

# **2023 IEEE 27th International Conference on Intelligent Engineering Systems (INES 2023)**

**Nairobi, Kenya  
26 – 28 July 2023**



**IEEE Catalog Number: CFP23IES-POD  
ISBN: 979-8-3503-2852-3**

**Copyright © 2023 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP23IES-POD
ISBN (Print-On-Demand):	979-8-3503-2852-3
ISBN (Online):	979-8-3503-2851-6
ISSN:	1543-9259

**Additional Copies of This Publication Are Available From:**

Curran Associates, Inc  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: (845) 758-0400  
Fax: (845) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

---

# Table of Contents

---

Topics .....	iii
Committees .....	iv
<b>Geometric and Data-driven Solutions of Detection Problems in Dynamic Systems and Networks.....</b>	<b>11</b>
<i>József Bokor, Zoltán Szabó</i>	
<b>Mathematical Modelling and Trauma Survival.....</b>	<b>13</b>
<i>Andrea De Gaetano</i>	
<b>Model Predictive Control for Unstable Processes - Application on Magnetic Suspension .....</b>	<b>15</b>
<i>Dejan Dovzan, Igor Skrjanc</i>	
<b>Educational Universal Analog Circuit Measurement Laboratory with FPAA .....</b>	<b>21</b>
<i>György Györök, Margit Makó, Olga Shvets</i>	
<b>Categorization of Digital Twins: A Literature Review of IoT and Industry.....</b>	<b>27</b>
<i>Jere Grönman, Petri Rantanen, Mika Saari</i>	
<b>A systematic review of Human Aspects in Industry 4.0 and 5.0: Cybersecurity Awareness and Soft Skills .....</b>	<b>33</b>
<i>Judit Módné Takács, Monika Pogatsnik</i>	
<b>Virtual and Physical Intelligent Engineering in Collaborative Space .....</b>	<b>41</b>
<i>László Horváth</i>	
<b>High-Power Battery Pack Load Test Methods .....</b>	<b>47</b>
<i>Zoltán Farkas, György Györök</i>	
<b>Noise modeling of tumor size measurements from animal experiments for virtual patient generation.....</b>	<b>53</b>
<i>Melánia Puskás, Borbála Gergics, Balázs Gombos, András Füredi, Gergely Szakács, Levente Kovács, Dániel András Drexler</i>	
<b>Open Robotics - Anyone Interested? .....</b>	<b>61</b>
<i>Petri Rantanen, Jari Soini, Jere Grönman, Mika Saari</i>	
<b>PD control and the unwinding effect in quaternion parameterized attitude control .....</b>	<b>67</b>
<i>Stephen Kimathi and Bela Lantos</i>	
<b>Data Considerations for a Smart Fourth Party in an Online Dispute Resolution System.....</b>	<b>73</b>
<i>Laurie Butgereit</i>	
<b>Clustering of Milling Strategies Using Machine Internal Data.....</b>	<b>77</b>
<i>Christian Brecher, Janis Ochel, Muhammad Mehmoed Ahmed, Marcel Fey</i>	
<b>Design and Implementation of Charging Circuit for Energy Storage System in Multi-Input Non-Isolated Converter with High Gain.....</b>	<b>83</b>
<i>Donya Taheri, Ghazanfar Shahgholian, Mohammad Mehdi Mirtalaei, Amirhosein Mosavi, Arman Fathollahi, Annamaria Varkonyi Koczy</i>	

<b>Adaptive ICT-based evaluation system in teaching and learning process.....</b>	<b>89</b>
<i>Karl Éva, Eniko Nagy, György Molnár</i>	
<b>Machine Learning for Drought Prediction; Review, Bibliometric Analysis, and Models Evaluation .....</b>	<b>95</b>
<i>Amirhosein Mosavi, Sina Ardabili</i>	
<b>Evaluation Metrics for XAI: A Review, Taxonomy, and Practical Applications.....</b>	<b>111</b>
<i>Md Abdul Kadir, Amir Mosavi, Daniel Sonntag</i>	
<b>Advancements in Code Restructuring: Enhancing System Quality through Object-Oriented Coding Practices.....</b>	<b>125</b>
<i>Moses Kibet Yegon Ngetich, Collins Otieno, Michael Kimwele, Stephen Gitahi</i>	
<b>Addressing Cybersecurity Challenges in 5G-enabled IoT and Critical Infrastructures: A Comprehensive Overview.....</b>	<b>131</b>
<i>Haya Altaleb, Rajnai Zoltán</i>	
<b>Impact of Imperfect SIC in NOMA Enabled Heterogeneous Cellular Network .....</b>	<b>137</b>
<i>Amit Baghel, Abhinav Singh Parihar, Vimal Bhatia, Peter Brida, Martin Augustynek</i>	
<b>turboBurst: A High Dimensional Data Classification approach for identifying Bursty Links in a Highly Spatiotemporal Correlated Sensor Network.....</b>	<b>143</b>
<i>Lawrence Mwenda Muriira</i>	
<b>Influence of Manufacturing Process Modularity on Throughput Rate and Complexity.....</b>	<b>149</b>
<i>Vladimir Modrak, Zuzana Soltysova</i>	
<b>Heart Rate (HR) Detection by Cattle Rumen Bolus .....</b>	<b>155</b>
<i>Éva Hajnal, Gergely Vakulya, Péter Udvardy</i>	
<b>Prof Pi: Tutoring Mathematics in Arabic Language using GPT-4 and Whatsapp .....</b>	<b>161</b>
<i>Laurie Butgereit, Herman Martinus, Muna Mahmoud Abugosseisa</i>	
<b>Reigning in GPT-4 to Tutor Java Programming Pupils and Students Instead of just Providing Answer Algorithms - a Prototype .....</b>	<b>165</b>
<i>Herman Martinus, Laurie Butgereit</i>	
<b>Online voting management system based on Blockchain.....</b>	<b>169</b>
<i>Eva Chovancova, Martin Chovanec, Norbert Adam, Jan Hurtuk</i>	
<b>Increasing of security of an actual social networks .....</b>	<b>175</b>
<i>Peter Pekarcík, Tatiana Kuchcáková, Dávid Valko</i>	
<b>Using modern hardware and software solutions for mass casualty incident management .....</b>	<b>183</b>
<i>Norbert Ádám, Dávid Valko, Eva Chovancová</i>	
<b>Designing a software that will facilitate access to biodiversity data and its implementation for ODONATA species and their habitats in Albania .....</b>	<b>189</b>
<i>Endri Xhina, Orion Lici, Inva Bilo, Ana Ktona, Anila Paparisto, Esmeralda Kadena</i>	
<b>Decentralized Social Network.....</b>	<b>193</b>
<i>Eva Chovancová, Martin Chovanec, Ján Hurtuk, Peter Pekarcík</i>	
<b>Modeling of Immune Sequences from COVID-19 Infected Human Blood Samples</b>	

<b>with Variational Autoencoders.....</b>	<b>199</b>
<i>Svetlana Zadedyurina, Ilya Makarov</i>	
<b>Parametric Fuzzy Distribution Sets .....</b>	<b>205</b>
<i>Ildar Z. Batyrshin, Angelica S. Klimova, Imre J. Rudas</i>	
<b>Extending Synthetic Data Evaluation Metrics .....</b>	<b>209</b>
<i>Andrea Galloni, Imre Lendák, Tomás Horváth</i>	
<b>Markov-Chain-Based Musical Creative Intelligent Agent Passing Successfully the Turing Test .....</b>	<b>215</b>
<i>L. Highams, J. I. Olszewska</i>	
<b>Assessment of the Utilization of Quadruped Robots in Pharmaceutical Research and Development Laboratories .....</b>	<b>221</b>
<i>Brian Parkinson, Ádám Wolf, Péter Galambos, Károly Széll</i>	
<b>Challenges in Isokinetic Sampling for Gas and Particle Measurements: Testing Homogeneity and Handling Interruptions in Sampling .....</b>	<b>229</b>
<i>Döniz Borsos, Attila Fodor, Tamás Sándor</i>	
<b>Machine Learning for Modeling Service Life: Comprehensive Review, Bibliometrics Analysis and Taxonomy .....</b>	<b>235</b>
<i>Mohammed Mudabbir, Amirhosein Mosavi</i>	
<b>Supervisory Control of the Sigfox Low Power Wide Area Network Technology.....</b>	<b>245</b>
<i>Fotis N. Koumboulis, Dimitrios G. Fragkoulis, Apostolos Palios</i>	
<b>Teaching Machine Learning for Oncogenicity Prediction Based on NGS Genomic Metadata.....</b>	<b>251</b>
<i>Marianna Dimitrova Kucarov, Béla Molnár, Miklos Kozlovszky</i>	
<b>3D video streaming in digital pathology using virtual reality.....</b>	<b>257</b>
<i>Miklós Vincze, Viktor Jónás, Mária Szántó, Abdallah Benhamida, Róbert Paulik, Anna Szandra Laczi, Boldizsár Szócska, Gábor Ender, Miklós Kozlovszky</i>	
<b>Parameter estimation and the space of random variables .....</b>	<b>263</b>
<i>Andrea De Gaetano, Giulia Aliffi</i>	
<b>Prediction of Left Atrial Appendage Occluder Size Based on a 3D Printed Model Method Design.....</b>	<b>269</b>
<i>Jan Hecko, Miroslav Hudec, Jan Chovancík, Otakar Jiravský, Roman Miklik, Lukas Knybel, Libor Sknouril, Marek Penhaker</i>	
<b>5G for Smart Grids: Review, Taxonomy, Bibliometrics, Applications and Future Trends.....</b>	<b>275</b>
<i>R. Rituraj, Daniel Tamas Varkonyi, Amirhosein Mosavi, Annamaria Varkonyi Koczy</i>	
<b>Towards a single goodness metric of clinically relevant, accurate, fair and unbiased machine learning predictions of health-related quality of life .....</b>	<b>285</b>
<i>Zsombor Zrubka, Áron Hölgyesi, Mehdi Neshat, Hossein Motahari Nezhad, Seyedali Mirjalili, Levente Kovács, Márta Péntek, László Gulácsi</i>	
<b>Mathematical modeling of phototoxicity during fluorescent imaging of tumor spheroids .....</b>	<b>291</b>
<i>Borbála Gergics, Flóra Vajda, Melánia Puskás, András Füredi, Dániel András Drexler</i>	
<b>Author's Index .....</b>	<b>297</b>