

CS375, Spring 2014

In at least one of your assignments you will need to use a SAT solver to solve a combinatorial problem such as sudoku or graph coloring.

You can use any SAT solver you want. I recommend that you use minisat which can be downloaded from <http://minisat.se/>. You can use the latest version (2.2.0) or ready to use binaries (v1.14).

Any SAT solver (and, in particular, minisat) accepts as input a file with a description of a CNF theory. The description follows the DIMACS format. The requirements are specified below

The file in DIMACS format can start with comments, that is lines beginning with the character `c`. Right after the comments, there is the line

```
p cnf nbvar nbclauses
```

indicating that the instance is in CNF format; `nbvar` is the exact number of variables appearing in the file; the allowed variables are all non-zero numbers between `-nbvar` and `nbvar`; `nbclauses` is the exact number of clauses contained in the file.

Then the clauses follow. Each clause is a sequence of distinct non-zero numbers between `-nbvar` and `nbvar` ending with 0; It cannot contain the opposite literals `i` and `-i` simultaneously. Positive numbers denote the corresponding variables. Negative numbers denote the negations of the corresponding variables.

An example follows:

```
c
c start with comments
c
c
p cnf 5 3
1 -5 4 0
-1 5 3 4 0
-3 -4 0
```

This file represents the theory consisting of three clauses:

$$\begin{aligned}x_1 \vee \neg x_5 \vee x_4 \\ \neg x_1 \vee x_5 \vee x_3 \vee x_4 \\ \neg x_3 \vee \neg x_4\end{aligned}$$

where we use i to represent the variable x_i , and $-i$ to represent $\neg x_i$.

The way to invoke minisat is by the command

```
minisat <input file> <output file>
```

The output file contains some statistics, the string SAT or UNSAT and, in the former case, also the truth assignment (that follows the DIMACS convention).

Please, download minisat and experiment with it using small, built-by-hand theories.