CS2023 - Data Structures and Algorithms
Take Home Assignment

Week 2 Complexity Analysis

March 09, 2023

You are required to answer the below questions and submit a PDF to the submission link provided under this week before the deadline (no extensions **will** be provided). **You can** either **write /** type **your** answers, but either **way** your answers should be readable.

Question 1

Study the Little Oh notation (o), Big Omega Notation(Ω) and Little Omega Notation(ω).
Note.: You should define. what these symbols mean and provide examples if possible.

Question 2

What are the relationships between the θ, O, o, and ω notations?
Note.: Please use a table to compare and contrast them

Question 3

Study the optimized Bubble sort algorithms given in the next page and

1. Analyze them for worst case time complexity.
2. Is there a difference in worst case time complexities?
3. Is there an easy method to analyze only the worst-case time complexity?

Algorithm 1 Bubble Sort Optimized - Version I

```
for j = A.length to 2 do
    swapped = false
    for i = 2 to j do
        swapped = false
        if (A[i — 1|> A[i]) then
            temp = A[i]
            A[i] = A[i — 1|
            A[i — 1| = temp
            swapped = true
    if (! swapped) then
        break;
n = newLimit
```

Algorithm 2 Bubble Sort Optimized - Version II

```
n = A.length
do
    swapped = false
    for i = 2 to n do
        if (A[i — 1| >A[i]) then
            temp = A[i]
            A[i] = A[i - 1|
            A[i - 1| = temp
            swapped = true
            newLimit = i-1
    n = newLimit
while swapped
```