

COMP362 WINTER 2014 ASSIGNMENT 2

Due at 14:30 on February 16th 2014

1) Consider the following problem:

Strongly Connected Component Pairs An instance consists of a graph with an even number of vertices and a partition of $V(G)$ into a set $\{x_i, x'_i \mid 1 \leq i \leq |V|/2\}$ of disjoint pairs. We are asked to determine if there is some pair which is contained in a strongly connected component of G .

We saw in class that determining if an instance of 2-SAT has a satisfying truth assignment can be reduced to an instance of this problem. Prove that Strongly Connected Components Pairs can be reduced to 2-SAT.

- 2) Take the dual of the LP you solved for Assignment 1 and solve it however you like.
- 3) (a) Take the dual of the LP in standard form with one constraint: maximize $\sum_1^n c_j x_j$ subject to $\sum_1^n a_j x_j \leq b$ and $x_j \geq 0$ for all j .
(b) what is the solution to the dual? (c) what is the solution to the primal? (d) what is the solution to the LP obtained from the primal by adding the constraint that each decision variable is at most 1?
- 4) Bigger_n is the decision problem which given two n bit binary numbers $a_1 a_2 \dots a_n$ and $b_1 b_2 \dots b_n$ returns true if the first is larger than the second and false otherwise. Show how to reduce Bigger_n to SAT.

Please email your solutions to yuditskyl@gmail.com