

# **2022 IEEE 5th International Conference on Industrial Cyber-Physical Systems**



| <b>Tuesday, 24 May 2022</b>   |   |
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| 09:00-09:20                   | <b>Room 1</b><br><b>Opening Ceremony</b>  |
| 09:20-10:00                   | <b>Room 1</b><br><b>Keynote talk - Prof. Alan Norbury "Adoption of Digitalisation in Practice"</b><br>Chairs: Robert Harrison, Bilal Ahmad  |
| 10:00-12:10                   | <b>Room 2</b><br><b>Industry Forum Session I</b>  |
| 11:30-13:00                   | <b>Plenary</b><br><b>Tutorial: Monitoring, Fault-Tolerant and Cyber-Resilient Control of Renewable Microgrids</b>   |
| 13:30-16:30                   | <b>Plenary</b><br><b>Tutorial: Ensuring Safety and Establishing Trust for AI enabled Cyber-Physical Systems through Explainability</b>  |
| 13:30-16:40                   | <b>Room 2</b><br><b>Industry Forum Session II</b>   |
| <b>Wednesday, 25 May 2022</b> |   |
| 09:00-10:00                   | <b>Plenary</b><br><b>Keynote - Prof. Christian Diedrich "Interoperability, semantics and digital twin in industrial cyber physical systems"</b>   |
| 10:30-12:00                   | <b>Room 2</b><br><b>S02 - TT - ICPS Applications - I</b><br>Chairs: Antonio Luque, Duc Pham<br><b>Fast Person Detector with Efficient Multi-level Contextual Block for Supporting Assistive Robot</b> <i>Muhamad Dwisnanto Putro</i><br><b>Bringing the new class of cable-driven parallel robots to the world of industrial cyber-physical systems based on RAMI 4.0</b> <i>Jonas Walter, Simon Grau, Tobias Raczok, Sebastian Reitelshöfer, Jörg Franke</i><br><b>Simulation-based Design and Locomotion Control Implementation for a Lower Body Exoskeleton</b> <i>Mustafa Derman, Ahmed Fahmy Soliman, Alihan Kuru, Suleyman Can Çevik, Ramazan Unal, Ozkan Bebek, Barkan Ugurlu</i><br><b>Development of a Leaf-Sweeping Robot</b> <i>Wei-chen Lee, Wei-hsun Chiang</i><br><b>Coarse-to-fine defect detection of heritage 3D models using a CNN learning approach</b> <i>Gerasimos Arvanitis, Stavros Nousias, Aris Lalos, Konstantinos Moustakas</i><br><b>A SDN Based Method for Blocking Malicious Attacks on Digital Substations Communication</b> <i>Santiago Sanchez, Salvatore D'Arco</i> |
|                               | <b>Room 1</b>   |

## Wednesday, 25 May 2022

### S01 - TT - ICPS Theory and Technologies

Chairs: Xianqiang Yang, Bugra Alkan

**Anomaly detection based on time series data from industrial automatic sewing machines** *Daniel Vranjes, Oliver Niggemann*

**Adaptive N-Step Technique for Real-Time Anomaly Detection in Smart Manufacturing** *Dattaprasad Shetve, Raju Imandi, Raja Vara Prasad, Ramona Trestian, Huan Nguyen, Hrishikesh Venkataraman*

**Quality-aware scheduling of on-board and off-board data analysis in vehicle development** *Lena Oden*

**Global Resource Management in the ELASTIC Architecture** *Rita Sousa, Luis Nogueira, Fátima Rodrigues, Luis Miguel Pinho*

**Radio Resource Efficient UWB Measurement System Design and Performance Analysis for TWR-based Ranging** *Gergely Hollosi, Csaba Lukovszki, Máté Bancsics*

**Event-triggering in Distributed MPC of Decoupled Nonlinear Systems against DoS Attacks** *Jicheng Chen, Zhifeng Sun, Hui Zhang*

13:00-14:30

#### Room 2

### S04 - SS - Diagnosis and Automated Repair

Chairs: Maria Krantz, Lukas Moddemann

**Off-Line Analysis of Dynamic Causal Dependencies in Evolving Industrial Alarm Floods** *Gianluca Manca, Alexander Fay*

**ServiceNavigator - A Bayesian Assistance System for Diagnosing Industrial Production Systems** *Alexander Diedrich, Patrick Deutschmann, Caroline Junker*

**Anomaly Detection with Autoencoders as a Tool for Detecting Sensor Malfunctions** *Artur Liebert, Oliver Niggemann*

**Integration of Pre-machining Geometries for Repair Application by Cold Spray** *Marcel Lewke, Hongjian Wu, Alexander List, Frank Gärtner, Thomas Klassen, Alexander Fay*

**Mobile Refurbishment by Robot-Based Additive Manufacturing** *Julian Ulrich Weber, Malte Buhr, Bohdan Vykhtar, André Fischer, Karl Gritz, Peter Schlüter*

**A Two-stage H.264 based Video Compression Method for Automotive Cameras** *Yiting Wang, Pak Hung Chan, Valentina Donzella*

#### Room 1

### S03 - TT - ICPS Modeling and Optimization

Chairs: Mingxi Liu, Shen Chao

**A Model Annotation Approach for the Support of Software Energy Properties Management using AMALTHEA** *Ricardo Gomes, Tiago Carvalho, António Barros, Luis Miguel Pinho*

**A Computational Framework for Generalized Constrained Inverse Problems** *Dimitar Ninevski, Paul O'Leary*

**Predicting Muscle Excitations of the Hand from Kinematic Data** *Callum Thornton, Michael Chappell, Neil Evans, Joseph Hardwicke*

**Observer-Based Robust Adaptive Control of Uncertain Robot Manipulator** *Abdul Rehan Khan Mohammed, JIAYI ZHANG, Bilal Ahmad*

**Predictive Maintenance in electrical machines: An edge computing approach** *Javier de las Morenas, Francisco Moya-Fernández*

**Diagnosis Electromechanical System by Means CNN and SAE: An Interpretable-Learning Study** *Francisco Arellano-Espitia, Miguel Delgado-Prieto, Víctor Martínez-Viol, Roque-Alfredo Osornio-Rios, Juan-Jose*

## Wednesday, 25 May 2022

Saucedo-Dorantes

15:00-16:30

Room 2

### S06 - TT - ICPS Applications - II

Chairs: Antonio Luque, Tiberiu Seceleanu

**NMPC Design for AUV Dynamic Positioning Control with Incremental Input Constraints** *Chao Shen, Yang Shi*

**Vision-based Ergonomic and Fatigue Analyses for Advanced Manufacturing** *Manuela Kunz, Chang Shu, Michel Picard, Daniel Vera, Peter Hopkinson, Pengcheng Xi*

**A Diagnosis Method of Inverter Anomalies under DoS Attack Based on Interval Sliding Mode Observer** *Jin Li, Youmin Zhang*

**Generating Causal Hypotheses for Explaining Black-Box Industrial Processes** *Kaja Balzereit, Alexander Diedrich, Daniel Kubus, Jonas Ginster, Andreas Bunte*

**A Research Agenda for AI Planning in the Field of Flexible Production Systems** *Aljosha Koecher, René Heesch, Niklas Widulle, Anna Nordhausen, Julian Putzke, Alexander Windmann, Oliver Niggemann*

**Analysis of interventions to optimize a pumping process in food production** *Michael Colombo, Philipp Jell, Philipp Theumer, Albert Heim*

Room 1

### S05 - TT - ICPS Education and Social Aspects

Chairs: Aniko Costa, Claudia-Melania Chituc

**Towards a Process Model to Enable Domain Experts to Become Citizen Data Scientists for Industrial Applications** *Silke Merkelbach, Sebastian von Enzberg, Arno Kühn, Roman Dumitrescu*

**Hands-on Learning Modules for Upskilling in Industry 4.0**

**Technologies** *Alexandre de Oliveira Júnior, Heitor Assumpção, Jonas Queiroz, Luis Piardi, Javier Parra, Paulo Leitao*

**A Data-driven Multi-fidelity Physics-informed Learning Framework for Smart Manufacturing: A Composites Processing Case Study** *Milad Ramezankhani, Amir Nazemi, Apurva Narayan, Heinz Voggenreiter, Mehrtash Harandi, Rudolf Seethaler, Abbas S. Milani*

**CyPhyTest: Cyber Physical Interaction Aware Test Case Generation to Identify Operational Changes** *Ayan Banerjee, Aranyak Maity, Imane Lamrani, Sandeep Gupta*

**The emergence of ethics engineering in Industrial Cyber-Physical Systems** *Paulo Leitao, Stamatis Karnouskos*

**Sarsa-based Model Predictive Control with Improved Performance and Computational Complexity** *Tianxiang Lu, Kunwu Zhang, Yang Shi*

## Thursday, 26 May 2022

09:30-11:00

Room 2

### S08 - TT - ICPS Engineering - I

Chairs: Stamatis Karnouskos, Kim Fung Tsang

**Context Aware Site-visit Scheduling for Asset Management in Oil & Gas Sector** *Ravi Shankar, Sasirekha GVK, Chandrashekhar Ramanathan, Jyotsna Bapat*

**From intentions to services in modular process plants** *Artan Markaj, Katharina Stark, Nicolai Schoch, Mario Hoernicke, Alexander Fay*

**On automatic generation of OPC UA connections in IEC 61499**

# Thursday, 26 May 2022

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|             | <p><b>automation systems</b> <i>Tuojian Lyu, Udayanto Atmojo, Valeriy Vyatkin</i><br/> <b>OPC UA Service Discovery and Binding in a Service-Oriented Architecture</b> <i>Aparajita Tripathy, Jan van Deventer, Cristina Paniagua, Jerker Delsing</i><br/> <b>Seamlessly Interfacing Automation Systems with Simulation Models</b> <i>Andrej Kurtovic, Gernot Steindl, Wolfgang Kastner</i><br/> <b>Automation Software Architecture in CPPS – Definition, Challenges and Research Potentials</b> <i>Birgit Vogel-Heuser, Eva-Maria Neumann, Juliane Fischer, Marga Marcos, Elisabet Estévez Estévez, Giacomo Barbieri, Lisa Sonnleithner, Rick Rabiser</i></p>   |
|             | <p><b>Room 1</b></p> <p><b>S07 - SS- Sensing and perception for unmanned, automated and intelligent vehicles</b><br/> Chairs: Valentina Donzella, Martina Sciola</p> <p><b>Status-preserving, Seamless Relocation of Processes in Orchestrated Networks such as Organic 6G</b> <i>Dennis Krummacker, Hans Dieter Schotten</i><br/> <b>AutoSCOOP: Automated Road-Side Sensor Coverage Optimization for Robotic Vehicles on Proving Grounds</b> <i>David Hermann, Alois Knoll, Clara Marina Martinez, Gereon Hinz, Frank Sayer</i><br/> <b>Machine Learning for Soft Robot Sensing and Control: A Tutorial Study</b> <i>Huijiang Wang, Thomas George Thuruthel, Kieran Gilday, Arsen Abdulali, Fumiya Iida</i><br/> <b>Robust Lateral and Longitudinal Tire Force Estimation Based on Robust PMI Observer for Intelligent Vehicle</b> <i>Xiaochen Dong, Siyou Tao, Hui Zhang</i><br/> <b>A Comparative Study of Vision-based Road Surface Classification Methods for Dataset From Different Cities</b> <i>huan liang, Hui Zhang, Zhifeng Sun</i><br/> <b>KerubLess - Design of a Driverless Formula SAE Vehicle</b> <i>Gabriele Baris, Michael Mugnai, Rambod Rahmani, Carlo Alberto Avizzano, Marco Gabiccini</i></p> |
| 11:30-12:30 | <p><b>Plenary</b></p> <p><b>Keynote - John Whitbread "Looking forward with lessons from the past"</b></p>  |
| 13:00-14:30 | <p><b>Room 2</b></p> <p><b>S10 - TT - ICPS Architectures</b><br/> Chairs: Jan Haase, Maz Ahmad</p> <p><b>Use Case Driven Digital Twin Generation</b> <i>Denis Göllner, Tobias Klausmann, Rik Rasor, Roman Dumitrescu</i><br/> <b>Real-time Dynamic Reconfiguration for IEC 61499</b> <i>Laurin Prenzel, Simon Hofmann, Sebastian Steinhorst</i><br/> <b>Implementing a PLC-Service bus with IEC 61499</b> <i>Virendra Ashiwal, Antonio Manuel Gutierrez, Alois Zoitl</i><br/> <b>Wire Grasping by Using Proximity and Tactile Sensors</b> <i>Gianluca Laudante, Salvatore Pirozzi, Andrea Cirillo</i><br/> <b>An approach for the bimanual manipulation of a deformable linear object using a dual-arm industrial robot: cable routing use case</b> <i>Pablo Malvido Fresnillo, Saigopal Vasudevan, Wael Mohammed</i><br/> <b>Cable Detection and Manipulation for DLO-in-Hole Assembly Tasks</b> <i>Kevin Galassi, Alessio Caporali, Gianluca Palli</i></p>   |

# Thursday, 26 May 2022

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|             | <p><b>Room 1</b></p> <p><b>S09 - SS- IoT Automation tools and toolchains - I</b><br/> Chairs: Federico Montori, Pál Varga</p> <p><b>Distributed Decision Making Enabled by the Arrowhead Framework</b> <i>Carlos Bocanegra Gallardo, Patrick Moder, Hans Ehm</i></p> <p><b>Improving wafer map classification in Industry 4.0</b> <i>Michael Scheiber, Clement Nartey, Anja Zernig, Andre Kaestner</i></p> <p><b>An IoT Solution for Condition Monitoring of a Lithography Coater Tool in a Semiconductor Fab</b> <i>Yvonne Bergmann, Michael Leippert, Juergen Kuehnle, Johannes Kristan, Sven Erik Jeroschewski, Lukas Roemer, Paul Knaus, Axel Wogawa</i></p> <p><b>Towards CBDC-supported Smart Contracts for Industrial Stakeholders</b> <i>Attila Frankó, Bence Oláh, Zoltán Sass, Csaba Heged, OPál Varga</i></p> <p><b>ThreatGet: Ensuring the Implementation of Defense-in-Depth Strategy for IIoT based on IEC 62443</b> <i>Christoph Schmittner, Abdelkader Shaaban, Georg Macher</i></p> <p><b>Building Experimental Laboratory for Digital Twin in Service Oriented Architecture</b> <i>Hoa Nguyen, Øystein Haugen</i></p>                         |
| 15:00-16:30 | <p><b>Room 2</b></p> <p><b>S12 - TT - ICPS Engineering - II</b><br/> Chairs: Daniel Vera, Valeriy Vyatkin</p> <p><b>Towards Configurable Conformance Checks of PLC Software with Company-specific Guidelines</b> <i>Juliane Fischer, Birgit Vogel-Heuser, Fabian Haben, Luca Beuggert, Eva-Maria Neumann</i></p> <p><b>Inferring Mechanical Fault Models from the Electrical Domain</b> <i>Nicola Dall'Ora, Francesco Tosoni, Enrico Fraccaroli, Franco Fummi</i></p> <p><b>Symbolic Encoding of Reliability for the Design of Redundant Architectures</b> <i>Antonio Tierno, Giuliano Turri, Alessandro Cimatti, Roberto Passerone</i></p> <p><b>Contextual Bandit Guided Data Farming for Deep Neural Networks in Manufacturing Industrial Internet</b> <i>Yingyan Zeng, Parshin Shojaee, Syed Hasib Akhter Faruqui, Adel Alaeddini, Ran Jin</i></p> <p><b>Model-Based Engineering of CPPS Functions and Code Generation for Skills</b> <i>Aljoshia Koecher, Alexander Hayward, Alexander Fay</i></p> <p><b>SysMD: Towards "Inclusive" Systems Engineering</b> <i>Sandor Dalecke, Christoph Grimm, Johannes Koch, Axel Ratzke, Khushnood Adil Rafique</i></p> |
|             | <p><b>Room 1</b></p> <p><b>S11 - SS - IoT Automation tools and toolchains - II</b><br/> Chairs: Pál Varga, Federico Montori</p> <p><b>Discovering traces between textual requirements and logical models in the functional design of Printed Circuit Boards</b> <i>Eduardo Cibrián, JOSE MARÍA ALVAREZ, Roy Mendieta, Juan Llorens</i></p> <p><b>Interoperability Between ROS and OPC UA: A Local Cloud-Based Approach</b> <i>Aparajita Tripathy, Jan van Deventer, Cristina Paniagua, Jerker Delsing</i></p> <p><b>Cloud-based Collaborative Learning (CCL) for the Automated Condition Monitoring of Wind Farms</b> <i>saleha Javed, Salman Javed, Jan van Deventer, Fredrik Sandin, Jerker Delsing, Marcus Liwicki, Sergio Martin Del Campo Barraza</i></p> <p><b>Joint Power Control and Structural Health Monitoring in Industry 4.0 Scenarios using Eclipse Arrowhead and Web of Things</b> <i>Carlo Puliafito,</i></p>   |



## Thursday, 26 May 2022

*Lorenzo Gigli, Ivan Zyrianoff, Federico Montori, Antonio Viridis, Stefano Di Pascoli, Enzo Mingozzi, Marco Di Felice*

**Management platform for data translators supported by semantic annotations** *Gonçalo Adelino, Rogerio Campos-Rebelo, Filipe Moutinho, Pedro Maló*

**Trust Model Experimental Validation to Improve the Digital Twin Recommendation System** *Flávia Pires, Bilal Ahmad, Antonio Paulo Moreira, Paulo Leitao*