Generalized Nonconvex Low-Rank Tensor Approximation for Multi-View Subspace Clustering

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Source IEEE TRANSACTIONS ON IMAGE PROCESSING

Volume: 30 Page: 4022-4035

DOI: 10.1109/TIP.2021.3068646

Published 2021

Indexed 2021-05-06

Document Type Article

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Abstract The low-rank tensor representation (LRTR) has become an emerging research direction to boost the multi-view clustering performance. This is because LRTR utilizes not only the pairwise relation between data points, but also the view relation of multiple views. However, there is one significant challenge: LRTR uses the tensor nuclear norm as the convex approximation but provides a biased estimation of the tensor rank function. To address this limitation, we propose the generalized nonconvex low-rank tensor approximation (GNLTA) for multi-view subspace clustering. Instead of the pairwise correlation, GNLTA adopts the low-rank tensor approximation to capture the high-order correlation among multiple views and proposes the generalized nonconvex low-rank tensor norm to well consider the physical meanings of different singular values. We develop a unified solver to solve the GNLTA model and prove that under mild conditions, any accumulation point is a stationary point of GNLTA. Extensive experiments on seven commonly used benchmark databases have demonstrated that the proposed GNLTA achieves better clustering performance over state-of-the-art methods.

Keywords **Author Keywords:** Tensors; Correlation; Sparse matrices; Clustering methods; Task analysis; Estimation; Pairwise error probability; Multi-view clustering; nonconvex low-rank tensor approximation; spectral clustering; subspace clustering

Keywords Plus: REPRESENTATION

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Categories/ Classification

Research Areas: Computer Science; Engineering

Citation Topics: 4 Electrical Engineering, Electronics & Computer Science › 4.17 Computer Vision & Graphics › 4.17.118 Face Recognition

Web of Science Categories Computer Science, Artificial Intelligence; Engineering, Electrical & Electronic

Funding

Funding agency	Grant number
National Natural Science Foundation of China (NSFC)	62071142
Science and Technology Development Fund, Macau SAR	189/2017/A3
University of Macau	MYRG2018-00136-FST

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Journal information

IEEE TRANSACTIONS ON IMAGE PROCESSING

ISSN 1057-7149

eISSN 1941-0042

Current Publisher IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC, 445 HOES LANE, PISCATAWAY, NJ 08855-4141

Journal Impact Factor Journal Citation Reports™

Research Areas Computer Science; Engineering

Web of Science Categories Computer Science, Artificial Intelligence; Engineering, Electrical & Electronic

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Journal Citation Indicator ™ (2022)

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