STATISTICS DEPARTMENT SEMINAR

TITLE: **LOW DISCREPANCY POINTS FOR EXPERIMENTAL DESIGNS AND OPTION PRICING**

SPEAKER: Fred J. Hickernell
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TIME: 4:00 P.M.

DATE: Wednesday, November 14, 2007

ROOM: 140 BARDEEN

ABSTRACT:

A statistical or computational problem can be solved more efficiently when one uses a good design, i.e., the set of points where the underlying function is sampled. For example, in laboratory experiments the budget may allow for only tens of runs. The linear regression coefficients and the variance of the noise are approximated more efficiently using optimal designs. In computer experiments one wishes to estimate an unknown function, but in this case the budgeted number of observations may be in the hundreds or thousands. Instead of a parametric model, one might use a nonparametric model such as a (smoothing) spline. Noise in the observations may be negligible. Again, a good design facilitates a more accurate approximation. The price of an exotic option can be modeled as the average value of the random payoff, which reduces to a high dimensional integral. A design that samples the space of asset price paths evenly leads to more accurate option prices for a fixed budget of samples.

Quasi-Monte Carlo methods are based on designs that are low discrepancy point sets. The discrepancy is a Kolmogorov-Smirnov goodness of fit test for the empirical distribution function of the design. This talk explains why quasi-Monte Carlo methods are well suited for approximating functions in computer or laboratory experiments as well as for evaluating exotic option prices. Two common families of low discrepancy points, lattices and digital nets are described. These are generalizations of grids and orthogonal arrays but spread points more evenly.

Coffee and Cookies at 3:30 p.m. in Room 1210 MSC