THE UNIVERSITY OF CHICAGO

Department of Statistics

SCIENTIFIC AND STATISTICAL COMPUTING SEMINAR

Naoki Saito

Department of Mathematics
University of California, Davis

Multiscale Basis Dictionaries on Graphs and Their Applications to Matrix Data Analysis and Signal Segmentation

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ABSTRACT

In recent years, the advent of new sensor technologies and social network infrastructure has provided huge opportunities and challenges for analyzing data recorded on such networks. In the case of data on regular lattices, computational harmonic analysis tools such as the Fourier and wavelet transforms have well-developed theories and proven track records of success. It is therefore quite important to extend such tools from the classical setting of regular lattices to the more general setting of graphs and networks.

In this talk, I first review our recent effort of constructing multiscale basis dictionaries on a graph, including the Hierarchical Graph Laplacian Eigenbasis Dictionary and the Generalized Haar-Walsh Wavelet Packet Dictionary, which are viewed as generalizations of the classical hierarchical block Discrete Cosine Transforms and the Haar-Walsh wavelet packets, respectively, to the graph setting. Finally, I demonstrate the usefulness of our dictionaries by applying them in some signal and image processing problems where classical tools have difficulty, e.g., analysis of term-document matrices and simultaneous segmentation and denoising of noisy signals sampled on regular lattices.

This is a joint work with my Ph.D. student Jeff Irion.