

Algorithms

Dynamic Programming Group Project (75 pts)

This project requires you to first theoretically solve the dynamic programming problem below and then write a program that implements your solution. ¹ **You are not allowed to use the internet or consult any references. The only people you can work with on this project are your group members.**

1. *Problem Description:* Given a sequence $x[1..n]$ of n characters, find the longest subsequence that reads the same whether read from left to right or right to left.

Example. Suppose the sequence is

A C G T G T C A A A A T C G

then the longest such subsequence is

C T A A A A T C

2. *Deliverables:* Please submit a **hard copy** of all of the items requested below. Please don't send this by email as I would have to print it out anyway.
 - (a) [40 pts] Theory: Devise a dynamic programming algorithm that solves the problem. Demonstrate each of the following dynamic programming steps:
 - i. Describe the main idea of your approach including how you break the problem into smaller recursive problems [20 pts].
 - ii. Write pseudocode for your dynamic programming algorithm [10 pts].
 - iii. Develop a traceback algorithm that returns a longest subsequence [10 pts].
 - (b) [10 pts] Theory: Derive the complexity of your algorithm in terms of n .
 - (c) [15 pts] Implementation: Implement your algorithm and submit the print-out of your code. If you were unable to get your code to compile/run, please state this clearly. Although we don't plan to run everybody's code, we might choose a few groups randomly and ask them to demonstrate that their code works. (It would look pretty bad if you claim your code runs, but it doesn't!)
 - (d) [10 pts] Implementation: Demonstrate that your code works correctly by showing its results on a small example. (Provide the example you used so that we can verify this while grading.)
 - (e) Submit group effort percentages and indicate who did what. These must be agreed upon by the group. See syllabus to determine how I will use this to compute your individual grade.

¹The problem has been adapted from the text by Dasgupta et al.