

Statistics Seminar
Department of Mathematics and Statistics

DATE:	Thursday, May 4, 2023
TIME:	1:15pm - 2:15pm
LOCATION:	WH 100E
SPEAKER:	Geran Zhao, Binghamton University
TITLE:	Deep Learning for Functional Data Analysis with Adaptive Basis Layers

Abstract

Despite their widespread success, the application of deep neural networks to functional data remains scarce today. The infinite dimensionality of functional data means standard learning algorithms can be applied only after appropriate dimension reduction, typically achieved via basis expansions. Currently, these bases are chosen a priori without the information for the task at hand and thus may not be effective for the designated task. We instead propose to adaptively learn these bases in an end-to-end fashion. We introduce neural networks that employ a new Basis Layer whose hidden units are each basis functions themselves implemented as a micro neural network. Our architecture learns to apply parsimonious dimension reduction to functional inputs that focuses only on information relevant to the target rather than irrelevant variation in the input function. Across numerous classification/regression tasks with functional data, our method empirically outperforms other types of neural networks, and we prove that our approach is statistically consistent with low generalization error.

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