Homework 4

CS201: Data Structures and Algorithms, Fall 2021
Due: 27/12/2021, 11:59pm

Topic: Heaps and Sorting Algorithms

Problem 0:

Implement Heap data structure, Insertion sort, BubbleSort, MergeSort, and QuickSort. For this problem, put all your implementations in one file.

Problem 1:

Reimplement the Mergesort such that in each step your split the array into 5 parts instead of 2. Analyze time requirements of your implementation.

Problem 2:

Given an array A of integers and an integer k, design an algorithm to find the k^{th} smallest integer in A such that the time complexity does not exceed $O(n \log(n))$.

Problem 3:

Given an array A of integers. Use heap data structures to sort A in $O(n \log(n))$ steps.

Deliverables:

- Add comments that explains your code. *If I can't understand ... I can't grade*
- Calculate **the time complexity** for each function in your files.
- Use only one programming Language. Either `C++`, `Java`, or `Python`
- **NOTE:** You might be selected to present your solution to the TA.

Hints and Advice:

- Start working on the homework ASAP.
- Ask questions if you feel you are lost.