Deep Learning-Enhanced Ensemble Clustering with Marine Predator Algorithm for High-Dimensional Spectral Data

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Abstract

High-dimensional spectral data clustering presents significant challenges due to computational complexity, scalability issues, and the curse of dimensionality. This paper presents a novel deep learning-enhanced ensemble clustering framework that integrates the Marine Predator Algorithm (MPA) for optimal weight assignment in spectral data analysis. The proposed methodology combines wavelet-based spectral data decomposition with deep neural networks (DNN) and ensemble clustering techniques to achieve superior clustering performance. Our approach leverages the MPA's bio-inspired optimization capabilities to fine-tune weights assigned to different clustering results, ensuring that the ensemble process is guided by the most relevant and high-quality clustering. The proposed method achieves superior performance with ARI . The integration of deep learning with spectral decomposition enables effective handling of high-dimensional data while maintaining computational efficiency.

Keywords

Ensemble clustering, Deep learning, Marine Predator Algorithm, Spectral data, Weight optimization, High-dimensional data.