FUDAN UNIVERSITY

Applied Math Ph.D. Seminar

DeepSPoC: A Deep Learning-Based PDE Solver Governed by Sequential Propagation of Chaos

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Time: 2024-10-24, 16:10 to 17:00

Location: Rm 1801, Guanghua East Tower

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Abstract: Sequential propagation of chaos (SPoC) is a recently developed tool to solve mean-field stochastic differential equations and their related nonlinear Fokker-Planck equations. Based on the theory of SPoC, we present a new particle method (DeepSPoC) that combines the interacting particle system of SPoC and deep learning. In the algorithm, two classes of frequently used deep models include fully connected neural networks and normalizing flows are considered. For high-dimensional problems, spatial adaptive method are designed to further improve the accuracy and efficiency of deepSPoC. We analysis the convergence of the framework of deepSPoC under some simplified conditions and also provide a posterior error estimation for the algorithm. Finally, we test our methods on a wide range of different types of mean-field equations.