

## A Tie-Breaking Strategy for Star Clusterings of Bipartite Graphs

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In this paper, we perform a thorough clustering study and identify the star clustering of bipartite graphs. We make use of the popular  $k$ -nearest neighbors clustering approaches based on the similarity between the dominant vertices and less dominant ones. The simplified  $k$ -nearest neighbors clustering algorithm needs to apply tie-breaking strategies in order to decide which star cluster is more reasonable when multiple configurations have the same  $k$ -nearest neighbors value. We investigate and improve a tie-breaking algorithm by introducing multi-step random walks weighted by Gaussian-type kernel functions. It is shown that this construction effectively breaks ties according to the similarity between each pairs of dominant and less-dominant vertices. In applications, we apply this algorithm for optimal detection of star clusters in a bipartite graph that models the quantified connections between protein-gene interaction data network in microbial study and miRNA and mRNA expression data in bioinformatics.

This is joint work with Drs. Qingsong Tang and Xiangde Zhang

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