Einladung

Würzburger Mathematisches Kolloquium

Julius-Maximilians-Universität Würzburg • Institut für Mathematik

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Harmonic Analysis meets Applications: Wavelet-based Function Spaces and Optimal Approximations of their Embeddings

Dienstag, 07. November • 14:15 Uhr

Seminarraum SE41 • Forschungsbau (Emil-Fischer-Straße 41, 97074 Würzburg)

Der Vortrag wird auch Zoom-Meeting übertragen: go.uniwue.de/ifmcolloquium-zoom

Abstract. As a rule of thumb in approximation theory, the asymptotic speed of convergence of numerical algorithms is governed by the regularity of the objects we like to approximate. Besides classical isotropic Sobolev smoothness, in the last decades the notion of so-called dominating- mixed regularity of functions turned out to be an important concept in numerical analysis. Indeed, it naturally arises in high-dimensional real-world applications, e.g., related to the electronic Schrödinger equation. Although optimal approximation rates for embeddings within the scales of isotropic or dominating-mixed L_p-Sobolev spaces are well-understood, not that much is known for embeddings across those scales (break-of-scale embeddings).

In this lecture, we first review the Fourier analytic approach towards by now well-established (Besov and Triebel-Lizorkin) scales of distribution spaces that measure either isotropic or dominating-mixed regularity. In addition, we introduce new function spaces of hybrid smoothness which are able to simultaneously capture both types of regularity at the same time. As a further generalization of the aforementioned scales, they particularly include standard Sobolev spaces on domains. On the other hand, our new spaces yield an appropriate framework to study break-of-scale embeddings by means of harmonic analysis. We shall present (non-)adaptive wavelet-based multiscale algorithms that approximate such embeddings at optimal dimension-independent rates of convergence. Important special cases cover the approximation of functions having dominating-mixed Sobolev smoothness w.r.t. L_p in the norm of the (isotropic) energy space H^1.

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