Assignment 3 solutions

June 2023

Local Search

1. Refer page: 5 of kleinberg tardos LOCAL SEARCH ppt
   A. Local and Global optimal same.
   B. Global- the central node and local-all other nodes except the central (worst case scenario).
   C. Global:All the nodes in the left partite set. Local: All the nodes in the right partite set.

2. Refer Page 663 of Kleinberg tardos book, figure 12.3. The statement is true.

3. Refer Page 673 of Kleinberg tardos book

4. Statement is true. Reasoning is mentioned in the class. Note that it allows uphill movement as well as downhill movement. (Refer last paragraph of page 667 of Kleinberg tardos book)

5. Refer page: 14, 16 of kleinberg tardos LOCAL SEARCH ppt

   A. Find the good edges as mentioned in the class. Note that edges with weights 8, -10, -1 are the good edges. Then find the absolute weights.

   B. Done in the class.

   C. The upper bound is the total absolute weights of all the edges. Therefore, the upper bound on the number of iterations is 24.

6. Refer the example of page: 13 of kleinberg tardos LOCAL SEARCH ppt. Consider the configuration with the graph in the form of a triangle with the edge weights as 5, 6, 7. This provides a counter example for the statement.

7. In this case there is no configuration of this directed network in which all the nodes are satisfied. If all nodes have the same state, they will all be unsatisfied; and if one node has a different state from the other two, then the node directly in front of it will be unsatisfied.