Data Structures
Introduction to Binary Trees

Cain Susko

Queen's University
School of Computing

February 5, 2022

Valid Trees

A valid tree is one that is defined as a tree where there is a single unique path to each node.

Binary Tree

A binary tree is a tree where each node either has 2 to 0 children. A binary tree can represent an arithmetic expression can be represented as a binary tree whose leaves are associated with variables or constants and whose internal nodes are associated with one of the operators in the expression.

Binary Subtrees

a sub tree is a section of a Binary tree that is also a valid tree, where the root of the subtree is a node in the original tree.

Complete & Full Binary Trees

A **full** binary tree is a tree where each node is either a leaf or possesses exactly two child nodes.
A **complete** binary tree is one where all *levels* are completely filled **except** the last level which has all keys as left as possible.
A Binary tree can be both full or complete.

Operations

the following are common operations that one might perform on a binary tree

- traverse all items
- search for item
- adding a new item
- deleting item or the entire tree (destruction)
- removing or adding a section of the tree

example

Below is an example implementation of a Binary tree class in Python

```
class BTNode:
        def_init_(self, data):
                self.left = None
                self.right = None
                self.value = data

def main():
        BTNode temp

        pRoot = new BTNode(5)

        temp = new BTNode(7)
        pRoot.left = temp

        temp = new BTNode(-3)
        pRoot,right = temp
```