

Shearlets: Multiscale Geometric Analysis using a Wavelet-Based Approach

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In data analysis, one main focus of current research is on the development of directional representation systems which precisely detect orientations of singularities like edges in a 2-D image while providing optimally sparse representations. The shearlet systems are the first directional representation systems, which not only possess those properties, but are moreover equipped with a rich mathematical structure similar to wavelets.

In this talk we will first give an introduction into the theory of shearlets. We will present the main properties of both the continuous and discrete shearlet transform, thereby in particular illustrating the detection of orientations and emphasizing the usefulness of the structural similarity to wavelets. We will then discuss some very recent results on improving the accuracy of the shearlet transform, on Banach spaces associated with the decay of the shearlet coefficients, and on shearlet subdivision schemes aiming at a fast algorithm for shearlet decomposition using FIR-filters.