Department of Computer Science - University of Sri Jayewardenepura

CSC 464 2.0 Computational Biology
Assignment 1

For this assignment, your goal is to implement the Needleman-Wunsch algorithm and Smith-Waterman algorithm, which was discussed under Section 2.1. You are expected to create and use a Google Colab Notebook for Python from https://colab.research.google.com/.

Part 1

In this part, you will be implementing the Needleman-Wunsch algorithm for Global Alignment of two sequences.

The following functions and code blocks are expected in your solution:

```
def scoring(match, mismatch, gap):
    # This method will be used to initialize the scoring scheme. If match, mismatch
    # and gap scores are given, then the scheme will be updated accordingly. If not
    # provided, default values of +1, -1 and -1 will be assigned to match, mismatch
    # and gap, respectively.
    # YOUR CODE COMES HERE

def needle(seq1, seq2):
    # When the two sequences are passed to this method, this method will perform
    # alignment according to the Needleman-Wunsch algorithm for Global Alignment
    # and print out one or more best alignments.
    # YOUR CODE COMES HERE
```

Test Case (with default scoring scheme)
Sequences: ATTAC and AATTC
Alignment 1: CATTA- and C-TTAA
Alignment 2: CATT-A and C-TTAA

Part 2

In this part, you will be implementing the Smith-Waterman algorithm for Local Alignment of two sequences, in the same Notebook that you created for Part 1.

The following additional functions and code blocks are expected in your solution:

```
def waterman(seq1, seq2):
    # When the two sequences are passed to this method, this method will perform
    # alignment according to the Smith-Waterman algorithm for Local Alignment
    # and print out one or more best alignments.
    # YOUR CODE COMES HERE
```

Test Case (with default scoring scheme)
Sequences: ACATAG and AATG
Alignment 1: ATAG and AT-G

Submission Guidelines

- Ensure that you follow best practices when coding by properly having meaningful comments where necessary.
- Late submissions will be penalized accordingly. Refer the Google Classroom for the Due Date of the Assignment.
- Your first Text Cell on the Notebook should include your Index Number.
- Before submission, please re-run all cells by clicking "Kernel" and selecting "Restart & Run All."
- To submit, click on 'Add' button, and select your Google Colab file from your Google Drive. Then, make sure to click on "Hand Over" button to complete your submission.