

STANFORD UNIVERSITY
DEPARTMENT OF STATISTICS
DEPARTMENTAL SEMINAR

4:15 p.m., Tuesday, Feb 1, 2005
Sequoia Hall Room 200
(Cookies at 3:45 in 1st Floor Lounge)

Reuven Rubinstein
Industrial and Engineering Management Technion
Israel Institute of Technology

Monte-Carlo Simulation, Rare-Event Estimation and Combinatorial Optimization using The Cross-Entropy Method

Abstract:

The cross-entropy (CE) method is one of the most significant developments in the fields of Monte-Carlo simulation and simulation-based optimization in recent years. The former includes probabilities of rare event estimation in complex models, like in queuing models; estimation of normalization constant, like in Ising models; counting problems, like calculating the permanent; the latter includes approximating the optimal solution of combinatorial and multi-extremal problems, like of Markovian decision problems under uncertainty and machine learning. The CE method presents a simple generic adaptive procedure, where each iteration contains two phases: (a) generating a random data samples (trajectories, vectors, etc.) according to a specified probability distribution. (b) updating the parameters of the distributions associated with the data generated by the random mechanism in order to produce a "better" sample at the next iteration.

In this talk I present a tutorial on the CE, show how it solves some of the above mentioned problems and indicate how CE is related to Sequential Monte-Carlo, MCMC and Gibbs Sampler. More details can be found in www.cemethod.org.