samsi
NSF·Duke·NCSU·UNC

Joint MUMS Program Transition - SPUQ Workshop
May 14-17, 2019
SPEAKER/ABSTRACT

Pierre Barbillon, AgroParis Tech

"Embedding a Discrepancy in the Computer Model"

Abstract:
In spite of the increasing complexity of computer models, they may still fail to perfectly represent real systems. Many works advocate for modeling the reality as the computer model corrected by an additive discrepancy function. When the computer model is derived from ordinary differential equations (ODE), another approach consists in embedding the discrepancy model inside the computer model through a stochastic relaxation which turns the ODE into Stochastic Differential Equations (SDE). We will explore this idea on two computer models: a failure model and mass-spring-damper system.

"Variable Selection in the Discrepancy Function Associated with a Simulator"

Abstract:
A statistical model which links field experiments with a simulator usually embeds a discrepancy function. The discrepancy function models the systematic gap between the simulator and the real system. Analyzing the discrepancy should help to understand to what extent the simulator is reliable. In particular, determining that some variables are active or inert in the discrepancy function is of major interest since it indicates which variables are correctly modeled or not by the simulator. Therefore, this could give some leads to improve the simulator and help to determine if extrapolation is safe or not with respect to a specific input.

The discrepancy function is modeled as a Gaussian process which is parametrized as in Linkletter et al. (2006). This parametrization provides a simple distinction between active and inert variables. The variable selection is performed through a model selection where the models in competition differ on the prior distribution considered for the parameter associated with the variables in the Gaussian process.

We resort to computations of Bayes factors by using a bridge sampling to perform the model selection. Contrasted synthetic examples are considered to support the proposed technique.

Joint work with Rui Paulo (Universidade de Lisboa) and Anabel Forte (Universitat de Valencia)