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Positivity of self-adjoint trace class operators (Spectral statistics without diagonalization)

Abstract:

Positivity of self-adjoint trace-class kernels can be studied by the so-called Newton's identities. It requires the knowledge of the different moments of the operator, from which the symmetric polynomials of the operator eigenvalues can be obtained. For positive operators the actual values of these symmetric polynomials are positive. If any of them is negative the operator is non-positive. We also propose a useful method to approximate the spectrum without diagonalizing the operator, by which spectral characteristics such as the von Neumann entropies or the Schatten norm of a non-positive operator can be calculated.