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 \( \ell_i, u_i \in \mathbb{R}^+ \), 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 \( L = \max\{\ell_1, \ldots, \ell_m\} \) 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.