



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

William Welch, City University of British Columbia
"Dimensional Analysis in Computer Experiments"

Abstract:

Dimensional analysis pays attention to the units of measurement when modeling scientific and engineering systems. It goes back at least a century (Buckingham, 1914) but has recently caught the attention of statisticians for statistical modeling, particularly in design of experiments (e.g., Shen, Davis, Lin, and Nachtsheim, 2014; Shen, Lin, and Chang 2017; Shen and Lin, 2018). Advantages have been demonstrated for both traditional physical experiments and computer experiments. The basic idea is to analyze in terms of more fundamental dimensionless quantities derived from the original variables, and possibly design for them too. With the "right" variables, prediction accuracy will hopefully improve. While these goals make much sense for scientific applications and statistical modeling, implementation of dimensional analysis is far from straightforward; choosing the derived quantities is particularly problematic. Empirical approaches to finding "good" derived variables in computer experiments will be described, based on the ongoing PhD thesis of G. Alexi Rodr -guez-Arelis. Tentatively, an application to storm surge in collaboration with Whitney Huang will be used for illustration too.