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Low Rank Matrix Completion Using Truncated Nuclear Norm and Sparse Regularizer

Jing Dong^{1,*}, Zhichao Xue¹, Jian Guan², Zi-Fa Han³, Wenwu Wang⁴

Abstract

Matrix completion is a challenging problem with a range of real applications. Many existing methods are based on the low-rank prior of the underlying matrix. However, this prior may not be sufficient to recover the original matrix from its incomplete observations. In this paper, we propose a novel matrix completion algorithm by employing the low-rank prior and a sparse prior simultaneously. Specifically, the matrix completion task is formulated as a rank minimization problem with a sparse regularizer. The low-rank property is modeled by the truncated nuclear norm to approximate the rank of the matrix, and the sparse regularizer is formulated as an ℓ_1 -norm term based on a given transform operator. To address the raised optimization problem, a method alternating between two steps is developed, and the problem involved in the second step is converted to several subproblems with closed-form solutions. Experimental results show the effectiveness of the proposed algorithm and its better performance as compared with the state-of-the-art matrix completion algorithms.

Keywords: Matrix completion; Low rank; Truncated nuclear norm; Sparse representation

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