonardo Testa, Oliver Kalmbach, Christoph M. Hackl**

**11:20-11:40**

ISIE23-000047 Mitigation of Current Ringing Effects in a Dual Active Bridge Converter  
**Alfonso Damiano, Giuseppe Bossi, Mauro Boi, Andrea Floris**

**11:40-12:00**

ISIE23-000065 Motion Control by Wireless Transmission of Power Packets: Experimental Verification with Multi-finger Robot Hand  
**Takahiro Mamiya, Shiu Mochiyama, Takashi Hikiyama**

## **M240 TT 03-1 Power Systems and the Smart Grid, Renewable Energy Systems and Smart Grid**

**Monday, 19 June 2023, 11:00-12:00**

**Chairs:** Bruno de Oliveira e Sousa, Christoph Hackl

### **PAPERS**

**11:00-11:20**

ISIE23-000078 A Predictive Control based Scheme for Maximum Power Extraction of PMSG based Wind Turbine Systems  
**fahimeh shiravani, Jose Antonio Cortajarena, Patxi Alkorta, Mikel Gonzalez Perez, Oscar Barambones**

**11:20-11:40**

ISIE23-000099 Reinforcement Learning based Coordination of Virtual Inertia Provision from Inverter-dominated Distribution Grids  
**Simon Stock, Davood Babazadeh, Philipp Hund, Christian Becker**

**11:40-12:00**

ISIE23-000008 The choice of components for the construction of a power inverter of 44 kW WPT system  
**Jakub Škorvaga, Michal Frivaldsky**

## **Y229c WIP TT 07-1**

**Monday, 19 June 2023, 11:00-12:00**

**Chairs:** Gabor Sziebig

### **PAPERS**

**11:00-11:20**

ISIE23-000360 Fuel Economy Simulation and Development of an Online Data Acquisition System with HIL Method for a VW Crafter Hybrid Car  
**Peter Szemes**

**11:20-11:40**

ISIE23-000389 Compensating Delays for Precise and Real-time ROS Cloud Robotics Localization

**Gábor Fehér, Norbert Reider, Marcell Balogh, Dániel Agócs, Dániel Rózsa****Y313 TT 11-1 Intelligent Factory Automation****Monday, 19 June 2023, 11:00-12:00****Chairs:** Chen-Wei Yang**PAPERS****11:00-11:20**

ISIE23-000025 Evaluation of Isolation and Communication Mechanisms for Real-Time Containers

**Moritz Walker, Marc Fischer, Armin Lechler, Alexander Verl****11:20-11:40**ISIE23-000054 A Real-Time Digital Twin Approach on Three-Phase Power Converters  
**Sergio de López, Roberto Martín López, Emilio José Bueno Peña, Francisco Javier Rodríguez Sánchez****11:40-12:00**ISIE23-000118 Component Test - Test Strategies with Asset Administration Shells  
**Dirk Schöttke, Stephan Schäfer, Thomas Kämpfe, Vasil Denkov, Aaron Zielstorff****Y307a TT 10-1 Industrial Informatics: Cloud Computing, Big Data, AI, Informatics and Software Engineering****Monday, 19 June 2023, 11:00-12:00****Chairs:** Seiichiro Katsura, Polina Ovsiannikova**PAPERS****11:00-11:20**ISIE23-000033 Temporal bi-index  
**Michal Kvet****11:20-11:40**ISIE23-000041 Application of reinforcement learning for energy consumption optimization of district heating system  
**Jifei Deng, Miro Eklund, Seppo Sierla, Jouni Savolainen, Hannu Niemistö, Tommi Karhela, Valeriy Vyatkin****11:40-12:00**

ISIE23-000098 A user-extensible solution for deploying fog computing in industrial applications

**Pietro d'Agostino, Massimo Violante, Gianpaolo Macario****Y346 TT 13-1 Human Centric ICT Enabling Smart Medicine, Assistive Robotics, Security, Education and Ethics****Monday, 19 June 2023, 11:00-12:00****Chairs:** Larisa Dunai, Jinhua She**PAPERS****11:00-11:20**ISIE23-000140 Effective Severity Assessment of Parkinson's Dis-ease with Wearable Intelligence using Free-living Environment Data  
**Liu Tao, Xulong Wang, Fengtao Nan, Jun Qi, Yun Yang, Po Yang****11:20-11:40**

ISIE23-000206 Proposal and implementation of k-anonymization method for data insertion and deletion

**KEITEN HAN, Hiroaki Nishi****11:40-12:00**ISIE23-000226 Presentation of Underwater Sensation by Drag in Knee Motion with a Lower Limb Exoskeleton Using MR Fluid Brakes  
**Ryunosuke Sawahashi, Taiki Masuda, Taiga Shimizu, Rie Shihama, Manabu Okui, Taro Nakamura****B Hall IEEE IES SYP (Student and Young Professional Forum)****Monday, 19 June 2023, 11:00-12:30****Chairs:** Pranay Jhunjunwala, Edivan Laercio Carvalho**PAPERS****11:00-11:05**Extending Edge-Based Mobile Robot Navigation with Social Awareness  
**Marcell Balogh****11:05-11:10**Fault-Tolerant Active Neutral-Point-Clamped Multilevel Inverter Maintaining Output Voltage at Failure  
**Jun Hitokuwata**

**11:10-11:15**

Methods of data streaming from IEC 61499 applications to Cloud storages

**Tatiana Liakh**

**11:15-11:20**

A DC-DC Modular Multilevel Converter Topology with Single Arm for MVDC Railway Application

**Sukrashis Sarkar**

**11:20-11:25**

A Novel Technique to Mitigate the Overlap-Time Effect in Current Source Inverters

**Umer Sohail**

**11:30-11:50**

Keynote 2

**Ronal Bejarano Rodriguez**

**11:55-12:15**

Keynote 3

**Pranay Jhunjunwala**

**12:15-12:30**

Discussions, Interactions, and Socialising

## Lunch

**Monday, 19 June 2023, 11:30-13:00**

## A Hall Opening ceremony

**Monday, 19 June 2023, 13:00-13:30**

## A Hall Keynote 1 - Liana Jo Ault

**Monday, 19 June 2023, 13:30-14:30**

**Keynote 1: Real time data, privacy, profit, and the distributed grid**

**Liana Jo Ault**

Venture General Manager for Energy Innovation, Nokia, UK

### Abstract:

In this topic we will investigate how distributed generation has changed the way we use data. We will discuss the impact privacy and profit have on the use of our data, the pitfalls and successes of existing solutions and challenges yet to be resolved.

### Speaker Bio:

Liana is a Venture General Manager for Energy Innovation at Nokia. Leading a new Nokia venture focused on digital platforms supporting optimization of flexible and renewable assets, her team focuses on commercialization in start-up environment.

Liana has extensive experience working with power utilities and industrial customers on new business models and industry trends. She likes to ask 'What If?' and is passionate about encouraging the next generation of sustainable engineers to challenge the status quo, ask the tough questions and find new innovative solutions.

## C Hall TT 05-3 Power Electronics & Energy Conversion

**Monday, 19 June 2023, 14:30-15:30**

**Chairs: Oscar Lucia, Khaled Laadjal**

### PAPERS

**14:30-14:50**

ISIE23-000066 Analysis and Mitigation of Low-Order-Harmonic Neutral-Point Voltage and Current Ripples in Five-Level NPC-Based Inverters

**ALMACHIUS KAHWA, Hidemine Obara, Yasutaka Fujimoto**

**14:50-15:10**

ISIE23-000070 Load-Independent Class E-1 Voltage-Driven Synchronous Rectifier

**Shizuna Oshima, Hirota Koizumi**

**15:10-15:30**

ISIE23-000076 Passive Damping Stabilization for Constant-Power Loaded Boost Converter

**Max Sebastià-Rullo, Angel Cid-Pastor, Hugo Valderrama-Blavi, Abdelali El Aroudi, Luis Martinez-Salamero**

## A Hall Industry Forum

**Monday, 19 June 2023, 14:30-15:30**

**Session 1: Digital Factory**

**Chair: Seppo Borenius**

Software defined factory - requirements to industrial communication infrastructure

**Mika Skarp, Senior Product Manager, Cumucore Oy**

OPC UA based data harmonization

**Jouni Aro, CTO, Prosys OPC Ltd**

The importance of services in the success of automation product development projects

**Mikko Heikkilä, Customer Lead, Technology Key Account Manager, Beckhoff Automation**

Unleashing industry 4.0 thanks to hardware independent automation apps

**Greg Boucaud, Chief Marketing Officer, UniversalAutomation.Org**

Experiences with industrial interoperability standards and Model Broker

**Gerardo Santillan, Senior Specialist and Sales Manager, Semantum Oy**

Energy Flexibility Management - Platform, Solutions and Services

**Veikka Pirhonen, Director, Energy Flexibility Management, Siemens**

### Coffee break

Monday, 19 June 2023, 15:30-16:00

## Y229a TT 12-1 ICT and AI Enabling Smart Cities, Buildings, Transport, Agriculture, Energy Efficiency and Sustainability

Monday, 19 June 2023, 16:00-17:00

**Chairs:** Kim Fung Tsang, Haibo Cheng

### PAPERS

**16:00-16:20**

ISIE23-000298 An Efficient and Secure DAG-based LoRaWAN System  
**Yang WEI, Kim Fung Tsang, Hao Wang**

**16:20-16:40**

ISIE23-000005 Artificial Intelligence-Based Diagnosis of Hydraulic Centrifugal Pumps Using Vibration Sensor: Feature Extraction and Failure Classification  
**Zahra Kazemi, Peter Rindom Andersen, Jakob Lemming, Peter Gorm Larsen**

**16:40-17:00**

ISIE23-000103 PestDSS: An Integrated Decision Support System for Sustainable Pest Management in Agriculture  
**Zhipeng Yuan, Ruolin Peng, Daniel Laybourne, Shunbao Li, Po Yang, Yang Li**

## Y405 TT 04-2 Electrical Machines and Drives

Monday, 19 June 2023, 16:00-18:00

**Chairs:** Firdausia Ahmed, Marko Hinkkanen

### PAPERS

**16:00-16:20**

ISIE23-000029 Segmentation Effects in the Modular HVDC Offshore Wind Generator and its Impact on Losses  
**Yannick Karekezi**

**16:20-16:40**

ISIE23-000071 Nonlinear Three-Phase Reluctance Synchronous Machine Modeling With Extended Torque Equation  
**Johannes Roßmann, Niklas Monzen, Maarten Kamper, Christoph M. Hackl**

**16:40-17:00**

ISIE23-000073 A Coupled Electromagnetic-thermal Dynamic Model for Wind Turbine Permanent Magnet Synchronous Generator Operation Analysis  
**Aras Ghafoor, Siniša Djurovi, Judith Apsley**

**17:00-17:20**

ISIE23-000113 Multiparameter Estimation Accuracy Improvement for PMSMs Using a Constriction Coefficient-Based Particle Swarm Optimization  
**Sana Etemadi, Hongfu Cheng, Mohammad Sedigh Toulabi, Uday Deshpande, Narayan Kar**

**17:20-17:40**

ISIE23-000129 A simple disturbance observer for stator flux linkage estimation of nonlinear synchronous machines  
**Niklas Monzen, Bernd Pfeifer, Christoph M. Hackl**

**17:40-18:00**

ISIE23-000130 Artificial neural network based optimal feedforward torque control of electrically excited synchronous machines  
**Niklas Monzen, Christoph M. Hackl**

## Y307 TT 09-1

Monday, 19 June 2023, 16:00-18:00

**Chairs:** Alin Tisan, Marta Marron-Romera

### PAPERS

**16:00-16:20**

ISIE23-000011 Bag-of-Functions Denoising: Extracting main components in time series  
**Hendrik Klopries, Andreas Schwung**

**16:20-16:40**

ISIE23-000097 Age Group Recognizer based on Human Face Supporting Smart Digital Advertising Platforms  
**Adri Priadana, Muhamad Dwisnanto Putro, Duy-Linh Nguyen, Xuan-Thuy Vo, Kanghyun Jo**

**16:40-17:00**

ISIE23-000110 A Noninvasive Smart Chair System for Monitoring Postures in Sedentary Workers

Luis Sigcha, Eduarda Pereira, Ana Lima, João Tiago Antunes, Diana Carvalhais, Diogo Sousa, Abdulay Abreu, Nelson Costa, Paulo Cardoso

**17:00-17:20**

ISIE23-000114 Gaze orientation to evaluate object interaction in human functional assessment

Álvaro Nieva Suárez, Marta Marrón Romera, Cristina Losada Gutiérrez

**17:20-17:40**

ISIE23-000183 ARTriViT: Automatic Face Recognition System Using ViT-Based Siamese Neural Networks with a Triplet Loss

Mustaqeem Mustaqeem, Muhammad Saeed, Abdulmotaleb Elsaddik, Wail Gueaieb

**17:40-18:00**

ISIE23-000184 Semantic-Based Image Steganography with Deep Convolutional Network

Fangfang Liu, Sicheng Wang, Yang Yang, Lunan Sun

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## **E Hall TT 03-2 Power Systems and the Smart Grid, Renewable Energy Systems and Smart Grid**

**Monday, 19 June 2023, 16:00-18:00**

**Chairs:** Bruno de Oliveira e Sousa, Christoph Hackl

### **PAPERS**

**16:00-16:20**

ISIE23-000009 Hardware-in-the-loop modeling of three-phase T-type neutral point clamped voltage source inverter for battery charging stations

Kristián Takács, Michal Frivaldsky

**16:20-16:40**

ISIE23-000035 Combining virtual synchronous machine and feedforward torque control for doubly-fed induction machine based wind energy conversion systems

Andre Thommessen, Christoph Hackl

**16:40-17:00**

ISIE23-000067 Three-level four-leg Voltage Source Inverter modulation techniques comparison for smart grids

Asier Davila, Iñaki Aizpuru, Estefania Planas, Jose Antonio Cortajarena, Antoni Arias

**17:00-17:20**

ISIE23-000072 TL-PVCNN: a Point Cloud Semantic Segmentation Framework on Transmission Line Scene

Ruiye Zhou

**17:20-17:40**

ISIE23-000094 On LinDistFlow Model Congestion Pricing: Bounding the Changes in Power Tariff

Shourya Bose, Kejun Chen, Yu Zhang

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## **Y228a SS 02-2 & WIP Machine Vision**

**Monday, 19 June 2023, 16:00-18:00**

**Chairs:** Danilo Caceres Hernández

### **PAPERS**

**16:00-16:20**

ISIE23-000275 Numerical Algorithm for Processing Phase Images for Measuring Three-Dimensional Geometry of Dynamic Objects by Phase Triangulation Methods

Sergey Dvoynishnikov, Vladimir Pavlov, Grigory Bakakin, Dmitry Kulikov, Vladimir Meledin, Vitaly Rakhmanov

**16:20-16:40**

ISIE23-000276 Application of narrowband optical filtering of Doppler signals in aerodynamic and hydrodynamic experiments

Vitaly Rakhmanov, Sergey Dvoynishnikov, Grigory Bakakin, Vladimir Pavlov

**16:40-17:00**

ISIE23-000315 A Robust Self-Organizing UAV Swarm with Loss Compensation Strategies for Efficient Mission Execution

Yang-Yi Chen, Chun-Liang Lin, Chian-Yu Lu, Wen Chun Huang, Chia-Hsuan Lai, Syu-You Ciou

**17:00-17:20**

ISIE23-000377 Autonomous Drone Swarm with Bionic Control

Chia-Hsuan Lai, Chun-Liang Lin, Yang-Yi Chen, Wen Chun Huang, Chian-Yu Lu, Syu-You Ciou

**17:20-17:40**

ISIE23-000366 An Image Location System Based on SIFT Algorithm to Alternative to GPS

Zi-Ming WANG, Chun-Liang Lin

**17:40-18:00**

ISIE23-000087 Fruit Detection and Classification Using Computer Vision and Machine Learning Techniques  
**Victor Zárate, Ednita Gonzalez, Danilo Cáceres-Hernández**

**Y347 SS 13-1****Monday, 19 June 2023, 16:00-18:00****Chairs:** Zaixin Song, Chunhua Liu**PAPERS****16:00-16:20**

ISIE23-000069 Deadbeat-Direct Complex Torque Control for Permanent Magnet Synchronous Motors  
**Wusen Wang, Yuxin Liu, Bowen Zhang, Hao Wen, Feng Yu, Chunhua Liu**

**16:20-16:40**

ISIE23-000089 Design of A Novel Dual Three-Phase Dual Stator Axial Flux Permanent Magnet Machine with Mechanical Offset  
**Rundong Huang, Bowen Zhang, Zaixin Song, Yuxin Liu, Yong Chen, Chunhua Liu**

**16:40-17:00**

ISIE23-000091 Power Quality Disturbance Identification Algorithm Based on Empirical Wavelet Transform And Time-Domain Kurtosis Feature Analysis  
**Chi Zhang, Yizhi Zhu, Caiyang Yu, Jiawei Bao, Qingsong Wang, Giuseppe Buja**

**17:00-17:20**

ISIE23-000117 Improved Predictive Control for Dual Motors Drives with Phase Angle Regulation  
**Yong Chen, Rundong Huang, Hao Wen, Bowen Zhang, Zaixin Song, Chunhua Liu**

**17:20-17:40**

ISIE23-000128 Comparison and Performance of Five-Phase SVPWM Overmodulation Strategies  
**Feifei Bu, Beijia Ma, Ya Qin, Peng Li, Qi Liu, Sorin Ioan Deaconu**

**17:40-18:00**

ISIE23-000156 Common-Mode Voltage Reduction-Based Space Vector Modulation Strategy for Three-Phase Two-Level Inverter with Delta-Connected Loads  
**Zhiping Dong, Hao Wen, Tianci Wang, Bowen Zhang, Zaixin Song, Chunhua Liu**

**C Hall TT 05-4 Power Electronics & Energy Conversion****Monday, 19 June 2023, 16:00-18:00****Chairs:** Khaled Laadjal**PAPERS****16:00-16:20**

ISIE23-000090 Combined Operation of CCM and DCM for an Active Buffer DAB AC-DC Converter  
**Kain Arai, Shohei Komeda, Shunsuke Takuma, Yoshiya Ohnuma**

**16:20-16:40**

ISIE23-000092 A Low Passive Count Redundant Four-Level Inverter Topology  
**Fernanda Vejar, Martin März**

**16:40-17:00**

ISIE23-000100 Multifunctional Grid-Forming Cascade Control for Converters Equipped with an LCL Filter  
**Rayane Mourouvin, Tuure Nurminen, Marko Hinkkanen, Ville Pirsto, Jarno Kukkolä**

**17:00-17:20**

ISIE23-000101 A novelty proposal of Grid-Forming Multi-Cell DC-AC Converter for Single-Phase Railway Catenary Systems  
**Roberto Martín López, Alessandro Faro, Sergio de López, Alessandro Lidozzi, Emilio Bueno**

**M240 TT 02-1 Electric Energy Storage****Monday, 19 June 2023, 16:00-18:00****Chairs:** Arun Nrayanan, Luca Tendersa**PAPERS****16:00-16:20**

ISIE23-000168 An Extension of the Kinetic Battery Model for Optimal Control Applications  
**Masoomah Karami, Sajad Shahsavari, Eero Immonen, Mohammad-Hashem Haghbayan, Juha Plosila**

**16:20-16:40**

ISIE23-000215 Design of a Thermal Battery Dummy with Integrated Sensor Node  
**Michael Grubmüller, Bernhard Schweighofer, Hannes Wegleiter**

**16:40-17:00**

ISIE23-000212 Degradation Detection of Series-Connected Li-ion based ESS via Time Domain Reflectometry  
**Hyeong Min Lee, Yong-June Shin**

**17:00-17:20**

ISIE23-000202 Three-Dimensional Model of a cylindrical Lithium-Ion Cell - Influence of Cell Design on State Imbalances and Fast-Charging Capability

**Alexander Fill, Mike Kopp, Jessica Hemmerling, Sabri Baazouzi, Luca Tendra, Kai Peter Birke**

## Y229c TT 07-2

**Monday, 19 June 2023, 16:00-18:00**

**Chairs:** Sertac Bayhan, Jiarui Zhang

### PAPERS

**16:00-16:20**

ISIE23-000122 A Resilient Framework for 5G-Edge-Connected UAVs based on Switching Edge-MPC and Onboard-PID Control

**Gerasimos Damigos, Achilleas Santi Seisa, Sumeet Gajanan Satpute, George Nikolakopoulos, Tore Lindgren**

**16:20-16:40**

ISIE23-000134 Discrete-time Observers for a Mechatronics System with PID Controllers Tuned Using SMA

**Alexandra-Iulia Szedlak-Stinean, Radu-Emil Precup, Raul-Cristian ROMAN, Emil Petriu**

**16:40-17:00**

ISIE23-000137 Dynamic path planning in human-shared environments for low-resource mobile agents

**Pangcheng David Cen Cheng, Marina Indri, Federico Maresca, Antonio Ragazzo, Fiorella Sibona**

**17:00-17:20**

ISIE23-000139 PI and Super Twisting Sliding Mode with Smith Predictor Control Structures for SMA Actuators

**Claudia-Adina Bojan-Dragos, Radu-Emil Precup, Raul-Cristian ROMAN, Emil M. Petriu, Mihai Muntyan**

**17:20-17:40**

ISIE23-000151 Angle Control Using Corona Discharge Considering Voltage Range Limitations

**Shigeki Yashita, Hiroaki Katagiri, Tomoya Kitamura, Yuki Inada, Yutaka Kazoe, Takahiro Nozaki**

**17:40-18:00**

ISIE23-000387 MQLINK: A Scalable and Robust Communication Network for Auton-

omous Drone Swarms

**Wen Chun Huang, Chun-Liang Lin, Yang-Yi Chen, Chia-Hsuan Lai, Chian-Yu Lu, Syu-You Ciou**

## Y313 TT 11-2

**Monday, 19 June 2023, 16:00-18:00**

**Chairs:** Alexander Fay, Yingyue Zhang

### PAPERS

**16:00-16:20**

ISIE23-000200 Deep Q-Learning versus Proximal Policy Optimization: Performance Comparison in a Material Sorting Task

**Reuf Kozlica, Stefan Wegenkittl, Simon Hirländer**

**16:20-16:40**

ISIE23-000240 Free Software and Open-Source Hardware for Industrial Automation

**Balakrishna Balakrishna, Ivan Tyagov, Sven Franck**

**16:40-17:00**

ISIE23-000271 A Semantic Model to Express Process Parameters and their Interdependencies in Manufacturing

**Tom Jeleniewski, Hamied Nabizada, Jonathan Reif, Aljoshä Köcher, Alexander Fay**

**17:00-17:20**

ISIE23-000290 A Methodology for Integrating Asset Administration Shells and Multi-agent Systems

**Lucas Sakurada, Fernando De la Prieta, Paulo Leitao**

**17:20-17:40**

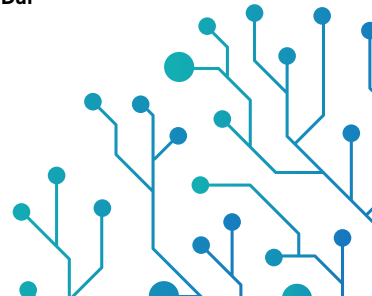
ISIE23-000295 Contract-Based Design for Low-Code Development in Industrial Edge Applications

**Deyuan Qu, YINGYUE ZHANG, Xiaoyu Hu, Wenbin Dai**

**17:40-18:00**

ISIE23-000296 Process-Product-Resource based Requirement Model for Discrete Manufacturing Systems

**Qiuyue Wang, YINGYUE ZHANG, Qinyun Hu, Xiao Wu, Wenbin Dai**





## Y307a WIP TT 10-2 Industrial Informatics: Cloud Computing, Big Data, AI, Informatics and Software Engineering

Monday, 19 June 2023, 16:00-18:00

Chairs: Luis Gomes, Sandeep Patil

### PAPERS

16:00-16:20

ISIE23-000241 Reliability Estimation of Split DNN Models for Distributed Computing in IoT Systems

Juan David Guerrero Balaguera, Ian A. Harshbarger, Josie Esteban Rodriguez Condia, Marco Levorato, Matteo Sonza Reorda

16:20-16:40

ISIE23-000368 Developing a Test Suite for Evaluating IEC 61499 Application Portability

Midhun Xavier, Tatiana Liakh, Sandeep Patil, Valeriy Vyatkin

16:40-17:00

ISIE23-000384 Hardware support for Static-Priority Stack Resource Policy based scheduling

Per Lindgren, Pawel Dzialo, Henri Lunnikivi

17:00-17:20

ISIE23-000393 Unified Digital Framework in Marine Applications

Cristiane Gonzaga, Hanna Kujawska, Bruno de Oliveira e Sousa

17:20-17:40

ISIE23-000398 Analysing navigation paths in constrained graphs using Petri nets

Luis Gomes, Jose Ribeiro-Gomes

17:40-18:00

ISIE23-000399 Supporting a .csv-based Workflow in MongoDB for Data Analysts

Matteo Fresta, Alessio Capello, Francesco Bellotti, Luca Lazzaroni, Marianna Cossu, Riccardo Berta

## Y346 TT 13-2 Human Centric ICT Enabling Smart Medicine, Assistive Robotics, Security, Education and Ethics

Monday, 19 June 2023, 16:00-18:00

Chairs: Larisa Dunai, Jinhua She

### PAPERS

16:00-16:20

ISIE23-000231 Artificial-Voice-Based Conversational Lecture Video Clips for Flipped Classroom

Kazuhiro Umetani, Yoshitaka Toyota, Masataka Ishihara, Eiji Hiraki

16:20-16:40

ISIE23-000303 An Explainable Artificial Intelligence Approach for Force Estimation from Surface-EMG Using the Element Description Method

Daiki Sodenaga, Issei Takeuchi, Seiichiro Katsura

16:40-17:00

ISIE23-000333 Analysis of Latent Factors Affecting Video Game Performance Using Machine Learning Methods

Julia Orlova, Anton Stepanov, Anton Vinogradov, Lubov Orlova, Anna Baldycheva, Andrey Somov

17:00-17:20

ISIE23-000347 Design and Preliminary Evaluation of a Virtual Reality with Haptic Feedback Tool for Spatial Neglect Assessment and Rehabilitation

Mohamed Guiatni

17:20-17:40

ISIE23-000371 Non-contact Physiological Monitor Based Fuzzy Control for Treadmill

Pei-Chun Hung, Yu-Chen Liu, Chun-Liang Lin, Wen Chun Huang

## Welcoming reception

Monday, 19 June 2023, 19:00-21:00

Conference Welcoming Reception at Hanasaari Restaurant (Hanasaarenranta 5, 02100 Espoo).

Dress code: Business Casual

## Y405 TT 04-3

Tuesday, 20 June 2023, 09:00-10:30

**Chairs:** Claude DELPHA, Firdausia Ahmed

### PAPERS

09:00-09:20

ISIE23-000135 Fault Severity Estimation in 7-Phase Electrical Machines in a Noisy Environment

**Lu ZHANG, Claude DELPHA, Demba DIALLO**

09:20-09:40

ISIE23-000147 Hybrid Encoderless Control of Multi-Salient Induction Motors in Parallel Connection at Variable Flux and Torque

**Eduardo Rodriguez Montero, Markus Vogelsberger, Thomas Wolbank**

09:40-10:00

ISIE23-000150 Modelling a Rotor Bar of an Induction Motor for Improving Electromagnetic Torque and Efficiency Using Permeance-Based Equivalent Circuit Model and FEA

**Areej Fatima, Ormolbanin Taqavi, Ze Li, Glenn Byczynski, Narayan Kar**

10:00-10:20

ISIE23-000157 Design and Analysis of A Highly Integrated Wireless Motor Drive System

**yingyu liu**

## Y347 TC Meeting - ESOC

Tuesday, 20 June 2023, 09:00-10:30

## Y313 TT 11-3 & WIP TT 11

Tuesday, 20 June 2023, 09:00-10:30

**Chairs:** Wenbin Dai, Haibo Cheng

### PAPERS

09:00-09:20

ISIE23-000401 Modeling Energy Consumption of Industrial Processes with Seq2Seq Machine Learning

**Simon Howind, Thilo Sauter**

09:20-09:40

ISIE23-000299 Automatic Microservice Orchestration and Deployment Method Based On the Modular Type Package for Industrial Edge Applications

**Jiale Kang, Xiao Wu, huiwen wu, Dali Yang, Wenbin Dai**

09:40-10:00

ISIE23-000316 Improving the Execution Time of Industrial Applications through Planned Cache Eviction Policy Selection

**Sergio Arribas Garcia, Giovanni Gracioli, Marco Caccamo, Tomasz Kloda, Denis Hoornaert**

10:00-10:20

ISIE23-000307 Collective Learning for Energy-centric Flexible Job Shop Scheduling

**Arun Narayanan, Evangelos Pournaras, Pedro Nardelli**

## Y346 TC Meeting - Cluster 4

Tuesday, 20 June 2023, 09:00-10:30

09:00-10:45

## Y307 TT 07-3 Motion Control, Robotics and Mechatronics

Tuesday, 20 June 2023, 09:00-10:45

**Chairs:** Mihoko Niitsuma, Chung-Ta King

### PAPERS

09:00-09:20

ISIE23-000166 Motion Planning of Fly-wing UAVs for Autonomous Landing in Crosswind

**Pengyuan Shao, Yanfei Dong, Jian Tan**

09:20-09:40

ISIE23-000176 Development of Automatically Controlled Facial Osteotomy Robot using Force Information - For Safe Le Fort I Osteotomy -

**Koji Niwa, Kazuki Yane, Yusuke Kido, Tomoya Kitamura, Takahiro Nozaki**

09:40-10:00

ISIE23-000182 A Performance-Adaptive and Time-Monitored Autonomous Ticket Booking Service in Cloud

**Hongyun Liu, Maarten Oudejans, Ruyue Xin, Paola Grosso, Zhiming Zhao**

10:00-10:20

ISIE23-000193 Proposal of a Method for Measuring Inside Diameter of Tubes Using a Drive Unit of a Robot for Inspection of Small Tubes

**Hiroto Nagashima, Kosuke Uchiyama, Fumio Ito, Manabu Okui, Taro Nakamura**

**10:20-10:40**

ISIE23-000306 Distributed Formation Control and Dynamic Formation Transformation for Multi-vehicle Systems based on Virtual Leader-Follower Structure and Triggered Strategy  
**Bohan Liu, bing yan**

## Y229a TT 01-1 New Technologies for Electric Transportation

**Tuesday, 20 June 2023, 09:00-10:45****Chairs:** Amir Babaki, Anandarup Das**PAPERS****09:00-09:20**

ISIE23-000036 A DC-DC Modular Multilevel Converter Topology with Single Arm for MVDC Railway Application  
**Sukrashis Sarkar, Anandarup Das**

**09:20-09:40**

ISIE23-000049 Reverse engineering of the hydrogen system of a commercial fuel cell vehicle  
**Markus Meindl, Martin März, Johannes Geilling, Richard Öchsner**

**09:40-10:00**

ISIE23-000063 Model Predictive Torque Control of Synchronous Machines Without a Current or Stator Flux Reference Generator  
**Kyunghwan Choi, Ki-Bum Park**

**10:00-10:20**

ISIE23-000136 Dynamic Wireless Charging Using LCC-S compensation topology in Low and Medium Power Applications  
**Martin Zavrel, Vladimir Kindl, Miroslav Tyrpekl**

**10:20-10:40**

ISIE23-000145 Optimal Components Sizing and Power Management for a Fuel Cell Electric Race Car Using a Bi-level Strategy  
**Essolizam PLANTE, Mylène Delhommais, Eric Bideaux, Mathias Gerard**

## M1 TT 03-3 Power Systems and the Smart Grid, Renewable Energy Systems and Smart Grid

**Tuesday, 20 June 2023, 09:00-10:45****Chairs:** Ties van der Heijden, Ali Mehrizi-Sani**PAPERS****09:00-09:20**

ISIE23-000105 Closed-loop simulation testing of a probabilistic DR framework for Day Ahead Market participation applied to Battery Energy Storage Systems  
**Ties van der Heijden, Edo Abraham, Peter Palensky, Nick van de Giesen**

**09:20-09:40**

ISIE23-000149 High-performance IoT Module for controlling and testing PV panels  
**Miguel Tradacete Ágreda, Enrique Santiso Gómez, Francisco Javier Rodríguez Sánchez, Pablo José Hueros Barrios, Carlos Santos Pérez, Rafael Pérez Sergui**

**09:40-10:00**

ISIE23-000155 Multifrequency Power Transfer in a Power Distribution Line  
**Xavier Genaro-Muñoz, Hugo Valderrama-Blavi, Roberto Giral**

**10:00-10:20**

ISIE23-000210 Harmonic Interaction of Voltage Source Converters in Grid Parallel Operation  
**Duc-Thanh Do**

## Y228a WIP SS 02-3 Machine Vision

**Tuesday, 20 June 2023, 09:00-10:45****Chairs:** Danilo Caceres Hernández, Hwei-Yung Lin**PAPERS****09:00-09:20**

ISIE23-000096 Improving Vehicle Localization with Lane Marking Detection Based on Visual Perception and Geographic Information  
**Hwei-Yung Lin, Jun-Yi Lee**

**09:20-09:40**

ISIE23-000224 Walking Optimization for Humanoid Robots Combining Screw Algebra with Genetic Algorithm  
**Paulo Fernando Ferreira Rosa, Fabio Suim Chagas, Luis David Peregrino de Farias, Franciele Sembay, José Lauro O. Schramm, Gabriel M. Lima, Ana L. Buze, Mateus S. Carvalho**

**09:40-10:00**

ISIE23-000272 Real-time Dynamic Obstacle Avoidance For A Non-holonomic Mobile Robot  
**Mukhtar Sani, Ahmad Hably, Bogdan Robu, Jonathan Dumon, Nacim Meslem**

**10:00-10:20**

ISIE23-000132 Method of Artificial Vision in Guide Cane for Visually Impaired People.  
**Leonardo Medina, Julio Rodriguez, Oscar Real-Moreno, Dayanna Ortiz, Wendy Flores-Fuentes, Oleg Sergiyenko, Moises J. Castro-Toscano, Paolo Mercorelli**

**10:20-10:40**

ISIE23-000261 Asynchronous Multi-Task Learning Based on One Stage YOLOR Algorithm  
**Cheng-Fu Liou**

## C Hall TT 05-5 Power Electronics

**Tuesday, 20 June 2023, 09:00-10:45**

**Chairs:** Antonio J. Marques Cardoso, Rayane Mourouvin

### PAPERS

**09:00-09:20**

ISIE23-000108 I/O-Linearization Based Current Decoupling Control of Modular Multilevel Cascade Converters  
**Oliver Kalmbach, Christoph M. Hackl**

**09:20-09:40**

ISIE23-000119 Thermo-Electrical Modeling of Multilevel Switching-Cell-Array-Based Power Converters  
**Roya Rafiezadeh, Sergio Busquets-Monge, Salvador Alepuz**

**09:40-10:00**

ISIE23-000120 Variant Parameters Identification of the PEMEL Circuit Model by

RMSE-Based Self-Tuning Method  
**Hamed Nezhadkhatami, Amin Hajizadeh, Mohsen Soltani, Damien Guilbert**

**10:00-10:20**

ISIE23-000125 Improved Dead-Beat Control for Single-Phase LC-Coupling Hybrid Active Power Filter (LC-HAPF)  
**Pak-Ian Chan, Wai-Kit Sou, Chi-Seng Lam**

**10:20-10:40**

ISIE23-000160 An Efficiency-Enhanced LCC-S Based Inductive Power Transfer Converter Throughout Battery Constant Current Charging Process  
**Yuying Luo, Paul IAM, Zhaoyi Ding, Pak-Ian Chan, Chi-Seng Lam**

## Y229c TT 06-1

**Tuesday, 20 June 2023, 09:00-10:45**

**Chairs:** Romain Delpoux

### PAPERS

**09:00-09:20**

ISIE23-000055 Adaptive Low-Computation Neural Network Control of Constrained Nonlinear Systems and Its Application to Agricultural Drones  
**Kang Liu, Po Yang, Rujing Wang**

**09:20-09:40**

ISIE23-000060 Model Predictive Control Method for Nonisolated Universal Battery Charger  
**Naki Guler, Ugur Fesli, Hasan Komurcugil, Sertac Bayhan**

**09:40-10:00**

ISIE23-000116 Distributed Sensor Fault Detection for Sensor Networks  
**Jiarui Zhang, Steven X. Ding, Linlin Li**

**10:00-10:20**

ISIE23-000205 Online Exciter Controller Tuning for a Synchronous Condenser in a Weak Grid  
**Ehsan Fouladi, Fatemeh Sharifi, Ali Mehrizi-Sani**

**10:20-10:40**

ISIE23-000227 Finite element dq-model for MTPA flux control of Synchronous Reluctance Motor (SynRM)  
**Romain DELPOUX, Thomas Huguet, Federico Bribiesca Argomedo, Loïc Queval, Jean-Yves Gauthier, Zohra Kader**

**Y228b SS 14-1**

Tuesday, 20 June 2023, 09:00-10:45

**Chairs:** Makoto Iwasaki, Daisuke Chugo**PAPERS****09:00-09:20**

ISIE23-000144 Finger Force Distribution Measurement System with Inclination Correction Function

**Lu Zhao, Koji Makino, Yasuo Kondo, Kazuki Yamada, Xiao Sun, Hidetsugu Terada****09:20-09:40**

ISIE23-000185 Estimating Changing Drive Timing Effects of Exosuit on Jumping Height for Augmenting Human Instantaneous Force

**Yusuke Ishii, Fumio Ito, Taro Nakamura****09:40-10:00**

ISIE23-000304 Shoe-type Wearable Device for Measuring Ground Reaction Force and Center of Pressure

**Ryuichi Kawasaki, Seiichiro Katsura****10:00-10:20**

ISIE23-000335 Dominant Hand Invariant Parkinson's Disease Detection Using 1-D CNN Model and STFT-based IMU Data Fusion

**Aleksei Shcherbak, Ekaterina Kovalenko, Ekaterina Bril, Anna Baldycheva, Andrey Somov****10:20-10:40**

ISIE23-000354 Analysis of Rehabilitation Methods for Small Dogs Based on the Muscular Activity

**Daisuke Chugo, Yujie Li, satoshi muramatsu, Sho Yokota, Jinhua She, Hiroshi Hashimoto, Hiroaki Kamishina, Hiroyuki Hirabayashi****Y307a TT 02-2 Electric Energy Storage**

Tuesday, 20 June 2023, 09:00-10:45

**Chairs:** Annukka Santasalo-Aarnio**PAPERS****09:00-09:20**

ISIE23-000017 Parameter Estimation of Second-Life Lithium-Ion Batteries Through Subspace Identification Methods

**Marcelo Camboim, Aghatta Moreira, Mateus Giesbrecht****09:20-09:40**

ISIE23-000046 Unscented Kalman Filter based Coestimation of SoC and SoH in Lithium Battery with Hysteresis

**Luca Aryn Hattouti, Roberto Di Rienzo, Federico Baronti, Roberto Roncella, ROBERTO SALETTI, Gianluca Aurilio, Riccardo Di Dio, Walter Nesci****09:40-10:00**

ISIE23-000074 Optimized Passive Battery Cell Balancing Algorithm for a Low-Cost Race Car

**Matteo Bonora, Roberto Passerone****10:00-10:20**

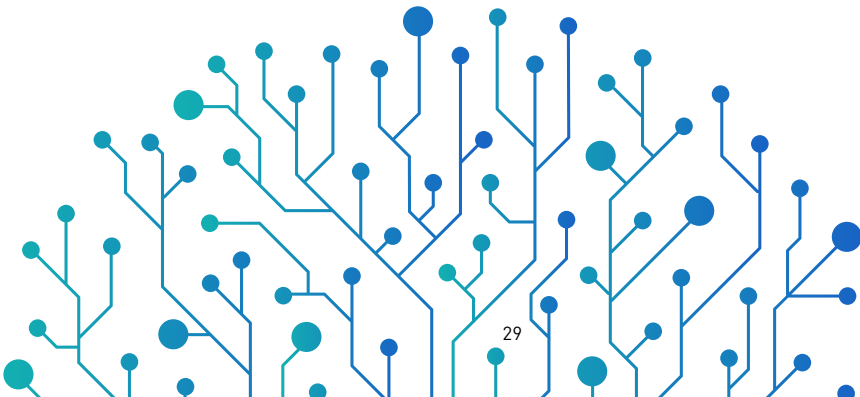
ISIE23-000079 The in-plane thermal conductivity of lithium-ion cells: Parametric influences and simulative prediction

**Luca Tendera****10:20-10:40**

ISIE23-000115 Charging Control of A Vanadium Redox Flow Battery Integrated With Solar PV Plant

**Mojtaba Hajhosseini, Mateja Car, Zeeshan Aleem, Vinko Leši****Coffee break**

Tuesday, 20 June 2023, 10:30-11:00



## A Hall Keynote 2a - Rikard Franz

Tuesday, 20 June 2023, 11:00-12:00

### **Keynote 2: The intelligent automation experience** **Rikard Franz**

Head of development department of Processing Automation, Tetra Pak, Sweden

#### **Abstract:**

Over the years, automation has improved performance in most production sites in the world and is actually seen as the 3rd revolution in the industry. The addition of the digitalization, has further improved the value of automation. As most people are currently wondering about how to make the best use of this we are thinking of how we can make the journey easier for people working with these solutions.

How can we make life easier for operators, maintenance people and managers. We have to add a new level to automation solutions, where things like UX and UI, linked to artificial intelligence will even further enhance the operations at production sites. Also, how can we make sure that Cyber Security threats does not put an abrupt end to this journey.

#### **Speaker Bio:**

With a long experience in Process Automation and manufacturing, Rikard is now heading the development department of Processing Automation at Tetra Pak, being an expert in plant control, monitoring, and automation services. After finalizing his master's degree at Lund University, Rikard started to work with Automation as a programmer. Over the years, various positions in Project Management, automation sales and management has taken Rikard to the senior expert position he is having today.

## Lunch

Tuesday, 20 June 2023, 11:30-13:30

## A Hall Keynote 2b - Alexander Fay

Tuesday, 20 June 2023, 13:30-14:30

### **Keynote 4: The digital twin: The why and the how**

#### **Alexander Fay**

Professor and Head of the Institute of Automation Technology, Helmut Schmidt University, Germany

#### **Abstract:**

Digital Twins have gained increasing interest during the last years. Various concepts and technologies exist for the implementation of Digital Twins, and their possible applications are multifold. Beyond promising perspectives, companies long for advice where they should start with applying Digital Twins: should they build Digital Twins to support their development processes, or their production? Or rather Digital Twins of their products, for better maintenance and update services? Should they restrict access to these Digital Twins to own staff, or can Digital Twins offer new perspectives also for their customers? Furthermore, Digital Twins will be gamechangers for lifecycle services. New business opportunities arise, and thus, new players. Who will be the owner of the Digital Twin and the data it comprises and generates? Which capabilities are required to make use out of it? How will this change the value chain of engineering and operation of systems in production, logistics, transport and energy distribution? These questions are the subject of this keynote, and methods how to find answers, individually for one's business: How to position in future in the value chain, how to identify attractive applications of the Digital Twin, how to identify which information is required to set up a Digital Twin, and how to make best use of standards and existing information.

#### **Speaker Bio:**

Alexander Fay (IEEE Member'02, Senior Member '07) is Full Professor and Head of the Institute of Automation Technology at the Helmut-Schmidt-University in Hamburg, Germany. His main research interests are models and methods for the engineering of large automated systems, especially in the process and manufacturing industries, in buildings and transportation systems. With his research team, he develops and employs knowledge-based methods,

ontologies, autonomous systems and other AI techniques. The aim of his team is to develop models, methods and tools to increase engineering efficiency and to assist in the engineering and operation of industrial plants. He is member of the Scientific Board of the German Society for Measurement and Automation (GMA) and Head of its Department "Methods of Automation". He was a member of the IEEE Industrial Electronics Society Administration Committee between 2009 and 2011. Between 2009 and 2017, he served as an Associate Editor of IEEE Transactions on Industrial Informatics. Alexander Fay is a member of acatech, the German Academy of Engineering Sciences. Since 2014, he has been a member of the Scientific Advisory Board and of the WC 2 "Research and Innovation" of the German "Industrie 4.0" initiative.

14:30-15:30

## Y405 TT 04-4 Electrical Machines and Drives

Tuesday, 20 June 2023, 14:30-15:30

Chairs: José Daviu, Yannick Karekezi

### PAPERS

14:30-14:50

ISIE23-000162 Quadratic Regression Model based Predictive Control of PMSM Drives with field weakening operation capability constrained to linear modulation range  
Kristóf Bándy, Péter Stumpf

14:50-15:10

ISIE23-000163 A PMaSynRM stator winding fault detection approach using an optimized PCA-based EWMA control scheme  
Pakedam LARE, Siyamak SARABI, Claude DELPHA, Demba DIALLO

15:10-15:30

ISIE23-000170 Dynamic Drive Cycle Model of a Fuel-Cell Powered Hybrid Bus  
Martin Novak, Jan Gruber

## Y229 aTT 01-2 & WIP TT 01 New Technologies for Electric Transportation

Tuesday, 20 June 2023, 14:30-15:30

Chairs: Amir Babaki, Anandarup Das

### PAPERS

14:30-14:50

ISIE23-000285 Feasibility Study of Using Modified Single-Phase Wireless Power Transfer System for Three-Phases Motor Driving

Alireza Jafari-Natanzi, Amir Babaki, Thomas Ebel, Sadegh Vaez-Zadeh

14:50-15:10

ISIE23-000381 Tangentially-Magnetized-Slot-PM-Assisted Magnet Saturation Relieving Design for Doubly Salient Reluctance Machine Position Sensorless Drive Applications

Weiye Wang, Shuangxia Niu, Xing Zhao, Weinong Fu

15:10-15:30

ISIE23-000364 Staggered Ackermann Steering Geometry for Autonomous Driving of a Paired E-Scooter System

Michael Frye, William Qian

## E Hall TC Meeting - Power Electronics

Tuesday, 20 June 2023, 14:30-15:30

## M1 TT 03-4 Power Systems and the Smart Grid, Renewable Energy Systems and Smart Grid

Tuesday, 20 June 2023, 14:30-15:30

Chairs: Jin Won Hwang, Chen-Wei Yang

### PAPERS

14:30-14:50

ISIE23-000225 Phase-independent control of a three-phase four-leg inverter

Iñaki Aizpuru, Asier Davila, Estefanía Planas, José Luis Martin, José Antonio Cortajarena

14:50-15:10

ISIE23-000265 Exploration of For-Purpose Decentralized Algorithmic Cyber Attacks in EV Charging Control

Mahan Fakouri Fard, Xiang Huo, Mingxi Liu

## Y228a TC Meeting - Standards

Tuesday, 20 June 2023, 14:30-15:30

## Y347 TC Meeting - Control, Robotics, and Mechatronics

Tuesday, 20 June 2023, 14:30-15:30

## C Hall TT 05-6 Power Electronics & Energy Conversion

Tuesday, 20 June 2023, 14:30-15:30

**Chairs:** Rayane Mourouvin

### PAPERS

**14:30-14:50**

ISIE23-000173 Input Impedance Modeling of Dual-Active-Bridge-Based Input-Series Output-Parallel Converters  
**Jiajun Yang, Sandro Guenter, Giampaolo Buticchi, Chunyang Gu, Marco Liserre, Pat Wheeler**

**14:50-15:10**

ISIE23-000177 Basic Study of a Heat Distribution Control Method for an Induction Heating System with Three AC-AC Direct Converters  
**Shunta Inami, Shohei Komeda**

**15:10-15:30**

ISIE23-000181 A Detection Method of Misalignment for a WPT System using Three-Power Transfer Circuits  
**Rin Arai, Shohei Komeda**

## M240 TT 12-2 WIP

Tuesday, 20 June 2023, 14:30-15:30

**Chairs:** Kim Fung Tsang

### PAPERS

**14:30-14:50**

ISIE23-000363 FIWARE-based Architecture for Smart Local Energy Communities  
**Max Thoma, Gernot Steindl, Wolfgang Kastner**

**14:50-15:10**

ISIE23-000373 Black Soldier Fly Bioconversion System: A Digital Twin Approach  
**Cheng Pang**

**15:10-15:30**

ISIE23-000374 Detection of Powdery Mildew Pest in Apple Tree Leaves Using Deep Learning in Intelligent Sprayer Robots  
**Majid Sorouri, Ali Aghajanpoor, Arash Sharifi**

## Y229c TT 06-2 Control Systems

Tuesday, 20 June 2023, 14:30-15:30

**Chairs:** Romain Delpoux, Jiarui Zhang

### PAPERS

**14:30-14:50**

ISIE23-000257 Flatness-Based Control for Transient Current Suppression in a Dual Active Bridge Converter  
**Simon Uicich, Bruno ALLARD, Xuefang Lin Shi, Jean-Yves Gauthier**

**14:50-15:10**

ISIE23-000283 Analysis of the zero dynamics of three-phase current source inverters using a complex-valued approach  
**Leila Rahimi, Arnau Doria-Cerezo, Robert Grino**

## Y228b SS 10-1

Tuesday, 20 June 2023, 14:30-15:30

**Chairs:** Tomoyuki Shimono, Tomoya Kitamura

### PAPERS

**14:30-14:50**

ISIE23-000194 Verification of Anode Position and Generated Force Vector of EHD at Wire-cylinder Electrode  
**Tomoya Kitamura, Hiroaki Katagiri, Shigeki Yashita, Yuki Saito, Hiroshi Asai, Kouhei Ohnishi, Takahiro Nozaki**

**14:50-15:10**

ISIE23-000195 Development of Optical Proximity/Biaxial Force Sensor and Application to Contact Movement  
**Tomoaki Baba, Toshiyuki Murakami, Hermano Igo Krebs, Takahiro Nozaki**

**15:10-15:30**

ISIE23-000208 Handheld Haptic Drill Simulator Using Visual Servoing System for Axial Force Presentation  
**Takuya Matsunaga, Shunya Takano, Tomoyuki Shimono, Kouhei Ohnishi, Mitsuru Yagi, Masaya Nakamura**



**Y313 WIP TT 09-2**

Tuesday, 20 June 2023, 14:30-15:30

Chairs: Kanghyun Jo, Marta Marrón

**PAPERS****14:30-14:50**

ISIE23-000385 Accurate RF-sensing of complex gestures using RFID with variable phase-profiles

Sahar Golipoor, Stephan Sigg

**14:50-15:10**

ISIE23-000386 Work-in-Progress: Multi-modal Odour and Image Recognition on Synthetic Dataset

Fanny Monori, Alin Tisan

**Y307a TT 10-3 Industrial Informatics: Cloud Computing, Big Data, AI, Informatics and Software Engineering**

Tuesday, 20 June 2023, 14:30-15:30

Chairs: Polina Ovsianikova, Christoph Binder

**PAPERS****14:30-14:50**

ISIE23-000152 From Model to Implementation: Engineering of flexible Production Systems with RAMI 4.0

Christoph Binder, Ambra Calà, Jan Vollmar, Christian Neureiter, Arndt Lder

**14:50-15:10**

ISIE23-000196 Onsite Renewable Generation Time Shifting for Photovoltaic Systems

Rakshith Subramanya, Harri Aaltonen, Seppo Sierla, Valeriy Vyatkin

**15:10-15:30**

ISIE23-000282 Method for Automatic Simulation Model Calibration and Maintenance for Brownfield Process Plants

Malte Ramonat, Alexander Fay

**Coffee break**

Tuesday, 20 June 2023, 15:30-16:00

**Y229a TT 12-3 ICT and AI Enabling Smart Cities, Buildings, Transport, Agriculture, Energy Efficiency and Sustainability**

Tuesday, 20 June 2023, 16:00-17:30

Chairs: Maria Carmela Di Piazza, Kostas Siozios

**PAPERS****16:00-16:20**

ISIE23-000216 ANN-based forecasting of solar irradiation under data clustering: an approach for improved estimation of PV power production

Giuseppe La Tona, Maria Di Piazza

**16:20-16:40**ISIE23-000220 ICE: A Low-Cost IoT Platform Targeting Real-Time Anonymous Visitors Flow Tracking at Museums  
Vasileios Serasidis, Ioannis Sofianidis, George Margaritis, Christos Sad, Vasileios Konstantakos, Kostas Siozios**16:40-17:00**ISIE23-000244 Embedded Intelligence of End Devices with MOS Sensors for CH<sub>4</sub> Detection

Simão Leite, Rui Costa, João Carvalho, Tomás Sapage, Rui Bessa, Sofia Paiva

**17:00-17:20**ISIE23-000297 Evaluation of AIoT-based Smart Lighting System: An IDex Case Study  
Hao Wang, Kim Fung Tsang, Yang WEI**Y228a SS 09-1 & WIP**

Tuesday, 20 June 2023, 16:00-17:45

Chairs: Kanghyun Jo, Jie Liu

**PAPERS****16:00-16:20**

ISIE23-000352 Classifying Breast Cancer Histopathological Images Using Attention Guided Convolutional Neural Network

Musfequa Rahman, ANIK SEN, Kaushik Deb, Kanghyun Jo

**16:20-16:40**

ISIE23-000061 Attack prevention and detection for cyber-physical systems based on coprime factorization technique

Shimeng wu, Hao Luo, Yuchen Jiang, Kuan Li

**16:40-17:00**

ISIE23-000088 An Interoperability Middleware for IIoT Gateways

**Pedro Henrique Morgan Pereira, Edison Pignaton De Freitas, Carlos E. Pereira, Gustavo Cainelli, João Paulo J. da Costa**

**17:00-17:20**

ISIE23-000154 Sustainability of ICPS from a Safety Perspective: Challenges and Opportunities

**Muhammad Gibran Alfarizi, JIE LIU, Jørn Vatn, Shen Yin**

**17:20-17:40**

ISIE23-000279 Cybersecurity of Industrial Automation and Control System (IACS) Networks in Biomass Power Plants

**Montri Wiboonrat**

16:00-18:00

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## **Y405 TT 04-5 Electrical Machines and Drives**

**Tuesday, 20 June 2023, 16:00-18:00**

**Chairs:** José Daviu, Yannick Karekezi

### **PAPERS**

**16:00-16:20**

ISIE23-000171 Modeling and Experimental Validation of a LTO Battery Cell for a Hydrogen Hybrid Bus

**Martin Novak, Zden k Novák**

**16:20-16:40**

ISIE23-000180 Comparative Study of Excitation Signals for Active Fault Diagnosis of Belt Drives

**Moritz Fehsenfeld, Johannes Kühn, Karl-Philipp Kortmann**

**16:40-17:00**

ISIE23-000198 Influence of the Flux Sensor Position for Rotor Fault Detection in WRIM: A Power Spectral Entropy Analysis

**Jose Guerra Carmenate, Miguel Iglesias Martínez, Jose Antonino Daviu, Pedro Fernandez de Cordoba, Dunai Larisa, Alfredo Quijano-Lopez**

**17:00-17:20**

ISIE23-000270 Design and Performance Superoptimization of a Novel High Temperature Superconducting Linear Flux-Switching Motor

**Xiangdong SU, Hang ZHAO, Fang LI**

**17:20-17:40**

ISIE23-000280 Automatic classification of stator asymmetries and insulation thermal damages in induction motors, applying persistence spectrum and a convolutional neural network to the stray-flux signals

**Vicente Biot-Monterde, Angela Navarro, Israel Zamudio-Ramirez, Jose Antonino Daviu, Roque Osornio-Rios, Jose E. Ruiz-Sarrio**

**17:40-18:00**

ISIE23-000287 Sensorless Control Strategy for Magnetic Drive-Trains Based on Adaptive Nonlinear State Observer

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## **Y307 TT 07-4 Motion Control, Robotics and Mechatronics**

**Tuesday, 20 June 2023, 16:00-18:00**

**Chairs:** Polina Ovsianikova

### **PAPERS**

**16:00-16:20**

ISIE23-000010 API for data transfer using USB to CAN converter

**Robert Plšíčik, Matúš Danko**

**16:20-16:40**

ISIE23-000053 Decentralized Motion Control for a Novel Planar Motor Intralogistics System

**Lukas Steinle, Nico Helfesrieder, Armin Lechler, Alexander Verl, Ali Montazeri, Jinfan Wang**

**16:40-17:00**

ISIE23-000058 Learning Diverse and Efficient Goal-reaching Policies for Robot Motion Planning

**Han-Cheng Yao, Chi-Kai Ho, Chung-Ta King**

**17:00-17:20**

ISIE23-000159 Extending Edge-Based Mobile Robot Navigation with Social Awareness

**Gábor Fehér, Dániel Rózsa, Marcell Balogh, Norbert Reider**

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## **B Hall IEEE IES Publications Committee Meeting**

**Tuesday, 20 June 2023, 13:30-16:00**

## M1 TT 03-5 Power Systems and the Smart Grid, Renewable Energy Systems and Smart Grid

Tuesday, 20 June 2023, 16:00-18:00

**Chairs:** Jin Won Hwang, Chen-Wei Yang

### PAPERS

**16:00-16:20**

ISIE23-000289 On interoperability of Data-centre and the Energy market in the Nordic Region

**Chen-Wei Yang, Nikolai Galkin, Valeriy Vyatkin**

**16:20-16:40**

ISIE23-000292 An emulator for static and dynamic performance evaluation of small wind turbines

**Adrien Prévost, Vincent Léchappé, Romain DELPOUX, Xavier Brun**

**16:40-17:00**

ISIE23-000312 Mapping the Optimal Sites for Offshore Wind Power Plants and Green Hydrogen Production: South and Southeast Brazilian Case Study

**Karen Paula, Hayro Pumaloclla, Mahdi Pourakbari Kasmaei, Joel Melo, Djalma Falcao**

**17:00-17:20**

ISIE23-000313 A low-cost digital twin for real-time monitoring of photovoltaic panels

**Pablo José Hueros-Barrios, Francisco Javier Rodríguez Sánchez, Miguel Tradacete Ágreda, Pedro Martín, Carlos Santos, David Pérez Saura**

**17:20-17:40**

ISIE23-000323 Photovoltaic and Wind Power Plants Production Profiles Generation from Scarce Data

**Antonio Karneluti, Filip Rukavina, Mario Vašak**

**17:40-18:00**

ISIE23-000325 Fast Earth-Fault and Feeder Detection in Medium-Voltage Distribution Power Grids

**Tomáš Komrská, Josef Štengl, Zdeněk Peroutka**

## C Hall TT 05-7

Tuesday, 20 June 2023, 16:00-18:00

**Chairs:** Alvaro Iribarren, Rayane Mourouvin

### PAPERS

**16:00-16:20**

ISIE23-000281 Voltage Balancing Analysis of DC-Link Capacitors in Six-phase Three-Level T-Type Inverters

**Luca Vancini, Michele Mengoni, Gabriele Rizzoli, Luca Zarri, Angelo Tani**

**16:20-16:40**

ISIE23-000338 Choke-less Class-E Oscillator Using p-MOSFET and n-MOSFET

**Yuta Ikutajima, Hiroataka Koizumi**

**16:40-17:00**

ISIE23-000346 A Novel Technique to Mitigate the Overlap-Time Effect in Current Source Inverters

**Umer Sohail, Trond Østrem, Bjarte Hoff**

**17:00-17:20**

ISIE23-000253 Small-Signal Stability Analysis of Power Converters with Optimal Pulsewidth Modulation Strategies

**Leyre Rosado, Javier Samanes, Jesus Lopez, Eugenio Gubia**

**17:20-17:40**

ISIE23-000039 Wireless Power Transfer with Resonant Pulsed Current Converter

**Dodi Garinto, Theodora Valerie**

**17:40-18:00**

ISIE23-000082 Enhancement of Steady State Response of Indirect Finite Control Set Model Predictive Control

**Saad Hamayoon, Morten Hovd, Jon Are Suul**



## M240 SS 13-2 & WIP

Tuesday, 20 June 2023, 16:00-18:00

Chairs: Zaixin Song, Chunhua Liu

### PAPERS

16:00-16:20

ISIE23-000218 Optimization design of permanent magnet synchronous motor torque ripple based on stator tooth crown slotting method

Mingle Jin, Ling Luo, Yuan Chai, Jian Song, Fei Jiang, Yixin Shao

16:20-16:40

ISIE23-000234 FPGA Validated Advanced Learning-based Voltage Control of DC/DC converter feeding CPL in DC Microgrid applications

Hussain Khan, Kimmo Kauhaniemi

16:40-17:00

ISIE23-000250 Design Considerations of Outer-Rotor Flux-Modulated Permanent-Magnet In-Wheel Motors

Zekang Huang, Yixiao Luo, Wenyuan Mi, Zheng Cai, Fei Zhao, Hang Zhao, Jincheng Yu

17:00-17:20

ISIE23-000266 A Fast Low-Cost Neuron Network Controller with Ripple Suppression Based on Model Predictive Direct Speed Control with Continuous Control Set and Long Horizon

Yuxuan Liu, Shuangxia Niu

17:20-17:40

ISIE23-000288 Overshoot Reduction Inspired Recurrent RBF Neural Network Controller Design for PMSM

Zhenxiao Yin, Hang ZHAO

17:40-18:00

ISIE23-000142 Design of A Novel Double-Stator Fault-Tolerant Transverse Flux Permanent Magnet Machine for Electric Propulsion Aircraft

Bowen Zhang, Rundong Huang, Zaixin Song, Wusen Wang, Zhiping Dong, Chunhua Liu

## Y228b SS 10-2

Tuesday, 20 June 2023, 16:00-18:00

Chairs: Tomoyuki Shimono, Tomoya Kitamura

### PAPERS

16:00-16:20

ISIE23-000211 Model-Based Pitch Angle Compensation for Center of Gravity Variation in Underactuated System with an Arm

Hirohisa Kanazawa, Kosuke Ishizaki, Yasuhiro Miyata, Masamichi Nawa, Norihiko Kato, Toshiyuki Murakami

16:20-16:40

ISIE23-000213 Frequency-Domain Modeling-Free Iterative Learning Control for Point-To-Point Motion

Yoshihiro Maeda, Makoto Iwasaki

16:40-17:00

ISIE23-000286 Universal Motion Controller: Adaptive Approach

Tarik Uzunovic, Sabanovic Asif

17:00-17:20

ISIE23-000300 Underactuated Control for Two-Wheeled Mobile Robot with an Arm Using Torque Constraint Conditions and Disturbance Observer

Jin Ito, Toshiyuki Murakami

## Y313 TT 09-3 Signal and Image Processing and Computational Intelligence

Tuesday, 20 June 2023, 16:00-18:00

Chairs: Alin Tisan, Óscar Lucía

### PAPERS

16:00-16:20

ISIE23-000305 Rapid FPGA implementation of a cost effective quaternion LMS estimator

Alin Tisan, Clive Cheong Took

16:20-16:40

ISIE23-000350 DenseNetx: Efficient DenseNets for Remote Scene Classification without Pretraining

Russo Ashraf, Tien-Dat Tran, Ge Cao, Kanghyun Jo

**16:40-17:00**

ISIE23-000353 Classification of Lung and Colon Cancer Histopathological Images Using Attention Based Convolutional Neural Network

**Md. Al-Mamun Provath, Syed Md. Minhaz Hossain, Kaushik Deb, Kanghyun Jo**

**17:00-17:20**

ISIE23-000189 Vibration Auralization System Using High-Speed Vision

**Kotaro Fujita, Felyue Wang, Kohei Shimasaki, Idaku Ishii, Ryo Okamoto, Hironori Higashida**

**17:20-17:40**

ISIE23-000190 A Comparison of Extended Kalman Filters for Parameter Estimation of Sinusoidal Signals

**Luis A. Barragan, Hector Sarnago, Denis Navarro, Oscar Lucia**

**17:40-18:00**

ISIE23-000207 Unifying Local and Global Fourier Features for Image Classification

**Xuan-Thuy Vo, Jehwan Choi, Duy-Linh Nguyen, Adri Priadana, Kanghyun Jo**

## **Y307a TT 10-4 Industrial Informatics: Cloud Computing, Big Data, AI, Informatics and Software Engineering**

**Tuesday, 20 June 2023, 16:00-18:00**

**Chairs:** Kanghyun Jo, Nishan Mills

### **PAPERS**

**16:00-16:20**

ISIE23-000291 Driving Profile Analysis Using Machine Learning Techniques and ECU Data

**Rafael Canal, Giovani Gracioli, Felipe Kaminsky Riffel**

**16:20-16:40**

ISIE23-000314 Formal verification of observers supervising a cyber-physical system implemented using IEC 61499

**Polina Ovsiannikova, Etienne Le Priol, Vincent Perret, Pranay Jhunjunwala, Midhun Xavier, Valeriy Vyatkin**

**16:40-17:00**

ISIE23-000318 Methods of data streaming from IEC 61499 applications to Cloud storages

**Tatiana Liakh, Tuojian Lyu, Nikolai Galkin, Chen-Wei Yang, Valeriy Vyatkin**

**17:00-17:20**

ISIE23-000321 Efficient Multi-Receptive Pooling YOLOv5 with Coordinate Attention Module for Object Detection on Drone

**Jinsu An, Muhamad Dwisnanto Putro, Priadana Adri, Youlkyeong Lee, Junmyeong Kim, Kanghyun Jo**

**17:20-17:40**

ISIE23-000322 A Cybersecurity Framework for Home Energy Management Systems using Artificial Intelligence

**Lakshitha Gunasekara, Harsha Moraliyage, Daswin de Silva, Nishan Mills, Daminda Alahakoon, Andrew Jennings, Milos Manic**

**17:40-18:00**

ISIE23-000324 Concept of blockchain based micro-service control strategy for a domestic water heater

**Primož Podržaj**

## **Y346 WIP SS 14-2**

**Tuesday, 20 June 2023, 16:00-18:00**

**Chairs:** Daisuke Chugo, Makoto Iwasaki

### **PAPERS**

**16:00-16:20**

ISIE23-000365 Feasibility of Smart-phone-Attached UWB Tag for Daily life Indoor Pedestrian Tracking

**Khawar Naheem, Mun Sang Kim**

**16:20-16:40**

ISIE23-000378 Disturbance rejection for pedaling rehabilitation robot based on integration of equivalent-disturbance-rejection and repetitive control methods

**Yujian Zhou, Jinhua She, Feng Wang, Makoto Iwasaki**

**16:40-17:00**

ISIE23-000396 Cognitive assistance for the visually impaired using haptics presentation of environmental information

**Takumi Sato, Mihoko Niitsuma**

## **Gala Dinner**

**Tuesday, 20 June 2023, 19:00-21:00**

**Gala Dinner at Pikku Finlandia / Little Finlandia Hall : Mannerheimintie 13 E, 00100 Helsinki**

## **Y229a TT 08-1 Instrumentation, Sensors, Actuators, Systems Integration and Nano-Technology**

**Wednesday, 21 June 2023, 09:00-10:30**

**Chairs:** Frank Wasinski, Kazi Javed Akram

### **PAPERS**

**09:00-09:20**

ISIE23-000080 Concept of an Optical Distance and Speed Sensor Using Novel Offsetless Spatial Frequency Filters in the Area of Functional Safety

**Frank Wasinski, Werner Bonath**

**09:20-09:40**

ISIE23-000138 Experimental Qualification of a Low-Noise Charge-Sensitive ROIC with Very High Time Resolution

**Alireza Mohammad Zaki, Stoyan Nihtianov**

**09:40-10:00**

ISIE23-000228 Capacitive Sensor-based Smart Water Tap: A Feasibility Study

**Kazi Javed Akram, Saikumar V, Bobby George**

**10:00-10:20**

ISIE23-000034 Physics-data cooperative ship motion prediction with onboard wave radar for safe operations

**Motoyasu Kanazawa, Tongtong Wang, Robert Skulstad, Guoyuan Li, Houxiang Zhang**

## **Y228a TT 03-6 & WIP Power Systems and the Smart Grid**

**Wednesday, 21 June 2023, 09:00-10:30**

**Chairs:** Jin Kwon Hwang, Maximilien Marc

### **PAPERS**

**09:00-09:20**

ISIE23-000277 Frequency-Domain System Identification of a First Order Governor-Turbine Model from PMU Ambient Data

**JINK WON HWANG, Janne Seppänen**

**09:20-09:40**

ISIE23-000369 On the Relationship between Inter-Area Modes and Power System Inertia

**Janne Seppänen, JINK WON HWANG, Matti Lehtonen**

**09:40-10:00**

ISIE23-000382 LVDC vs LVAC: A comparison of system losses

**Maximilien MARC, Dominique Roggo, Miikka Säteri, Tero Tuomarmäki, Samuli Ranta**

**10:00-10:20**

ISIE23-000345 An Unbiased Fuzzy Double Q-Learning based Energy Management for Fuel Cell Hybrid Electric Vehicles

**Liang GUO, Zhongliang LI, Rachid OUTBIB**

## **M240 TT 10-5 Industrial Informatics: Cloud Computing, Big Data, AI, Informatics and Software Engineering**

**Wednesday, 21 June 2023, 09:00-10:30**

**Chairs:** Nishan Mills, Harsha Moraliyage

### **PAPERS**

**09:00-09:20**

ISIE23-000326 Automated Machine Learning in Critical Energy Infrastructure for Net Zero Carbon Emissions

**Harsha Moraliyage, Dilantha Haputhanthri, Chamod Samarajeewa, Nishan Mills, Daswin de Silva, Milos Manic, Andrew Jennings**

**09:20-09:40**

ISIE23-000327 Tiny Federated Learning with Bayesian Classifiers

**Ning Xiong, Sasikumar Punnekkat**

**09:40-10:00**

ISIE23-000330 Debugging approach for IEC 61499 control applications in FBME\

**Tatiana Liakh, Radimir Sorokin, Daniil**

**Akifev, Polina Ovsianikova, Valeriy Vyatkin**

**10:00-10:20**

ISIE23-000336 Augmenting Industrial Chatbots in Energy Systems using ChatGPT Generative AI

**Gihan Sameera Wiriththamulla Gamage, sachin kahawala, Nishan Mills, Daswin de Silva, Milos Manic, Daminda Alahakoon, Andrew Jennings**

## C Hall TT 05-8 Power Electronics & Energy Conversion

Wednesday, 21 June 2023, 09:00-10:45

**Chairs:** Rayane Mourouvin, Hirotaka Koizumi

### PAPERS

**09:00-09:20**

ISIE23-000209 Fault-Tolerant Active Neutral-Point-Clamped Multilevel Inverter Maintaining Output Voltage at Failure  
Jun Hitokuwata, Hirotaka Koizumi

**09:20-09:40**

ISIE23-000214 Selective harmonic mitigation-pulse amplitude modulation technique for 7-level inverters

**Concettina Buccella, Maria Gabriella Cimoroni, Francesco Simonetti, Carlo Cecati**

**09:40-10:00**

ISIE23-000217 SiC JFET/P-MOSFET cascode for SSCB and inrush current limiter in 300V DC power systems

**Ausias Garrigos, David Marroqui, José Manuel Blanes, Cristian Torres, Carlos Orts, Pablo Casado**

**10:00-10:20**

ISIE23-000245 MODELLING AND CONTROL OF MULTI-PORT DC-DC CONVERTER FOR OFFSHORE WIND-HYDROGEN ENERGY SYSTEMS

**Shahriar Farajdadian, Amin Hajizadeh, Mohsen Soltani**

**10:20-10:40**

ISIE23-000273 Multi-Objective SHM-PWM Modulation Technique for CMV Control in 3-Phase Inverters

**mohammad sharifzadeh, Mahdiah Sadabadi, Eric Laurendeau, Kamal Al-Haddad**

## Y228b SS 05-1

Wednesday, 21 June 2023, 09:00-10:45

**Chairs:** Dirk Benyoucef, Djaffar Ould Abdeslam

### PAPERS

**09:00-09:20**

ISIE23-000037 An Efficient Adaptive Algorithm for Batteries Charging Supplied by Photovoltaic Panels

**Yacine Triki, Ali BECHOUCHE, Hamid SEDDIKI, Djaffar OULD ABDESLAM, Radu Porumb**

**09:20-09:40**

ISIE23-000093 A New Optimal Centralized Demand Side Management for a Campus Smart Microgrid

**Mohamed Hassan**

**09:40-10:00**

ISIE23-000161 LSTM Networks for Cyber-physical Attack Diagnoses in Microgrids  
Bushra CANAAN, Bruno Colicchio, Djaffar OULD ABDESLAM, Lhassane Idoumghar

**10:00-10:20**

ISIE23-000238 Model-Free HVAC Optimizer based on Reinforcement Learning  
Charalampos Marantos, Christos Lamprakos, Kostas Siozios, Dimitrios Soudris

**10:20-10:40**

ISIE23-000264 Local Energy Marketplace Agents-based Analysis  
Ameni Boumaiza

## B Hall IEEE IES strategy workshop

Wednesday, 21 June 2023, 09:00-12:00

### Coffee break

Wednesday, 21 June 2023, 10:30-11:00

## Y229a SS 08-1

Wednesday, 21 June 2023, 11:00-12:00

**Chairs:** Hadi Kanaan, Romain Delpoux

### PAPERS

**11:00-11:20**

ISIE23-000050 Analytical Model and Control Strategy for Three-Phase Single-Stage Rectifier for Battery Charging Applications  
**Elie PEREZ, Xuefang Lin-Shi, Bruno ALLARD**

**11:20-11:40**

ISIE23-000126 Review of Different Current Control Strategies for Thyristor-Controlled LC-Coupling Hybrid Active Power Filter  
**Wai-Kit Sou, Pak-Ian Chan, Cheng Gong, Chi-Seng Lam**

**11:40-12:00**

ISIE23-000197 Attenuation of Voltage Distortion Effects on a Three-Phase Grid-Connected Converter  
**Alfonso Damiano, Mauro Boi, Andrea Floris, Alessandro Serpi**

## C Hall TT 05-9 Power Electronics & Energy Conversion

Wednesday, 21 June 2023, 11:00-12:00

**Chairs:** Rayane Mourouvin, Hiroataka Koizumi

### PAPERS

**11:00-11:20**

ISIE23-000260 Asymmetrical firing angle modulation for 12-pulse thyristor rectifiers supplying high-power electrolyzers  
**Alvaro Iribarren Zabalegui, Ernesto L. Barrios, David Elizondo, Pablo Sanchis, Alfredo Ursúa**

**11:20-11:40**

ISIE23-000267 Modeling a Grid-Forming DFIG Wind Turbine  
**Iker Oraa, Javier Samanes, Jesus Lopez, Eugenio Gubia**

**11:40-12:00**

ISIE23-000268 Switching control to enhance performance in smart protections  
**manuela la rosa, Davide Patti, Giovanni Scurella, Donata Nicolosi, Salvatore D'Angelo**

## M240 TT 10-6 Industrial Informatics: Cloud Computing, Big Data, AI, Informatics and Software Engineering

Wednesday, 21 June 2023, 11:00-12:00

**Chairs:** Sandun Mavikumbure, Harsha Moraliyage

### PAPERS

**11:00-11:20**

ISIE23-000341 Application of Deep Learning Method to Estimate Bottomhole Pressure Dynamics of Oil Wells  
**Cheng Haibo**

**11:20-11:40**

ISIE23-000344 Towards migration from IEC 61131-3 to IEC 61499 in process industry: redesign of visualisation  
**Hiruni Kothalawala, Pranay Jhunjunwala, Valeriy Vyatkin**

**11:40-12:00**

ISIE23-000349 Physical Anomaly Detection in EV Charging Stations: Physics-based vs ResNet AE  
**Harindra Sandun Mavikumbure, Victor Cobilean, Chathurika S. Wickramasinghe, Tyler Phillips, Benny J. Varghese, Barney Carlson, craig rieger, Timothy Pennington, Milos Manic**

## Y228b TT 04-6 & WIP

Wednesday, 21 June 2023, 11:00-12:00

**Chairs:** Nader Safari-Shad, Marko Hinkanen

### PAPERS

**11:00-11:20**

ISIE23-000395 Online Parameter Estimation of Dual Three-Phase Permanent-Magnet Synchronous Machine for More-Electric Aircraft Applications  
**Shengyu Cao, Tao Yang, Yuzheng Chen, Serhiy Bozhko, Pericle Zanchetta**

**11:20-11:40**

ISIE23-000158 An Investigation into Permanent Magnet Hysteresis Losses in Reverse-salient Permanent Magnet Synchronous Motors  
**Immanuel Williams, Anouar Belahcen, Shrikrishna Kulkarni**



**11:40-12:00**

ISIE23-000400 Transient Thermal Analysis of Totally Enclosed Railway Traction Motor with high power density

**Choung-Seo Kim, Hyung-Woo Lee, Woo-Young Ji**

**Lunch**

**Wednesday, 21 June 2023, 11:30-13:30**

**B Hall IEEE IES strategy workshop**

**Wednesday, 21 June 2023, 13:00-15:30**

**A Hall Keynote 3 - Duncan McFarlane**

**Wednesday, 21 June 2023, 13:30-14:15**

**Keynote 3: Industry 4.0 on Shoestring: The Case for Low-Cost Digitalisation?**

**Duncan McFarlane**

Professor of Industrial Information Engineering / Head of Distributed Information & Automation Lab, University of Cambridge, UK

**Abstract:**

This talk will review the original intent of Industry 4.0 and some of its limitations when being applied in small companies. A systematic template for supporting digitalisation for small manufacturers will be presented and the Digital Manufacturing on a Shoestring programme introduced as a means of addressing key aspects of this template. The key features of the Shoestring programme will be presented along with results of numerous developments and deployments in the last 2-3 years. Future industrial developments and research challenges in this area will be presented.

**Speaker Bio:**

Duncan McFarlane is Professor of Industrial Information Engineering at the University of Cambridge and Head of Distributed Information & Automation Lab and a visiting Professor at University of Melbourne. He began his career as an engineering cadet with BHP in Melbourne and has worked in the industrial automation area for over 25 years joining Cambridge in 1995. He was Research Director of the Auto ID Centre in 2000-3 and subsequently co-founder and Chairman of RedBite Solutions Ltd - an industrial RFID/IoT based asset manage-

ment solutions company. He is Principal Investigator on the Digital Manufacturing on a Shoestring programme developing low cost digital solutions for small manufacturers with more recent spin-outs into construction, logistics and medical systems. The Shoestring approach is currently being rolled-out with SMEs across several regions in the UK and overseas. From March to July 2020 he led a team which won the RAE Presidents Award for providing Industrial Engineering support to local hospitals managing the Covid-19 Epidemic and from September 2020 to July 2021 was Operations Logistics lead at Cambridge University for its Asymptomatic Covid-19 Student Testing Programme.

**A Hall Industry Forum**

**Wednesday, 21 June 2023, 14:30-15:45**

**Session II: Interoperability and Platforms**

**Chair: Raine Viitala**

Software defined factory - requirements to industrial communication infrastructure

**Mika Skarp, Senior Product Manager, Cumucore Oy**

OPC UA based data harmonization  
**Jouni Aro, CTO, Prosys OPC Ltd**

The importance of services in the success of automation product development projects

**Mikko Heikkilä, Customer Lead, Technology Key Account Manager, Beckhoff Automation**

Unleashing industry 4.0 thanks to hardware independent automation apps

**Greg Boucaud, Chief Marketing Officer, UniversalAutomation.Org**

Experiences with industrial interoperability standards and Model Broker

**Gerardo Santillan, Senior Specialist and Sales Manager, Semantum Oy**

Energy Flexibility Management - Platform, Solutions and Services

**Veikka Pirhonen, Director, Energy Flexibility Management, Siemens**

**Coffee break**

**Wednesday, 21 June 2023, 15:30-16:00**

## B Hall IEEE IES strategy workshop

Wednesday, 21 June 2023, 16:00-17:00

## E Hall WIP TT 13-3

Wednesday, 21 June 2023, 16:00-17:30

**Chairs:** Larisa Dunai, Kostas Siozios

### PAPERS

**16:00-16:20**

ISIE23-000203 Modeling and Control of Differential-Drive Chassis for a Homecare Assistive Robot

**Ping He, Honghao Lv, Haiteng Wu, Geng Yang**

**16:20-16:40**

ISIE23-000362 Headset gas sensor for monitoring of blood EtOH

**Kohji Mitsubayashi, Shota Suzuki, Kenta Ichikawa, Kenta Iitani, Koji Toma, Takahiro Arakawa**

**16:40-17:00**

ISIE23-000372 Architecture of a Feedback System for Human-Machine Interaction in Collaborative Environment

**Mikhail Kolesnikov, Jan Olaf Blech, Udayanto Dwi Atmojo, Valeriy Vyatkin, Maxim Afanasev**

**17:00-17:20**

ISIE23-000380 Perturbation Device for Crutch Walk Training

**Naoaki Tsuda, Ryosei Ikoma, Ryo Takahashi, Kodai Hayashi, Susumu Tarao, Yasunori Fujiwara, Yoshihiko Nomura, Norihiko Kato**

## M240 TT 02-3 Electric Energy Storage

Wednesday, 21 June 2023, 16:00-17:30

**Chairs:** Alexander Fill, Jan Haase

### PAPERS

**16:00-16:20**

ISIE23-000258 Temperature Indicators and Overtemperature Detection in Lithium-Ion Batteries based on Electrochemical Impedance Spectroscopy

**Iñaki Lalinde, Alberto Berrueta, Adrián Soto, Joseba Arza, Pablo Sanchis, Alfredo Ursúa**

**16:20-16:40**

ISIE23-000259 Onset of Irreversible Reactions in Overcharging Lithium-Ion Cells: an Experimental and Modeling Approach

**Elisa Irujo, Alberto Berrueta, Iñaki Lalinde, Joseba Arza, Pablo Sanchis, Alfredo Ursúa**

**16:40-17:00**

ISIE23-000332 Integrated Lithium-ion battery model and experimental validation of a second-life prototype

**Ane Pérez, Idoia San Martín, Pablo Sanchis, Alfredo Ursúa**

**17:00-17:20**

ISIE23-000337 Survey on Current Large-Scale Energy Storage Systems

**Jan Haase, Ahmad Almaghrebi, Fares Aljuheshi, Sam Moayed, Nasser Aljuhaishi, Mahmoud Alahmad**

## Y228b SS 08-2

Wednesday, 21 June 2023, 16:00-17:30

**Chairs:** Sally Sajadian, Hadi Kanaan

### PAPERS

**16:00-16:20**

ISIE23-000246 Performance Comparison of Modulation Techniques for Modular Multilevel Converter

**Anthony ABDAYEM, Jean Sawma, Flavia Khatounian, Eric Monmasson, Ragi Ghosn**

**16:20-16:40**

ISIE23-000274 High-Dynamics P-E and Q-f Control of PV Inverters for Strong and Weak Grids

**Ibai Urtasun, Andoni Urtasun, Luis Marroyo**

**16:40-17:00**

ISIE23-000294 Modified Model Predictive Control for Power Balancing in Multilevel Inverter for Battery Energy Storage Applications

**Henry Grote, Yuehao Zhu, sally sajadian**

**17:00-17:20**

ISIE23-000319 Improved Transient Response in Inverter-Based Resources using Deep Reinforcement Learning

**Ashwin Venkataramanan, Ali Mehrizi-Sani**

## C Hall WIP TT 05-10

Wednesday, 21 June 2023, 14:30-15:30

Chairs: Keith Corzine, Naira Goñi

### PAPERS

16:00-16:20

ISIE23-000084 Fault Detection, Localization and Clearance for MMC based on Indirect Finite Control Set Model Predictive Control  
Saad Hamayoon, Morten Hovd, Jon Are Suul

16:20-16:40

ISIE23-000248 A orientation tolerant wireless power transfer system using bipolar coil topology  
Jure Domajnko, Rok Friš, Mitja Trunti, Nataša Prosen

16:40-17:00

ISIE23-000361 Demonstration of On-road Vehicle Drive with Electric Motor Fed by Power Packets  
Shiu Mochiyama, Taketsune Nakamura

17:00-17:20

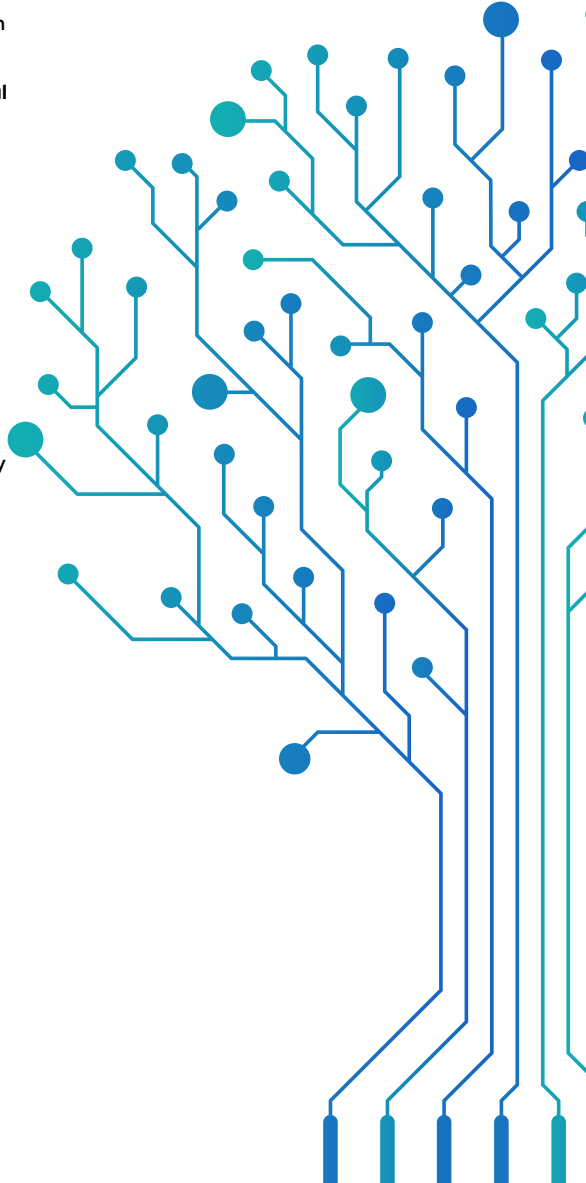
ISIE23-000390 High-fidelity averaged model of grid-following inverter for stability analysis considering the PLL influence  
Naiara Goñi, Javier Marcos, Miguel García, Alberto García, Andoni Urtasun, Luis Marroyo

17:20-17:40

ISIE23-000397 A Z-Source Ac Circuit Breaker  
Keith Corzine, Yuan Li, Fang Peng

## A Hall Closing

Wednesday, 21 June 2023, 17:40-18:00



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