Algorithms + Data Structures = Programs (1976 book) +4

# What are the types of trees in data structures?





## 6 Answers

Sumanta Chatterjee, Been learning and evolving with computer programming

Updated Mar 30, 2017 · Upvoted by John L. Miller, 25 years at Microsoft, Amazon, Google, etc. C++, C, Java, Basic, etc. PhD.

There are different types of tree data structures. Some of them are

1. **Binary Tree**: This is the most basic basic from of tree structure. Where each node can have utmost two children. A **perfect** binary tree is a binary tree in which all interior nodes have two children *and* all leaves have the same *depth* or same *level*. *A **full binary tree** (sometimes referred to as a proper[15] or plane binary tree) is a tree in which every node in the tree has either 0 or 2 children. In a **complete** binary tree every level, except possibly the last, is completely filled, and all nodes in the last level are as far left as possible. In the **infinite complete** binary tree, every node has two children.*
2. **Binary search tree:** BST is a binary tree with certain properties such as , and left child of the given node contains value less than equal to the given node and right hand child contain node greater than the given node.
3. **AVL tree or height balanced binary tree**: It is a variation of the Binary tree where height difference between left and right sub tree can be at most 1. If at any time they differ by more than one, rebalancing is done to restore this property. Lookup, insertion, and deletion all take O(log n) time in both the average and worst cases, where n is the number of nodes in the tree prior to the operation.
4. **Red-Black tree**: Another variant of binary tree similar to AVL tree it is a self balancing binary search tree. In this tree nodes are either colored red or black.
5. **Splay tree:** A splay tree is a self-adjusting binary search tree with the additional property that recently accessed elements are quick to access again. All normal operations on a binary search tree are combined with one basic operation, called splaying. Splaying the tree for a certain element rearranges the tree so that the element is placed at the root of the tree.

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full,complete or perfect n-ary tree. N-ary is some time known as forest.

7. **Trie Structure**: In computer science, a trie, also called digital tree and sometimes radix tree or prefix tree (as they can be searched by prefixes), is an ordered tree data structure that is used to store a dynamic set or associative array where the keys are usually strings. All the descendants of a node have a common prefix of the string associated with that node, and the root is associated with the empty string.
8. **Suffix tree**: Trie and suffix tree are closely related. a suffix tree (also called PAT tree or, in an earlier form, position tree) is a compressed trie containing all the suffixes of the given text as their keys and positions in the text as their values. Suffix trees allow particularly fast implementations of many important string operations.
9. **Huffman Tree:** Huffman tree is a frequency sorted binary tree used widely in compressing data. Huffman tree is constructed to allocate a short code word to a long text based on its frequency of occurrences.
10. **Heap Structure** [Edit as suggested]: Heap structure is another widely used tree structure with a specific ordering property. There are two types of heap - Min heap and Max heap. In a min heap the parent of a node must be smaller than the values of all its children. Similarly in max heap the parent always have greater value compared to all its children. One common implementation of heap is Binary heap where each parent can have at most two children.

Other popular tree structure includes but not exhaustively **B-Tree, B+- tree , R-Tree, Counted-B Tree, K-D tree** ( or K- dimensional BST) , Decision tree ( a variant of n-ary tree) , **Markel tree, Fenwick tree** ( or binary index tree) , Range Tree.



Dhirendra Singh Patel, Student at Harcourt Butler Technical University, Kanpur (2016-present)
Answered Jun 21, 2017

There are some types of trees with good and short explanation:

1.Binary Trees:

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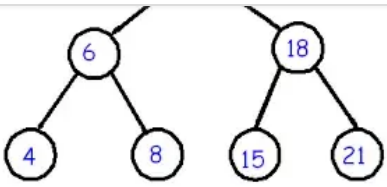
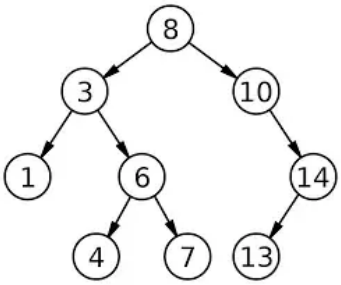



A **binary tree** is a **tree data structure** in which each node has at most two children, which are referred to as the left child and the right child.

2.Binary Search Tree:

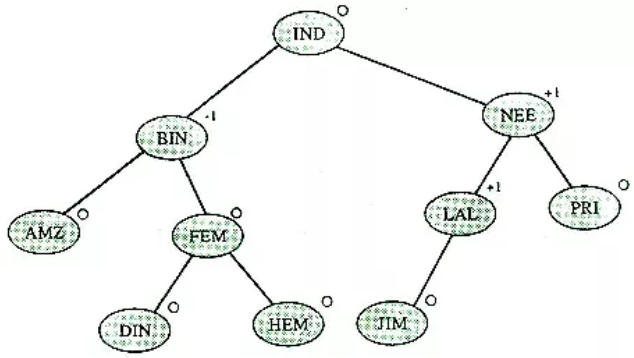



Binary Search Tree follow (Left.Value<Root<Rightchild.value) Rule

*The major advantage of binary search trees over other data structures is that the related sorting algorithms and search algorithms such as in-order traversal can be very efficient; they are also easy to code.

*Binary search trees are a fundamental data structure used to construct more abstract data structures such as sets , multisets , and associative arrays .

3.AVL TREE:




A **AVL tree** is a self-balancing binary search **tree**. In an **AVL tree**, the heights of the two child subtrees of any node differ by at most one; if at any time they differ by more than one, rebalancing is done to restore this property.

Operations Like Insertion and deletion have low complexity.

**4.B-Tree:**

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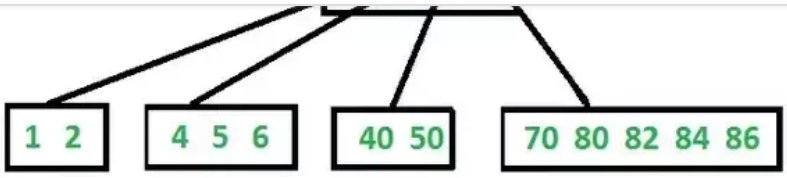
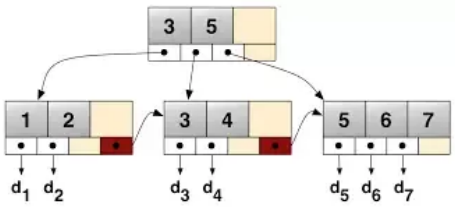



A **B-tree** is a self-balancing **tree data structure** that keeps **data** sorted and allows searches, sequential access, insertions, and deletions in logarithmic time. The **B-tree** is a generalization of a binary search **tree** in that a node can have more than two children.

5.B+ Tree:




A **B+ tree** is an n-array tree with a variable but often large number of children per node. A B+ tree consists of a root, internal nodes and leaves. The root may be either a leaf or a node with two or more children.

A B+ tree can be viewed as a B-tree in which each node contains only keys (not key–value pairs), and to which an additional level is added at the bottom with linked leaves.

I hope it will helpful.

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Marymiller
Answered May 7, 2016

The tree is one of the most powerful of the advanced data structures and it often pops up in even more advanced subjects such as AI and compiler design. Surprisingly though the tree is important in a much more basic application - namely the keeping of an efficient index.

Whenever you use a database there is a 99% chance that an index is involved somewhere. The simplest type of index is a sorted listing of the key field. This

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The trouble with a simple ordered list only becomes apparent once you start adding new items and have to keep the list sorted - it can be done reasonably efficiently but it takes some advanced juggling. A more important defect in these days of networking and multi-user systems is related to the file locking properties of such an index. Basically if you want to share a linear index and allow more than one user to update it then you have to lock the entire index during each update. In other words a linear index isn't easy to share and this is where trees come in - I suppose you could say that trees are shareable.

Binary trees

A worthwhile simplification is to consider only binary trees. A binary tree is one in which each node has at most two descendants - a node can have just one but it can't have more than two.

Clearly each node in a binary tree can have a left and/or a right descendant. The importance of a binary tree is that it can create a data structure that mimics a "yes/no" decision making process.

For example, if you construct a binary tree to store numeric values such that each left sub-tree contains larger values and each right sub-tree contains smaller values then it is easy to search the tree for any particular value.



Jesse Pollard, programmer/analyst/administrator from way back
Answered Mar 11, 2018

Originally Answered: What are tree variants in data structure?

“What are tree variants in data structure?”

It depends on the data, and what you use the data for.

A simple binary tree allows a discriminate to select one of two sub trees.

A b+ tree allows a discriminate to select one of a number of sub trees.

Then there is sometimes the need to have a linear ordering of the tree (such as when the tree discriminate is priority). To quickly find the first entry you can look at the root of the tree - which then has a pointer to the leftmost leaf node. That leaf node then has two pointers - one to its parent, and one to the next entry. Thus quick to find, and easy to remove... and relatively quick to insert.

Then there are radix trees where the discriminate may be something like text - the left tree contains all words starting with “a”. The next entry (if in a b+ tree),

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The next level repeats with the next input (so the left tree would represent "aa" through "az". And left tree would be "aaa" through "aaz". It can make a dictionary search relatively fast.

How the variant is done depends on the data, and what the goal is.



Gunpreet Ahuja, DS has remained an important subject throughout my B.Tech degree and GATE exam.
Answered Apr 10, 2016

There are a lot many trees in data structures. However, there are few that have an important place in books and students (especially CS students) should know basics of these. They are:

Binary Trees

Binary Search Trees

AVL trees

B Trees (or general m-way search trees)

B+ Trees

Knowing these would let to say, Boom! I know Trees. ;)

P.S.: These are just for basics in Trees topic of Data structures.



Harman Kumar, Research Engineer at Snapchat
Answered Apr 10, 2016

Too many for one person to remember!!

But the most famous ones are:

1. AVL Tree
2. Red black tree
3. Splay tree
4. a,b Tree

While 1,2,3 are examples of balanced binary trees, a,b trees have nodes with a <= #children <= b and are also self balancing.

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