Abstract:

Consider an instance of Euclidean $k$-means or $k$-medians clustering. We show that the cost of the optimal solution is preserved up to a factor of $(1+\epsilon)$ under a projection onto a random $O(\log(k/\epsilon)/\epsilon^2)$-dimensional subspace whp. Further, the cost of every clustering is preserved within $(1+\epsilon)$. Crucially, the dimension does not depend on the total number of points $n$ in the instance. Additionally, our result applies to Euclidean $k$-clustering with the distances raised to the $p$-th power for any constant $p$.

For $k$-means, our result resolves an open problem posed by Cohen, Elder, Musco, Musco, and Persu (STOC 2015); for $k$-medians, it answers a question raised by Kannan.

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