COT 5407 Introduction to Algorithms
Homework 3

Due on Tuesday, November 13, 2018

This homework covers Ch 15,25

1. Dynamic Programming [15 points] Given as an input a sequence of characters $< x_1, x_2, \ldots, x_n >$ propose a Dynamic Programming algorithm to find the longest subsequence that reads the same whether it is read from left to right or from right to left (palindrome). For instance, if the sequence is

   $< T, G, C, A, C, A, G, T, T, T, T, A, G, C >$

   the longest palindrome subsequence is T, G, C, A, C, G, T and two non-optimal such subsequences are $< C, A, A, C >$ and $< T, A, T >$. Notice that a subsequence does not have to be contiguous.

2. Dynamic Programming [15 points] A string w of parentheses (and) and brackets [and] is balanced if it satisfies one of the following conditions:

   - w is the empty string.
   - w = (x) for some balanced string x
   - w = [x] for some balanced string x
   - w = x y for some balanced strings x and y

   For example, the string $w = ([()][]())[()()]()$ is balanced, because $w = xy$, where $x = ([()][]())$ and $y = [()()]()$. Describe and analyze an algorithm to compute the length of a longest balanced subsequence of a given string of parentheses and brackets. Your input is an array $w[1 \ldots n]$, where $w[i] \in \{(,), [,]\}$ for every index i.

3. **[10 points]** Carefully read section 15.3 and the solve exercise 15.3-1.

4. **[10 points]** Solve exercise 15.2-1 from Cormen.

5. **[10 points]** Solve exercise 15.4-1 from Cormen.

6. **[10 points]** Solve exercise 15.4-5 from Cormen.

7. **[10 points]** Solve exercise 15.1-5 from Cormen.

8. **[10 points]** Solve exercise 25.1-5 from Cormen.

9. **[10 points]** Solve exercise 25.2-1 from Cormen.