STATISTICS COLLOQUIUM

WEDNESDAY, MAY 07, 2008
TALK: 4:00 PM — SCIENCE CENTER RM. 705
RECEPTION: 5:15 PM — SCIENCE CENTER, 7TH FLOOR

"Rare-event Simulation for Heavy-tailed Multi-server Queues"

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ABSTRACT

I will present the first provably efficient simulation algorithm for steady-state estimation of long delays in a positive recurrent two-server (G/G/2) queue with heavy-tailed service requirement. In such systems, long delays are usually caused by one or two customers (depending on the traffic intensity) who have extremely large service requirement and block the servers for long time. We propose a three-step program to design the algorithm and prove its efficiency. First, we adopt a mixture family of changes-of-measure; second, propose an appropriate Lyapunov inequality to control the variance of our estimator; third, construct a Lyapunov function (the solution to the Lyapunov inequality) and tune various parameters to verify the inequality. Because of the upper bound provided by the Lyapunov function, our method also suggests an asymptotic approximation of the rare-event probability. Therefore, rare-event simulation and large deviations analysis for heavy-tailed models are connected naturally. Our strategy including the mixture family, the construction of Lyapunov function, and proof techniques can solve a large class of problems. This talk is a natural extension of the work in Chapter four of my dissertation, which solves a similar problem for single-server queue.