CISC-471 FALL 2018

Please work on these problems and be prepared to share your solutions with classmates in class on Thursday, October 18. Assignments will **not** be collected for grading.

PROGRAMMING

Write a program in the language of your choosing (I recommend Python) and verify that it works on the sample data (using the on-line Rosalind platform). For each problem be prepared to tell us why you think your algorithm is correct (whether you program worked on the sample data or not). Also provide an estimate of the time and space complexity of your algorithm.

Greedy Motif Finding:

A greedy heuristic for finding motifs, GREEDYMOTIFSEARCH, is described in section 5.5 of the text. Implement this algorithm and try it on the following data:

```
AAATTGACGCAT
GACGACCACGTT
CGTCAGCGCCTG
GCTGAGCACCGG
AGTACGGGACAG
```

and find the best 3-mer motif.

PROBLEMS

These questions come from *An Introduction to Bioinformatics Algorithms* by Neil C. Jones and Pavel A. Pevzner.

Problem 6.4: Modify DPCHANGE to return not only the smallest number of coins but also the correct combination of coins.

Problem 6.6: Find the number of different paths from source (n, m) to sink $(0, 0)$ in an $n \times m$ rectangular grid. These paths are described in section 6.3 The Manhattan Tourist Problem. A valid path can only go up or left (no diagonal moves). Write a dynamic programming algorithm to determine this quantity. You can also obtain the result by thinking of a valid path as a string of length $n + m$ using n 'U's and m 'L's. BONUS: Now also allow diagonal moves (up and left). Update your program to handle this additional move. The combinatorial solution now must deal with this additional move in a non-trivial way.