

Low-rank methods for the solution of PDEs in Isogeometric Analysis

M. Montardini

Università degli studi di Pavia, Dipartimento di Matematica, Pavia, Via Ferrata 5, Italy
e-mail: monica.montardini@unipv.it

ABSTRACT

Similarly to other numerical methods to solve PDEs, Isogeometric Analysis suffers from the so-called curse of dimensionality, i.e. memory storage and computational effort grow exponentially with respect to the problem's dimension. In this talk we present low-rank techniques that can overcome those issues.

We first give an introduction on tensors, tensor formats and the techniques used to store these objects efficiently. Then we introduce Isogeometric Analysis and how to exploit tensor decomposition in this context. In particular, we approximate the non-tensor product coefficients with the sum of few Kronecker-product functions, and thus the linear system matrix results in the sum of few Kronecker-product matrices. This yields a small memory footprint and cost for matrix products. A suited linear solver and associated preconditioner are essential for the good behavior of the method and they are presented in the last part of this talk.