

Ottawa Chapter Newsletter

September 2024

SREOttawa.com



SRE OTTAWA CHAPTER

<u>EXECUTIVE</u>		
President	vacant	
V/President	vacant	
Treasurer	James Menard	613 371-3278
Secretary	Malcolm Nash	613-596-7343
<u>CHAIRS</u>		
Tech Prgm	vacant	
Education	Paul Dobrovlny	613-225-2844
Membership	Jim Arsenault	613 836-4003
Newsletter	James Menard	613 371-3278
Int'l Rep.	vacant	
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POINT OF VIEW

Welcome Back! I hope everyone had a great break over the summer. The kernel of executive members did manage to scrape together a program for the fall, as set out below. This issue marks the start of my 21st year as newsletter editor, and I've also been VP and President before taking on Treasurer. Jim Arsenault, Malcolm Nash and Paul Dobrovlny are also long-in-the tooth executives. We are tired. Tired of trying to keep the chapter running as well as it did in the past. We need more support from the membership. You don't have to join the executive to find someone willing to give a presentation, or to suggest an article for the newsletter, or to recruit new members. If you value our chapter activities, please step up.

- James Menard

FALL 2024 OTTAWA SRE TECHNICAL PROGRAM

Mark your calendar! Here are the dates for presentations this Fall:

7:00 p.m. Greetings & Chapter Business
7:15 p.m. Presentation
8:00 - 9:00 Questions and Discussion

All presentations for the 2024 Fall season will be delivered in person in the Edge Room at General Dynamics mission Systems Canada, 1941 Robertson Rd, and on-line via Zoom. The link will

be sent with the meeting notices. See special notes for November.

26 September - Jeremy Bruce, CiENA, Component Engineering: Supply Side Reliability Establishment;

30 October - Regis Alencar, TTC, *Safety as a Function of Reliability and Reliability as a Function of Design*;

27 November - *Pumps and Compressors: Operation, Reliability and Troubleshooting* webinar conducted by Professor Mike Ivanovic, EPIC Training.

CHAPTER NEWS

Congratulations to Julio Pulido, SREI President, winner of the Colin Chabot Award for best presentation, namely *Reliability of Thermoelectric Devices*. Well done!

You will see that November's presentation, arranged by our Education Chair, will be a remote webinar conducted by Professor Mike Ivanovic - note that advance registration is required, since we have to pay per seat. More details are below.

[Technical Course - Heat Pumps: Operation, Reliability and Troubleshooting on Zoom 5:45 p.m. Wed, November 27, 2024](#)

CHAT-GPT WRITES AN ARTICLE FOR US!

Are you ready for the AI revolution? One of the challenges of being newsletter editor is to come up with interesting reliability engineering topics, so who could resist the temptation to let the article write itself. If you are new to Chat-GPT here is a [great tutorial](#). The response I asked it to compose was: "I'm a member of the society of reliability engineers. What are some topics on reliability engineering I could write about in the newsletter I write?" Here is its response:

Here are some topics on reliability engineering that could be interesting for your newsletter:

- *Reliability Growth Modeling: Discuss methodologies like Crow-AMSAA and Duane models that help in predicting and improving system reliability over time.*

- *Accelerated Life Testing: Explain how accelerated testing methods can predict product lifespan under normal use conditions by testing at elevated stress levels.*
- *Root Cause Analysis (RCA) in Reliability Engineering: Highlight techniques like fault tree analysis (FTA), 5 Whys, and fishbone diagrams for identifying the underlying causes of failures.*
- *Design for Reliability (DfR): Explore how reliability is incorporated early in the design phase through best practices and tools such as FMECA (Failure Modes, Effects, and Criticality Analysis).*
- *Weibull Analysis: Dive into the use of Weibull distribution for analyzing failure data and predicting future reliability and maintenance needs.*
- *Reliability-Centered Maintenance (RCM): Discuss strategies to optimize maintenance practices based on reliability data to ensure systems remain functional over time.*
- *Probabilistic Risk Assessment (PRA): Introduce techniques that quantify the likelihood of failures and the associated risks, and how these methods are applied in high-stakes industries like aerospace and nuclear.*
- *Big Data and AI in Reliability Engineering: Explore how data analytics, machine learning, and AI are being integrated into reliability prediction, anomaly detection, and preventive maintenance.*
- *Human Reliability Analysis (HRA): Discuss the role of human factors in reliability and methods to assess and mitigate human error in complex systems.*

“Tell me more about Big Data and AI in Reliability Engineering: Explore how data analytics, machine learning, and AI are being integrated into reliability prediction, anomaly detection, and preventive maintenance.”

Big Data and AI in Reliability Engineering is a growing area of interest due to the ability of advanced data analytics to enhance decision-making and predict failures before they occur. Here's how data analytics, machine learning, and AI are being integrated into reliability engineering:

1. Data-Driven Reliability Predictions:
With the rise of IoT (Internet of Things) and connected devices, organizations now collect massive amounts of operational data from equipment and systems. This "big data" is used to identify patterns and trends related to reliability. Machine learning models can be trained on

historical failure data and environmental factors to predict the likelihood of future failures. These predictions allow for more proactive maintenance strategies and improved system design.

2. Anomaly Detection:

Traditional methods of anomaly detection often rely on predefined thresholds or basic statistical techniques. However, AI-driven approaches can detect subtle anomalies by learning the normal operational patterns of a system. Techniques like neural networks, clustering algorithms, and support vector machines can flag deviations from normal behavior, which may indicate an impending failure.

3. Preventive and Predictive Maintenance:

Predictive maintenance uses machine learning to forecast when equipment is likely to fail so that maintenance can be scheduled just in time—neither too early (wasting resources) nor too late (leading to breakdowns). AI models can combine sensor data, historical maintenance records, and operational conditions to recommend the best maintenance windows, minimizing downtime and extending equipment life.

4. Root Cause Analysis and Fault Diagnostics:

Machine learning algorithms can analyze vast datasets to help identify the root causes of failures by correlating multiple variables. This data-driven approach helps uncover hidden relationships between failure modes and operational conditions that might be missed using traditional analysis techniques.

5. Reliability Modeling and Simulation:

AI and data analytics enhance traditional reliability models by incorporating real-time data inputs. Bayesian networks and probabilistic modeling are examples of AI techniques used to dynamically update reliability predictions as new data comes in. These models are more adaptive and accurate than static models.

6. Digital Twins:

A digital twin is a virtual replica of a physical asset, system, or process. By integrating big data, AI, and simulation models, digital twins can provide real-time insights into the reliability and performance of assets. They simulate different scenarios, allowing reliability engineers to test strategies for improving system robustness without risking actual assets.

7. AI-Driven Decision Support Systems:

AI-powered systems provide decision-making support by analyzing large volumes of reliability-related data and recommending actions. For example, decision trees and expert systems can

be integrated into maintenance management platforms, helping engineers decide on the most effective interventions based on the current health of equipment.

8. Challenges and Considerations:

Data Quality and Integration: For AI models to be effective, high-quality data is essential. Reliability engineers must focus on data cleaning, integration, and management.

Model Interpretability: Many AI models, especially deep learning models, can be black boxes.

Ensuring interpretability and trustworthiness in model predictions is critical in high-stakes reliability scenarios.

Scalability and Implementation: Moving from pilot projects to fully scaled implementations across an organization requires significant investment and alignment between reliability, IT, and operations teams.

9. Industry Applications:

Manufacturing: AI-based predictive maintenance is used in manufacturing plants to monitor production machinery and avoid costly downtime.

Aerospace: Airlines leverage AI to monitor the health of aircraft systems and optimize maintenance schedules, improving safety and reducing operational costs.

Energy and Utilities: Power plants use predictive analytics to ensure the reliability of turbines and other critical infrastructure.

Automotive: AI-driven diagnostics are used in autonomous and electric vehicles to enhance reliability and safety.

In summary, big data and AI are transforming reliability engineering by enabling more precise and proactive decision-making. They help shift the focus from reactive to predictive maintenance, leading to increased uptime, lower costs, and improved overall reliability.

So you can see that AI can provide knowledgeable answers in reliability engineering, as in everything else that it gleans from scraping the internet. And you can see how easy it would be for me to just get Chat-GPT to do my editor job. Now if only it could do my treasurer job!

SREOttawa.com Technical Course – Heat Pumps: Operation, Reliability and Troubleshooting on Zoom

5:45 p.m. Wed, November 27, 2024

Wed, November 27, 2024 05:45 PM - 09:00 PM EST
1941 Robertson Rd, Nepean, ON K2H 5B7, Canada



SREOttawa.com - Society of Reliability Engineers - Ottawa Chapter

offers technical professional development instructor-led training provided by EPIC Group Training's industry consultant Dr. Mike Ivanovic. 5:45pm-9pm EST on Wednesday November 27th, 2024.

A \$10 event cover charge applies, and new members are invited to join the chapter for \$50/year.

SREO Newsletter

If you have something to share with the Ottawa SRE community, please send it to: James Menard jamespmenard@gmail.com. Deadline for the next Newsletter is Dec 31, 2024



January 27- 30, 2025
Hilton Sandestin Beach
Resort, Miramar Beach,
Florida, USA