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

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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
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