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Sum-of-squares decompositions and nonlocal games

Any nonlocal game has an associated game polynomial representing its winning probability. Exhibiting a sum-of-squares decomposition of this game polynomial gives an upper-bound on the quantum value of the nonlocal game. Such decompositions can be numerically found via a complete hierarchy of semidefinite programs and thus are powerful tools in the theory of nonlocal games. In this talk, we'll discuss how sum-of-squares decompositions can give us self-testing results for nonlocal games and upper-bounds for multipartite games on quantum networks. This is partly based on joint work with Arthur Mehta, Hamoon Mousavi, and Sajjad Nezhadi.