# Collaborative Spectral Clustering in Attributed Networks

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**Abstract:** We proposed a novel spectral clustering algorithm for attributed networks, where $n$ nodes split into $R$ non-overlapping communities and each node has a $p-$dimensional meta covariate from various of formats such as text, image, speech etc.. The connectivity matrix $W_{n times n}$ is constructed with the adjacent matrix $A_{n times n}$ and covaraite matrix $X_{n times p}$, and $W = (1-alpha)A + alpha K(X,X')$, where $alpha in [0,1]$ is a tuning parameter and $K$ is a Kernel to measure the covariate similarities. We then perform the classical $k$-means algorithm on the element-wise ratio matrix of the first $K$ leading eigenvector of $W$. Theoretical and simulation studies showed the consistent performance under both Stochastic Block Model (SBM) and Degree-Corrected Block Model (DCBM), especially in imbalanced networks where most community detection algorithms fail.