

Interlaced eigenvalues and quantum information theory

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The rank- k numerical range of a matrix M is the set of complex z such that for some rank- k projection P we have $PMP = zP$. Among the many generalizations that have been proposed for the classical numerical range (which is the rank-1 numerical range), this one seems especially promising. It has, for example, applications in QIT (quantum information theory); indeed, its study was first suggested by problems in quantum error correction. It also provides a striking extension of the Toeplitz-Hausdorff theorem: numerical ranges of all ranks are convex subsets of the complex plane. In this talk we'll survey recent developments, including the connections with certain eigenvalue interlacing phenomena that have a history stretching all the way back to Cauchy.