

Wu, Chien-Fu Jeff (Georgia Institute of Technology, USA) and Z. Qian
Bayesian Hierarchical Modeling for Integrating Low-Accuracy and High-Accuracy Experiments

Abstract: Standard practice in analyzing data from different types of experiments is to treat data from each type separately. By borrowing strength across multiple sources, an integrated analysis can produce better results. Careful adjustments need to be made to incorporate the systematic differences among various experiments. To this end, some Bayesian hierarchical Gaussian process models (BHGP) are proposed. The heterogeneity among different sources is accounted for by performing flexible location and scale adjustments. The approach tends to produce prediction closer to that from the high-accuracy experiment. The Bayesian computations are aided by the use of Markov chain Monte Carlo and Sample Average Approximation algorithms. The proposed method is illustrated with two examples: one with detailed and approximate finite elements simulations for mechanical material design and the other with physical and computer experiments.