A Complete Semidefinite Algorithm for Detecting Copositive Matrices and Tensors

Abstract:

A real symmetric matrix (resp., tensor) is said to be copositive if the associated quadratic (resp., homogeneous) form is greater than or equal to zero over the nonnegative orthant. The problem of detecting their copositivity is NP-hard. This paper proposes a complete semidefinite relaxation algorithm for detecting the copositivity of a matrix or tensor. If it is copositive, the algorithm can get a certificate for the copositivity. If it is not, the algorithm can get a point that refutes the copositivity. We show that the detection can be done by solving a finite number of semidefinite relaxations, for all matrices and tensors.

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