

CNDE Webinar Presentation August 14, 2025 - 10:00 a.m. CST

This webinar will be recorded and made available on the CNDE website



Artificial Intelligence in Nondestructive Evaluation: Challenges and Paths Forward

Presented by:

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Abstract:

Artificial intelligence (AI) is becoming increasingly pervasive in our daily lives. However, its widespread adoption in nondestructive evaluation (NDE) and other physically grounded disciplines remains limited. This webinar will explore three critical challenges facing the integration of AI into these fields that must be addressed in the coming decade:

1. The practical difficulties of collecting sufficient data to train AI models.
2. The challenge of capturing diverse data, especially for rare or extreme events, which is essential for informed decision-making.
3. The limited interpretability and explainability of data-driven approaches compared to physics-based models and expert systems.

We will examine why traditional shallow and deep learning methods struggle with these challenges and explore how the broader machine learning community is beginning to address them. Key topics will include transfer learning, explainable AI, uncertainty quantification, and physics-informed machine learning. We will also discuss how these emerging techniques may need to be adapted or extended to maximize their impact in the field of NDE.

Speaker:

Dr. Joel B. Harley is an Associate Professor and Kent and Linda Fuchs Faculty Fellow in the Department of Electrical and Computer Engineering at the University of Florida. His research integrates physical knowledge with machine learning to advance fundamental science and engineering. Dr. Harley has received multiple departmental and college-level teaching awards and is the recipient of the 2021 Achenbach Medal from the International Workshop on Structural Health Monitoring, the 2020 IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society Star Ambassador Award, and the Air Force Summer Faculty Fellowship in both 2020 and 2018.

Dr. Harley has authored over 80 peer-reviewed journal papers and more than 90 conference proceedings. He currently serves as an Associate Editor for *Structural Health Monitoring* and as the Subject Editor for Artificial Intelligence and Machine Learning at *NDT&E International*. He has previously taught short courses on artificial intelligence at the Review of Quantitative Nondestructive Evaluation Conference as well as the Minerals, Metals & Materials Society (TMS) Annual Meeting.

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