

**CSC 323 Algorithm Design and Analysis, Spring 2020**  
**Instructor: Dr. Natarajan Meghanathan**

**Assignment 9: Dynamic Programming-based Solution for the Longest Common Subsequence Problem**

**Due: April 2nd, 2020: by 11.59 PM (in Canvas)**

In this assignment, you will implement the dynamic programming-based solution to find the longest common subsequence (LCS) of two sequences.

Your inputs will be the two sequences (as Strings) and the outputs are the longest common subsequence (printed as a String) and the final matrix (printed as a two-dimensional array) depicting the length of the longest common subsequences (as shown in the slides) for all possible subsequences of the two input sequences.

The two input sequences to be used by each student are shown below. The LCS expected for the two sequences is also shown.

Student Name	Row Sequence	Column Sequence	LCS
Abate, Biruk	TCGCCTT	GGGGTAACT	TCT
Akintade, Oluwaseun	TAAAATCTAG	CTTGGATC	TATC
Alharbi, Abdullah	GTGTGGAAAC	GCTTCTTTCT	GTTC
Alharbi, Abdulmajeed	AGGACGGTGAA	AATTTTTA	AATA
Atkins, Nayaa	CGGCCAGGCGAT	CGAGGTAAGTAG	CGAGGGA
Barnett, Isaiah	GCTATTAT	ATAGAAATC	GAAT
Dent, Kaitlyn	TTCTGATGTT	TCGGGAT	TCGAT
Drake, Keilah	CAGATGTATCTG	GAGACAGGAT	CAGGAT
Harris, Chawne	CTCAGGT	GTGAGGGGGA	TAGG
McGee, Bria	GATTGCACTA	GTAGCAGT	GAGCAT
Rankin, Simeon	GCTAAGC	AGTGCCG	GTGC
Redmond, Brandon	ATCACC	GCTCGATCTGCA	TCACC
Roberts, Cambria	TTTTAATCCAGC	TGCAGAGAACTA	TAATA
Stubbs, Jasmine	GAGTAAG	GCGACG	GGAG
Swami, Shaurya	CCCCTATAGT	CTGACG	CTAG
Tchakoua, Landrie	AGAGGC	CAATCGCAACGC	AGAGC
Teshome, Nahom	TATCAA	TGGACTCCGCAC	TATCA
Triplett, Marzell	GTACCCAGTAT	TACCGTGCAAG	TACCCAG
Wilkes, Kayla	GGATACCACAGTA	CAGTCAGGTACG	GTCAGTA

**A sample output is shown below.**

```

Row Sequence: ATTAGTGTCCGA
Column Sequence: ATGCGGGG
0 0 0 0 0 0 0 0 0 0
0 1 1 1 1 1 1 1 1 1
0 1 2 2 2 2 2 2 2 2
0 1 2 2 2 2 2 2 2 2
0 1 2 3 3 3 3 3 3 3
0 1 2 3 3 3 3 3 3 3
0 1 2 3 3 4 4 4 4 4
0 1 2 3 4 4 4 4 4 5
0 1 2 3 4 5 5 5 5 5
0 1 2 3 4 5 5 5 5 5
LCS: ATGGC

```

**Submission (through Canvas):**

- 1) The entire .cpp code file
- 2) A word or PDF document containing the following:
  - (i) Screenshot of the outputs showing the final dynamic programming table (of the lengths of the longest common subsequences of all possible subsequences of the two input strings) and the longest common subsequence
  - (ii) the final alignment (determined manually by working out the alignment based on the table printed in i, and typed in the word document) of the two input strings and the gaps (-) that need to be introduced in order to facilitate an alignment that matches with the LCS obtained.