Title: AI Models for Virtual Source Phased Array Ultrasound Imaging

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Abstract

Nondestructive Evaluation (NDE) techniques play an essential role in the quality control of the structural component lifecycle, which ranges from raw materials to finished products and their in-service inspection for various industrial applications. These structures, prone to damage gradually due to aging, need to be evaluated periodically to prevent catastrophic failures. Therefore, there is a requirement to develop and implement a robust automated defect recognition (ADR) system to characterize structural components in nondestructive evaluation (NDE) applications. The ADR system uses an AI-based deep learning algorithm for defect detection and classification. Building a reliable ADR system requires a large quantity of annotated defective datasets, and characterizing the bigger structural components to be free from defects requires rapid inspection techniques. The proposed phased array ultrasound imaging techniques can significantly improve image resolution and reduce the experimental scanning time, and generative AI models can be implemented to generate faster and more accurate defective datasets.

About the Speaker

Dr. Thulsiram Gantala is a recent Ph.D. graduate from the Center for NDE in the Department of Mechanical Engineering, Indian Institute of Technology Madras, under the guidance of Prof. Krishnan Balasubramanian. Now, he is working as a Post Doctoral Researcher in the same department and professor. He has a bachelor's degree from NIT Trichy in production engineering and a Master's degree from IIT Kanpur in Solid Mechanics and Design, Mechanical Engineering. Before joining the Ph.D., he worked for four years in two MNCs LnT and Rolls Royce. Where he worked in the CAE team for the design and development of the Indian Defense Products and Trent Engine Family of Rolls Royce components. During his Ph.D., he developed an advanced phased array ultrasound imaging technique for reducing scanning time with improved image resolution and AI generative models to generate synthetic defective images and simulate ultrasonic wave dynamics. He received a Prime minister fellowship for doctoral Research in 2020 for developing industrial-relevant cutting-edge technology under the public-private partnership between SERB and Baker Hughes. Presently, he is working on multiple funded and consultancy projects to develop inspection techniques for Austenitic steel welds and High-temperature imaging of continuous casting. Besides the research, he is teaching machine learning concepts to solve differential equations of forward and inverse problems in the graduate course along with Prof. Prabhu Rajagopal in the ME Department.