

# Program Structures and Algorithms

## Spring 2023

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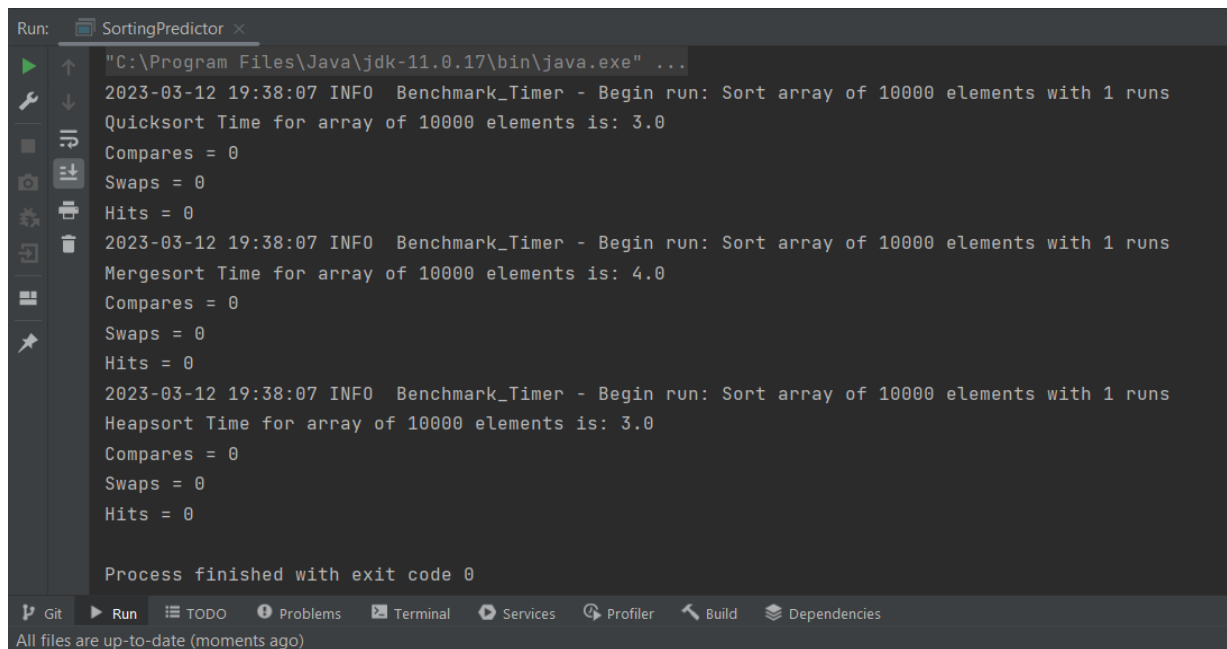
**NUID:** 002707220

### Task:

To determine, what is the best predictor of total execution time for comparisons, swaps/copies, hits (array accesses) of different sorting algorithms.

**Relationship Conclusion:** From the graphs and values we can conclude that hits and compares are both important predictors of the total execution time for a sorting algorithm.

**Evidence to support that conclusion:** Swaps cannot be a predictor of the execution time as for merge sort the number of swaps is always 0.



```
Run: SortingPredictor x
"C:\Program Files\Java\jdk-11.0.17\bin\java.exe" ...
2023-03-12 19:38:07 INFO Benchmark_Timer - Begin run: Sort array of 10000 elements with 1 runs
Quicksort Time for array of 10000 elements is: 3.0
Compares = 0
Swaps = 0
Hits = 0
2023-03-12 19:38:07 INFO Benchmark_Timer - Begin run: Sort array of 10000 elements with 1 runs
Mergesort Time for array of 10000 elements is: 4.0
Compares = 0
Swaps = 0
Hits = 0
2023-03-12 19:38:07 INFO Benchmark_Timer - Begin run: Sort array of 10000 elements with 1 runs
Heapsort Time for array of 10000 elements is: 3.0
Compares = 0
Swaps = 0
Hits = 0
Process finished with exit code 0
```

The screenshot shows an IDE terminal window with a dark theme. The title bar of the terminal is "Run: SortingPredictor x". The output text is as follows: "C:\Program Files\Java\jdk-11.0.17\bin\java.exe" ... (on a new line), 2023-03-12 19:38:07 INFO Benchmark\_Timer - Begin run: Sort array of 10000 elements with 1 runs, Quicksort Time for array of 10000 elements is: 3.0, Compares = 0, Swaps = 0, Hits = 0, 2023-03-12 19:38:07 INFO Benchmark\_Timer - Begin run: Sort array of 10000 elements with 1 runs, Mergesort Time for array of 10000 elements is: 4.0, Compares = 0, Swaps = 0, Hits = 0, 2023-03-12 19:38:07 INFO Benchmark\_Timer - Begin run: Sort array of 10000 elements with 1 runs, Heapsort Time for array of 10000 elements is: 3.0, Compares = 0, Swaps = 0, Hits = 0, and Process finished with exit code 0. The IDE's bottom status bar shows icons for Git, Run, TODO, Problems, Terminal, Services, Profiler, Build, and Dependencies, along with the text "All files are up-to-date (moments ago)".

```
Run: SortingPredictor x
2023-03-12 18:56:06 INFO Benchmark_Timer - Begin run: Sort array of 10000 elements with 1 runs
QuickSort Time for array of 10000 elements is: 209.0
Compares = 154233
Swaps = 69318
Hits = 444358
2023-03-12 18:56:07 INFO Benchmark_Timer - Begin run: Sort array of 10000 elements with 1 runs
MergeSort Time for array of 10000 elements is: 5.0
Compares = 120503
Swaps = 0
Hits = 534464
2023-03-12 18:56:07 INFO Benchmark_Timer - Begin run: Sort array of 10000 elements with 1 runs
HeapSort Time for array of 10000 elements is: 17.0
Compares = 235348
Swaps = 124203
Hits = 967508

Process finished with exit code 0
```

Git Run TODO Problems Terminal Services Profiler Build Dependencies

Build completed successfully in 3 sec, 243 ms (moments ago)

## Graphical Representation:

