UNIVERSITY of HOUSTON

Department of Mathematics

Scientific Computing Seminar

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Weak TransNet: A Petrov-Galerkin based neural network method for solving elliptic PDEs

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1 PM- 2 PM
Room 646 PGH

Abstract: While deep learning has achieved remarkable success in solving partial differential equations (PDEs), it still faces significant challenges, particularly when the PDE solutions have low regularity or singularities. To address these issues, we propose the Weak TransNet (WTN) method for solving elliptic PDEs, based on a Petrov-Galerkin formulation. Specifically, the neural feature space defined by TransNet is used as the trail space, while the test space consists of radial basis functions. Since the solution is expressed as a linear combination of trial functions, the combination coefficients can be determined by least squares to minimize a weak residual of the PDE. Thus, this approach could help mitigating the issues of non-convexity and ill-conditioning that often arise in neural network training. Furthermore, the WTN method is extended to handle problems whose solutions exhibit multiscale features or possess sharp variations. Several numerical experiments are presented that demonstrate the robustness and efficiency of the proposed methods.

This seminar is easily accessible to persons with disabilities. For more information or for assistance, please contact the Mathematics Department at 743-3500.