Sparse Bayesian Kernel Techniques for the Solution of SPDEs

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The sparse grid method has been widely utilized in uncertainty propagation problems of SPDEs with well known limitations. As the need for of alternative approaches is evident, we investigate the performance of sparse Bayesian kernel techniques to the problem. The variational approximation to Bayesian model selection is employed in order to adaptively identify the best kernels from a pool of available ones as well as estimate their missing parameters. The informational content of the stochastic space is characterized by the predictive variance. This allows us to devise an iterative scheme that selects highly informative data points thus minimizing the calls to the finite element deterministic solver.