Bayesian Mixture of Gaussian Processes for Deterministic Computer Experiments

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Use of Gaussian processes is a popular approach to analyzing data from computer experiments. Combining more than one Gaussian process in a surrogate model for computer simulation could prove useful when there is uncertainty regarding the family of correlation functions, or when one wishes to characterize both global trends and finer details, all in the same model. One such option is to fit a model of the form $Y(x) = \mu + pZ_1(x) + (1-p) Z_2(x)$, where Z_1 and Z_2 are independent stationary Gaussian processes whose correlation functions differ in scale parameters.

We suggest a fully Bayesian treatment of the problem, taking advantage of MCMC sampling methods and providing point estimates and Bayesian credible intervals with a high degree of success, according to simulation results.