

# **2023 Systems and Information Engineering Design Symposium (SIEDS 2023)**

**Charlottesville, Virginia, USA  
27-28 April 2023**



**IEEE Catalog Number: CFP23SIE-POD  
ISBN: 979-8-3503-0065-9**

**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:	CFP23SIE-POD
ISBN (Print-On-Demand):	979-8-3503-0065-9
ISBN (Online):	979-8-3503-0064-2

**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

Locating Emergency Response Facilities in the Metrorail System: A Decision Support Tool .....	1
<i>Elizabeth R. Ottinger, Alejandro F. Medina Mora, Kaveena A. Patel, Islay R. Van Dusen,     Erica Gralla</i>	
Identifying Dark Patterns in Social Robot Behavior .....	7
<i>Elizabeth Dula, Andres Rosero, Elizabeth Phillips</i>	
Quantifying the Benefits of Mindful Driving Training in Safety and Sustainability.....	13
<i>Rebecca Dollahite, Michael Duffy, B. Brian Park</i>	
Secure Mobile Payment Architecture Enabling Multi-Factor Authentication .....	19
<i>Hosam Alamleh, Ali Abdullah S. Alqahtani, Baker Al Smadi</i>	
Electrical Assessment of Bicol University - Legazpi East Campus, Philippines.....	25
<i>Garry V. Hilutin, Alwin M. Lunas, Fernan D. Dematera, Zendy D. Mañago, Laurence Albert     D. Ayo, Pee Jay N. Gealone</i>	
Identifying Competency Gaps Among Engineering Students in a Post K-12 Setting Through the Use of Clustering Algorithms .....	31
<i>John Raymond B. Barajas, Pee Jay N. Gealone, Marben S. Ramos, Nico O. Aspra, Arpon T.     Lucero, Oliver M. Padua</i>	
AI Assisted Trail Map Generation Based on Public GPS Data .....	37
<i>Jared Macshane, Ali Ahmadinia</i>	
Horizontal Gaze Nystagmus Transmission Interlock System.....	43
<i>Chase Coleman, Matthew Jenkins, William Roberts, Charlie Thomas, William Westerkamp,     Rod Macdonald, Ahmad Salman</i>	
Optimizing Outpatient Cancer Infusion Center Throughput Using a Systems-Based Approach .....	49
<i>Devon M. Zavacky, Anna M. Bustamante, Hayden C. Ratliff, Rupa S. Valdez</i>	
Personalization in Circadian Rhythm-Based Event Scheduling .....	55
<i>Prachi Sadekar, Jackson Baitinger, Sean Conway, Matthew Clark, Afsaneh Doryab</i>	
A Design Feasibility Investigation for a Pulmonary ePTFE Transcatheter Pediatric Heart Valve .....	61
<i>Ryan M. Arul, McKaila K. Danajka, Emily C. Gray, Kendall P. Henretta, Olga Pierrakos</i>	
The Effect of 3D/VR on the Perception of Robot Humanlikeness .....	67
<i>Rydia R. Weiland, Min Ji Kim, Elizabeth K. Phillips</i>	
Analyzing Efficacy of Home Electronic Incarceration on Return-To-Custody Rates for Inmates During the COVID-19 Pandemic .....	72
<i>Josh Dornfeld, Imani Hankinson, Livia Hughes, Sarah Murphy, Ronica Peraka, McBride     Rawson, Loreto Peter Alonzi, Michael Smith, K. Preston White, Neal Goodloe</i>	
Finding a Needle in the Haystack: Predicting the Location of Lost People Using Agent-Based Modeling and Behavioral Inertia.....	78
<i>John Nguyen, Caroline Joseph, Bailey Richardson, Roy Hayes, Ricardo Pakula, Robert     Koester</i>	

Creating a Comprehensive Survey and Preventative Maintenance Plan for Water Piping Infrastructure on a Historic College Campus .....	84
<i>Marla Rain Moock, Belle Williams, Professor Jonathan Bender</i>	
Solar-Powered Refrigerator on Wheels: An Engineering Design Challenge.....	90
<i>Mallory R. Poff, Sirena Hargrove-Leak</i>	
Control and Coordination for Swarm of UAVs Under Multi-Predator Attack .....	96
<i>Md Muzakkir Quamar, Sami Elferik</i>	
Developing a Climbing Assistive Exoskeleton.....	102
<i>Jared Rathbun, Austin Sharky, Prathamesh Urunkar, Ashraf Saleem, Paniz Hazaveh</i>	
Deep Temporal Neural Networks for Water Level Predictions of Watershed Systems .....	108
<i>Jordan Huff, Jeremy Watts, Anahita Khojandi, Jon Hathaway</i>	
No Space? No Problem. Accessible Balance Control Using VR Player Movement .....	114
<i>M. K. George, A. D. Roveri, A. S. Weitz, A. N. Azan, C. T. Ogunmola, W. T. Pluer, M. W. Wittstein</i>	
Improving Patient Flow in a Healthcare Clinic Post COVID-19: A Data Validation and Exploratory Analysis Approach .....	119
<i>Aditi Jain, Aram Bahrini, Eric Nour, Harshal Patel, Emily Riggelman, Tyson Wittmann, Karen Measells, Kimberly Dowdell, Sara L. Riggs, Robert J. Riggs</i>	
Time Saves Lives: Optimizing Pediatric Clinic Patient Visit Times .....	125
<i>Julia C. Arnsberger, Amelia J. Jacquat, Michael J. O'Keefe</i>	
GymSense: Exploration in Measuring Bench Press Form Using Sensor Technology.....	131
<i>Ritavash Chowdhury, Michael Chung, Dylan Gnagey, Jason Forsyth</i>	
Hydrologic Modeling and System Optimization for IoT Flood Management.....	137
<i>Nicolas Khattar, Taja M Washington, Arnold Mai, Lili Malinowski, Andrew N. Bowman, Khwanjira Phumphid, Victor A Leal Sobral, Jonathan L. Goodall</i>	
Capacity Planning and Investment for Electrification of Maritime Container Ports .....	143
<i>Ekaterina M. Forkin, Carter A. Paulen, Matthew J. Swierczewski, Tanushri Roy, Timothy D. Costello, Davis C. Loose, Joi Y. Williams, David L. Slutzky, Thomas L. Polmateer, Karen R. Jackson, Daniel C. Hendrickson, James H. Lambert</i>	
Ukraine Food Crisis: Understanding the Impacts of War on the Global Supply Chain and Applying to Future Events.....	149
<i>Elizabeth Breslin, Alyssa Freedman, Cutter Huston, Genesis Marrero-Garcia, Thomas Mossburg</i>	
Distinguishing Human-Written and ChatGPT-Generated Text Using Machine Learning .....	154
<i>Hosam Alamleh, Ali Abdullah S. Alqahtani, Abdelrahman Elsaid</i>	
A Heuristic ETL Process to Dynamically Separate and Compress AIS Data.....	159
<i>Atefe Sedaghat, Masood Jafari Kang, Maryam Hamidi</i>	
Robust Process Capability Indices for Multivariate Linear Profiles.....	165
<i>Golnoosh Toosi, Mohammad Mahdi Ahmadi</i>	
Degradations of Trust in Automation Associated with Repeated Monitoring Checks.....	171
<i>Addison B. Bright, Jenna E. Cotter, Nathan L. Tenhundfeld</i>	

Tissue Classification Using RNA-Seq Transcriptomics with Distribution Analysis and SVM Models.....	177
<i>Dominick Decanio, Minah Kim, Samuel Haddox, Gianluca Guadagni</i>	
Analysis of the Machine Learning Classification of Cardiac Disease on Embedded Systems.....	183
<i>Sanda Thura, Jason Forsyth, Kevin Molloy, Jacob Couch</i>	
Neural Circuit Representation Through the Interplay Correlation of Turbulent Fluid Flow and Action Potential from fMRI Mapping .....	189
<i>Sarah R. Stanley, Bryan R. Kuhr</i>	
Enhancing the Admissions Process for Engineering Baccalaureate Programs: A Machine Learning Approach to Developing a Valid and Reliable Examination .....	191
<i>Marben S. Ramos, John Raymond B. Barajas, Pee Jay N. Gealone, Nico O. Aspra, Oliver M. Padua, Arpon T. Lucero</i>	
Uncovering the Most Vulnerable in Times of Crisis: Analyzing Procurement Capacity Index with Multi-Criteria Decision-Analysis .....	197
<i>John Raymond B. Barajas</i>	
Energy Trading Market Simulator Blockchain-Based .....	203
<i>Ameni Boumaiza</i>	
Faculty Complement Gap Analysis: A Case Study in a State University in the Philippines .....	208
<i>Pee Jay N. Gealone, Ramon Gian A. Bron, Rogelyn P. Samar, John Raymond B. Barajas, Amelia A. Dorosan</i>	
A Systems Approach to Improving the Spectator Experience at Collegiate Football Games.....	214
<i>Haley Austin, Abigail Freed, Alexandra Labus, Brendan Lynch, Joseph Mastrullo, Julia Sharff, Robert J. Riggs</i>	
Embodied AI for Financial Literacy Social Robots.....	220
<i>Qinyuan Jiang, Lucas Zak, Shirley Leshem, Pulkit Rampa, Sophie Howle, Haley N. Green, Tariq Iqbal</i>	
The Current State and Future Needs of Systems Engineering Education: A Proposed Curriculum .....	226
<i>Thomas J. Gwilliam, Salem T. Keleta, Maggie D. Salomonsky, Vinay V. Vangala, Mia E. Varghese, Matthew W. Burkett, William T. Scherer</i>	
Investigating the Stability of Organic Materials for Commercial Dyeing .....	232
<i>Vivian Krause, Mary Hermes, Jordan Wels, Lauren Hanchar, Jonathan T. Su</i>	
Designing a Dashboard to Streamline Pediatric Heart Transplant Decision Making .....	237
<i>Connor Hyldahl, Olivia Kaczmarskyj, Joseph Laruffa, Allison Miller, Lilleth Snavely, Angela Wan, Sara L. Riggs</i>	
Site-Specific and Generalized Weir Design for the Mississippi Delta.....	243
<i>Mallory R. Poff, Maggie E. Cox, Carleigh M. Wood, Jackson T. Abele, W. T. Pluer</i>	
Quantifying the Socio-Economic Impacts of Decarbonization Policy Using Integrated Assessment Modeling .....	247
<i>A. Castro, R. Quillian, S. Zajec</i>	
Improved Food Waste Processing Through Water Removal in a University Dining Hall .....	253
<i>Henry Agyemang, Sonith Riem, Samantha Direnzo, John Ring, Jonathan T. Su</i>	

Employee Perceptions of Cultural Wants and Barriers to Affordability in an Organization.....	257
<i>Nishtha Sathi, Taylor Yeazitzis, Kristin Weger, Bryan Mesmer</i>	
Pricing and Carbon Emission Reduction Decisions in a Dual-Channel Supply Chain .....	262
<i>Atefe Sedaghat, Ata Allah Taleizadeh</i>	
A Robust Control Chart for Monitoring Reliability Systems .....	268
<i>Parisa Jahani Alamdari, Mohammad Mahdi Ahmadi</i>	
ChatGPT: Applications, Opportunities, and Threats.....	274
<i>Aram Bahrini, Mohamadsadra Khamoshifar, Hossein Abbasimehr, Robert J. Riggs, Maryam Esmaeli, Rastin Mastali Majdabadkohne, Morteza Pasehvar</i>	
Developing a Project Management Tool for Network Migration to Improve Transparency Between Enterprises and Network Experts .....	280
<i>E. Goggins, C. Kennedy, M. Nguyen, A. Pore, A. Rissmeyer, C. Smith, G. J. Gerling</i>	
Developing an Environmental Monitoring Dashboard to Identify Construction Activities that Affect On-Site Air Quality and Noise.....	286
<i>Casey Calixto, Juan Chavez, Arsalan Heydarian, Abid Hussain, Kathryn Owens, Alex Repak</i>	
Designing and Building a Deep Imaging Multi-Parametric Optical Coherence Tomography System for Disease Assessment .....	292
<i>Bruce Vagt, Matthew Foster, Richard Blackmon</i>	
Investigating the Impact of Temporal Labeling of Emergency Department Visits for COVID-19: Comparing Healthcare Disparities Analyses Using Comprehensive, Single-Site Data with National COVID Cohort Collaborative (N3C) Data.....	297
<i>Madeleine Jones, Aubrey Winger, Christian Wernz, Jonathan Michel, Sihang Jiang, Andrea Zhou, Ebony Jade Hilton, Mikhail Zemmel, Saurav Sengupta, Kierah Barnes, Johanna Loomba, Donald E. Brown</i>	
Car Wash Deterrent System.....	303
<i>Ruth De Souza, Hina Saleem, Erin Nelson, Jonathan Bender</i>	
A General Framework for Human-Drone Interaction Under Limited On-Board Sensing.....	308
<i>S. Nayhouse, S. Chadha, P. Hourican, C. Moore, N. Bezzo</i>	
Deterring Adversarial Learning in Penetration Testing by Exploiting Domain Adaptation Theory .....	314
<i>Shreyas Bera, Liam Glenn, Abhay Raghavan, Emma Meno, Tyler Cody, Peter A. Beling</i>	
Adapting Hydropower Operations to Support Renewable Energy Transitions and Freshwater Sustainability in the Columbia River Basin.....	319
<i>Genevieve Allen, Sin Lin, Asher Llewellyn, Adi Pillai, Elynore Zarzyski, Samarth Singh, Julianne Quinn</i>	
Methods for the Spatial Analysis of Invasive Species and Ecosystem Fragmentation at Conservation Sites in Malta Using Drones.....	325
<i>E. C. McConville, A. I. Oancea, E. M. Enright, T. C. Brown, J. J. Henriques</i>	
A Floating Farm for Hydroponic Crop Cultivation in Small Island Developing States .....	330
<i>Ethan A. Gerlach, Arthur Hoang, Saffiata Kamara, Anwar Longi, Derek A. Sprincis, Ethan W. Thurmond, Boyang Lu, Garrick E. Louis</i>	

## **Author Index**