CPSC 335 - Project 2

Project Report

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Hypothesis:

We hypothesis that the mergesort will be more efficient for lower input sizes and quicksort will be the most efficient for higher input sizes.

Average Performance:

Mergesort: 0.178348
Quicksort: 0.053312

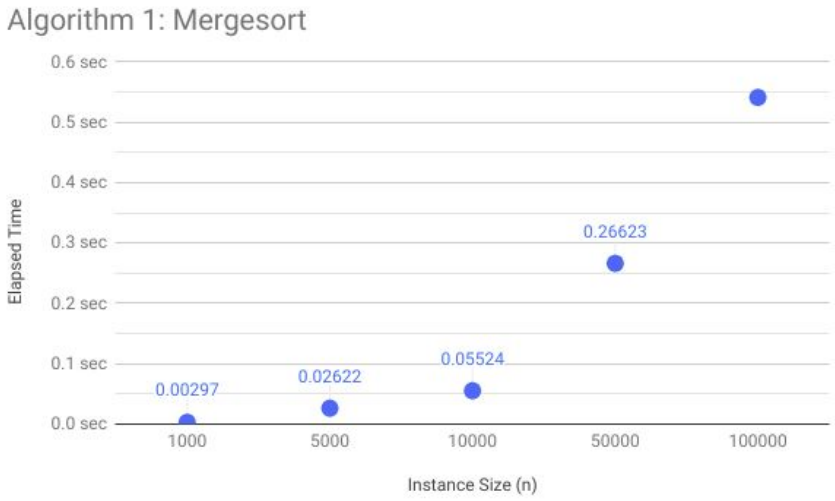
Range:

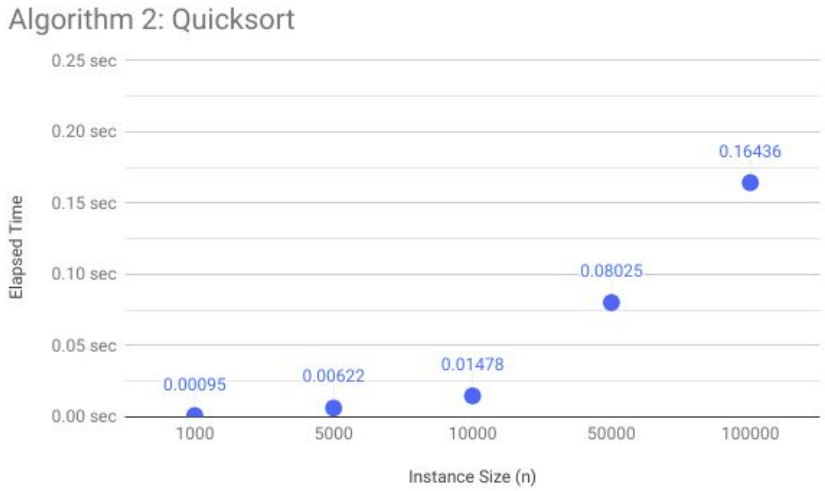
Mergesort: 0.53811
Quicksort: 0.16341

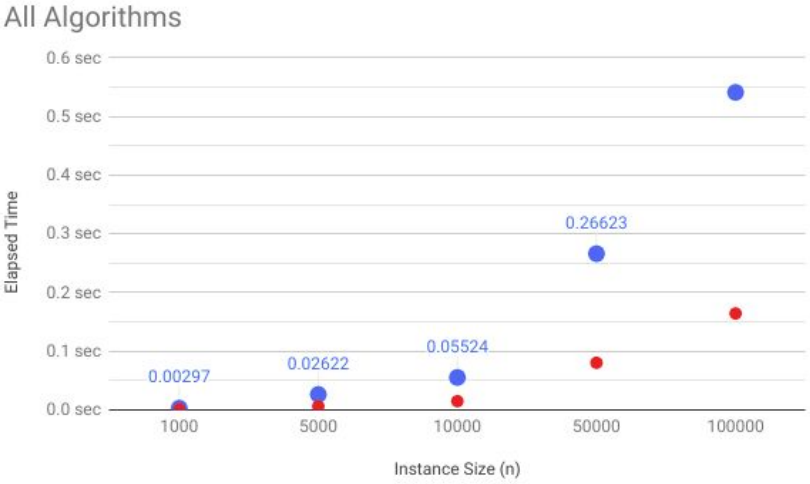
Standard Deviation:

Mergesort: 0.20413412
Quicksort: 0.06245232

Plots:


Algorithm 1: Mergesort
0.6 sec
0.5 sec
0.4 sec
0.3 sec
0.2 sec
0.1 sec
0.0 sec
Elapsed Time
0.00297
0.02622
0.05524
0.26623
1000
5000
10000
50000
100000
Instance Size (n)


Algorithm 2: Quicksort
0.25 sec
0.20 sec
0.15 sec
0.10 sec
0.05 sec
0.00 sec
Elapsed Time
0.00095
0.00622
0.01478
0.08025
0.16436
1000
5000
10000
50000
100000
Instance Size (n)


All Algorithms
0.6 sec
0.5 sec
0.4 sec
0.3 sec
0.2 sec
0.1 sec
0.0 sec
Elapsed Time
0.00297
0.02622
0.05524
0.26623
1000
5000
10000
50000
100000
Instance Size (n)

Conclusion:

Our hypothesis was half-correct. The quicksort algorithm was indeed more efficient for larger data sets, but it also beast the mergesort algorithm in smaller data sets as well. The average Big O time for the quicksort algorithm is O(nlogn) while the worst-case scenario is $O(n^2)$. The worst case is when data is already sorted and the pivot is the first element. Meanwhile, the Big O for the mergesort algorithm is also O(nlogn) and its worst-case scenario is O(nlogn). Having said all this, we avoided the worst case for the quicksort algorithm by choosing a random pivot. Therefore, our quicksort performed slightly better than its mergesort counterpart in all cases.