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"Efficient Analysis of High Dimensional Data in Tensor Formats"

Abstract:
In this article we introduce new methods for the analysis of high dimensional data in tensor formats, where the underling data come from the stochastic elliptic boundary value problem. After discretisation of the deterministic operator as well as the presented random fields via KLE and PCE, the obtained high dimensional operator can be approximated via sums of elementary tensors. This tensors representation can be effectively used for computing different values of interest, such as maximum norm, level sets and cumulative distribution function. The basic concept of the data analysis in high dimensions is discussed on tensors represented in the canonical format, however the approach can be easily used in other tensor formats. As an intermediate step we describe efficient iterative algorithms for computing the characteristic and sign functions as well as pointwise inverse in the canonical tensor format. Since during majority of algebraic operations as well as during iteration steps the representation rank grows up, we use lower-rank approximation and inexact recursive iteration schemes. This is joint work with Mike Espig, Wolfgang Hackbusch, Hermann G. Matthies and Elmar Zander.