



Numerical Analysis Seminar

Neural and spectral operator surrogates

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Abstract

In this talk we discuss expression rates for neural network-based operator surrogates, which are employed to approximate smooth maps between infinite-dimensional Hilbert spaces. Such surrogates have a wide range of applications and can be used in uncertainty quantification and parameter estimation problems in fields such as classical mechanics, fluid mechanics, electrodynamics, earth sciences etc. In this case, the operator input represents the problem configuration and models initial conditions, material properties, forcing terms and/or the domain of a partial differential equation (PDE) describing the underlying physics. The output of the operator is the corresponding PDE solution. Our analysis is based on representing the operator in- and outputs in stable bases such as frames, and exploiting the resulting sparsity created by this separation in high- and low-frequency features. We will also present an alternative approach based on polynomial interpolation, which allows for deterministic construction and eliminates the need for training the network weights. In both cases, we achieve algebraic convergence rates that are free from the curse of dimension.

Date:	May 8, 2024 (Wednesday)
Time:	4:00 - 5:00pm
Venue:	ZOOM: https://hku.zoom.us/j/ Meeting ID: 913 6532 3891 Password: 310656