Comparison of BST and AVL Trees

The study is based on 100 input datasets, each containing 1000 unique positive integers.

Introduction:

Compared tree heights and work done during insertions of 1000 nodes and deletions of 100 nodes.

Method:

Data Generation
100 datasets, each comprising 1000 unique positive integers, were generated.

Binary Search Trees (BST)

Construction: For each dataset, a BST was constructed through sequential insertion.
Height: The final height of each BST was recorded.
Deletion: 100 keys were randomly chosen from the dataset without replacement, and these keys were deleted one by one.
Work Done: The number of comparisons and pointer operations during construction and deletion were counted.

AVL Trees

Construction: Similar to BST, AVL Trees were constructed for each dataset.
Height: The final height of each AVL Tree was recorded.
Deletion: 100 keys were randomly chosen from the dataset, and these keys were deleted, tracking comparisons and pointer operations.
Work Done: The number of comparisons and pointer operations were counted.

Analysis of Heights:

Avl's heights are more consistent and it is less as compared to Bst's heights.Avl heights coming 12 mostly . bst heights 18 to 22 mostly. Bst heights are more variable.

Analysis of Work Done:

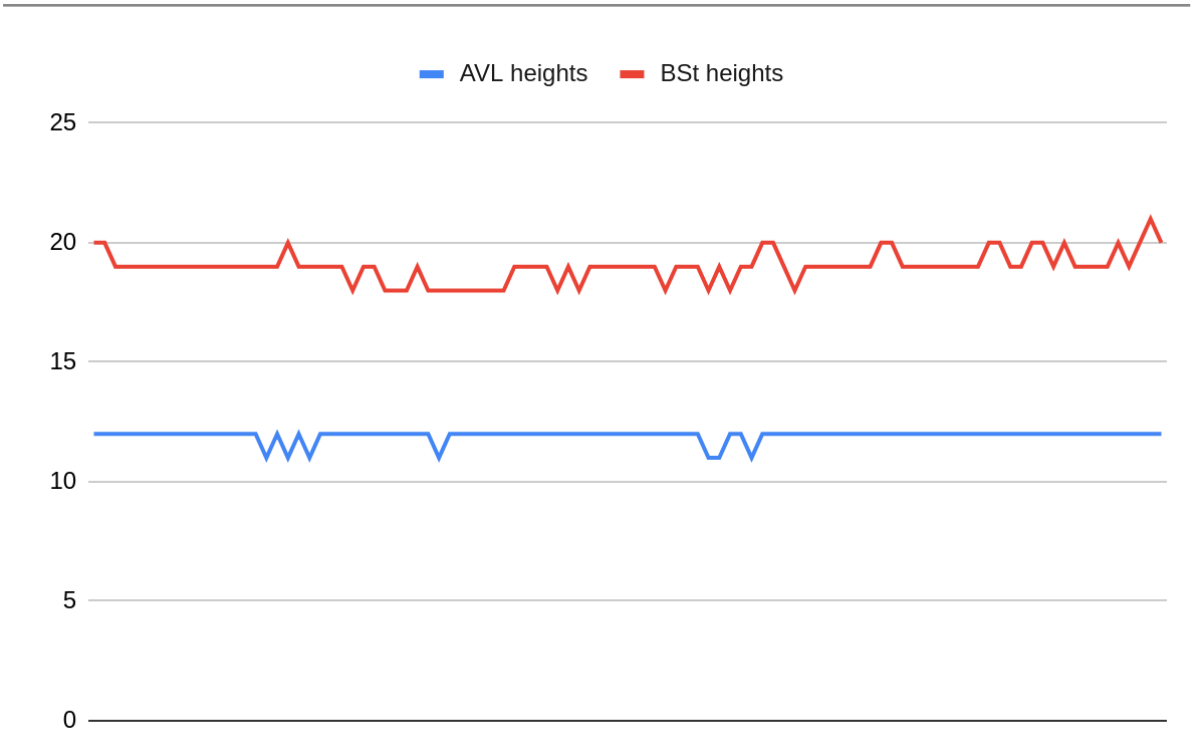
Comparing work done, we observe that AVL trees generally require more comparisons and pointer operations during construction but outperform BSTs during deletions, as AVL trees maintain balance.

Overall:

AVL trees are suitable for scenarios where frequent insertions and deletions are expected, while BSTs might be more efficient when insertions dominate.

Conclusion:

This report comes to the conclusion that AVL trees are more beneficial in terms of maintaining balanced heights and efficient deletion operations. However,Bst is more efficient when only insertion are done.



AVL heights are consistent. 11-12 .
BST heights are more variable 18 to 22 .

Avl work is more consistent . nearly equal in all cases.
BST work is more variable . Have wide range.