

Talk: Sums of squares and moments for polynomial optimization

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Abstract: In these lectures we consider polynomial optimization, which is the problem of minimizing a polynomial f over a semialgebraic set K . Since finding this minimum value is a computationally hard problem, one is interested in getting tractable bounds for this minimum.

We present the basic moment/sum-of-squares (sos) approach which leads to hierarchies of lower bounds for the minimum. In particular we will discuss in detail the following aspects:

- recognizing sums of squares of polynomials via semidefinite programming
- duality of the moment/sos bounds
- asymptotic convergence (when K is compact, under the Archimedean condition)
- finite convergence (via the so-called flatness criterion) and extraction of global minimizers

Some other topics we may touch upon (depending on time) include:

- exploiting structure like sparsity and polynomial equations to design more efficient relaxations
- application to the special case of binary polynomial optimization
- sum-of-square approach to get upper bounds and their eigenvalue reformulation