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Exploring potential circRNA biomarkers for cancers based on double-line heterogeneous graph representation learning

Compared with the time-consuming and labor-intensive for biological validation in vitro or in vivo, the computational models can provide high-quality and purposeful candidates in an instant. Existing computational models face limitations in effectively utilizing sparse local structural information for accurate predictions in circRNA-disease associations. This study addresses this challenge with a proposed method, CDA-DGRL (Prediction of CircRNA-Disease Association based on Double-line Graph Representation Learning), which employs a deep learning frame-work leveraging graph networks and a dual-line representation model integrating graph node features.CDA-DGRL comprises several key steps: initially, the integration of diverse biological information to compute integrated similarities among circRNAs and diseases, leading to the construction of a heterogeneous network specific to circRNA-disease associations. Subsequently, circRNA and disease node features are derived using sparse autoencoders. Thirdly, a graph convolutional neural network is employed to capture the local graph network structure by inputting the circRNA-disease heterogeneous network alongside node features. Fourthly, the utilization of node2vec facilitates depth-first sampling of the circRNA-disease heterogeneous network to grasp the global graph network structure, addressing issues associated with sparse raw data. Finally, the fusion of local and global graph network structures is inputted into an extra trees classifier to identify potential circRNA-disease associations.

Keywords
Graph networks,Representation learning,Heterogeneous,Neural network, node2vec

Biography
Zhenmei Wang, Software Designer. Her research interests include artificial intelligence and bioinformatics. She has participated in one National Natural Science Foundation project, presided over one municipal/ministerial-level project, published four academic papers, and obtained one authorized invention patent.