Unsupervised Feature Selection via Robust Autoencoder and Adaptive Graph Learning

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Effective feature selection is essential for high-dimensional data analysis and machine learning. Unsupervised feature selection (UFS) aims to simultaneously cluster data and identify the most discriminative features. Most existing UFS methods linearly project features into a pseudo-label space for clustering, but they suffer from two critical limitations: (1) an oversimplified linear mapping that fails to capture complex feature relationships, and (2) an assumption of uniform cluster distributions, ignoring outliers prevalent in real-world data. To address these issues, we propose the Robust Autoencoder-based Unsupervised Feature Selection (RAEUFS) model, which leverages a deep autoencoder to learn nonlinear feature representations while inherently improving robustness to outliers. We further develop an efficient optimization algorithm for RAEUFS. Extensive experiments demonstrate that our method outperforms state-of-the-art UFS approaches in both clean and outlier-contaminated data settings.