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Forbidden subgraphs and spherical two-distance sets

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Abstract

A set of unit vectors in a Euclidean space is called a spherical two-distance set if the pairwise inner products of these vectors assume only two values $\alpha > \beta$. It is known that the maximum size of a spherical two-distance grows quadratically as the dimension of the Euclidean space grows. However when the values α and β are held fixed, a very intricate behavior of the maximum size emerges. Building on the recent resolution in the equiangular case where $\alpha + \beta = 0$, we make a plausible conjecture which connects spherical two-distance sets with spectral theory of signed graphs in the regime $\beta < 0 < \alpha$, and we confirm this conjecture when $\alpha + 2\beta < 0$ or $(1 - \alpha)/(\beta - \alpha) < 2.0198$. Joint work with Alexandr Polyanskii, Jonathan Tidor, Yuan Yao, Shengtong Zhang and Yufei Zhao.