

SEMINAR SERIES
Department of Quantitative Analysis and Operations Management
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Retrospective Methods for Stochastic Root Finding and Optimization

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A common situation in the simulation of stochastic systems is the need to determine system parameters to obtain a specified performance level (root finding) or to minimize or maximize performance level (optimization). The practitioner provides a simulation model that can estimate, for any specified system parameter values, the corresponding level of system performance. The research problem is to develop root finding and optimization algorithms that are guaranteed to converge and are computationally efficient without the need to "tune" the algorithm to a specific problem type.

Our approach is retrospective, based on solving stochastic counterparts (or sample-path approximations) to the problem of interest. We numerically solve, with improving error tolerances, a sequence of improving stochastic counterparts. The research is joint work with Huifen Chen (Da-Yeh University) and Jihong Jin (Purdue University).

We will discuss two examples. The first is a one-dimensional root-finding application at Thiokol Corporation, the manufacturer of the solid-fuel booster engines for the space shuttle. The problem is to find, in real time, design parameters to yield a specified reliability. The second example is a combinatorial optimization buffer-allocation problem, the topic of Song Foh Chew (and his advisor, Kevin Healy) in a recent M.S. thesis at Purdue.

Bruce Schmeiser is a professor in the School of Industrial Engineering at Purdue University. He received his Ph.D. from the School of Industrial and Systems Engineering at Georgia Tech in 1975, and was on Southern Methodist University's operations research faculty until joining Purdue in 1979. His undergraduate degree in the mathematical sciences and master's degree in industrial engineering are from The University of Iowa. From 1970 through 1972 he was a systems engineer with Electronic Data Systems.

Professor Schmeiser's research interests are the probabilistic and statistical aspects of digital-computer stochastic simulation, especially input modeling, random-variate generation, output analysis, variance reduction, and stochastic root finding and optimization. He has served in various service roles professional organizations, including InfORMS, the Winter Simulation Conference, Omega Rho, and the IIE.