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A spectral gap precludes low-dimensional embeddings

We prove that if an n-vertex $O(1)$-expander graph embeds with average distortion D into a finite dimensional normed space X, then necessarily the dimension of X is at least $n^{c/D}$ for some universal constant $c > 0$. This is sharp up to the value of the constant c, and it improves over the previously best-known estimate $\dim(X) > c(\log n)^2/D^2$.