

Tree Data Structure

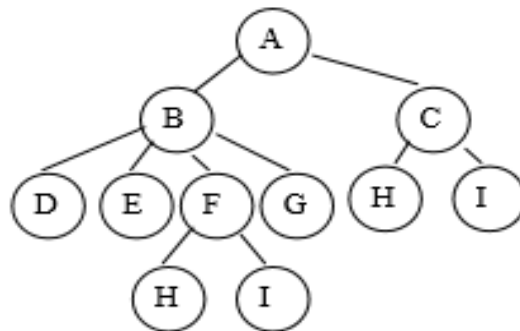
Introduction

Tree is a non-linear data structure which organizes data in a hierarchical structure.

A tree is a finite nonempty set of elements or nodes. Nodes are connected by edges. Each node contains a value or data, and it may or may not have a child node. consists of nodes with a parent-child relation.

Applications:

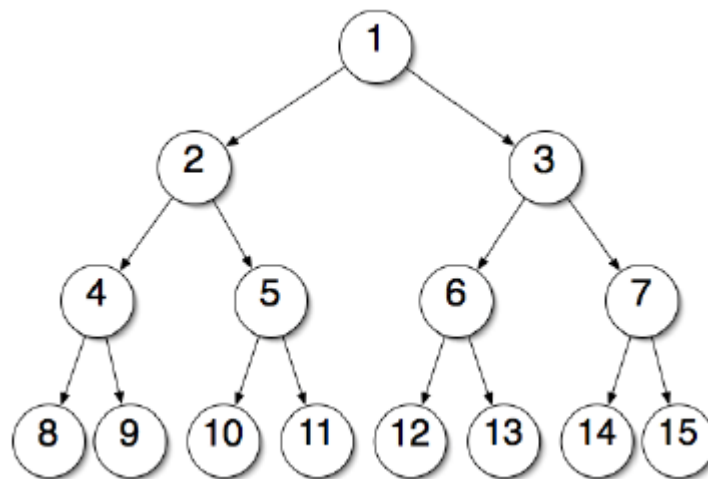
1. Organization charts
2. File systems



Binary Tree

Binary Tree is a special data structure used for data storage purposes. A binary tree has a special condition that each node can have two children at maximum.

“In computer science, a binary tree is a tree data structure in which each node has at the most two children, which are referred to as the left child and the right child.”



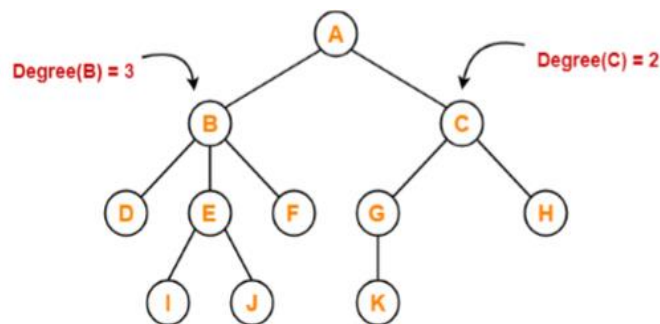
Trees Terminology

The important terms related to tree data structure are:

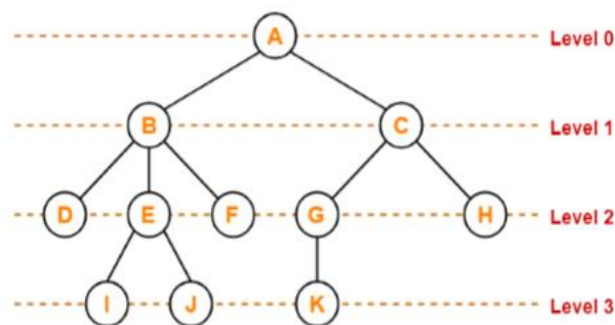
1. **Root:** The first node from where the tree originates is called as a root node. In any tree, there must be only one root node.
2. **Edge:** The connecting link between any two nodes is called as an edge. In a tree with n number of nodes, there are exactly $(n-1)$ number of edges.
3. **Parent:** The node which has a branch from it to any other node is called as a parent node. In other words, the node which has one or more children is

called as a parent node. In a binary tree, a parent node can have only at maximum two child nodes.

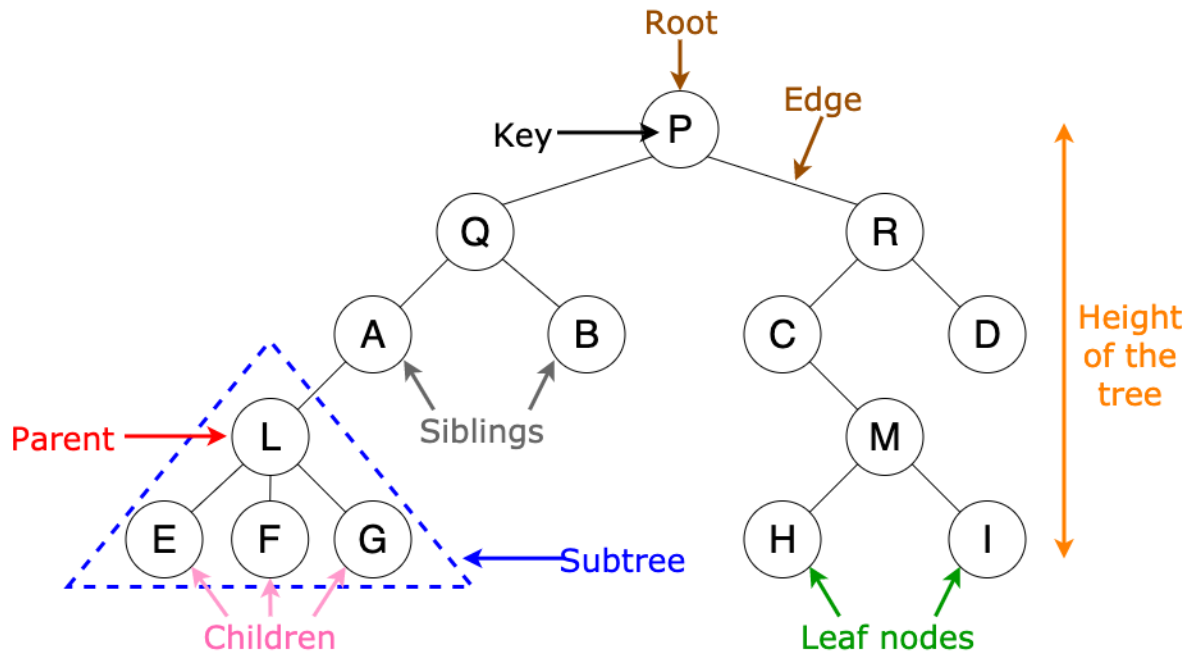
4. **Child:** The node which is a descendant of some node is called as a child node. All the nodes except root node are child nodes.
5. **Sibling:** Nodes which belong to the same parent are called as siblings. In other words, nodes with the same parent are sibling nodes.
6. **Degree:** Degree of a node is the total number of children of that node. Degree of a tree is the highest degree of a node among all the nodes in the tree.



7. **Leaf node:** The node which does not have any child is called as a leaf node.
8. **Level :** In a tree, each step from top to bottom is called as level of a tree. The level count starts with 0 and increments by 1 at each level or step.



9. **Sub tree:** In a tree, each child from a node forms a subtree recursively. Every child node forms a subtree on its parent node.



Applications:

1. arithmetic expressions.
2. decision processes.