**Program 3: SAT Assignment**

This assignment uses several heuristic search techniques to find possibly optimal truth assignments for variables in the given Boolean formulas (see the bottom of the assignment).

The formulas are in conjunctive normal form (*AND*s of *OR*s). The fitness of an assignment is the number of clauses (*OR*s) that the assignment satisfies. If there are *​​c* clauses, then the highest fitness is bounded by *​c*​. However, if the formula is not satisfiable, then you cannot simultaneously make all ​*c*​ clauses true.

You will use three of the following seven techniques:

1. DPLL
2. Resolution
3. Genetic algorithms
4. Local search
5. Simulated annealing
6. GSAT
7. WalkSAT

*You must choose at least one complete algorithm to implement - DPLL or Resolution.*

**To do:**

Run each of your three algorithms on each formula. If your algorithm uses randomness (genetic algorithm, simulated annealing, GSAT, WalkSAT), do 10 runs per formula. Collect data, for each formula and each run, on the CPU time taken, and the highest value of ​*c*​ (highest number of satisfied clauses for any assignment) found. Put these data in tables or graphs (clearly labeled!)  (How long did it take as a function of number of clauses satisfied, or perhaps formula number vs. time.)  ***Note that Resolution doesn't return an assignment, so you can't count the number of satisfied clauses.  Similarly, I don't see a good way to treat DPLL as a maximizer.  So these graphs of max #clauses satisfied are for the heuristic algorithms (everything except these two).***

**To hand in:**

* A brief description of each algorithm, including design decisions (how you set your parameters in the genetic algorithm, for instance)
* Your code
* The data you collected (graphs with labeled axes!)
* A learning outcome section (what did you learn from this assignment?)
* A who-did-what in the comments.

You can find information about the format for the formulas starting on page 4 of the SATCompetitionRules.pdf document in the Files of this Canvas directory.

You will use the formulas in ​the directory PA3\_benchmarks you will find under Files (see Canvas sidebar).