Data Structures and Algorithms

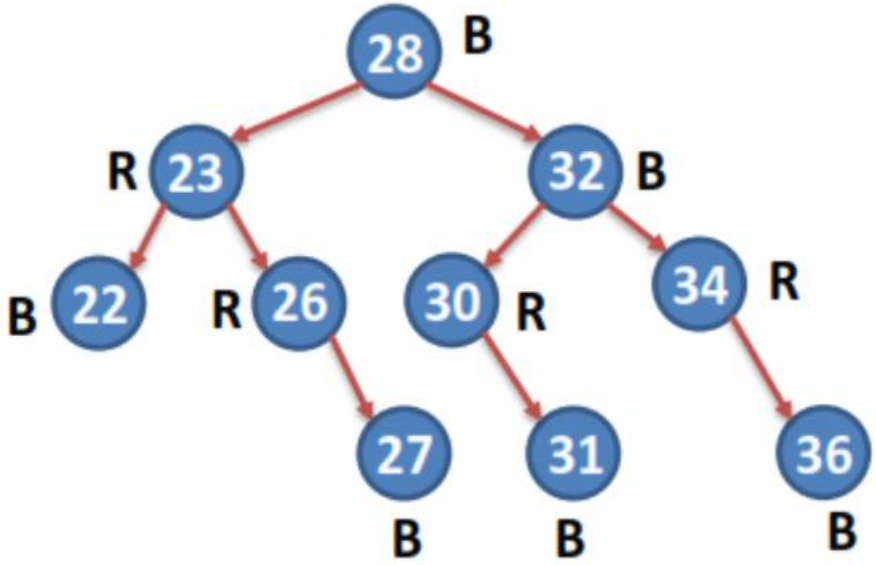
Lecture 31: AVL Trees - Deletion

AVL Tree - Deletion

- If element to be deleted does not have empty right sub-tree, then element is replaced with its In-Order successor and its In-Order successor is deleted instead.
- During winding up phase, we need to revisit every node on the path from the point of deletion upto the root, rebalance the tree if require.

AVL Tree – Deletion Example

- Delete node 28 & 30 and draw the tree after each deletion

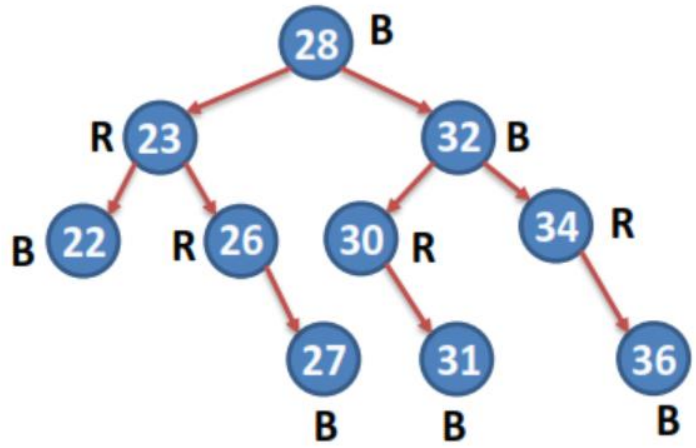


In-Order Traversal

22, 23, 26, 27, 28, 30, 31, 32, 34, 36

AVL Tree – Deletion Example

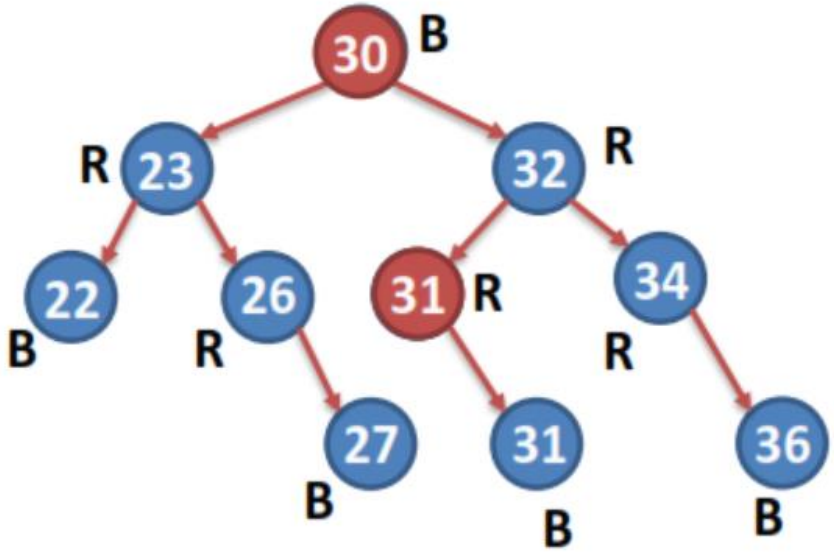
- Delete node 28 & 31 and draw the tree after each deletion



In-Order Traversal

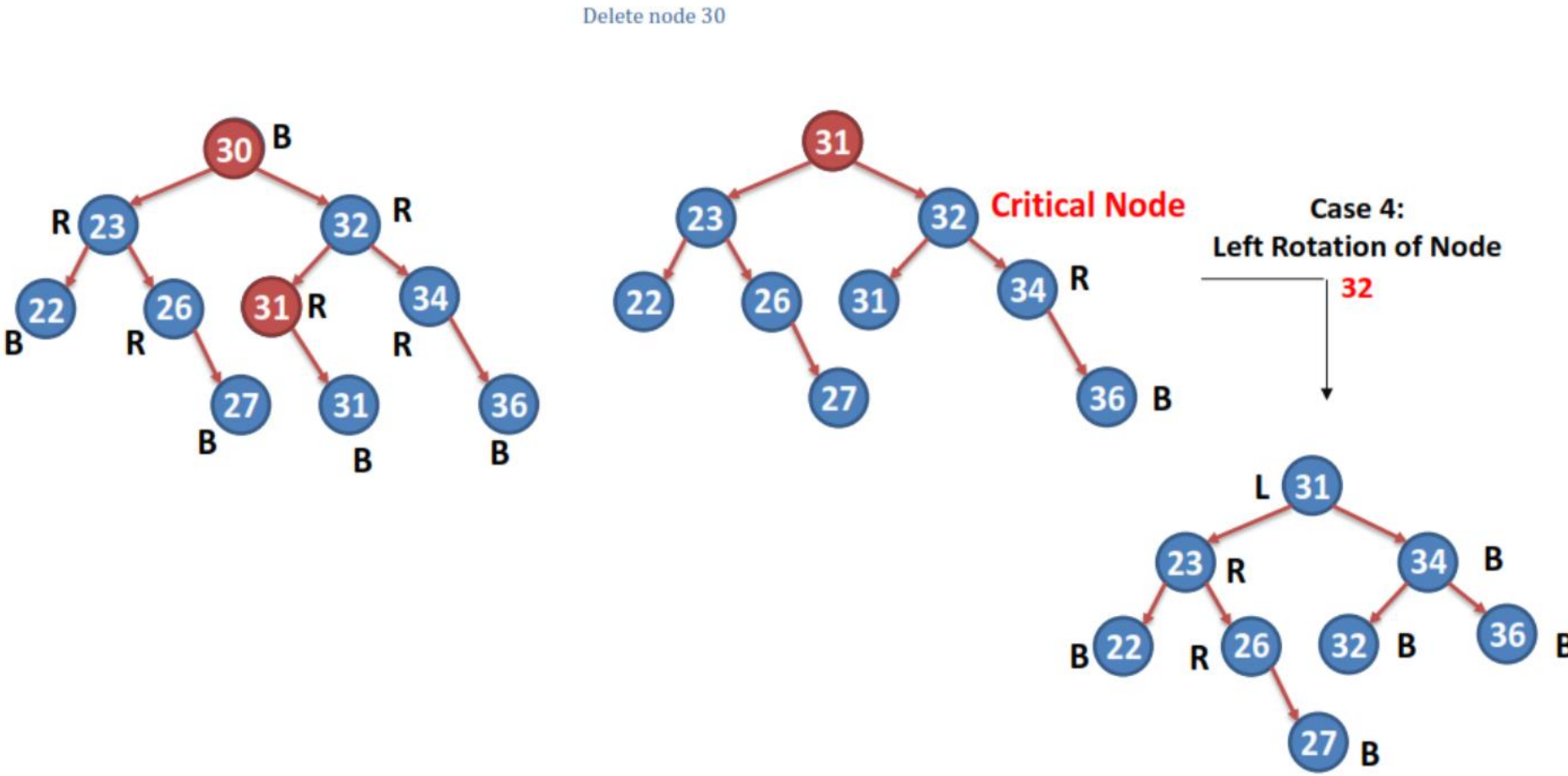
22, 23, 26, 27, 28, 30, 31, 32, 34, 36

Delete Node 28



AVL Tree – Deletion Example

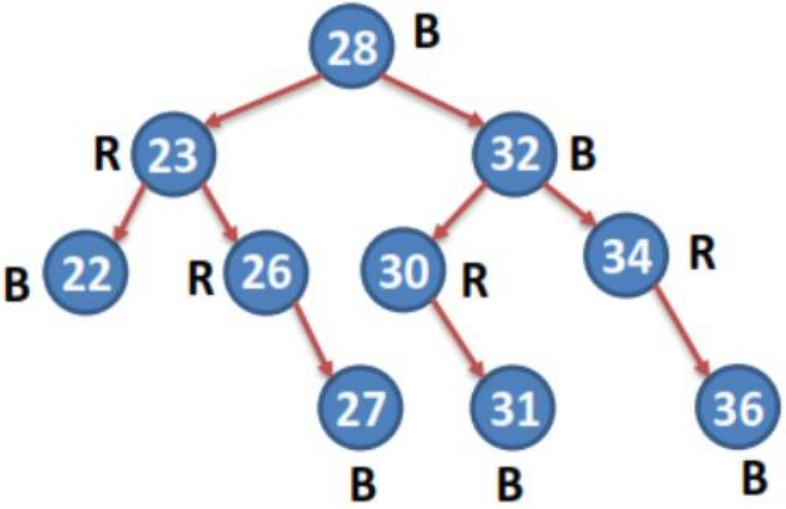
- Delete node 28 & 31 and draw the tree after each deletion



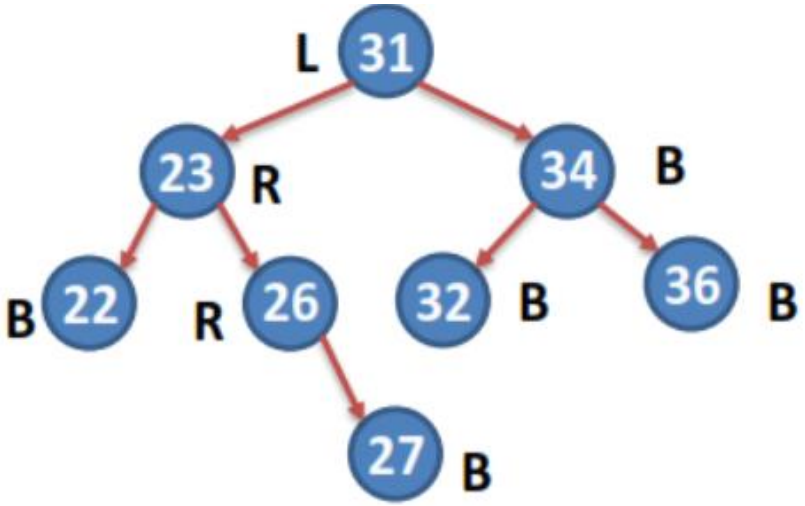
AVL Tree – Deletion Example

- Before and after deletion of 28 and 30.

Before Deletion



After Deletion



Applications of AVL Tree

- It is used to index huge records in a database and also to efficiently search in that.
- For all types of in-memory collections, including sets and dictionaries, AVL Trees are used.
- Database applications, where insertions and deletions are less common but frequent data lookups are necessary
- Software that needs optimized search.
- It is applied in corporate areas and storyline games.

Advantages of AVL Tree

- AVL trees can self-balance themselves.
- It is surely not skewed.
- It provides faster lookups than Red-Black Trees
- Better searching time complexity compared to other trees like binary tree.
- Height cannot exceed log(N), where, N is the total number of nodes in the tree.

Disadvantages of AVL Tree

- It is difficult to implement.
- It has high constant factors for some of the operations.
- Less used compared to Red-Black trees.
- Due to its rather strict balance, AVL trees provide complicated insertion and removal operations as more rotations are performed.
- Take more processing for balancing.