

COP 5536 Fall 2018

Assignment 2

Due Date: Nov 30th, 2018, 11:59 pm EST

1. The assignment is due at 11:59 pm on 30th of November 2018. Submit online via Canvas in PDF format or hand over to TAs during office hours.
2. Answers will be graded on correctness, efficiency, and other quality measures.

Last name:

First name:

UFID:

Question 1. (10)

(a) [4 points] Draw a clearly labeled suffix tree for the string dggddgg#.

(b) [6 points] Describe how you can use a suffix tree to find the Longest Common Substring of two strings in time linear in the lengths of the two strings.

Question 2. (15)

For the min radix priority search tree (RPST) with range $[0,32)$,

(a) [8 points] Perform insert operation into an initially empty RPST in sequence with the following keys: (6,6), (9,17), (4,4), (17,1), (6,3), (21,7). Show each step. The elements x and y of a key (x, y) stand for the search and priority key values, respectively.

(b) [7 points] Delete (6, 3) from the result RPST of part (a).

Question 3. (10)

Suppose that you are to design a Bloom filter with minimum $P(u)$ and that

$n = 100,000$, $m = 5000$, and $u = 1000$.

(a) [5 points] Using any of the results obtained in the class, compute the number h , of hash functions to use. Show your computations.

(b) [5 points] Compute the probability, $P(u)$, of a filter error when h has this value.

Question 4. (15)

Given n pairs of intervals (l_i, r_i) , $i=1,2,\dots,n$, and a query interval $J = (l, r)$. In order to list all the intervals that overlap J , we have constructed an interval tree with the following properties:

Each node v has a value $v.key$ and two subtrees $v.left$ and $v.right$.

The interval tree is a binary search tree on the "key" values.

Intervals with $r_i < v.key$ are stored in the left subtree of v .

Intervals with $l_i > v.key$ are stored in the right subtree of v .

Intervals with $l_i \leq v.key \leq r_i$ are stored in v .

Describe an efficient algorithm that returns all the intervals that intersect J using the above interval tree data structure.