

# **2025 IEEE Engineering Reliable Autonomous Systems (ERAS 2025)**

**Worcester, Massachusetts, USA  
29-30 May 2025**



**IEEE Catalog Number: CFP25VY3-POD  
ISBN: 979-8-3315-1321-4**

**Copyright © 2025 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:	CFP25VY3-POD
ISBN (Print-On-Demand):	979-8-3315-1321-4
ISBN (Online):	979-8-3315-1320-7

**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)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

## IEEE ERAS 2025 Conference Table of Content

<b>Foreword</b> .....	<b>9</b>
<b>Committee</b> .....	<b>10</b>
<b>REGULAR PAPERS</b>	
<b>Skill-Based Architectures in Autonomous Systems: An Empirical Study</b> .....	<b>12</b>
Pierre Malafosse ( <i>LAAS-CNRS, Université de Toulouse, France</i> )	
Alexandre Albore ( <i>ONERA The French Aerospace Lab, France</i> )	
Jérémy Guiochet ( <i>LAAS-CNRS, Université de Toulouse, France</i> )	
Charles Lesire ( <i>ONERA The French Aerospace Lab, France</i> )	
<b>Reliable Robot Missions in Dynamic Environments Using Agent-based Controllers</b> .....	<b>20</b>
Raynaldio Limarga ( <i>University of Manchester, UK</i> )	
Kwai Wa Tse ( <i>University of Manchester, UK</i> )	
Louise A. Dennis ( <i>University of Manchester, UK</i> )	
Clare Dixon ( <i>University of Manchester, UK</i> )	
Fatma Faruq ( <i>University of Manchester, UK</i> )	
Michael Fisher ( <i>University of Manchester, UK</i> )	
<b>From Developer Needs to Domain-Specific Languages: Specifying Sceneries for Simulation-Based Validation of Mobile Robots</b> .....	<b>28</b>
Argentina Ortega ( <i>University of Bremen, Germany</i> )	
Samuel Parra ( <i>Hochschule Bonn-Rhein-Sieg, Germany</i> )	
Sven Schneider ( <i>KU Leuven, Belgium</i> )	
Nico Hochgeschwender ( <i>University of Bremen, Germany</i> )	
<b>Automatic Tuning of Autonomous System Design Parameters for Performance Robustness</b> .....	<b>36</b>
Paul Stankiewicz ( <i>Johns Hopkins Applied Physics Laboratory, MD, USA</i> )	
Jordan Appler ( <i>Johns Hopkins Applied Physics Laboratory, MD, USA</i> )	
<b>Advancing Autonomous Vehicle Safety: A Combined Fault Tree Analysis and Bayesian Network Approach</b> .....	<b>43</b>
Lansu Dai ( <i>University of Ottawa, Canada</i> )	
Burak Kantarci ( <i>University of Ottawa, Canada</i> )	

**Autonomous Robotic Swarms: A Corroborative Approach for Verification and Validation ..... 50**

Dhaminda B. Abeywickrama (*University of Manchester, UK*)

Suet Lee (*University of Bristol, UK*)

Chris Bennett (*University of Bristol, UK*)

Razanne Abu-Aisheh (*University of Bristol, UK*)

Tom Didiot-Cook (*University of Bristol, UK*)

Simon Jones (*University of Bristol, UK*)

Sabine Hauert (*University of Bristol, UK*)

Kerstin Eder (*University of Bristol, UK*)

**Towards a Resilient Framework for Multirotor UAVs: Autonomous Adaptation to Failures and Disturbances ..... 58**

Luis Hector Manjarrez Muñoz (*Center for Research and Advanced Studies of the National Polytechnic Institute, Mexico City, Mexico*)

Eduardo Steed Espinoza Quesada (*Mexican Secretariat of Science, Humanities, Technology and Innovation, Mexico City, Mexico*)

Luis Rodolfo Garcia Carrillo (*New Mexico State University, NM, USA*)

**Arguing Reliability of Machine Learning-based Components ..... 65**

Boyue Caroline Hu (*University of Toronto, Canada*)

Alessio Di Sandro (*University of Toronto, Canada*)

Lina Marsso (*University of Toronto, Canada*)

Krzysztof Czarnecki (*University of Waterloo, Canada*)

Marsha Chechik (*University of Toronto, Canada*)

**Monitoring Safety Properties for Autonomous Driving Systems with Vision-Language Models ..... 73**

Felipe Toledo (*University of Virginia, VA, USA*)

Sebastian Elbaum (*University of Virginia, VA, USA*)

Divya Gopinath (*KBR Inc. / NASA Ames Research Center, CA, USA*)

Ramneet Kaur (*SRI, CA, USA*)

Ravi Mangal (*Colorado State University, CO, USA*)

Corina S. Păsăreanu (*KBR, NASA Ames Research Centre, CA, USA*)

Anirban Roy (*SRI, CA, USA*)

Susmit Jha (*SRI, CA, USA*)

**NeRF-To-Real Tester: Neural Radiance Fields as Test Image Generators for Vision of Autonomous Systems ..... 81**

Laura Wehl (*IT University of Copenhagen, Denmark*)

Bilal Wehbe (*Robotics Innovation Centre, DFKI, Bremen, Germany*)

Andrzej Wąsowski (*IT University of Copenhagen, Denmark*)

**Why Good Detectors Can Make Bad Trackers: mAP Worse than Random Chance at Model Selection ..... 89**

Trenton Tabor (*Carnegie Mellon University, PA, USA*)

Tomasz Swierzewski (*Carnegie Mellon University, PA, USA*)

Casidhe Hutchison (*Carnegie Mellon University, PA, USA*)

Oren Wright (*Carnegie Mellon University, PA, USA*)

Eric Heim (*Carnegie Mellon University, PA, USA*)

Christopher S. Timperley (*Carnegie Mellon University, PA, USA*)

**Diffusion-Based Failure Sampling for Evaluating Safety-Critical Autonomous Systems ..... 97**

Harrison Delecki (*Stanford University, CA, USA*)

Marc R. Schlichting (*Stanford University, CA, USA*)

Mansur Arief (*Stanford University, CA, USA*)

Anthony Corso (*Stanford University, CA, USA*)

Marcell Vazquez-Chanlatte (*Nissan Advanced Technology Center Silicon Valley, CA, USA*)

Mykel J. Kochenderfer (*Stanford University, CA, USA*)

**Automation Testing Framework for Reliable Autonomous Agentic AI ..... 105**

Grant Martin (*University of the West Scotland, UK*)

Joanna Olszewska (*University of the West Scotland, UK*)

**Democracy Saves Robot: Crowd Voting Dramatically Outperforms Individual Judgments at Validating System Specifications ..... 113**

Ho Chit Siu (*MIT – Massachusetts Institute of Technology, MA, USA*)

Isabelle Hurley (*MIT – Massachusetts Institute of Technology, MA, USA*)

Rohan Paleja (*MIT – Massachusetts Institute of Technology, MA, USA*)

Ashley Suh (*MIT – Massachusetts Institute of Technology, MA, USA*)

Jaime D. Peña (*MIT – Massachusetts Institute of Technology, MA, USA*)

**Towards Systematic Maintenance of Assurance for Evolving Self-Adaptive Systems ..... 121**

Logan Murphy (*University of Toronto, Canada*)

Marc Carwehl (*Humboldt Universität zu Berlin, Germany*)

Juliane Päßler (*University of Oslo, Norway*)

Marsha Chechik (*University of Toronto, Canada*)

**Conduct Governance Assurance - An Architecture Implementation for High-Risk Autonomous Systems ..... 129**

Andrew Schellenberg (*Carnegie Mellon University, PA, USA*)

Emily Newman (*Carnegie Mellon University, PA, USA*)

Charles Loughlin (*Carnegie Mellon University, PA, USA*)

Tyler Brooks (*Carnegie Mellon University, PA, USA*)

**Robot Competency Self-Assessments for Assured Mission Management in Uncertain Environments ..... 137**

Nicholas Conlon (*University of Colorado Boulder, CO, USA*)

Nisar R. Ahmed (*University of Colorado Boulder, CO, USA*)

Daniel Szafir (*University of North Carolina Chapel Hill, NC, USA*)

**Maximizing Reputation for Serving Time-Constrained Tasks with Distributed Heterogeneous Teams ..... 145**

Mela Coffey (*Boston University, MA, USA*)

Arnav Chaudhry (*Boston University, MA, USA*)

Alyssa Pierson (*Boston University, MA, USA*)

**Explainability Pattern Specifications for Human-Robot Teamwork ..... 153**

Hazel M. Taylor (*University of Manchester, UK*)

Anastasia Mavridou (*KBR Inc. / NASA Ames Research Center, CA, USA*)

Marie Farrell (*University of Manchester, UK*)

Louise A. Dennis (*University of Manchester, UK*)

## SHORT PAPERS

### **Defining and Designing Reliable AI-Enabled and Autonomous Systems ..... 161**

Benjamin D. Werner (*US Army*)

Benjamin J. Schumeg (*US Army*)

Shawn P. Brady (*US Army*)

Nathan W. Herbert (*US Army*)

James J. Foerster (*US Army*)

### **C2HI: Towards a Command and Control Hierarchical Interface for Human-Robot Teams in Dynamic Social Environments ..... 164**

John A. Duncan (*University of Texas at Austin, TX, USA*)

Farshid Alambeigi (*University of Texas at Austin, TX, USA*)

Mitchell W. Pryor (*University of Texas at Austin, TX, USA*)

### **Human Systems Integration for Human Machine Integrated Formations ..... 168**

Elizabeth Mezzacappa (*US Army*)

Dominic T. Cheng (*US Army*)

Alexis M. Cady (*US Army*)

Florence Chua (*US Army*)

### **Digital Twin Synchronization: Bridging the Sim-RL Agent to a Real-Time Robotic Additive Manufacturing Control ..... 172**

Matsive Ali (*University of Louisiana at Lafayette, LA, USA*)

Sandesh Giri (*University of Louisiana at Lafayette, LA, USA*)

Sen Liu (*Bradley University, IL, USA*)

Qin Yang (*Bradley University, IL, USA*)

### **RailGoerl24: Görlitz Rail Test Center CV Dataset 2024 ..... 176**

Rustam Tagiew (*German Centre for Rail Traffic Research at the Federal Railway Authority (DZSF), Dresden, Germany*)

Ilkay Wunderlich (*EYYES GmbH, Gedersdorf, Austria*)

Mark Sastuba (*German Centre for Rail Traffic Research at the Federal Railway Authority (DZSF), Dresden, Germany*)

Kilian Göller (*Dresden University of Technology, Germany*)

Steffen Seitz (*Dresden University of Technology, Germany*)

<b>Look What You Made Me Do: Formal Methods and the Verification-Validation Gap in System Assurance .....</b>	<b>180</b>
Ho Chit Siu ( <i>MIT – Massachusetts Institute of Technology, MA, USA</i> )	
Kevin J. Leahy ( <i>WPI - Worcester Polytechnic Institute, MA, USA</i> )	
Jaime D. Peña ( <i>MIT – Massachusetts Institute of Technology, MA, USA</i> )	
Zachary Serlin ( <i>MIT – Massachusetts Institute of Technology, MA, USA</i> )	
<b>Consistency Measurement as a Means to Enhance Reliability in Autonomous Systems .....</b>	<b>184</b>
Pragati Satpute ( <i>Cambridge, MA, USA</i> )	
<b>Neuroimaging and Physiological Data-driven Autonomous Vehicle Driving Simulation System in Extended Reality .....</b>	<b>187</b>
Curt Lynch ( <i>University of Tennessee at Martin, TN, USA</i> )	
Kyle Byassee ( <i>University of Tennessee at Martin, TN, USA</i> )	
Isaac Copeland ( <i>University of Tennessee at Martin, TN, USA</i> )	
Seth Hatchett ( <i>University of Tennessee at Martin, TN, USA</i> )	
Saman Sargolzaei ( <i>University of Tennessee at Martin, TN, USA</i> )	
<b>A Framework for Filtering Neural Network Predictions for Robust State Estimation .....</b>	<b>191</b>
Rohan Walia ( <i>WPI - Worcester Polytechnic Institute, MA, USA</i> )	
Kevin Leahy ( <i>WPI - Worcester Polytechnic Institute, MA, USA</i> )	
<b>Artificial Intelligence on the Edge for Enabling Reliable Affordable Mass .....</b>	<b>195</b>
Kin Gwn Lore ( <i>RTX Technology Research Center, CT, USA</i> )	
James P. Wilson ( <i>RTX Technology Research Center, CT, USA</i> )	
Subramanya Nagesh Rao ( <i>RTX Technology Research Center, CT, USA</i> )	
Gerald Wang ( <i>RTX Technology Research Center, CT, USA</i> )	
Timothy E. Wang ( <i>RTX Technology Research Center, CT, USA</i> )	
Mark Moulin ( <i>RTX Technology Research Center, CT, USA</i> )	
Amit Bhatia ( <i>RTX Technology Research Center, CT, USA</i> )	
Francesca Stramandinoli ( <i>RTX Technology Research Center, CT, USA</i> )	
<b>Author Index .....</b>	<b>199</b>