The critical exponent of a graph

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Abstract

Given a graph G, let P_G denote the cone of positive semidefinite (psd) matrices with zeros according to G. Which powers preserve psd-ness when applied entrywise to all matrices in P_G?

In joint work with D. Guillot and B. Rajaratnam, we show how preserving positivity relates to the geometry of the graph G. This leads to a hitherto unexplored graph invariant: the "critical exponent" of G. Our main result shows how this purely combinatorial invariant resolves the positivity problem for all chordal graphs.