samsi
NSF·Duke·NCSU·UNC

Optimization Program Inverse Problems Workshop
January 26-27, 2017

Lecture: *Goal-Oriented Optimal Experimental Design*

Speaker: Ahmed Attia

Abstract:

Computer models play an essential role in forecasting complicated phenomena such as the atmosphere, ocean dynamics, volcanic eruptions among others. These models however are usually imperfect due to various sources of uncertainty. Measurements are snapshots of reality that are collected as an additional source of information. Parameter inversion and data assimilation are means to fusing information obtained from measurement, model, prior knowledge, and other available sources to produce reliable and accurate description (the analysis) of the underlying physical system. The accuracy of the analysis is greatly influenced by the quality of the observational grid design used to collect measurements. Sensor placement can be viewed as optimal experimental design (OED) problem, where the locations of the sensors define an experimental design. There are many criteria for choosing an optimal experimental design, such as minimization of the uncertainty in the output (e.g., minimization of the trace of the posterior covariance). Including the end-goal (predictions) in the experimental design leads to a goal-oriented OED approach that can be used in several applications. In this talk, we outline the idea of goal-oriented optimal design of experiments for PDE based Bayesian linear inverse problems with infinite-dimensional parameters.