SPARSITY-INDUCING NON-CONVEX NON-SEPARABLE REGULARIZATION FOR CONVEX IMAGE PROCESSING

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A popular strategy for determining solutions to linear least-squares problems relies on using sparsity-promoting regularizers and is widely exploited in image processing applications such as, e.g., image denoising, deblurring and inpainting. It is well known that, in general, non-convex regularizers hold the potential for promoting sparsity more effectively than convex regularizers such as, e.g., those involving the ℓ_1 norm. To avoid the intrinsic difficulties related to non-convex optimization, the Convex Non-Convex (CNC) strategy has been proposed [2, 1], which allows the use of non-convex regularization while maintaining convexity of the total objective function. In this talk, a unified CNC variational model is proposed, based on a more general parametric non-convex non-separable regularizer. A primal-dual forward-backward splitting algorithm is proposed for solving the related saddle-point problem. Numerical experiments related to image deblurring, denoising and inpainting are presented which prove the effectiveness of the proposed approach.

References

[1] A. Lanza, S. Morigi, I. Selesnick, F. Sgallari, *Nonconvex nonsmooth optimization via convex-nonconvex majorization-minimization*, Numerische Mathematik, 136(2) (2017), pp. 343–381.

[2] A. Lanza, S. Morigi, F. Sgallari, *Convex Image Denoising via Non-convex Regularization with Parameter Selection*, Journal of Mathematical Imaging and Vision, (56)2 (2016), pp.195–220.