CSE 4425 Midterm test - Sample questions
Fall 2018
October 18, 2018
Instructor: S. Datta

1. What is the Central Dogma of Molecular Biology?

2. What is the difference between exons and genes? What is alternative splicing? What is 3-periodicity?

3. Suppose we are trying to align gene X in the genomes of two (human) individuals A, B. We extract the sequences of the two genes (X_A, X_B), and use an aligner. Should we use local alignment or global alignment? Suppose we are trying to find SNPs (single nucleotide polymorphisms or differences) in the alignment. Describe a penalty function that encourages 1 mismatch but discourages (penalizes) two or more successive mismatches. How do the recurrences for alignment change? Do not consider affine gap penalties in this question.

4. Suppose you are given a DNA sequence. Use dynamic programming to solve the following problem – compute the longest subsequence of the given sequence that is of the form $A^*C^*T^*G^*$.
Hint: relate this problem to the LCS problem.

An alignment of circular strings is defined as an alignment of linear strings formed by cutting (linearizing) these circular strings at arbitrary positions. Devise an efficient algorithm to find an optimal global alignment of circular strings. In other words your algorithm should find the cut points of the two strings that maximize the alignment of the two resulting linear strings.