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Applied Math and Numerical Analysis Seminar

Neural network approximate solutions for partial differential equations utilizing domain decomposition algorithms

by

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Abstract :
With the success of deep learning technologies in many scientific and engineering applications, neural network approximation methods have emerged as an active research area in numerical partial differential equations. However, the new approximation methods still need further validations on the accuracy, stability, and efficiency so as to be used as alternatives to classical approximation methods. In this talk, we first introduce the neural network approximation methods for partial differential equations, where a neural network function is introduced to approximate the PDE (Partial Differential Equation) solution and its parameters are then optimized to minimize the cost function derived from the differential equation. We then study the approximation error and the optimization error behaviors in the neural network approximate solution. To reduce the approximation error, a neural network function with a larger number of parameters is often employed but when optimizing such a larger number of parameters the optimization error usually pollutes the solution accuracy and efficiency. To deal with such problems in the neural network approximation, a partitioned neural network function is formed to approximate the PDE solution and then the parameters in each local neural network function are optimized to minimize the cost function. We finally discuss the possibilities in this new approach as a way of enhancing the neural network solution accuracy, stability, and efficiency by utilizing classical domain decomposition algorithms and their convergence theory.

Date :	April 13, 2023 (Thursday)
Time :	2:00pm – 3:00pm (Hong Kong SAR)
Zoom link:	https://cuhk.zoom.us/j/9792985952
Meeting ID:	9792985952
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All are Welcome