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Subspace clustering using a low-rank constrained autoencoder. (English) [Zbl 1436.68319]

Summary: The performance of subspace clustering is affected by data representation. Data representation
for subspace clustering maps data from the original space into another space with the property of bet-
ter separability. Many data representation methods have been developed in recent years. Typical among
them are low-rank representation (LRR) and an autoencoder. LRR is a linear representation method that
captures the global structure of data with low-rank constraint. Alternatively, an autoencoder nonlinearly
maps data into a latent space using a neural network by minimizing the difference between the recon-
struction and input. To combine the advantages of an LRR (globality) and autoencoder (self-supervision
based locality), we propose a novel data representation method for subspace clustering. The proposed
method, called low-rank constrained autoencoder (LRAE), forces the latent representation of the neural
network to be of low rank, and the low-rank constraint is computed as a prior from the input space.
One major advantage of the LRAE is that the learned data representation not only maintains the local
features of the data, but also preserves the underlying low-rank global structure. Extensive experiments
on several datasets for subspace clustering were conducted. They demonstrated that the proposed LRAE
substantially outperformed state-of-the-art subspace clustering methods.

MSC:
68T07 Artificial neural networks and deep learning
62H30 Classification and discrimination; cluster analysis (statistical aspects)

Keywords:
deep neural networks; subspace clustering; autoencoder; low-rank representation

Software:
darch; COIL-100

Full Text: DOI

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