Sparse, Adaptive Quadrature Methods for Bayesian Inverse Problems of Parametric Operator Equations

Christoph Schwab, ETH

We present sparsity theory for PDEs with uncertain input parameters, related to recently developed, deterministic, high-order Quasi-Monte Carlo quadratures; specifically, we consider higher-order, interlaced polynomial lattice rules.

Admissible problems include (linear or semilinear) elliptic or parabolic partial differential equations with uncertain parameters, shape uncertainty and the corresponding Bayesian inverse problems.

A parametrization of the distributed uncertainty reduces the computational problem to an ntegration problem over infinite-dimensional parameter spaces. Based on a holomorphy condition on the parametric dependence, we present regularity estimates for the parametric integrand functions and for uniform prior measure on the parameter uncertainty.

Work supported by the European Research Council (ERC) under FP7 Grant AdG247277.

Joint w. Robert Gantner (ETH), Josef Dick, F. Kuo and Th. LeGia (UNSW)