SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
COLLEGE OF DESIGN AND ENGINEERING
Website: https://cde.nus.edu.sg/ece

Area: Microwave & Radio Frequency (MWRF)

Host: Professor Chen Xudong

Technical Seminar Co-Organized by
Department of ECE/NUS and IEEE MTT/AP Joint Chapter

TOPIC	:	**Deep Learning Enhanced Subsurface Characterization for Energy Transition**
SPEAKER	:	**Professor Jiefu Chen** **Department of Electrical and Computer Engineering, University of Houston**
DATE	:	**Tuesday, 13 January 2026**
TIME	:	**10:00AM to 11:00AM**
VENUE	:	**E4-05-39 - ECE Conference Room** **College of Design and Engineering, NUS**

ABSTRACT

Understanding the structure and properties of the subsurface is essential for many technologies supporting energy transition, such as underground carbon storage, geologic hydrogen, and critical mineral exploration. However, imaging and characterizing the subsurface are inherently challenging due to limited and noisy measurements, large uncertainties, and the fact that multiple subsurface models can often explain the same observations. Conventional physics based methods frequently rely on strong assumptions and can be computationally expensive, especially in geologically complex settings. Recent advances in machine learning, and deep learning in particular, have opened new possibilities for extracting information from subsurface data by learning complex relationships directly from examples. While these data driven approaches can be powerful, they often struggle when data are scarce and may produce results that are difficult to interpret or inconsistent with known physical laws. In this talk, I will present our group's recent efforts to bridge physics based modeling and deep learning through physics guided learning frameworks. By embedding physical principles and forward models into the training process, these approaches combine the reliability of physics based methods with the flexibility and efficiency of deep learning. I will illustrate how this hybrid strategy improves robustness and accuracy in subsurface characterization, with examples in borehole electromagnetic prospecting, seismic full-waveform inversion, and multiphysics joint inversion.

BIOGRAPHY

Jiefu Chen received the B.S. degree in engineering mechanics and the M.S. degree in dynamics and control from Dalian University of Technology, China, and the Ph.D. degree in electrical engineering from Duke University, USA, in 2003, 2006, and 2010, respectively. From 2011 to 2015, he was a Staff Scientist at the Advantage Research and Development Center, Weatherford International Ltd., Houston, USA. He joined the University of Houston in 2015 and is currently an Associate Professor in the Department of Electrical and Computer Engineering. He has published more than 100 journal papers and over 150 conference papers in the areas of computational electromagnetics, inverse problems, geophysical data processing, subsurface wireless communications, and well logging. He received the John T. Chambers Fellowship from Duke University; Honorable Mention in the Student Paper Contest from the IEEE International Symposium on Antennas and Propagation; Best Paper Award from IEEE Transactions on Components, Packaging and Manufacturing Technology; Early Innovator Award, Andrea Prosperetti Research Computing Faculty Award, and President's Circle Award from the University of Houston. He serves as an Associate Editor for IEEE Transactions on Geoscience and Remote Sensing.

CONTACT PERSON

Professor Chen Xudong, Department of Electrical and Computer Engineering
Contact: 65162297, elechenx@nus.edu.sg