ADAPTIVE STOCHASTIC GALERKIN FINITE ELEMENT METHODS

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Parametric partial differential equations (PDEs) arise in several contexts, e.g., in optimization problems and in mathematical models with inherent uncertainties. In such PDEs, the differential operators usually depend on large, possibly infinite, sets of parameters, so that naive applications of standard numerical methods often lead to the so-called 'curse of dimensionality', a deterioration of the convergence rates and an exponential growth of the computational cost as the dimension of the space increases. In this talk, we give an overview of a specific numerical method for solving such PDEs, namely of the stochastic Galerkin finite element method (sGFEM). First, we consider the numerical approximation of a class of parametric elliptic boundary value problems and introduce a first (so-called 'single-level') version of the scheme. Then, we discuss some of our recent results on *a posteriori* error estimation, adaptivity, and 'multi-level' sGFEM, and show that the proposed approaches help to mitigate (or even avoid) the curse of dimensionality. This is joint work with Dirk Praetorius (TU Wien), Alex Bespalov and Leonardo Rocchi (University of Birmingham).