Optimal Designs and Prediction Methodologies for Computer Experiments

Prof. David M. Steinberg
Professor of Statistics, Department of Statistics and Operations Research
Chair of the School of Mathematical Sciences
Tel Aviv University, Israel

Date 3 July 2014 (Thursday)
Time 10:30am (Tea/Coffee service at 10:15am)
Venue B6619, 6/F, AC1

Abstract

Use of Gaussian processes is a popular approach to analyzing data from computer experiments. Combining more than one Gaussian process in a surrogate model for computer simulation could prove useful when there is uncertainty regarding the family of correlation functions, or when one wishes to characterize both global trends and finer details, all in the same model. One such option is to fit a model of the form $y(x) = \mu + pZ_1(x) + (1-p)Z_2(x)$, where $Z_1$ and $Z_2$ are independent stationary Gaussian processes whose correlation functions differ in scale parameters. We suggest a fully Bayesian treatment of the problem, taking advantage of MCMC sampling methods and providing point estimates and Bayesian credible intervals with a high degree of success, according to simulation results.

Strategic experimental design could prove to be crucial when data are hard to collect. We use the Karhunen–Loève decomposition to study several popular design criteria. The resulting expressions are useful for understanding and comparing the criteria. A truncated form of the expansion is used to generate optimal designs. We give detailed results, including an error analysis, for the well established integrated mean squared prediction error design criterion.
About the Speaker
Prof. Steinberg is a Professor of Statistics in the Department of Statistics and Operations Research at Tel Aviv University and Chair of the School of Mathematical Sciences there. His field of research specialization is the statistical design of experiments, including factorial experiments, Latin hypercubes, computer experiments, robust parameter design experiments and seismic networks. He has worked on numerous applications in a variety of fields. For 10 years he headed the Statistical Laboratory at Tel Aviv University and was a collaborator in a great deal of medical research in that capacity.

From 2008-2010 he served as Editor of the leading journal Technometrics (and as Editor-Elect during 2007). He is currently on the editorial boards of the Journal of Uncertainty Quantification and Quality Technology and Quantitative Management. He was Section Editor for Experimental Design for the Wiley Encyclopedia of Statistics in Quality and Reliability. He has served in the past as an Associate Editor for Technometrics and Applied Statistics. In 2013 he received the George Box Medal from the European Network for Business and Industrial Statistics.

Enquiry: 3442 8408

All are Welcome!