by choosing a literal

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ASSIGNMENT-2

CS202A

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Q. To implement a SAT Solver

We will implement the SAT solver using DPLL algorithm.

DPLL is a complete, backtracking-based search algorithm for deciding the satisfiability of propositional logic formulae in cnf form.

The basic backtracking algorithm runs
- by choosing a literal
- assigning a truth value to it.
- simplifying the formula and then
- recursively checking if the simplified formula is satisfied

  ↳ If this is case then original formula is satisfied

  Else the same recursive check is done assuming the opposite truth value.

PseudoCode

Algorithm DPLL

Input: A formula in DIMACS representation ϕ

Output: Interpretation of ϕ if Satisfiable of Proposition
otherwise "Unsatisfiable".

```
function DPLL(φ)
    while (there is a unit clause {l} in φ){
        φ = unit-propagation(l, φ);
    }
    while (there is a literal l that occurs pure
           in φ) {
        φ = pure-literal-assign(l, φ);
    }
    if (φ is empty) then
        return True;
    if (φ contains an empty clause) then
        return false;
    l = choose-literal(φ);
    return DPLL(φ ∧ {l}) or DPLL(φ ∧ not{l}));
```

unit propagation: unit propagation consists in removing every clause containing a unit clause's literal and discarding the complement of a unit clause's literal from every clause containing complement.

pure literal elimination: A pure literal can always be assigned in a way that makes all clauses containing it true. Thus, when it is assigned such way, these clauses do not constrain the search anymore and can be deleted.