Representations of Non-Negative Polynomials, Degree Bounds and Applications to Optimization

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Abstract. Natural sufficient conditions for a polynomial to have a local minimum at a point are considered. These conditions tend to hold with probability 1. It is shown that polynomials satisfying these conditions at each minimum point have nice presentations in terms of sums of squares. Applications are given to optimization on a compact set and also to global optimization. In many cases, there are degree bounds for such presentations. These bounds are of theoretical interest, but they appear to be too large to be of much practical use at present. In the final section, other more concrete degree bounds are obtained which ensure at least that the feasible set of solutions is not empty.

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