CS32 Intro to Computer Science II

Baoxiong Jia & Muthu Palaniappan, DIS 1C Week 8
UCLA Spring 2021

About Us

- TA: Baoxiong Jia
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  - Office Hours: Tuesday 8:30-10:30am
  - Thursday 8:30-10:30am
  - Discussion 1C: Friday 12:00-13:50pm

- LA: Muthu Palaniappan
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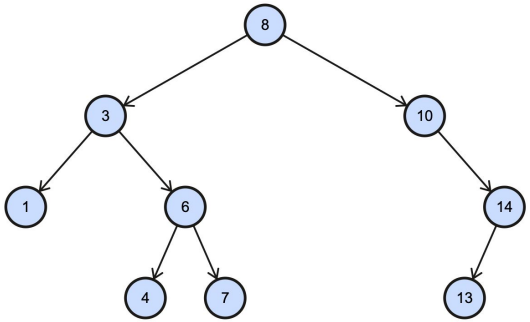
  - Office Hours: Monday 10:30-11:30am
  - Wednesday 10:30-11:30am

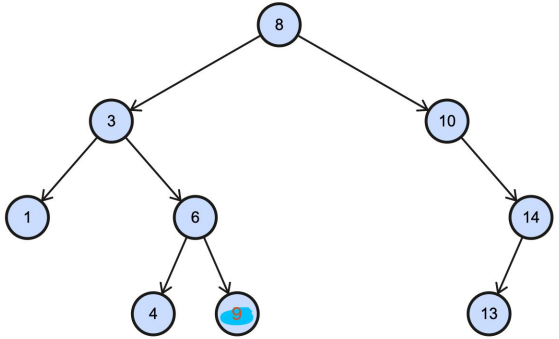
Outline

- Tree

Trees

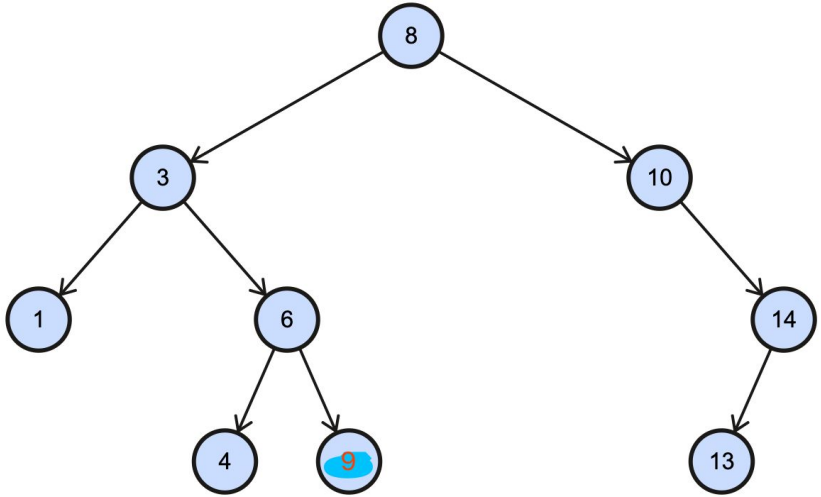
- Binary tree
  - At most 2 child nodes per parent node
- Binary search tree
  - A binary tree that all elements in the left subtree are strictly less than the current node value and all elements in the right subtree are strictly larger than the current node value.
  - Balanced tree: The left and right subtrees' heights differ by at most one, AND the left subtree is balanced, AND the right subtree is balanced.





Binary tree traversal

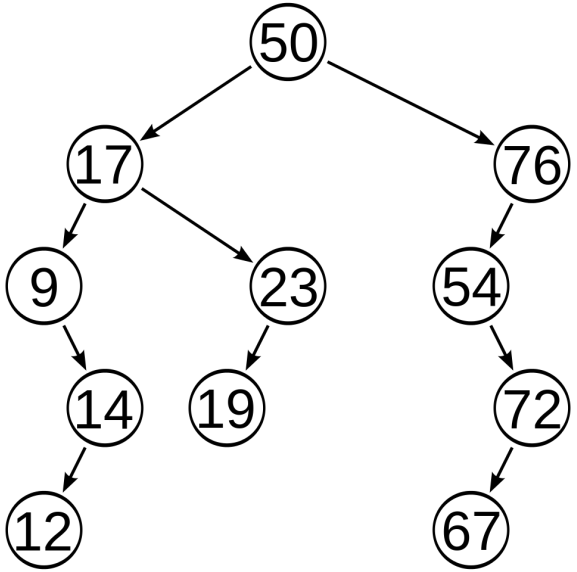
https://repl.it/@jiajerry/TreeTraversal#main.cpp

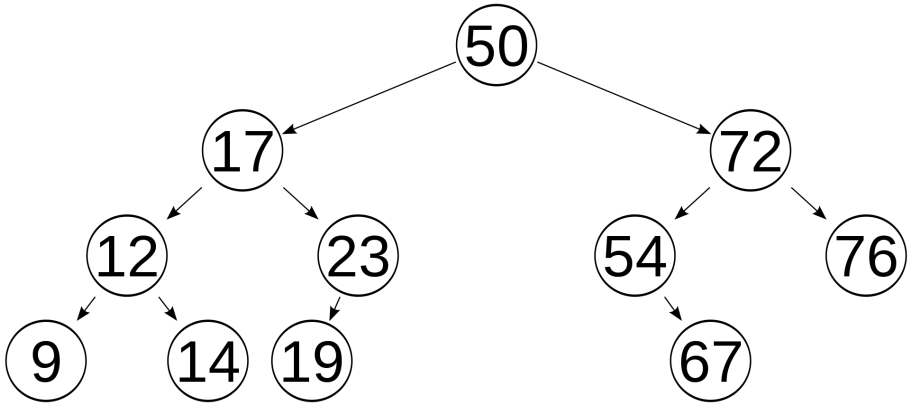


pre: 8 -> 3 -> 1 -> 6 -> 4 -> 9 -> 10 -> 14 -> 13
in: 1 -> 3 -> 4 -> 6 -> 9 -> 8 -> 10 -> 13 -> 14
post: 1 -> 4 -> 9 -> 6 -> 3 -> 13 -> 14 -> 10 -> 8

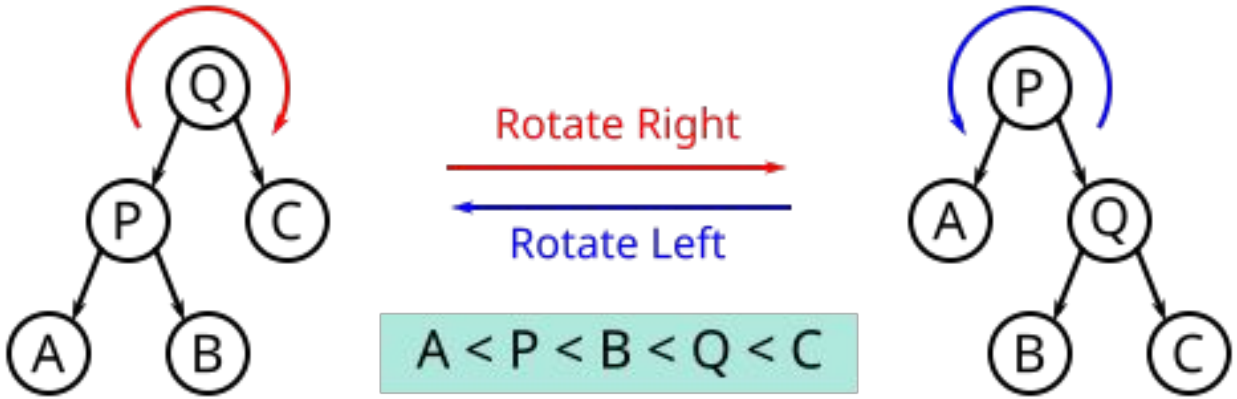
Balanced trees

- A naive way of constructing binary search trees will lead to inefficient data storage, we will want to balance the tree to have O(logn) searching efficiency.





Balanced Trees



Balanced trees

- AVL tree
  - https://en.wikipedia.org/wiki/AVL_tree
- Treap
  - https://en.wikipedia.org/wiki/Treap
- Splay tree
  - https://en.wikipedia.org/wiki/Splay_tree
- Red-black tree
  - https://en.wikipedia.org/wiki/Red%E2%80%93black_tree
- Weight balanced tree
  - https://en.wikipedia.org/wiki/Weight-balanced_tree
- 2-3 tree
  - https://en.wikipedia.org/wiki/2%E2%80%933_tree