CISC 5835—Algorithms for Data Analytics
Fall, 2019

Chapter 6 Homework

For all these problems, make sure to show your intermediate steps. In other words, if the answer is `42`, don't simply write "`42`".

1. [10 points] Use the dynamic programming algorithm in Section 6.2 of the text to find a longest increasing subsequence in the sequence $2, 7, 1, 8, 2, 8, 1, 8, 2, 8$.

2. [10 points] Use the dynamic programming algorithm in Section 6.3 to find a minimal sequence of edits needed to change `POLY` to `LOG`. Also, give the edit distance.

3. [20 points] Suppose you have a knapsack that can hold 20 pounds, along with pieces of gold having weights of 17, 6, 4, 8, and 9 pounds. Note that that the value of each object is essentially given by its weight. Solve this problem (giving the total weight, as well as the items actually chosen) using one of two strategies:

(a) The dynamic programming algorithm of Section 6.4.

(b) Formulate a greedy strategy for this problem, and determine the solution it provides. In terms of percentage, how good is the greedy solution, compared to the optimal solution?

4. [10 points] Use the dynamic programming algorithm in Section 6.5 to find the optimal parenthesization for computing the matrix product $A_1 \times A_2 \times A_3 \times A_4 \times A_5$, where A_1 is 40×10, A_2 is 10×30, A_3 is 30×20, A_4 is 20×60, and A_5 is 60×50.

Suggestion: When following the algorithm on page 171: Along with computing $m_{i,j}$, compute the break-point k such that $(A_i \times \dot{\times} A_k)(A_{k+1} \times \dot{\times} A_j)$ is the optimal way to calculate $A_i \times \dot{\times} A_j$.