EECS 10: Computational Methods in Electrical and Computer Engineering

Lecture 19

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Announcements

• Homework assignment due Monday
• Read chapters 5-7 in book
• Programming assignment oral review in lab this week
Searching

• How long does it take to find an item in a sorted linked list?
• Have to start at the beginning and check every node until we either:
  • Find item, or
  • Find an item that should appear after the desired item
How can we do better?

- Store data in a tree
Binary Search Trees

• Store data in a tree
• Each node can have up to two child nodes
  • one left child
  • one right child
Binary Search Trees

- All left descendants have smaller values
- All right descendants have larger values
- Nodes w/o descendants are called leaf node
Binary Search Trees

1. To find a value in a tree start at the root
2. If the value is less than the current node look at its left child
3. If the value is greater, look at its right child
Binary Search Trees

1. To find a value in a tree start at the root
2. If the value is less than the current node look at its left child
3. If the value is greater, look at its right child
4. Repeat 2 until either we find the node or we reach the bottom of the tree
5. If we reach the bottom of the tree, it doesn’t contain the value
Searching Tree

- Search for 5
- Start at root
Searching Tree

• Since 5 > 4 look at right child
Searching Tree

• Since 5<6 look at left child
Searching Tree

- Found value!!!
Inserting a Node into a Tree

- Find where to place node:
  Use same algorithm as search algorithm
- Two possible outcomes:
  - Find value – then simply do a replacement
  - End up at node where we can’t search any further:
    - If less than leaf node add to left side
    - If greater than leaf node add to right side