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Tue 19/11/2019 6:29 PM

To: Zhen Wang <zwan4121@uni.sydney.edu.au>

Cc: dacheng.tao@gmail.com <dacheng.tao@gmail.com>

Dear Mr. Wang:

The manuscript: Single-cell RNA Sequencing Data Clustering by Low-Rank Subspace Ensemble Framework CYB-E-2019-11-2524

has been submitted to the IEEE Transactions on Cybernetics.

I would greatly appreciate your taking your time to review this manuscript. The abstract is attached below.

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Sincerely,

Prof. Dacheng Tao
Associate Editor, IEEE Transactions on Cybernetics

TITLE:
Single-cell RNA Sequencing Data Clustering by Low-Rank Subspace Ensemble Framework

ABSTRACT:

The rapid development of single-cell RNA sequencing (scRNA-seq) technology reveals the gene expression status and gene structure of individual cells, reflecting the heterogeneity and diversity of cells. The traditional methods of scRNA-seq data analysis treat data as the same subspace, and hide structural information in other subspaces. In addition, most dimensionality reduction methods use only one fixed model to solve the optimal problem, while ignoring the correlation between multiple model results. In this paper, we propose a low-rank subspace ensemble clustering framework (LRSEC) to analyze scRNA-seq data. Assuming that the scRNA-seq data exist in multiple subspaces, the low-rank model is used to find the lowest rank representation of the data in the subspace. It is worth noting that the penalty factor of the low-rank kernel function is uncertain, and different penalty factors correspond to different low-rank structures. Moreover, the single cluster model is difficult to find the cellular structure of all datasets. Therefore, we construct a new ensemble clustering framework LRSEC by using the low-rank model as the basic learner. The LRSEC framework captures the global structure of data through low-rank subspaces, which has better clustering performance than a single clustering model. We validate the performance of the LRSEC framework on seven small datasets and one large-scale dataset. Compared with ten state-of-art single-cell data clustering methods, the LRSEC framework has the highest clustering results.