On the Sparse and Low Rank Decomposition of a Matrix: Strategies for Handling the Problem and Applications

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Resumo/Abstract:
This work addresses the problem of decomposing a given matrix into a sparse and a low rank components. This type of decomposition appears in the applied context of video surveillance, face recognition and latent semantic indexing, for example. It can be modeled as a non-smooth optimization problem in which the objective function is a weighted combination between the componentwise norm one of the sparse component and the nuclear norm of the low rank component, subject to the sum of the two components being the given matrix. We have proposed two distinct approaches for solving the unconstrained reformulation of the problem. The first involves the smoothing of the two terms of the objective function and the use of a limited memory quasi-Newton strategy, combined with a homotopic adjustment of the smoothing control parameter. The second consists of the smoothing of the term with the norm one, together with a proximal strategy for the term of the nuclear norm. Comparative numerical experiments illustrate and contextualize the usage of both approaches.