

CS201: HW2 Report

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Section: 01

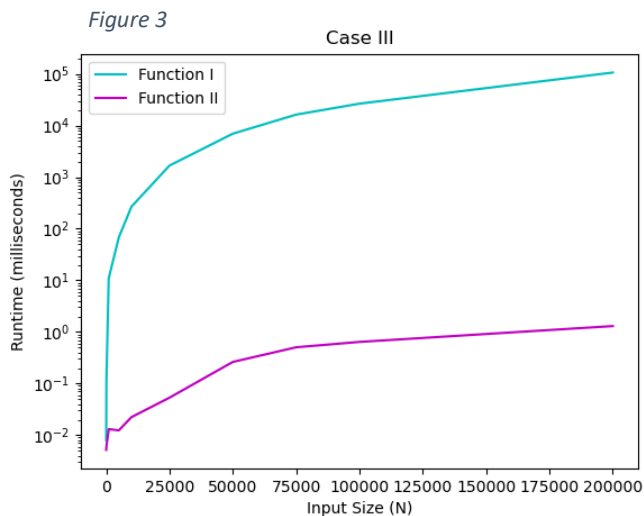
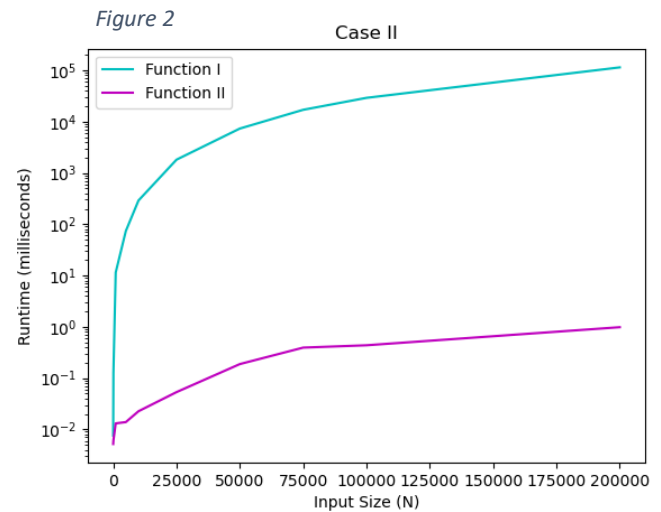
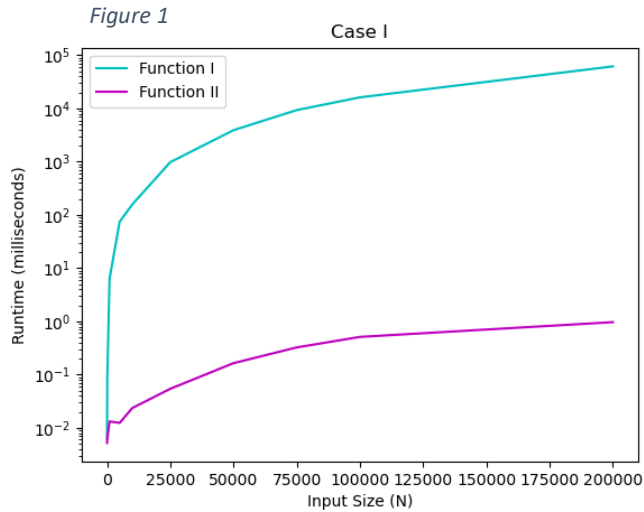
Specifications for my computer:

Processor: Intel® Core™ i7-9750H CPU @ 2.60GHz 2.59 GHz

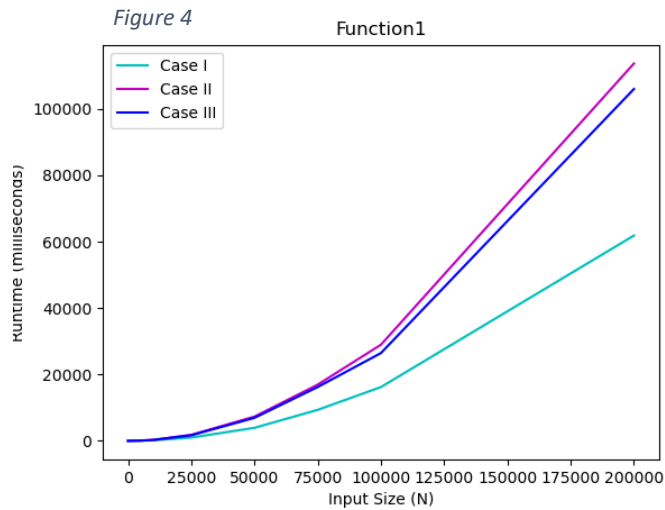
RAM: 16.0 GB (15.9 GB usable)

Operating System: Windows 64-bit operating system, x64-based processor

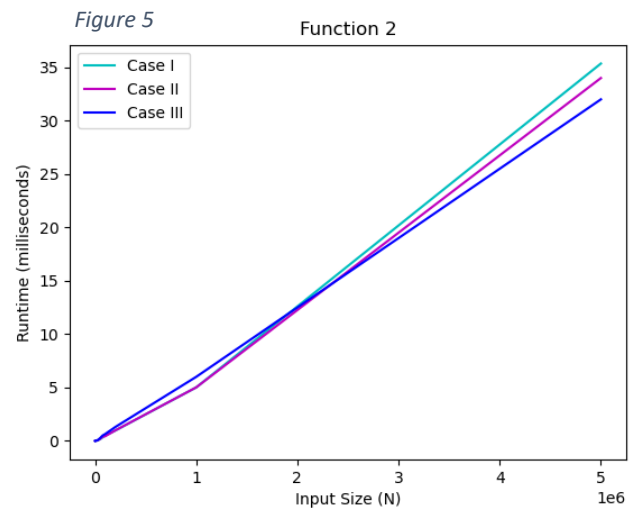
Plots according to my measurements:



I chose to show the comparison of function 1 and 2 by log scaling. Otherwise, the measurements of the function 2 were so small in comparison to function 1 that the measurements looked like they were always 0.



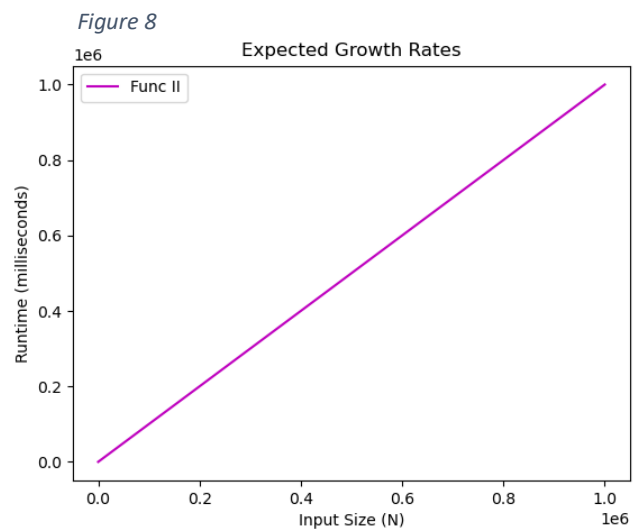
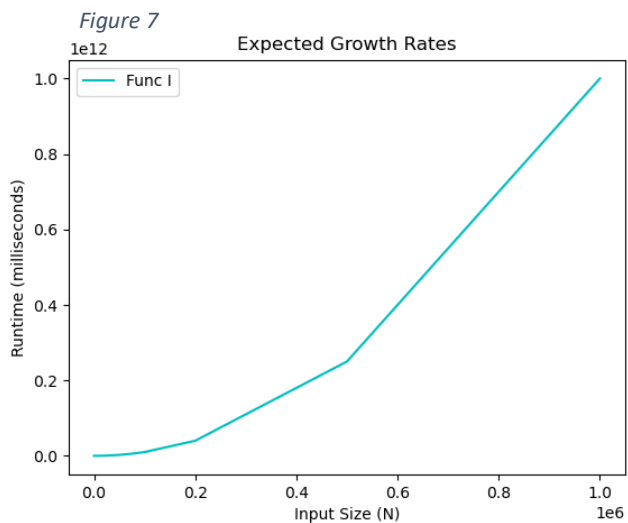
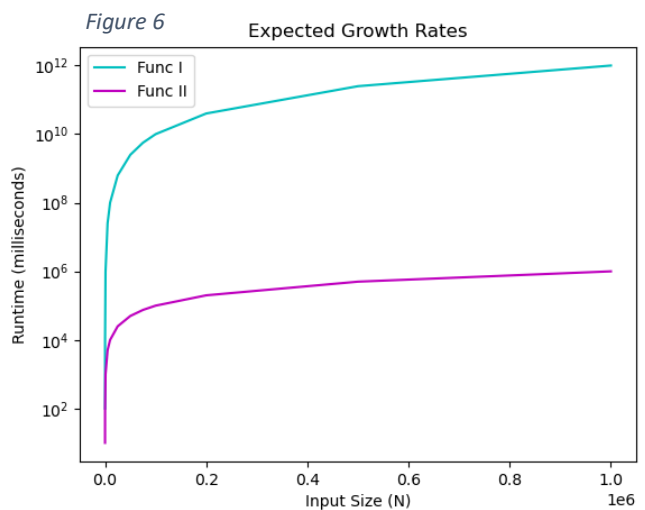
Best case: Case I
Average case: Case III
Worst case: Case II



There is no best/average/worst case.

Plots according to my expectations:

Func1: Growth rate is $O(N^2)$
Func2: Growth rate is $O(N)$



Discussion of measurements and expectations:

I have prepared different graphs to discuss my observations. Beginning with my theoretical analysis of my two functions, I thought that the growth rates of the functions 1 and 2 should be $O(N^2)$ and $O(N)$ respectively. I showed the graphs of my expectations in Figures 7 and 8. I have also compared the expected growth rates of functions 1 and 2 in Figure 6. We can say that the growth rate of function 1 is much greater than the growth rate of function 2 from these graphs. We can say the same thing by looking at the Figures 1, 2 and 3 that compare the results of cases I, II and III.

I also wanted to look at functions 1 and 2 individually. For function 1, from the Figure 4 we can interpret that the worst case is case II where array2 elements are strictly smaller than array1 elements. This is because the function shifts the elements of array3 for all elements of array2. When array2's elements are strictly greater than array1's elements, the function doesn't shift the elements and puts them at the end of the array. This happens in case I, which is the best case. Also, in case III the numbers in the arrays are random so we don't have strictly smaller/greater elements. This is why this case is the average case and in Figure 4, its line is in between the lines of case I and case II. Moreover, when we consider function 2 in Figure 5, we see that the lines of these three cases are very close to each other. This indicates that there is no best/average/worst case, because there is no shifting of the elements and function 2 only inserts the smaller element to array3. Still, there are small differences between the cases, but they are small errors that can be neglected considering that the measurement unit is milliseconds. Furthermore, the Figures 4 and 7, and Figures 5 and 8 are quite similar. This proves that the expected growth rates are correct.