A Variational Approach to the Wavelet Denoising Problem

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Thresholding estimators in an orthonormal wavelet basis are well established tools for Gaussian noise removal. However, the threshold choice \( \lambda = \sigma \sqrt{(2\log N)} \) suggested by Donoho and Johnstone, implies the knowledge of the variance \( \sigma^2 \) of the noise.

In this talk we consider the denoising problem as a variational problem, whose solution can be formulated in terms of wavelet shrinkage, and we propose a new choice of the shrinkage parameter. This is obtained by using, in the wavelet domain, a numerical method which is widely used for the selection of the regularization parameter in the solution of discrete ill-posed problems.

Experimental results show that this new choice of the shrinkage parameter yields better results then Donoho and Johnstone VisuShrink procedure, even if the variance of the noise is supposed not known.