

A SPECTRAL PALM ALGORITHM FOR DICTIONARY LEARNING

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Dictionary Learning (DL) is one of the leading sparsity promoting techniques in the context of image classification, where the "dictionary" matrix D of images and the sparse matrix X are determined so as to represent a redundant image dataset. The resulting constrained optimization problem is nonconvex and non-smooth, providing several computational challenges for its solution. To preserve multidimensional data features, various tensor DL formulations have been introduced, adding to the problem complexity. We present a new alternating algorithm for the solution of the DL problem both in the matrix and tensor frameworks; in the latter case a new formulation based on Tensor-Train decompositions is also introduced. The new method belongs to the Proximal Alternating Linearized Minimization (PALM) algorithmic family, with the inclusion of second order information to enhance efficiency. The numerical performance of the new method will be discussed on the image classification of several benchmark datasets.

This is joint work with Valeria Simoncini and Domitilla Brandoni (Department of Mathematics, University of Bologna).

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