Unit 6 - Week 4

Assignment 4

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2019-08-28, 23:59 IST.

Topics: Travelling Salesman Problem, Tabu Search, Simulated Annealing

Please DO NOT ENTER ANY BLANKS. This assessment is evaluated by a program that does exact string matching. *Any blank in the answer will result in even a correct answer being evaluated as wrong.*

This "no blanks" policy will hold THROUGHOUT this course.

The following policy applies throughout. *If there is a tie between two or more nodes for being picked by the algorithm, then the tie is broken as followed – the node that comes earlier in the dictionary ordering is selected. For example, if there is a tie between M, F and R, then F is selected first because occurs earlier in the ordering A, B, .., Z.*

1) Exploitation in the context of heuristic search refers to *1 point*

- taking unfair advantage of the CLOSED list
- the willingness to go against the heuristic value
- choosing the next node as indicated by the heuristic function
- moving along the steepest gradient on the surface
- none of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
choosing the next node as indicated by the heuristic function
moving along the steepest gradient on the surface

2) Exploration in the context of heuristic search refers to *1 point*

- moving along the steepest gradient on the surface
- the tendency to explore newer areas in the search space
- the willingness to go against the heuristic value
- the ability to head straight for the goal node
- none of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
the tendency to explore newer areas in the search space
the willingness to go against the heuristic value

3) Which of the following is/are a deterministic search technique? *1 point*

- Tabu Search
- Iterated Hill Climbing
- Random Walk
- Simulated Annealing

No, the answer is incorrect.
Score: 0
Accepted Answers:
Tabu Search

4) Which of the following search algorithm(s) is/are complete in a finite search space? *1 point*

- Tabu Search
- Iterated Hill Climbing
- Random Walk
- Simulated Annealing
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
None of the above

5) _______________ is an extreme of exploitation and __________ is an extreme of exploration. *1 point*

- Hill Climbing, Random Walk
- Random Walk, Hill Climbing
- Simulated Annealing, Tabu Search
- Tabu Search, Simulated Annealing

No, the answer is incorrect.
Score: 0
Accepted Answers:
Hill Climbing, Random Walk

6) Which of the following is/are true for Tabu Search? *1 point*

- It can move forward even if the best neighbour is worse than the current node
- Having moved off a local optimum it avoids returning to it immediately
- It never moves to a state worse than the current state
- It randomly marks some moves as taboo

No, the answer is incorrect.
Score: 0
Accepted Answers:
It can move forward even if the best neighbour is worse than the current node
Having moved off a local optimum it avoids returning to it immediately

7) In Iterated Hill Climbing which of the following are true? *1 point*

- The algorithm always finds the global optimum
- The algorithm makes deterministic moves from the current state
- The algorithm makes stochastic moves from the same start state
- The algorithm uses different start states chosen randomly
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
The algorithm makes deterministic moves from the current state
The algorithm uses different start states chosen randomly

8) Let Figure 3.2 (please use the same figure from Week 3 assignment) represent a solution space search problem in which each node is a candidate solution. The edges represent the allowed perturbations. Node X is the solution or goal node, and there is no start node. The Manhattan distance on the grid is used as the heuristic function. Each option below *represents a run* of the Iterated Hill Climbing (IHC) algorithm starting from the specified 3 start nodes. Which of the runs succeed in finding a path to the goal node. *1 point*

- L,B,E
- M,C,L
- E,L,Q
- T,Q,M
- none of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
M,C,L
T,Q,M

9) Consider a state S in the search space for an instance of a problem P. Let moveGen(S) generate k neighbouring states. Which of the following is/are true? *1 point*

- Iterated Hill Climbing randomly picks any one of the k neighbours and moves to it.
- Iterated Hill Climbing always picks the best one of the k neighbours and moves to it
- Iterated Hill Climbing picks the best one of the k neighbours and moves to it only if it is better than the current state
- Random Walk randomly picks any one of the k neighbours and moves to it
- Random Walk always picks the best one of the k neighbours and moves to it
- Random Walk randomly picks any one of the k neighbours and moves to it only if it is better than the current state

No, the answer is incorrect.
Score: 0
Accepted Answers:
Iterated Hill Climbing picks the best one of the k neighbours and moves to it only if it is better than the current state
Random Walk randomly picks any one of the k neighbours and moves to it

10) Fill in the blanks. For higher values of temperature T, Simulated Annealing behaves like _________________and for lower values of T, Simulated Annealing behaves like _________________ *1 point*

- Iterated Hill Climbing, Hill Climbing
- Hill Climbing, Iterated Hill Climbing
- Random Walk, Hill Climbing
- Hill Climbing, Random Walk
- Random Walk, Tabu Search

No, the answer is incorrect.
Score: 0
Accepted Answers:
Random Walk, Hill Climbing

11) Let the current state S for an instance of TSP be (H,G,F,E,D,C,B,A). Which of the following is/are the neighbour(s) of S, if moveGen(S) implements 2-edge exchange? *1 point*

- (H, G, F, D, C, E, B, A)
- (H, G, B, C, D, E, F, A)
- (H, G, F, A, B, C, D, E)
- (H, B, F, E, G, C, D, A)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(H, G, B, C, D, E, F, A)
(H, G, F, A, B, C, D, E)

12) What is the tour generated by Greedy Heuristic for a TSP with six cities A, B, C, D, E and F? The edge costs are given in the adjacency matrix in Table 4.1. Your answer should start with the edge DE, and is a comma-separated list of cities, followed by the cost, for example, D,E,F,A,B,C,2000

	A	B	C	D	E	F
A	0	10	20	30	40	50
B	10	0	31	21	51	41
C	20	31	0	12	59	100
D	30	21	12	0	5	8
E	40	51	59	5	0	69
F	50	41	100	8	69	0

TABLE 4.1

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) D,E,C,A,B,F,143
(Type: String) D, E, C, A, B, F, 143

1 point

13) Hand simulate the algorithm and report the tour generated by the Nearest Neighbour Algorithm starting at city A. Your answer must be a comma separated list of cities starting with A, followed by the cost of the tour found. For example A,B,C,D,E,F,2000

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) A,B,D,E,C,F,245
(Type: String) A, B, D, E, C, F, 245

1 point

14) Hand simulate the algorithm and report the tour generated by the Nearest Neighbour Algorithm starting at city F. Your answer must be a comma separated list of cities starting with F, followed by the cost of the tour found. For example F,E,D,C,B,A,2000

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) F,D,E,A,B,C,194
(Type: String) F, D, E, A, B, C, 194

1 point

15) Does the TSP problem in the above table appear to be Euclidean and satisfying the Triangle Inequality? *1 point*

- Yes
- No
- Cannot say

No, the answer is incorrect.
Score: 0
Accepted Answers:
No

16) Which of the following is/are true of Simulated Annealing (SA)? *1 point*

- SA generates all neighbours and picks the best one. Then it decides to move to it with a certain probability
- SA generates only one neighbour randomly and then decides to move to it with a certain probability
- SA generates one neighbour randomly and always moves to it if it is better
- SA generates one neighbour randomly and may move to it even if it is worse

No, the answer is incorrect.
Score: 0
Accepted Answers:
SA generates only one neighbour randomly and then decides to move to it with a certain probability
SA generates one neighbour randomly and may move to it even if it is worse

The following SAT formula is defined on the variables a, b, c, d, and e. A *candidate solution* is a corresponding vector represented by a 5-bit string (for example 11010) and the *Memory Vector M* is represented by a vector of five digits (for example M = 20010 depicts the tabu tenure of the variables a, b, c, d, and e respectively). *We represent a node in the search tree by (candidate.M), for example* (11010.20010).

$$((b \lor \neg c) \land (c \lor \neg d) \land (\neg b \lor c) \land (\neg a \lor \neg e) \land (\neg a \lor d) \land (\neg c \lor \neg d))$$

The *moveGen* or neighbourhood function *flips one bit*. Tabu Search explores the SAT problem starting at the node (01101.20010). The *tabu* tenure is 2 and the heuristic function is the number of clauses satisfied. *If two successors have the same heuristic value then the one that flips the bit on the left is chosen*. The heuristic value is given to you in the following table.

a	b	c	d	e	h(n)
0	0	0	0	0	6
0	0	0	0	1	6
0	0	0	1	0	5
0	0	0	1	1	5
0	0	1	0	0	5
0	0	1	0	1	5
0	0	1	1	0	4
0	0	1	1	1	4
0	1	0	0	0	5
0	1	0	0	1	5
0	1	0	1	0	4
0	1	0	1	1	4
0	1	1	0	0	6
0	1	1	0	1	6
0	1	1	1	0	5
0	1	1	1	1	5
1	0	0	0	0	5
1	0	0	0	1	4
1	0	0	1	0	5
1	0	0	1	1	4
1	0	1	0	0	4
1	0	1	0	1	3
1	0	1	1	0	4
1	0	1	1	1	3
1	1	0	0	0	4
1	1	0	0	1	3
1	1	0	1	0	4
1	1	0	1	1	3
1	1	1	0	0	5
1	1	1	0	1	4
1	1	1	1	0	5
1	1	1	1	1	4

17) Given the start node 10101, how many nodes, including the start node, does *Hill Climbing* end up visiting?

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 3

1 point

18) Given the start node 10101 does *Hill Climbing* end up in the solution node? *1 point*

- Yes
- No
- Cannot say

No, the answer is incorrect.
Score: 0
Accepted Answers:
Yes

19) Which of the following bits are allowed to be flipped by Tabu search to generate successors of the start node (01101.20010)? *1 point*

- a
- b
- c
- d
- e

No, the answer is incorrect.
Score: 0
Accepted Answers:
b
c
e

20) What is the FOURTH node inspected by Tabu search (remember the start node (01101.20010) is the first node)?

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) (00000.01200)
(Type: String) 00000.01200

1 point