Astrophysical Population Emulation and Uncertainty Quantification Workshop
April 3-7, 2017

SPEAKER TITLES/ABSTRACTS

Derek Bingham
Simon Fraser University

"Design of Computer Experiments: Which simulations to run?"

Experiments on computer models to help understand physical systems are ubiquitous are science. Computer experiments differ from traditional experiments in that the simulators are frequently deterministic and, though computationally costly, are cheaper than performing filed trials. Similar to physical experiments, computer experiments are performed with a variety of goals in mind. Objectives include factor screening, building an efficient emulator, optimization and model calibration. This aim of this talk is to give an overview of some of the main issues and strategies for the design of computer experiments (i.e., selecting the suite of simulations to run to meet your goals).

"Tutorial: An introduction to computer model emulation - issues and advice"

There is a long history in the statistics literature of effectively using a Gaussian process emulator to model the output of a complex mathematical model. The use of the Gaussian process itself raises many important questions relating to the exact form of the GP model; which involves choosing a regression function and an appropriate correlation kernel. Additionally, there are important issues around quantifying various sources of uncertainty during the modelling process. In this talk, I will introduce the basic Gaussian process emulator, discuss the issues around exact form of the model and discuss how Bayesian methods can be used to account for various sources of uncertainty.

Earl Lawrence
Los Alamos National Laboratory

"Calibration - Combining models and data for predicting, parameter estimation and UQ"

Computational models are used throughout science as a way to explore physical systems.
Using field observations, in conjunction with computer models, presents opportunities to estimate parameters that govern the model's behaviour or to build a a predictive model that is better than using the observations or physics model alone. In this talk, a statistical framework for combining observations and simulations is presented. The approach - computer model calibration - treats the physics model parameters as a type of missing data. The inferential framework for parameter estimation, prediction and assessing uncertainty is described.