



復旦大學
FUDAN UNIVERSITY

Applied Math
Ph.D. Seminar

High-Precision Seismology: Seismic-petrophysical Probabilistic Inversion

Speaker: Jin Wen (Tsinghua University)

Time: 2025-12-18, 16:10 to 17:00

Location: Rm 1801, Guanghua East Tower

Advisor: Dinghui Yang (Tsinghua University)

Abstract: The primary objective of seismic-petrophysical inversion is to predict reservoir rock and fluid properties from observed data—most notably elastic parameters—which are fundamental to exploration geophysics. This prediction task reformulates the inverse problem as a conditional (posterior) probability model conditioned on the observed data. Within the Bayesian framework, physical constraints inform the construction of the likelihood function, while data constraints guide the development of the prior model.

A central challenge lies in building high-fidelity mathematical models grounded in both physics and data. An additional challenge is the need for algorithmic innovation to solve these complex models efficiently. For instance, although common probabilistic inversion algorithms offer global convergence capabilities, their computational cost is often orders of magnitude higher—typically thousands of times—than that of lower-precision, locally convergent seismic inversion methods. This substantial computational burden has severely limited the industrial deployment of high-precision seismology.

In this talk, I will present our latest research on both modeling strategies and algorithmic developments for seismic-petrophysical probabilistic inversion, and demonstrate the effectiveness of these approaches in real industrial applications. Moreover, the rapid rise of deep learning has, to some extent, reshaped the research paradigm of traditional seismology. Accordingly, neural network models and deep learning-based inversion algorithms will also be featured in this report.