

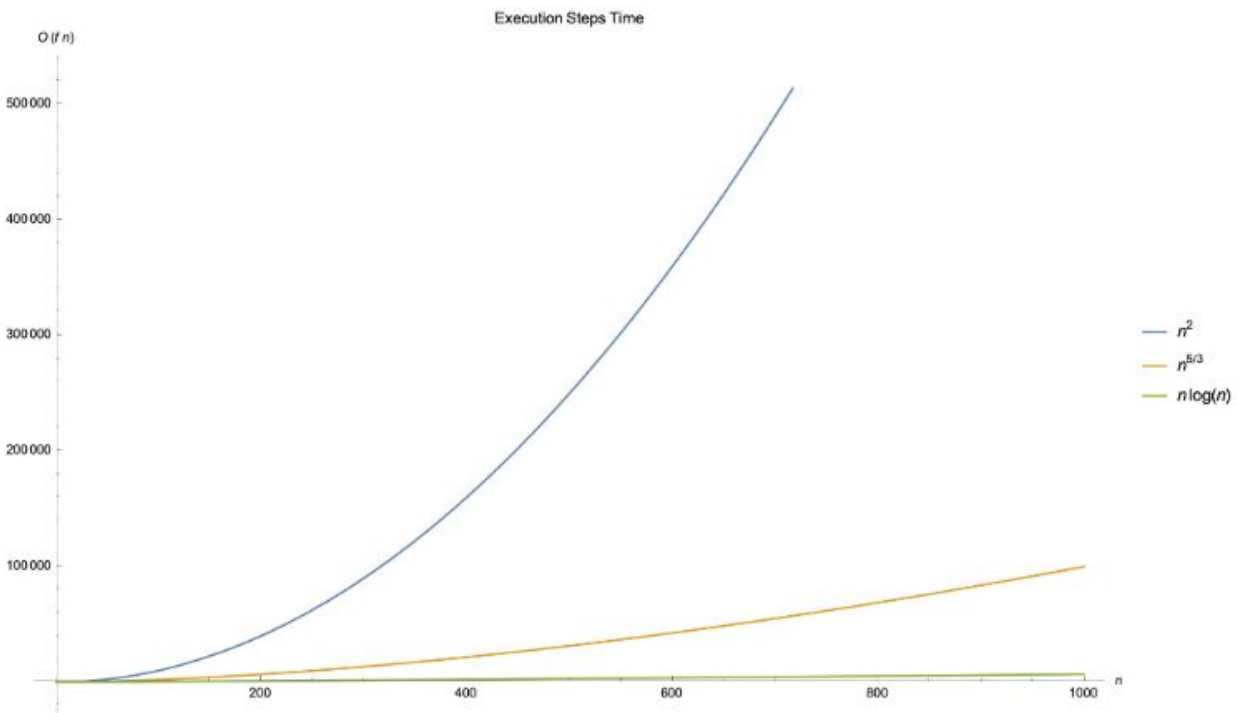
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Assignment 5 WriteUp

Each sorting algorithm uses a different method in order to sort values and thus takes a different amount of time to execute their specific method. Here are the sorting algorithms we were told to implement in order from slowest time complexity to fastest: Bubble sort, Binary Insertion sort, and the worst case for Quicksort are $O(n^2)$, Shell sort is $O(n^{5/3})$, and average case Quicksort is $O(n \log n)$. At a small enough constant there are fewer differences in time complexity in regard to sorting algorithms, basing time more on the capabilities of the system. But as the constant grows larger, the differences in time complexity reveal what algorithms are more productive when sorting large amounts of data. Below is a graph detailing the time complexity of each algorithm in relation to the growth of the constant.



After implementing the four different sorting algorithms I learned that sorting is a fundamental operation in the Computer Science field and something I will need to master in order to unlock my potential as a programmer. The many different methods available to sort values and their corresponding time complexities has a huge impact on computing effectiveness.

The efficiency of an algorithm can have a much larger impact on productivity in comparison to the literal hardware of the running computational system depending on the scenario.

I experimented with the different sorting algorithms in many different ways. One way was checking what each sorting function would return if there were only one or even zero elements in the array being sorted. All functions would either return the single element first, or all zeros depending on the value of n . I also tested the difference in time and output between running all options separately and using the `-A` option. There was no noticeable difference between running the two different sets of options. I also wanted to see what would happen if any errors would occur if every element in the array were the same value. Luckily no errors occurred in any of the sorting functions I created when I tested this instead, as expected the same value was printed at every column specified by the `-p` option.