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Hyperbolic wavelet analysis of classical anisotropic function spaces

In this talk we introduce new function spaces which we call anisotropic hyperbolic Besov and Triebel-Lizorkin spaces. Their definition is based on a hyperbolic Littlewood-Paley analysis involving an anisotropy vector only occurring in the smoothness weight. These new spaces provide a general setting in order to understand what kind of anisotropic smoothness can be described using the hyperbolic (also called tensor-product) wavelets. One of the main results is a characterization of these spaces using the hyperbolic wavelet transform. Note, that hyperbolic wavelets are usually used to characterize spaces of dominating mixed smoothness. In addition, we study the link between these spaces and the classical anisotropic Besov-Triebel-Lizorkin spaces. Surprisingly, both approaches to resolve an anisotropy coincide in the Sobolev case. This observation, in turn, provides a new characterization of classical anisotropic Sobolev spaces using a universal hyperbolic wavelet basis. That allows for detecting a classical anisotropy by analyzing hyperbolic wavelet coefficients since we do not need a priori knowledge on the anisotropy for constructing the wavelet basis. This is joint work with Beatrice Vedel (Vannes).