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**"Optimizing with symmetric polynomials"**

**Abstract:**

Solving polynomial optimization problems is known to be a hard task in general. In order to turn the recently emerged relaxation paradigms into efficient tools for these optimization questions it is necessary to exploit further structure whenever presented in the problem structure. In this talk we will focus on the situation of optimization problems that are given by symmetric polynomials in order to highlight several approaches to take advantage of symmetry. The techniques presented in the talk will also give a better understanding of the cones of symmetric sums of squares and symmetric non negative forms and the symmetric mean inequalities associated to these. In particular, we will show that in degree four, symmetric mean inequalities are characterized by sum of squares decomposition.