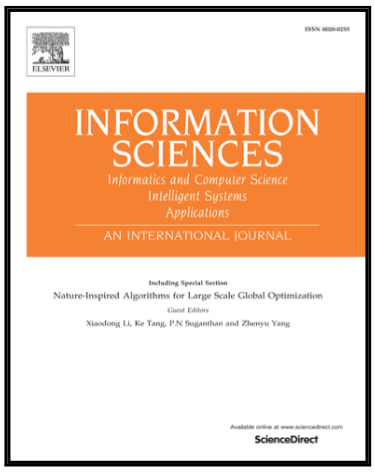

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A Multi-objective Memetic Algorithm for Low Rank and Sparse Matrix Decomposition

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Abstract

Low rank and sparse matrix decomposition is increasingly concerned in many research fields for its particular properties in exploring local and global components. The objective of this problem consists of two conflicting terms, the low rank term and the sparse term, most of the previous methods combine these two terms into a scalar objective with weight parameter. However, the preset of weight parameter is a difficult task because any priori knowledge about two terms is unavailable before optimization. In this paper, we establish a singular value encoding based multi-objective low rank and sparse matrix decomposition model. Two conflicting objectives are constructed to find the low rank and sparse components of the given data matrix. A novel multi-objective memetic algorithm, which encodes the singular value of the low rank matrix, is proposed to minimize two objectives simultaneously. The proposed method can obtain a series of different trade-off solutions between low rank and sparse components, and decision makers can choose satisfying solution from them directly. The experimental results demonstrate that the proposed method is effective and has better performance than some existing approaches in terms of the decomposition accuracy and the diversity of solutions.

Keywords: Matrix decomposition, multi-objective optimization, low rank, sparse, singular value.