

## Recovery of algebraic-exponential data from moments and a generalization of the Lowner-John ellipsoid problem

Jean Lasserre, Centre National de la Recherche Scientifique (CNRS)

Let  $G$  be a bounded open subset of Euclidean space with real algebraic boundary  $\Gamma$ . In a first part of the talk we consider the case where  $G = \{x: g(x) \leq 1\}$  for some quasi-homogeneous polynomial  $g$  and derive several properties of  $G$  as well as the non-Gaussian integral  $\int \exp(-g) dx$ . In particular, we show that the volume of  $G$  is a convex function of the coefficients of  $g$  and solve a generalization of the Lowner-John problem.

Next, we consider a more general case and under the assumption that the degree  $d$  of  $\Gamma$  is given, and the power moments of the Lebesgue measure on  $G$  are known up to order  $3d$ , we describe an algorithmic procedure for obtaining a polynomial vanishing on  $\Gamma$ . The particular case of semi-algebraic sets defined by a single polynomial inequality raises an intriguing question related to the finite determinateness of the full moment sequence. The more general case of a measure with density equal to the exponential of a polynomial is treated in parallel. Our approach relies on Stokes theorem and simple Hankel-type matrix identities.