**Class Lab 1**

**ISCG 6426**

**Data Structures and Algorithms**

**Semester 1, 2021**

Department of Computing, Electrical and Applied Technology

Class Lab 1

**Released:** August 16th, 2021

**Due date:** August 23th, 2021

**Percentage Mark:** 6% (1 of 5)

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| Testing Results | | | | |
| **Algorithms** | **Test array size** | | | |
| **100** | **1000** | **10000** | **100000** |
| Linear Search | 0.0054790 | 0.0006411 | 0.0003077 | 0.0003636 |
| Binary Search | 0.0050712 | 0.0005483 | 0.0002956 | 0.0003502 |
| Bubble Sort | 0.0052870 | 0.0147601 | 0.9574075 | 90.6161478 |
| Quicksort | 0.0025955 | 0.0004594 | 0.0025239 | 0.0249470 |

**Conclusions**

provide your conclusions of the above results. Topics to discuss in your conclusions include, but are not limited to:

* Time complexity (big O, big Theta, big Omega).
* Impact of random vs sorted arrays on search algorithms.
* Smaller vs longer arrays.
* Time consistency of algorithms (fluctuations in results from repeating the same test).

[conclusion here]

* The linear search works with arrays that have random integers, while the binary search works with integers in ascending order. In this case, binary search consumed similar time on average with linear search.
* Both searches consumed very little time on average (far less than 1 second). The time consuming is also quite similar among different sizes of array. The 100 size could be a little slower than other sizes.
* The time consuming can be random and quite depends on where the random number that is being searched locates at the index.
* Time complexity of bubble sort: O(n^2), Θ(n^2), Ω(n)

Time complexity of quicksort: O(n^2), Θ(n log n), Ω(n log n)

* For array in 100 size, both bubble sort and quicksort were processing very fast (far less than 1 second). Quicksort has approximately twice efficiency on average but did not differ too much with bubble sort.
* For 1,000 size, quicksort finished the fastest.
* For 10,000 size, bubble sort consumed approximately 1 second on average, whereas quicksort consumed far less time and has significantly higher efficiency.
* For 100,000 size, bubble sort displayed a very poor performance, whereas quicksort has approximately 3600 times efficient than bubble sort.

Bubble sort is highly inefficient when dealing with large size of data, so it will probably not be used in real-world businesses.

**Table

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