



THE UNIVERSITY OF
CHICAGO

Departments of Computer Science, Mathematics, Statistics, and the Computation Institute
SCIENTIFIC AND STATISTICAL COMPUTING SEMINAR

DIMITRIS GIANNAKIS

Center for Atmosphere Ocean Science (CAOS)
Courant Institute of Mathematical Sciences

**Capturing Intermittent and Low-frequency Variability
in High-dimensional Data Through Nonlinear
Laplacian Spectral Analysis**

THURSDAY, May 30, 2013, at 4:30 PM

Eckhart 133, 5734 S. University Avenue

ABSTRACT

Nonlinear Laplacian spectral analysis (NLSA) is a method for spatiotemporal analysis of high-dimensional data, which represents spatial and temporal patterns through singular value decomposition of a family of maps acting on scalar functions on the nonlinear data manifold. Through the use of orthogonal basis functions (determined by means of graph Laplace-Beltrami eigenfunction algorithms) and time-lagged embedding, NLSA captures intermittency, rare events, and other nonlinear dynamical features which are not accessible through classical linear approaches such as singular spectrum analysis. We present applications of NLSA to detection of decadal and intermittent variability in the North Pacific sector of comprehensive climate models, and multiscale physical modes of the Madden-Julian Oscillation in infrared brightness temperature satellite data.

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