2024 IEEE 7th International Conference on Industrial Cyber-Physical Systems

Monday, 13 May 2024

09:00-10:00	*Arch View Ballroom* **Plenary Talk: Artificial Intelligence of Things in Manufacturing** Roland Essmann, Artificial Intelligence of Things in Manufacturing
10:00-10:30	*Room 2* **Break**
	Arch View Ballroom **Break**
	Room 1 **Break**
	Room 3 **Break**
10:30-12:10	*Room 2* **Autonomy and Intelligence for ICPS** **Advanced Observer Design for Sensorless Control in Industrial Physical Systems** *Haoxun Shen, Runze Guo, Dongda Liu, Suneel Kommuri* **Output Tracking Control of Nonlinear Systems With Statistical Learning-based Extremum Seeking** *Jiliang Song, Dawei Shi, Junzheng Wang* **Safe Reinforcement Learning for Connected and Automated Vehicle Platooning** *Kai Jiang, Yun Lu, Rong Su* **Exploring the linkage between partition-based distributed extended Kalman filter and distributed full-information estimation** *Xiaojie Li, Xunyuan Yin* **A Data-Driven Two-Stage Dynamometer Diagram Inference Approach for Variable Operational Conditions in Pumping Machines** *Jiusi Zhang, Hao Luo, Jilun Tian, Xinyu Qiao, Xiaoyi Xu, Yuchen Jiang, Shen Yin, Okyay Kaynak*
	Arch View Ballroom **Artificial Intelligence for ICPS** **From Unstructured Product Descriptions to Structured Data for Industry 4.0 with ChatGPT** *Christof Tinnes, Uwe Hohenstein, Hans Wernher van de Venn, Marko Ristin, Kiavash Fathi* **Conjugacy Search Problem Homomorphic Encryption Based Vertically Federated Graph Neural Network** *Bo Mi, Zeng Ran* **Prediction of irrigation water requirement based on parallel CNN-LSTM model and Mann-Kendall test** *Hao Wen, Haochen Ma, Yu Du, Jinchao Zhang, Li He* **Fed-SMAE: Federated-Learning Based Time Series Anomaly Detection with Shared Memory Augmented Autoencoder** *Jie Huang, Danya Xu, Tao Yang* **Data-Driven Prediction of Plunge Milling Force Using Stochastic Differential Equations** *Feng Hua, Yasen WANG, Ziheng ZHOU, Zhanpeng YANG, Zhihui WANG, Cheng Cheng*

Monday, 13 May 2024

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Room 1

Special Session: Performance Assurance of Industrial Wireless Systems

Chairs: Richard Candell, Kang Lee

On the Impact of TIG Welding Interference on Industrial Wi-Fi Networks: Modeling of Empirical Data and Analytical Studying of Coexistence *Mohamed Kashef, Jing Geng, Karl Montgomery, Richard Candell*

Mixing Neural Networks and Exponential Moving Averages for Predicting Wireless Links Behavior *Gabriele Formis, Stefano Scanzio, Lukasz Wisniewski, Gianluca Cena*

Wireless Safe Data Transmission Protocol Links for Railway Applications *Pablo Sanz, Jon Montalban, Aitor Arriola, Pablo Angueira*

An Analytical Evaluation for Software-based TSN in Industrial Wi-Fi Networks *Mohamed Kashef, Karl Montgomery, Richard Candell*

Scheduling with Probabilistic Per-Packet Real-Time Guarantee for Industrial URLLC *zhibo meng, Hongwei Zhang, James Gross*

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Room 3

Energy and Power Electronics for ICPS

Frequency optimization aiming at lightweight Design of Electro-aerodynamic Propulsion HVPS *ffÆ*

Measurement Method of Capacitive Current in Distribution Network Under Parallel Operation of Double Arc-suppression Coils *chen liu*

Enhanced Unscented Kalman Filter for Accurate State of Charge Estimation in Aerial Drone Lithium-Ion Batteries *Islam Md Monirul, Li Qiu, Ali Ahmad*

SOC Estimation of Lithium-ion Battery Based on Dual Time Scale SVD-UKF Algorithm *Zhenhan Ye, Zehua Ye, Dan Zhang, Qiyun Ge*

Speed control of a permanent magnet synchronous motor utilizing fractional-order principles *Mingzhuo Zhou, Keyong Shao*

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<tr><td>12:10-13:30</td><td>

Arch View Ballroom

Lunch

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<tr><td>13:30-14:30</td><td>

Arch View Ballroom

Industry Forum (I)

Chad Lloyd, Protecting Critical Assets in Aging Infrastructure with Modern Solutions

Marten Lohstroh, Software Design Automation for Industrial Cyber-Physical Systems

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<tr><td>14:30-15:00</td><td>

Room 2

Break

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Arch View Ballroom

Break

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Room 1

Break

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Monday, 13 May 2024

	Room 3 **Break**
15:00-16:40	*Room 2* **Design and Manufacturing** Chairs: Philipp Rosenthal

Room 2

Design and Manufacturing
Chairs: Philipp Rosenthal

- **Automated Derivation of Application Workload Models for Design Space Exploration of Industrial Distributed Cyber-Physical Systems** *Faezeh Sadat Saadatmand, Todor Stefanov, Ignacio Gonzalez-Alonso, Andy Pimentel, Benny Akesson, Marius Herget, Martin Christiaan Bor*
- **Plan-Based Derivation of General Functional Structures in Product Design** *Philipp Rosenthal, Niels Demke, Frank Mantwill, Oliver Niggemann*
- **Predictive Model for Machining Time in CNC Lathe Process** *Hsing-Wu Chen, Kuo-Chang Wu, Wei-chen Lee*
- **Design of an ISO 23247 Compliant Digital Twin for an Automotive Assembly Line** *Victória Melo, Jose Barbosa, Gonçalo Mota, Fernando De la Prieta, Paulo Leitao*
- **Demonstrating Containerization of Model Predictive Control for Modular Plants** *Lucas Vogt, Zohra Charania, Jonathan Mädler, Julius Lorenz, Helaleh Badrnoebashar, Amy Koch, Leon Urbas*

Room 1

Special Session: Fault Diagnosis and Attack Defense for ICPS
Chairs: Youming Zhang

- **Zero Dynamics Attacks on Unknown Bilinear Systems: Case Study** *M. Aminul Haq, W. Steven Gray*
- **Detection of Ladder Logic Bombs in PLC Control Programs: an Architecture based on Formal Verification** *Antonio Iacobelli, Lorenzo Rinieri, Andrea Melis, Amir Al Sadi, Marco Prandini, Franco Callegati*
- **FDI Attack Detection Based on L2 Gain Performance Adaptive Integral Sliding Mode Observer** *JIN LI, Youmin Zhang*
- **Securing Cyber-Physical Systems with Two-level Anomaly Detection Strategy** *Zeeshan Ahmad, Andrei Petrovski*
- **Real-time PV Fault Detection using Embedded Machine Learning** *Deep Pujara, David Ramirez, Andreas Spanias, Cihan Tepedelenlioglu, Devarajan Srinivasan*

Room 3

Multi-Robot and Human-Robot Autonomy
Chairs: Xuan Wang

- **Visual Autonomous Quadrotor Navigation Using an Improved Artificial Potential Field** *Jose Daniel, Shaoshuai Mou*
- **Vision-based Navigation for the Affine Formation Control of a Multi-Robot Team** *Zike Wang, Ya-Jun Pan*
- **Multi-Robot Formation Control with Human-on-the-Loop** *Tianyu Zhou, Zehui Lu, Shaoshuai Mou*
- **Human Uncertainty-Aware MPC for Enhanced Human-Robot Collaborative Manipulation** *Al Jaber Mahmud, Duc M. Nguyen, Filipe Veiga, Xuesu Xiao, Xuan Wang*
- **Digital Twins in Human-Robot Collaboration: Systematic Analysis of Literature and Challenges** *Piatan Palar, Luis Piardi, André Oliveira, Paulo*

Monday, 13 May 2024

	Leitao
15:00-18:00	*Arch View Ballroom* **Workshop**

Tuesday, 14 May 2024

09:00-10:00	*Arch View Ballroom* **Plenary Talk: Recent Advances of Industrial AI Augmented CPS for Highly Connected and Complex Industrial Systems** Jay Lee, Recent Advances of Industrial AI Augmented CPS for Highly Connected and Complex Industrial Systems
10:00-10:30	*Room 2* **Break**
	Arch View Ballroom **Break**
	Room 1 **Break**
	Room 3 **Break**
10:30-12:10	*Room 2* **Intrusion Detection and Resilient Control** Chairs: Wassila Lalouani **STRIDE-based Methodologies for Threat Modeling of Industrial Control Systems** *Thomas Rosenstatter, Olaf Saßnick, Christian Schäfer, Stefan Huber* **Integrated Safety and Security by Design in the IT/OT Convergence of Industrial Cyber-Physical Systems** *Amirali Amiri, Gernot Steindl, Siegfried Hollerer* **Edge Multi-agent Intrusion Detection System Architecture for IoT Devices with Cloud Continuum** *Gustavo Funchal, Tiago Pedrosa, Fernando De la Prieta, Paulo Leitao* **Explainable Intrusion Detection in Industrial Control Systems** *Reham Eltomy, wassila Lalouani* **Disruption of Commercial Solar Inverter System by TLS Proxy Man-in-the-Middle Attack** *BoHyun Ahn, Alycia Jenkins, Joaquin Mass, Lauren Silva, Taesic Kim, Seungdeog Choi* *Arch View Ballroom* **Modeling** **Sparse Measurement Algorithm Execution Time Prediction on Heterogeneous Edge Devices for Early Stage Software-Hardware Matching** *Bernhard Rupprecht, Birgit Vogel-Heuser, Jannik Möhrle, Dominik Hujo, Yizhi Wang* **Complexity Analysis of Industrial Scale Cyber Physical Systems** *Ibtihaj Ahmad, Zain Ul Islam, SALEEM RIAZ*

Tuesday, 14 May 2024

Cyber Physical System for Data-Driven Modeling of Fused Filament Fabrication (FFF) Extrusion Process *Osama Habbal, Maximilian Ullrich, Dawood Al Nabhani, Pravansu Mohanty, Zhen Hu, Abdallah Chehade, Christopher Pannier*

Maximizing Secrecy Rate in Dual USVs System for Secure Underwater Wireless Communication with Unknown Eavesdropper *Heng Zhang, Lei Wu, Zhikai Zhang, Yubin Zhi, Hongran Li, Jian Zhang*

Task Scheduling Strategy Based on Resource Constraint in Edge Computing System *Ren Qing, Huanle Rao, Gangyong Jia, Youqing Xu, Wang Wei, GuoJie Xie*

Room 1

Advances in Cyber-Physical Manufacturing

Chairs: Christopher Pannier

Prediction of Carbonation Capacity of SCMs Using Ensemble Learning Method *Kangyi Cai, Jian Liu, Edward Mwanza, Mahelet G. Fikru, Hongyan Ma, Donald C. Wunsch II*

Accurate Prediction of CNC Machining Time for Milling Operations Using Neural Networks *Xiao-Xing Chen, Wei-chen Lee*

Coatings Intelligence: Data-driven Automation for Chemistry 4.0 *Sayed Hoseini, Gaoyuan Zhang, Dominik Polke, Alvin Surjana, Lasse Wagner, Christian Schmitz, Christoph Quix*

Advancing Machine-to-Machine Calibration for a Network of 3D Printers in Industrial Cyber- Physical Systems *Dawood Al Nabhani, Osama Habbal, Maximilian Ullrich, Kennedi Williams, Pravansu Mohanty, Christopher Pannier*

Change Categories Based on Mutable Artifacts in PLC Control Software Projects *Yizhi Wang, Birgit Vogel-Heuser, Eva-Maria Neumann, Michael Gnadlinger, Ziming Wen, Jan Wilch, Bernhard Rupprecht*

Room 3

Autonomous Intelligent Systems

Fast NMPC Design for Image-Based Visual Servoing of Autonomous Underwater Vehicles *Hang Gu, Chao Shen*

Spacecraft Formation Orbit-Injection Trajectory Optimization for the Space Gravitational Wave Detection Mission *Hao Liang, Youpeng Xing, Zeyang Yin, Yuxin Liao*

Cooperative adaptive optimal output regulation of multi-agent systems with an application to connected and autonomous vehicles *Yuchen Dong, Weinan Gao*

Cooperative Path Following Control of Unmanned Surface Vehicles Using Model Predictive Control *Syed Hamza Ahmed, Minzhong Zhao, Huiping Li*

Consensus control of MASs with distributed dynamic event-triggered intermittent communication strategy *Meilin Li, Tieshan Li*

12:10-13:30	*Arch View Ballroom* ## Lunch
13:30-15:00	*Arch View Ballroom* ## Industry Forum (II) Kevin Wise, Future Directions in Aerospace: Sustainability, Autonomy, and Learning For Control Christopher Vo, Unmanned Logistics at Sea: Challenges and Opportunities

Tuesday, 14 May 2024

	Di Wu, Navigating the Complexities of Cyber-Physical Energy Storage for Grid Deployment
15:00-15:30	*Room 2* **Break**
	Arch View Ballroom **Break**
	Room 1 **Break**
	Room 3 **Break**
15:30-17:10	*Room 2* **Fault Detection and Monitoring for Energy and Power** Chairs: Tapadhir Das

Temporal Graph Convolutional Autoencoder based Fault Detection for Renewable Energy Applications *Murshedul Arifeen, Andrei Petrovski*

Non-Intrusive Load Monitoring-based Fuzzy Actor-Critic Reinforcement Learning for Smart Home Energy Management *Sima Hamedifar, Shichao Liu, George Xiao*

Context Aware Model Learning in Cyber Physical Systems *Aranyak Maity, Ayan Banerjee, Sandeep Gupta*

Telling Apart: ML Framework Towards Cyber Attack and Fault Differentiation in Microgrids *Tapadhir Das, Suman Rath, Shamik Sengupta*

Leveraging Structures in Fault Diagnosis for Lithium-Ion Battery Packs *Amir Farakhor, Di Wu, Yebin Wang, Huazhen Fang*

Room 1

Special Session: Advances in Decision, Control, and Testing for Autonomous Intelligent Systems
Chairs: Bosen Lian

A Study of a Data-Driven Cyber-Physical Control System Using an Assessment Mechanism *Zhifeng Li, Kei Hiraoka, TORU YAMAMOTO*

Two-Player Multiagent Graphical Games with Reinforcement Learning *Bosen Lian, JIacheng Wu*

Deep reinforcement learning-based model predictive control of uncertain linear systems *Pengcheng Hu, Xinyuan Cao, Kunwu Zhang, Yang Shi*

Improved Line-of-Sight Path Following Control for Underactuated USVs with Unknown Parameters Using Q-learning *Danjie Zhu, Ya-Jun Pan, Tianye Wang, Shiwei Liu, Wenwen Pei*

Robust Data-driven Model Predictive Control via On-policy Reinforcement Learning for Robot Manipulators *Tianxiang Lu, Kunwu Zhang, Yang Shi*

Room 3

Artificial Intelligence for Monitoring of Industrial Systems

Tuesday, 14 May 2024

	Chairs: Kang Lee
	Stable Soft Sensor Modeling for Industrial Systems *Liang Cao, Yankai Cao, Bhushan Gopaluni*
	Uncertainty Quantification of a Cyber-Physical System for Monitoring Aircraft Performance *Lance Bays*
	Positioning Cyber-Physical Systems and Digital Twins in Industry 4.0 *Flávia Pires, Victória Melo, Jonas Queiroz, Antonio Paulo Moreira, Fernando De la Prieta, Elisabet Estevez, Paulo Leitao*
	Hardware-In-The-Loop (HIL) Simulation-based Interoperability Testing Method of Smart Sensors in Smart Grids *Eugene Song, Kang Lee*
	Co-operative game for certification and continued conformance check of AI enabled CPS *Ayan Banerjee, Aranyak Maity, Imane Lamrani, Sandeep Gupta*
18:30-21:30	*Arch View Ballroom* **Banquet**

Wednesday, 15 May 2024

09:00-10:00	*Arch View Ballroom* **Plenary Talk** TBD
10:00-10:30	*Room 2* **Break**
	Arch View Ballroom **Break**
	Room 1 **Break**
	Room 3 **Break**
10:30-12:10	*Room 2* **Artificial Intelligence for ICPS** Chairs: Jian Liu **A Continual and Incremental Learning Approach for TinyML On-device Training Using Dataset Distillation and Model Size Adaption** *Marcus Rüb, Philipp Tuchel, Axel Sikora, Daniel Mueller-Gritschneder* **Enhancing Cyber-Physical System Analysis with Structure-Aware Modular Neural Networks** *Daniel Vranjes, Oliver Niggemann* **Multi-Modal Learning with Joint Image-Text Embeddings and Decoder Networks** *Ajai Chemmananm, Bijoy Jose, Asif Moopan* **Survey of Hidden Markov Models (HMMs) for Sign Language Recognition (SLR)** *Iwan Sandjaja, Ahmad Alsharoa, Donald Wunsch II, Jian Liu* **Quantum-Inspired Machine Learning Framework using a Physics-based Ising Solver Chip** *Ameya Khot, Taesic Kim, Alve Akash, Chris Kim, William Moy*

Wednesday, 15 May 2024

	Arch View Ballroom
	## Advances in ICPS Architecture and Digitization
	Chairs: Martin Bär
	In-Situ Model Validation for Continuous Processes Using In-Network Computing *Ike Kunze, Dominik Scheurenberg, Liam Tirpitz, Sandra Geisler, Klaus Wehrle*
	Generation of Digital Twins for Exchanging Information via Application Programming Interfaces *Nico Braunisch, Marko Ristin, Uwe Schmidt, Robert Lehmann, Martin Wollschlaeger, Hans Wernher van de Venn*
	Digitalization of the Components of a Mini Factory with the Implementation of RAMI 4.0 Asset Administration Shell *Jyotsna Singh, Lakshay Mundeja, Armando Walter Colombo, Bilal Ahmad*
	A Novel Industry 4.0-compliant digitalization procedure for Reactive and Re-configurable ICPS within the context of Industrial Organisations *Martin Alejandro Bär, Armando Walter Colombo*
	Development of a test automation framework based on a comparison of different approaches for test automation in the embedded systems area *Stefan Wilker, Stefan Arthofer, Thilo Sauter*
	Room 1
	## Optimal Control Design/Implementation for ICPS
	Chairs: Jiajun Shen
	Application of Event-based Cloud NMPC with Time Delay Compensation *Alvin Surjana, Elmar Ahle, Dirk Söffker*
	Inverse Optimal Control with System Output *Zihao Liang, Shaoshuai Mou*
	Development of an Open, Modular Controller for Training in Emergent Automation Technologies *João Potier, Miguel Arvana, Leandro Filipe, Fabio M-Oliveira, Andre Rocha, Jose Barata*
	Model-free Resilient Controller Design based on Incentive Feedback Stackelberg Game and Q-learning *Jiajun Shen, Huazhen Fang, Morteza Hashemi, Fengjun Li*
	A modified Bayesian approach for model calibration with interval random observed data *Wei Zhang*
	Room 3
	## ICPS Emerging Applications
	Chairs: Madjid Fathi-Torbaghan
	Comparing Knowledge Source Integration Methods for Optimizing Healthcare Knowledge Fusion in Rescue Operation *Mubaris Nadeem, Madjid Fathi-Torbaghan*
	Hardware Analysis for Low Cost Portable ECG Monitoring and Analysis System *Neena Goveas, Shashank Rana, Aditya Handur-Kulkarni, Shubhangi Gawali*
	Analysing MLOps and its Applicability in the Maritime Domain through a Systematic Mapping Study *Andrei Raoul Morariu, Tanwir Ahmad, Bogdan Iancu, Jussi Poikonen, Jerker Björkqvist*
	Quantization Effects of Deep Neural Networks on a FPGA platform *Daniel Pohl, Birgit Vogel-Heuser, Marius Krüger, Markus Echtler*
	Designing Architecture in a Bridge Engineering Simulation *Nathan Hartzler, Mohammed Belkhouche*
12:10-13:30	*Arch View Ballroom*

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	Lunch
13:30-15:00	*Arch View Ballroom* **Industry Forum (III)** Dave Cavalcanti, Time-Sensitive Computing and Communications: Requirements, Industry Standards and Challenges Angela Nicoara, IoT and Edge Computing Revolution: Challenges, Technologies and Future Trends David Wollman, Cyber-Physical Systems and Industrial Internet of Things Program Initiatives at NIST
15:00-15:30	*Room 2* **Break**
	Arch View Ballroom **Break**
	Room 1 **Break**
	Room 3 **Break**
15:30-17:10	*Room 2* **Artificial Intelligence-Driven Energy and Power Systems** Chairs: Hicham Chaoui **Deep Reinforcement Learning Based MPPT Control for Grid Connected PV Systems** *Kunal Vora, Shichao Liu, Himavarsha Dhulipati* **Artificial Neural Network Based Virtual Sensor for Distributed Controlled DC Microgrids** *Devakumar Annavaram, Sukumar Mishra* **Physics-Informed Neural Network for Inertia Estimation of Power System with Inverter-Based Distributed Generation** *Osarodion E. Egbomwan, Shichao Liu, Hicham Chaoui* **Machine Learning-Driven Remaining Energy Prediction for Lithium-Ion Batteries** *Hao Tu, Huazhen Fang* **Online HVAC Optimization under Comfort Constraints via Reinforcement Learning** *Christian Stippel, Rafael Sterzinger, David Sengl, Aleksey Bratukhin, Markus Kobelrausch, Stefan Wilker, Thilo Sauter*
	Room 1 **ICPS Ecosystems and Impacts** Chairs: Didem Gurdur Broo **Teaching programmable logic controllers: a hands-on and skill-building approach** *Jesper Puggaard de Oliveira Hansen, Svend Hansson, Matthias Koenig* **Grammar-Based Inductive Learning (GBIL) for Sign-Spotting in Continuous Sign Language Videos** *Venkata Naga Sai Apurupa Amperayani* **Cultivating Ecocentric Machines: Changing the Direction of the Anthropocentric Lineage in Intelligent Machines** *Didem Gurdur Broo,*

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Joshua Gellers, Henrik Skaug Sætra

Capability Skill Service Model as enabler for Intralogistics 4.0: A Review *Benjamin Blumhofer, Marco Simon, Alexandra Ritter, Laura-Marie Weil, Tatjana Legler, Martin Ruskowski*

Digitalization of Industrial Inspection Assets through the Asset Administration Shell *Iury Michel Treuk, Alexandre Oliveira Júnior, Rui Lopes, Gonçalo Mota, Joaquim Mira Junior, Paulo Leitao*

Room 3

Advances in Autonomous Driving

Chairs: Nikos Piperigkos

HybridTE2: Hybrid Transformer-based End-to-End Learning for Autonomous Driving *HARITHA PRASAD RAYAKOTA, Pei-Chi Huang*

Cooperative Plug-and-Play-KalmanNet for 4D situational awareness in autonomous driving *NIKOS PIPERIGKOS, Alexandros Gkillas, Christos Anagnostopoulos, Aris Lalos*

A Real-time Explainable-by-design Super-Resolution Model for LiDAR SLAM *Alexandros Gkillas, Christos Anagnostopoulos, NIKOS PIPERIGKOS, Aris Lalos*

An Inferential Control Approach for Autonomous Vehicle Motion Planning with Neural Network Dynamics *Iman Askari, Jiajun Shen, Huazhen Fang*