



復旦大學
FUDAN UNIVERSITY

Applied Math Ph.D. Seminar

Adaptive-Growth Randomized Neural Networks for PDEs: Algorithms and Numerical Analysis

Speaker: Haoning Dang (Xi'an Jiaotong University)

Time: 2025-10-23, 16:10 to 17:00

Location: Rm 1801, Guanghai East Tower

Advisor: Fei Wang (Xi'an Jiaotong University)

Abstract: Randomized neural network (RaNN) methods have been proposed for solving various partial differential equations (PDEs), demonstrating high accuracy and efficiency. However, initializing the fixed parameters remains a challenging issue. Additionally, RaNNs often struggle to solve PDEs with sharp or discontinuous solutions. In this talk, we propose a novel approach called Adaptive-Growth Randomized Neural Network (AG-RaNN) to address these challenges. We introduce growth strategies that expand the neural network, making it wider and deeper to improve the accuracy of the numerical solution. A key feature of AG-RaNN is its adaptive strategy for determining the weights and biases of newly added neurons, enabling the network to expand in both width and depth without requiring additional training. Instead, all weights and biases are generated constructively, significantly enhancing the network's approximation capabilities compared to conventional randomized neural network methods. In addition, a domain splitting strategy is introduced to handle the case of discontinuous solutions. A comprehensive theoretical analysis of RaNN methods is also presented, covering approximation, statistical, and optimization errors.