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Jing Dong, Zhichao Xue, Jian Guan, Zi-Fa Han, Wenwu Wang

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Low Rank Matrix Completion Using Truncated Nuclear Norm and Sparse Regularizer

Jing Dong[1,*], Zhichao Xue[1], Jian Guan[2], Zi-Fa Han[3], Wenwu Wang[4]

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

*Corresponding author.

[1]J. Dong and Z. Xue are with the College of Electrical Engineering and Control Science, Nanjing Tech University, Nanjing, Jiangsu, China. (emails: jingdong@njtech.edu.cn, xuezhichao@njtech.edu.cn).

[2]J. Guan is with the Computer Application Research Center, Harbin Institute of Technology, Shenzhen, China. (email: j.guan@cs.hitsz.edu.cn).

[3]Z.-F. Han is with the Central Research Institute, 2012Labs, Huawei Technologies, Co., Ltd. (email: zifahan@gmail.com).

[4]W. Wang is with the Centre for Vision, Speech and Signal Processing, University of Surrey, Guildford GU2 7XH, U.K. (email: w.wang@surrey.ac.uk).