CSC 212: Data Structures and Abstractions

Trees

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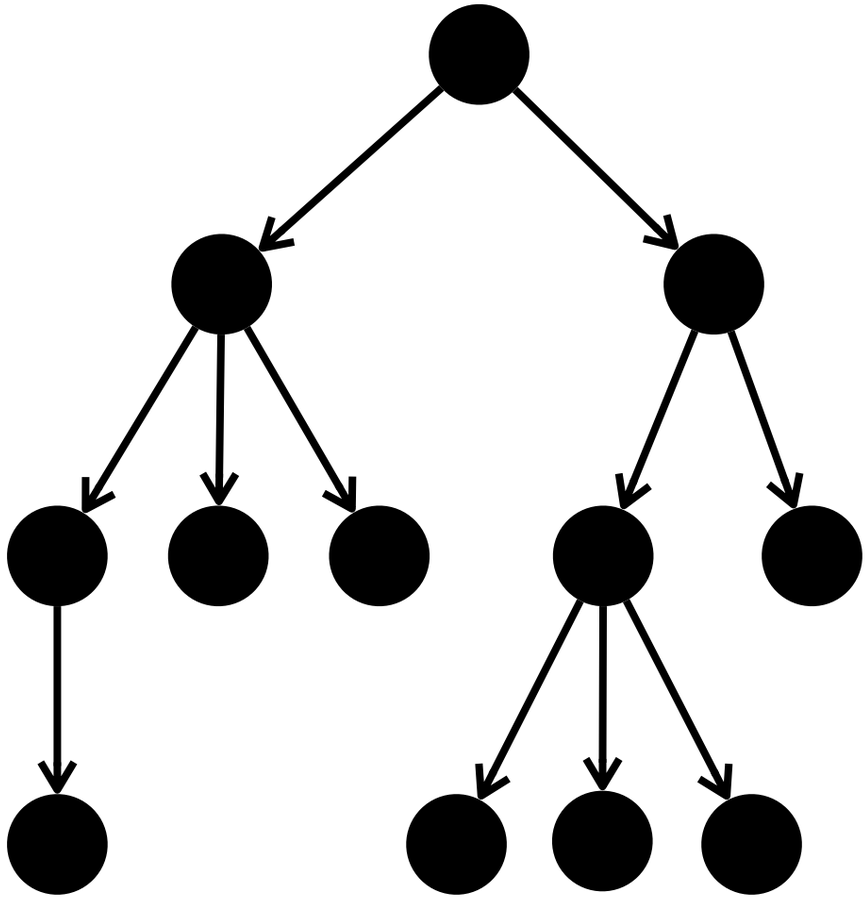
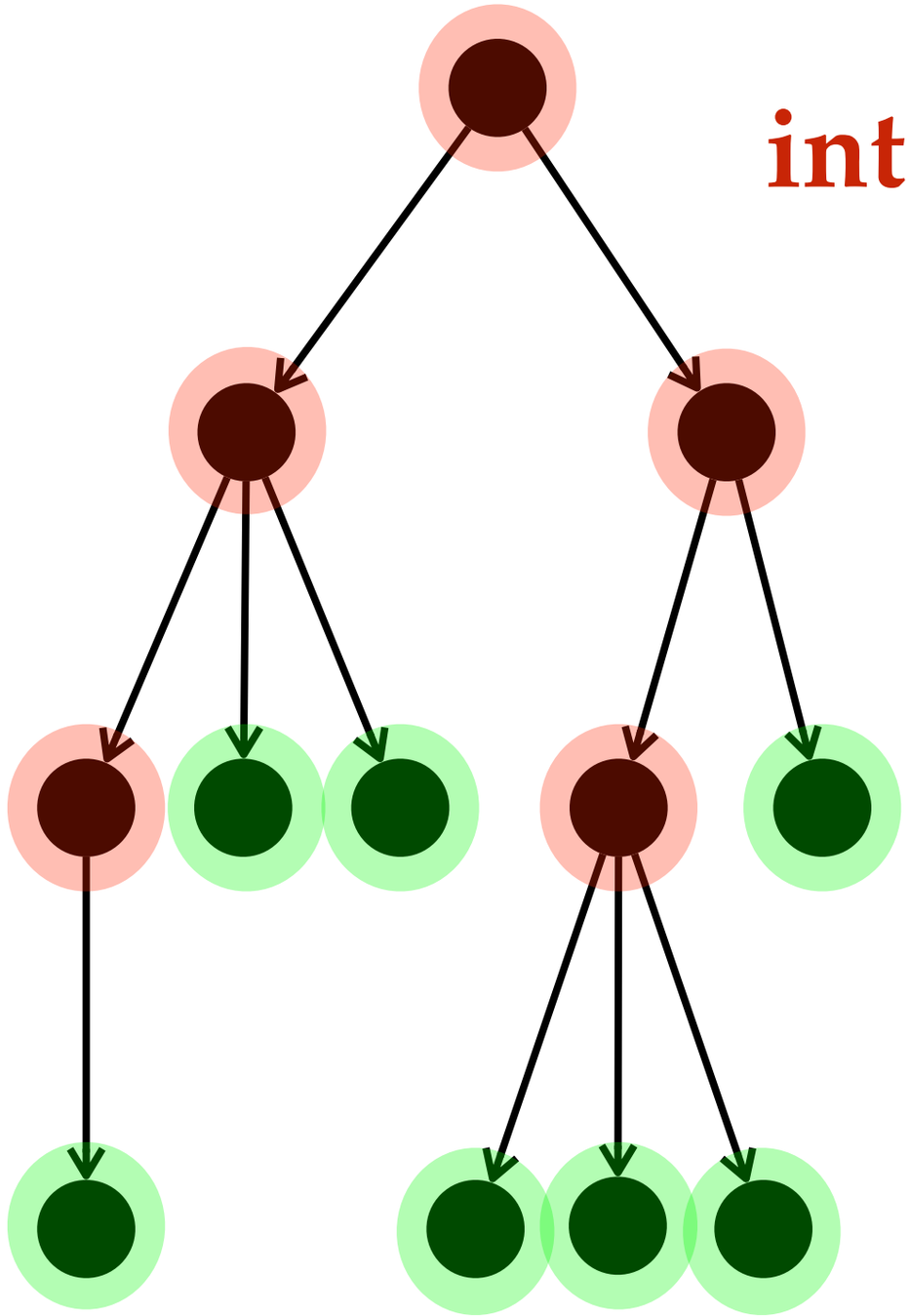
Trees

- Lists, Stacks, Queues are **linear data structures**

- Trees allow for **hierarchical** relationships
  - nodes have **parent-child** relation

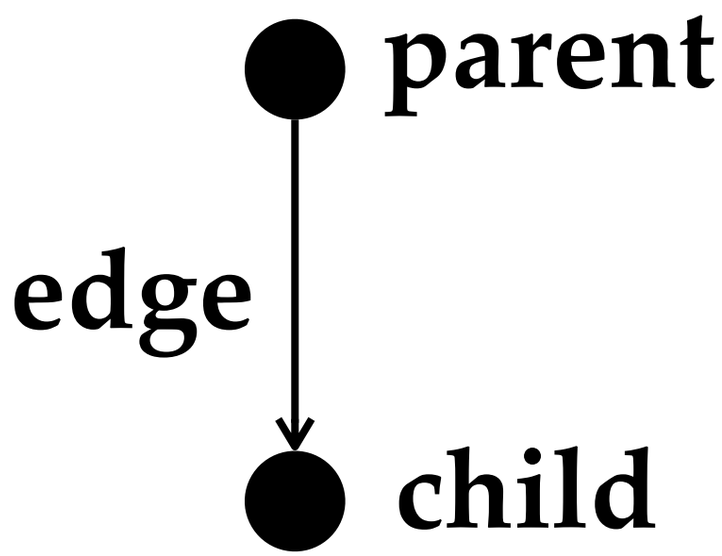


Trees (jargon)



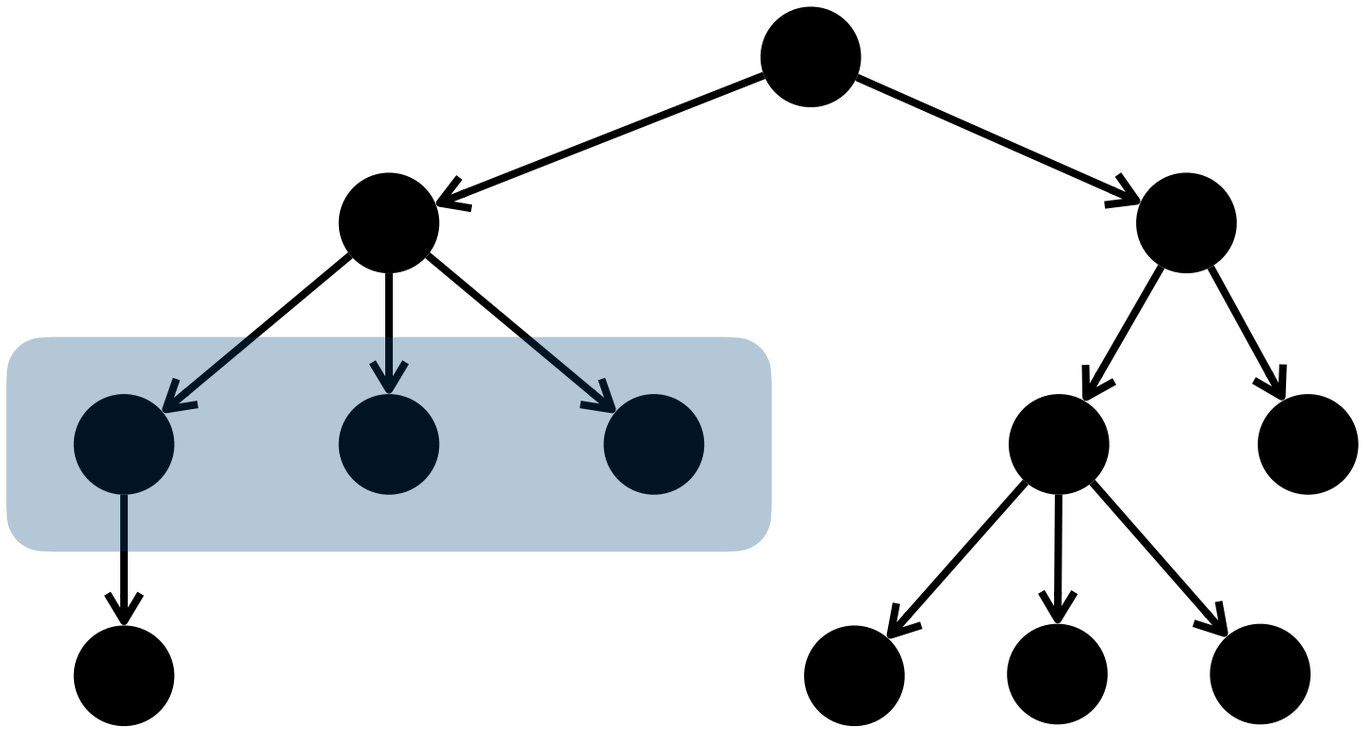
internal nodes

leaves

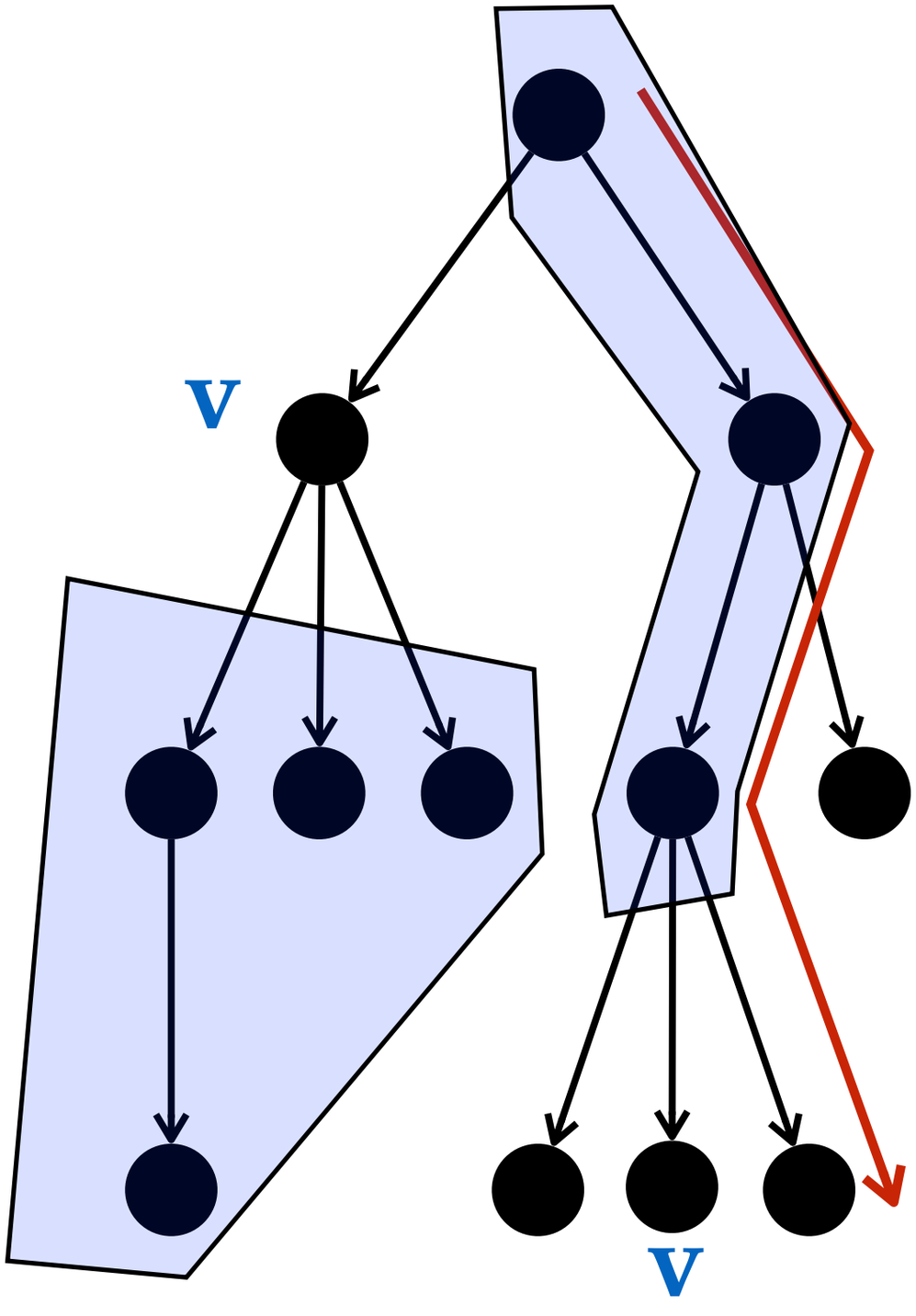


Trees (jargon)

- Each node is either a **leaf** or an **internal node**
  - an internal node has one or more children
  - a leaf node (external node) has no children
- Nodes with the same parent are **siblings**



Paths

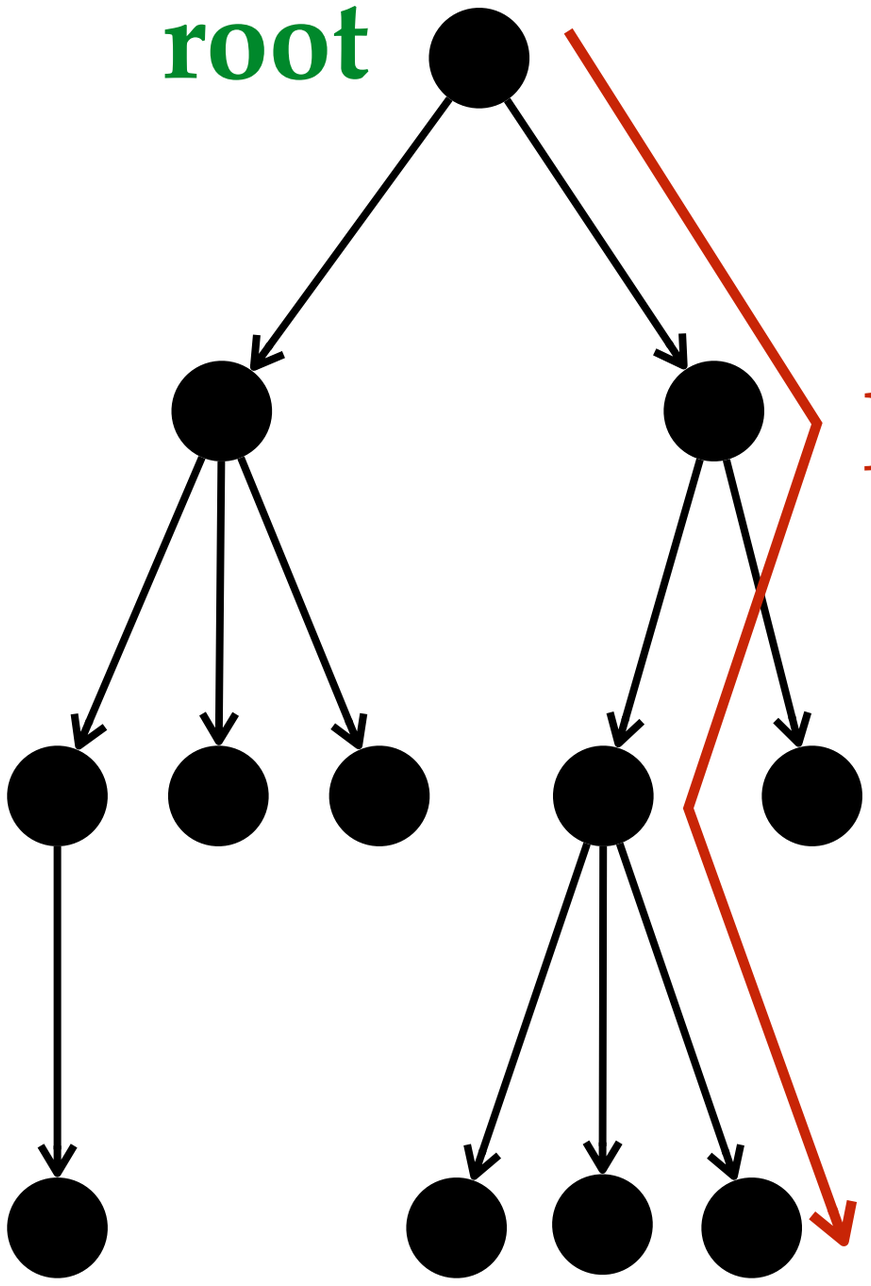


A **path** from node $\mathbf{v_0}$ to $\mathbf{v_n}$ is a sequence of nodes $\mathbf{v_0}$, $\mathbf{v_1}$, $\mathbf{v_2}$, … , $\mathbf{v_n}$, where there is an edge from one node to the next

The **descendants** of a node **v** are all nodes reached by a path from node **v** to the leaf nodes

The **ancestors** of a node **v** are all nodes found on the path from the root to node **v**

Depth and Height



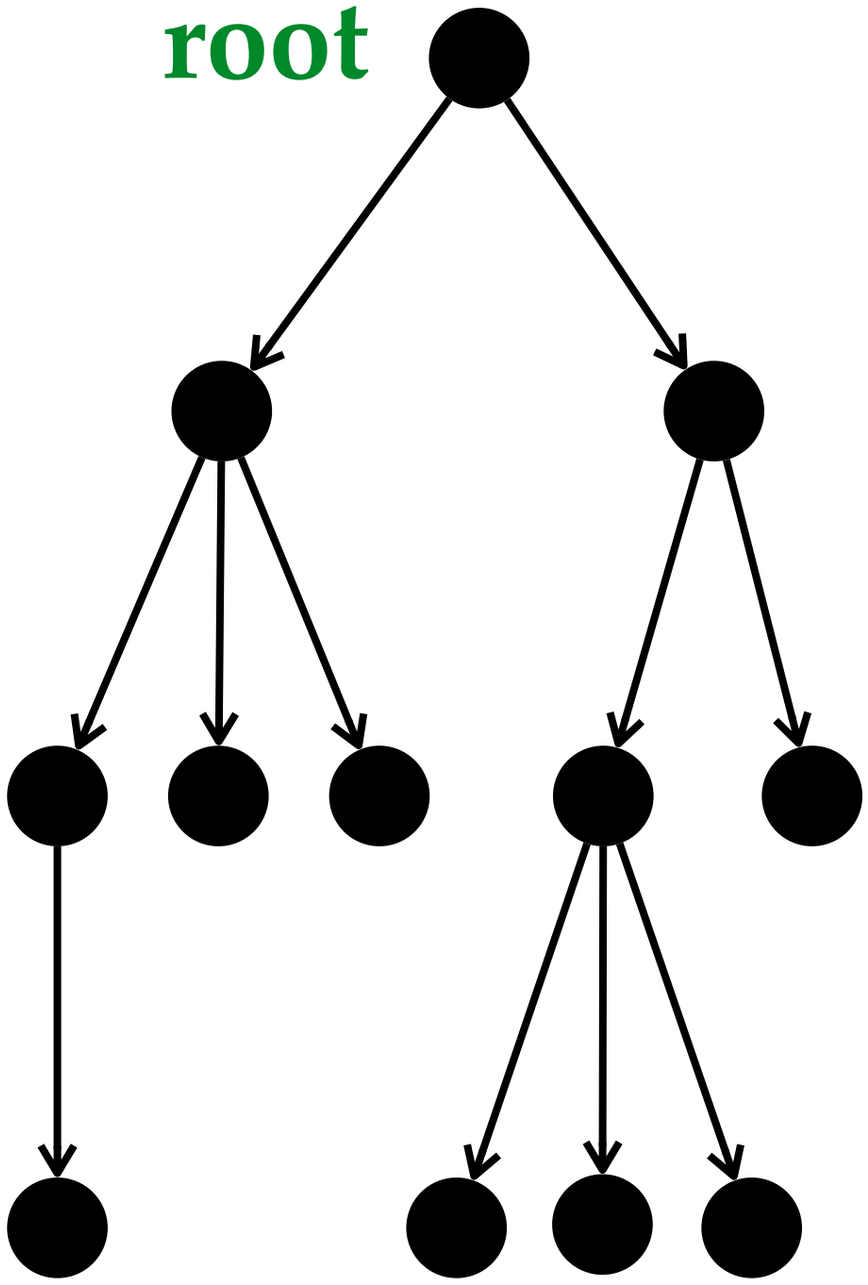
The length of a **path** is the number of edges in the path

length = 3

The **depth** (level) of a node **v** is the length of the path from the root node to **v**

The **height** of a node **v** is the length of the path from **v** to its deepest descendant

Tree Properties



The **depth of the tree** is the depth of deepest node

The **height of the tree** is the height of the root