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SEMINAR OF NUMERICAL ANALYSIS

➤ **TUESDAY 24 OCTOBER 2017 - ROOM GR A3 32 - 16:15**

Dr Peter ZASPEL (Mathematics Institute, Basel - CH) will present a seminar entitled:

« Optimal-complexity kernel-based stochastic collocation with applications in fluid mechanics »

Abstract:

In this talk, the solution of partial differential equations (PDEs) with random input by means of kernel-based stochastic collocation is considered. Kernel-based stochastic collocation uses mesh-less (RBF) kernel-based function approximation in the stochastic parameter(s) and combines high-order algebraic or even exponential convergence rates of spectral (sparse) tensor-product methods with optimal pre-asymptotic convergence of kriging and the profound stochastic framework of Gaussian process regression. The focus is on problems of "large scale", that is, either each solve of the underlying deterministic PDE is very expensive or a rather high amount of solves of a computationally inexpensive PDE has to be made in order to resolve the stochastics. This condition imposes high requirements on the complexity of the linear solvers.

Therefore, algebraic multigrid for the PDE part and hierarchical matrices and preconditioning techniques for the stochastic part are considered. As model problems, the solution of an elliptic problem with random coefficients and the expensive three-dimensional two-phase Navier-Stokes equations with random input are discussed. An empirical error analysis will be presented. It allows to give hints on the required work to achieve a given target error, even if no numerical analysis for a given PDE exists. Finally, a brief remark will be made on the parallel implementation on many-core processors in HPC clusters.

Lausanne, 18 September 2017/FN/rb