Abstract

Given a constraint satisfaction problem (CSP) on n variables, $x_1, x_2, \ldots, x_n \in \{\pm 1\}$, and m constraints, a global cardinality constraint has the form of $\sum_{i=1}^{n} x_i = (1-2p)n$, where $p \in (\Omega(1), 1-\Omega(1))$ and pn is an integer. Let AVG be the expected number of constraints satisfied by randomly choosing an assignment to $x_1, x_2, \ldots, x_n$, complying with the global cardinality constraint. The CSP above average with the global cardinality constraint problem asks whether there is an assignment (complying with the cardinality constraint) that satisfies more than $(AVG + t)$ constraints, where t is an input parameter. In this paper, we present an algorithm that finds a valid assignment satisfying more than $(AVG+t)$ constraints (if there exists one) in time $(2^{O(t^2)} + n^{O(d)})$. Therefore, the CSP above average with the global cardinality constraint problem is fixed-parameter tractable.