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

Rebecca Morrison, MIT
"Representing Model Inadequacy in Reduced Models of Interacting Systems"

Abstract:
In many applications of interacting systems, we are only interested in the dynamic behavior of a subset of all possible active species. For example, this is true in combustion models (many transient chemical species are not of interest in a given reaction) and in epidemiological models (only certain critical populations are truly consequential). Thus it is common to use greatly reduced models, in which only the interactions among the species of interest are retained. However, reduction introduces a model error, or inadequacy, which typically is not well characterized. In this talk, I explore the use of an embedded and statistically calibrated inadequacy operator to represent model error. The operator is constrained by available physical information and embedded within the differential equations of the model. Both the reduced and operator models are also designed to respect what I call *species correspondence, i.e.,* that the model outputs of the reduced and operator models correspond to the species of the original model. This design of an augmented, yet physically realistic, model is intended to allow for reliable predictions under extrapolative conditions---in, for example, time or scenario parameters.