数学与系统科学研究院

计算数学所学术报告

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报告题目：

A new look at nonnegativity and polynomial optimization

邀请人：　　优化与应用研究中心

报告时间：**2010** 年 **12** 月 **15** 日（周三）

下午 **16：30-17：30**

报告地点：　科技综合楼三层 **311**

计算数学所报告厅

Abstract:

Obtaining tractable characterizations of functions which are nonnegative on a set $K \subset R^n$ is a topic of primary importance. Indeed, such characterizations are highly desirable to help solve (or at least approximate) many important problem in various areas, and in particular, the global optimization problem:

$$P: \qquad f^* = \min\{f(x) : x \in K\},$$

because solving P is equivalent to solving $f^* = \max\{\lambda : f - f^* \geq 0 \quad on \quad K\}$**.**
When f is a polynomial and K a basic semi-algebraic set, we have seen in the previous talk that Putinar's Positivstellensatz provides such tractable characterizations. Those characterizations depend on the representation of K through its defining polynomials.

In this talk we consider another way to look at continuous functions that are nonnegative on a (non necessarily compact basic semi-algebraic) set $K \subseteq R^n$**. This time, knowledge on K is through a finite Borel measure** μ **with support sup** $\mu = K$**, and whose all moments** $y = (y_a), a \in N^n$**, are available. This new characterization permits to define convergent outer approximations of the convex cone** $C_d(K)$ **of polynomials of degree at most d, nonnegative on K, by a hierarchy of spectrahedra (convex sets defined by linear matrix inequalities) defined uniquely in terms of the coeffcients of f. Important examples of cones** $C_d(K)$ **are the cone of nonnegative polynomials on** R^n **and the cone of copositve matrices. Checking whether a fixed and known polynomial f is nonnegative on K reduces to solving a sequence of generalized eigenvalue problems for real symmetric matrices of increasing size.**

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