On the approximability of the maximum feasible subsystem problem with 0/1-coefficients

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September 29, 2008

Given a system of constraints $\ell_i \leq a_i^T x \leq u_i$, where $a_i \in \{0,1\}^n$, and $\ell_i, u_i \in_+$, for $i = 1, \ldots, m$, we consider the problem RMFS of finding the largest subsystem for which there exists a feasible solution $x \geq 0$. We present approximation algorithms and inapproximability results for this problem, and some of its important special cases. Our main conclusions are

(I) There exists a sharp separation in the approximability between the case when $L = \max\{\ell_1, ..., \ell_m\}$ is bounded above by a polynomial in n and m, and the case when it is not.

(II) for the case where the constraint matrix has the consecutive ones property, there exists a sharp separation in approximability between the case where we allow a violation of the upper bounds by at most a $(1+\epsilon)$ factor, for any fixed $\epsilon > 0$, and the case when no violations are allowed.

We will also give an application of this RMFS problem to a recently studied profit-maximizing pricing problem.

This is joint work with Rajiv Raman, Saurabh Ray, and Rene Sitters.