USC Viterbi
School of Engineering
Ming Hsieh Department of Electrical Engineering

Ming Hsieh Institute Seminar Series
Ming Hsieh Department of Electrical Engineering
Mathematical Foundations of Learning From Signals and Data (Math-FLDS)

Crafting Laplacian Eigenfunctions to the Data Science Task

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3:00 PM

Abstract:
We will discuss two topics related to the importance of selecting particular eigenfunctions of the graph Laplacian. First, we discuss the geometry of Laplacian eigenfunctions on compact manifolds and combinatorial graphs. We will use a notion of similarity between eigenfunctions that allows to reconstruct a dual geometry, which recovers classical duals in particular cases. We will focus on the applications of discovering such a dual geometry, namely in constructing anisotropic graph wavelet packets and anisotropic graph cuts. A second topic will be the relevance of selecting import eigenfunctions for two sample testing, namely kernel Maximum Mean Discrepancy. This creates a more powerful test than the classical MMD while still maintaining sensitivity to common departures. We examine this two-sample testing in several medical examples.

Alex Cloninger is an Assistant Professor of Mathematics at UCSD. He received his PhD in Applied Mathematics and Scientific Computation from the University of Maryland in 2014 and was then an NSF Postdoc and Gibbs Assistant Professor of Mathematics at Yale University until 2017, when he joined UCSD. Alex researches problems around the analysis of high dimensional data. He focuses on approaches that model the data as being locally lower dimensional, including data concentrated near manifolds or subspaces. These types of problems arise in a number of scientific disciplines, including imaging, medicine, and artificial intelligence, and the techniques developed relate to a number of machine learning and statistical algorithms, including deep learning, network analysis, and measuring distances between probability distributions.

Hosted by Mahdi Soltanolkotabi (soltanol@usc.edu) and Paul Bogdan (pbogdan@usc.edu)