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k-locally positive semidefinite matrices, factor width, and spectral inequalities

A Hermitian matrix X is called k-locally positive semidefinite if every $k \times k$ principal submatrix of X is positive semidefinite. These matrices form exactly the dual cone of the set of k-incoherent quantum states, in other words, matrices having factor width at most k. We develop some bounds on the possible spectra of k-locally PSD matrices, and present a method for numerically constructing a k-locally PSD matrix with a given spectrum. We explore the connection to the concept of k-incoherent states from quantum information theory, as well as the connection to hyperbolicity cones. This is joint work with Nathaniel Johnston, Shirin Moein, and Rajesh Pereira.