

Department of Applied and Computational Mathematics and Statistics Colloquium



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Deep Learning Estimation of the Spectral Density of Functional Time Series on Large Domains

The talk is concerned with the estimation of the spectral density of a time series of surfaces or images defined on large grids of hundreds of thousands of points. Such sequences occur in biomedical and climate studies. The estimator is the output of a multilayer perceptron neural network. Existing estimators use sample autocovariance kernels represented as high-dimensional matrices whose manipulation is computationally demanding or even infeasible. We use the theory of spectral functional principal components to derive our deep learning estimator and prove that it is a universal approximator to the spectral density under general assumptions. It can be trained without computing the autocovariance kernels and can be parallelized to provide the estimates much faster than existing approaches. We validate its performance by simulations and an application to fMRI images.

Wednesday, Sept. 16, 2026

3:30 – 4:30 PM

117 Hayes-Healy Center

Colloquium Tea – 3:15 PM in 117 Hayes-Healy