

Algorithms Homework 4*

Selection

Reading: GT Chapter 4.7

1. (GT C-4.16) Suppose we are given a sequence S of n elements, on which a total order relation is defined (meaning any two elements can be compared). Describe an efficient method for determining whether there are two equal elements in S . What is the running time of your method?
2. (GT C-4.23) Given an unordered sequence S of n comparable elements, describe an efficient method for finding the $\lceil \sqrt{n} \rceil$ items whose rank in an ordered version of S is closest to that of the median. What is the running time of your method?
3. (GT C-4.27) Given an unsorted sequence S of n elements, and an integer k , give an $O(n \lg k)$ expected time algorithm for finding the $O(k)$ elements that have rank $\lceil n/k \rceil$, $2\lceil n/k \rceil$, $3\lceil n/k \rceil$, and so on.
4. (CLRS) Let A be a list of n (not necessarily distinct) integers. Describe an $O(n)$ -algorithm to test whether any item occurs more than $\lceil n/2 \rceil$ times in A . Your algorithm should use $O(1)$ additional space.

extra credit (GT C-4.14) Suppose we are given a sequence S of n elements, each of which is an integer in the range $[0, n^2 - 1]$. Describe a simple method for sorting S in $O(n)$ time.

*Collaboration is allowed, even encouraged, provided that the names of the collaborators are listed along with the solutions. Write up the solutions on your own.