Assignment 5

CIS 2168 (Section 001)

Fall 2023

Instructor: Shuvra Chakraborty

Total points: 100

Objectives

In this assignment, you will work with binary search trees (BSTs) and implement various operations on them, including insertion, deletion, traversal, height calculation, search, and so on. BSTs are binary trees with the following properties: each node has a value, the left subtree contains values less than the node, and the right subtree contains values greater than the node. [Hint: consult the class lecture and helpful resources provided on BST]

Problem description

Create a Java program that implements a BST and performs the following operations on it:

1. Insertion:
Implement an insertion operation that adds a new node with a specified value to the BST. Ensure that the BST property is maintained.

2. Deletion:
Implement a deletion operation that removes a node with a specified value from the BST while preserving the BST structure.

3. Traversal:
Implement the three primary types of BST traversal: in-order, pre-order, and post-order.

4. Search Operation:
Implement a search operation that searches for a specific value in the BST and returns true if the value is found, or false if it's not present.

5. Subtree size calculation:
Implement a method such that for each node in the BST, it reports the number of nodes in the left subtree and right subtree of the corresponding node.
Assume that the order of node traversal does not matter. Just make sure that it prints the

subtree sizes for each node in the tree.

Extra credit (15 pts)
Given the root of the BST, calculate the height of the BST.

Submission Instruction

The assignment should be submitted through the available link on course Canvas shell. The assignment rubric is as follows:

1. Source code and demonstration [90 points]:

Provide the source code in zip file. Each file should have proper comments (e.g., explanations for methods, class and so on). It will be graded based on accuracy (e.g., program execution), clarity of the necessary comments, and short demonstration as instructed by TA or instructor.

2. Status.txt [10 points]:

In this text file, you need to report:

- The status of your program (completed or not; partial credit will be given even if the program is not completed).
- The design of your program (what and how the objectives have been accomplished).
- Support and advice (if any) you get from TA and/or your classmates.
- Comments and suggestions to improve this assignment.
- If you have completed the extra credit part, mention it explicitly.
- If you are doing late submission, you should mention the number of days you are late since the due date. According to our policy, for N days of late submission, you get a deduction of Nx3 points per day even if your submission completes all the requirements. That said, if you are late for 5 days, your maximum point can be up to 85 out of 100.

Please have the source codes and status files zipped into a single file DSAssign5-LastnameFirstname.zip and upload the file on Canvas.