



Tutorial 6: Trees and Algorithms

CAB301 - Algorithms and Complexity

School of Computer Science, Faculty of Science

Tree

A **tree** is a collection of nodes connected by directed edges.

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Various implementations, but in CAB301, each node:

- Has a piece of data (`Key`)
- Reference to its `FirstChild`
- Reference to its `FirstSibling`

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```
public class Node
{
    public int Key;
```

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Breath First Traversal

Visit all nodes at a given depth before moving to the next depth. Use a **Queue** to store sibling nodes. Nearer siblings (first in) are visited first (first out).

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ALGORITHM *BreadthFirstTraversal*(*root*)

$q \leftarrow \emptyset$ // Empty queue

$q.\text{enqueue}(\text{root})$

while $q \neq \emptyset$ **do**

$r \leftarrow q.\text{dequeue}()$

 visit r

$r \leftarrow r.\text{FirstChild}$

while $r \neq \text{null}$ **do**

Depth First Traversal

Visit all nodes in a branch before moving to the next branch. Use a **Stack** to store sibling nodes. Deeper siblings (last in) are visited first (first out).

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ALGORITHM *DepthFirstTraversal*(*root*)

$s \leftarrow \emptyset$ // Empty stack

$s.\text{push}(\textit{root})$

while $s \neq \emptyset$ **do**

$r \leftarrow s.\text{pop}()$

while $r \neq \text{null}$ **do**

 visit r

if $r.\text{FirstSibling} \neq \text{null}$