Statistics Seminar Series

Multiscale Analysis of Photon-Limited Astronomical Signals and Images.

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Thursday, January 16, 2003, 4:00-5:00pm
Mathematics and Computer Science (MCS) Building, Room 149
111 Cummington Street, Boston

Tea and Cookies at 3:30pm in MCS 153

Abstract: The nonparametric multiscale algorithms presented here are powerful new tools for photon-limited signal and image denoising and Poisson inverse problems. Unlike traditional wavelet-based multiscale methods, these algorithms are both well suited to processing Poisson data and capable of preserving image edges. The recursive partitioning scheme underlying these methods is based on multiscale likelihood factorizations of the Poisson data model. These partitions allow the construction of multiscale signal decompositions based on polynomials in one dimension and multiscale image decompositions based on platelets in two dimensions. We originally developed platelets for medical image reconstruction problems, and more recently we have successfully applied them to problems in astronomical imaging. Platelets are localized functions at various positions, scales and orientations that can produce highly accurate, piecewise linear approximations to images consisting of smooth regions separated by smooth boundaries. Polynomial- and platelet-based maximum penalized likelihood methods for signal and image analysis are both tractable and computationally efficient. Simulations establish the practical effectiveness of these methods in applications such as Gamma Ray Burst intensity estimation and astronomical image reconstruction; statistical risk analysis establishes the theoretical near-optimality of these methods.

For directions and maps, please see *http://math.bu.edu/research/statistics/statseminar.html*. For other information, please contact Eric Kolaczyk (*kolaczyk@math.bu.edu*) or the main department office at (617)353-2560.