

STANFORD UNIVERSITY
DEPARTMENT OF STATISTICS
DEPARTMENTAL SEMINAR

4:15 p.m., Tuesday, January 27, 2004
Sequoia Hall Room 200
(Cookies at 3:45 in 1st Floor Lounge)

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**Multivariate Analysis of Infrared Spectral Maps to Detect
Cancer in Tissue Biopsies**

Abstract:

Infrared (IR) Spectroscopy is a well-established analytical method, in which infrared radiation causes molecules to access higher levels of vibrational excitation. In this process, distinct infrared spectra are produced for all molecular species.

Since IR spectra can be collected for as little as 10-10 gram of sample, it can be used to monitor the chemical composition of individual human cells, and compositional changes that may be caused by disease. In infrared spectral imaging, thousands of infrared spectra are collected for individual pixels of tissue, quite similar to digital imaging first introduced during LANDSAT observations. However, rather than imaging at a few discrete colors, in IR imaging the entire, continuous spectra are sampled.

Multivariate methods, in particular Principal Component Analysis (PCA) and Hierarchical Cluster Analysis (HCA) have been used to extract small, but reproducible spectral changes, and to obtain pseudo-color tissue images in a totally unsupervised fashion. Further developments include the use of trained, diagnostic algorithms, such as artificial neural nets, to obtain stable, reliable methods of medical diagnoses based on objective measurements and mathematical analysis.