CS/CPE590: Algorithms
Spring 2023
Assignment1

Sorting Algorithms & Running Times

1. (10+15+15=40 Points) Implement (in C++) Bubble sort, Insertion sort, and Merge sort on an array of integers (Implement a function for each of the sorting algorithms, check the provided code template). Provide sufficient comments to document your code.

2. (20 Points) Consider re-implementing those functions (do function overloading) with the help of pointers using dynamic memory allocation (you have to write three more functions: one for each of the sorting algorithms).

3. (40 points) Consider running the algorithms on arrays of sizes 10, 100, and 1000 respectively. Measure the run-time performance for each of the cases with random, sorted, and reverse-sorted inputs. Tabulate and plot the results. Repeat each test a number of times (at least 10 times) and compute the average running time for each of the scenarios (combination of algorithm, input size, and nature of the input). Report your findings and explain the results obtained.

Remarks:

- The assignment has to be completed individually. No collaboration is allowed between students. No code from online resources is allowed to be used. Any sign of collaboration or use of online materials will result in a 0 and be reported to the Graduate Academic Integrity Board. You have to strictly follow the provided template. The late submission policy is applicable to the assignment as specified in the course syllabus.
- You have to submit a typed report as a pdf file. You should provide figures that plot the running times in relation to the input size parameters for each of the cases.
- "Report and explain" means that you have to analyze and interpret your findings properly. What do the experiments tell you? The report must have visual presentations (plots & tables) for each sort in different scenarios. You have to express how the results agree with expectations. The report must be submitted separately in a pdf file.
- The programming, testing, and experimentation will take some time. Start early.
- You have to make sure your program works as expected in the following online compiler: https://www.onlinegdb.com/online_c++_compiler. If it doesn't compile there, you will get 0.
- **Submit a zip file containing your report(.pdf) file and code(.cpp) file**.