

BTree Motivation

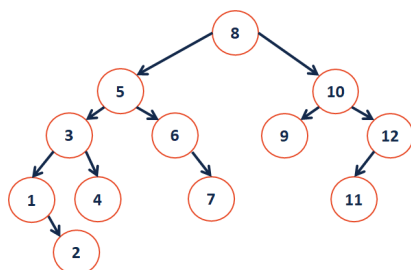
Can we always fit our data in main memory?

Where else do we keep our data?

-
-

vs. CPU: 3 GHz == 3m ops / _____ * _____ cores

AVL Operations on Disk:

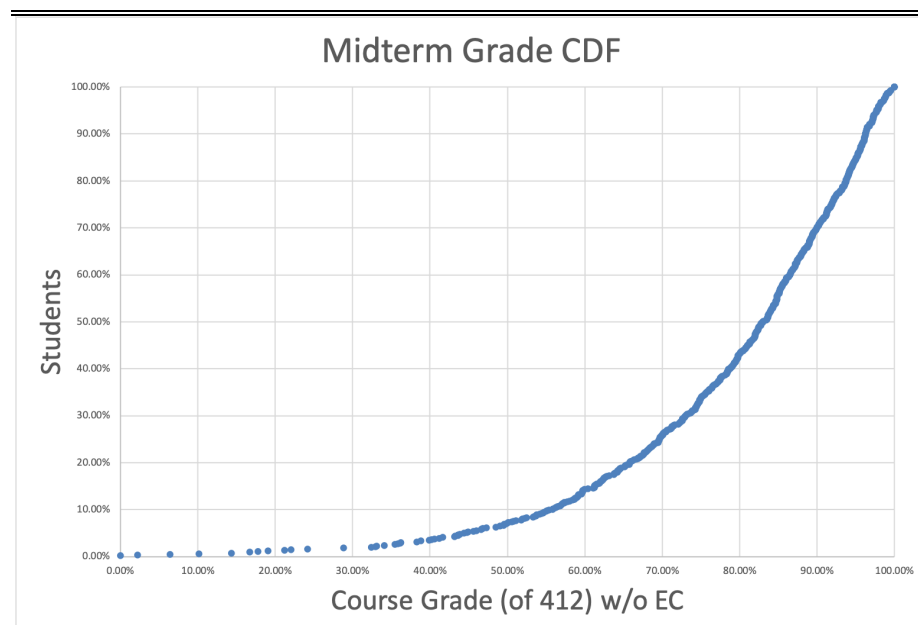


How deep do AVL trees get?

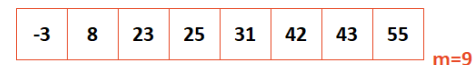
BTree Motivations

Knowing that we have long seek times for data, we want to build a data structure with two (related) properties:

- 1.
- 2.



BTree_m



Goal: Build a tree that uses _____ /node!
...optimize the algorithm for your platform!

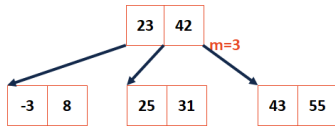
A **BTree of order m** is an m-way tree where:

1. All keys within a node are ordered.

BTree Insert, using $m=5$

...when a BTree node reaches m keys:

BTree Insert, $m=3$:



Great interactive visualization of BTrees:

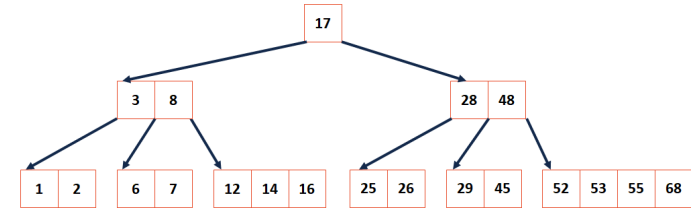
<https://www.cs.usfca.edu/~galles/visualization/BTree.html>

BTree Properties

For a BTree of order m :

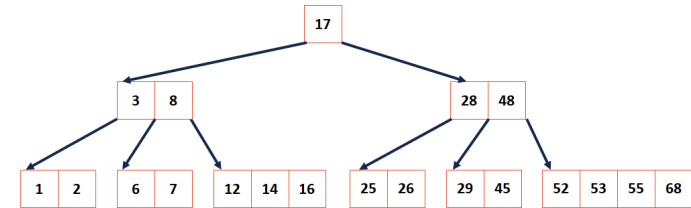
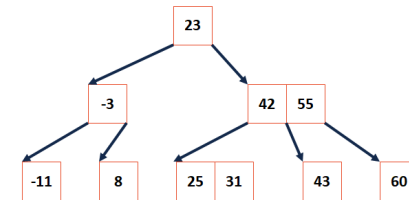
1. All keys within a node are ordered.
2. All leaves contain no more than $m-1$ nodes.
3. All internal nodes have exactly **one more key than children**.
4. Root nodes can be a leaf or have $[2, m]$ children.
5. All non-root, internal nodes have $[\text{ceil}(m/2), m]$ children.
6. All leaves are on the same level.

Example BTree



What properties do we know about this BTree?

BTree Search



CS 225 – Things To Be Doing:

1. mp_traversal extra credit ongoing (final deadline Monday, March. 23rd)
2. lab_avl released this week; course feedback in lab this week!
3. Daily POTDs are ongoing!