

2025 Annual Reliability and Maintainability Symposium (RAMS 2025)

**Destin, Florida, USA
27-30 January 2025**



**IEEE Catalog Number: CFP25RAM-POD
ISBN: 979-8-3503-6775-1**

**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:	CFP25RAM-POD
ISBN (Print-On-Demand):	979-8-3503-6775-1
ISBN (Online):	979-8-3503-6774-4
ISSN:	0149-144X

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
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

TABLE OF CONTENTS

Multi-Scale System Reliability Analysis of Multi-Layer Network Infrastructures	1
<i>Phat K. Huynh, Ca Hoang, Duy Nguyen, Tien Truong, Trung Tim Q. Le</i>	
Probabilistic AI Reliability Analysis in MBSE and SysML	8
<i>Sanja Cvijic, Steve Hookway, Scott Harrison, Andrew Strelzoff</i>	
Analytical Reliability Prediction for an Industrial Dynamic Furnace	14
<i>Vinicius Gonçalves, Bianca Medeiros, Welbert Alves</i>	
A Unified Model for Tradeoff of Sample Size, Reliability and Risks During Product Life Cycle.....	19
<i>Zhaofeng Carl Huang</i>	
Modeling the Impact of Corrosion Orientation and Location on Pipeline Reliability	26
<i>Nikesh Kumar, José Carlos Hernández Azucena, Haitao Liao, Edward Pohl</i>	
A Simplified Testing Approach for Performance Analysis of Integrated Circuits Through Reliability Testing	32
<i>Cher Ming Tan, Steve Wang, Vimal Kant Pandey, Henry Yh Luo</i>	
Reliability Analysis of Dynamic Fiber Bundle Models with Local Load Sharing	40
<i>Tushar C. Tummala, Venkata R. C. Tummala, Suprasad V. Amari</i>	
Semiconductor Parametric Yield Prediction: A Combination of Machine Learning and Physics-Informed Approach.....	47
<i>Karthik Sankaran, Ali Mosleh, Kamran Hakim</i>	
Four Problematic Methods in Reliability Analysis.....	53
<i>Harry W. Jones</i>	
Towards Risk-Based Rationality in Autonomous Systems and Operations.....	59
<i>Ingrid Bouwer Utne, Tor Arne Johansen, Asgeir J. Sørensen</i>	
Risk Assessments Integrating V2X into Cooperative Driving Automation.....	65
<i>Camila Correa-Jullian, Ali Mosleh, Jiaqi Ma</i>	
Use of Inherited Items in Projects at NASA Goddard Space Flight Center.....	71
<i>Jeffrey W. Dawson</i>	
Precursors: An Analysis System in Reliability Parallel with FAA Certification.....	76
<i>Jan B. Smith</i>	
Lessons Learned in an Aerospace Design for Reliability Program	86
<i>Donald L Hatfield, Sharon L Honecker</i>	
Reliability Engineering Reference Architecture for DoD Acquisition	92
<i>Justin B. Brown, Galen Valentine</i>	
Mixed Models for Product Design Selection Based on Accelerated Degradation Testing	97
<i>Cesar Ruiz, Ali Dashti</i>	
Assessing the Extrapolation Variance of Non-Orthogonal Response Surface Designs	103
<i>Marco Arndt, Erich Rittmaier, Martin Dazer</i>	

Equivalent Field Stress Level and Usage with Multiple Distributional Stress Types	109
<i>Jiliang Zhang</i>	
Simulative Analysis of Statistical Power of Optimal Test Designs	115
<i>Erich Rittmaier, Marco Arndt, Martin Dazer</i>	
Point Unavailability and Its Density Processes with Periodic Inspections in ISO 26262.....	122
<i>Sakurai Atsushi</i>	
Modeling Imperfect Repair for Realistic RAM Analysis of Operating Facilities.....	128
<i>Supriyo Kar, Subhadip Sengupta</i>	
Degradation Analysis and Optimum Inspection Intervals for High-Pressure Mud Lines.....	134
<i>Gustavo Diniz Corgosinho, Emanuel Santos, Eloi Orlandini</i>	
Wind Turbine Fault Detection Through Autoencoder-Based Neural Networks	141
<i>Welker F. Nogueira, Arthur H. A. Melani, Luiz D. R. S. Custodio, Gilberto F. M. De Souza</i>	
On-Board SOH Estimation Using Quantized Adaptive Dual Extended Kalman Filter in Resource Constraint Battery Management Systems.....	147
<i>Lakshmi Manoj, Pingfeng Wang</i>	
Induction Motor Failure Detection Using Explainable Features from Motor Currents	153
<i>Wei Li, Hariram Arni, Bin Jou, Sagar Kamarthi</i>	
Prognostics of Hall Thruster Erosion Using Multiphysics-Based Modeling and Machine Learning	159
<i>Yuan Jiang, Alexandra N. Leeming, Joshua L. Rovey, Pingfeng Wang</i>	
Transformer-Based Prognostic Modeling for Smart Grid Health Monitoring.....	166
<i>Phat K. Huynh, Phi Huynh, Om P. Yadav, Chau Le, Harun Pirim, Trung Q. Le</i>	
Data Assurance Plan for Safety and Reliability of Artificial Intelligence Enabled Systems	173
<i>Benjamin D. Werner, Benjamin J. Schumeg</i>	
Leveraging AI for Resilience in Class 1 Freight Railroads	179
<i>Donald A. Dzedzy, Bilal M. Ayyub</i>	
OntoKGen: A Genuine Ontology and Knowledge Graph Generator Using Large Language Model	184
<i>Mohammad Sadeq Abolhasani, Rong Pan</i>	
Optimizing Software Defect Classification with Locally Linear Embedding Techniques	190
<i>Fatemeh Salboukh, Hesam Saki, Lance Fiondella</i>	
Estimating Software Reliability Without Test Hours.....	197
<i>Ann M. Neufelder</i>	
Test Case Design for the System Level Reliability Testing of a Complex Electro-Mechanical Product+	203
<i>Robinson Lawrance, Nishith Kumar Reddy Gorla</i>	
Modeling Recurrent Failure Processes Using Padé Approximants	209
<i>Alex Yevkin, Vasily Krivtsov</i>	
Likelihood Ratio Bounds as Constrained Nonlinear Optimization Problems	217
<i>Michael Z. Spivey</i>	

Analysis of Censored Aggregate Failure-Time Data Using Phase-Type Distributions	223
<i>Haitao Liao, Samira Karimi, Ke Yang, Neng Fan</i>	
A Two-Phase Arrhenius Model for Film Capacitors for Large Temperature Ranges	229
<i>Achim Benz, Clemens Uhl, Martin Dazer, Jan Knoch</i>	
All-Terminal Network Reliability Estimation Using a Link Degradation Prediction Model	235
<i>Risat Rimi Chowdhury, Om Prakash Yadav, Shah M Limon, Maneesh Singh, Ajay Pal Singh Rathore</i>	
State of Quantum RNNs for Time-Series Forecasting.....	242
<i>Auguste Hirth, Enrique Lopez Droguett</i>	
Forecast Accuracy: Weibayes Versus Generic Weibull Using Monte Carlo Simulation.....	248
<i>Dylan Chase, Van Culver, Dina Zreik</i>	
Tackling Difficult Data: A Multi-Faceted Approach Using Accessible Techniques	254
<i>Carol Parendo, Dan Bickelhaupt</i>	
Enhancing FMEA with ChatGPT: Structured Outputs, Qualitative Evaluations, and AI-Human Hybrid FMEA.....	259
<i>Meng Xu</i>	
Risk Mitigation Using Design Optimization, Tolerancing Analysis and Test Coverage Analysis.....	265
<i>Yavuz Goktas, David D Yellamati, James Ezhaya</i>	
A Comprehensive System Level Reliability Assessment: Modeling Guided by FMEA	271
<i>Wei Huang, Dale Borja</i>	
Three Aspects of Making Successful FMECA's with MBSE: People, Process and Tools	277
<i>Nilgun Kutay, Özlem Erdener Sönmez, Cem Talip Öndes</i>	
Advanced Driver Assistance Systems Reliability Modeling	281
<i>Jiliang Zhang</i>	
Applying Innovative AI Techniques to Complex U.S. Army Datasets.....	287
<i>Jordan K. Mills, Megan B. Shumate, Kris B. Walker, Russ R. Alexander</i>	
The Future of Availability: Integration of AI in RAM Operations	293
<i>Charles Etheredge, Haven Brown, Tony Donatelli, Seth Farrington</i>	
Using Multi-Criteria Decision-Making Techniques for Industrial Robot Selection	299
<i>Behin Elahi, Rakshitha Gokuldas, Sourabh Hegde, Shikha Uppala, Sonali Kini, Shadan Rehmani, Piyush Anil Patil, Pragya Jain Santosh, Shaista Fathima Basheeruddin, Harshwardhan Shrikrushna Raykar</i>	
Web Application for Failure Analysis Applying Text Mining Methods	305
<i>Carlos Recalde</i>	
Mitigating Risk of Overload Cascading Failures in Storage Area Networks	311
<i>Guixiang Lyu, Liudong Xing, Guilin Zhao</i>	
Dual Machine Learning Models for IoT Quality and Supply Chain Management.....	318
<i>Mourad Larbi, Yongjin Choi, Chris Cheng</i>	
Artificial Intelligence is Not Going to Replace Your Fault Tree Analysis.....	324
<i>John E. Weglian</i>	

Exploring Grover-Enhanced QAOA for Minimal Cut Set Identification	330
<i>Gabriel San Martín Silva, Enrique López Droguett</i>	
Reliability Analysis of PEM Electrolyser Balance of Plant.....	336
<i>Salim Ubale, Rasa Remenyte-Prescott, Alastair Stuart, Adam Hague, David M. Grant</i>	
Mission Reliability of Collaborative Heterogenous Drone Rescue System	342
<i>Junxing Ren, Liudong Xing</i>	
Reliability Modeling Using Weibull Analysis and AI Based on Field Returns	349
<i>Awni Qasaimeh, Eva Kosiba</i>	
Enhanced Thermal-RGB Fusion for Anomaly Detection and Segmentation	355
<i>Afshin Asadi, Salih Salihoglu, Ramin Moghaddass</i>	
Efficient Reliability Analysis: Debiasing Machine Learning with Partial Data	361
<i>Yanwen Xu</i>	
Physics-Informed Machine Learning for Battery Pack Thermal Management	367
<i>Zheng Liu, Yuan Jiang, Yumeng Li, Pingfeng Wang</i>	
Which Chapters and Topics Should Be Included in a Safety Case?	374
<i>Thor Myklebust, Dorte Mathilde Kristin Vatn, Tor Stålhane</i>	
Reliability and Safety Assessment Model for LOCA Event in BWRX-300.....	381
<i>Saikat Basak, Lixuan Lu</i>	
Sensitivity of a Video Detection System and the Impact on Availability Vs Safety	387
<i>Sven W Scholz</i>	
A Standard for Reliability Block Diagrams in SysML	393
<i>Myron Hecht, Tomas Juknevicius, Kyle Post, Andrius Armonas</i>	
A New View to Mission Profiles	401
<i>Horst J. Lewitschnig, Marcus Mayrhofer, Peter Filzmoser</i>	
Optimizing Operational Readiness of Complex Systems Previously Thought to Be Non-Optimizable	407
<i>Justin Woulfe</i>	
Functional Requirement and User's Needs for Food Serving Robots.....	413
<i>Behin Elahi, Abhishek Prasad Dalvi, Wint Lae Kyaw, Vincent Lee, Chanakarn Boonmuen, Jacob Cortez, Alyssa Fileds, Yusof Roshan</i>	
Evaluating Success Conditions for Predictive Maintenance	419
<i>Paula Fischer, Martin Dazer</i>	
Feature Engineering Toolkit for Predictive Analytics in Engineering and Healthcare Informatics	426
<i>Haozhou Zhou, Wei Li, Srinivasan Radhakrishnan, Sagar Kamarthi</i>	
Comparative Study on Remaining Useful Life Prediction Using Testing Data.....	433
<i>Alicia Auer, Stefan Bracke</i>	
Generative Twins: A Deep Learning Approach to Next-Gen Digital Twins	439
<i>Giuseppe Mannone, Kim D. Hintz, Martin Dazer</i>	

A Systemic Approach of Reliability Allocation in the Development of Multizone Well Completion.....	445
<i>Pankaj Shrivastava</i>	
Recommended Best Practices for Allocating Reliability/Availability Requirements	451
<i>Matthew W. Daniels</i>	
RelOps - Introduction to Reliable Operations	457
<i>Nemat Bidokhti</i>	
A Decision- Theoretic Perspective of Maintenance Optimization of a Complex System	463
<i>Fahad Izhar Khan, Allan T. Mense</i>	
Human Reliability Analysis for Maintenance Operations: Phoenix Methodology and an Example Application	470
<i>Tingting Cheng, Marilia A. Ramos, Camila Correa-Jullian, Ali Mosleh</i>	
Establishing Common Values in Design for Sustainability	476
<i>Joseph B. Krocilick</i>	
Risk-Based Optimization of Periodic Maintenance for Power Grid Equipment	482
<i>Miguel Diago, Xavier Lebeuf, Toulith Jean-Marc Meango, Alain Côté, Claude Rajotte</i>	
Predictive Maintenance for Smart Buildings: Balancing QoS and Cost Efficiency	488
<i>Anas Hossini, Leila Kloul, Maël Guiraud, Benjamin Cohen Boulakia</i>	
Queueing Theory-Based Spare Parts Prediction Through Machine Learning	495
<i>Hongzhou Wang, Brian Hart</i>	
Large Language Models Maintenance Approach for Commercial/Fleets	502
<i>Lukmon Rasaq, Om Prakash Yadav, Madhuri Siddula, Rhonda Walthall</i>	
Developing Measurement Models Using Bayesian Neural Networks.....	508
<i>Roohollah Heidary, Jesse Williams, Hongyue Sun, Chenyu Xu, Paulo Moreira</i>	
Integration of Value Stream Mapping and Simulation for Productivity Enhancement.....	513
<i>Shankey Chaudhary, Behin Elahi, Pooja Varshini Thulasi Das, Miral Varotaria, Divyansh Jain, Meet Kalpesh Rathod</i>	
Optimizing RAMS with DES Using Operational Data for Enhanced Maintenance.....	518
<i>Rahul Gottumukkala, Deepak Tripathy, Jono Jarvis, Chris Stecki</i>	
Contingency Assessment Based on Cost and Schedule Planning.....	524
<i>Paul Franklin</i>	
Reliability Test Monitoring: Detection of Time-To-Failure with Specific Instrumentation	528
<i>Marco Bonato, Arnaud Maire</i>	
PrivateAIDELPHI: Adopting and Adapting Private AI for Risk Assessment of Safety Critical Systems.....	534
<i>Nikolaos Papakonstantinou, Douglas Van Bossuyt, Ryan Bell, Ryan Longshore, Mika Heikkilä</i>	
A Machine Learning Framework for Failure Mode Identification from Warranty Data	540
<i>Prerna Awasthi, Mathew Thomas, Dinesh Junghare, Massimo Bianco</i>	
Graph Neural Networks and Fault Tree Analysis for Runtime Dynamic Risk Assessment of Autonomous Systems	546
<i>Joachim Grimstad, Andrey Morozov</i>	

Use Cases for AI in Reliability and Maintainability	552
<i>David A. Nelson</i>	
Bayesian Model of Risk Informed Scheduling.....	556
<i>Geoffrey Berlin, Paul Franklin</i>	
Prioritizing Failure-Contributing Causes in Switchgear Systems.....	562
<i>Manisha Gupta, Behin Elahi</i>	
Defining Minimum Fleet Flight Hour Reliability Limit for a DOD Aircraft Program.....	569
<i>James F. Wasko, Gerardo E. Burciaga</i>	
Reliability and Mission Engineering: Improving Mission Success	574
<i>Justin Brown</i>	
Reliability Growth Modeling and Testing	579
<i>Harry W. Jones</i>	
Supporting R&M in MBSE Development: Lessons Learned in Vertical Lift Platforms	584
<i>Heather Shar, Dainys Carrasquillo, Joshua Hasty, Mike Petersen</i>	
Multi-Scale Temporal Analysis for Failure Prediction in Energy Systems.....	590
<i>Anh Le, Phat K. Huynh, Om P. Yadav, Chau Le, Harun Pirim, Trung Q. Le</i>	
Enhancing Maintenance Data Analytics: A Novel Failure Mode and Effect Analysis-Natural Language Processing Integration.....	597
<i>Mathieu Payette, Georges Abdul-Nour, Toulith Jean-Marc Meango, Miguel Diago, Alain Côté</i>	
Reliability Assessment of Select Natural Gas Infrastructure Under Hydrogen Blending.....	603
<i>Theresa M. Stewart, Ali Mosleh, Narasi Sridhar, François Ayello, Abhishek N. Salilkumar</i>	
Fault Tree Analysis and Risk Importance Measures Applied to Electric Grids	609
<i>Martin Royer, Vincent Poiré, Jérémie Turcotte, Dragan Komljenovic</i>	
Bridging Static and Dynamic Design for Enhanced Safety Analysis	615
<i>Tim Gonschorek, Hannes Stützer, Frank Ortmeier, Michael Oppermann</i>	
Resilience Assessment and Optimization of Image Classifiers	622
<i>Berit Schuerrle, Andrey Morozov</i>	
Extending Coverage Modeling to Voter Behavior for Spacecraft Reliability Modeling	628
<i>Leila Meshkat</i>	
Application of FTA for Design of Safety Critical Systems	634
<i>David D Yellamati, Pascal Gabeur, Yunwei Hu, Yavuz Goktas</i>	
Common Cause Failures Dominate and Defeat Redundancy	639
<i>Harry W. Jones</i>	
Availability Risk Management for Systems with Multiple Configurations.....	644
<i>Joseph Molvar, Alastair Moubray, Nobel Mathew, Joshua Danker</i>	
Analysis of the Repairability of Ship Machinery Failures.....	650
<i>Spencer A. Dugan, Ingrid B. Utne</i>	

Framework for Identifying Failure Mechanisms in Consumer Electronics Using Large Language Models	656
<i>Eunseo So, Mohammad Modarres</i>	
Strategic Artificial Intelligence Learning (SAIL) and Applications - Mastering Risk in Space Explorations.....	662
<i>Prince Kalia, Humberto Calvani, Jonathan Patterson, Tim Crumbly</i>	
Leveraging Generative AI Tools for Proactive Risk Mitigation in Design.....	668
<i>Yunwei Hu, Amith Nag N A, David Deepak Yellamati, Yavuz Goktas</i>	
Integrating Artificial Intelligence/Machine Learning in Failure Reporting, Analysis, and Corrective Action Systems.....	674
<i>Jordan Long, Kimberly Malone</i>	
Beyond Computer Aided Design: Holographic Collaboration in Enhancing Product Life Management	680
<i>James Pesculis, Robert J. Pavlovich, Eisen Montalvo-Ruiz, Christopher P. Sullivan</i>	
Physics of Failure Modeling for Improved Automotive Warranty Cost Predictions	686
<i>Marco Bonato, Aziz Moudoub</i>	
Machine Learning with Weibull Analysis and Mixed Failure Mechanisms	692
<i>Vinayak Hegde</i>	
Leveraging Telematics Data for Estimation of Gear Damage and Residual Useful Life	698
<i>Rahul Soni, Dinesh Junghare, Morandi Gabriele, Mathew Thomas</i>	
Transductive Transfer Learning Features for Prognostics and Health Management	703
<i>Shimeng Yang, Yuan Jiang, Zheng Liu, Pingfeng Wang</i>	
Cluster Analysis to Define Operational Conditions for Systems Fault Detection	710
<i>Renan F. Da Silva, Miguel Angelo De Carvalho Michalski, Gilberto Francisco Martha De Souza</i>	
Vehicle Event Condition Monitoring Reliability in Mass Transit Fleets Using a Simplified Covariate Non-Honogeneous Poisson Proces Model	716
<i>Aercio Regis Alencar</i>	

Author Index