Department of Statistics

SCIENTIFIC AND STATISTICAL COMPUTING SEMINAR

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Relative Entropy Relaxations for Signomial Optimization

TUESDAY, September 30, 2014 at 3:00 PM
133 Eckhart Hall, 5734 S. University Avenue
Host: Lek-Heng Lim

ABSTRACT

The relative entropy function plays a prominent role in a variety of contexts information theory and statistics. In this talk, we discuss some of its beneficial computational properties that are a consequence of its joint convexity with respect to both its arguments. Signomial programs (SPs) are optimization problems specified in terms of signomials, which are weighted sums of exponentials composed with linear functionals of a decision variable. SPs are non-convex optimization problems in general, and families of NP-hard problems can be reduced to SPs. We describe a hierarchy of convex relaxations to obtain successively tighter lower bounds of the optimal value of SPs. This sequence of lower bounds is computed by solving increasingly larger-sized relative entropy optimization problems, which are convex programs specified in terms of linear and relative entropy functions. Our approach relies crucially on the observation that the relative entropy function provides a convex parametrization of certain sets of globally nonnegative signomials with efficiently computable nonnegativity certificates via the arithmetic-geometric-mean inequality. By appealing to representation theorems from real algebraic geometry, we show that our sequences of lower bounds converge to the global optima for broad classes of SPs. Finally, we also demonstrate the effectiveness of our methods via numerical experiments. (Joint work with Parikshit Shah)

Organizers:
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