Assignment 6 (Hits as time predictor)

Problem Description: Determine the best predictor for total execution time.

1. MergeSort (Array Copy with No insurance)

In MergeSort, compares and copies are the best predictors for the execution time. The slope for compares and copy operations is 1.1 and the slope for the time is 1.16, making them the best predictors for the execution time.

Size	Time	Normalized Time	Hits	Copies	Swaps	Compares
16000	3.47	2.89	434,695	189,312	14,018	204,954
32000	8.22	3.17	933,448	410,624	28,050	441,917
64000	18.40	3.30	1,994,887	885,248	56,098	947,829
128000	40.46	3.39	4,245,379	1,898,496	112,097	2,023,575
256000	86.81	3.42	9,002,965	4,052,992	224,245	4,303,164

Table 1: The table shows the Time (ms), Normalized time (msec), Hits, Copies, Swaps, and Compares completed for MergeSort for various sized inputs

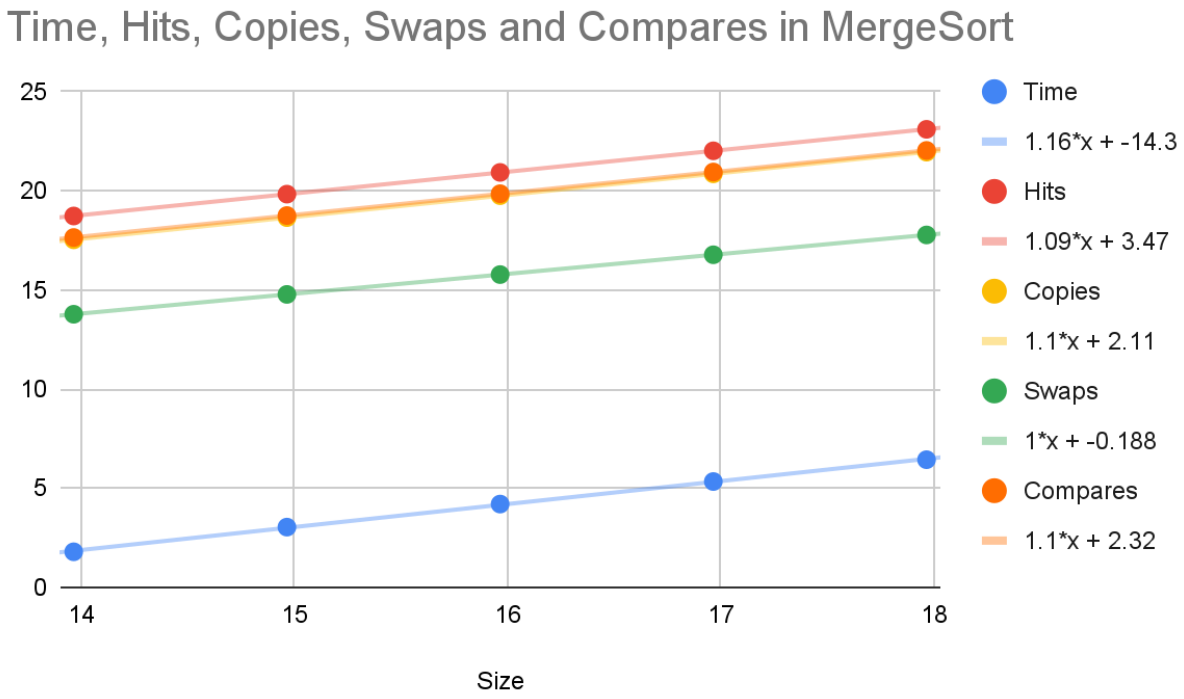


Figure 1: The chart shows the log/log scatter plot for all predictors in MergeSort

2. QuickSort

In QuickSort, the slope of all predictors, is approximately equal. As per the data collected, the slope of the log/log chart for time is 1.18 and the slope for all predictors is 1.1. Thus, no single predictor is best.

Size	Time	Normalized Time	Hits	Swaps	Compares
16000	2.70	3.25	702,512	111,160	265,136
32000	6.71	2.59	1,532,359	242,542	577,337
64000	14.63	2.62	3,275,204	516,193	1,239,156
128000	35.07	2.94	6,950,028	1,099,427	2,612,587
256000	70.71	2.79	14,835,902	2,336,032	5,605,731

Table 1: The table shows the Time (ms), Normalized time (msec), Hits, Copies, Swaps, and Compares completed for QuickSort for various sized inputs.

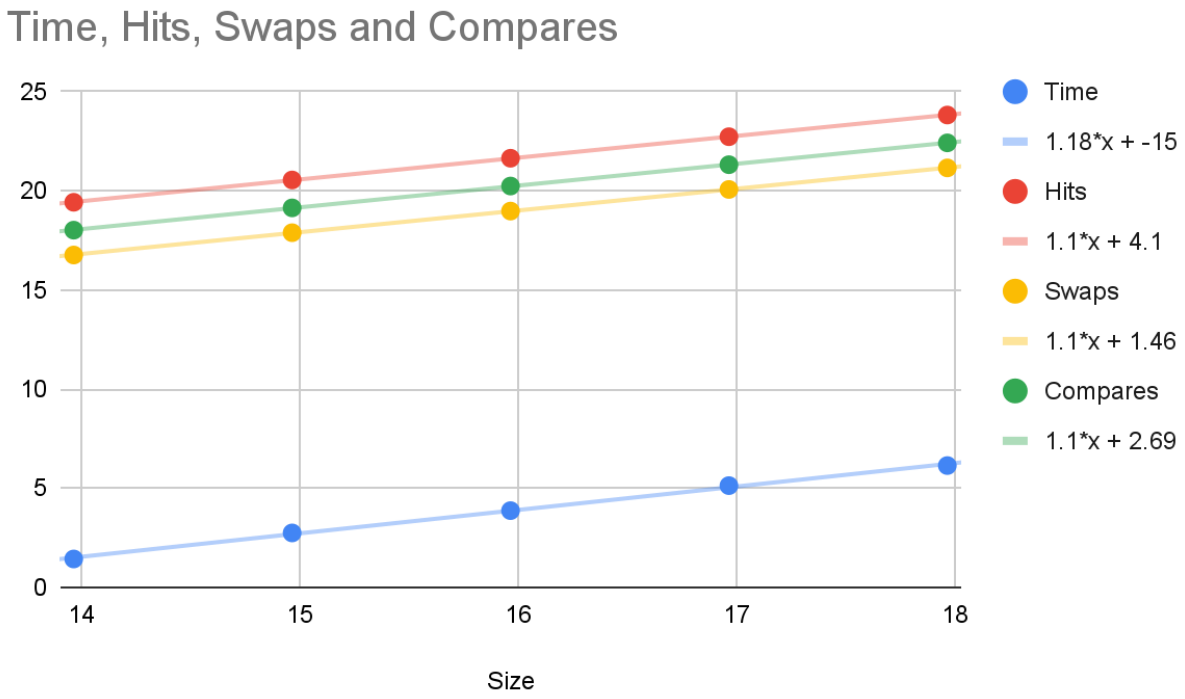


Figure 2: The chart shows the log/log scatter plot for all predictors in QuickSort

3. HeapSort

In HeapSort, the slope of all predictors, is approximately equal. As per the data collected, the slope of the log/log chart for time is 1.19 and the slope for all predictors is 1.1. Thus, no single predictor is best.

Size	Time	Normalized Time	Hits	Swaps	Compares
16000	4.12	3.43	1,632,290	209,248	397,650
32000	9.55	3.68	3,520,651	450,507	859,312
64000	21.01	3.77	7,553,205	964,997	1,846,608
128000	51.39	4.31	16,129,884	2,057,911	3,949,120

256000	110.00	4.33	34,308,651	4,371,964	8,410,397

Table 3: The table shows the Time (ms), Normalized time (msec), Hits, Copies, Swaps, and Compares completed for HeapSort for various sized inputs.

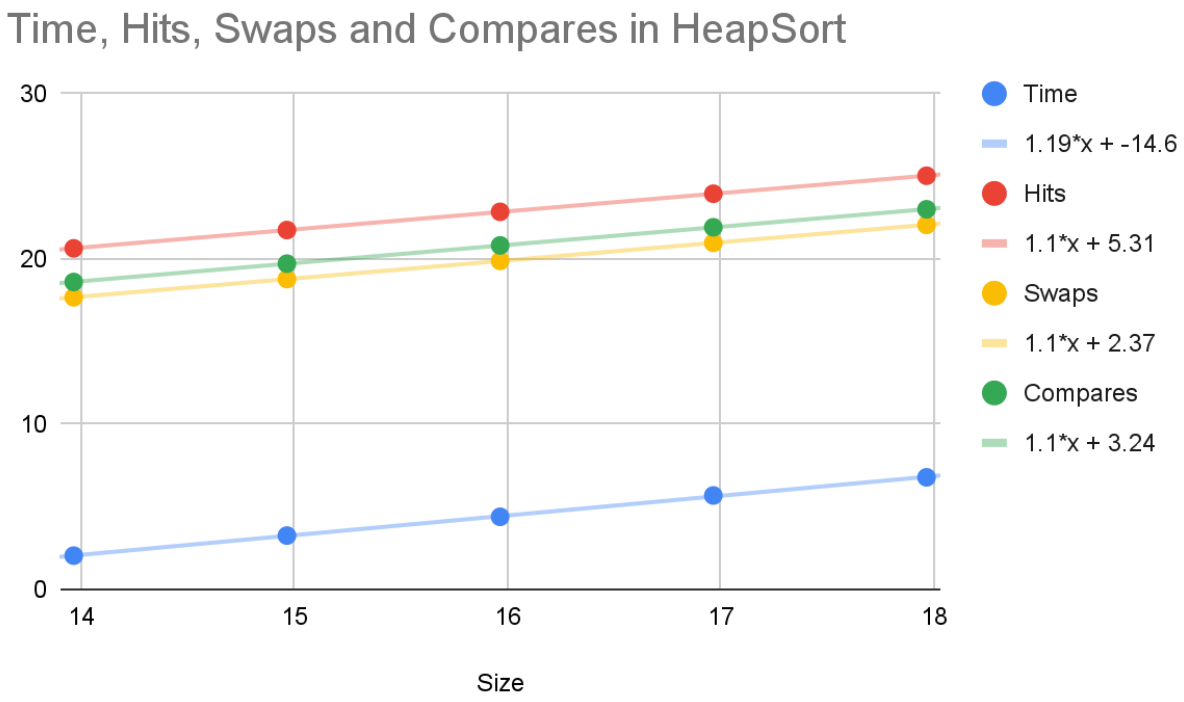
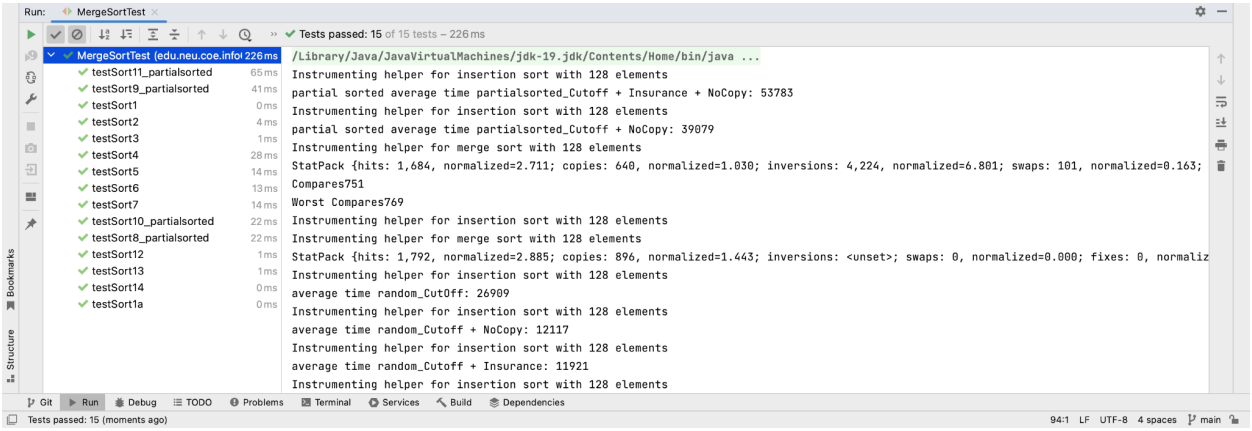


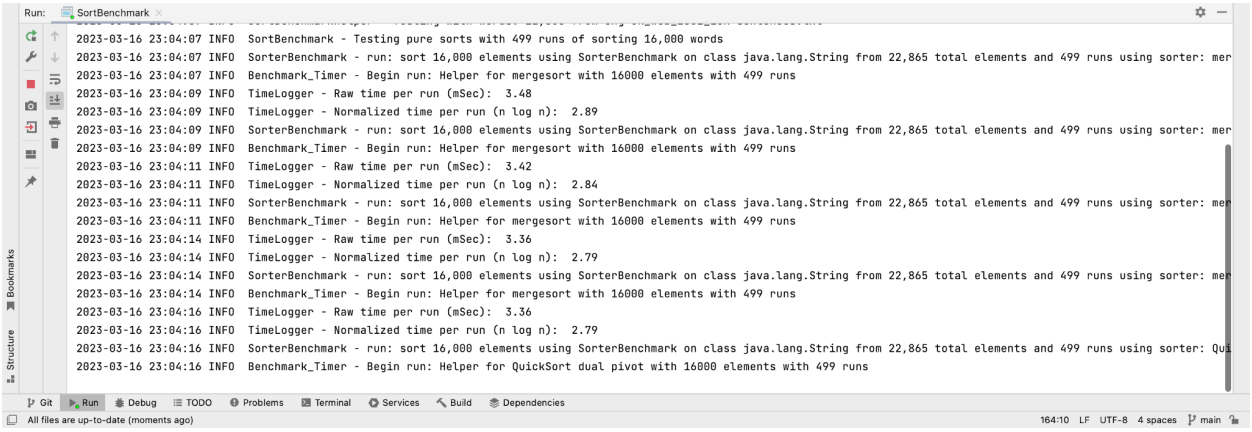
Figure 3: The chart shows the log/log scatter plot for all predictors in HeapSort

Code Snippets

1. MergeSortTest.java



2. SortBenchmark.java with argument 16000



3. info6205.log

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2023-03-16 21:10:36 INFO  SortBenchmark - SortBenchmark.main: null with word counts: [128000]
2023-03-16 21:10:36 INFO  Benchmark_Timer - Begin run: intArraysorter with 100 runs
2023-03-16 21:10:37 INFO  TimeLogger - Raw time per run (mSec):  4.20
2023-03-16 21:10:37 INFO  TimeLogger - Normalized time per run (n log n):  .46
2023-03-16 21:10:37 INFO  Benchmark_Timer - Begin run: integerArraysorter with 100 runs
2023-03-16 21:10:39 INFO  TimeLogger - Raw time per run (mSec):  13.33
2023-03-16 21:10:39 INFO  TimeLogger - Normalized time per run (n log n):  1.46
2023-03-16 21:10:39 INFO  SortBenchmark - Beginning String sorts
2023-03-16 21:10:40 INFO  SortBenchmarkHelper - Testing with words: 303,172 from eng-uk_web_2002_1M-words.txt
2023-03-16 21:10:40 INFO  SortBenchmark - Testing pure sorts with 50 runs of sorting 128,000 words
2023-03-16 21:10:40 INFO  SorterBenchmark - run: sort 128,000 elements using SorterBenchmark on class java.lang.String from 303,17
2023-03-16 21:10:40 INFO  Benchmark_Timer - Begin run: Helper for mergesort with 128000 elements with 50 runs
2023-03-16 21:10:42 INFO  TimeLogger - Raw time per run (mSec):  40.22
2023-03-16 21:10:42 INFO  TimeLogger - Normalized time per run (n log n):  3.37
2023-03-16 21:10:42 INFO  SorterBenchmark - run: sort 128,000 elements using SorterBenchmark on class java.lang.String from 303,17
2023-03-16 21:10:42 INFO  Benchmark_Timer - Begin run: Helper for mergesort with 128000 elements with 50 runs
2023-03-16 21:10:45 INFO  TimeLogger - Raw time per run (mSec):  39.29
2023-03-16 21:10:45 INFO  TimeLogger - Normalized time per run (n log n):  3.30
2023-03-16 21:10:45 INFO  SorterBenchmark - run: sort 128,000 elements using SorterBenchmark on class java.lang.String from 303,17
2023-03-16 21:10:45 INFO  Benchmark_Timer - Begin run: Helper for mergesort with 128000 elements with 50 runs
2023-03-16 21:10:47 INFO  TimeLogger - Raw time per run (mSec):  37.68
2023-03-16 21:10:47 INFO  TimeLogger - Normalized time per run (n log n):  3.16
2023-03-16 21:10:47 INFO  SorterBenchmark - run: sort 128,000 elements using SorterBenchmark on class java.lang.String from 303,17
2023-03-16 21:10:47 INFO  Benchmark_Timer - Begin run: Helper for mergesort with 128000 elements with 50 runs
2023-03-16 21:10:49 INFO  TimeLogger - Raw time per run (mSec):  37.82
2023-03-16 21:10:49 INFO  TimeLogger - Normalized time per run (n log n):  3.17
2023-03-16 21:10:49 INFO  SorterBenchmark - run: sort 128,000 elements using SorterBenchmark on class java.lang.String from 303,17
2023-03-16 21:10:49 INFO  Benchmark_Timer - Begin run: Helper for QuickSort dual pivot with 128000 elements with 50 runs
2023-03-16 21:10:52 INFO  TimeLogger - Raw time per run (mSec):  33.63
2023-03-16 21:10:52 INFO  TimeLogger - Normalized time per run (n log n):  2.82
2023-03-16 21:10:52 INFO  SorterBenchmark - run: sort 128,000 elements using SorterBenchmark on class java.lang.String from 303,17
2023-03-16 21:10:52 INFO  Benchmark_Timer - Begin run: Helper for Heapsort with 128000 elements with 50 runs
2023-03-16 21:10:55 INFO  TimeLogger - Raw time per run (mSec):  49.88
2023-03-16 21:10:55 INFO  TimeLogger - Normalized time per run (n log n):  4.18
2023-03-16 21:10:55 INFO  SortBenchmark - Beginning LocalDateTime sorts
2023-03-16 23:03:54 INFO  SortBenchmark - SortBenchmark.main: null with word counts: [128000]
2023-03-16 23:03:54 INFO  Benchmark_Timer - Begin run: intArraysorter with 100 runs
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