

COMP21111 Assignment 4
20 marks

Show your working.

Deadline: 29th Oct., time: 12:00, SSO
Deadlines are strict

Problem 1 (9 marks)

Apply the DPLL algorithm and draw the DPLL tree to the following set of clauses:

$$\begin{array}{l}\neg p \vee q \vee r \\ p \vee \neg q \vee \neg r \\ \neg p \vee \neg q \vee \neg r \\ p \vee q \\ p \vee r \\ \neg p \vee q \vee \neg r \\ \neg p \vee \neg q \vee r\end{array}$$

Is this set of clauses satisfiable?

Problem 2 (8 marks)

Apply exhaustively DPLL optimizations: a) tautology deletion and b) pure literal optimisation to the following set of clauses.

$$\begin{aligned} &r \\ &\neg r \vee s \\ &\neg s \vee r \\ &\neg q \vee \neg p \vee \neg s \\ &r \vee \neg p \vee \neg q \\ &p \vee q \vee \neg p \vee s \end{aligned}$$

1. Is the original set Horn?
2. Is the resulting set Horn?
3. Apply unit propagation to the resulting set.
4. Is the original set of clauses satisfiable? if it is, give a model.

Problem 3 (3 marks)

Consider 3-clauses over 80 variables. For a randomly generated set (as described in the lecture) of 240 of such clauses:

- ▶ is the probability of this set to be *satisfiable* small or large?

Justify your answer based on graphs presented at the lecture.

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