

Algorithmic Trends

Homework 2

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March 26, 2014

The homework is due on 09/04/2014

Problem 1. In the MAX-SAT-A-A problem we are given a CNF-SAT formula with m clauses and an integer k . The question is whether there is an assignment satisfying at least $m/2 + k$ clauses. Show that this problem admits a kernel with $\mathcal{O}(k)$ clauses.

Problem 2. We say that a string s is a substring of s' if one can obtain s from s' by removing some (possibly empty) prefix and some (possibly empty) suffix. In the SHORTEST SUPERSTRING problem we are given a set of strings s_1, \dots, s_n of length at most m , and one is to find a shortest string that contains all strings s_i as substrings.

1. Show that this problem is solvable in $2^n(n+m)^{\mathcal{O}(1)}$ time.
2. Show that this problem is solvable in $2^n(n+m)^{\mathcal{O}(1)}$ time and polynomial space.

Problem 3. In the FEEDBACK VERTEX SET IN TOURNAMENTS (FVST) we are given a directed clique, called a tournament, together with an integer k , and the goal is to remove at most k vertices to make the graph acyclic.

1. Show that this problem is solvable in $c^k n^{\mathcal{O}(1)}$ time.
2. Show that this problem is solvable in $2^k n^{\mathcal{O}(1)}$ time.