Johann Radon Institute for Computational and Applied Mathematics Austrian Academy of Sciences (ÖAW)

Group Seminar

Computational Methods for PDEs & Geometry in Simulations

Best approximation spaces of a given dimension

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Abstract

In this talk we provide a priori error estimates in standard Sobolev norms for approximation in spline spaces of maximal smoothness on arbitrary grids. The error estimates are expressed in terms of a power of the maximal grid spacing, an appropriate derivative of the function to be approximated, and an explicit constant. We further show that for certain reduced spline spaces the obtained constants equal the n-width, which implies that (i) these constants are sharp and (ii) the reduced spline spaces are optimal for the n-width problem, i.e. they provide the "best possible approximation". The results of this talk can be used to theoretically explain the benefits of spline approximation under k-refinement by isogeometric discretization methods. They also form a theoretical foundation for the outperformance of smooth spline discretizations of eigenvalue problems that has been numerically observed in the literature, and for optimality of geometric multigrid solvers in the isogeometric analysis context.