ECS 122A B01-B03 FQ 2021 Homework 04

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TOTAL POINTS

81 / 100

QUESTION 1

1 Q1 **20 / 30**

   + 30 pts All correct

   + 10 pts Part 1 complete

   + 20 pts Part 2 complete

   ✓ **+ 5 pts** *Incomplete work shown in Part 1*

   ✓ **+ 15 pts** *Incomplete pseudo-code in Part 2*

   + 0 pts Invalid/No submission

   + 10 pts No work shown in Part 2, but

conceptual understanding show in Part 1

QUESTION 2

2 Q2 **40 / 40**

   ✓ **+ 40 pts** *All Correct*

   + 0 pts Invalid/No submission

   + 20 pts Part 1 Complete

   + 20 pts Part 2 Complete

   + 15 pts Incomplete Part 1

QUESTION 3

3 Q3 **21 / 30**

   + 30 pts All Correct

   + 10 pts Part 1 Correct

   + 10 pts Part 2 Correct

   + 10 pts Part 3 Correct

   ✓ **+ 7 pts** *Part 1 Partially Correct*

   ✓ **+ 7 pts** *Part 2 Partially Correct*

   ✓ **+ 7 pts** *Part 3 Partially Correct*

+ 0 pts Invalid/No Submission

+ 5 pts No work shown for Part 3

+ 10 pts Incorrect solution in all the 3 parts

$$A = \begin{bmatrix} 3 & 8 \\ 5 & 2 \end{bmatrix} \quad B = \begin{bmatrix} 2 & 3 \\ 4 & 9 \end{bmatrix}$$

Q1

$$m_1 = \overset{A_{11}}{[(3)} + \overset{A_{22}}{(2)]}(\overset{B_{11}}{2} + \overset{B_{22}}{9}) = 55$$

$$m_2 = (5 + 2)(2) = 14$$

$$m_3 = [(3)(3 - 9)] = -18$$

$$m_4 = 2(4 - 2) = 4$$

$$m_5 = (3 + 8)(9) = 99$$

$$m_6 = (5 - 3)(2 + 3) = 10$$

$$m_7 = (8 - 2)(4 + 9) = 78$$

$$\begin{bmatrix} C_{11} & C_{12} \\ C_{21} & C_{22} \end{bmatrix} = \begin{bmatrix} m_1 + m_4 - m_5 + m_7, & m_3 + m_5 \\ m_2 + m_4, & m_1 - m_2 + m_3 + m_6 \end{bmatrix}$$

$$C_{11} = 55 + 4 - 99 + 78 = 38$$

$$C_{12} = -18 + 99 = 81$$

$$C_{21} = 14 + 4 = 18$$

$$C_{22} = 55 - 14 + -18 + 10 = 33$$

$$\begin{bmatrix} 38 & 81 \\ 18 & 33 \end{bmatrix}$$

2) Square matrix multiply (A, B)

   n = A.rows

   let C is new n×n matrix

       for i=1 to n

          for j=1 to n

             $C_{ij} = 0$

             for k=1 to n

                $C_{ij} = C_{ij} + a_{ik} \cdot b_{kj}$

      Return C

1 Q1 **20 / 30**

>   **+ 30 pts** All correct

>   **+ 10 pts** Part 1 complete

>   **+ 20 pts** Part 2 complete

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> ✓ **+ 15 pts** *Incomplete pseudo-code in Part 2*

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>   **+ 10 pts** No work shown in Part 2, but conceptual understanding show in Part 1

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Prefix = ""

n = len(Array) - length array   m = len longest string

Q2   Longest Common Prefix (Array)

        Array.sort()   — Sort takes m time? by length
        for i=1 to n   str
            if array[0][i] == array[-1][i]:   — Compare first
                Prefix += array[0][i]   & last
            Else: Break
        return Prefix

            $O(nm)$ n = len arr   m = maxstr len

```
2) LCP (Arr, low, high):
    if low == high:
        return arr[low]
    if high > low:
        mid = ⌊low + (high-low) / 2⌋  floor or truncate?
    Str1 = LCP(arr, low, mid)
    Str2 = LCP(arr, mid+1, high)
    while i=1 to len(str1) & j=1 to len(str2)
        if str1[i] != str2[j]:
            break                              — not equal, break loop
        Sol += str1[i]                         — append Prefix
        i++, j++
    return Sol
```

                                                    0 1 2 3 4 5
                                                   [a b c | d e f]
                                                    low mid   high
                                         ⌊n/2⌋ & ⌈n/2⌉   low...mid
                                                         mid+1...high

2 Q2 **40 / 40**

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      + 20 pts Part 2 Complete

      + 15 pts Incomplete Part 1

Q3 1. Earliest start time   All can lead to non optimal

let OPT $= \{O_1, O_2, ..., O_k\}$ be an optimal solution
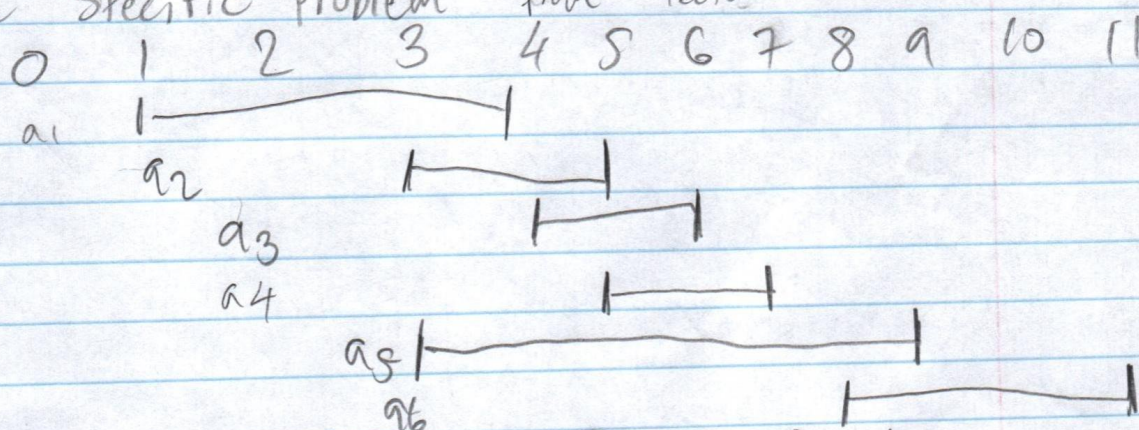 $B = \{b_1, b_2, ...\}$ be our greedy solution

    $B' = \{b_1, O_2, O_3, ..., O_k\}$ assume O_1 is different first choice
    $f[b_1] \leq f[O_1]$

              $f[b_1] \leq f[O_1] \leq s[O_2]$

2. Shortest Duration
      All can lead to non optimal solutions   but there exists
      at least one optimal solution   that starts with
      greedy choice
   in the specific problem   from lecture

   O   1   2   3   4   5   6 7 8   9   10   11

with OPT $\{O_1, O_2, ..., O_k\}$ be optimal
     $A = \{a_1, a_2, ...\}$ be greedy
     $A' \{a_2, a_4, a_6\}$ is optimal

3 fewest conflicts   E atleast one optimal
                           solution

$OPT = \{O_1, O_2, \ldots, O_k\}$

$B = \{b_1, b_2, \ldots\}$

$B' = \{b_1, O_2, O_3\}$

$B' = \{b_1, b_3, b_6\}$

3 Q3 **21 / 30**

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