

Large Graphs and Symmetric Sums of Squares

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Polynomial optimization over hypercubes has important applications in combinatorial optimization. We develop a symmetry-reduction method that finds sums of squares certificates for non-negative symmetric polynomials over k -subset hypercubes that improves on a technique due to Gatermann and Parrilo. For every symmetric polynomial that has a sos expression of a fixed degree, our method finds a succinct sos expression whose size depends only on the degree and not on the number of variables. Recently, we have used these tools to investigate the problem of certifying valid inequalities involving graph densities. This is joint work with Greg Blekherman, James Saunderson, Mohit Singh and Rekha Thomas.