



연세대학교 수학교산학부

YONSEI Math-CSE Colloquium

Numerical approximation of PDEs via deep neural networks: analysis and computation

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Abstract: In recent years, due to the tremendous success of machine learning in various fields, it has recently begun to gain more attention to solving partial differential equations (PDEs) using a deep learning algorithm.

In particular, by utilizing the approximation properties of deep neural networks and statistical learning theory to numerical PDEs, this new approach opened a new area of research which is recently called scientific machine learning.

In this talk, I will introduce some well-known algorithms in scientific machine learning, and address the mathematical analysis of these methods in the context of the classical numerical analysis framework. Also, I will introduce my recent result on the analysis and approximation of unsupervised Legendre–Galerkin neural network (ULGNet), which is based on the techniques both from numerical analysis and scientific machine learning. Unlike existing deep learning-based numerical methods for PDEs, the ULGNet expresses the solution as a spectral expansion with respect to the Legendre basis and predicts the coefficients with deep neural networks by solving a variational residual minimization problem. Numerical evidence will also be provided to support the theoretical result.

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Sci Building #225

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