STANFORD UNIVERSITY

DEPARTMENT OF STATISTICS

DEPARTMENTAL SEMINAR

4:15 p.m., Thursday, July 26, 2001
Sequoia Hall Rm. 200
(Cookies at 3:45 in 1st Floor Lounge)

Larry Shepp, Martin Lindquist
Department of Statistics
Rutgers University

Two Statistical Applications Yielding Basic Insights into Math

Two Statistical Applications Yielding Basic Insights into Math

Mathematical probability and statistics have engineering applications but things can work the other way as we will illustrate with two examples.

First LS will speak about a new model for wireless telephony: from each point (R, θ) of a two dimensional Poisson set a telephone signal, ϵ, is broadcast, independent for different points. The signal dies off with a power β (empirically β is between 3.5 and 3.9) of R and so the total noise due to all the signals at a base station, located at the origin is

$N = \sum \epsilon / R^{\beta}$

where the sum is taken over all the Poisson points. It is important to know the distribution of the noise N since one would like to know how much this will interfere with a given signal at a distance r. We will show N is always a stable random variable (provided the series converges) but N is never normal. If $R_1 < R_2 < ...$ are the distances of the nearest, second nearest, etc. Poisson points to 0 then the differences of the squares of R_n are iid exponential variables and this is the key property that makes N stable. This is joint work with Moe Win.

Then ML will speak about functional magnetic resonance imaging (fMRI) where prolate wavelets are used to trade spatial for temporal resolution which is important in studying higher cognition. An fMRI experiment conducted at Stanford last summer will be reviewed and discussed and the data presented.