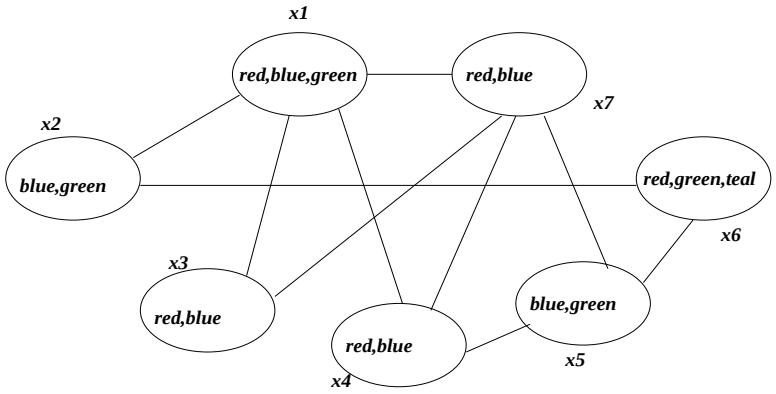

Figure 1: A modified coloring problem.

Rina Dechter, Winter-2016

ICS 275, Assignment 6

This homework is based on Chapters 7 and 8. There are 5 required questions, 2 optional questions and one extra credit. The optional questions are just recommendation for you to do. They will not affect the grade.

1. (Question 1, chapter 7, optional) Consider stochastic local search (SLS) algorithms such as GSAT and Walksat. Apply algorithm SLS to the 5-queen problem when your initial assignment is all the queens are on the diagonal. Give at most one page description of tracing the algorithm.

2. (10 pts. question 3, chapter 7) Analyze the complexity of SLS local search step.

3. (10 pts. question 4, chapter 7) Analyze the complexity of walksat step

4. (15 pts. optional) Apply SLS to the problem in Figure 1. You can write your own code.

5. (20 pts.) Consider the following cnf theory

$$\varphi = \{(A, \neg B, D), (\neg D, F, C), (\neg C), (B, F, E), (C, F, \neg A), (\neg F, \neg A)\}$$

   1. Apply directional resolution to φ along two orderings of your choice.
   2. Is φ belong to any tractable class that you are familiar with?
   3. Apply unit-propagation to φ.
   4. Show how you find a model to φ using Directional resolution and using DPLL.
   5. (extra credit, 5 pts.) Find all prime implicates of φ.

6. (10 pt.) Describe in words how CDCL (conflict-directed-clause-learning) works. (see class page pointing to SAT handbook chapters 3 and 4:

https://www.enseignement.polytechnique.fr/informatique/INF321/TD/TD910/files/SATHandbo
CDCL.pdf) Simulate its performance on

$$\varphi = \{(A, \neg B, D), (\neg D, F, C), (\neg C), (B, F, E), (C, F, \neg A), (\neg F, \neg A)\}$$

7. (10 pts.) Consider the following set of linear inequalities:

$$5x_1 + x_2 + 2x_3 \leq 15$$

$$2x_2 - 7x_3 + x_4 + x_5 \leq 3$$

$$14x_3 + x_5 - x_6 \leq 30$$

$$x_2 \geq 10, x_6 \geq 20$$

Show the execution of algorithm DLE on this theory along ordering $d_1 = x_1, x_2, x_3, x_4, x_5, x_6$ and d_2 which is the reverse order of d_1.