CISC-471 FALL 2018

HOMEWORK 8

Please work on these problems and be prepared to share your solutions with classmates in class on Thursday Nov. 15. Assignments will **<u>not</u>** be collected for grading.

PROBLEMS

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

Problem 8.6: Find the shortest common superstring for eight 3-mers:

{AGT, AAA, ACT, AAC, CTT, GTA, TTT, TAA}

and solve the following two problems:

- Construct the graph with 8 vertices corresponding to these 3-mers (Hamiltonian path approach) and find a Hamiltonian path (7 edges) which visits each vertex exactly once. Does this path visit every edge of the graph? Write the superstring corresponding to this Hamiltonian path.
- Construct the graph with 8 edges corresponding to these 3-mers (Eulerian path approach) and find an Eulerian path (8 edges) which visits each edge exactly once. Does this path visit every vertex of the graph exactly once? Write the superstring corresponding to this Eulerian path.

Problem 8.8: Find the shortest common superstring for all 8 3-digit binary numbers in 0-1 alphabet.

Not from textbook: Let n be a positive integer, and x can be any floating point number.

An easy way to compute x^n uses n multiplications of x.

However, a divide and conquer strategy can be used to compute x^n using $O(\log n)$ multiplications.

Design an algorithm to do this and implement it in a programming language of your choice.

Note: you can ignore overflow issues for this excersize.