Low-Rank Tensor Graph Learning for Multi-View Subspace Clustering

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IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY

Volume: 32 **Issue:** 1 **Page:** 92-104

DOI: 10.1109/TCSVT.2021.3055625

Published: JAN 2022

Indexed: 2022-01-21

Document Type: Article

Abstract

Graph and subspace clustering methods have become the mainstream of multi-view clustering due to their promising performance. However, (1) since graph clustering methods learn graphs directly from the raw data, when the raw data is distorted by noise and outliers, their performance may seriously decrease; (2) subspace clustering methods use a "two-step" strategy to learn the representation and affinity matrix independently, and thus may fail to explore their high correlation. To address these issues, we propose a novel multi-view clustering method via learning a Low-Rank Tensor Graph (LRTG). Different from subspace clustering methods, LRTG simultaneously learns the representation and affinity matrix in a single step to preserve their correlation. We apply Tucker decomposition and l(2,1)-norm to the LRTG model to alleviate noise and outliers for learning a "clean" representation. LRTG then learns the affinity matrix from this "clean" representation. Additionally, an adaptive neighbor scheme is proposed to find the K largest entries of the affinity matrix to form a flexible graph for clustering. An effective optimization algorithm is designed to solve the LRTG model based on the alternating direction method of multipliers. Extensive experiments on different clustering tasks demonstrate the effectiveness and superiority of LRTG over seventeen state-of-the-art clustering methods.

Keywords

Author Keywords: Multi-view clustering; low-rank; tensor approximation; graph learning

Keywords Plus: DIMENSIONALITY REDUCTION; MODELS

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Categories/Classification

Research Areas: Engineering

International Patent Classification *From Inspec®*

Subject Classification codes *From Inspec®*

CODEN *From Inspec®*

Controlled Terms *From Inspec®*

Uncontrolled Terms *From Inspec®*

Funding

Funding agency	Grant number
Science and Technology Development Fund, Macau SAR	189/2017/A3
University of Macau	MYRG2018-00136-FST

Funding Table

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Journal information

IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY

ISSN: 1051-8215
eISSN: 1558-2205
Current Publisher: IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC, 445 HOES LANE, PISCATAWAY, NJ 08855-4141
Journal Impact Factor: Journal Citation Report ™
Research Areas: Engineering
Web of Science Categories: Engineering, Electrical & Electronic

4.685
Journal Impact Factor ™ (2020)

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