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Minimum number of distinct eigenvalues of Johnson and Hamming graphs

This talk focuses on the inverse eigenvalue problems for graphs (IEPG), which investigates the possible spectra of real symmetric matrices associated with a graph G. These matrices have off-diagonal non-zero entries corresponding to the edges of G, while diagonal entries are unrestricted. A key parameter in IEPG is $q(G)$, the minimum number of distinct eigenvalues among such matrices. We present lower bounds on $q(G)$ based on the existence or non-existence of certain cycles in G. Notably, we show that every Johnson graph admits a $\{-1, 0, 1\}$-matrix with exactly two distinct eigenvalues. Additionally, we explore $q(G)$ for Hamming graphs and other distance-regular graphs. This work is in collaboration with Shaun Fallat, Allen Herman, and Johnna Parenteau.