



# ELECTRICAL & COMPUTER ENGINEERING SEMINAR

## “A Random Walk on Image Patches”

by

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Monday, April 2, 2012, 11:00 a.m.  
Location LSC 213-215

**Abstract:** Algorithms that analyze patches extracted from time series or images have led to state-of-the art techniques for classification, denoising, and the study of nonlinear dynamics. In the first part of the talk, we describe two examples of such algorithms: a novel method to estimate the arrival-times of seismic waves from a seismogram, and a new patch-based method to denoise images. Both approaches combine the following two ingredients: the signals (time series or images) are first lifted into a high-dimensional space using time/space-delay embedding; the resulting phase space is then parameterized using a nonlinear method based on the eigenvectors of the graph Laplacian. Both algorithms outperform existing gold standards. In the second part of the talk, we provide a theoretical explanation for the success of algorithms that organize patches according to graph-based metrics. Our approach relies on a detailed analysis of the commute time on prototypical graph models that epitomize the geometry observed in general patch-graphs.

**Biography:** Francois Meyer graduated with Honors from Ecole Nationale Supérieure d'Informatique et de Mathématiques Appliquées, Grenoble, in 1987, with a M.S. in applied mathematics. He received a Ph.D. degree in electrical engineering from INRIA, France, in 1993. Meyer worked on the thermonuclear fusion program of the French Nuclear Energy Agency during his military service. He is currently an Associate Professor with the Department of Electrical Engineering, University of Colorado, Boulder. He had previously been an Assistant Professor at Yale University, a Visiting Professor at the Institute Henri Poincaré (Paris), a Senior Fellow at the Institute of Pure and Applied Mathematics, (UCLA), and a Visiting Research Scholar at Princeton University.

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