INDIN2019

2019 IEEE 17th International Conference on Industrial Informatics (INDIN)

22-25 July 2019 | Helsinki-Espoo, Finland

IEEE

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A! Aalto University

Tampere University

FINNISH SOCIETY OF AUTOMATION
SUOMEN AUTOMAATIOSEURA RY

Sponsored by the
IEEE Industrial Electronics Society

indin2019.org

CONTENTS

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: Maarintie 8, 02150 Espoo, Helsinki. The closest metro station is Aalto University, exit to the Tietotie street (Exit B).

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. The cheapest unlimited Internet plan costs less than 7€ per month. 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 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 lunch and dinners tickets in your delegate backage.

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 using USB drive. The presentation time is 15 minutes, and 5 more minutes is allocated to questions and change of the presenter.

INDIN 2019


VALERIY


JOSÉ


KIM


LUCIA


REN


THILO

MESSAGE FROM THE GENERAL AND PROGRAM CHAIRS

Dear delegates and authors of INDIN 2019, welcome to Finland in one of its best seasons – summer! The INDIN conference series, which started 16 years ago in Banff, Canada, has made it to first of the Nordic European countries. It is hosted by Aalto University and co-sponsored by Tampere University – two distinguished education and research institutions positioned on the forefront of the progress.

INDIN 2019 is remarkable in many aspects.

Firstly, it is strongly dedicated to the greatest technical trend of the last years: new incarnation of Artificial Intelligence. Both industry and academia are very much keen about machine learning and neural networks these days and INDIN'19 is at the forefront of these developments. The AI track of the conference is the largest, spanning its sessions across all 3 days of the conference.

Along with this focus, INDIN'19 boasts the breadth of coverage of topics. There are 14 technical tracks comprehensively covering the most important areas of industrially relevant information sciences. These are complemented by 14 special sessions dedicated to emerging and niche topics.

INDIN'19 received 470 submissions which is the record number for this series of conferences. 284 papers were accepted for the conference program. A unique feature of this year's INDIN is that it gives an opportunity to its delegates to accelerate publication in the prestigious Transactions on industrial informatics. There are 45 lucky authors who got recommendation for submitting their papers straight to the transactions along with presenting them at the conference.

Secondly, it is trying to give a new meaning to the word "Industrial" in its title. For the first time, INDIN includes in its program the Industry Forum whose sessions will take place every day and in exclusive time slots. This is intended for giving each participant the chance to attend, participate and benefit from the discussions with the global industry leaders.

The industry forum will be complemented by keynote talks given by the truly leading bold thinkers from academia and industry: Professors Toshio Fukuda, Ren Luo and Stavros Tripakis, and Dr. Alf Isaksson.

INDIN'19 offers great tutorials and workshops, including the Women in Engineering workshop.

Last but not least, the conference provides an opportunity to experience the vibrant still relaxed capital of Finland and feel the spirit and culture of this country, voted the world's happiest nation two times in the row.

We do hope you will spend four exciting days in Helsinki and Espoo!

INDIN2019 General Chairs: Valeriy Vyatkin, José Luis Martinez Lastra and Kim Fung Man
INDIN2019 Program Chairs: Lucia Lo Bello, Ren Luo and Thilo Sauter

INDIN 2019

ORGANIZING COMMITTEES

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- Toshio Fukuda, Nagoya University; Meijo University, Japan; Beijing Institute of Technology, China
- Kari Koskinen, Aalto University, Finland
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- Xinghuo Yu, RMIT University, Australia

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PROGRAM AT GLANCE

Tuesday through Thursday lunches will be served in the TUAS building self-service restaurant 11:00-13:30.

To avoid queues, delegates are advised to have lunch outside of the midday peak hour.

Coffee Breaks are in the first floor hall
- Tuesday 10:30-10:50, 15:30-16:00
- Wednesday 10:30-10:50, 15:30-16:00
- Thursday 10:40-11:00, 14:30-15:00

MONDAY
- Registration desk open 08:00-15:00
- Workshops and tutorials: 09:00-15:00
- Lunch for the workshop and tutorial participants: 12:00-13:30, at Fat Lizard restaurant

TUESDAY
- Registration desk opens at 08:00
- Opening Ceremony - 09:00-9:30 in AS2
- Keynote talk 1 9:30 - 10:30 in AS2: T. Fukuda "Multi-Scale Robotics - From brachiation robot to micro/nano robotic manipulation"
- Technical sessions 10:50-12:10, 16:00-18:00
- Keynote talk 2 13:00 - 14:00 in AS2: R. Luo "AIoT and Robotics Driving Paradigm Shift of Intelligent Manufacturing New Biz: Some Exemplary Best Practices"
- Industry forum session 1 - 14:00 - 15:30 in AS2
- Welcome Reception –- 19:00, at Hanasaari Hotel (Hanasaarenranta 5, Espoo, Koivusaari metro)

WEDNESDAY
- Registration desk opens at 08:00
- Technical sessions 08:30-10:30, 16:00-18:00
- Keynote talk 3 - 11:00 - 12:00 in AS2: S. Tripakis "The Science of Software and System Design"
- Keynote talk 4 - 13:00 - 14:00 in AS2: A. Isaksson "Fully Autonomous Manufacturing – Only a dream or future reality?"
- Industry forum session 2 - 14:00 - 15:30 in AS2
- Women in Engineering workshop - 14:00-18:00, at OIH
- Conference Gala dinner –- 19:00, at Paasitorni (Paasivuorenkatu 5 A, FIN-00530 Helsinki)

THURSDAY
- Registration desk opens at 08:00
- Industry forum bus departure: 08:00, return around 12:30
- Technical sessions 09:00-10:40, 11:00-12:00, 15:00-17:00
- IES Finland chapter workshop: 09:00-12:00 at AS2
- Industry forum session 3 - 13:00 - 14:30 in AS2
- Closing ceremony: 17:00-17:30 at AS2

SESSIONS AT A GLANCE

WiE	Keynote	Tutorial	Meetings	Workshops	SS/TT	Ceremony	Industry forum	Lunch/ coffee break

MONDAY 22ND OF JULY

	Hall	AS1	AS2	TU1	TU3	TU5	TU6	TU7	AS3	AS4	AS6	1592
8:00												
8:30												
9:00					**09:00 - 12:00** Workshop 2 - Distributed architectures in electric power systems	**09:00 - 10:30** Tutorial 2 - Enabling Energy Internet via Machine-type Communications		**09:00 - 12:00** Workshop 1 - Geeking IEC61499 - from function blocks programming to function block Apps validation through the DAEDALUS Marketplace	**09:00 - 11:00** Tutorial 1: Hands-on Deep Learning for Industrial Informatics Applications			
9:30												
10:00												
10:30							**10:30 - 12:00** Tutorial 4 - Reality-centric reference architectures					
11:00												
11:30												
12:00	**12:00 - 13:00** Lunch (at Fat Lizard Restaurant)											
12:30												
13:00							**13:00 - 14:30** Tutorial 6 - Time Sensitive Networking from information models down to hardware	**13:00 - 15:30** Workshop 1 - Geeking IEC61499 - from function blocks programming to function block Apps validation through the DAEDALUS Marketplace				
13:30						**13:30 - 15:30** Tutorial 3 - Data informatics-driven machine intelligence for human-oriented computing: From deep learning-based video processing to system			**13:30 - 15:00** Tutorial 5: Methods and Tools for Integrated Development of Product-Service Systems			
14:00												
14:30												
15:00												

TUESDAY 23RD OF JULY

	Hall	AS1	AS2	TU1	TU3	TU5	TU6	TU7	AS3	AS4	AS6	1592
8:00												
8:30												
9:00			**09:00 - 09:30** Opening ceremony									
9:30			**09:30 - 10:30** Keynote Talk 1									
10:00												
10:30 - 10:50	**10:30 - 10:50** Coffee Break											
11:00	10:50-12:10	**10:50 - 12:10** TT Robotics and Mechatronics in Industrial applications - 1	**10:50 - 12:10** TT Artificial Intelligence in Industrial Applications - 1	**10:50 - 12:10** TT Factory Automation and Communication Systems- 1	**10:50 - 12:10** SS Engineering of Software Products for Industry	**10:50 - 12:10** TT Safety and Security in Industrial Applications - 1	**10:50 - 12:10** TT Human, Computer and Machine Interaction - 1	**10:50 - 12:10** SS Intelligent Application of Consumer Wireless Technologies for Industry - 1	**10:50 - 12:10** SS Deep Learning Methods for Medical Image Analysis	**10:50 - 12:10** SS Efficiency in Future Data Centers - 1	**10:50 - 12:10** TT Simulation, Virtual and Mixed Reality - 1	**10:50 - 12:10** IEEE P2660.1 standard committee meeting
11:30	**11:30 - 14:30** Lunch											
12:00												
12:30												
13:00			**13:00 - 14:00** Keynote Talk 2									
13:30												
14:00			**14:00 - 15:30** Industry Forum 1 : AI in manufacturing and supply chain									
14:30												
15:00												
15:30	**15:30 - 16:00** Coffee Break											
16:00		**16:00 - 18:00** TT Industrial cyber-physical systems and industrial agents - 1	**16:00 - 18:00** TT Artificial Intelligence in Industrial Applications - 2	**16:00 - 18:00** TT Safety and Security in Industrial Applications - 2	**16:00 - 18:00** SS Intelligent Vehicle and Transportation Systems	**16:00 - 18:00** TT Systems and Software Engineering - 1	**16:00 - 18:00** TT Industry Digitalisation and Digital Twins in Industrial Applications - 1	**16:00 - 18:00** TT Industrial Informatics Tools - 1	**16:00 - 18:00** SS Holistic Approach to Control and Analysis of Complex Systems	**16:00 - 18:00** SS Efficiency in Future Data Centers - 2	**16:00 - 18:00** TT Factory Automation and Communication Systems- 2	
16:30												
17:00												
17:30												

WEDNESDAY 24TH OF JULY

	Hall	AS1	AS2	TU1	TU3	TU5	TU6	TU7	AS3	AS4	AS6	1592	OIH
8:30		08:30 - 10:30 TT Industrial cyber-physical systems and industrial agents - 2	08:30 - 10:30 TT Artificial Intelligence in Industrial Applications - 3	08:30 - 10:30 TT Safety and Security in Industrial Applications - 3	08:30 - 10:30 SS Integration of Software Agents and Low-Level Automation Functions - 1	08:30 - 10:30 TT Systems and Software Engineering - 2	08:30 - 10:30 TT Industry Digitalisation and Digital Twins in Industrial Applications - 2	08:30 - 10:30 TT Technologies and Infrastructures for Smart grids, Buildings, and Cities - 1	08:30 - 10:30 SS Informatics models for IoT enabled healthcare	09:00 - 10:30 TT Real-time and networked embedded computing - 1	08:30 - 10:30 SS Monitoring, Diagnosis, Prognosis and Resilient Control Methods and Applications - 1	09:00 - 10:00 IEEE P2668 standard committee meeting	
9:00													
9:30													
10:00												10:00 - 11:00 IEEE P21451.002 standard committee meeting	
10:30	10:30 - 10:50 Coffee Break												
11:00			10:50 - 12:00 Keynote Talk 3										
11:30	11:30 - 14:30 Lunch												
12:00													
12:30													
13:00			13:00 - 14:00 Keynote Talk 4										
13:30													
14:00			14:00 - 15:30 Industry Forum 2: AI for autonomous systems										14:00 - 17:30 Women in Engineering Forum
14:30													
15:00													
15:30	15:30 - 16:00 Coffee Break												
16:00		16:00 - 18:00 TT Industrial cyber-physical systems and industrial agents - 3		16:00 - 18:00 TT Artificial Intelligence in Industrial Applications - 4	16:00 - 18:00 TT Human, computer and machine interaction - 2	16:00 - 18:00 TT Robotics and Mechatronics in Industrial Applications - 2	16:00 - 18:00 TT Industry Digitalisation and Digital Twins	16:00 - 18:00 TT Technologies and infrastructures for Smart Grids, Buildings and Cities - 2	16:00 - 18:00 SS Efficient multimedia sensing and computing in industrial applications	16:00 - 18:00 SS Lower Power Smart Sensing for the Industry 4.0	16:00 - 18:00 SS Monitoring, Diagnosis, Prognosis and Resilient Control Methods and Applications - 2		
16:30													
17:00													
17:30													

THURSDAY 25TH OF JULY

	Hall	AS1	AS2	TU1	TU3	TU5	TU6	TU7	AS3	AS4	AS6	1592
9:00		09:00 - 10:40 TT Human, Computer and Machine Interaction - 3	09:00 - 12:20 Workshop of the IES Chapter Finland	09:00 - 10:40 TT Factory Automation and Communication Systems- 3	09:00 - 10:40 TT Distributed and Networked Control Systems-1		09:00 - 10:40 TT Simulation, Virtual and Mixed Reality - 2	09:00 - 10:40 TT Technologies and infrastructures for Smart Grids, Buildings and Cities - 3	09:00 - 10:40 SS Communications and Computing for Fog Based Control Systems - 1	09:00 - 10:40 TT Education in engineering and industrial informatics - 1	09:00 - 10:40 SS Monitoring, Diagnosis, Prognosis and Resilient Control Methods and Applications - 3	09:00 - 10:00 IEEE P2805.1 standard committee meeting
9:30												
10:00												10:00 - 11:00 IEEE P2805.2 standard committee meeting
10:40-11:00	10:40 - 11:00 Coffee Break											
11:00				11:00 - 12:20 TT Factory Automation and Communication Systems - 4	11:00 - 12:20 TT Distributed and Networked Control Systems-2	11:00 - 12:00 TT Robotics and Mechatronics in Industrial Applications-3	11:00 - 12:00 TT Real-time and networked embedded computing-2	11:00 - 12:00 TT Technologies and infrastructures for Smart Grids, Buildings and Cities - 4	11:00 - 12:20 SS - Innovative Technologies and Methods for Zero Defect Manufacturing on Industrial Cyber-Physical Systems Context - 1	11:00 - 12:00 TT Education in Engineering and Industrial Informatics - 2	11:00 - 12:00 SS Communications and Computing for Fog Based Control Systems - 2	11:00 - 12:00 IEEE P2805.3 standard committee meeting
11:30	11:30 - 14:30 Lunch											
12:00												
12:30												
13:00			13:00 - 14:30 Industry Forum 3 - AI and Informatics Systems									
13:30												
14:00												
14:30	14:30 - 15:00 Coffee Break											
15:00			15:00 - 16:40 TT Artificial Intelligence in Industrial Applications - 5			15:00 - 17:00 TT Industrial Informatics Tools - 2	15:00 - 16:00 SS - Innovative Technologies and Methods for Zero Defect Manufacturing on Industrial Cyber-Physical Systems Context - 2			15:00 - 17:00 SS 5G for Vertical Industry Services		
15:30												
16:00												
16:30												
17:00			17:00 - 17:30 Closing Ceremony									

KEYNOTE TALKS

Keynote by Dr. Alf Isaksson

FULLY AUTONOMOUS MANUFACTURING – ONLY A DREAM OR FUTURE REALITY?

We hear almost daily about new advances in self-driving cars and artificial intelligence. For autonomous driving there are already established standards with levels from 0 to 5 describing the steps from completely manual operation to fully autonomous driving. Is it realistic to aim towards the fully autonomous manufacturing plant? What do we even mean by an autonomous plant?

This talk will make an effort in defining levels of autonomy for a manufacturing industry. The step towards autonomy will be illustrated by recent examples from industrial applications. One important observation is that while the automotive standards focus completely on operation of the car, it is for process and manufacturing industry equally important to take steps towards also autonomous engineering and autonomous maintenance.

About Dr. Alf Isaksson

Alf Isaksson received an MSc in Computer Engineering and a PhD in Automatic Control, in 1983 and 1988 respectively, both from Linköping University, Sweden. After graduating he stayed at Linköping University until 1991 as an Assistant Professor. From 1991 to 1992 he spent one year as a Research Associate at The University of Newcastle, Australia. Returning to Sweden in 1992 Isaksson moved to the Royal Institute of Technology (KTH) in Stockholm, where eventually in 1999 he was promoted to full Professor. During this time he also spent 6 months in 1999 at the Pulp & Paper Centre of University of British Columbia, Vancouver, Canada as visiting professor.

In 2001 he made the shift from academic to industrial research and joined ABB Corporate Research in Västerås, Sweden. After a specialist career culminating in an appointment to Corporate Research Fellow in 2009, he is now since January 2014 Group Research Area Manager with the responsibility of internally coordinating all research in Control at all of ABB's 7 research centers world-wide. At the same time Isaksson still kept a connection to the academic world as Adjunct Professor in Automatic Control at Linköping University 2006-2015, where he was leading a Process Industry Center from 2009 to 2012.

DR. ALF ISAKSSON

Keynote by Prof. Ren C. Luo

AIOT AND ROBOTICS DRIVING PARADIGM SHIFT OF INTELLIGENT MANUFACTURING NEW BIZ: SOME EXEMPLARY BEST PRACTICES

There are 10 widely recognized disruptive innovations and technologies in which Artificial Intelligence, Internet of Things, Robotics, Intelligent Manufacturing and Digital Economy are included. As the society facing the reality of aging and the industry encountered increased salary/wage levels as well as lack of skilled workers, the need of robots and manufacturing automation enhanced by Artificial Intelligence of Things (AIoT) is obvious. Amazon and Google are investing in AIoT and intelligent robotics technology. Others are likely to follow, further to stimulate investment and innovation.

Artificial Intelligence becomes important core technology of soft power in terms of global technological development, which has a wide spectrum of applications including robot integrated manufacturing automation, industrial cyber-physical systems (iCPS), internet of things, etc. The aforementioned issues, challenges and opportunities will be the focus of this presentation including some exemplary best practices and research results with video demo from NTU iCeiRA Lab.

About Prof. Ren C. Luo

Prof. Ren C. Luo received Dipl.-Ing, and Dr.-Ing. Degree in Electrical Engineering from the Technische Universitaet Berlin, Germany. He is currently an Irving T. Ho Chair and Life Distinguished Professor and Director of International Center of Excellence on Intelligent Robotics and Automation Research at National Taiwan University; Editor-in Chief of IEEE Transactions

on Industrial Informatics. Prof. Luo also served two terms as President of National Chung Cheng University in Taiwan and Founding President of Robotics Society of Taiwan. He served as a tenured Full Professor of Department of Electrical and Computer Engineering at North Carolina State University, Raleigh, NC, USA and Toshiba Chair Professor in the University of Tokyo, Japan.

His research interests include robotic control systems, multi-sensor fusion and integration for intelligent systems, mechatronics, computer vision, 3D printing additive manufacturing technologies. He has authored more than 500 papers on these topics in refereed international transactions/ journals and refereed conference proceedings. He also holds more than 25 international patents. Prof. Luo received IEEE Eugean Mittlemann Outstanding Research Achievement Award, IEEE IROS Harashima Innovative Technologies Award; ALCOA Company Foundation Outstanding Engineering Research Award, USA. He served 5 years as Editor-in-Chief of IEEE/ASME Transactions on Mechatronics. Prof. Luo served as President of IEEE Industrial Electronics Society. He also served as President of Chinese Institute of Automation Engineers, Program Director of Automation Technology Division, Ministry of Science and Technology; Prof. Luo served as Science and Technology Adviser to the Prime Minister in Taiwan. Prof. Luo also served as referee and final review panel member for the evaluation and assessment of national competitive grants program in major cross-disciplinary research project for numerous international organizations and countries, such as USA, Japan, Canada, Australia, European Union, Austria, Singapore, etc. Dr. Luo is a Fellow of IEEE and a Fellow of IET.

PROF. REN C. LUO

As the society facing the reality of aging and the industry encountered increased salary/wage levels as well as lack of skilled workers, the need of robots and manufacturing automation enhanced by Artificial Intelligence of Things (AIoT) is obvious.

Keynote by Prof. Stavros Tripakis

THE SCIENCE OF SOFTWARE AND SYSTEM DESIGN

Science is knowledge that allows us to make predictions. What is the science of system design? What predictions can we make about the systems we build and deploy? As these systems increasingly rely on software, what predictions can we make about that software? Using examples from our own research, we advocate a formal approach to tackling these questions. In particular, we present some of our recent work on: (1) the Refinement Calculus of Reactive Systems, a compositional modeling and formal reasoning framework for cyber-physical systems; (2) synthesis from scenarios and requirements, a powerful combination of learning from examples and formal synthesis from specifications; and (3) synthesis of platform mappings with applications to security.

About Prof. Stavros Tripakis

Stavros Tripakis is an Associate Professor at Northeastern University. He received his Ph.D. degree in Computer Science at the Verimag Laboratory, Joseph Fourier University, Grenoble, France, and has held positions at the University of California at Berkeley, at the French National Research Center CNRS, at Cadence Design Systems, and at Aalto University. His research interests are in the foundations of software and system design, computer-aided verification, and cyber-physical systems. Dr. Tripakis was co-Chair of the 10th ACM & IEEE Conference on Embedded Software (EMSOFT 2010), and Secretary/Treasurer (2009-2011) and Vice-Chair (2011-2013) of ACM SIGBED. His H-index is 47.

PROF. STAVROS TRIPAKIS

Keynote by Prof. Toshio Fukuda

MUTLI-SCALE ROBOTICS - FROM BRACHIATION ROBOT TO MICRO/NANO ROBOTIC MANIPULATION

This keynote is an overview of the Multi-scale robotics, based on the Cellular Robotics System, which is the basic concept of the emergence of intelligence in the multi-scale way from Cell Level to the Organizational Level, proposed more than 30 years ago. It consists of many elements how the system can be structured from the individual to the group/society levels in analogy with the biological system. It covers with the wide range of challenging topics:

- Individual robot level, Brachiation Robots and Multi-locomotion robots
- Medical robotics and simulator
- Cooperation and competition of the multiple robotics system
- Distributed autonomous robotic system
- Micro and nano robotics system
- Bio analysis and bio-synthesis: bio-robotics system
- Cyborg and Bionic System
- Other systems
- The keynote will mainly focus on bio cell manipulation and cell assembly and refer to applied areas for the future hybrid system to improve the quality of life of human.

About Prof. Toshio Fukuda

Toshio Fukuda graduated from Waseda University, Tokyo, Japan in 1971 and received the Master of Engineering degree and the Doctor of Engineering degree both from the University of Tokyo, in 1973 and 1977, respectively. He studied at Graduate School of Yale University in 1973-1975. He joined the National Mechanical Engineering Laboratory in Japan in 1977, the Science University of Tokyo in 1982, and then joined Department of Mechanical Engineering, Nagoya University, Japan in 1989. He worked at University of Stuttgart, as Humboldt Fellow in 1979-1981. He was one thousand talented foreign Professor at BIT (2013-2018). He is Professor Emeritus of Nagoya University. Department of Micro and Nano-Systems Engineering and Professor of Meijo University. He has been working as Professor of Shenyang University of Technology, Suzhou University, Institute of Automation, Chinese Academy of Science, Russell Springer Chaired Professor at UC Berkeley, Seoul National University, Advisory Professor of Industrial Technological Research Institute in Taiwan and etc. He is a Foreign member of Chinese Academy of Sciences (2017).

He is mainly engaging in the research fields of intelligent robotic system, micro and nano robotics, bio-robotic system, and technical diagnosis and error recovery system.

He was the President of IEEE Robotics and Automation Society (1998-1999), Director of the IEEE Division X, Systems and Control (2001-2002), the Founding President of IEEE Nanotechnology Council (2002-2005), Region 10 Director (2013-2014), Director of Division X, Systems and Control (2017-2018) and IEEE President- elect (2019). He was Editor-in-Chief of IEEE/ASME Trans. Mechatronics (2000- 2002).

He was the Founding General Chair of IEEE International Conference on Intelligent Robots and Systems (IROS) held in Tokyo (1988). He was Founding Chair of the IEEE Conference on Nanotechnology(2001), IEEE Workshop on Robot and Human Communication (1994), IEEE Workshop on Advanced Robotics Technology and Social Impacts (ARSO, 2005), Founding Chair of the IEEE Workshop on System Integration International (SII, 2008), Founding Chair of the International Symposium on Micro- Nano Mechatronics and Human Science (MHS, 1990-2012), IEEE Conference on Cyborg and Bionic Systems(2017), IEEE Conference on Intelligence and Safety of Robots (2018).

He has received many awards such as IEEE Eugene Mittelmann Achievement Award (1997), IEEE Third Millennium Medal (2000) , Humboldt Research Prize (2003), IEEE Robotics and Automation Pioneer Award (2004), IEEE Transaction Automation Science and Engineering Googol Best New Application Paper Award (2007), George Saridis Leadership Award in Robotics and Automation (2009), IEEE Robotics and Automation Technical Field Award (2010). He received the IROS Harashima Award for Innovative Technologies (2011), Friendship Award of Liaoning Province PR China (2012), Friendship Award from Chinese Government (2014), JSME Achievement Award (2015), IROS Distinguished Service Award (2015) and Honor of Medal with the Purple Ribbon from Japanese Government (2015). Award from Automation Foundation (2016).

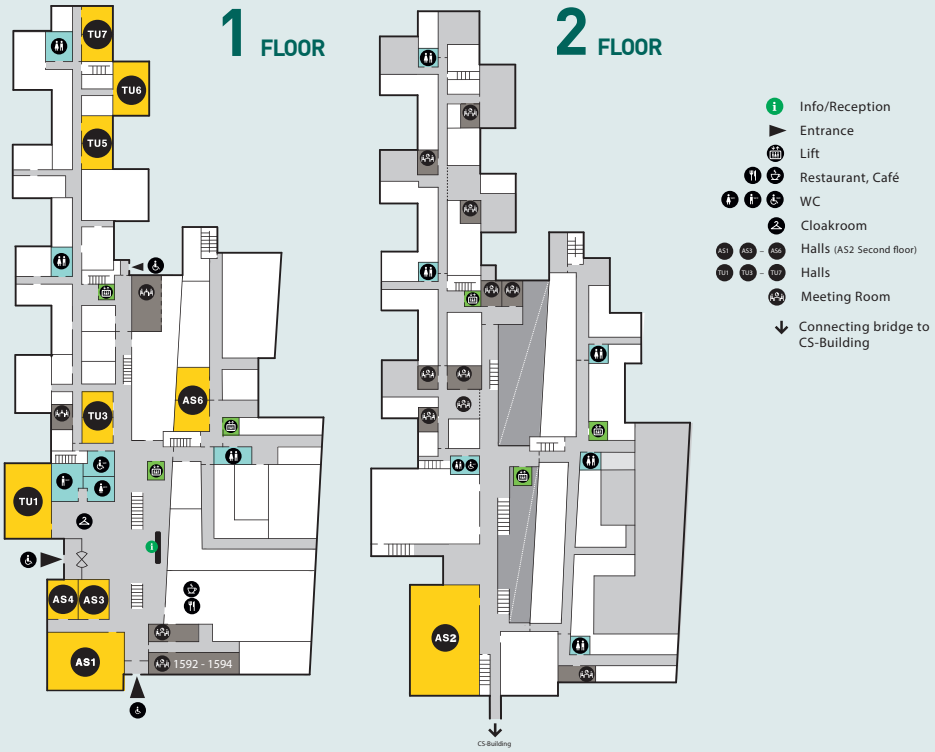
IEEE Fellow (1995). SICE Fellow (1995). JSME Fellow (2002), RSJ Fellow (2004), VRSJ Fellow (2011) and member of Science Council of Japan (2008-2014), and Academy of Engineering of Japan (2013-).

PROF. TOSHIO FUKUDA

MAP

Aalto-yliopisto
Aalto-universitetet
Aalto University

Maarintie 8



INDUSTRY FORUM

ON INDUSTRIAL APPLICATIONS OF ARTIFICIAL INTELLIGENCE

IEEE INDIN'19 will host three Industry Forum sessions during the conference, addressing the Industrial Applications of Artificial Intelligence. Industry Forum is an IES program for Industry to engage with research in a productive manner. Industry speakers are invited to discuss industry, technology directions, and, most importantly, challenges for the companies. These presentations inform the attendees on the vision and application of technologies in business and what challenges companies are encountering. Another aspect of this forum is that it offers the opportunity for researchers to study the particular challenge and know the contact in the companies should they have a solution that the company might utilize. We want all conference attendees to engage in the Industry Forum and listen to the presentations of our industry speakers so all communities can benefit.

SESSION 1 - ARTIFICIAL INTELLIGENCE IN MANUFACTURING AND SUPPLY CHAIN

Room/Time: AS2, Tuesday 23rd of July, 14:00

Chaired by: Lasse Eriksson, Kalmar, Finland; Victor Huang, IEEE IES Standards, USA;

This Industry Forum session addresses the key opportunities and challenges related to applying artificial intelligence in manufacturing and supply chain. The session will provide the participants with a state-of-the-art view to how industry is applying artificial intelligence to create new business models, improve manufacturing performance and enhance supply chain predictability, transparency and efficiency.

In this session, the speakers are encouraged to submit presentations tackling with AI within manufacturing and supply chain.

Gerardo Santillán
Senior Specialist,
Semantum Oy, Mexico

Karno Tenovuo
CEO, AWAKE.AI, Finland

Michael Kübel
EMEA Regional Vice President
Field Service Lightning,
Salesforce, Europe

Petri Roine
Senior Advisor, SAS
Institute, Finland

TALK DETAILS

Presenter: Michael Kübel

STORIES FROM THE FIELD: HOW AI AND CONNECTIVITY ARE CHANGING THE GAME OF FIELDSERVICE

Abstract: Across industries we see an enormous shift in focus and relevance of the mobile workforce: from primarily skill and cost perspective to Customer experience oriented; from re-active to pro-active and predicitve; from internal to networks; from ressources to markets and Uber-ization. Connectivity and AI are massive gamechangers on that transformation journey. We will discuss what could be the future blueprint of Fieldservice and look into best practices.

Bio of the speaker: Michael has a background of both Economics and Technical Engineering. Most of his professional life he build, turned around and managed Customer Service and Fieldservice operations. He was global VP of Service at domestic Heating Market Leader Vaillant Group before joining Salesforce in 2018 where he is now responsible for EMEA market development of their Fieldservice Product.

Presenter: Petri Roine

MODERN ANALYTICS SOLUTIONS IN MANUFACTURING INDUSTRY - THIS IS HOW IT IS DONE IN PRACTICE

Abstract: There's a long road to go from having modern algorithms running on your own office computer to a fully scaled intelligent solution being thoroughly embedded in manufacturing site's daily operations and processes. In this presentation I will introduce SAS' approach

to implementing modern analytical solutions. I will showcase the approach via manufacturing industry example where output of the plant increased by over 30% within just one month after implementation.

Bio of the speaker: Petri Roine is a Senior Advisor at SAS Institute and has helped organizations in over 40 countries to transform data into intelligence. After receiving his MSc degree in Automation and Systems Technology from Aalto University, he has worked in R&D organizations building intelligent computer vision and manufacturing systems. He has experience leading digital transformation projects and in his current role he focuses on helping Nordic Telco and Manufacturing organizations shaping and implementing analytical solutions to tackle problems with significant value.

Presenter: Gerardo Santillán

EFFICIENT DEVELOPMENT OF DIGITAL TWINS BASED ON SIMULATION FOR OPERATION SUPPORT OF PROCESS PLANTS

Abstract: Digital Twins are the cornerstone of industrial digitalization. In the process industry domain, Digital Twins are a holistic application where up to date plant structure and process dynamics information are persistently available, enabling several powerful applications. Efficient implementation is critical to achieve wider industrial adoption of these systems. In this session, different development methods targeted to reduce engineering effort for implementing Digital Twins will be presented. Example implementations include industrial cases as well as proof of concept systems.

Bio of the speaker: Gerardo Santillán is a Senior Specialist at Semantum, a software development company specialized on engineering automation and on implementation of simulation-based Digital Twins for process plants. Gerardo has over four years of experience on the application of simulation over the process plant lifecycle.

Presenter: Karno Tenovuo

SMART SHIPPING & PORTS OPEN DATA PLATFORM AND ECOSYSTEM

Abstract: Awake.AI is a collaborative and open data platform company that facilitates ecosystem creation for smart ports and evolving autonomous shipping. Presentation focuses on AI applications for future smart shipping and smart ports.

Bio of the speaker: Karno Tenovuo created autonomous shipping business for Rolls-Royce. He holds a double master's in automation engineering and international business. Background as entrepreneur and founder, SVP and P&L owner of intelligent marine solutions business. Now building the next wave of disruption in shipping.

SESSION 2 - ARTIFICIAL INTELLIGENCE FOR AUTONOMOUS SYSTEMS

Room/Time: AS2, Wednesday 24th of July, 14:00

Chaired by: Zhibo Pang, ABB Corporate Research, Sweden, and Royal Institute of Technology (KTH), Sweden; Victor Huang, IEEE IES Standards, USA;

As an emerging trend, industrial systems are transforming from automated to autonomous. The systems that, without manual intervention, can change their behavior in response to unanticipated events during operation are called "autonomous". In the recent years, we have seen many explorations in both academia and industries on such systems, ranging from driverless cars, unmanned aviation vehicles (UAV), automated guided vehicles (AGV), autonomous robots, autonomous ships, unmanned mining equipment, unmanned warehouses and distribution centers, unmanned groceries and shops, unmanned hotels and restaurants, and even autonomous power grids. Compared with traditional automatic control, the AI or machine learning techniques will play essential roles in such systems to enable the autonomous execution of complex tasks in more dynamic and unstructured environments with unpredictable changes.

In this session, the invited speakers will address state-of-the-art, research challenges, and business cases of the autonomous industrial systems.

TALK DETAILS

Presenter: Dr. Zhibo Pang

INDUSTRIAL COMMUNICATION AND EDGE COMPUTING IN THE ERA OF AI: CHALLENGES AND DIRECTIONS

Abstract: There is big hype about industrial AI along with industrial communication and edge

computing. More realistic industrial thinking and application-pulling instead of technology-pushing should be applied when selecting starting points of R&D. In this presentation, I will introduce some industrial specific challenges, potential use cases and future research directions.

Bio of the speaker: Dr. Zhibo Pang, received MBA from University of Turku in 2012 and PhD from the Royal Institute of Technology (KTH) in 2013. He is currently a Principal Scientist on Wireless Communications at ABB Corporate Research, Västerås, Sweden. He is a Senior Member of IEEE and Co-Chair of the Technical Committee on Industrial Informatics. He was awarded the "Inventor of the Year Award" by ABB Corporate Research Sweden in 2017 and 2019.

Presenter: Lei Shan

PRACTICE AND PROSPECT OF INTELLIGENT DEVELOPMENT OF PORT INDUSTRY

Abstract: The port industry in the world is experiencing a transformation from traditional manual operation to automated operation. In recent years, with the development of artificial intelligence technology, the demand for such transformation is becoming stronger and stronger. This time, we will introduce the development of port automation, as well as the problems and application scenarios that need to be solved by using artificial intelligence technology.

Bio of the speaker: Lei Shan, Master in control science and engineering from Tongji University in 2008. He is currently in charge of technology research and development for automated terminal at ZPMC. He was awarded several times "the Science and Technology Progress Award" by ZPMC and port industry association in China.

Presenters: Sumitaka (Sam) Matsumoto, Paul Long

SECURITY AND MACHINE LEARNING FOR LOW COMPLEXITY SENSORS IN AUTONOMOUS AND IIOT SYSTEMS

Abstract: Low complexity sensors such as those in autonomous systems or IIoT lend themselves to attack vectors easily exploited by nefarious hackers. These simple sensors are proving difficult to upgrade with security as they do not have the computational power, time for chatty authentication processes (e.g. Diffie-Hellman), or CPU-consuming encryption schemes where sensor speed could mean the difference between life and death. This presentation proposes a faster and lower-cost security solution underpinned with Machine Learning. This would result in less complex/expensive, yet smarter systems, able to scale to millions of sensor messages/hour, gathering and sharing intelligence realtime to prevent attacks from escalating. The insurance industry is presented as one of the beneficiaries of this low impact security solution enhanced by Machine Learning.

Bio of the speakers:
Sumitaka (Sam) Matsumoto is currently the director of Japan Cluster of Security Professional where he co-founded this international PhD Cybersecurity exchange program between Japan and renown Universities in UK and US. Previously Sam served as CEO of SkipperWireless, a US startup in the high-speed mesh market which provided hardened, multi-media OFDM product to the French military and peace-keeping forces in Africa. Sam has throughout his career pioneered multiple international BD efforts on behalf of Fortune 500 Japanese companies including energy and automotive industries.

Paul holds 19 US patents, including 4 international patents in the area of wireless, mobility, and security. He is currently co-founder of FrogBeam, LLC, a privately held technology development group focusing on security and IOT systems. He also served as COO of KatanaMe, a technology partner to Nintendo delivering low-latency wireless mesh, and was previously co-founder of JetCell which developed the market's first GSM over IP product which was acquired by Cisco.

Presenter: Dr. Nicholas Lehment

AI ON THE INDUSTRIAL EDGE: RECOGNITION AND ACTION ON MOBILE PLATFORMS

Abstract: Driven by more flexible manufacturing and logistic concepts, intelligence moves from datacenters to edge devices acting in busy manufacturing environments. Facing hard real time constraints, a wide array of mission profiles and scalability to large fleets of devices, demands on the chips running AI have shifted accordingly. In this talk, we will examine the challenges arising in such industrial applications with a focus on autonomous, vision-driven systems.

Bio of the speaker: Dr. Nicolas Lehment is the systems architect at NXP's Industrial Competency Center where he advises on strategic topics such as ML/AI, connectivity and safety for industrial automation. Before joining NXP he designed cut-

Dr. Zhibo Pang
Principal Scientist, ABB Corporate Research, Sweden

Lei Shan
General Manager, R&D Center, ZPMC (Zhenhua Port Machinery Company) Smart Solution Group, China

Sumitaka (Sam) Matsumoto
JCLSP, (Japan)

Paul Long
FrogBeam Inc. (USA)

Dr. Nicholas Lehment
Systems Architect Industrial Competency Center, NXP Semiconductors, Germany

ting-edge computer vision and robotics systems for ABB and Smartray. He has collaborated on research papers for topics ranging from ML-driven video classification over human pose tracking to collaborative robotics and earned his doctoral degree at the Technische Universität München.

SESSION 3 - ARTIFICIAL INTELLIGENCE AND INFORMATICS SYSTEMS

Room/Time: AS2, Thursday 25th of July, 13:00

Chaired by: Michael Condry, IEEE, USA; Victor Huang, IEEE IES Standards, USA;

In industrial electronics systems activity happens at the edge with sensors, camera, etc. that detect information and with actuators, control, and other services that act. Many activities are well understood, and detect and act can be managed at the edge. However, many of these activities require advanced AI systems, rule based or neural networks typically in the cloud , that need history and current information to make complex decisions such as “replace this factory element”, “reroute the transport vehicle”, or “check with the doctor.” The informatics here require much more computing power and storage than typically is available at the edge system. There are many challenges such as sending the “right” amount of information to the cloud to make proper decisions without overloading the network or the cloud; also, doing so in a timely manner that the control decision can be made in suitable time. Design here depends on the application, and these kinds of systems are found in many applications including factory control and automation, transportation, medicine and agriculture, just to name a few. This Industry Forum session looks at the challenges and solutions to this problem space found in application systems today and in the near future.

In this session, the speakers are encouraged to submit presentations tackling with AI within Industrial Informatics.

TALK DETAILS

Presenter: Michael W Condry

USING AI AND INFROMATICS WITH A MEDICAL SOLUTION

Bio of the speaker: Michael is currently the Chair, of the Advisory Board for ClinicAI, Inc. Michael’s career spans both academic and industry positions, mostly in industry. His industry experience includes senior leadership roles in major corporations such as Intel, Sun, and AT&T Bell Laboratories. At Intel, Michael retired in 2015 after being the Chief Technical Officer in the Client Division. He held teaching and research positions at Princeton University and University of Illinois, Urbana-Champaign. His background includes projects in computer architecture, software, firmware, operating systems, networking, IoT, internet applications, standards, and computer security. Michael retired from Intel in June 2015. Michael, an IEEE Fellow, has many years engaging in the IEEE. He is the President of the IEEE Technology and Engineering Management Society (TEMS). Michael is a senior board member for the IEEE Industrial Electronics Society (IES).

Presenter: Edgar Ramos

LIFE CYCLE MANAGEMENT OF DISTRIBUTED AI

Abstract: Intelligent applications requires that the intelligence is configured and distributed to the remote subsystems that might not always be connected. They might be in constrained environment and subject to tight requirements (performance, latency, processing, etc.) Embed-

Michael W Condry
ClinicAI, USA

Edgar Ramos
Ericsson, Finland

Peter Waher
Trust Anchor Group, Sweden

ding intelligence in the applications tie them to the own application life management cycle, and in consequence updates or changes in intelligence results in updates to the applications and vice versa. One solution to avoid the effect of the high coupling is to provide the intelligence as local or remote services to the applications. To serve this purpose, the intelligence is distributed in multiple aspects and domains (training, agent functional, service functional and execution) and a own life management process must be defined and specified to provide sustainable and secure processes for onboarding, updating, decommissioning and managing the intelligence services. From the point of view of business processes and ecosystems interactions, the life cycle management must be standardized and open in order to promote the interoperability of intelligence components.

Bio of the speaker: Edgar Ramos, works as a senior researcher and project leader in the area of IoT and Distributed Artificial Intelligence systems at Ericsson Research in Finland. He also has wide experience on wireless and mobile systems including the development of 5G concepts.

Presenter: Peter Waher

CROSS-DOMAIN AUTONOMOUS COOPERATION AND MONETIZATION WITH IEEE P1451.99

Abstract: This talk presents how IEEE P1451.99 can help autonomous systems to interact (autonomously) with other autonomous systems, operated under different do-mains and by different controllers. Autonomous Systems need AI and Informatics and the cloud to successfully interoperate. This demands a standard for interoperability. IEEE P1451.99 standard proposal presently under development, defines an archi-tecture and federated, globally scalable communication infrastructure that includes support for security, ownership, consent-based privacy, decentralized (edge) pro-cessing, discovery, deterministic decision support, legal identities, smart contracts and monetization. It provides a means for owners of things to define rules, and for autonomous devices to find other devices, sign legally binding agreements and (co)operate with them. It also protects against malicious use. The infrastruc-ture counts usage, which is used to create billing instructions, providing a means for a Return of Investment for owners in Cross-Domain autonomous systems. The economic feedback model also provides an efficient means to optimize indus-trial processes autonomously using third party systems.

Bio of the speaker: Editor of IEEE P1451.99, vice chair IEEE P1451.1.4. Contributor to IEEE P2668 & P2805. Works on standardization for the IoT and the Smart City/Society. Co-founder of Trust Anchor Group (TAG), creating open, interoperable and secure networks and infrastructures for Smart Societies. Founder of Little Sister®, a standards based distributed social network, based on the principles of privacy & information ownership, for organizations, individuals and machines. Author.

Presenter: Panel Discussions Moderated by Michael W Condry

PANEL DISCUSSIONS MODERATED BY MICHAEL W CONDRY

WOMEN IN ENGINEERING

WORKSHOP ON "NEW TRENDS IN AUTOMATION IN INDUSTRIAL ENGINEERING & NETWORKING FOR EU PROJECTS" - IN CONJUNCTION WITH INDIN 2019

IEEE WIE is one of the world's leaders in changing the face of engineering. Its global network connects over 20,000 members in over 100 countries to advance women in technology at all points in their life and career. IEEE WIE members make lifelong friendships, acquire influential mentors, and make a difference for the benefit of humanity. IEEE WIE is proud to organize a workshop at the INDIN 2019 conference.

Note: This event is to foster the women involvement in scientific and technical activities, but it is not intended for women only. Professionals and students, independently of the gender, are welcome to network in a relaxed atmosphere.

DETAILS

Date: 24th July
Time: 14:00 - 18:00
Location: Open Innovation House, Maarintie 6, Espoo. (Note that this is the adjacent building to the INDIN 2019 conference building)

REGISTRATION:

Please register to the event via the following link:
https://www.webropolsurveys.com/S/105B48AD0E900CC0.par

Notes:

- We prefer your registration before July 19, 2019. However, the site will be kept open for late registration.
- The one-day WiE event is FREE of charge to the participants (does NOT need INDIN 2019 Conference registration).

SPEAKERS

Prof. Lucia Lo Bello
IES representative for WiE, University of Catania, Italy

M.Sc. Heli Karaila
Valmet Oyj, Finland

Prof. Minna Lanz
Tampere University, Finland

M.Sc. Outi Ruusunen
University of Oulu, Finland

Dr. Maryam Mohammadi
Aalto University, Finland

Dr. Sanna-Maija Kiviranta
Head of Pre-Award Services, Aalto University, Finland

Prof. Sirkka-Liisa Jämsä-Jounela
Aalto University, Finland

Dr. Rafia Inam
Ericsson, Sweden

PROGRAM

WOMEN IN ENGINEERING (WIE) FORUM (14:00 - 15:40)

14.00-14.10: Welcome and Introduction to the WiE in IEEE
- Prof. Lucia Lo Bello, University of Catania, Italy, IES representative for WiE

14.10-14.30: Invited Speech
- Dr. Rafia Inam, Senior Project Manager, Ericsson, Sweden
- Title: "Artificial Intelligence and Automation in Telecom Networks"

14.30-14.45: Invited Speech
- Prof. Lucia Lo Bello, University of Catania, Italy
- Title: "New Trends in Automotive Networks: Automotive Ethernet and Time-Sensitive Networking"

14.45-15.00: Invited Speech
- M.Sc. Heli Karaila, Business Manager, Valmet Oyj, Finland
- Title: "Water/wastewater Online Monitoring"

15.00-15.15: Invited Speech
- Prof. Minna Lanz, Tampere University, Finland
- Title: "Robotics DIHs for Speeding Up the Digital Transformation of SMEs"

15.15-15.30: Invited Speech
- M.Sc. Outi Ruusunen, Oulu University, Finland
- Title: "Data Analysis as a Tool for Plant Disease Forecasting"

15.30-15.45: Invited Speech
- Dr. Maryam Mohammadi, Aalto University, Finland
- Title: "The Impact of Sustainable Supply Chain on Waste-To-Energy Operations"

15.45-16.00: Invited Speech

EU PROJECTS PITCHING & NETWORKING (16:30 - 17:00)

Dr. Sanna-Maija Kiviranta, Head of Pre-Award Services, Aalto University, Finland
Title: "Current Status of EU Research Funding Landscape: How and Why to get on board?"
Participants will have the opportunity to pitch and/or present their research activities for networking.

VISIT TO THE AALTO BIOPRODUCT (ABIO) CENTER (17:00 - 18:00)

Prof. Sirkka-Liisa Jämsä-Jounela, Aalto University, Finland
Participants will have the opportunity to visit the ABio Center and have a demo on the process automation set up for the factory of the future.

Talk by Dr. Rafia Inam

ARTIFICIAL INTELLIGENCE AND AUTOMATION IN TELECOM NETWORKS"

The Fifth Generation Mobile Networks (5G) are seen as a key enabler for diverse-natured industry verticals (such as automotive, manufacturing, mining, utility, health, etc.) by providing a platform to support heterogeneous sets of network quality requirements. The presentation will discuss a paradigm shift in mobile network implementation and will discuss how Artificial Intelligence and automation can support Telecom industry. The work is focused on automating multiple use cases using 5G and Artificial Intelligence

About Dr. Rafia Inam
Rafia Inam is a senior project manager at Ericsson Research in research area Artificial Intelligence, Sweden. She joined Ericsson research in 2014 and worked on 5G for industries. She also worked as Single Point of Contact for Scania. Her research interests include 5G network slices and management, using AI for automation, use cases applied to 5G, service modeling for Intelligent Transport Systems, automation and safety for CPS, reusability of real-time software and ITS. She received her Ph.D. from Mälardalen University, Sweden, in 2014. Rafia has co-authored 38+ scientific publications and 34+ patent families.

Talk by Prof. Lucia Lo Bello

NEW TRENDS IN AUTOMOTIVE NETWORKS: AUTOMOTIVE ETHERNET AND TIME-SENSITIVE NETWORKING

Automated driving cars are equipped with several different types of sensors, such as, radars, ultrasound, GPS, LiDARs, and video cameras,

that contribute to obtain a correct perception of the surrounding environment in various driving conditions. These sensors require a transmission channel able to support high bit rates (e.g., video cameras and LiDARs are the most bandwidth-demanding devices) and high synchronization levels. In addition, safety-critical automotive control applications require deterministic and reliable communications. This means that the transmission/reception times of safety-critical data have to be known and guaranteed.

Automotive Ethernet is considered the solution to overcome the drawbacks of current in-vehicle communication architectures, that are characterized by several small networks connected via gateways, and to move towards a homogenous in-vehicle network. In this context, the Time-Sensitive Networking (TSN) set of standards defined by the IEEE TSN Task Group is a useful tool set that enables reliability, determinism and time synchronization in automotive communications over Ethernet links. TSN networks consist of IEEE 802.1Q bridges with special features, such as time-synchronization, enhanced scheduling and traffic shaping, path selection and reservation, fault-tolerance, and many others. These features make TSN networks very suitable for supporting deterministic communications for automated driving cars.

The talk will explore Automotive Ethernet and the most significant TSN standards for automotive communications.

About Prof. Lucia Lo Bello

Prof. Lucia Lo Bello is tenured Associate Professor with the Department of Electrical, Electronic and Computer Engineering, University of Catania, Italy. She received the M.S. degree in Electronic Engineering and the Ph.D. degree in Computer Engineering from the University of Catania in 1994 and 1998, respectively. She was also Guest Professor at the University of Malardalen, Sweden (2014) and a Visiting Researcher with the Department of Computer Engineering, Seoul National University, Korea (2000-2001). Since 2004 she has been actively involved in standardization activities, relevant to wired and wireless industrial networks, at both national and international level. Her research interests include automotive communications, with a special focus on Automotive Ethernet, IEEE Audio Video Bridging and Time-Sensitive Networking, industrial networks, real-time embedded systems, and wireless sensor networks. She authored or coauthored more than 150 technical papers in these areas. She is responsible for several international and national projects in the area of real-time embedded systems and networks. Prof. Lo Bello is Senior Member of the IEEE and was the Chair of the IEEE Industrial Electronic Society Technical Committee on Factory Automation for two terms (2014-15) and (2016-2017). She is the current IES representative within IEEE Women in Engineering.

Talk by M.Sc. Heli Karaila

WATER/WASTEWATER ONLINE MONITORING

The Water and Wastewater online monitoring is getting more important in order to fulfill the environmental targets as well as optimize the process costs. It has been still typical to use laboratory analysis for monitoring and optimizing the water process. The frequency of the laboratory measurement is normally ones pro day or couple of times during the week and because of so seldom taken samples as well as the results of the laboratory measurements comes with delays it is not possible to create optimization control applications on the basis of those measurements. In order to optimize the water /wastewater processes it is at first needed reliable measurements. In this article there are presented different kind of monitoring applications / technologies in the water / wastewater process and what are the benefits of using those.

About M.Sc. Heli Karaila

M.Sc (tech.) Heli Karaila; Business manager Valmet has global responsibility of Valmet wastewater business. Heli has been developing business as well as selling and developing wastewater related products globally and in that way, she has learnt to know the wastewater market very well. In Valmet, which is a global technology company, Heli has started her career by doing end customer projects and developing automation related solutions, like quality measurements and controls for the pulp and paper processes. Therefore, Heli has long experience not only from wastewater but also pulp and paper industry. Valmet is a member of the Finnish Water Association as well as Finnish Water Forum. Heli has been an active member of these associations and in that way, she has also large Finnish water and wastewater network, which includes companies, municipalities as well as authorities. Heli is a member of the Finnish Society of Automation Board since 2019.

Talk by Prof. Minna Lanz

ROBOTICS DIHS FOR SPEEDING UP THE DIGITAL TRANSFORMATION OF SMES

In order to stay competitive, European SMEs need to embrace flexible automation and robotics, ICT and cyber security to maintain efficiency, flexibility and quality of production in highly volatile environment. Raising the output and efficiency of SMEs will have a significant impact on Europe's manufacturing and employment capacity. Robots are no longer standalone systems in the factory floor. Within all areas of robotics, the demand for collaborative and more flexible systems is rising as well. The level of desired collaboration and increased flexibility will only be reached if the systems are developed as whole including perception, reasoning and physical manipulation.

About Prof. Minna Lanz

Minna Lanz works as a Professor of Mechanical engineering focusing on Production Systems and Technologies. She coordinates research and development projects focusing on following topics on Manufacturing ICT, Industrial robotics, human-robot collaboration, safety, sustainable manufacturing, and education research in technology rich environments. Aside from the project management and research work, her interests have been in public private partnerships, financial instruments for SMEs and collaboration in EC-funded projects. She is a member of Finnish Robotics Association, EFFRA, Manufuture, Vanguard Initiative and euRobotics, and actively contributes to Visions and Strategic Research and Innovation roadmaps.

Talk by M.Sc. Outi Ruusunen

DATA ANALYSIS AS A TOOL FOR PLANT DISEASE FORECASTING

In crop farming, pests and plant diseases cause losses for both grain yield and quality. With the accurate plant disease prediction system, the farmers could optimize the chemical spraying and thus obtain economical and environmental benefits. The plant disease modelling is a challenging and widely discussed topic in modern agriculture. This presentation introduces a novel point of view for the net blotch prediction. In this approach, the weather measurements are combined with the historical net blotch observations. This research is realized together with Natural Resources Institute Finland (Luke). The financier for this research project is Ministry of Agriculture and Forestry of Finland.

About M.Sc. Outi Ruusunen

Outi Ruusunen (née MÄYRÄ) is a post-graduate student (M.Sc. (tech)) in Control Engineering research group in Environmental and Chemical Engineering Unit at University of Oulu. Her research interests include data analysis in both industrial and non-industrial applications and process modelling. She is active with the teaching development and takes studies on education at the moment. She has been the responsible project leader in modelling and data analysis as a tool in plant protection-project since 2018.

Talk by Dr. Maryam Mohammadi

THE IMPACT OF SUSTAINABLE SUPPLY CHAIN ON WASTE-TO-ENERGY OPERATIONS

This research addresses the optimal planning of an integrated supply chain network for waste-to-energy systems. A mixed integer linear programming model is presented, which simultaneously considers the tactical and operational decisions related to transportation, inventory, production, and distribution. The objective of the proposed model is to find a balance between supply chain costs, waste reduction, and using the generated waste efficiently. It also ensures environmental sustainability in the operations of waste-to-energy systems and continuous feedstock supply. The considered waste type is combustible non-biodegradable municipal solid waste with low moisture content, and the employed technologies are pyrolysis, gasification, and combined heat and power to produce electricity and heat. The proposed model is formulated and solved using GAMS/CPLEX.

About Dr. Maryam Mohammadi

Maryam Mohammadi is currently a Post-doctoral Research Fellow in Process Control and Automation Research Group, School of Chemical Engineering, Aalto University, Finland, working in the field of municipal solid waste management. She has developed mathematical models to achieve a sustainable system for optimizing the processing route for the best utilization and conversion of waste into useful

products in the full potential, in addition to maximizing the profit of the integrated waste supply chain network. Maryam has received her Ph.D. in Manufacturing Engineering from the University of Malaya, Malaysia where she mainly worked on metaheuristic algorithms for solving lot-sizing and scheduling problems in single and multi-plant environments. Maryam has in-depth knowledge related to supply chain management, production planning and control, operations research, and optimization methods. She is a member of the Finnish Society of Automation since 2018.

Talk by Dr. Sanna-Maija Kiviranta

CURRENT STATUS OF EU RESEARCH FUNDING LANDSCAPE: HOW AND WHY TO GET ON BOARD?

Participants will have the opportunity to pitch and/or present their research activities for networking.

About Dr. Sanna-Maija Kiviranta
Dr. Sanna-Maija Kiviranta is the Head of Pre-Award Services at Aalto University. She has extensive experience in different research funding related positions for example at Aalto University, University of Helsinki and Academy of Finland. She has also served as an expert evaluator for EU Commission (REA) for several programmes.

Talk by Prof. Sirkka-Liisa Jämsä-Jounela

VISIT TO THE AALTO BIOPRODUCT (ABIO) CENTER

Participants will have the opportunity to visit the ABio Center and have a demo on the process automation set up for the factory of the future.

About Prof. Sirkka-Liisa Jämsä-Jounela
After graduation from Helsinki University of Technology, Sirkka-Liisa Jämsä-Jounela gained practical experience in working for a number of companies in the Finnish process industry. She joined Kemira Engineering and worked as a control engineer at the Siilinjärvi phosphate plant. She was later employed as a research scientist (industrial researcher) by the Academy of Finland and Kemira Oy and worked for her Ph.D. as a visiting scholar at the Department of Metallurgical Engineer, University of Utah, USA. After the Ph.D. degree, she joined the Outokumpu Group, where she worked as a senior consultant and received practical experience in international automation projects. Prof. Jämsä-Jounela has also made MBA studies at the Helsinki School of Economics and Business Administration, at Glasgow University, United Kingdom and at the European Business School in Copenhagen, Denmark.

Currently, Prof. Sirkka-Liisa Jämsä-Jounela heads the process control group at the School of Chemical Engineering in Aalto University. The laboratory provides education in process automation, mainly in the fields of Chemical Technology, Forest Products Technology and Materials Science and Rock Engineering. Prof. Jämsä-Jounela has supervised about 250 MSc exams and about 15 Ph.D. students. She has published over 250 international conference and journal papers, mainly on process control and automation. She has given numerous invited lectures and plenaries in international conferences and workshops.

Prof. Jämsä-Jounela began her affiliation with IFAC as a member of the TC Automation in Mining, Mineral and Metal Processing, and was later appointed Chair of this Technical Committee. Prof. Jämsä-Jounela served as IFAC Vice President and Chair of the Technical Board. She has been the IPC chair in numerous events organized by IFAC and other international societies. She has also been the Chair of the Nordic Process Control Group and the board member of the European Union Control Association. Prof. Jämsä-Jounela has been the associate editor of the IEEE TCST and is a member of the Finnish Academy of Technologies. Prof. Jämsä-Jounela has served Aalto University, School of Chemical Engineering as a Vice Dean (Research) and as a Member of the Natural Sciences and Engineering Research Council in Academy of Finland.

CONTACT

Need more details?
For additional information relating to the program and registration, please contact the technical support, Dr. Maryam Mohammad, Email: maryam.mohammadi@aalto.fi

Event Organizers

- Prof. Lucia Lo Bello, International Organizer and IES WiE Representative, Email: lobello@unict.it
- Prof. Sirkka-Liisa Jämsä-Jounela, Local Organizer at Aalto University, Email: sirkka-liisa.jamsa-jounela@aalto.fi

More about IEEE Women in Engineering at web-site: https://wie.ieee.org/

TUTORIAL 1: HANDS-ON DEEP LEARNING FOR INDUSTRIAL INFORMATICS APPLICATIONS

Room/Time: **AS3, Monday 22nd of July, 09:00**
Lecturer/s: **Daswin De Silva, Rashmika Nawaratne, Achini Adikari**

TUTORIAL 2 – ENABLING ENERGY INTERNET VIA MACHINE-TYPE COMMUNICATIONS

Room/Time: **TU5, Monday 22nd of July, 09:00**
Lecturer/s: **Pedro H. J. Nardelli, Hirley Alves**

After the tutorial, the audience will be able to:

- Define what is Energy Internet and how the technological advances in machine-type communications (MTC) are enabling its development.
- Model human- and machine-type of traffic.
- Differentiate operation modes of the Internet of Things (IoT), namely Ultra-reliable Low-latency Communications (URLLC) and massive Machine-type Communications (mMTC) in addition to the broadband communications.
- Propose possible ways to manage the energy system based on packetized energy together with the required IoT/MTC solutions.

WORKSHOP 1 – GEEKING IEC61499 – FROM FUNCTION BLOCKS PROGRAMMING TO FUNCTION BLOCK APPS VALIDATION THROUGH THE DAEDALUS MARKETPLACE

Room/Time: **TU7, Monday 22nd of July, 09:00**
Lecturer/s: **Alois Zoitl, Sandeep Patil / Dmitrii Drozdov / Giuseppe Landolfi**

In this hands-on tutorial, you will learn about the IEC 61499 distributed programming paradigm. The tutorial introduces the elements of IEC 61499 and how they can be used for the development of distributed control applications by means of concrete hands-on application examples. The tutorial consists of 4 parts:

- Part 1: Introduction to IEC 61499.
- Part 2: Distributed control systems programming with IEC 61499 using DAEDALUS Framework, powered by IEC 61499 engineering tool NxtStudio
- Part 3: Daedalus market place and validation.
- Part 4: Advanced concepts of IEC 61499.

WORKSHOP 2 – DISTRIBUTED ARCHITECTURES IN ELECTRIC POWER SYSTEMS

Room/Time: **TU3, Monday 22nd of July, 10:00**
Organisers: **Dmitry Kholkin, Igor Chausov**

Distributed energy, including small-scale power generation, energy storage systems, adjustable load on the side of end users will play the crucial role in upcoming development of power industry. These solutions, being interconnected and integrated into the centralized grid represent an untapped resource for raising the electrical efficiency of power systems and thus have a potential to address the challenges of Energy Transition.

Program:

Internet of Distributed Energy Architecture (IDEA): new approach to distributed power systems

- Igor Chausov , Lead expert-analyst, Infrastructure Center of EnergyNet, Moscow, Russia

Pilot projects and demonstrator for Internet of Distributed Energy Architecture (IDEA)

- Ilya Burdin , Lead expert-analyst, Infrastructure Center of EnergyNet, Moscow, Russia

Multi-agent peer-to-peer trade systems for Internet of Distributed Energy Architecture

- Evgeniy Voloshin, Evgeniy Rogozinnikov, Research scientists, Moscow Power Engineering Institute; SmartEPS Company, Moscow, Russia

Transactive Energy as a challenge: architecture, use cases, examples

- Diana Islamova, Business development lead, ONDER Cooperative, Tallinn, Estonia

Composition and applications of power system digital twins based on ontological modeling

- Sergey Kovalyov, Lead specialist, RTSoft; lead research scientist, Institute of control science of RAS, Moscow, Russia

Multi-agent flexibility market trade system and virtual synchronous machines approach

- Evgenii Nefedov, Software engineer, Moscow Institute of Physics and Technics, Dolgoprudny, Russia

TUTORIAL 4 – REALITY-CENTRIC REFERENCE ARCHITECTURES

Room/Time: **TU6, Monday 22nd of July, 10:30**
Lecturer: **Paul Valckenaers**

Introducing the concept of a reality-centric reference architecture: software components and composition/aggregation/structure are defined in terms of the relationship between reality (the world of interest) and the software. The architecture remains agnostic concerning the IT.

Understanding the complementarity of reality-centric reference architectures versus, e.g., RAMI 4.0-alike reference models. Understand where, respectively, they are most useful/indicated.

Understanding the key aspects in reality-centric reference architectures that provide/enable adaptability, auto-configurability, interoperability, etc. and why/where/how deviations from guidelines will not and cannot remain unpunished.

Notion of the semantic gap between reality (physical) and IT (cyber) for the available options in industrial automation.

Hint at the applicability beyond manufacturing (i.e. activities on resources).

TUTORIAL 6 – TIME SENSITIVE NETWORKING FROM INFORMATION MODELS DOWN TO HARDWARE

Room/Time: **TU6, Monday 22nd of July, 13:00**
Lecturer/s: **Santiago Soler Perez Olaya**

The main aim is to get to understand what Time Sensitive Networking is, how it works, what is possible, and what is not.

Understand how the information models are representing the hardware.

Understand what measures/configurations/methods help for what aim.

Get an overview of TSN related to industrial communications and sound industrial communication technologies.

TUTORIAL 3 – DATA INFORMATICS-DRIVEN MACHINE INTELLIGENCE FOR HUMAN-ORIENTED COMPUTING: FROM DEEP LEARNING-BASED VIDEO PROCESSING TO SYSTEM OPTIMIZATION

Room/Time: **TU5, Monday 22nd of July, 13:30**
Lecturer/s: **Haijun Zhang, Tommy W. S. Chow**

The proposed tutorial is aimed at introducing the most important machine learning techniques that are particular useful to industrial informatics engineers and researchers. The techniques that will be covered in the tutorial are the state-of–the-art and are still ongoing hot research topics. This tutorial is designed in a way to bridge the areas of industrial informatics and machine learning.

TUTORIAL 5: METHODS AND TOOLS FOR INTEGRATED DEVELOPMENT OF PRODUCT-SERVICE SYSTEMS

Room/Time: **AS3, Monday 22nd of July, 13:30**
Lecturer/s: **Birgit Vogel-Heuser, Helmut Krcmar, Minjie Zou, Mohammadreza Basirati**

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OPENING CEREMONY

Room/Time: **AS2, Tuesday 23rd of July, 09:00**

KEYNOTE TALK 1: MUTLI-SCALE ROBOTICS - FROM BRACHIATION ROBOT TO MICRO/NANO ROBOTIC MANIPULATION

Room/Time: **AS2, Tuesday 23rd of July, 09:30**
Keynote Speaker: Toshio Fukuda

Abstract- This keynote is an overview of the Multi-scale robotics, based on the Cellular Robotics System, which is the basic concept of the emergence of intelligence in the multi-scale way from Cell Level to the Organizational Level, proposed more than 30 years ago. It consists of many elements how the system can be structured from the individual to the group/society levels in analogy with the biological system. It covers with the wide range of challenging topics:

- Individual robot level, Brachiation Robots and Multi-locomotion robots
- Medical robotics and simulator
- Cooperation and competition of the multiple robotics system
- Distributed autonomous robotic system
- Micro and nano robotics system
- Bio analysis and bio-synthesis: bio-robotics system
- Cyborg and Bionic System
- Other systems

The keynote will mainly focus on bio cell manipulation and cell assembly and refer to applied areas for the future hybrid system to improve the quality of life of human.

TT ROBOTICS AND MECHATRONICS IN INDUSTRIAL APPLICATIONS - 1

Room/Time: **AS1, Tuesday 23rd of July, 10:50**
Chair/s: **Yasutaka Fujimoto, Yoshihiro Maeda**

Transformation Between Simple and Detailed Maps Based on Line Matching for Robot Navigation

Ryo Toshimitsu, Yasutaka Fujimoto

A Robotic Passive Vision System for Texture Analysis in Weld Beads

Luciane Baldassari Soares, ÁTila Astor Weis, Ricardo Nagel Rodrigues, Silvia Silva da Costa Botelho

A Stable Parameter Area Calculation Method for Advanced Auto-tuning of a Feedback Controller

Yoshihiro Maeda, Naoki Gou, Makoto Iwasaki

Performance Analysis of Torque-sensorless Assist Control of a Powered Exoskeleton Using Highly Back-drivable Actuators

Yoshiki Kanai, Yasutaka Fujimoto

TT ARTIFICIAL INTELLIGENCE IN INDUSTRIAL APPLICATIONS - 1

Room/Time: **AS2, Tuesday 23rd of July, 10:50**
Chair/s: **Daswin De Silva, Paulo Leitao**

Using anomaly detection to support classification of fast running packaging processes

Tilman Klaeger, Andre Schult, Lukas Oehm

A machine learning based quality control system for power cable manufacturing

Jussi Hanhirova, Jaakko Harjuhahto, Janne Harjuhahto, Vesa Hirvisalo

Machine Learning Applied to an Intelligent and Adaptive Robotic Inspection Station

Luis Variz, Luis Piardi, Pedro João Rodrigues, Paulo Leitão

Comparison of Semi-supervised Deep Neural Networks for Anomaly Detection in Industrial Processes

Gavneet Singh Chadha, Arfyan Rabbani, Andreas Schwung

TT FACTORY AUTOMATION AND COMMUNICATION SYSTEMS- 1

Room/Time: **TU1, Tuesday 23rd of July, 10:50**
Chair/s: **Frederico Tramarin, Lucia Lo Bello**

Reliability and Availability Enhancements of the 5G Connectivity for Factory Automation

Farah Salah, Lauri Kuru, Riku Jäntti

Configuration of Application Layer Protocols within Real-time I4.0 Components

Frederick Prinz, Michael Schoeffler, Andreas Eckhardt, Armin Lechler, Alexander Verl

Demonstrating the Impact of LTE Communication Latency for Industrial Applications

Fedor Polunin, Dick Carrillo Melgarejo, Tuomo Lindh, Antti Pinomaa, Pedro Nardelli, Olli Pyrhönen

Comprehensive management function models applied to heterogeneous industrial networks

Santiago Soler Perez Olaya, Robert Lehmann, Martin Wollschlaeger

SS03 - ENGINEERING OF SOFTWARE PRODUCTS FOR INDUSTRY

Room/Time: TU3, Tuesday 23rd of July, 10:50
Chair/s: Anirban Sarkar, Narayan C. Debnath

Efficient Any Source Overlay Multicast In CRT-Based P2P Networks - A Capacity-Constrained Approach

Indranil Roy, Koushik Maddali, Swathi Kaluvakuri, Benafsheh Rekabdar, Ziping Liu, Bidyut Gupta, Narayan Debnath

Things as a Service: Service model for IoT

Amit Mandal, Agostino Cortesi, Anirban Sarkar, Nabendu Chaki

Pixel Value Difference Based Image Steganography with One Time Pad Encryption

Giridhar Maji, Sharmistha Mandal, Narayan C. Debnath, Soumya Sen

A Hypergraph Coloring Based Modelling of Service Oriented System

Sugyan Kumar Mishra, Ramzi A. Haraty, Narayan C. Debnath, Anirban Sarkar

TT SAFETY AND SECURITY IN INDUSTRIAL APPLICATIONS - 1

Room/Time: TU5, Tuesday 23rd of July, 10:50
Chair/s: Roopak Sinha, Antti Pakonen

A Multi-Agent Approach for Hybrid Intrusion Detection in Industrial Networks: Design and Implementation

Cyntia Vargas Martinez, Michael Sollfrank, Birgit Vogel-Heuser

Designing Actively Secure, Highly Available Industrial Automation Applications

Awais Tanveer, Roopak Sinha, Stephen G. MacDonell, Paulo Leitao, Valeriy Vyatkin

Whitelisting Cyber Attack Detection according to Estimated Operational States for CPS

Tsunato Nakai, Sachihiro Ichikawa, Nobuhiro Kobayashi, Kosuke Hata, Kenji Sawada

On the Security Threat of Abandoned and Zombie Cellular IoT Devices

Gabor Soos, Pal Varga

TT HUMAN, COMPUTER AND MACHINE INTERACTION - 1

Room/Time: TU6, Tuesday 23rd of July, 10:50
Chair/s: Jinhua She, Daisuke Chugo

Why consider the human-in-the-loop in automated cyber-physical production systems? Two cases from cross-company cooperation

Philipp Brauner, Martina Ziefle

Research on Optimization of Space Layout and Display Interface of Shield Control Room

Xingyu Jiang, Mingyu Ma, Shengshun Ma, Ruiying Zhu, Yisong Jin, Yitao Lu

Adapting Virtual Training Systems for Industrial Procedures to the Needs of Older People

Frieder Loch, Saskia Böck, Minjie Zou, Birgit Vogel-Heuser

On-line Training and Monitoring of Robot Tasks through Virtual Reality

Leire Amezua Hormaza, Wael M. Mohammed, Borja Ramis Ferrer, Ronal Bejarano, Jose L. Martinez Lastra

SS17 - INTELLIGENT APPLICATION OF CONSUMER WIRELESS TECHNOLOGIES FOR INDUSTRY - 1

Room/Time: TU7, Tuesday 23rd of July, 10:50
Chair/s: Gerhard P. Hancke, Victor Huang

Experimental Evaluation on NB-IoT and LoRaWAN for Industrial and IoT Applications

Massimo Ballerini, Tommaso Polonelli, Davide Brunelli, Michele Magno, Luca Benini

Developing a Secure, Smart Microgrid Energy Market using Distributed Ledger Technologies

Lehlogonolo P.I. Ledwaba, Gerhard P. Hancke, Sherrin J. Isaac, Hein S. Venter

An Approach to Improve Location Accuracy in Non-Line-of-Sight Scenarios using Floor Plans

Bruno Silva, Gerhard Hancke

Approaches for Best-Effort Relay-Resistant Channels on Standard Contactless Channels

Yuanzhen Liu, Jingyi Zhang, Wanying Zheng, Gerhard Hancke

SS01 - DEEP LEARNING METHODS FOR MEDICAL IMAGE ANALYSIS

Room/Time: AS3, Tuesday 23rd of July, 10:50
Chair/s: Po Yang, Igor Buzhinsky

LGAN: Lung Segmentation in CT Scans Using Generative Adversarial Network

Jiaxing Tian, Longlong Jing, Yumei Huo, Yingli Tian, Oguz Akin

Measuring System Entropy with a Deep Recurrent Neural Network Model

Miguel Martinez-García, Yu Zhang, Kenji Suzuki, Yudong Zhang

Hybrid Evaluation System for Facial Paralysis Rehabilitation based on Machine Learning and Doctor Experience

Zhijie Zhang, Wenbin Dai, Zhongxiu Xie, Wenjin Wang, Wei Wang

A Survey of Disease Progression Modeling Techniques for Alzheimer's Diseases

Xulong Wang, Jun Qi, Yun Yang, Po Yang

SS05 - EFFICIENCY IN FUTURE DATA CENTERS - 1

Room/Time: AS4, Tuesday 23rd of July, 10:50
Chair/s: Tor-Björn Minde, Chen-Wei Yang

Flow Disruptions and Mitigation in Virtualized Water-Cooled Data Centers

Udaya Puvvadi, Anuroop Desu, Tyler Stachecki, Sami Alkharabsheh, Kanad Ghose, Bahgat Sammakia

A Deep Neural Network based Approach to Energy Efficiency Analysis for Cloud Data Center

Hibat-Allah Ounifi, Abdelouahed Gherbi, Nadjia Kara, Wubin Li

Energy-Efficient Task Distribution Using Neural Network Temperature Prediction in a Data Center

Minato Omori, Yusuke Nakajo, Minami Yoda, Yogenda Joshi, Hiroaki Nishi

Characterization of Liquid Cooled Cold Plates for a Multi Chip Module (MCM) and their Impact on Data Center Chiller Operation

Bharath Ramakrishnan, Mohammad Tradat, Yaser Hadad, Kanad Ghose, Bahgat Sammakia

TT SIMULATION, VIRTUAL AND MIXED REALITY - 1

Room/Time: AS6, Tuesday 23rd of July, 10:50
Chair/s: Tommi Karhela, Evgeny Nefedov

Saliency Mapping for processing 3D Meshes in Industrial Modeling Applications

Gerasimos Arvanitis, Aris Lalos, Konstantinos Moustakas

Design and Application of a Domain Specific Modeling Language for Distributed Co-Simulation

Martin Krammer, Martin Benedikt

Artificial Neural Network enabled P2D Model Deployment for End-of-Line Battery Cell Characterization

Artem Turetskyy, Vincent Laue, Raphael Lamprecht, Sebastian Thiede, Ulrike Krewer, Christoph Herrmann

State-Estimation for Delay-Management in Distributed Real-Time Co-Simulation via the Internet

Tobias Pieper, Roman Obermaisser

Keynote Talk 2: AIoT and Robotics Driving Paradigm Shift of Intelligent Manufacturing New Biz: Some Exemplary Best Practices

Room/Time: AS2, Tuesday 23rd of July, 13:00
Keynote Speaker: Ren C. Luo

INDUSTRY FORUM 1: ARTIFICIAL INTELLIGENCE IN MANUFACTURING AND SUPPLY CHAIN

Room/Time: AS2, Tuesday 23rd of July, 14:00

This Industry Forum session addresses the key opportunities and challenges related to applying artificial intelligence in manufacturing and supply chain. The session will provide the participants with a state-of-the-art view to how industry is applying artificial intelligence to create new business models, improve manufacturing performance and enhance supply chain predictability, transparency and efficiency.

In this session, the speakers are encouraged to submit presentations tackling with AI within manufacturing and supply chain.

TT INDUSTRIAL CYBER-PHYSICAL SYSTEMS AND INDUSTRIAL AGENTS - 1

Room/Time: AS1, Tuesday 23rd of July, 16:00
Chair/s: Thiago Jesus, Luis Ribeiro

Adaptive Duty Cycle MAC Protocol of Low Energy WSN for Monitoring Underground Pipelines

Liming Qiu, Zoran Salcic, Kevin Wang

Power Consumption Optimization of a Wireless Temperature Sensor Node Using Unidirectional Communication

Reza Taherkhani, Stoyan Nihtianov

Experimental Evaluation of Non-identical Pulse-Coupled Oscillators Synchronisation in IEEE 802.15.4 Wireless Sensor Networks

Yan Zong, Xuewu Dai, Zhiwei Gao, Richard Binns, Krishna Busawon

A Testbed and an Experimental Public Dataset for Energy-Harvested IoT Solutions

Melisa Kuzman, Xavier del Toro, Soledad Escolar, Antonio Caruso, Stefano Chessa, Juan Carlos López

An Availability Metric and Optimization Algorithms for Simultaneous Coverage of Targets and Areas by Wireless Visual Sensor Networks

Daniel G. Costa, Elivelton Rangel, Joao Paulo J. Peixoto, Thiago C. Jesus

A Fast Iteration Algorithm for Coverage Optimization of Circular Sector Sensor Networks

Lei Feng, Xi Chen, Xiang Chen

TT ARTIFICIAL INTELLIGENCE IN INDUSTRIAL APPLICATIONS - 2

Room/Time: AS2, Tuesday 23rd of July, 16:00
Chair/s: Alessandro Brusaferri, Yasutaka Fujimoto

Nonlinear system identification using a recurrent network in a Bayesian framework

Alessandro Brusaferri, Matteo Matteucci, Pietro Portolani, Stefano Spinelli

Industrial Transfer Learning: Boosting Machine Learning in Production

Hasan Tercan, Alexandro Guajardo, Tobias Meisen

Interoperability and machine-to-machine translation model with mappings to machine learning tasks

Jacob Nilsson, Fredrik Sandin, Jerker Delsing

Mitigating the Weaknesses of Machine Learning in Short-Term Forecasting of Aggregated Power System Active Loads

Pekka Koponen, Harri Niska, Antti Mutanen

ANN based Interwell Connectivity Analysis in Cyber-Physical Petroleum Systems

Haibo Cheng, Xiaoning Han, Peng Zeng, Haibin Yu, Evgeny Osipov, Valeriy Vyatkin

Rainfall Forecasting by using Residual Network with Cloud Image and Humidity

Jun Tsukahara, Yasutaka Fujimoto, Hironori Fudeyasu

TT SAFETY AND SECURITY IN INDUSTRIAL APPLICATIONS - 2

Room/Time: TU1, Tuesday 23rd of July, 16:00
Chair/s: Gerhard Hancke, Karl-Heinz Niemann

IT security extensions for PROFINET

Karl-Heinz Niemann

Security in Wireless Sensor Networks: A formal verification of protocols

Giann Spilere Nandi, David Pereira, Martin Vigil, Ricardo Moraes, Analucia Schiaffino Morales, Gustavo Araujo

Enhancing Authorization Mechanisms using Attribute Certificates for OPCUA based Applications

Gajasri Karthikeyan, Stefan Heiss

An Optimized Mechanism for Malicious Behavior Detection in IoT-based blockchain system

Chunpeng Ge, Zhe Liu, Peizhong Shi, Jinyue Fang, J. Leon Zhao

A Versatile Security Layer for AutomationML

Bernhard Brenner, Edgar Weippl, Andreas Ekelhart

Event-related potential from EEG for a two-step Identity Authentication System

Luis Alfredo Moctezuma, Marta Molinas

SS20 - INTELLIGENT VEHICLE AND TRANSPORTATION SYSTEMS

Room/Time: TU3, Tuesday 23rd of July, 16:00
Chair/s: Yi Lu Murphey, Jia-Sheng Hu

Analysis and Implementation of Novel Energy Management System for Electric Vehicles

Chang-Yi Cheng, Jia-Sheng Hu, Min-Fu Hsieh, Mi-Ching Tsai

Self-alignment procedure for IMU in automotive context

Marco Carratù, Salvatore Dello iacono, Vincenzo Paciello, Antonio Pietrosanto

Decentralizing Air Traffic Flow Management with Blockchain-based Reinforcement Learning

Duong Ta, Hong-Linh Truong

Detection of driver stress in real-world driving environment using physiological signals

Ke Wang, Yi Lu Murphey, Yating Zhou, Xin Hu, Ximu Zhang

Detecting Sequential Human Mental Workload Using U-Net with Continuity-Aware Loss Applied to Streamed Physiological Signals

Yongquan Xie, Yi Lu Murpey, Dev Kochhar

TT SYSTEMS AND SOFTWARE ENGINEERING - 1

Room/Time: TU5, Tuesday 23rd of July, 16:00
Chair/s: Roopak Sinha, Wenbin Dai

Virtual Gateway in TCMS Execution Environment based on an Integrated Architecture

Hongjie Fang, Roman Obermaisser

Recipe Based Skill Matching

Haitham Elfaham, Julian Grothoff, Torben Deppe, Mahyar Azarmipour, Ulrich Epple

Chatter Detection in Hot Strip Mill Process based on Modified Independent Component Analysis

Ha-Nui Jo, Byeong Eon Park, Yumi Ji, Dong-kuk Kim, Jung Eun Yang, In-Beum Lee, Jeong Byeol Hong

An Approach to Efficient Test Scheduling for Automated Production Systems

Kathrin Land, Suhyun Cha, Birgit Vogel-Heuser

Similarity Analysis of Control Software Using Graph Mining

Mina Fahimipirehgalin, Juliane Fischer, Safa Bougouffa, Birgit Vogel-Heuser

Production Planning with IEC 62264 and PDDL

Bernhard Wally, Jiří Vyskočil, Petr Novák, Christian Huemer, Radek Šindelář, Petr Kadera, Alexandra Mazak, Manuel Wimmer

TT INDUSTRY DIGITALISATION AND DIGITAL TWINS IN INDUSTRIAL APPLICATIONS - 1

Room/Time: TU6, Tuesday 23rd of July, 16:00
Chair/s: Jose Barbosa, Igor Buzhinsky

An Industrial Marketplace - the Smart Factory Web Approach and Integration of the International Data Space

Friedrich Volz, Ljiljana Stojanovic, Robin Lamberti

The Exchange Network: A General-Purpose Architecture for Digital Negotiation and Exchange

Emanuel Palm, Olov Schelén, Ulf Bodin, Richard Hedman

Edge Computing for the Production Industry - A Systematic Approach to Enable Decision Support and Planning of Edge

Jakob Zietsch, Nils Weinert, Christoph Herrmann, Sebastian Thiede

A Contract-based Methodology for Production Lines Validation

Roberta Chirico, Stefano Spellini, Marco Panato, Michele Lora, Franco Fummi

Supporting Digital Production, Product Lifecycle and Supply Chain Management in Industry 4.0 by the Arrowhead Framework - a Survey

Dániel Kozma, Pál Varga, Gábor Soós

Fostering the creation of a Digital Ecosystem by a distributed IEC-61499 based automation platform

Andrea Barni, Alessandro Brusaferri, Franco A. Cavadini, Giuseppe Landolfi, Sandeep Patil, Dario Piga, Stefano Spinelli, Valeriy Vyatkin

TT INDUSTRIAL INFORMATICS TOOLS - 1

Room/Time: TU7, Tuesday 23rd of July, 16:00
Chair/s: Andrei Lobov, Bilal Ahmad

Cargo-call-stack - Static Call-stack Analysis for Rust

Nils Fitinghoff, Per Lindgren, Jorge Aparicious

Robust and Efficient Privacy Preservation in Industrial IoT via correlation completion and tracking

Aris Lalos, Evangelos Vlachos, Kostas Berberidis, Apostolos Fournaris, Christos Koulamas

A Survey: Microservices Architecture in Advanced Manufacturing Systems

Aydin Homay, Alois Zoitl, Mario de Sousa, Martin Wollschlaeger

Performance and energy efficiency of the analysis of the growing synchrophasor in a high-perfomance computing environment

Vladimir Berezovsky, Aleksandr Popov, Kirill Butin, Andrey Rodionov

Granularity Cost Analysis for Function Block as a Service (FBaaS)

Aydin Homay, Martin Wollschlaeger, Alois Zoitl, Mario de Sousa, Christos Chrysoulas

Development of Injection Attacks Toolbox in MATLAB/Simulink for Attacks Simulation in Industrial Control System Applications

Sasanka Potluri, Sai Ram Roy Nanduru, Kishore Vasamshetty, Christian Diedrich

SS14 - HOLISTIC APPROACH TO CONTROL AND ANALYSIS OF COMPLEX SYSTEMS

Room/Time: AS3, Tuesday 23rd of July, 16:00
Chair/s: Gennady Veselov, Andrey Sklyarov

Knowledge discovery model based on the effective control theory for decision support systems

Alexander Tselykh, Larisa Tselykh, Vladislav Vasilev

Non-linear control of a group of tracked robots

Gennady Veselov, Andrey Sklyarov, Valeriy Vyatkin

Mobile-cloud data processing system on digital images

Alexey Samoylov, Yuri Borodyansky, Andrei Kostyuk, Ivan Polovko

Non-linear control of a tracked robot

Gennady Veselov, Andrey Sklyarov, Jordanis Viltres Chávez

A fuzzy maximum dynamic flow model for emergency building evacuation

Evgeniya Gerasimenko, Vladimir Kureichik

SS05 - EFFICIENCY IN FUTURE DATA CENTERS - 2

Room/Time: AS4, Tuesday 23rd of July, 16:00
Chair/s: Tor Bjorn Minde, Chen-Wei Yang

AC vs. Hybrid AC/DC Powered Data Centers: A Workload Based Perspective

Anuroop Desu, Udaya Puvvadi, Tyler Stachecki, Shane Case, Kanad Ghose

A hybrid fault detection and diagnosis method in server rooms' cooling systems

Yulia Berezovskaya, Valeriy Vyatkin, Arash Mousavi, Xiaojing Zhang, Chen-Wei Yang

Integrated thermal management of a 150kW pilot Open Compute Project style data center

Sebastian Fredriksson, Jonas Gustafsson, Daniel Olsson, Jeffrey Sarkinen, Alan Beresford, Matthew Kaufeler, Tor Bjorn Minde, Jon Summers

Digital Twin for Tuning of Server Fan Controllers

Rickard Brännvall, Jon Summers

TT FACTORY AUTOMATION AND COMMUNICATION SYSTEMS- 2

Room/Time: AS6, Tuesday 23rd of July, 16:00
Chair/s: Ilkka Seilonen, Alexander Gogolev

OPC UA based Universal Edge Gateway for Legacy Equipment

Hyun Min Park, Jae Wook Jeon

OPC UA Information Model and a Wrapper for IEC 61499 Runtimes

Ilkka Seilonen, Valeriy Vyatkin, Udayanto Atmojo

Automated OPC UA address space generation from existing data structures

Christian von Arnim, Sebastian Friedl, Armin Lechler, Alexander Verl

A formal mapping between OPC UA and the Semantic Web

Rainer Schiekofer, Stephan Grimm, Maja Milicic Brandt, Michael Weyrich

TSN Traffic Shaping for OPC UA Field Devices.

Alexander Gogolev, Roland Braun, Philipp Bauer

Towards user-oriented programming of skill-based Automation Systems using a domain-specific Meta-Modeling Approach

René Lindorfer, Roman Froschauer

TT INDUSTRIAL CYBER-PHYSICAL SYSTEMS AND INDUSTRIAL AGENTS - 2

Room/Time: AS1, Wednesday 24th of July, 08:30
Chair/s: Evgeny Nefedov, Chen-Wei Yang

Adaptive Production Control in a Modular Assembly System - Towards an Agent-based Approach

Sebastian Mayer, Nikolas Hoehme, Dennis Gankin, Christian Endisch

Using Multi-Agent Systems for Demand Response Aggregators: Analysis and Requirements for the Development

Stefan Woltmann, Julia Kittel

Optimization of multi-agent auctioning processes in flexible production networks

Felix Gehlhoff, Hamied Nabizada, Alexander Fay

Janus: A Systems Engineering Approach to the Design of Industrial Cyber-Physical Systems

Dennis Jarvis, Jaqueline Jarvis, Chen-Wei Yang, Roopak Sinha, Valeriy Vyatkin

Development of Wearable Lower Limb Exoskeleton Robots

Guo-Shing Huang, Shao-Chian Chang, Chi-Chun Chen, Chung-Liang Lai, Hsiung-Cheng Lin, Cheng-Yu Peng

TT ARTIFICIAL INTELLIGENCE IN INDUSTRIAL APPLICATIONS - 3

Room/Time: AS2, Wednesday 24th of July, 08:30
Chair/s: Xiao Song, Daswin Da Silva

Contrast Enhancement and Image Completion: A CNN Based Model to Restore Ill Exposed Images

Cristiano Steffens, Lucas Messias, Paulo Drews-Jr, Silvia Botelho

Multi-scale Convolution and Advanced Semantics Loss based Video Interpolation Model

Fuwang Zhao, Xiao Song

Data Augmentation For CNN-Based 3D Action Recognition on Small-Scale Dataset

Thien Huynh-The, Dong-Seong Kim

Fast mesh denoising with data driven normal filtering using deep autoencoders

Stavros Nousias, Gerasimos Arvanitis, Aris Lalos, Konstantinos Moustakas

Determining input variable ranges given a trained regression model and an output range

Noelia Oses Fernández, Aritz Legarretaetxebarria, Marco Quartulli, Igor G. Olaizola, Mikel Serrano

H-Rank: A keywords extraction method from web pages using POS tags

Himat Shah, Muhammad Usman Khan, Pasi Franti

TT SAFETY AND SECURITY IN INDUSTRIAL APPLICATIONS - 3

Room/Time: TU1, Wednesday 24th of July, 08:30
Chair/s: Daniil Chivilikhin, Sandeep Patil

On-the-fly conformance testing of safety PLC code using QuickCheck

Adnan Khan, David Thönnessen, Martin Fabian

Formalization of natural language requirements into temporal logics: a survey

Igor Buzhinsky

Demonstration of a conformity assessment data model

Joonas Linnosmaa, Jarmo Alanen

On the Preservation of the Trust by Regression Verification of PLC software for Cyber-Physical Systems of Systems

Suhyun Cha, Mattias Ulbrich, Alexander Weigl, Bernhard Beckert, Kathrin Land, Birgit Vogel-Heuser

Evaluating Two Semantics for Falsification using an Autonomous Driving Example

Zahra Ramezani, Nicholas Smallbone, Martin Fabian, Knut ÅKesson

Verification of Safety Functions Implemented in Rust - a Symbolic Execution based approach

Nils Fitinghoff, Per Lindgren, Marcus Lindner, Johan Eriksson

SS10 - INTEGRATION OF SOFTWARE AGENTS AND LOW-LEVEL AUTOMATION FUNCTIONS - 1

Room/Time: TU3, Wednesday 24th of July, 08:30
Chair/s: Paulo Leitao, Filip Andren

IASelect: Finding Best-fit Agent Practices in Industrial CPS Using Graph Databases

Chandan Sharma, Roopak Sinha, Paulo Leitao

Time-related Constrains in Administration Shell Design within Cyber-physical Production Systems

Luis Ribeiro, Martin Hochwallner

Deployment of Industrial Agents in a Smart Parking System

Lucas Sakurada, José Barbosa, Paulo Leitão

Agent-based Plug and Produce Cyber-Physical Production System - Test Case

Andre Dionisio Rocha, João Tripa, Duarte Alemão, Ricardo Silva Peres, Jose Barata

TT SYSTEMS AND SOFTWARE ENGINEERING - 2

Room/Time: TU5, Wednesday 24th of July, 08:30
Chair/s: Wenbin Dai, Andrei Lobov

A Case Study on Automatic Requirement Transformation for Code Generation in Industrial Cyber-Physical Systems

Yineng Song, Weiqi Sun, Xian Wu, Jue Wang, Wenbin Dai

System of Systems integration via a structured naming convention

Cristina Paniagua, Jens Eliasson, Csaba Hegedus, Jerker Delsing

Product/ion-Aware Modeling Languages that Support Tracing Design Decisions

Lukas Kathrein, Arndt Lüder, Kristof Meixner, Dietmar Winkler, Stefan Biffl

KPI-ML based integration of industrial information systems

Muhammad Ashhal Tahir, Mehdi Mahmoodpour, Andrei Lobov

Novel orchestration architecture for Fog computing

Adrián Orive, Aitor Agirre, Josu Bilbao, Marga Marcos

Increasing Awareness for Potential Technical Debt in the Engineering of Production Systems

Felix Ocker, Matthias Seitz, Marius Oligschläger, Minjie Zou, Birgit Vogel-Heuser

TT INDUSTRY DIGITALISATION AND DIGITAL TWINS IN INDUSTRIAL APPLICATIONS - 2

Room/Time: TU6, Wednesday 24th of July, 08:30
Chair/s: Arto Visala, Valeriy Vyatkin

Efficient State Update Exchange in a CPS Environment for Linked Data-based Digital Twins

Andrii Berezovskyi, Rafia Inam, Jad El-khoury, Martin Törngren, Elena Fersman

Conceptual Framework for manufacturing data preprocessing of diverse input sources

Dominik Flick, Sebastian Gellrich, Li Ji, Marc Filz, Sebastian Thiede, Christoph Herrmann

Complex Event Processing as an Approach for real-time Analytics in industrial Environments

Robin Lamberti, Ljiljana Stojanovic

A Hierarchical Storage System for Industrial Time-Series Data

Kevin Villalobos, Victor Julio Ramírez, Borja Diez, José Miguel Blanco, Alfredo Goñi, Arantza Illarramendi

Survey of Formats for Decoupling Machine Intelligence from Application in IoT devices

Borys Plyenkov, Valeriy Vyatkin

Interledger for the Industrial Internet of Things

Pekka Nikander, Juuso Autiosalo, Santeri Paavolainen

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TT TECHNOLOGIES AND INFRASTRUCTURES FOR SMART GRIDS, BUILDINGS, AND CITIES - 1

Room/Time: TU7, Wednesday 24th of July, 08:30
Chair/s: Hailong Huang, Thiago Jesus

A LoRaWAN-based Camel Crossing Alert and Tracking System

Tariq Al Balushi, Ayoub Al Hosni, Hashim Al Theeb Ba Omar, Dawood Al Abri

Control of a Novel Parcel Delivery System Consisting of a UAV and a Public Train

Hailong Huang, Andrey Savkin, Chao Huang

Indoor Air Quality Monitoring Using Infrastructure-Based Motion Detectors

Naser Hossein Motlagh, Martha Arbayani Zaidan, Eemil Lagerspetz, Samu Varjonen, Juhani Toivonen, Julien Mineraud, Andrew Rebeiro-Hargrave, Matti Siekkinen, Tareq Hussein, Petteri Nurmi

Routing Autonomous Emergency Vehicles in Smart Cities Using Real Time Systems Analogy: A Conceptual Model

Subash Humagain, Roopak Sinha

MegaSense: Feasibility of Ultra-Low-Cost Sensors for Pollution Hot-spot Detection

Eemil Lagerspetz, Naser Hossein Motlagh, Martha Arbayani Zaidan, Pak L. Fung, Julien Mineraud, Samu Varjonen, Matti Siekkinen, Petteri Nurmi, Yutaka Matsumi, Sasu Tarkoma

Wireless visual sensor networks redeployment based on dependability optimization

Thiago Jesus, Daniel Costa, Paulo Portugal

SS04 - INFORMATICS MODELS FOR IOT ENABLED HEALTHCARE

Room/Time: AS3, Wednesday 24th of July, 08:30
Chair/s: Po Yang, Yun Yang

Improving CNN-based activity recognition by data augmentation and transfer learning

Gerasimos Kalouris, Evangelia I. Zacharaki, Vasileios Megalooikonomou

Ensemble of Receptive Fields for Training Central-Focused Convolutional Neural Networks

Wenzhao Shao, Po Yang, Yun Yang

Automatic Computer Aided System for Lung Cancer in Chest CTs Using MD-RFCN Combined with Tri-Level Region Proposal Network

Anum Masood, Bin Sheng, Ping Li, Po Yang, Jinman Kim

An IoT-enabled Telerobotic-Assisted Healthcare System based on Inertial Motion Capture

Huiying Zhou, Honghao Lv, Kang Yi, Zhibo Pang, Huayong Yang, Geng Yang

SS02 - MONITORING, DIAGNOSIS, PROGNOSIS AND RESILIENT CONTROL METHODS AND APPLICATIONS - 1

Room/Time: AS6, Wednesday 24th of July, 08:30
Chair/s: Zhiwei Gao, Yichuan Fu

Kullback-Leibler Divergence Constructed Health Indicator for Data-Driven Predictive Maintenance of Multi-Sensor Systems

Oluseun O. Aremu, Darren O. O'Reilly, David Hyland-Wood, Peter R. McAree

Remaining Useful Life Estimation for Unknown Motors Using a Hybrid Modeling Approach

Marcel Hildebrandt, Mohamed Khalil, Christoph Bergs, Volker Tresp, Roland Wüchner, Kai-Uwe Bletzinger, Michael Heizmann

Detection of Machine Tool Anomalies from Bayesian Changepoint Recurrence Estimation

Christian Reich, Christina Nicolaou, Ahmad Mansour, Kristof Van Laerhoven

Machine Learning-Based Embedding for Discontinuous Time Series Machine Data

Oluseun O. Aremu, David Hyland-Wood, Peter R. McAree

Fault Classification in Wind Turbines Using Principal Component Analysis Technique

Yichuan Fu, Yuanhong Liu, Zhiwei Gao

Comparison of Different Probabilistic Graphical Models as Causal Models in Alarm Flood Reduction

Paul Wunderlich, Nemanja Hranisavljevic

TT REAL-TIME AND NETWORKED EMBEDDED COMPUTING - 1

Room/Time: AS4, Wednesday 24th of July, 09:00
Chair/s: Kim Dong Seong, Matthias Becker

FARELI: A FAst and RELIable Routing Path for Cognitive Radio Sensor Networks

Tran-Dang Hoa, Kim Dong-Seong

An Adaptive Resource Provisioning Scheme for Industrial SDN Networks

Matthias Becker, Zhonghai Lu, De-Jiu Chen

Towards Cognitive Radio in Low Power Wide Area Network for Industrial IoT Applications

Adeiza J. Onumanyi, Adnan M. Abu-Mahfouz, Gerhard P. Hancke

Exploring Control-Message Quenching in SDN-based Management of 6LoWPANs

Musa Ndiaye, Adnan Abu-Mahfouz, Gerhard Hancke, Bruno Silva

KEYNOTE TALK 3: THE SCIENCE OF SOFTWARE AND SYSTEM DESIGN

Room/Time: AS2, Wednesday 24th of July, 10:50
Keynote Speaker: Stavros Tripakis

KEYNOTE TALK 4: FULLY AUTONOMOUS MANUFACTURING – ONLY A DREAM OR FUTURE REALITY?

Room/Time: AS2, Wednesday 24th of July, 13:00
Keynote Speaker: Alf Isaksson

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INDUSTRY FORUM 2: ARTIFICIAL INTELLIGENCE FOR AUTONOMOUS SYSTEMS

Room/Time: AS2, Wednesday 24th of July, 14:00

As an emerging trend, industrial systems are transforming from automated to autonomous. The systems that, without manual intervention, can change their behavior in response to unanticipated events during operation are called “autonomous”. In the recent years, we have seen many explorations in both academia and industries on such systems, ranging from driverless cars, unmanned aviation vehicles (UAV), automated guided vehicles (AGV), autonomous robots, autonomous ships, unmanned mining equipment, unmanned warehouses and distribution centers, unmanned groceries and shops, unmanned hotels and restaurants, and even autonomous power grids. Compared with traditional automatic control, the AI or machine learning techniques will play essential roles in such systems to enable the autonomous execution of complex tasks in more dynamic and unstructured environments with unpredictable changes. In this session, the invited speakers will address state-of-the-art, research challenges, and business cases of the autonomous industrial systems.

TT INDUSTRIAL CYBER-PHYSICAL SYSTEMS AND INDUSTRIAL AGENTS - 3

Room/Time: AS1, Wednesday 24th of July, 16:00
Chair/s: Daniil Chivilikhin, Yun Yang

Towards Formal Modeling and Analysis of SystemJ GALS Systems using Coloured Petri Nets

Weiyi Zhang, Zoran Salcic, Avinash Malik

Towards an OPC UA Compliant Programming Approach with Formal Model of Computation for Dynamic Reconfigurable Automation Systems

Udayanto Dwi Atmojo, Valeriy Vyatkin

Towards automatic state machine reconstruction from legacy PLC using data collection

Daniil Chivilikhin, Sandeep Patil, Anthony Cordonnier, Valeriy Vyatkin

Applying semantics into Service-oriented IoT Framework

An Ngoc Lam, ØYstein Haugen

Knowledge Graph based Internet of Things Middleware

Cheng Xie, Di Liu, Yun Yang, Po Yang, Beibei Yu, Qing Liu, Zhibo Chen, Qiang Feng, Jiqin Peng

Network Transparent Fog-based IoT Platform for Industrial IoT

Ryo Morishima, Hiroaki Nishi

WOMEN IN ENGINEERING FORUM

Room/Time: **OIH, Wednesday 24th of July, 14:00**
Organizers: **Lucia Lo Bello, Sirkka-Liisa Jämsä-Jounela**

Welcome and Introduction to the WiE in IEEE
- Prof. Lucia Lo Bello, University of Catania, Italy

New Trends in Automotive Networks: Automotive Ethernet and Time-Sensitive Networking
- Prof. Lucia Lo Bello, University of Catania, Italy

Water/wastewater Online Monitoring
- Heli Karaila, Business Manager, Valmet Oyj, Finland

Robotics DIHs for Speeding Up the Digital Transformation of SMEs
- Prof. Minna Lanz, Tampere University, Finland

Data Analysis as a Tool for Plant Disease Forecasting
- Outi Ruusunen, Oulu University, Finland

The Impact of Sustainable Supply Chain on Waste-To-Energy Operations
- Dr. Maryam Mohammadi, Aalto University, Finland

Future calls for the EU programme
- Dr. Sanna-Maija Kiviranta, Senior Research Liaison Officer, Aalto University, Finland

Visit to the Aalto Bioproduct (ABio) Center
- Prof. Sirkka-Liisa Jämsä-Jounela, Aalto University, Finland

TT ARTIFICIAL INTELLIGENCE IN INDUSTRIAL APPLICATIONS - 4

Room/Time: **TU1, Wednesday 24th of July, 16:00**
Chair/s: **Byoung Chul Ko, Wenbin Dai**

Machine learning for assistance systems: pattern-based approach to online step recognition

Marta Fullen, Alexander Maier, Arthur Nazarenko, Volkan Aksu, Sascha Jenderny, Carsten Röcker

Understanding Human Decision-making during Production Ramp-up using Natural Language Processing

Melanie Zimmer, Ali Al-Yacoub, Pedro Ferreira, Niels Lohse

A Cognitive Model for Emotion Awareness in Industrial Chatbots

Achini Adikari, Daswin De Silva, Damminda Alahakoon, Xinghuo Yu

Fall Detection with Supervised Machine Learning using Wearable Sensors

Davide Giuffrida, Guido Benetti, Daniele De Martini, Tullio Facchinetti

HT-GSOM: Dynamic Self-organizing Map with Transience for Human Activity Recognition

Rashmika Nawaratne, Damminda Alahakoon, Daswin De Silva, Xinghuo Yu

Intelligent Driver Emotion Monitoring Based on Lightweight Multilayer Random Forests

Mira Jeong, Byoung Chul , Byoung Chul Ko

TT HUMAN, COMPUTER AND MACHINE INTERACTION - 2

Room/Time: **TU3, Wednesday 24th of July, 16:00**
Chair/s: **Jinhua She, Hong He**

Angle Control of Antagonistic Pneumatic Driven and Inflatable Arm Joint

Hirofusa Ogasawara, Sho Yokota, Akihiro Matsumoto, Daisuke Chugo, Hiroshi Hashimoto

Feature Selection and Recognition of Multivariate Physiological Signals Using Binary Firefly Algorithm

Hong He, Feihu Peng, Jun Ying

Hand Gesture-Based On-Line Programming of Industrial Robot Manipulators

Antonios Sylari, Borja Ramis Ferrer, Jose L. Martinez Lastra

Improvement of the ungrounded force display using grooved cam

Emi Kakuda, Sho Yokota, Akihiro Matsumoto, Daisuke Chugo, Hiroshi Hashimoto

Development of One Hand Drive Wheelchair System 2nd report: Evaluation of the designed hand rim

Akira Takahashi, Sho Yokota, Akihiro Matumoto, Daisuke Chugo, Hiroshi Hashimoto

An Approach for adapting a Cobot Workstation to Human Operator within a Deep Learning Camera

Olatz De Miguel Lazaro, Wael M. Mohammed, Borja Ramis Ferrer, Ronal Bejarano, Jose L. Martinez Lastra

TT ROBOTICS AND MECHATRONICS IN INDUSTRIAL APPLICATIONS - 2

Room/Time: TU5, Wednesday 24th of July, 16:00
Chair/s: Yasutaka Fujimoto, Hailong Huang

On Adhesion Modeling and Control of a Vortex Actuator for Climbing Robots

Andreas Papadimitriou, George Andrikopoulos, Angelica Brusell, George Nikolakopoulos

Maneuvering Assistance of Teleoperation Robot Based on Identification of Gaze Movement

Reo Arita, Satoshi Suzuki

Communication Delay Compensation for Precise Force Matching in Teleoperation

Naoya Tojo, Tetsuya Tashiro, Minoru Yokoyama, Tomoyuki Shimono, Roberto Oboe, Takahiro Mizoguchi, Kouhei Ohnishi

Power-based Restoration of Haptic Teleoperation from Communication Blackout

Satoshi Hangai, Takahiro Nozaki

When Drones Take Public Transport: Towards Low Cost and Large Range Parcel Delivery

Hailong Huang, Andrey Savkin, Chao Huang

TT INDUSTRY DIGITALISATION AND DIGITAL TWINS

Room/Time: TU6, Wednesday 24th of July, 16:00
Chair/s: Udayanto Dwi Atmojo, Jose Barbosa

A Qualitative Study of Industry 4.0 Use Cases and their Implementation in Electronics Manufacturing

Jonas Zinn, Birgit Vogel-Heuser

Hybrid Cloud - Architecture for Administration Shells with RAMI4.0 Using Actor4j

David Bauer, Juho Mäkiö

Digital Twin in Industry 4.0: Technologies, Applications and Challenges

Flávia Pires, Ana Cachada, José Barbosa, António Paulo Moreira, Paulo Leitão

Discovery Service for Industry 4.0 based on Property Value Statements

Torben Deppe, Haitham Elfaham, Ulrich Epple

Utilization of the Asset Administration Shell to Support Humans During the Maintenance Process

Dorota Lang, Sergej Grunau, Lukasz Wisniewski, Jürgen Jasperneite

Towards Product Centric Manufacturing: From Digital Twins to Product Assembly

Vladimir Kuliaev, Udayanto Dwi Atmojo, Seppo Sierla, Jan Olaf Blech, Valeriy Vyatkin

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TT TECHNOLOGIES AND INFRASTRUCTURES FOR SMART GRIDS, BUILDINGS AND CITIES - 2

Room/Time: TU7, Wednesday 24th of July, 16:00
Chair/s: Alessandro Brusaferri

Day-ahead Prediction of Building District Heat Demand for Smart Energy Management and Automation in Decentralized Energy Systems

Abinet Tesfaye Eseye, Matti Lehtonen, John Millar, Toni Tukia, Semen Uimonen

Probabilistic Wind Power Forecasting via Bayesian Deep Learning Based Prediction Intervals

Honglin Wen, Jie Gu, Jinghuan Ma, Zhijian Jin

Day ahead electricity price forecast by NARX model with LASSO based features selection

Alessandro Brusaferri, Lorenzo Fagiano, Matteo Matteucci, Andrea Vitali

Short-term Forecasting of Electricity Consumption in Buildings for Efficient and Optimal Distributed Energy Management

Abinet Tesfaye Eseye, Matti Lehtonen, John Millar, Toni Tukia, Semen Uimonen

SOC estimation of Lithium-ion battery based on an Extended H-infinity filter

Tiantian Cai, Yuanyuan Liu, Zhiwei He, Mingyu Gao, Jingbiao Liu

State of Charge Estimation for Lithium-Ion Batteries Based on NARX Neural Network and UKF

Xiaohan Qin, Mingyu Gao, Zhiwei He, Yuanyuan Liu

SS06 - EFFICIENT MULTIMEDIA SENSING AND COMPUTING IN INDUSTRIAL APPLICATIONS

Room/Time: AS3, Wednesday 24th of July, 16:00
Chair/s: Tommy S. Chow, Jingjing Gao

Deep Learning-based Beverage Recognition for Unmanned Vending Machines: An Empirical Study

Haijun Zhang, Donghai Li, Yuzhu Ji, Haibin Zhou, Weiwei Wu

English Out-of-Vocabulary Lexical Evaluation Task

Han Wang, Ye Wang, Xinxiang Zhang, Mi Lu, Yoonsuck Choe, Jingjing Cao

Sub-Graph Regularization for Scalable Semi-supervised Classification

Mingbo Zhao, Yue Zhang, Xue-song Tang

Bend Detection of Bridge Chords in UAV Images via Region-Based Deep Semantic Segmentation Network

Xinxiang Zhang, Ye Wang, Han Wang, Yue Zhang, Hao Wu, Mingbo Zhao

A Multi-resident Activity Recognition Approach based on Frequent Itemset Mining Features

Wenjing Yuan, Jingjing Cao, Zeyi Jin, Fei Xia, Ran Wang

Modelling for Dynamic Growth of User Population of Products and Services

Choujun Zhan, Xiaoting Zhong, Qizhi Zhang, Mingbo Zhao, Yu Wang

Piecewise Large Margin Learning for Partially Annotated Sequences

Xiaolei Lu, Tommy Chow, Haijun Zhang

Hard Disk Drives Failure Detection Using A Dynamic Tracking Method

Yu Wang, Shan Jiang, Long He, Yizhen Peng, Tommy Chow

SS11 - LOWER POWER SMART SENSING FOR THE INDUSTRY 4.0

Room/Time: AS4, Wednesday 24th of July, 16:00
Chair/s: Vincenzo Paciello, Victor Huang

Probabilistic Geomagnetic Fingerprinting for Low-Power Orientation Estimation utilising Geometric Models

Johannes Meyer, Lars Klitzke, Gerd von Cölln

Energy Harvesting Powered Wireless Sensor Nodes With Energy Efficient Network Joining Strategies

Zheng Jun Chew, Tingwen Ruan, Meiling Zhu

Energy characterization of attitude algorithms

Marco Carratù, Salvatore Dello Iacono, Minh Long Hoang, Antonio Pietrosanto

Cryptographic Strength And Machine Learning Security For Low Complexity Iot Sensors

Paul Long, Sam Matsumoto

A Discussion about the Implementation of a WSN to Industry 4.0 based on the IEEE 1451 Standard

Rita Pinto, João Pereira, Helbert Rocha, Roberta Martin, António Espírito-Santo

IoT System for Indoor Air Quality Measurement

Janne Luukkaa, Arto Visala, Panu Harmo, Mirja Salkinoja-Salonen

SS02 - MONITORING, DIAGNOSIS, PROGNOSIS AND RESILIENT CONTROL METHODS AND APPLICATIONS - 2

Room/Time: AS6, Wednesday 24th of July, 16:00
Chair/s: Iris Weiss, Milutin Pajovic

A Data-Driven Method for Predicting Capacity Degradation of Rechargeable Batteries

Milutin Pajovic, Philip V. Orlik, Toshihiro Wada, Tomoki Takegami

Analysis of the applicability of fault detection and failure prediction based on unsupervised learning and Monte Carlo simulations for real devices in the industrial automobile production

Jonathan Manrique Garay, Christian Diedrich

Data-Driven Condition Monitoring of Control Valve in Laboratory Test Runs

Iris Weiss, Andreas Hanel, Emanuel Trunzer, Mina Fahimi Pirehgalin, Stefan Unland, Birgit Vogel-Heuser

Time-series Deep Learning Fault Detection with the Application of Wind Turbine Benchmark

Reihane Rahimilarki, Zhiwei Gao, Nanlin Jin, Aihua Zhang

An Adversarial Learning Framework for Zero-shot Fault Recognition of Mechanical Systems

Jinglong Chen, Tongyang Pan, Zitong Zhou, Shuilong He

Adaptive Remaining Useful Lifetime Prediction of Magnetic Head under Varying Stress Conditions

Yizhen Peng, Yu Wang, Tommy W. S. Chow

TT HUMAN, COMPUTER AND MACHINE INTERACTION - 3

Room/Time: AS1, Thursday 25th of July, 09:00
Chair/s: Daisuke Chugo, Igor Buzhinsky

Development of robot design evaluating system using Augmented Reality for affinity robots

Shyang Shao, Satoshi Muramatsu, Katsuhiko Inagaki, Daisuke Chugo, Syo Yokota, Hiroshi Hashimoto

An Intelligent Assistance System for Controlling Wind-Assisted Ship Propulsion Systems

Marcel Müller, Moritz Götting, Thomas Peetz, Michael Vahs, Elmar Wings

Predicting the difficulty of TSP instances using MST

Lahari Sengupta, Pasi Fränti

A Thermal Video-based Robust Activity Recognition Using Discriminant Skeleton Features and RNN

Md Zia Uddin, Weria Khaksar, JIm Torresen

Workshop of the IES Chapter Finland

Room/Time: AS2, Thursday 25th of July, 09:00
Chair/s: Yousef Ibrahim

TT FACTORY AUTOMATION AND COMMUNICATION SYSTEMS- 3

Room/Time: TU1, Thursday 25th of July, 09:00
Chair/s: Lin Zhang, Jan Olaf Blech

Proximity Contours: Vision based Detection and Tracking of Objects in Manufacturing Plants using Industrial Control Systems

Shishira S, Vidyadhar Rao, Sithu D Sudarsan

Predictive Analytics in a Pulp Mill using Factory Automation Data - Hidden Potential

Mikko Nykyri, Mikko Kuisma, Tommi J. Kärkkäinen, Tero Junkkari, Kari Kerkelä, Jouko Puustinen, Jesse Myrberg, Pertti Silventoinen, Jukka Hallikas

Study of 3D Printing Model Aggregation and Retrieval Mechanism in Cloud Manufacturing

Xiao Luo, Fan Pan, Lin Zhang, Lei Ren, Guoqiang Shi, Liqin Guo, Tingyu Lin

Granulometric Analysis of Fertilizers by Digital Image Processing

Julio Cezar Mendonça, Marta Duarte, Victor Coch, Emanuel Estrada, Ricardo Rodrigues, Sílvia Botelho

A Concept for Integration of Voice Assistant and Modular Cyber-Physical Production System

Maxim Ya. Afanasev, Yuri S. Andreev, Yuri V. Fedosov, Anastasiya A. Krylova, Sergey A. Shorokhov, Kseniia V. Zimenko, Mikhail V. Kolesnikov

TT DISTRIBUTED AND NETWORKED CONTROL SYSTEMS-1

Room/Time: TU3, Thursday 25th of July, 09:00
Chair/s: Andreas Schwung, Xiao-zhi Gao

Design of Distributed Curing Control System for Mass Concrete Pouring

Haitang Liu, Yanjun Fang

A Review of State-of-the-art Control and Optimization Methods in Permanent Magnet Synchronous Machine Drives

Zhanjun Tan, Xiao-Zhi Gao

A Method to Estimate Exogenous Disturbances in Nonlinear Systems Based on Equivalent-Input-Disturbance Approach

Xiang Yin, Jinhua She, Zhentao Liu, Min Wu, Daiki Sato, Kaoru Hirota

Cooperative Robot Control in Flexible Manufacturing Cells: Centralized vs. Distributed Approaches

Andreas Schwung, Dorothea Schwung, Mohammed Sharafath Abdul Hameed

Optimal Tuning of Cascade Controllers for Feed Drive Systems using Particle Swarm Optimization

Milica Petrović, Alberto Villalonga, Zoran Miljković, Fernando Castaño, Stanisław Strzelczak, Rodolfo Haber

TT SIMULATION, VIRTUAL AND MIXED REALITY - 2

Room/Time: TU6, Thursday 25th of July, 09:00
Chair/s: Tommi Karhela, Christopher Turner

IIoT-based Fatigue Life Indication using Augmented Reality

Mohamed Khalil, Christoph Bergs, Theodoros Papadopoulos, Roland Wüchner, Kai-Uwe Bletzinger, Michael Heizmann

A Distributed Architecture for Modular and Dynamic Augmented Reality Processes

Tobias Küster, Nils Masuch, Johannes Fähndrich, Gudrun Tschirner-Vinke, Jan Taschner, Markus Specker, Hendrik Iben, Hannes Baumann, Falko Schmid, Jörg Stöcklein

A Framework for Next Generation Interactive and Immersive DES Models

Christopher Turner, Ashutosh Tiwari, Neha Prajapat, Windo Hutabarat, Divya Tiwari

Scalability of a Machine Learning Environment for Autonomous Driving Research

Anton Debner, Matias Hyyppä, Jussi Hanhirova, Vesa Hirvisalo

TT TECHNOLOGIES AND INFRASTRUCTURES FOR SMART GRIDS, BUILDINGS AND CITIES - 3

Room/Time: TU7, Thursday 25th of July, 09:00
Chair/s: Filip Andren, Bo Jorgensen

Incentivizing Strategy for Demand Response Aggregator Considering Market Entry Criterion: A Game Theoretical Approach

Mengmeng Yu, Seung Ho Hong, Xiongfeng Zhang, Junhui Jiang, Xuefei Huang, Min Wei, Kai Wang, Wei Liang

Composition and Application of Power System Digital Twins Based on Ontological Modeling

Sergey K. Andryushkevich, Serge P. Kovalyov, Evgeny Nefedov

Applying Machine Learning Concepts to Enhance the Smart Grid Engineering Process

Marcel Otte, Sebastian Rohjans, Filip Pröstl Andrén, Thomas Strasser

Distributed Energy Resource Adoption for Campus Microgrid

Zheng Ma, Magnus Værbak, Rune Kvols Rasmussen, Bo Nørregaard Jørgensen

SS18 - COMMUNICATIONS AND COMPUTING FOR FOG BASED CONTROL SYSTEMS - 1

Room/Time: AS3, Thursday 25th of July, 09:00
Chair/s: Federico Tramarin, Luca Leonardi

A Deep Learning Method for Material Performance Recognition in Laser Additive Manufacturing

Yuemeng Li, Hairong Yan, Yuefei Zhang

Exploring Docker Containers for Time-sensitive Applications in Networked Control Systems

Michael Sollfrank, Frieder Loch, Birgit Vogel-Heuser

Minimizing Age of Information for Real-Time Monitoring in Resource-Constrained Industrial IoT Networks

Qian Wang, He Chen, Yonghui Li, Zhibo Pang, Branka Vucetic

Comparing Decoding Performance of LDPC Codes and Convolutional Codes for Short Packet Transmission

Yi Deng, Ming Zhan, Meng Wang, Chao Yang, Xiaohong Luo, Jie Zeng, Jing Guo

TT EDUCATION IN ENGINEERING AND INDUSTRIAL INFORMATICS - 1

Room/Time: AS4, Thursday 25th of July, 09:00
Chair/s: Niko Nevaranta, Bilal Ahmad

Coderiu: a cloud platform for computer programming e-learning

Guido Benetti, Gianluca Roveda, Davide Giuffrida, Tullio Facchinetti

Examining Student Response to Virtual Reality in Education and Training

Tim Hatchard, Mohammad Al-Amin, Zeina Rihawi, Alaa Alsebae, Bilal Ahmed, Freeha Azmat

Analyzing Students' Mental Models of Technical Systems

Birgit Vogel-Heuser, Frieder Loch, Sarah Hofer, Eva-Maria Neumann, Frank Reinhold, Sarah Scheuerer, Jonas Zinn, Kristina Reiss

Concept, Challenges, and Learning Benefits Developing an Industry 4.0 Learning Factory with Student Projects

Maximilian Zarte, Jeffrey Wermann, Philipp Heeren, Agnes Pechmann

Interactive Learning Material for Control Engineering Education Using Matlab Live Scripts

Niko Nevaranta, Pekko Jaatinen, Krister Gräsbeck, Olli Pyrhönen

SS02 - MONITORING, DIAGNOSIS, PROGNOSIS AND RESILIENT CONTROL METHODS AND APPLICATIONS - 3

Room/Time: AS6, Thursday 25th of July, 09:00
Chair/s: Reihane Rahimilariki , Yichuan Fu

Semi-supervised locally linear embedding for machinery fault diagnosis

Yuanhong Liu, Panpan Guo, Yichuan Fu, Fangfang Zhang, Zhiwei Gao

A Hybrid Memetic Algorithm for Simultaneously Selecting Features and Instances in Big Industrial IoT Data for Predictive Maintenance

Yu-Lin Liang, Chih-Chi Kuo, Chun-Cheng Lin

Intelligent Logistics Supplier Selection Based On Improved Agglomerative Hierarchcial Clustering Algorithm

Yajie Zhang, Yaqiong Lv, Lei Tu, Yueqiu Hou

TT FACTORY AUTOMATION AND COMMUNICATION SYSTEMS - 4

Room/Time: TU1, Thursday 25th of July, 11:00
Chair/s: Lin Zhang, Jan Olaf Blech

Potential Game based Distributed Optimization of Modular Production Units

Dorothea Schwung, Jan Niclas Reimann, Andreas Schwung, Steven X. Ding

An Optimization Model for the Design of Additive Manufacturing Supply Chains

Filipe M. de Brito, Gelson da Cruz Júnior, Enzo M. Frazzon, João P. Basto, Symone G. S. Alcalá

Integrated automation system with PSO based scheduling for PCB remanufacturing plants

Alessandro Brusaferri, Egidio Leo, Leonardo Nicolosi, Danial Ramin, Stefano Spinelli

A framework for scheduling in cloud manufacturing with deep reinforcement learning

Yongkui Liu, Lin Zhang, Lihui Wang, Yingying Xiao, Xun Xu, Mei Wang

TT DISTRIBUTED AND NETWORKED CONTROL SYSTEMS-2

Room/Time: TU3, Thursday 25th of July, 11:00
Chair/s: Alois Zoitl, Sandeep Patil

The Component-based Design Method for Agent-based Multi-AGV System

Guangxi Wan, Zhenbang Nie, Peng Wang, Peng Zeng

Towards IEC 61499 Based Distributed Intelligent Automation: Design and Computing Perspectives

Guolin Lyu, Robert W. Brennan

Implementation of state transition models in IEC 61499 and its use for recognition and selection of sequences of events and objects

Victor Dubinin, Artem Voinov, Ilya Senokosov, Valeriy Vyatkin

FBBeam: An Erlang-based IEC 61499 Implementation

Laurin Prenzel, Julien Provost

TT ROBOTICS AND MECHATRONICS IN INDUSTRIAL APPLICATIONS - 3

Room/Time: TU5, Thursday 25th of July, 11:00
Chair/s: Yasutaka Fujimoto, Chen-Wei Yang

CNN Based Reliable Classification of Household Chores Objects for Service Robotics Applications

Ren-C. Luo, Hsien-Chang Lin, Yu-Ting Hsu

Implementing a Human-Robot Collaborative Assembly Workstation

Ronal Bejarano, Borja Ramis Ferrer, Wael M. Mohammed, Jose L. Martinez Lastra

Improving Safety in Collaborative Robot Tasks

Avijit Mandal, Divyasheel Sharma, Mohak Sukhwani, Raoul Jetley, Santonu Sarkar

TT REAL-TIME AND NETWORKED EMBEDDED COMPUTING-2

Room/Time: TU6, Thursday 25th of July, 11:00
Chair/s: Andrei Lobov, Andrey Somov

Sensors and Game Synchronization for Data Analysis in eSports

Anton Stepanov, Andrey Lange, Nikita Khromov, Alexandr Korotin, Evgeny Burnaev, Andrey Somov

Schedulability Analysis and GCL Computation for Time-Sensitive Networks

Frimpong Ansah, Mohamed Amine Abid, Hermann de Meer

Time-Critical State Transfer during Operation of Distributed Embedded Applications

Kilian Telschig, Alexander Knapp

TT TECHNOLOGIES AND INFRASTRUCTURES FOR SMART GRIDS, BUILDINGS AND CITIES - 4

Room/Time: TU7, Thursday 25th of July, 11:00
Chair/s: Antti Pakonen, Evgeny Nefedov

Flexible event-driven measurement technique for electricity metering with filtering

Mauricio de Castro Tomé, Pedro Nardelli, Luiz Carlos Pereira da Silva

A Frequency control using multiple BESS in islanded Microgrid

Heungseok Lee, Kyuhan Kim, Junghwan Kim, June Ho Park

Decentral Load Control for Grid Stabilization

Felix Uster, Dirk Timmermann

SS12 - INNOVATIVE TECHNOLOGIES AND METHODS FOR ZERO DEFECT MANUFACTURING ON INDUSTRIAL CYBER-PHYSICAL SYSTEMS CONTEXT - 1

Room/Time: AS3, Thursday 25th of July, 11:00
Chair/s: Paulo Leitao, Christian Eitzinger

Simulation of injection molding process and 3D-printing of forming parts for small-batch production

Olga Timofeeva, Yuriy Andreev, Eugeny Yablochnikov

Data-driven modeling of semi-batch manufacturing: a rubber compounding test case

Carmen Alfaro-Isac, Salvador Izquierdo, Gabriel Baquedano

Virtual Sensor Development Based on Reduced Order Models of CFD Data

Cristina Bengoechea-Cuadrado, María García-Camprubí, Valentina Zambrano, François Mazuel, Salvador Izquierdo

Reduced order models for uncertainty management and zero-defect control in seal manufacturing

Ismael Viejo, Noelía Alcalá, Salvador Izquierdo, Ignacio Conde, Valentina Zambrano, Leticia A. Gracia

TT EDUCATION IN ENGINEERING AND INDUSTRIAL INFORMATICS - 2

Room/Time: AS4, Thursday 25th of July, 11:00
Chair/s: Igor Buzhinsky, Bilal Ahmad

Evaluation Instrument for Engineering Modules and Courses

Elena Mäkiö-Marusik, Freeha Azmat, Bilal Ahmad, Robert Harrison, Armando Walter Colombo

IoT Demonstration Platform for Education and Research

Mikko Nykyri, Mikko Kuisma, Tommi J. Kärkkäinen, Jukka Hallikas, Janne Jäppinen, Katriina Korpinen, Pertti Silventoinen

SS18 - COMMUNICATIONS AND COMPUTING FOR FOG BASED CONTROL SYSTEMS - 2

Room/Time: **AS6, Thursday 25th of July, 11:00**
Chair/s: **Federico Tramarin, Luca Leonardi**

Embedded systems for time-critical applications over Wi-Fi: design and experimental assessment

Francesco Branz, Riccardo Antonello, Federico Tramarin, Tommaso Fedullo, Stefano Vitturi, Luca Schenato

A Proposal Towards Software-Defined Management of Heterogeneous Virtualized Industrial Networks

Luca Leonardi, Mohammad Ashiajei, Hossein Fotouhi, Lucia Lo Bello

A scalable approach for periodic traffic scheduling in IEEE 802.15.4-DSME networks

Filippo Battaglia, Mario Collotta, Luca Leonardi, Lucia Lo Bello, Gaetano Patti

INDUSTRY FORUM 3 - ARTIFICIAL INTELLIGENCE AND INFORMATICS SYSTEMS

Room/Time: **AS2, Thursday 25th of July, 13:00**

In industrial electronics systems activity happens at the edge with sensors, camera, etc. that detect information and with actuators, control, and other services that act. Many activities are well understood, and detect and act can be managed at the edge. However, many of these activities require advanced AI systems, rule based or neural networks typically in the cloud , that need history and current information to make complex decisions such as “replace this factory element”, “reroute the transport vehicle”, or “check with the doctor.” The informatics here require much more computing power and storage than typically is available at the edge system. There are many challenges such as sending the “right” amount of information to the cloud to make proper decisions without overloading the network or the cloud; also, doing so in a timely manner that the control decision can be made in suitable time. Design here depends on the application, and these kinds of systems are found in many applications including factory control and automation, transportation, medicine and agriculture, just to name a few. This Industry Forum session looks at the challenges and solutions to this problem space found in application systems today and in the near future. In this session, the speakers are encouraged to submit presentations tackling with AI within Industrial Informatics.

TT ARTIFICIAL INTELLIGENCE IN INDUSTRIAL APPLICATIONS - 5

Room/Time: **AS2, Thursday 25th of July, 15:00**
Chair/s: **Andreas Schwung, Udayanto Atmojo**

A Deep Learning-based Approach to Anomaly Detection with 2-Dimensional Data in Manufacturing

Marco Maggipinto, Alessandro Beghi, Gian Antonio Susto

Feature Selection Based on Visual Analytics for Quality Prediction in Aluminium Die Casting

Sebastian Gellrich, Thomas Beganovic, Alexander Mattheus, Christoph Herrmann, Sebastian Thiede

A Mesoscale Endpoint Predictive Model of Ore Grinding Particle Size

Shaowen Lu, Shuyu Huang

Fault Detection Assessment using an extended FMEA and a Rule-based Expert System

Fernando Arevalo, Cristhian Tito, Mochammed Rizky Diprasetya, Andreas Schwung

Deep Learning-based Object Detection in High Resolution UAV Images: An Empirical Study

Haijun Zhang, Mingshan Sun, Yuzhu Ji, Shichao Xu, Weihan Cao

TT INDUSTRIAL INFORMATICS TOOLS - 2

Room/Time: **TU5, Thursday 25th of July, 15:00**
Chair/s: **Andrei Lobov, Bilal Ahmad**

Data Analysis Tool and Image Acquisition System for Linear Arc Weld Deposition Evaluation

Bryan Pernambuco, Cristiano Steffens, Silvia Botelho, Adriano Werhli

Quality Risks in the Data Exchange Process for Collaborative CPPS Engineering

Stefan Biffl, Arndt Lueder, Felix Rinker, Laura Waltersdorfer, Dietmar Winkler

Data Preparation for Data Mining in Chemical Plants using Big Data

Reuben Borrison, Benjamin Kloepper, Jennifer Mullen

Supporting the Data Model Integrator in an Engineering Network by Automating Data Integration

Arndt Lüder, Konstantin Kirchheim, Johanna-Lisa Pauly, Stefan Biffl, Felix Rinker, Laura Waltersdorfer

Demonstration of a Toolchain for Feature Extraction, Analysis and Visualization on an Industrial Case Study

Sten Grüner, Andreas Burger, Hadil Abukwaik, Sascha El-Sharkawy, Klaus Schmid, Tewfik Ziadi, Anton Paule, Felix Suda, Alexander Viehl

Plant Leaves Region Segmentation in Cluttered and Occluded Images Using Perceptual Color Space and K-means-Derived Threshold with Set Theory

Michael Osadebey, Marius Pedersen, Dag Waaler

SS12 - INNOVATIVE TECHNOLOGIES AND METHODS FOR ZERO DEFECT MANUFACTURING ON INDUSTRIAL CYBER-PHYSICAL SYSTEMS CONTEXT - 2

Room/Time: **TU6, Thursday 25th of July, 15:00**
Chair/s: **Paulo Leitao, Christian Eitzinger**

Virtual Quality control using bidirectional LSTM networks and gradient boosting

Amirreza Baghbanpourasl, Edwin Lughofer, Pauline Meyer-Heye, Helmut Zörrer, Christian Eitzinger

Probabilistic Modelling combined with a CNN for boundary detection of carbon fiber fabrics

Sebastian Zambal, Christoph Heindl, Christian Eitzinger

Integration Challenges for the Deployment of a Multi-Stage Zero-Defect Manufacturing Architecture

Cristina Cristalli, Giacomo Angione, Josè Barbosa, Paulo Leitao

SS07 - 5G FOR VERTICAL INDUSTRY SERVICES

Room/Time: **AS4, Thursday 25th of July, 15:00**
Chair/s: **Po Yang, Md Ibrahim Mamun**

Deep Learning based Automatic Approach using Hybrid Global and Local Activated Features towards Large-scale Multi-class Pest Monitoring

Liu Liu, Rujing Wang, Chengjun Xie, Po Yang, Sud Sudirman, Fangyuan Wang, Rui Li

5G as Key Technology for Networked Factories: Application of Vertical-specific Network Services for Enabling Flexible Smart Manufacturing

Marcel Müller, Daniel Behnke, Patrick-Benjamin Bök, Manuel Peuster, Stefan Schneider, Holger Karl

Dependency-Aware Task Allocation Algorithm for Distributed Edge Computing

Jaewook Lee, Sangheon Pack, Haneul Ko, Joonwoo Kim

Test and Measurement of LPWAN and Cellular IoT Networks in a Unified Testbed

Jubin Sebastian E, Axel Sikora, Manuel Schappacher, Zubair Amjad

Healthcare Monitoring System Inside Self-driving Smart Car in 5G Cellular Network

Md. Ibrahim Mamun, Afroza Rahman, Md. Abdul Khaleque, M. F. Mridha, Md. Abdul Hamid

AutiLife: A Healthcare Monitoring System for Autism Center in 5G Cellular Network using Machine Learning Approach

Md. Ibrahim Mamun, Afroza Rahman, Md. Abdul Khaleque, Md. Abdul Hamid, M. F. Mridha

CLOSING CEREMONY

Room/Time: **AS2, Thursday 25th of July, 17:00**

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