

STATISTICS COLLOQUIUM

MONDAY, OCTOBER 18, 2010

TALK: 4:00 PM — SCIENCE CENTER RM. 309

RECEPTION: 5:15 PM — SCIENCE CENTER, 7TH FLOOR

“Designs for Complex System Simulations, Cross-validation and Stochastic Optimization”

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ABSTRACT

Complex simulations are becoming increasingly important for studying diverse phenomena such as climate change, oil spills, energy efficiency and city traffic. The trend of replacing physical experiments with computer simulations to save cost and time has accelerated recently, with great industrial and societal impacts. The prevailing statistical framework for design and analysis of complex simulations assumes that all the factors are quantitative. Motivated by a real problem from the IT industry for designing green data centers, we introduce a new type of design, called sliced space-filling design, intended for complex simulations with both qualitative and quantitative factors. Such a design achieves attractive stratification in low-dimensional projections, and can be sliced into groups corresponding to different level combinations of the qualitative factors in which the points in each group are evenly spread in the design space. Beyond computer simulations, it is appealing to use sliced space-filling designs to enhance sample average approximations for various stochastic optimization problems and to significantly reduce the variability of cross-validation in estimation of the error rate of a prediction rule, tuning parameter selection, bandwidth selection in kernel models and other estimation problems.