Extending maximum nullity and zero forcing from graphs to hypergraphs

Leslie Hogben*, Iowa State University and American Institute of Mathematics

A given graph G describes the family $\mathcal{S}(G)$ of real symmetric matrices whose off-diagonal entries are nonzero exactly where G has edges. The inverse eigenvalue problem of G is to determine the collection of all possible spectra (multisets of eigenvalues) for such matrices. One standard technique is to study the maximum possible multiplicity of an eigenvalue, or equivalently, the maximum possible nullity, among matrices in $\mathcal{S}(G)$. The zero forcing number, which is the minimum number of blue vertices needed to color all the vertices blue using a graph coloring process where blue vertices represent zeros in a null vector, gives an upper bound on maximum nullity. Maximum nullity and zero forcing number are equal for many of the graphs for which maximum nullity is known. This talk will begin with a survey of results on the inverse eigenvalue problem of a graph, maximum nullity, and zero forcing, and then discuss an extension of these ideas to hypergraphs.

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