Approximating minimum cost \( k \)-node-connected spanning subgraphs
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Given an undirected graph with costs on the edges and a positive integer \( k \), consider the problem of finding a minimum cost spanning subgraph that is \( k \)-node-connected. We present a 6-approximation algorithm for this NP-complete problem, assuming that the number of nodes is at least \( k^3(k - 1) + k \). This gives the first constant factor approximation for the problem.

For edge-connectivity variants, constant factor approximation can be achieved using the iterative rounding of the linear programming relaxation, a powerful technique developed by Jain. Whereas it has been long known that iterative rounding cannot yield a constant factor approximation for node-connectivity on arbitrary input graphs, we show that it does give a 2-approximation for a restricted class of instances. We apply a combinatorial preprocessing, based on the Frank–Tardos algorithm for \( k \)-outconnectivity, to transform any input into such an instance. This is a joint work with Joseph Cheriyan.