

## COSC 2430 lab 3: Sorting with clock

### 1. Introduction

You will create a C++ program test the time complexity for five sorting algorithms, Selection Sort, Insertion Sort, Bubble Sort, Quick Sort, and Merge Sort. You will be experimenting with a large array size to test the theoretical vs. the actual time complexity for these sorting methods. Your program should be able to replicate the theoretical time after your execution. Assuming the worst-case scenario for each sort, you will have:

- Selection Sort:  $O(n^2)$
- Insertion Sort:  $O(n^2)$
- Bubble Sort:  $O(n^2)$
- Quick Sort:  $O(n^2)$
- Merge Sort:  $O(n\log(n))$

Although four out of five sorting method have the same worst-case time complexity of  $O(n^2)$ , their actual execution time is different, your task is to rank these algorithms base on their execution time, from fastest to slowest.

For this lab, you can use a vector or dynamic array to allocate your input since static array of large size could crash on some system.

### 2. Input and Output

#### a. Input file

The input file will contain an array of integers that you will use for your sorting exercise.

The first line will consist of an integer  $n$  which is the size of your array.

The next  $n$  integers will be the elements of your array, each integer will be separated by a space.

#### b. Output file

Ranking of the five sorting algorithms in ascending order (fastest to slowest)

Example of output: each separated by a comma and a space

Quick Sort, Merge Sort, Insertion Sort, Selection Sort, Bubble Sort

Note: the output is the same for all test cases

### 3. Turn in your lab assignment

Lab 3 needs to be turned in to our Linux server, follow the link here

[https://rizk.netlify.app/courses/cosc2430/2\\_resources/](https://rizk.netlify.app/courses/cosc2430/2_resources/)

Make sure to create a folder under your root directory, name it lab3 (name need to be lower case), copy your code and argumentmanager.h to this folder, no testcase or other files needed.

PS: This document may have typos, if you think something illogical, please email TAs for confirmation.