

SEMINAR OF APPLIED MATHEMATICS

TUESDAY 10 March 2015 at 15h15, lecture hall BI A0 448 (CIB)

Prof. **Markus BACHMAYR** (*Université Pierre et Marie Curie Paris 6*)
will present a seminar entitled:

"Low-Rank Approximations for High-Dimensional Problems: Error Estimates and Algorithms"

Abstract:

In the numerical treatment of high-dimensional operator equations by separable approximations, there have been substantial recent advances concerning tensor representations that can be regarded as higher-dimensional generalizations of the singular value decomposition. The contributions presented in this talk address the theoretically possible efficiency of such approximations for certain problem classes as well as their practical numerical computation.

We consider two types of high dimensional problems: on the one hand, multiparametric differential equations, where the solution can be regarded as a function depending on spatial and on parametric variables; and on the other hand, high-dimensional elliptic equations (for instance, the Poisson equation on a high-dimensional unit cube), where all variables play the same role.

The first part of the talk is concerned with error estimates for low-rank approximation. In particular, we focus on estimates of Kolmogorov n -widths of solution manifolds of diffusion equations with several parameters. This allows conclusions concerning the performance that can be achieved by model reduction based on the reduced basis method.

In the second part of the talk, we turn to iterative numerical methods for finding low-rank approximations in hierarchical tensor formats. A crucial problem is here to ensure convergence to the exact solution while keeping the arising tensor ranks of iterates under control. For an iterative scheme based on soft thresholding of tensor representations, we show convergence with quasi-optimal bounds on the ranks of all iterates.

This talk is based on joint projects with Albert Cohen and with Reinhold Schneider.

Lausanne, March 6, 2015 / mg