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*0-1 Semidefinite Programming for Clustering: Modeling and Approximation*

In the past few years, spectral clustering has caught much attention in the machine learning community and numerous algorithms have been proposed and well-studied. In this paper, we present a unified framework for these methods based on a new optimization model: 0-1 semidefinite programming (0-1 SDP). We also show that various constrained clustering problems can be embedded into the new 0-1 SDP model. Secondly, we consider the issue of how to solve the underlying 0-1 SDP problem. We consider two approximation methods based on principal component analysis (PCA) and projected PCA, respectively and prove that both algorithms can provide a 2-approximation to the original clustering problem. The complexity of these approximation algorithms are also discussed.