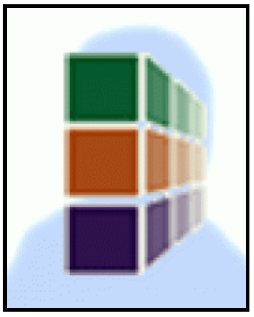

Special Guest Lectures

Enhancing Image Fidelity through Spatio-Spectral Design for Color Image Acquisition, Reconstruction, and Display

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Electrical Engineering Building 117
April 15, 2008 - 09:30 am

Abstract:
In the first part of the talk, we consider extending an image denoising problem to the problem of missing or incomplete pixel values---either due to mechanical designs or distortions. In the context of wavelet-based image processing, missing or incomplete pixels pose a particularly difficult challenge because none of the wavelet coefficients can be observed. In this talk, a unified framework for coupling the EM algorithm with the Bayesian hierarchical modeling of transform coefficients is presented. This empirical-Bayes strategy offers a statistically principled and extremely flexible approach to a wide range of pixel estimation problems including image denoising, image interpolation, super resolution, demosaicking. In the second part of the talk, we consider the "throughput" of color imaging systems. Pixel values are typically sensed or displayed via a spatial subsampling procedure implemented as a color filter array---a physical construction whereby only a single color value is measured or displayed at each pixel location. Owing to the growing ubiquity of acquisition and display devices, much of recent work has focused on the implications of such arrays for subsequent digital processing, including in particular the canonical demosaicking task of reconstructing a full color image from spatially subsampled and incomplete color data acquired under a particular choice of array pattern. In contrast to the majority of the acquisition and display literature, we consider here the problem of color filter array design and its implications for spatial reconstruction quality. We prove the sub-optimality of a wide class of existing array patterns, and provide a constructive method for its solution that yields robust, new panchromatic designs implementable as subtractive colors.

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