CENG 202: DATA STRUCTURES

Programming Assignment 2

Deadline: SUNDAY, 9 APRIL 2023 by 20:00

Rules

1. You will use Java to implement the tasks
2. You will lose 20 points for each day your assignment is submitted late.
3. No deadline extensions will be granted.
4. Your code must be developed individually. You cannot collaborate with your peers. You cannot post your code on any public repository, nor can you share it with anybody. Any violations to this code of conduct will be treated as academic misconduct.
5. Submitted code will be automatically checked using tools that detect plagiarism.
6. In case cheating is detected, the grade of this assignment will be zero and a further penalty of 50 points will be applied to the next homework assignment.
7. You may be asked to explain your code and rewrite some parts of it in front of the instructor.
8. Submit your codes to AYBUZEM.
9. Write your name as a comment line in each file you submit.
10. In order to be accepted, your submission
    - must be of text format with a '.java' extension (no Word or other formats and no archives will be accepted)
    - You will receive a zero grade if you do not submit the assignment or you do not adhere to this rule!

Task:
In this homework, you'll compare the relative performance of different sorting algorithms on the same dataset as well as the same algorithm on different datasets. Here are the steps of this homework:

- Implement selection sort, bubble sort, merge sort, quick sort, and counting sort as discussed in the lecture.
- Generate integer arrays of size 1000, 10000, 50000, and 100000, where each element is randomly selected between 0 and 10^6.
- Measure the time it takes to sort the arrays using each of the sorting algorithms. Note that all sorting algorithms should use the same input when the input size is the same.
- To test the speed of your sorting algorithms, you may use `System.currentTimeMillis()`, which returns a long that contains the current time (in milliseconds). Call `System.currentTimeMillis()` before and after the algorithm runs, and subtract the two times.
- You are expected to provide the CPU time on the same machine, and the number of comparisons for each of the sorting algorithms for each input.
- Write a report showing your findings. The report should include the graphs showing the speed of each sorting algorithm and the number of comparisons. Also, write your findings and conclusions in your own words.

Note: You can only use code/pseudo code from the slides. You need to develop the rest of the code yourself.

What to turn in electronically:

- Your source code (*.java) for all of the sorting algorithms
- Your report in PDF