Computing Division Cross-Disciplinary Seminars (2026)

Report of Contributions

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GPGreen: Learning Linear Operators with Gaussian Processes

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Abstract

Operator learning has emerged as a promising data-driven approach to emulating solutions of partial differential equations (PDEs). Existing deep learning-based models lack principled uncertainty quantification, rely on access to large numbers of training examples, and remain largely uninterpretable. Here, we use Gaussian process regression to make uncertainty-aware estimates of PDE solutions. We show our method is competitively accurate compared to existing approaches, while additionally providing uncertainty quantification and improving sample efficiency. The framework exploits Kronecker structures and Fast Fourier Transforms to achieve resolution-invariant prediction cost scaling.

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