AI/ML for NDT Applications - Challenges and Success Stories - Is this a hype or reality?

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Non-Destructive Testing (NDT) has long been the cornerstone of quality assurance and safety in aerospace, manufacturing, oil and gas, energy and power generation, rail transportation, and beyond. It involves an array of modalities/techniques that allow us to assess the internal properties of materials and structures without causing damage. In the era of rapid technological advancement, we find ourselves at a pivotal juncture where AI and ML hold the potential to amplify the capabilities of NDT to unparalleled heights. The NDT field has recently seen remarkable innovations in integrating Artificial Intelligence (AI) and Machine Learning (ML) techniques. The fusion of AI and ML with NDT brings a paradigm shift. By leveraging the power of data-driven insights, predictive analytics, and pattern recognition, we can enhance defect detection accuracy, optimize maintenance strategies, and propel industries into a new era of efficiency and reliability. But, as with any transformative technology, this journey comes with challenges – from data acquisition and preprocessing to interpretability and ethical considerations. This paper overviews the successes, challenges, and opportunities in implementing AI/ML for several NDT applications across various industries. Several case studies and examples will be presented that show the successes, challenges, and opportunities in implementing AI/ML for NDT applications. Widespread adoption and implementation of AI/ML for NDT applications will require embracing the opportunities presented by AI/ML, trust, ethics, industry leadership, collaboration, change in mindsets, and a commitment to addressing the unique demands of NDT. This paper also encourages industries to seize the initiative, driving the adoption of AI/ML in NDT and promoting safety, efficiency, and quality in critical applications.