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DK Seminar

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Adaptive algorithms for high-dimensional parametric PDEs

Parametric PDEs are typical in optimisation problems and in mathematical models with inherent uncertainties (e.g., groundwater flow models). Differential operators in such PDEs depend on a large, possibly infinite, number of parameters, and naive application of numerical methods often results in the “curse of dimensionality”. In this talk, we focus on a specific numerical method for solving such PDEs, namely on the stochastic Galerkin finite element method, for which we present an efficient adaptive algorithm. In this algorithm, we use an adaptive strategy to “build” a polynomial space over a low-dimensional manifold in the infinitely-dimensional parameter space so that the total discretisation error is reduced most effectively, and thus the “curse of dimensionality” is avoided.