Polynomial Optimization

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This course will consist of eight introductory lectures on the modern point of view of polynomial optimization as a subject that lies at the intersection of real algebraic geometry and convex optimization. After the basic definitions and a range of examples, we will look at the sum of squares relaxations of polynomial optimization problems that in turn can be solved using semidefinite programming. This brings us to fascinating questions concerning the geometry and complexity of spectrahedra which are the feasible regions of semidefinite programs. We will also see a duality theory that is based on cones coming from non-negative polynomials, sums of squares polynomials and moment sequences. A series of exercises will illustrate the key points and develop further topics.

Reference: Semidefinite Optimization and Convex Algebraic Geometry, edited by G. Blekherman, P.A.Parrilo and R.R.Thomas, SIAM 2013