Total Variation Dictionary Model and Dictionary Learning for Image Recovery

Tieyong Zeng
Hong Kong Baptist University

Abstract: Image restoration plays an important role in image processing, and numerous approaches have been proposed to tackle this problem. This talk presents a modified model for image restoration, that is based on a combination of Total Variation (TV) and Dictionary approaches. Since the well-known TV regularization is non-differentiable, the proposed method utilizes its dual formulation instead of its approximation in order to exactly preserve its properties. The data-fidelity term combines the one commonly used in image restoration and a wavelet thresholding based term. Then the resulting optimization problem is solved via a first-order primal-dual algorithm. Numerical experiments demonstrate the good performance of the proposed model. Moreover, we replace the classical TV by the nonlocal TV regularization, which results in a much higher quality of restoration. We then turn to the dictionary learning problem for image recovery. Various numerical results on non-Gaussian noises and image decompression illustrate the superior performance of our approach.