

Program Structures and Algorithms
Spring 2023(SEC –03)

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Task:

Assignment 6 (Hits as time predictor)

Relationship Conclusion:

Merge Sort:

Swaps.

Swap – Time has the maximum R^2 (0.9458). And R^2 is near 1, so the swap number is the best predictor for merge sort.

Quick Sort Dual Pivot:

Swaps.

Quick Sort Dual Pivot is strongly influenced by instrumentation. So I prefer to use time (with instrumenting) as the indicator.

Swap – Time has the maximum R^2 (0.9887). And R^2 is near 1, so the swap number is the best predictor for quick sort dual pivot.

Heap Sort:

Hit or Hit/Swaps/Compares.

Hit/Swaps/Compares all have a good R^2 (0.9751). Because swaps and compares all involve array hits, the number of hits is the best predictor.

Evidence to support that conclusion:

Merge Sort Log Relation

N	LogCompares	LogSwaps	LogHits	LogCopies	LogTime(without instrumenting)	LogTime(with instrumenting)
10000	17.48571927	16.5377189	19.09091	16.28771238	1.925999419	2
20000	18.5587458	17.5305054	20.13691	17.45763738	2.137503524	1.678071905
40000	19.63535501	18.5386777	21.19124	18.60964047	2.847996907	2.765534746
80000	20.7032691	19.5356855	22.23686	19.747144	3.906890596	3.837943242
160000	21.77063607	20.538566	23.28458	20.87267488	5.061776198	4.944858446

Quick Sort Dual Pivot Log Relation

N	LogCompares	LogSwaps	LogHits	LogTime(without instrumenting)	LogTime(with instrumenting)
10000	17.46409899	16.583215	19.0105	2.169925001	6.652486495
20000	18.5200508	17.7221872	20.13207	1	8.812819074
40000	19.71121492	18.8001005	21.25441	2.03562391	11.33594857

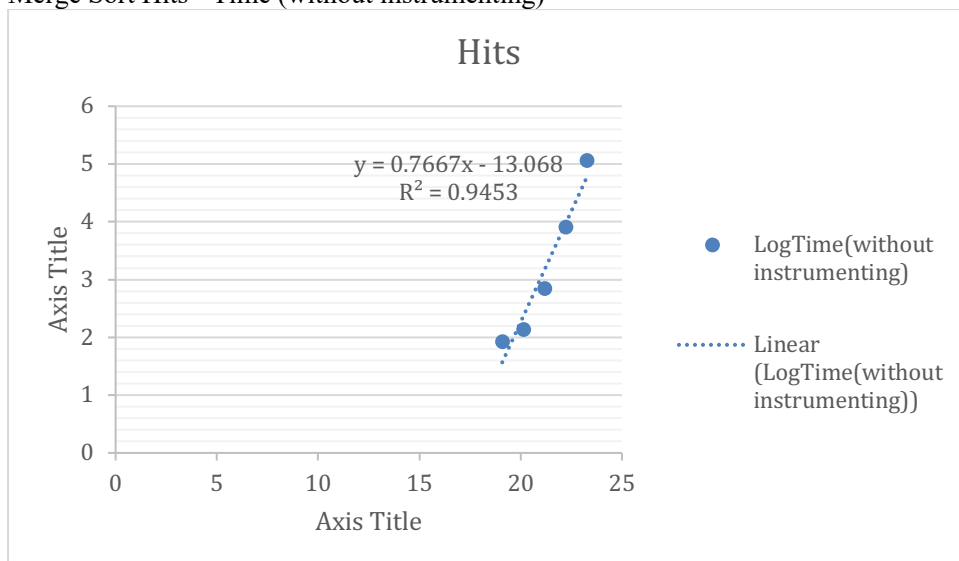
8000 0	20.81313 688	19.8355 878	22.315 81	3.217230716	12.3022962
1600 00	21.84011 135	20.9657 956	23.420 02	4.292781749	14.75380173

Heap Sort Log Relation

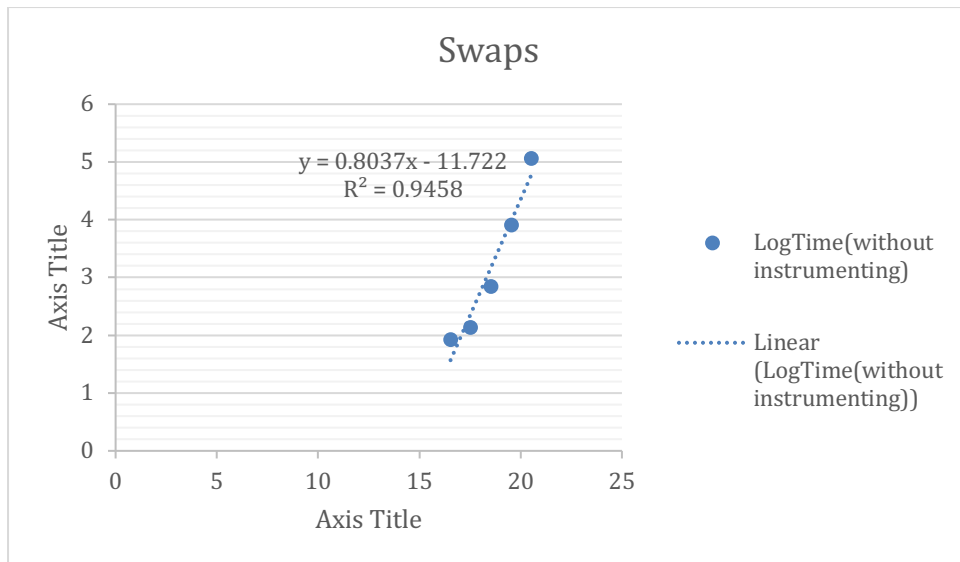
N	LogComp ares	LogSwa ps	LogHit s	LogTime(without instrumenting)	LogTime(with instrumenting)
1000 0	17.84538 591	16.9233 623	19.884 9	0.485426827	7.608809243
2000 0	18.96307 952	18.0348 581	20.999 42	1.584962501	9.704249502
4000 0	20.07088 874	19.1376 141	22.104 64	2.744161096	11.77585716
8000 0	21.17198 793	20.2340 619	23.203 36	4.578938713	13.79191579
1600 00	22.26663 472	21.3250 309	24.296 13	4.972692654	15.7158092

Graphical Representation:

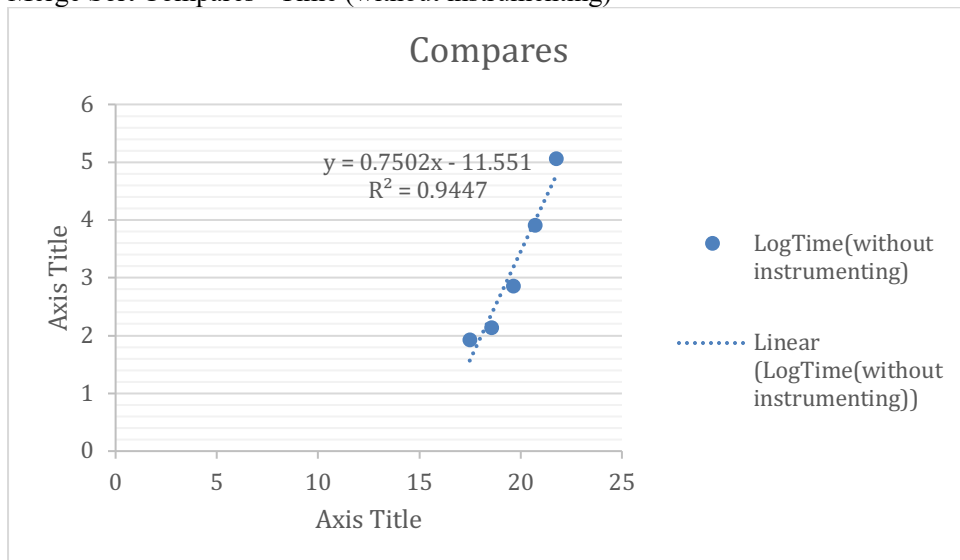
Merge Sort Hits - Time (without instrumenting)



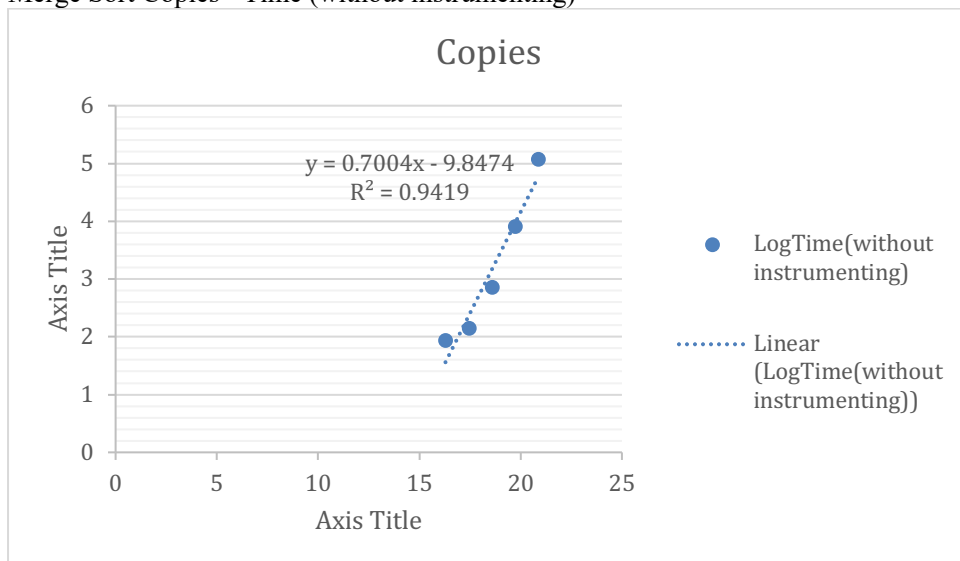
Merge Sort Swaps - Time (without instrumenting)



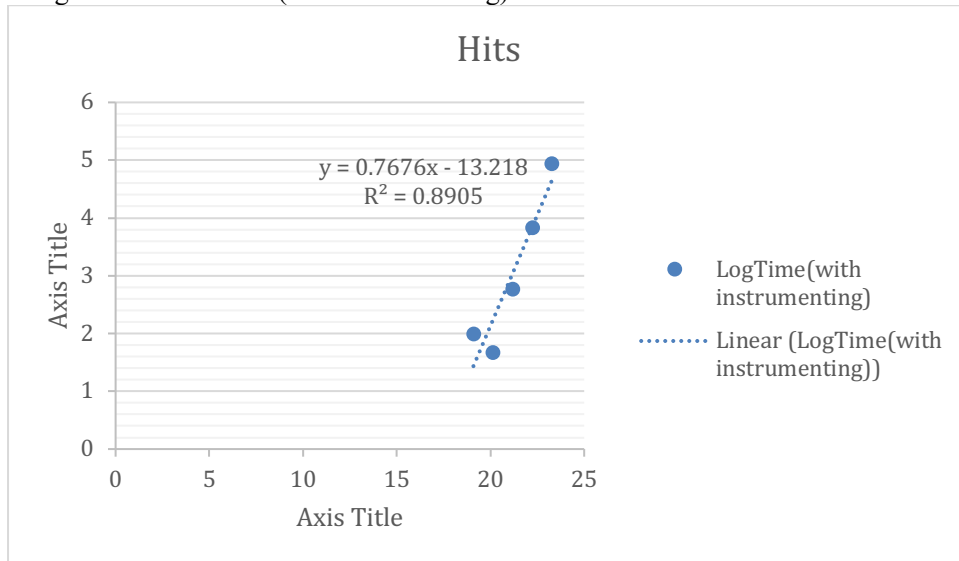
Merge Sort Compares - Time (without instrumenting)



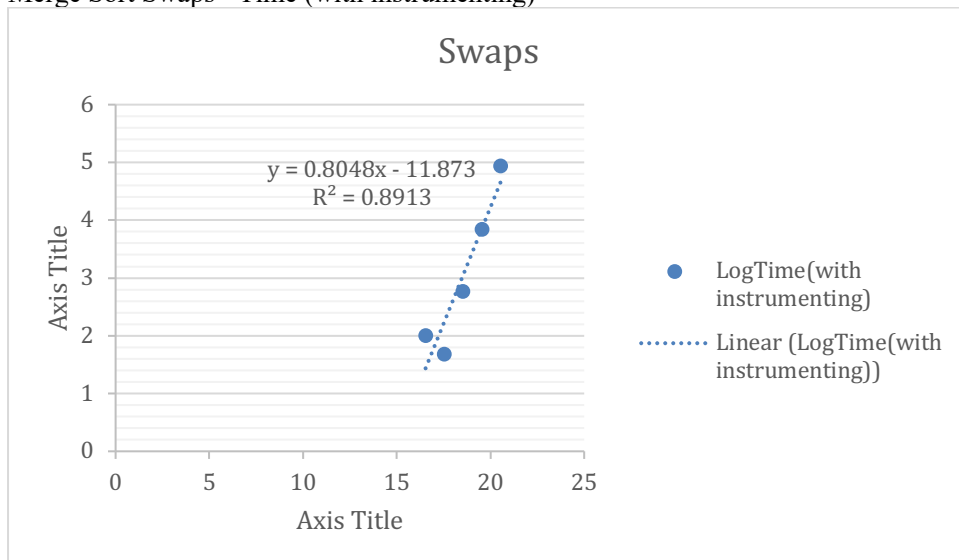
Merge Sort Copies - Time (without instrumenting)



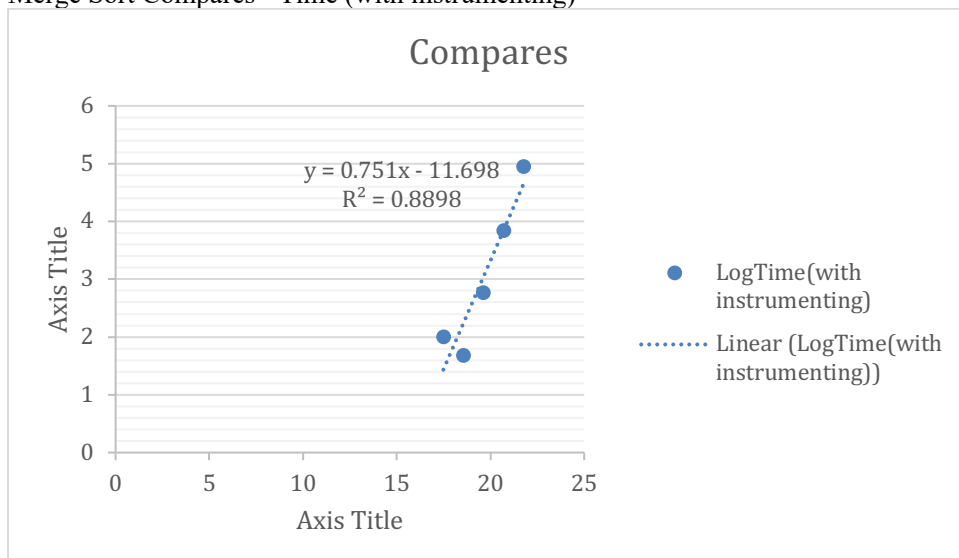
Merge Sort Hits - Time (with instrumenting)



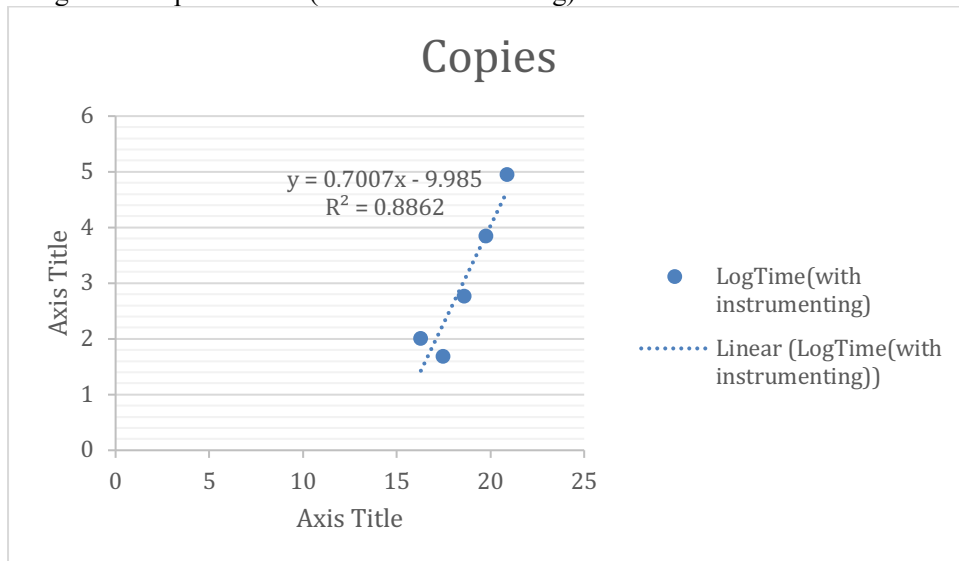
Merge Sort Swaps - Time (with instrumenting)



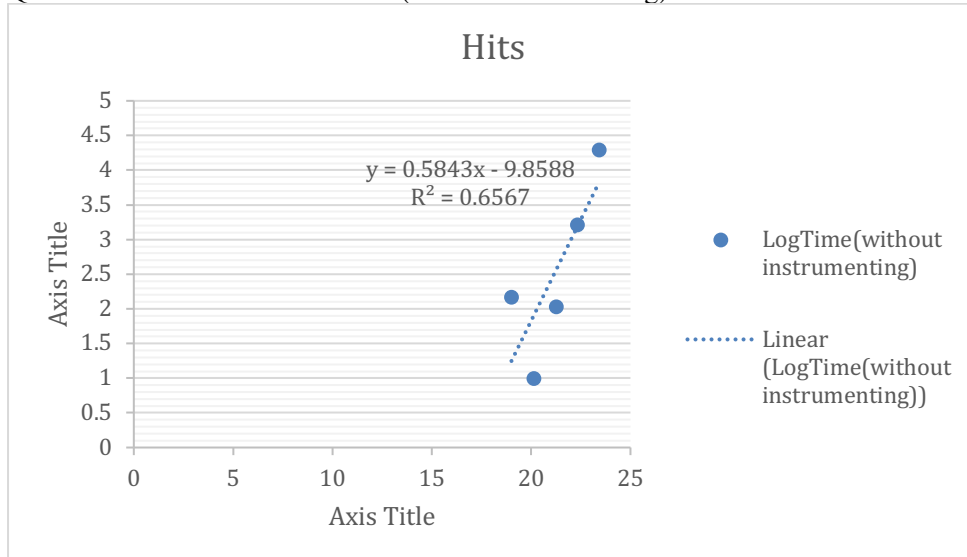
Merge Sort Compares - Time (with instrumenting)



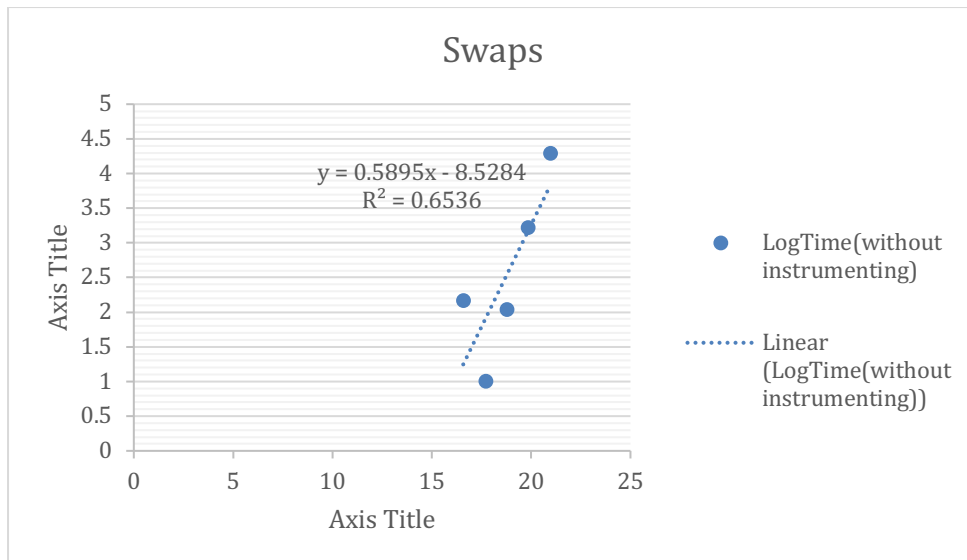
Merge Sort Copies - Time (without instrumenting)



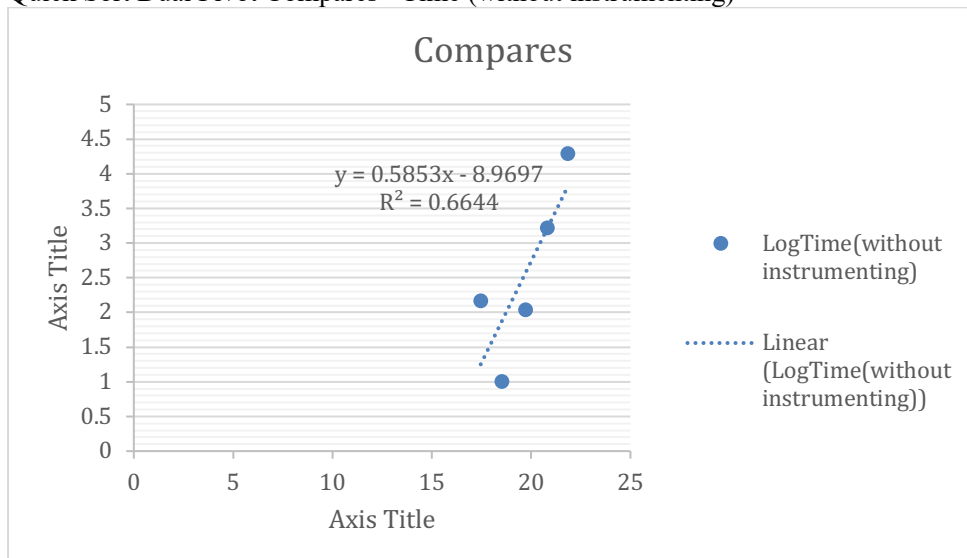
Quick Sort Dual Pivot Hits - Time (without instrumenting)



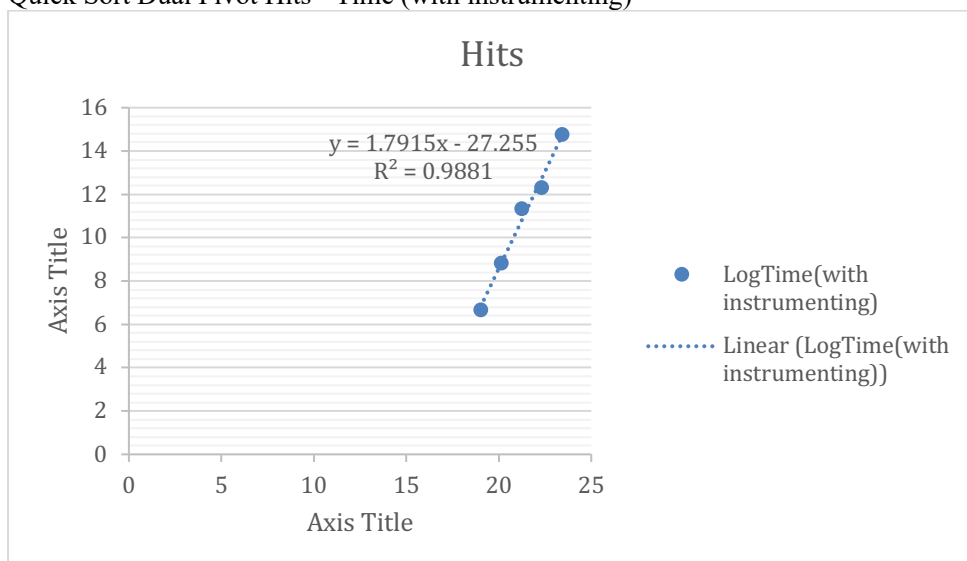
Quick Sort Dual Pivot Swaps - Time (without instrumenting)



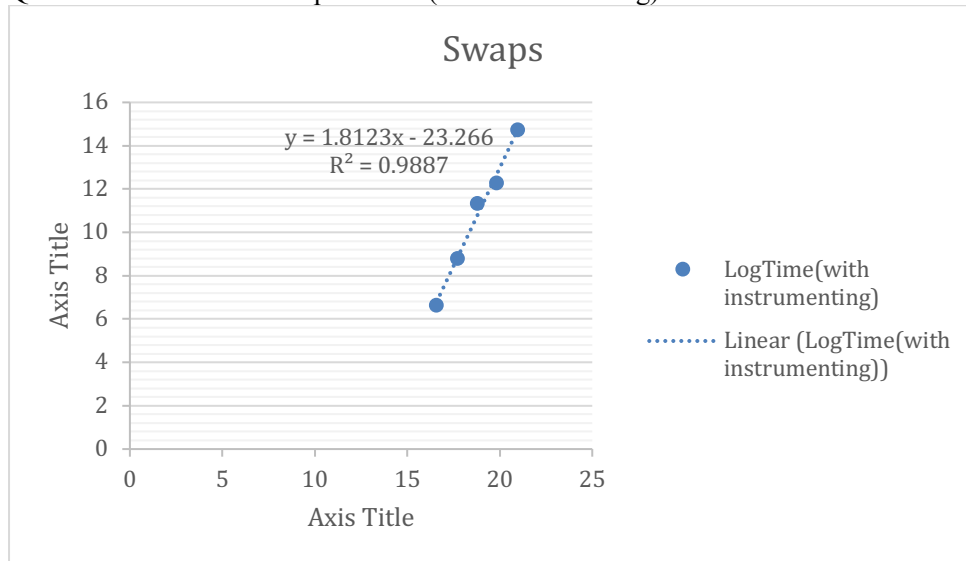
Quick Sort Dual Pivot Compares - Time (without instrumenting)



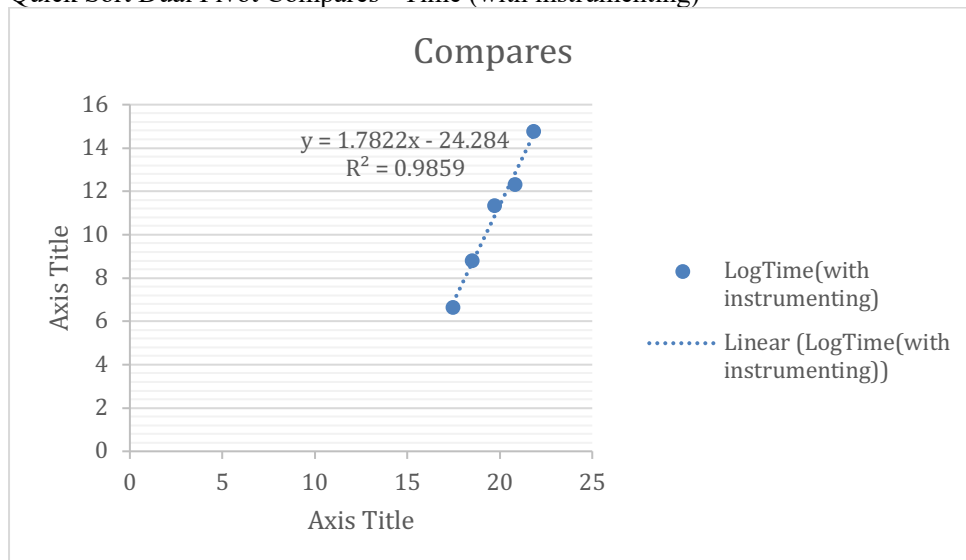
Quick Sort Dual Pivot Hits - Time (with instrumenting)



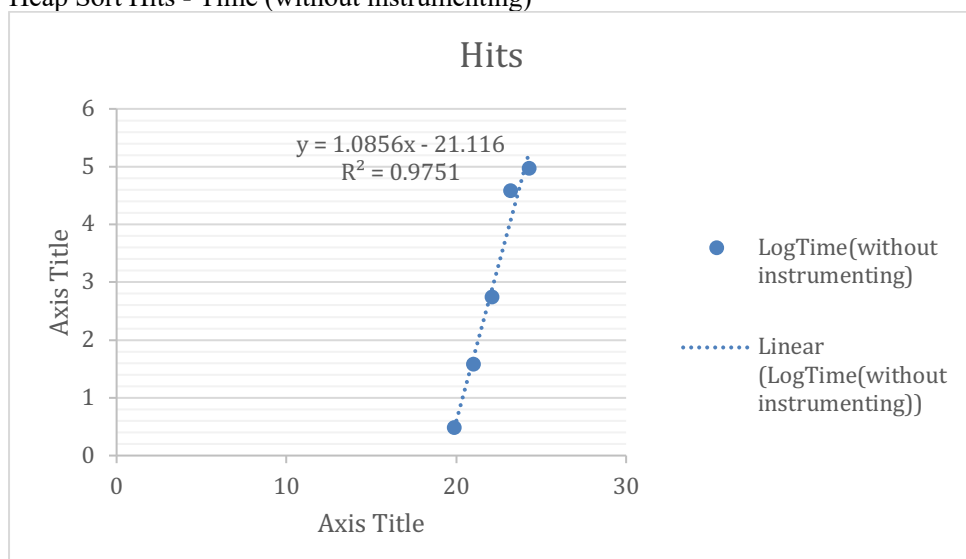
Quick Sort Dual Pivot Swaps - Time (with instrumenting)



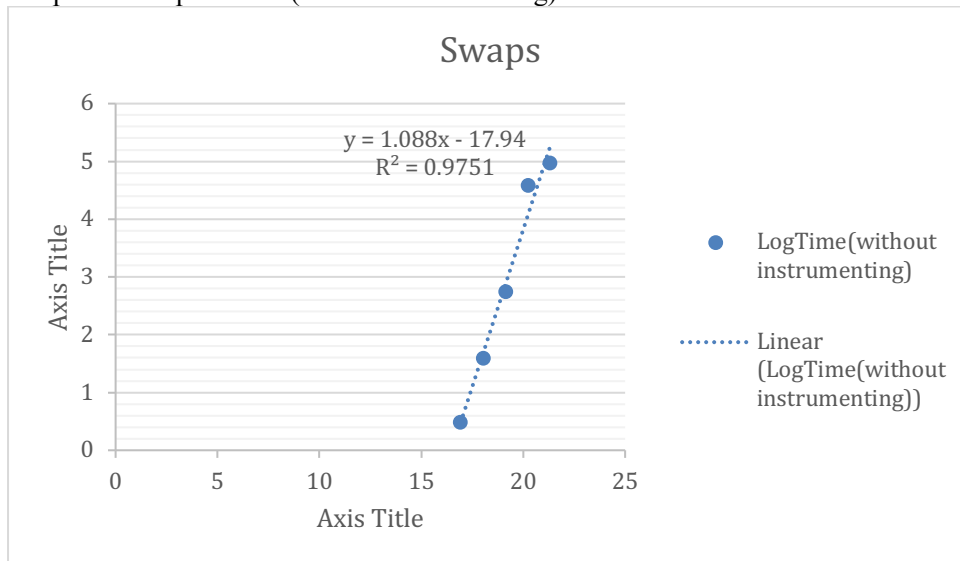
Quick Sort Dual Pivot Compares - Time (with instrumenting)



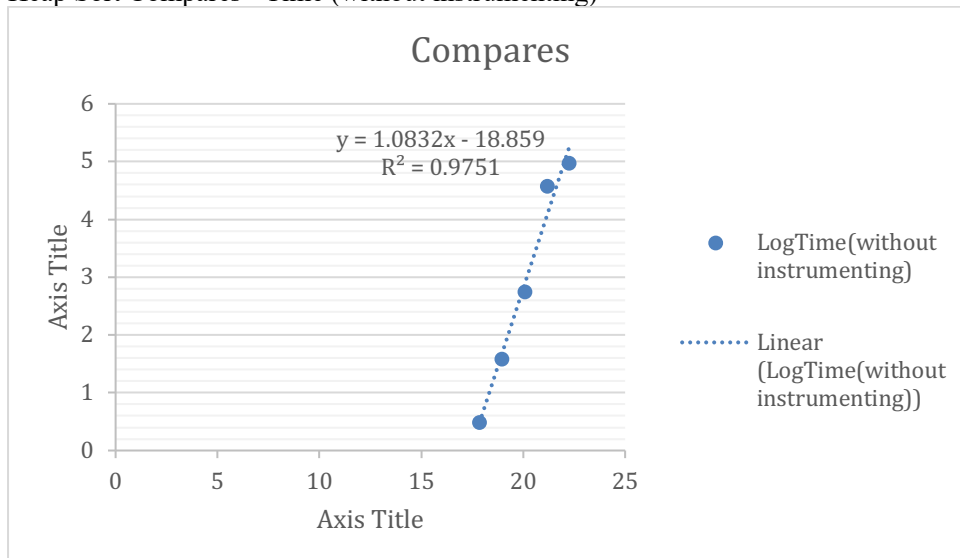
Heap Sort Hits - Time (without instrumenting)



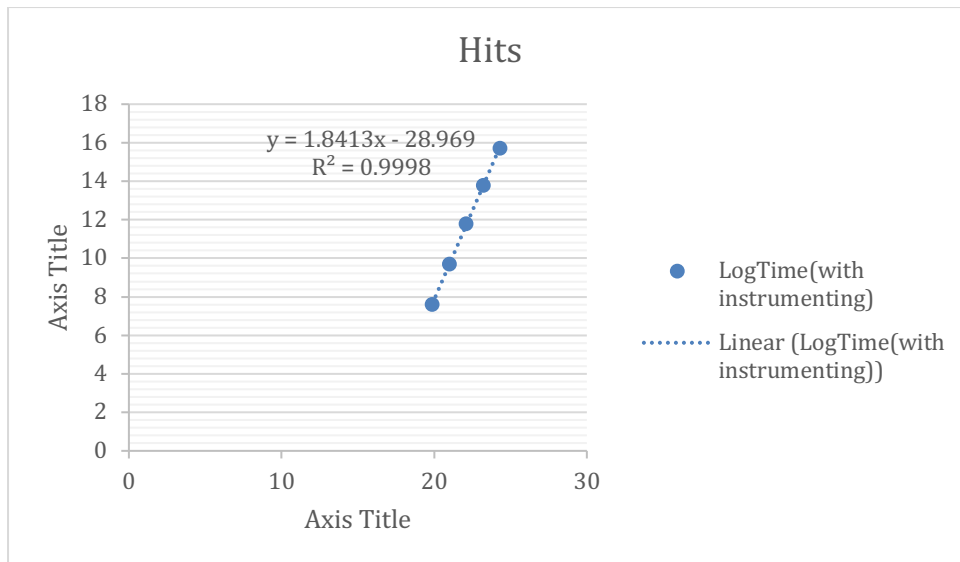
Heap Sort Swaps - Time (without instrumenting)



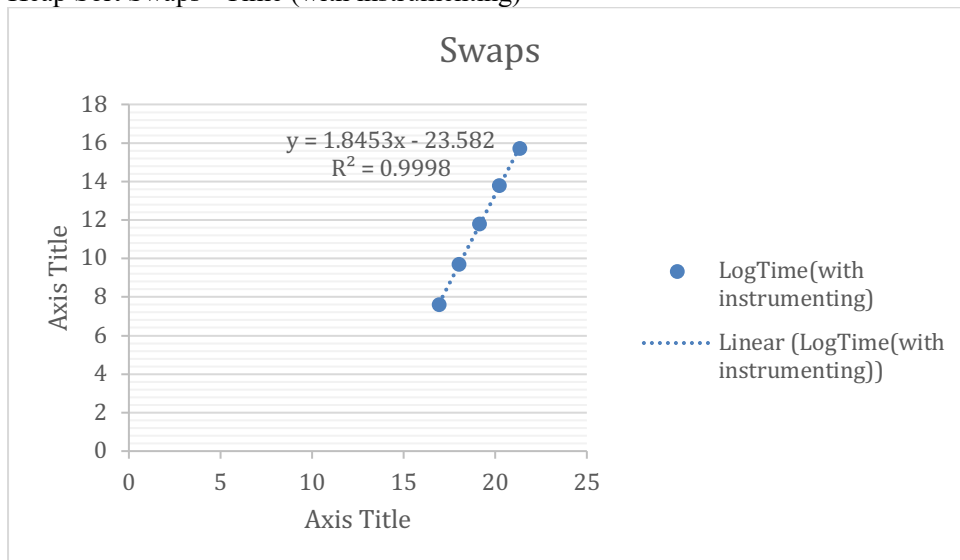
Heap Sort Compares - Time (without instrumenting)



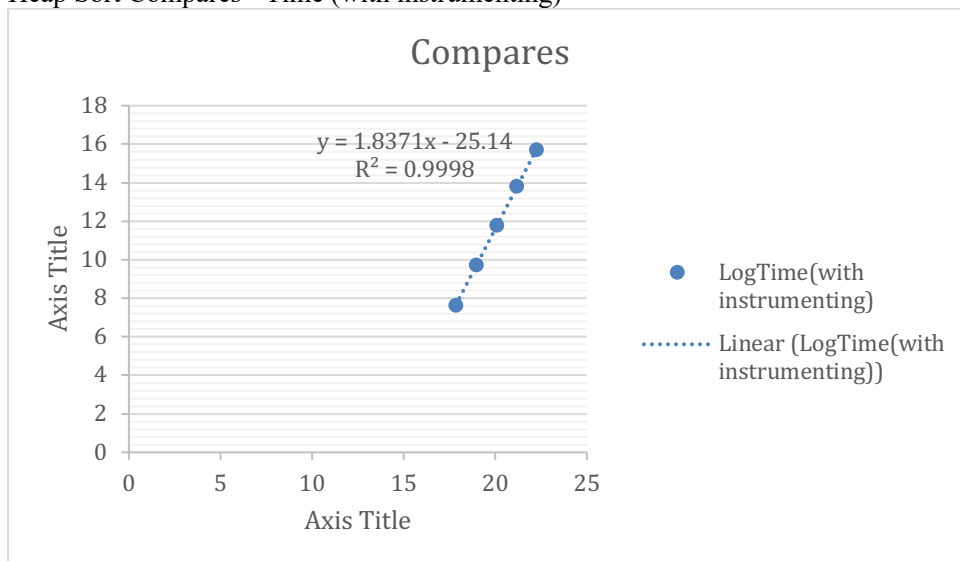
Heap Sort Hits - Time (with instrumenting)



Heap Sort Swaps - Time (with instrumenting)



Heap Sort Compares - Time (with instrumenting)



Unit Test Screenshots:

Merge Sort Test:

