CCDSALG Term 3, AY 2019 – 2020

Project 1 – Comparing Sorting Algorithms

Section	Names	Task 1	Task 2	Task 3	Task 4
S12	Gan, John Matthew Ong	X	X	X	X
S16	Noblefranca, Jose Noel Cleofe	X	X		
S15	Remudaro, Angelo Alvarez		X		X

Fill this part with your section and names. For the tasks, put an X mark if you have performed the specified task. Please refer to the project specifications for the tasks.

LIST OF SORTING ALGORITHMS

Sorting Algorithm	Author (if available)	Downloaded From
Bubble sort	programmingsimplified.com	https://www.programmingsimplified.com/c/source-code/c-program-bubble-sort
Insertion sort	hackerearth.com	https://www.hackerearth.com/practice/algorithms/sorting/insertion-sort/tutorial/
Selection sort	geeksforgeeks.org	https://www.geeksforgeeks.org/selection-sort/
Merge sort	geeksforgeeks.org	https://www.geeksforgeeks.org/merge-sort/
Quick sort	geeksforgeeks.org	https://www.geeksforgeeks.org/quick-sort/
Radix sort	geeksforgeeks.org	https://www.geeksforgeeks.org/radix-sort/

COMPARISON TABLE

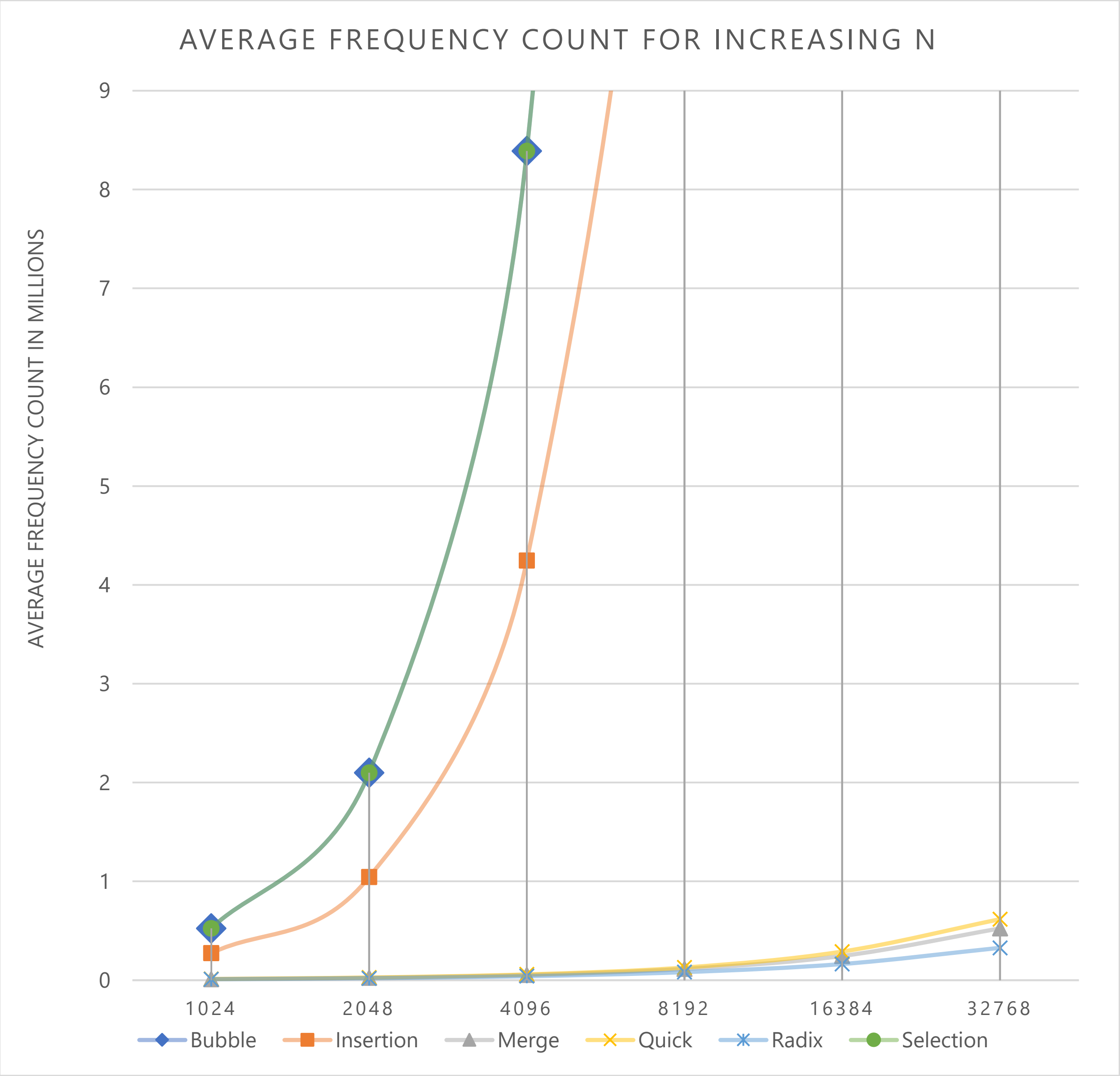
M = (10)

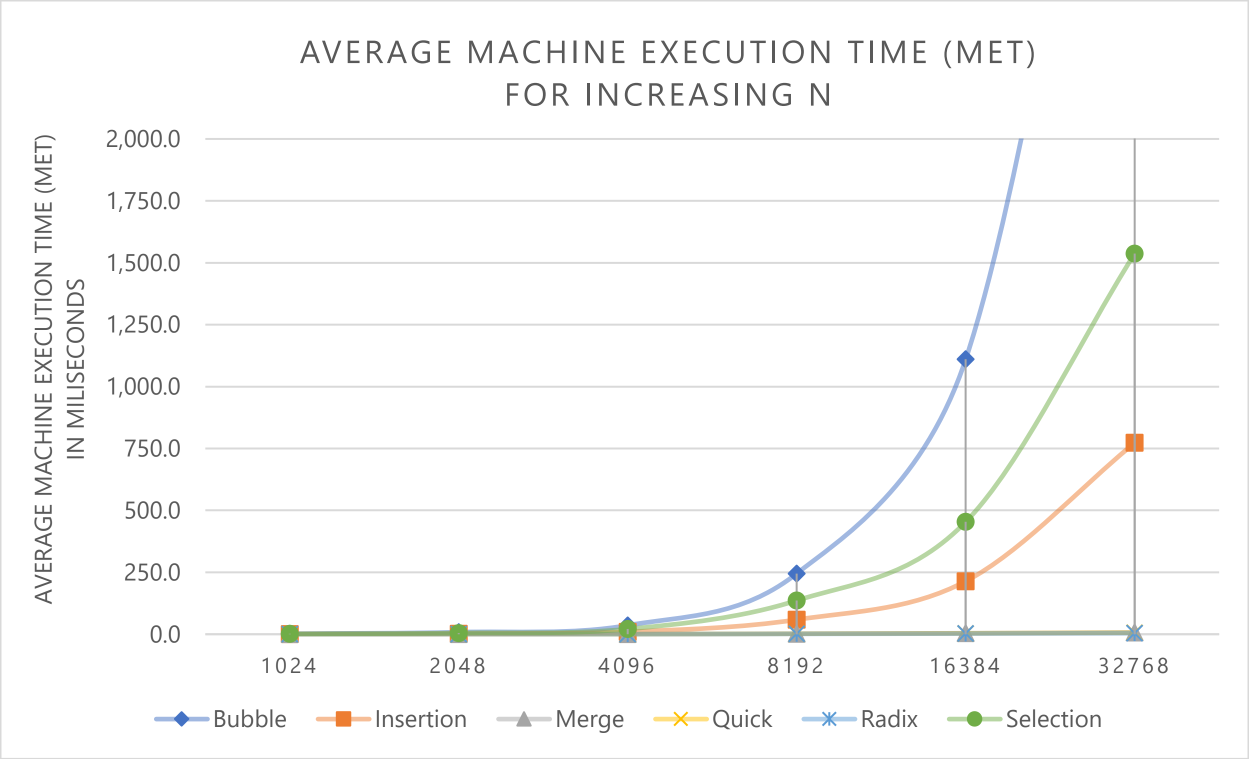
Size N	Average Machine Execution Time (in milliseconds)					
	Bubble $O(n^2)$	Insertion $O(n^2)$	Selection $O(n^2)$	Merge $O(n \log n)$	Quick $O(n^2)$	Radix $O(n*k)$
1024	2.292	0.674	1.204	0.251	0.199	0.000
2048	8.282	2.096	4.993	0.399	0.298	0.399
4096	35.876	9.872	20.748	0.400	0.397	0.399
8192	245.050	58.808	136.192	2.294	1.993	1.395
16384	1110.002	213.791	453.668	4.083	3.695	2.587
32768	4354.261	772.954	1537.165	7.590	6.191	4.292

Size N	Average Counter Value (in millions)					
	Bubble $O(n\hat{}2)$	**Insertion** $O(n\hat{}2)$	**Selection** $O(n\hat{}2)$	**Merge** $O(n\, log\, n)$	**Quick** $O(n\hat{}2)$	**Radix** $O(n * k)$
1024	0.524799	0.273881	0.524800	0.011276	0.012477	0.010285
2048	2.098175	1.043734	2.098176	0.024589	0.027369	0.020525
4096	8.390655	4.246568	8.390656	0.053262	0.058675	0.041005
8192	33.558528	16.522178	33.558528	0.114703	0.128216	0.081965
16384	134.225920	66.937032	134.225920	0.245776	0.290103	0.163885
32768	536.887296	266.814240	536.887296	0.524305	0.617586	0.327725

GRAPHS

Copy/paste the graphs here, make sure it is big enough to see the trend in the increase of the average Machine Execution Time (MET) and the average counter value.





DISCUSSION

Explain interesting findings based on your experiments.

- The fastest sorting algorithm based on growth rate and MET is Radix sort, while the slowest is Bubble sort.
- Despite that Bubble sort and Selection sort have a very similar growth rate, Bubble sort has a significantly longer MET than Selection sort, which makes Bubble sort slower than Selection sort in terms of time complexity.
- When plotted based on average frequency count, the graph type of each sorting algorithms corresponds to the growth rate in their respective Big O.
- In most cases, the average growth rate based on the average frequency count and the average MET of each sorting algorithm is directly proportional. Therefore, the slower the growth rate, the longer the MET.
- Sorting algorithms that are recursive in nature (Merge, Quick, Radix) have faster average MET and smaller average frequency count than those that are non-recursive (Bubble, Insertion, and Selection).
- Therefore, recursive sorting algorithms scale better with larger N values than non-recursive sorting algorithms.