

Mar 28, 2023

Lab 4: Analyzing Time Complexity of Algorithms

Task 1 (originated from R-4.13).

Show that $3n + 100 \log_2 n + 8$ is $O(n)$ and $\Omega(\log n)$

Task 2 (originated from R-4.18).

Give a big-O characterization, in terms of n , of the running time of the following algorithm:

Algorithm Ex3(A):

Input: an array A storing $n \geq 1$ integers

Output: the sum of the prefix sums in A

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 $s \leftarrow 0$ 
for  $i \leftarrow 0$  to  $n - 1$  do
   $s \leftarrow s + A[0]$ 
  for  $j \leftarrow 1$  to  $i$  do
     $s \leftarrow s + A[j]$ 
return  $s$ 
```

Task 3 (originated from C-4.5).

Suppose that you are given an n -element array A containing distinct integers that are listed in increasing order.

Given a number k , describe a recursive algorithm to find two integers in A that sum to k , if such a pair exists.

Find an algorithm for this problem. What is the time complexity of your algorithm?

Task 4 (originated from C-4.6).

Given an n -element unsorted array A of n integers and an integer k , describe an algorithm for re-arranging the element in A such that all elements less than or equal to k come before any elements larger than k .

Find an algorithm for this problem. What is the time complexity of your algorithm?