BENCHMARKING OPERATOR LEARNING WITH SIMPLE AND INTERPRETABLE KERNEL METHODS

Pau Batlle[1], Matthieu Darcy[1], Bamdad Hosseini[2] and Houman Owhadi[1]

[1]California Institute of Technology
[2]University of Washington

ABSTRACT

Deep learning methods have gained popularity for learning operators between Banach spaces. Although these methods have been benchmarked against each other (Deep Operator Net (DeepONet) and Fourier Neural Operator (FNO) are two notable examples [1,2]), they have not been benchmarked against simpler methods. We present kernel-based methods for operator learning and compare their performance with DeepONet and FNO on the same tasks as in [3,4]. We show that these kernel methods are competitive in terms of cost-accuracy tradeoff. Additionally, kernel methods offer several advantages: simplicity, interpretability, convergence guarantees, a priori error estimates, and bayesian uncertainty quantification. As such, these methods can serve as natural benchmarks for operator learning.

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