Task 3: Heuristic Search Algorithms

Domain: Uniform Random-4-SAT is a family of SAT problems distributions obtained by randomly generating 3-CNF formulae in the following way: For an instance with $n=4$ variables and $k=5$ clauses, each of the k clauses is constructed from 3 literals which are randomly drawn from the $2n$ possible literals (the n variables and their negations) such that each possible literal is selected with the same probability of $1/2n$. Clauses are not accepted for the construction of the problem instance if they contain multiple copies of the same literal or if they are tautological (i.e., they contain a variable and its negation as a literal). Each choice of n and k thus induces a distribution of Random-4-SAT instances. Uniform Random-4-SAT is the union of these distributions over all n and k.

Firstly generate your formula for N = 4 and k = 5. Please write your clauses in the text file and each clause should be written in a different line of the text file. Then input the formula to three algorithms.

Implement:

1. Variable neighborhood descent : Modify Hill-Climbing Search to switch to a denser neighborhood function when stuck at a local optimum.
2. Beam Search : Code for different beam lengths
3. Tabu Search : Implement tabu search and find an optimum tabu tenure value for the domain.

Report Format :
  1. Brief description about the domain:

      1.   State space
      2.   Start node and goal node
      3.   MOVEGEN and GOALTEST algorithm

  %2.   Heuristic functions considered
  %2.Beam search analysis for different beam lengths
  %2.Tabu search for different values of tabu tenure
  %2.Comparison of Variable neighborhood descent, Beam Search, Tabu Search: Nodes explored by each

Evaluation Criteria:
Correctness: 15
Report: 10
Code Quality: 5

Deadline: 11:59 PM 5th Feb 2021
Note : *Penalty of 10% will be issues per day if the deadline is not met*
If found copied, 0% score will be awarded

For Reference :

Heuristic search and Hill Climbing:
https://drive.google.com/file/d/1rNpKGSBK_bd9lhs5suOH8VYaVxqO4dgy/view?usp=sharing
Beam Search Tabu Search:
https://drive.google.com/file/d/1gbWgDeCurYZN35yd7fov_2U5wqZ1HIQT/view?usp=sharing
Tabu Search
https://drive.google.com/file/d/14nmG0OkkGJVxEPfu0VhbHRcOrlB9g95O/view?usp=sharing

https://drive.google.com/file/d/1-FiLcQxGuaurwzX8985xth0l42HjNYK-/view?usp=sharing