GITTA KUTYNIOK, University of Osnabrueck
Geometric Separation by Single-Pass Alternating Thresholding

Modern data is customarily of multimodal nature, and analysis tasks typically require separation into the single components such as, for instance, in neurobiological imaging a separation into spines (pointlike structures) and dendrites (curvilinear structures). Although a highly ill-posed problem, inspiring empirical results show that the morphological difference of these components sometimes allows a very precise separation.

In this talk we will present a theoretical study of the separation of a distributional model situation of point- and curvilinear singularities exploiting a surprisingly simple single-pass alternating thresholding method applied to wavelets and shearlets as two complementary frames. Utilizing the fact that the coefficients are clustered geometrically in the chosen frames, we prove that at sufficiently fine scales arbitrarily precise separation is possible. Surprisingly, it turns out that the thresholding index sets even converge to the wavefront sets of the point- and curvilinear singularities in phase space and that those wavefront sets are perfectly separated by the thresholding procedure. Main ingredients of our analysis are the novel notion of cluster coherence and a microlocal analysis viewpoint.

This is joint work with David Donoho (Stanford U.).