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CSE 431 – Algorithm Engineering

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Asymptotic Analysis for Selection Sort and Merge Sort Algorithm

**Hypothesis:**

It is well known that asymptotically speaking, the sorting algorithm, merge sort will outperform selection sort. For small values of N however, where N represents the amount of data to be sorted, selection sort may outperform merge sort. Asymptotically, Selection sort is characterised as while Merge sort is characterised as an . Mathematically, there is never a case where is true. This lead me to believe that it will not be the case that Selection sort will out perform Merge sort even for small values of N.

**Method:**

To test this hypothesis, I wrote a program in C++ that implemented the two sorting algorithms. Credits to Stack Overflow and Bing AI for the merge sort algorithm. Checks were put in place to make sure the data is indeed sorted by comparing it with the C++ STL Vector::Sort algorithm. With the two algorithms in place, the program simply asks the user for how many trial runs, how many N values, the minimum possible value and the maximum possible value. The GenerateVector() function is then called to populate a vector with N values in the range of minimum value and maximum value. Once the vector is generated, a clock timer starts right before we start the selection sort algorithm and stops right afterwards. The stop and start time are subtracted and outputted to the console to communicate the length of time it took to return from the function. Similarly, the same procedure is done right before and right after merge sort algorithm is executed. When the values are done, the program notifies the user of the faster algorithm for the specified amount of N values and prompts for a re-run. This is repeated for x amount of trial runs and recorded. I pick 20 trials: the first 5 trials are for low values of N; 10 and

**Results:**

The results showed that I was indeed wrong and