# Lab Assignment 8

CS 361 – Principles of Programming Languages I

Fall 2021

The goal of this lab is to implement a binary search tree in C (not C++). The binary search tree should be able to store key-value pairs and should dynamically allocate memory to create new nodes.

## Assignment

You are given a header file *bst.h* (which you may not change) declaring the type `BST` and basic operations for a binary search tree. Write a file *bst.c* which implements these operations. Feel free to implement additional functions within your *bst.c* file.

## Types and Operations

**`struct Node`:** Represents a node of the tree and stores a key-value pair. Additionally, it has pointers to its left and right child.

**`struct BST`:** Represents a binary search tree. It contains an integer `size` which stores the total number of nodes in the tree, and a pointer to the root node of the tree.

**`BST* newTree()`:** Creates a new empty tree and returns a pointer to the allocated memory storing the `BST` object. A newly created tree should contain no nodes and, therefore, its root-pointer should be `NULL`.

**`void deleteTree(BST* tree)`:** Deletes the given tree and all its nodes. All allocated memory will be freed.

**`void insert(BST* tree, int key, int value)`:** Inserts a given key-value pair into a given tree. If the key is already stored in the tree, the function updates the value associated with the given key.

**`bool contains(BST* tree, int key)`:** Determines if a given key is stored in the given tree.

**`int getValue(BST* tree, int key)`:** Returns the value associated with the given key. If there is no such key-value pair stored in the given tree, then the function returns `0`.

**`void delete(BST* tree, int key)`:** Deletes the key-value pair (and the node storing it) with the given key from the given tree. The function does nothing if there is no such key-value pair stored in the tree.

## Submission

For your submission, upload the file *bst.c* with your implementation to canvas.

This is an individual assignment. Therefore, a submission is required from each student.

**Deadline:** Sunday, December 5, 11:59 p.m.