

SPECTRAL AND NEURAL OPERATORS IN SCIENTIFIC MACHINE LEARNING

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ABSTRACT

Scientific Machine Learning (SciML) is an emerging scientific field at the interface of data science, high-dimensional approximation, statistics, and deep learning methodologies. Central themes are *operator approximation* and *operator learning*.

This MS will present recent contributions on spectral, polynomial, and other “high-order” approximation and computation methodologies for operator surrogates in SciML.

Recent progress in spectral and polynomial approximation theoretical results and approximation algorithms will be reviewed, on the one hand in operator learning and on the other hand in deep learning and statistical learning theory and computation in relation to operator approximation.

SPEAKERS

All proposed speakers have been pre-contacted and have tentatively agreed to present in this MS.

1. E. Calvello (Lawrence Berkeley National Laboratory, USA): “Scaling Scientific Machine Learning.”
2. M. Feischl (TU Vienna, Austria).
3. O. Ghattas (University of Texas at Austin, USA) “Neural Operator Learning of Solutions of Inverse Problem”
4. M. Ghiotto (Pavia, Italy): “Multi-Patch Neural Operators: A Spectral-Element Approach to Operator Learning on Complex Domains”
5. H. Harbrecht (Basel, Switzerland): “Kernel Approximation in Operator Learning.”
6. Y. Korolev (University of Bath, England): “A graph convergence analysis of the approximation of maximally monotone operators.”
7. M. Maric (Heidelberg, Germany).
8. A. Nouy (EC Nantes, France).
9. N. Rares-Franco (Politecnico di Milano, Italy).
10. N. Reinhardt (Heidelberg, Germany).
11. D. Sanz-Alonso (University of Chicago, USA): “From Spectral Methods to Sample Complexity Bounds for Fourier Neural Operators.”
12. Ch. Schwab (ETHZ, Switzerland): “Shape Neural Operators for elliptic and parabolic PDEs: expression rate bounds”
13. M. Trautner (University of Texas at Austin, USA). “Theory-to-Practice Gap in Operator Learning”
14. J. Westermann (ETHZ, Switzerland). “High-dimensional approximation for measure transport.”
15. D. Xiu (Ohio State University, USA): “Flow Map Learning for Unknown Dynamical Systems.”
16. F. Zehetgruber (TU Vienna, Austria).