

CNDE Webinar Presentation September 18, 2025 - 10:00 a.m. CST

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



Electromagnetic Inverse Scattering: Current Trends and Future Developments

Presented by:

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Abstract:

Electromagnetic inverse scattering (*EM-IS*) techniques play a crucial role in a variety of engineering domains, with applications in biomedical diagnostics, through-wall imaging, structural health monitoring, and non-destructive testing/evaluation (*NDT/NDE*). These methods enable the extraction of both qualitative (i.e., shape and location) and quantitative (i.e., material properties) characteristics of hidden targets within inaccessible structures. For instance, by analyzing the scattered field data collected from an external observation domain, *EM-IS* techniques can identify defects like cracks, voids, and material discontinuities in complex and/or inhomogeneous domains. This webinar will start by revisiting the fundamental concepts and mathematical principles behind *EM-IS*, along with the key challenges associated with high-frequency *EM* scattered data inversion. It will then delve into a range of both traditional and emerging solution techniques and algorithms, discussing their strengths, limitations, and the ongoing developments in both approximate and full-wave (exact) reconstruction approaches.

Designed for students, researchers, and professionals, this webinar will provide an introduction to the core principles of *EM-IS*, examine cutting-edge algorithms and methodologies, highlight the various applications of *EM-IS* in both academic and industrial scenarios, and explore future trends in the field with particular focus on the *NDT* community.

Speaker:

Andrea MASSA (IEEE Fellow, IET Fellow, Electromagnetic Academy Fellow) has been a Full Professor of EM Fields @ University of Trento since 2005. At present, Prof. MASSA is the director of the network of federated laboratories "ELEDIA Research Center" located in Brunei, China, Czech, Ethiopia, France, Greece, Italy, Japan, Perù, Tunisia with more than 150 researchers. Moreover, he is holder of a Chang-Jiang Chair Professorship @ UESTC (Chengdu – China), Visiting Research Professor @ University of Illinois at Chicago (Chicago – USA), Distinguished Visiting Professor @ Tsinghua (Beijing - China), Visiting Professor and IAS Distinguished Scholar @ Tel Aviv University (Tel Aviv – Israel), and Professor @ CentraleSupélec (Paris - France). He has been holder of a Senior DIGITEO Chair at L2S-CentraleSupélec and CEA LIST in Saclay (France), UC3M-Santander Chair of Excellence @ Universidad Carlos III de Madrid (Spain), Adjunct Professor at Penn State University (USA), Guest Professor @ UESTC (China), and Visiting Professor at the Missouri University of Science and Technology (USA), the Nagasaki University (Japan), the University of Paris Sud (France), the Kumamoto University (Japan), and the National University of Singapore (Singapore). He has been appointed IEEE AP-S Distinguished Lecturer (2016-2018) and served as Associate Editor of the "IEEE Transaction on Antennas and Propagation" (2011-2014). His research activities are mainly concerned with inverse problems, antenna analysis/ synthesis, radar systems and signal processing, cross-layer optimization and planning of wireless/RF systems, system-by-design and material-by-design (metamaterials and reconfigurable-materials), and theory/applications of optimization techniques to engineering problems (coms, medicine, and biology).

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