DSA Lab

31/01/2023

Find the α-quantile of an array

- Given an array of integers A (distinct) , their respective probability weights W and α (where 0 <= α <= 1), find the α-quantile of the array.
  - Example: A = [1,3,4,9,2,7], W = [0.1, 0.2, 0.1, 0.15, 0.05, 0.4]
  - Define Define F_x = sum $\{w_y \in W \mid y < x \text{ and } y \in A\}$
  - The α-quantile of A is defined as $\max\{x \in A \mid F_x <= \alpha\}$
  - Here 0.3-quantile is 2
  - Here 0.1-quantile is 1
  - Here 0.9-quantile is 7
- Solve the problem by modifying SELECT and QuickSelect

Sorting

- Implement the quicksort and mergesort algorithms
  - Quicksort should be a 3-way quicksort (pick two pivots) and stable
  - Mergesort should be bottom up

  - Stable sort means if same element (say x) appears multiple times in an array, then the first occurence of x should appear before the second occurence of x in the sorted array. This means that the order of the duplicate elements should be preserved in the sorted array.
  - Ex: 1,2,3,10_1 ,5,10_2 ,9,10_3
    - The sorted array will be 1, 2, 3, 5, 9,10_1 ,10_2 ,10_3 (10 is maintaining its order)