

Sum of Squares Programs: What are They Good For, and How To Solve Them

Sum of squares (SOS) programs are a particular class of convex optimisation problems, that combine in a very appealing way notions from algebraic and numeric computation. They are based on the sum of squares decomposition for multivariate polynomials, and have found many interesting applications, mainly through semidefinite relaxations of polynomial optimization problems.

In this talk we will discuss the basic SOS formulation, some important applications, as well as the techniques available for exploiting their special algebraic structure towards an efficient numerical solution.

Additionally, we identify properties of systems of polynomial equations and inequalities that can be successfully exploited for numerical efficiency. The results will be motivated and illustrated through applications of sum of squares techniques from different areas, including quantum information and systems and control theory.