CS 201: Fundamentals of Computer Science I

Homework Assignment 2

Fall 2020

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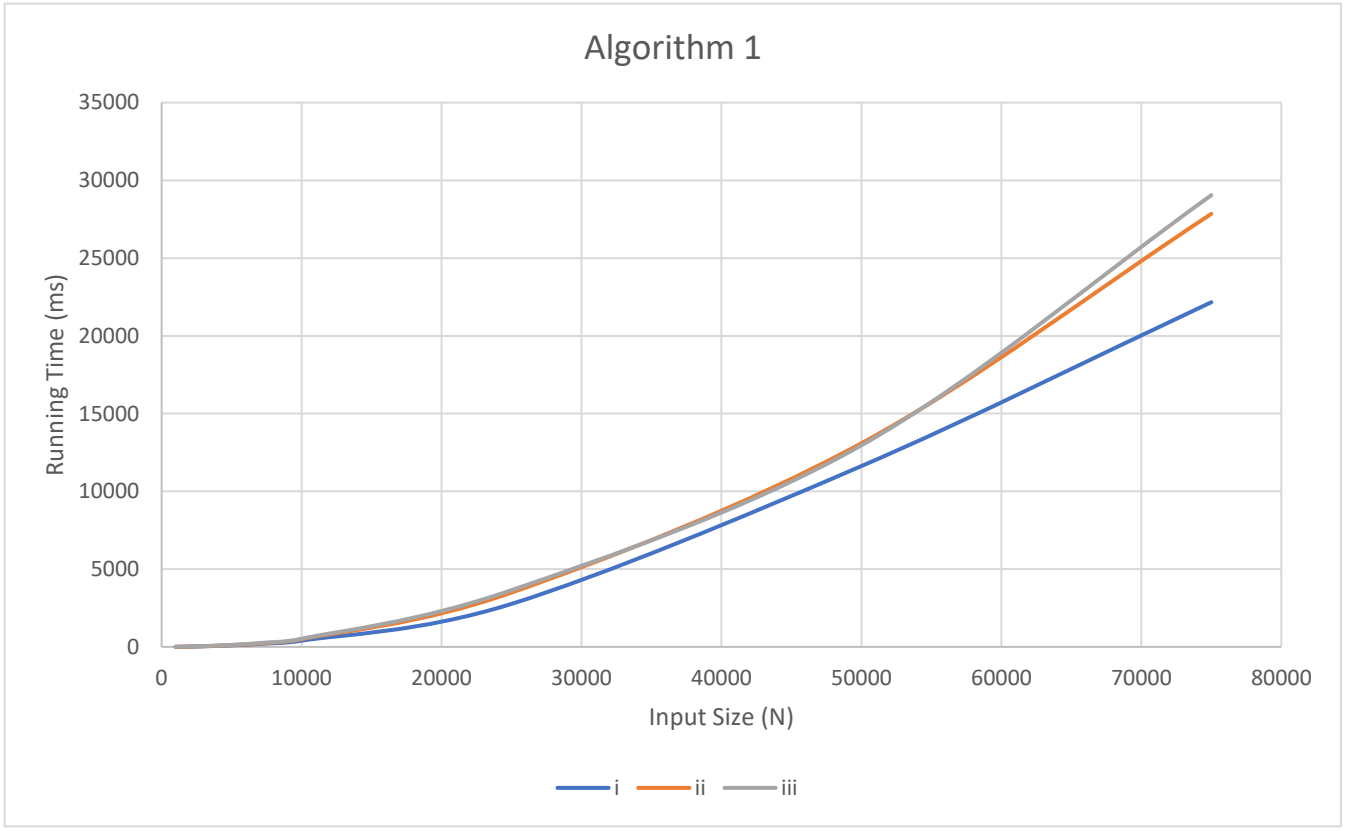
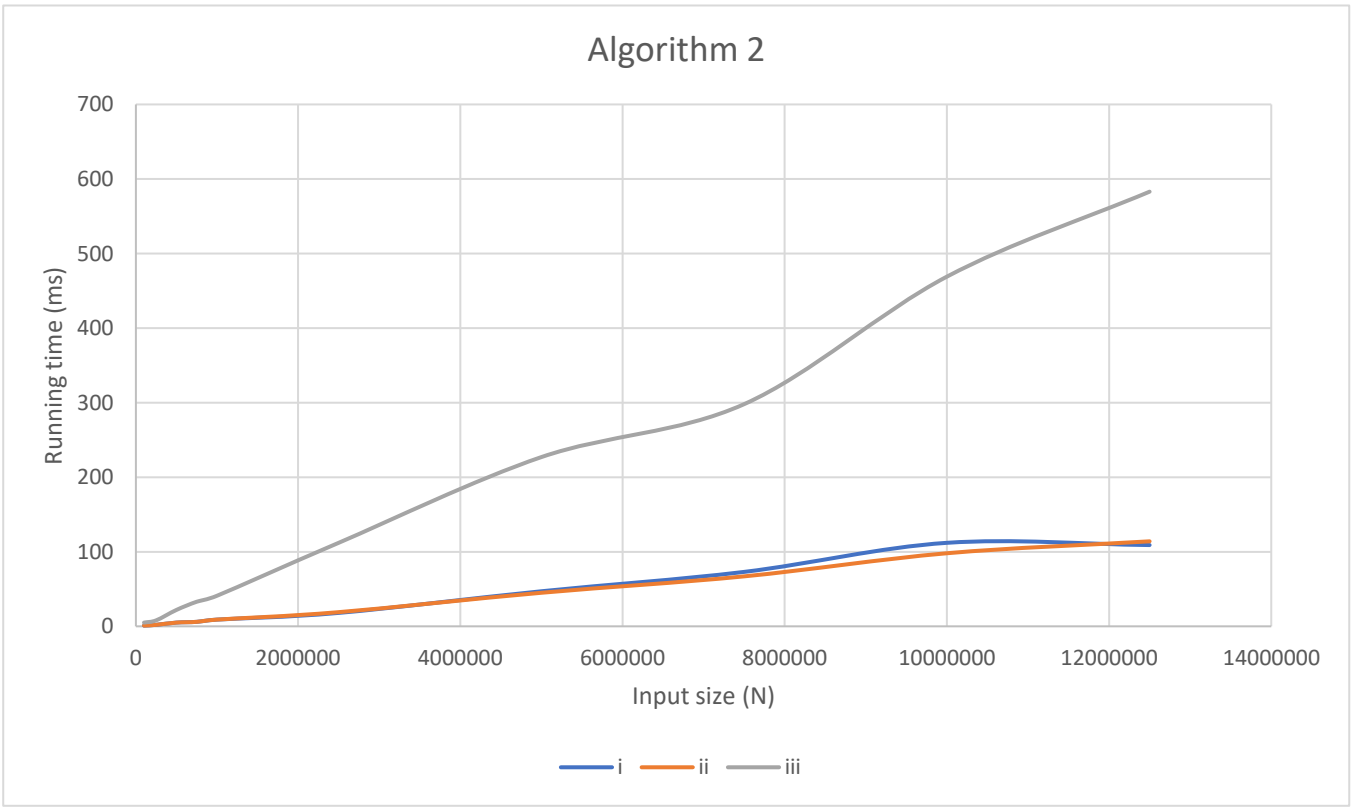
Task 2: Running Time vs Input Size graph of algorithms 1 and 2





Task 3:

Algorithm 1:

- Average case: case 1 (i, indicated with orange)
- Best case: case 3 (iii, indicated with grey)
- Best case: case 2 (ii, indicated with blue)

Worst case time complexity = O (n^2)

Algorithm 2:

- Worst case: case 3 (iii, indicated with grey)

Because the average and best-case scenarios are very close, it is hard to name them. Although it is best to name case 1 (i) and case 2 (ii) as best-case scenarios, we can distinguish them by looking the results of some cases:

- Average case: case 1 (i, indicated with blue)
- Best case: case 2(ii, indicated with orange)

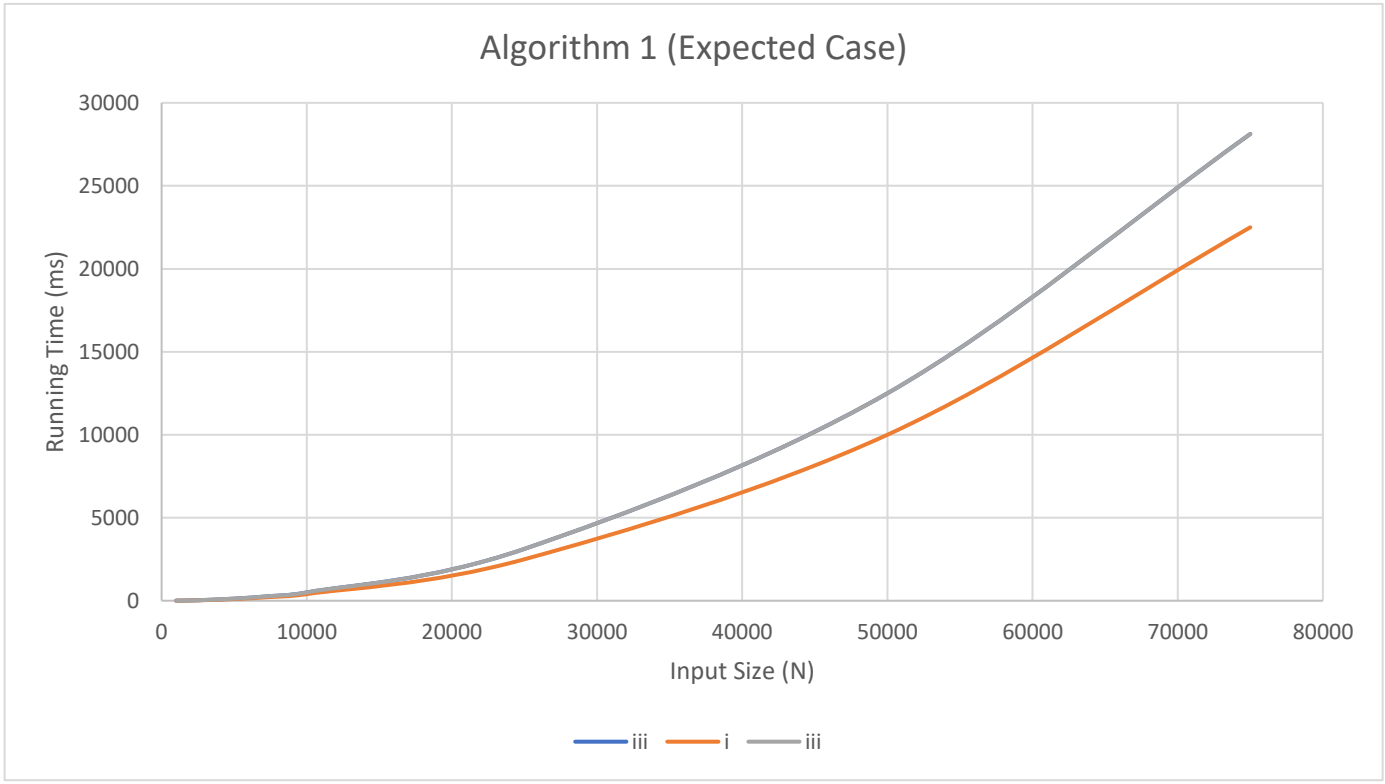
Worst case time complexity = O (n)

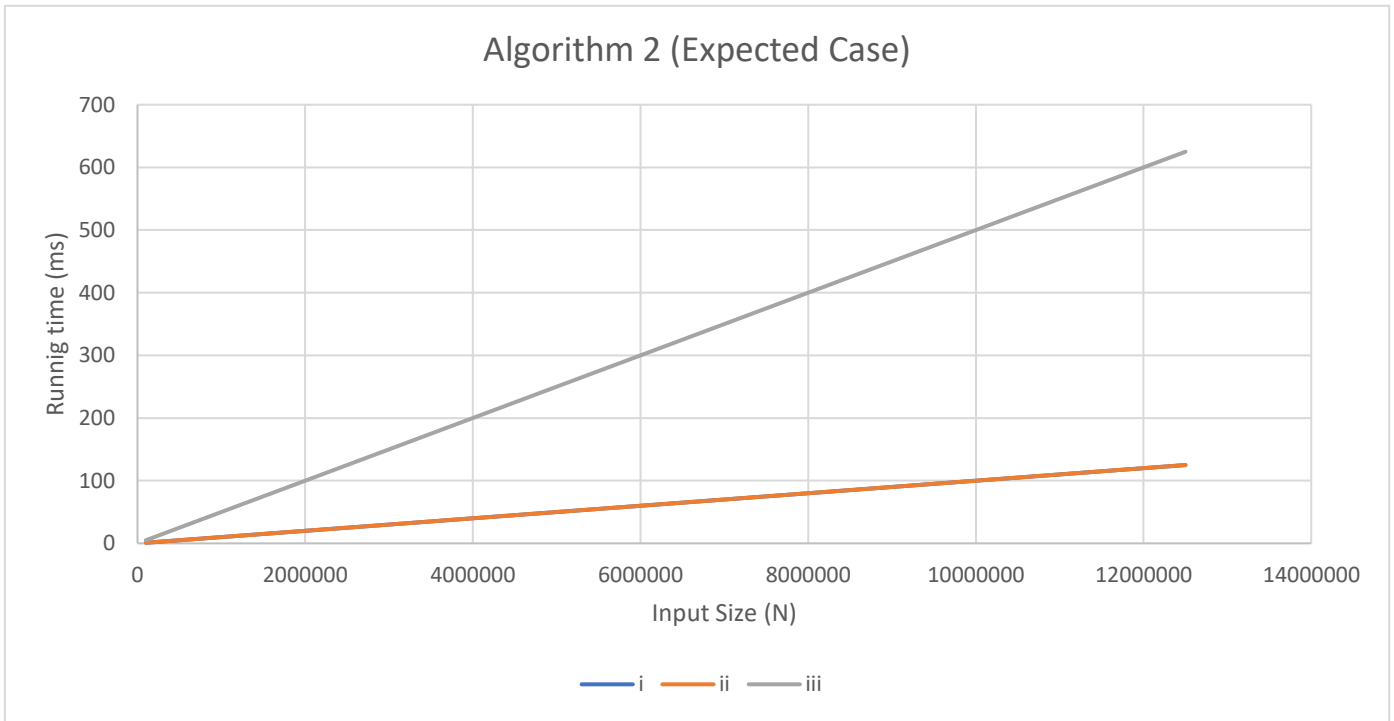
Task 4:

Specifications of my computer:

- Intel Core i5 4570 CPU
- AMD Radeon R9 270X GPU
- 8 GB DDR3 1600Mhz
- Windows 10 Home 64-bit Build 18363

Task 5:


Algorithm 1 (Expected Case)
Running Time (ms)
30000
25000
20000
15000
10000
5000
0
0
10000
20000
30000
40000
50000
60000
70000
80000
Input Size (N)
iii
i
iii


Algorithm 2 (Expected Case)
Runnig time (ms)
700
600
500
400
300
200
100
0
0
2000000
4000000
6000000
8000000
10000000
12000000
14000000
Input Size (N)
i
ii
iii

Task 6: Conclusion

The results of Algorithm 1 are slightly different than what we expected. In theoretical analysis, we see that case (ii) is worse than case (i). But according to our expected case graph these two should be nearly identical. The cause of this difference might differ. At the time when the execution happens, the operating system might be executing a more hardware demanding program. Also, the compiler might optimize the program differently so that it takes a different time to execute.

The results of Algorithm 2 are more like the expected one but we see little waves. Reasons of this very little execution time differences might be same with what happened at Algorithm 1, but the starting point and end point of the lines are very much the same with what we expected. Hence, we can say that we get results of what we expected for most of the time.