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Correlation Clustering with Sherali-Adams

Given a complete graph G = (V, E) where each edge is labeled + or -, the Correlation Clustering problem asks to partition V into clusters to minimize the number of + edges between different clusters plus the number of - edges within the same cluster. Correlation Clustering has been used to model a large number of clustering problems in practice, making it one of the most widely studied clustering formulations. The approximability of Correlation Clustering has been actively investigated, culminating in a 2.06-approximation algorithm in 2015 based on rounding the standard linear program (LP) relaxation. Since it has been known that the standard LP cannot give better than a 2-approximation, it has remained an open question to determine if the approximation factor of 2 can be reached, or even breached. In this work, we answer this question affirmatively by showing that there exists a $(1.994 + \epsilon)$-approximation algorithm based on a strengthened LP relaxation called the Sherali-Adams hierarchy.