

A Bouquet of Shearlets

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April 18, 2019

In this talk, I will present three different ideas of generalizations of shearlets. Firstly, shearlets are only defined for scalar-valued functions $f : \mathbb{R}^2 \rightarrow \mathbb{R}$. In order to analyze flow fields, colored images or other vector-valued signals $f : \mathbb{R}^2 \rightarrow \mathbb{R}^d$, however, a vector-valued shearlet is necessary. I will show two different definitions one can make and an application to denoising of RGB colored images. Secondly, I will show a few ideas I summarize under the term *deeplets*, which shall lead to decompositions of images in a hierarchical, non-linear way analogous to deep neural networks. This structure, however, would allow for visualizations of what each neuron “sees” for a given input via shearlet reconstructions. Moreover, it would be more accessible to theoretical analysis. Thirdly, I present the preliminary concept of *iso-shearlets*. Such a frame would contain all shearlets of a regular shearlet frame, as well as linear combinations of those. That is, the frame contains the parabolic, but also isotropic scalings of the mother shearlet. Advantages would be a bigger frame with better approximation properties in practice compared to regular shearlets with little computational overhead, and possibly a definition of a multiresolution analysis.