CMPE 59H: Bioinformatics, Fall 2018
Assignment 1 - Pairwise Sequence Alignment with Affine Gap Penalty
Due: 16/11/2018, 23:00

A. Implement the Needleman-Wunsch dynamic programming *global sequence alignment* algorithm with *affine gap penalties*. Your program should take two amino acid sequences, gap opening, and gap extension penalties as input, and should output the maximum alignment score of these sequences, as well as the alignment achieving this maximum score. If there are multiple optimal alignments, you may print one of them. Use the BLOSUM62 scoring matrix (available at http://www.ncbi.nlm.nih.gov/Class/BLAST/BLOSUM62.txt).

B. Implement the Smith-Waterman dynamic programming *local sequence alignment* algorithm with *affine gap penalties*. Your program should take two amino acid sequences, gap opening, and gap extension penalties as input, and should output the maximum alignment score of these sequences, as well as the alignment achieving this maximum score. If there are multiple optimal alignments, you may print one of them. Use the BLOSUM62 scoring matrix (available at http://www.ncbi.nlm.nih.gov/Class/BLAST/BLOSUM62.txt).

Test your programs in A and B by aligning the pairs of sequences in the test-pair1.txt, test-pair2.txt, and test-pair3.txt files. Each line in the files contains one sequence. In your report show the produced alignments as well as their scores when the gap opening penalty is set to 11 and the gap extension penalty is set to 1. Include *screenshots* from running both of your programs on the three test pairs of sequences and the results produced.

Submission: Please submit your assignment using Moodle. Upload a single zip file named as YourNameSurname.zip. Your zip file should include your report, your source code, and the corresponding readme file. You can use any programming language of your choice. But, your readme file should clearly explain how to run your program.

Late Submission: You are allowed a total of 3 late days on homeworks with no late penalties applied. You can use these 3 days as you wish. For example, you can submit the first homework 2 days late, then the second homework 1 day late. After using these 3 extra days, 10 points will be deducted for each late day.