CS101-Quiz5-Review

Suting Chen

CS101-Quiz5-Review

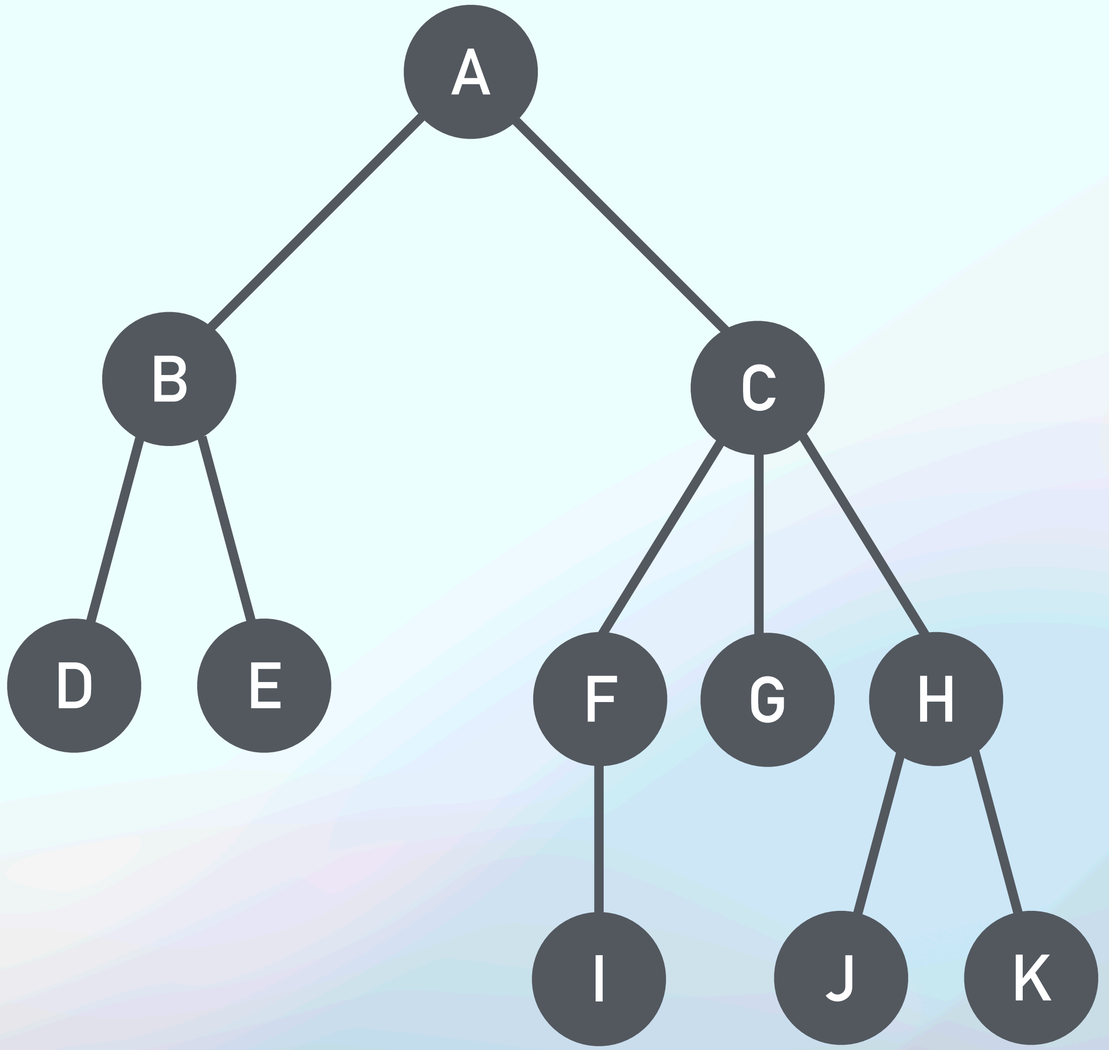
Key Points

1. Tree
2. Breadth-First and Depth-First Traversal
3. Binary Tree

Tree

Basic Definition — Children

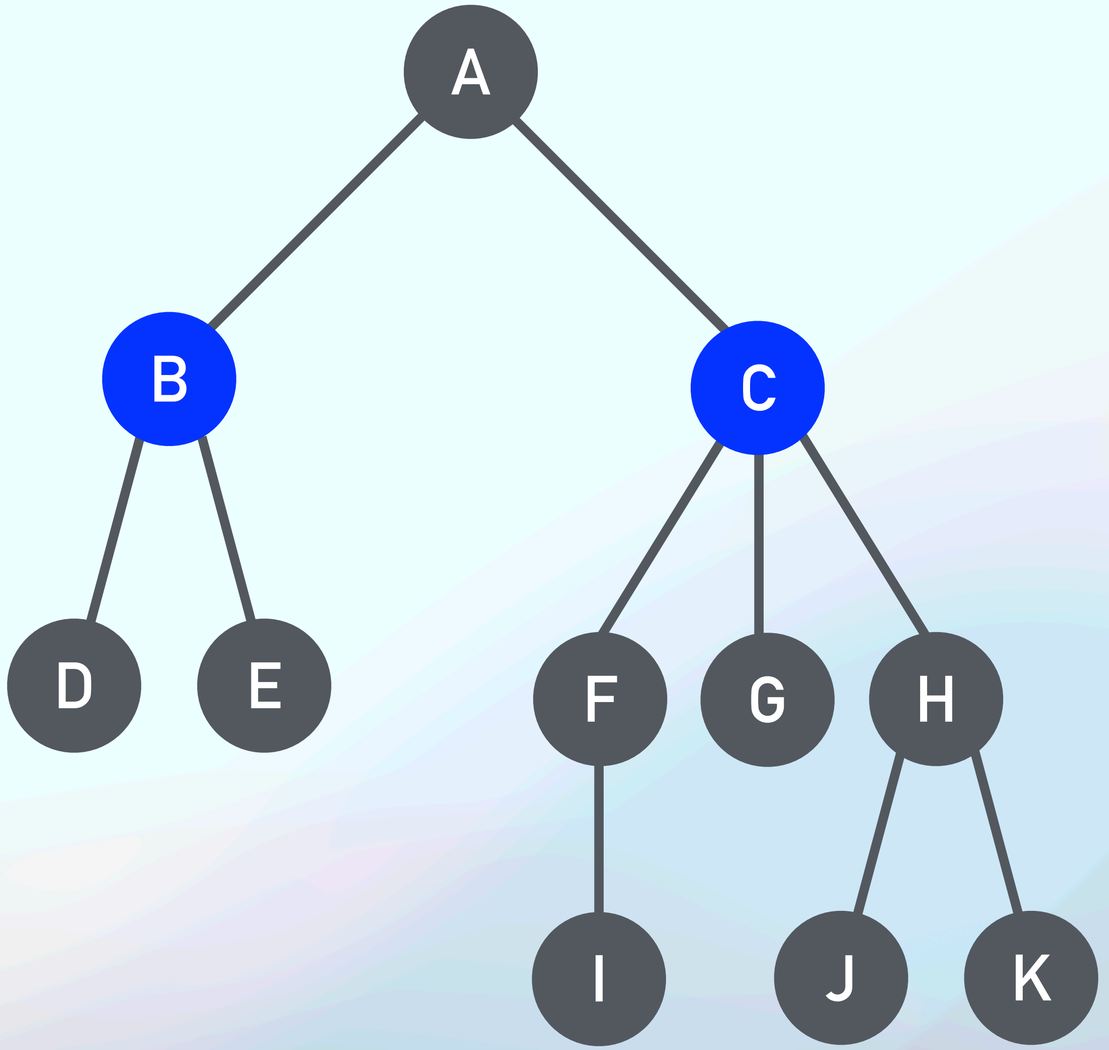
A	
C	
K	



Tree

Basic Definition — Children

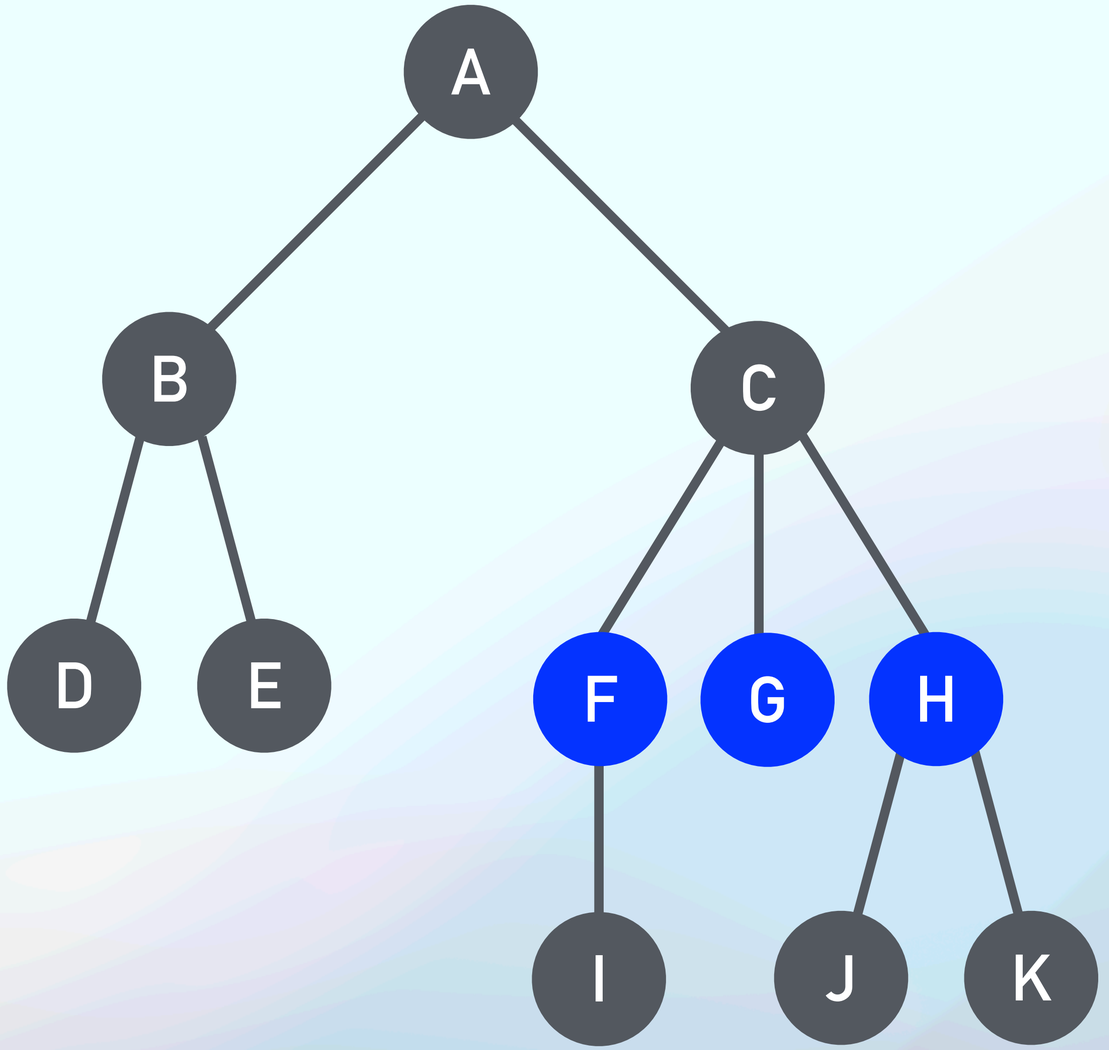
A	B C
C	
K	



Tree

Basic Definition — Children

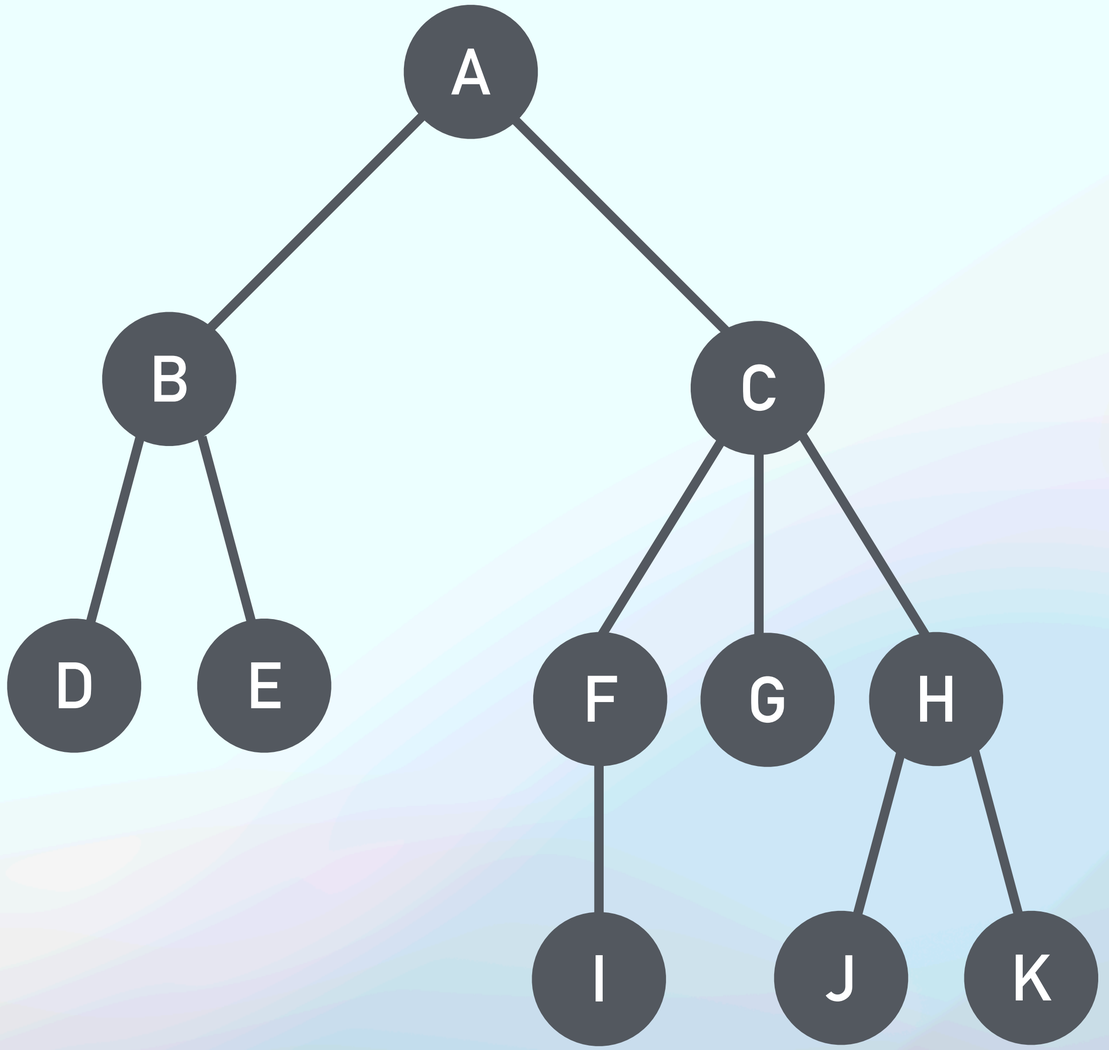
A	B C
C	F G H
K	



Tree

Basic Definition — Children

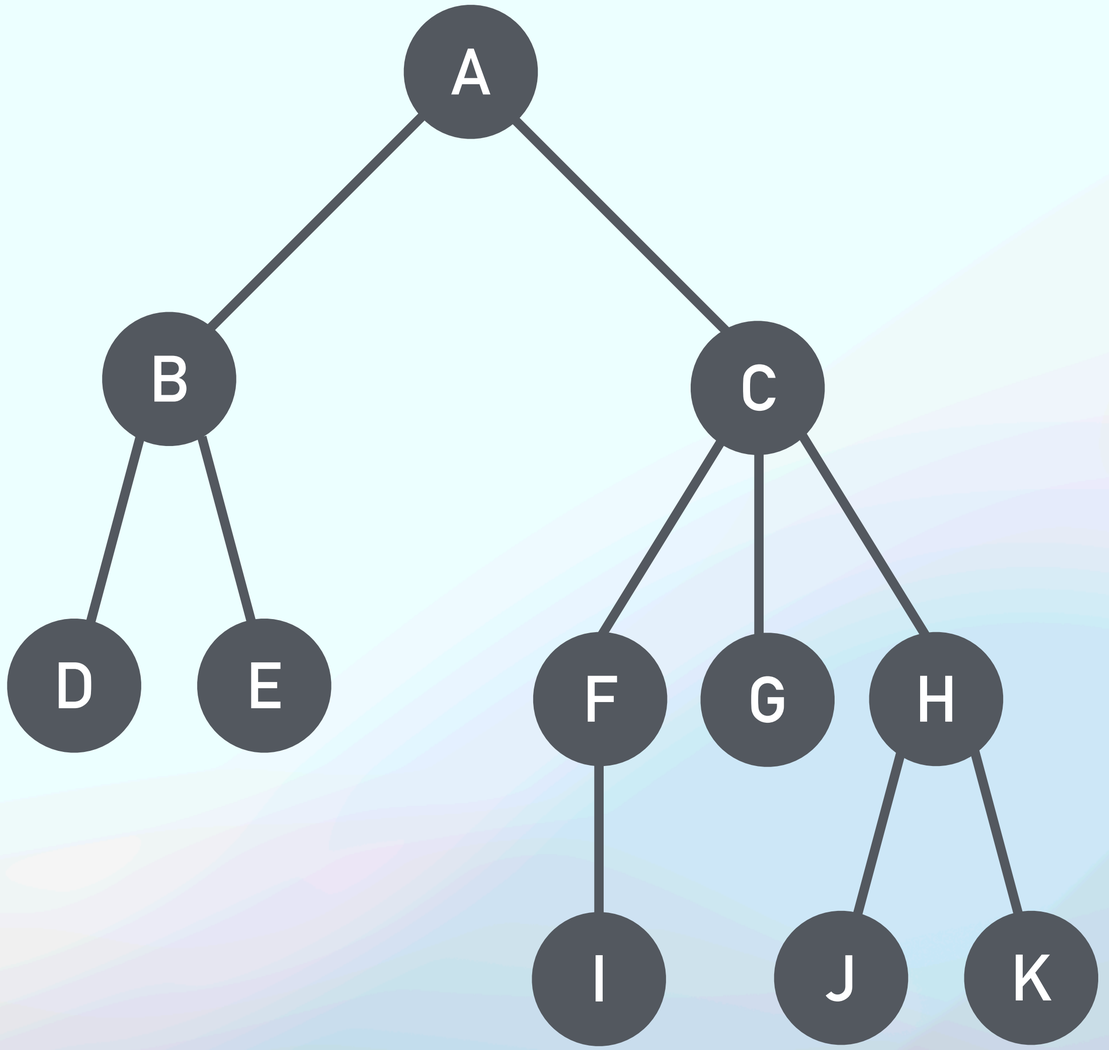
A	B C
C	F G H
K	None



Tree

Basic Definition — Parent

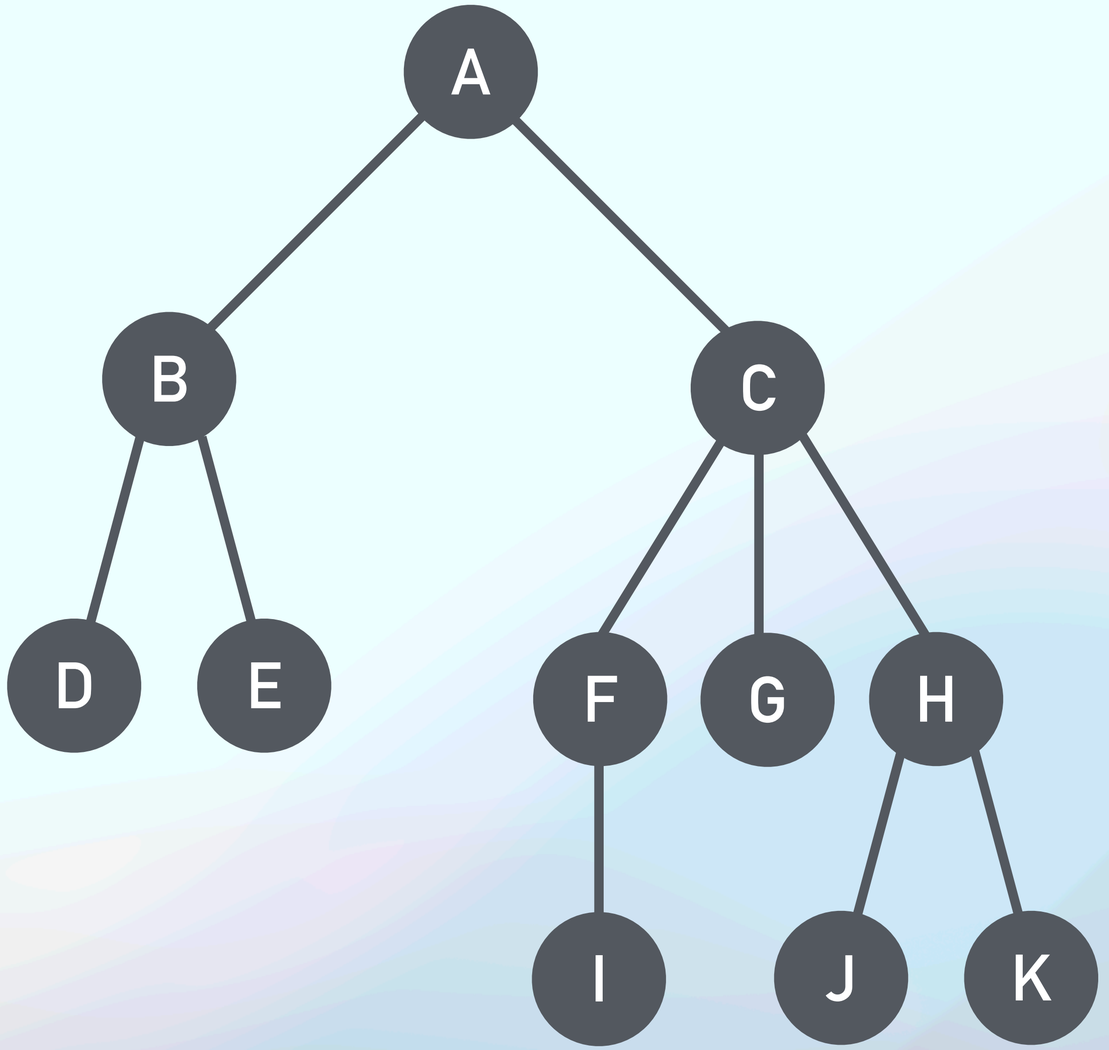
A	
C	
K	



Tree

Basic Definition — Parent

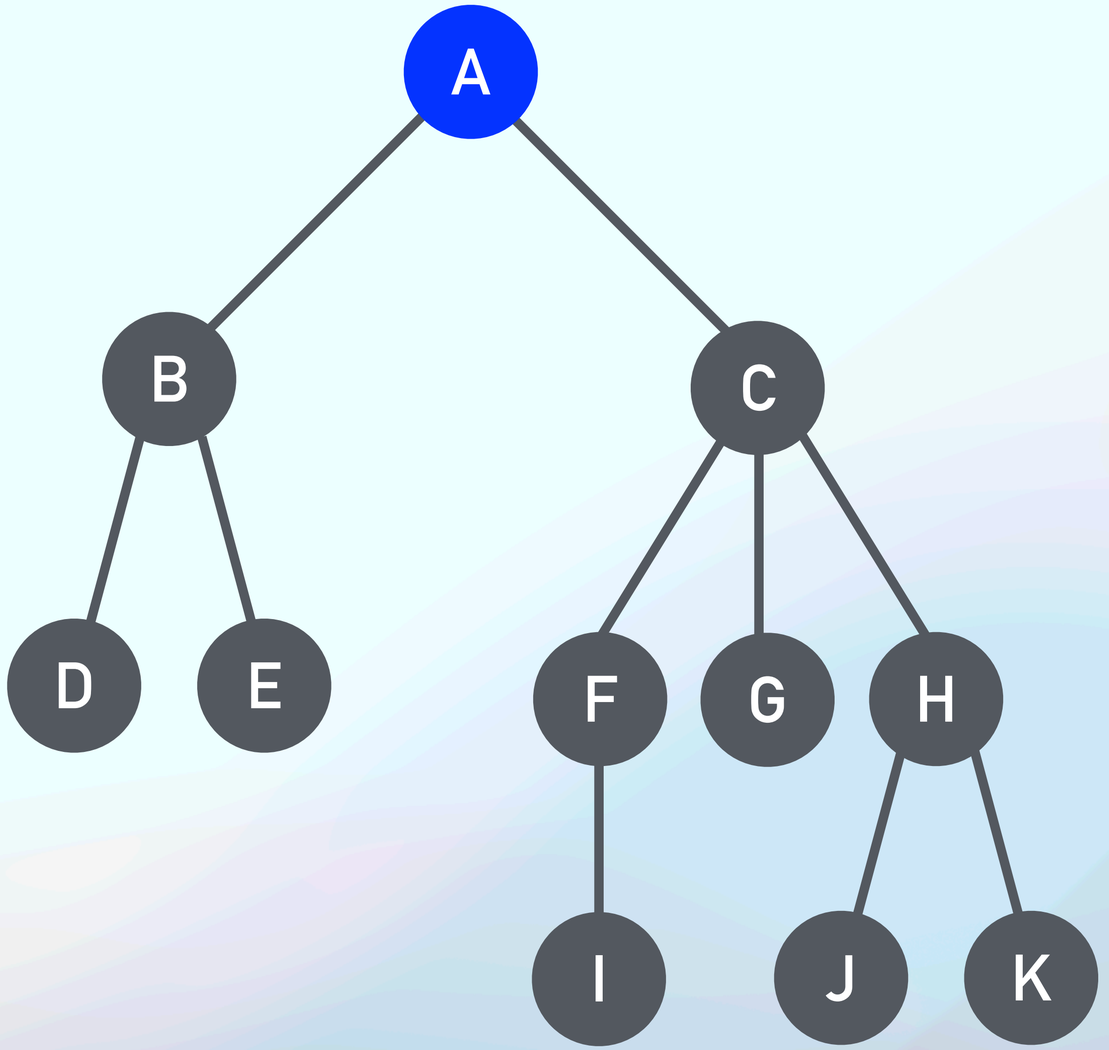
A	None
C	
K	



Tree

Basic Definition — Parent

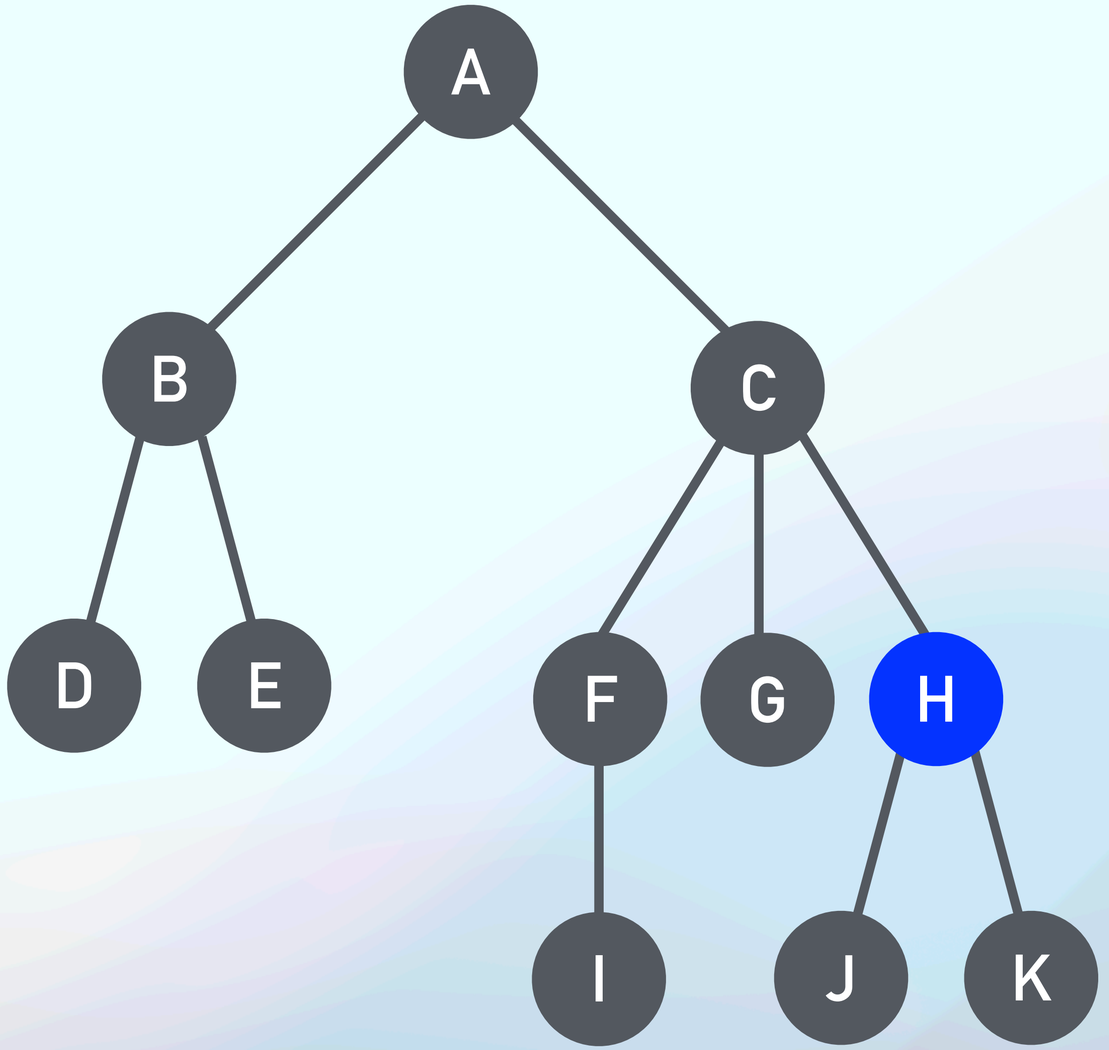
A	None
C	A
K	



Tree

Basic Definition — Parent

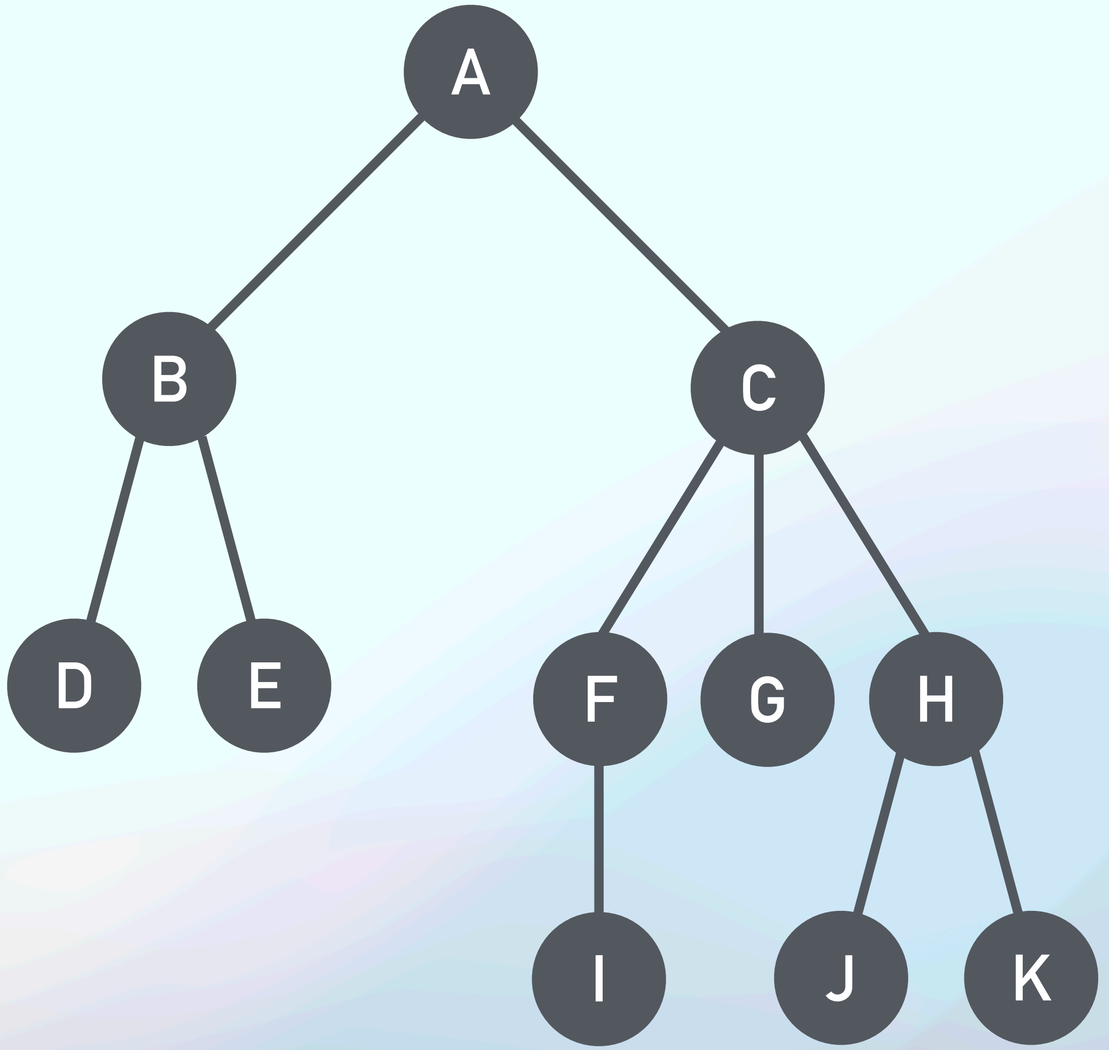
A	None
C	A
K	H



Tree

Basic Definition — Degree

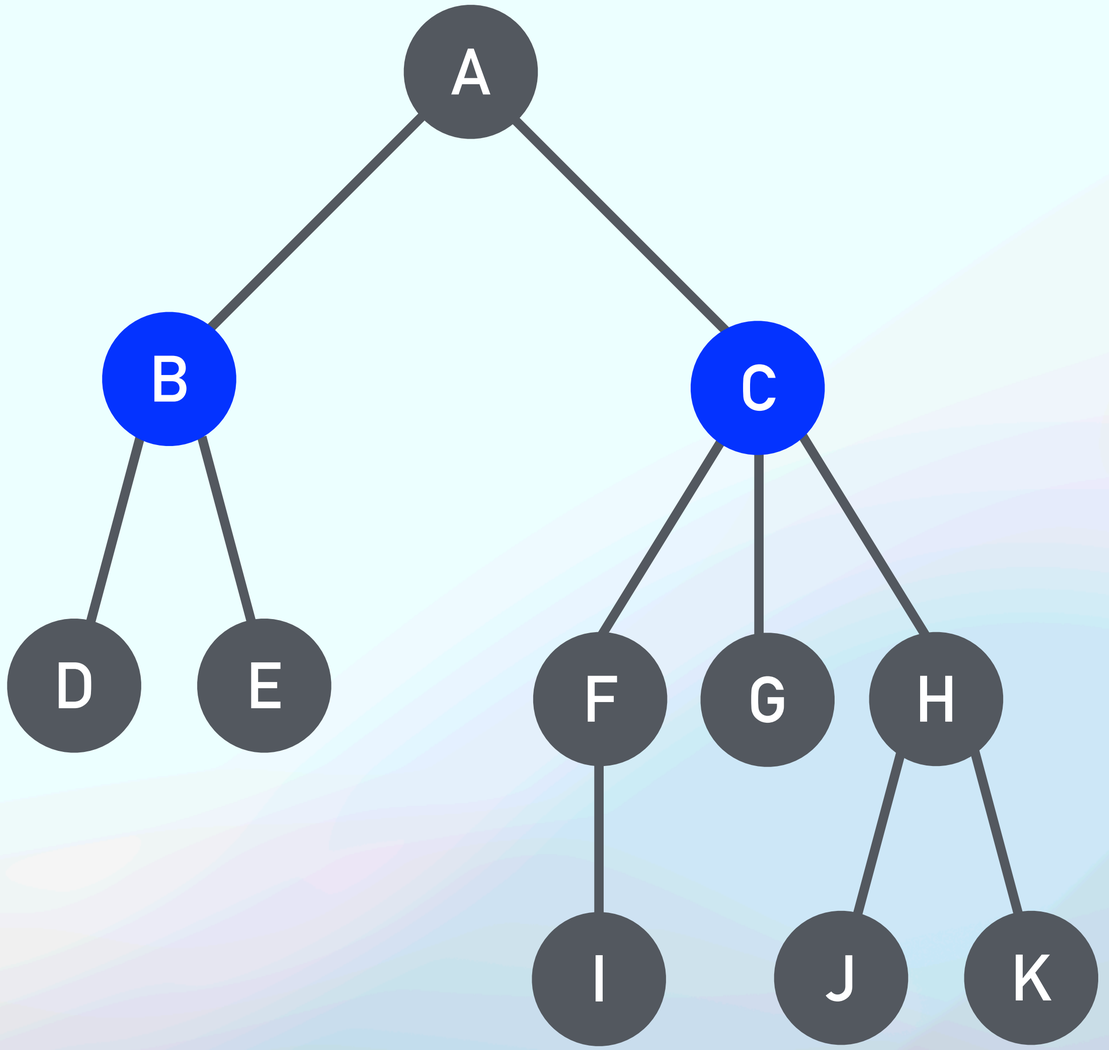
A	
C	
K	



Tree

Basic Definition — Degree

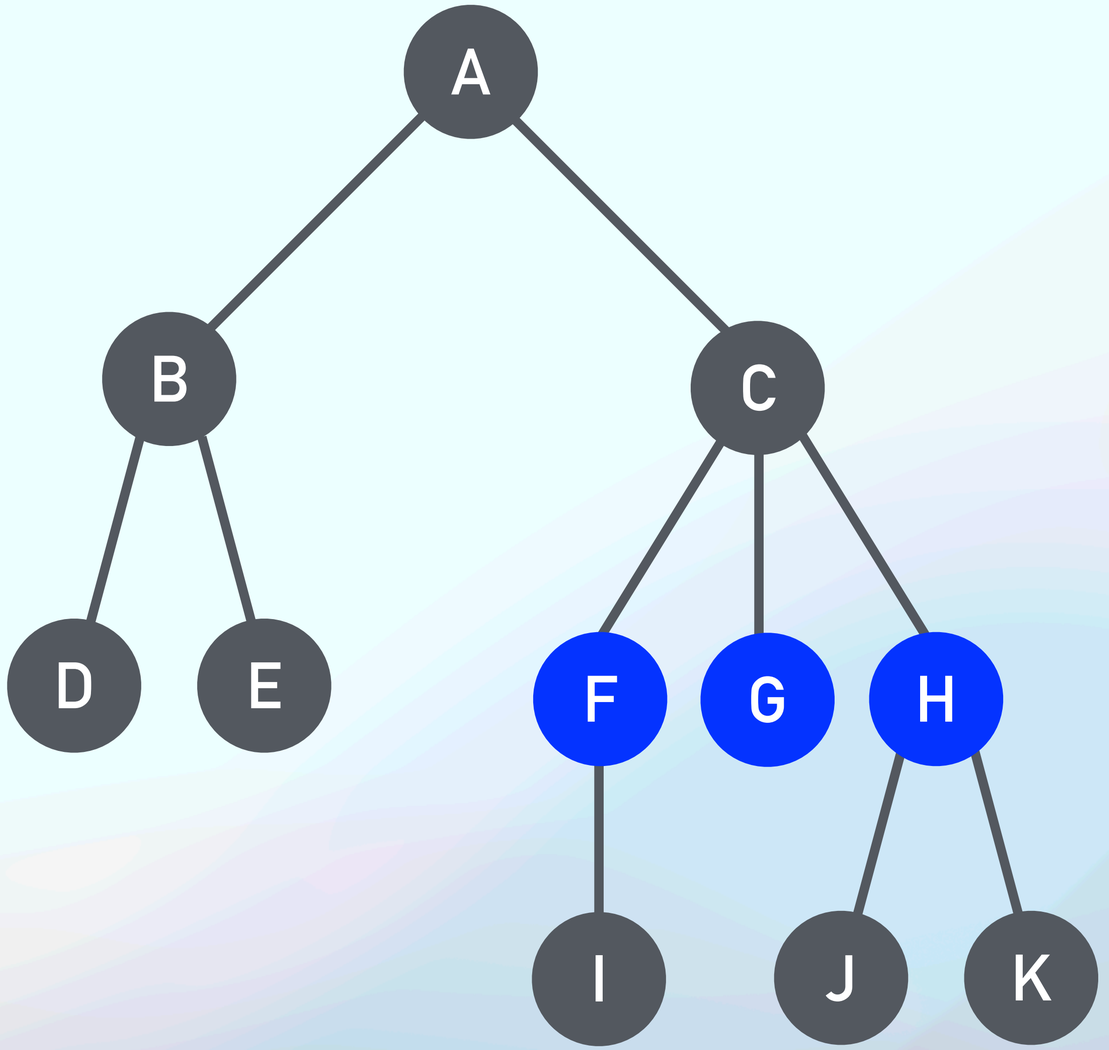
A	2
C	
K	



Tree

Basic Definition — Degree

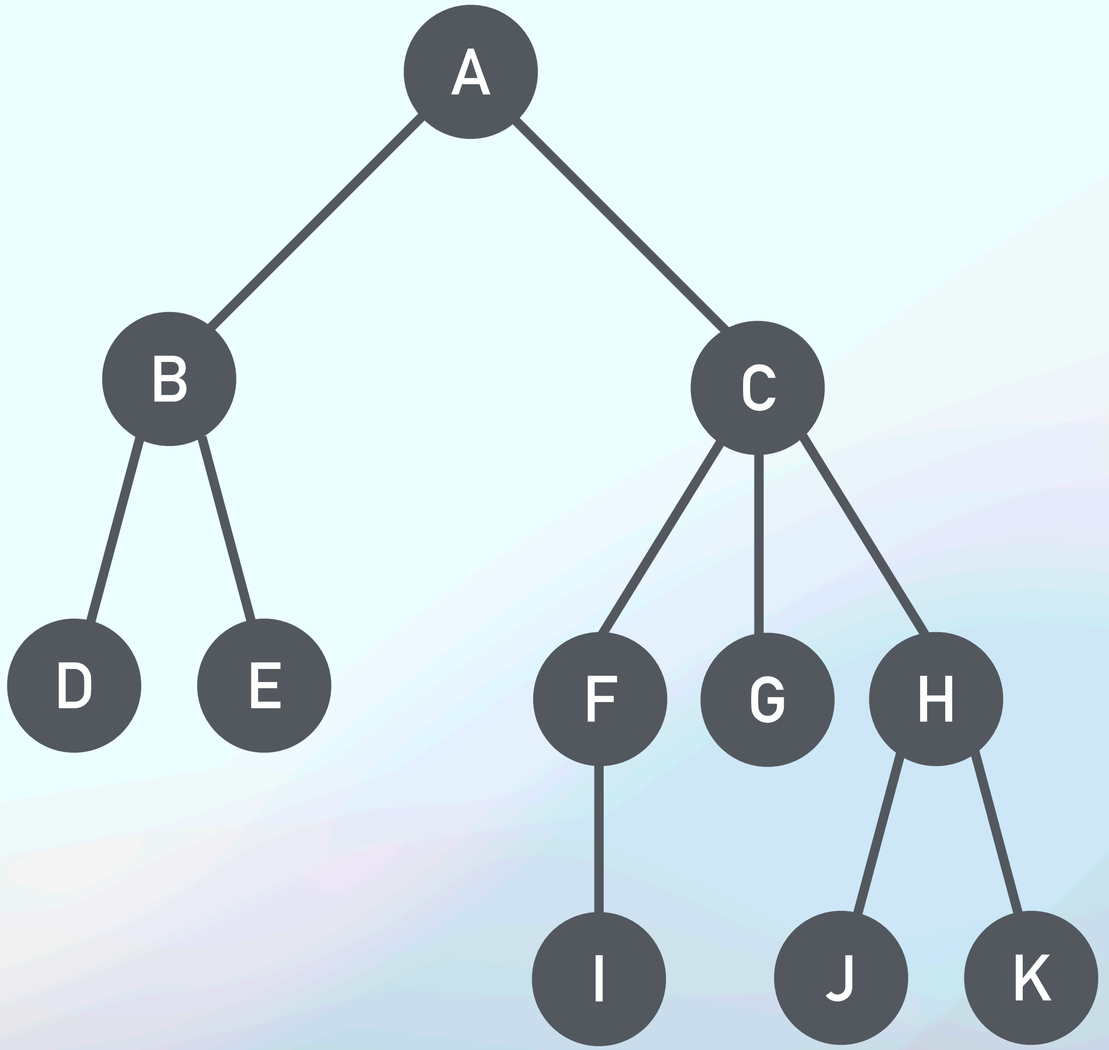
A	2
C	3
K	



Tree

Basic Definition — Degree

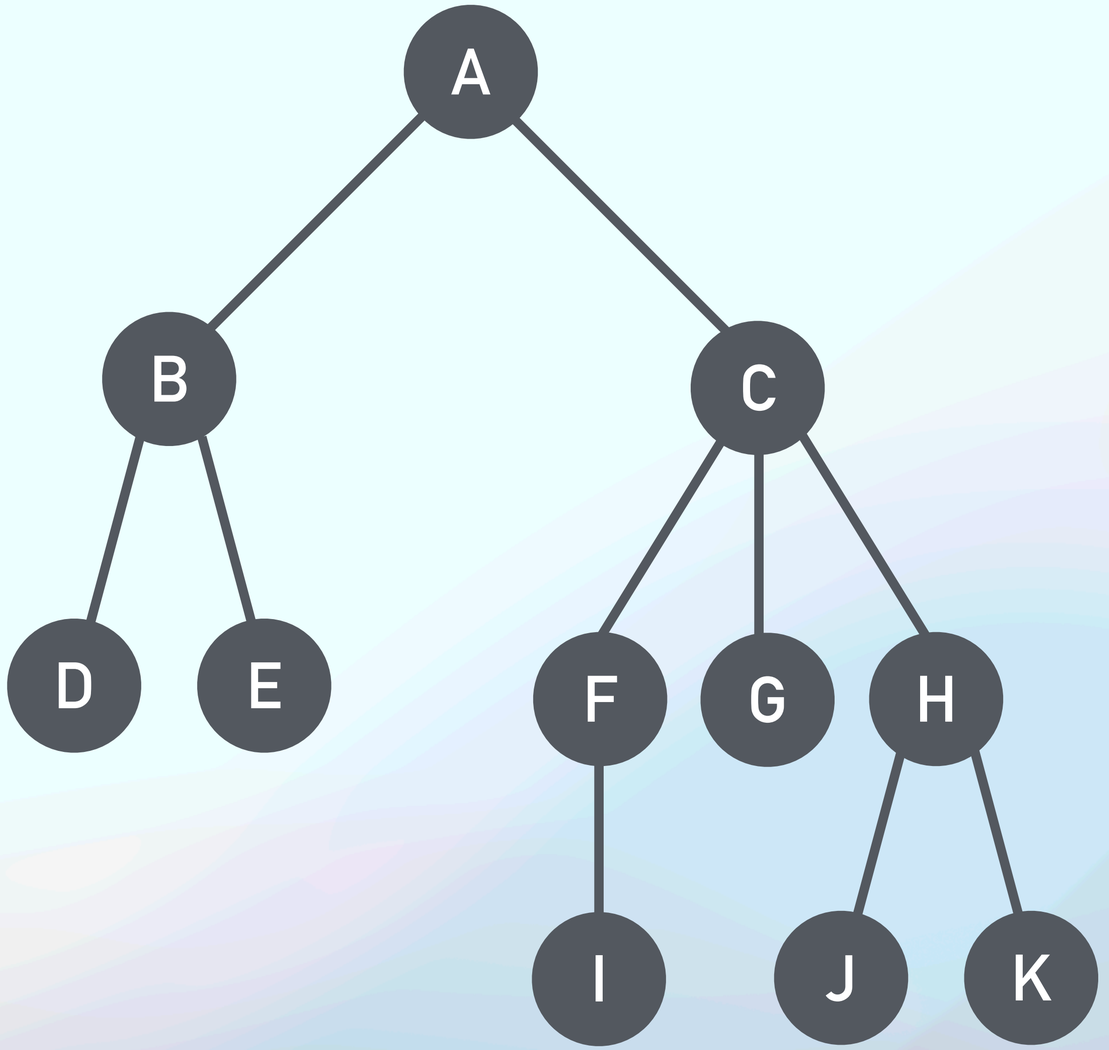
A	2
C	3
K	0



Tree

Basic Definition — Siblings

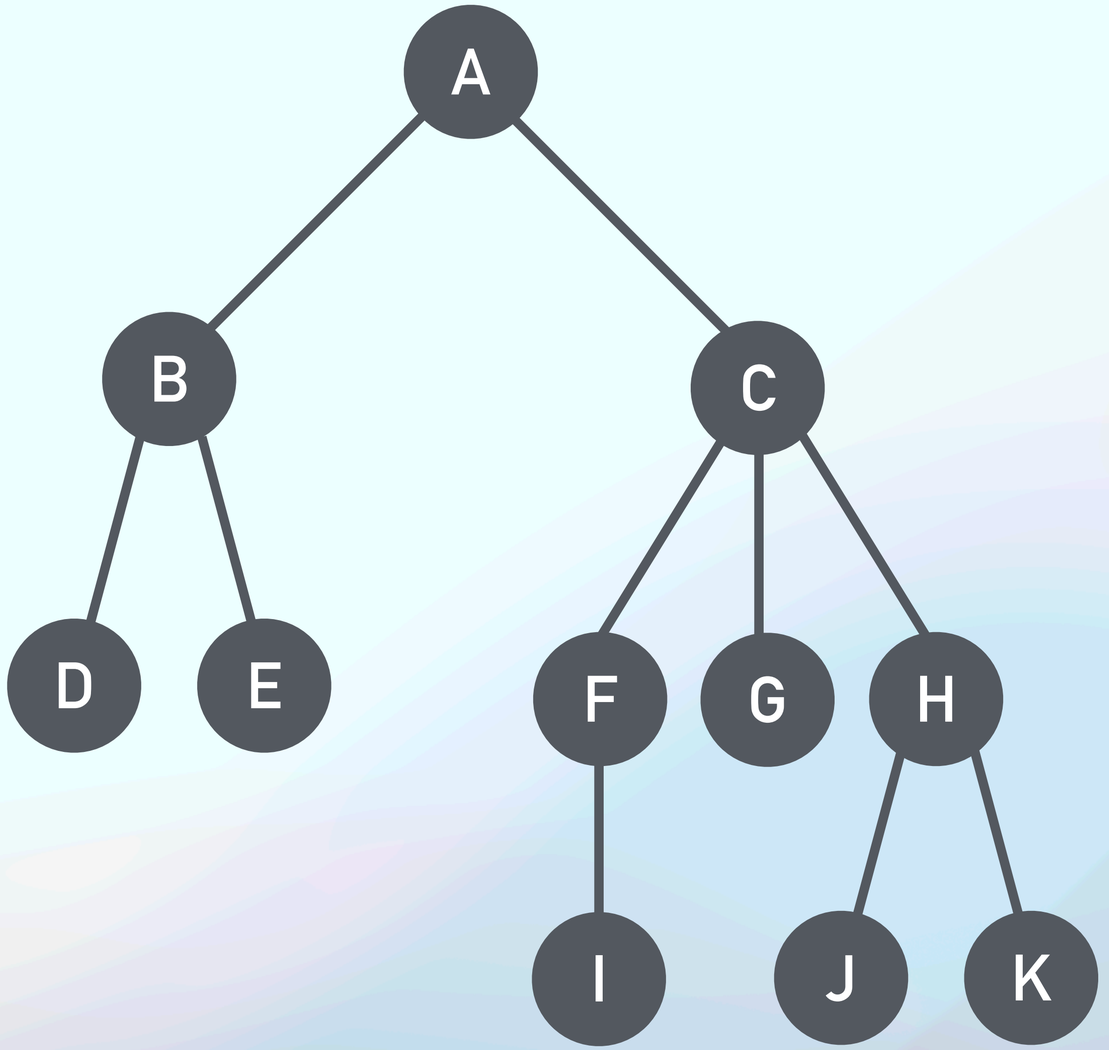
A	
C	
K	



Tree

Basic Definition — Siblings

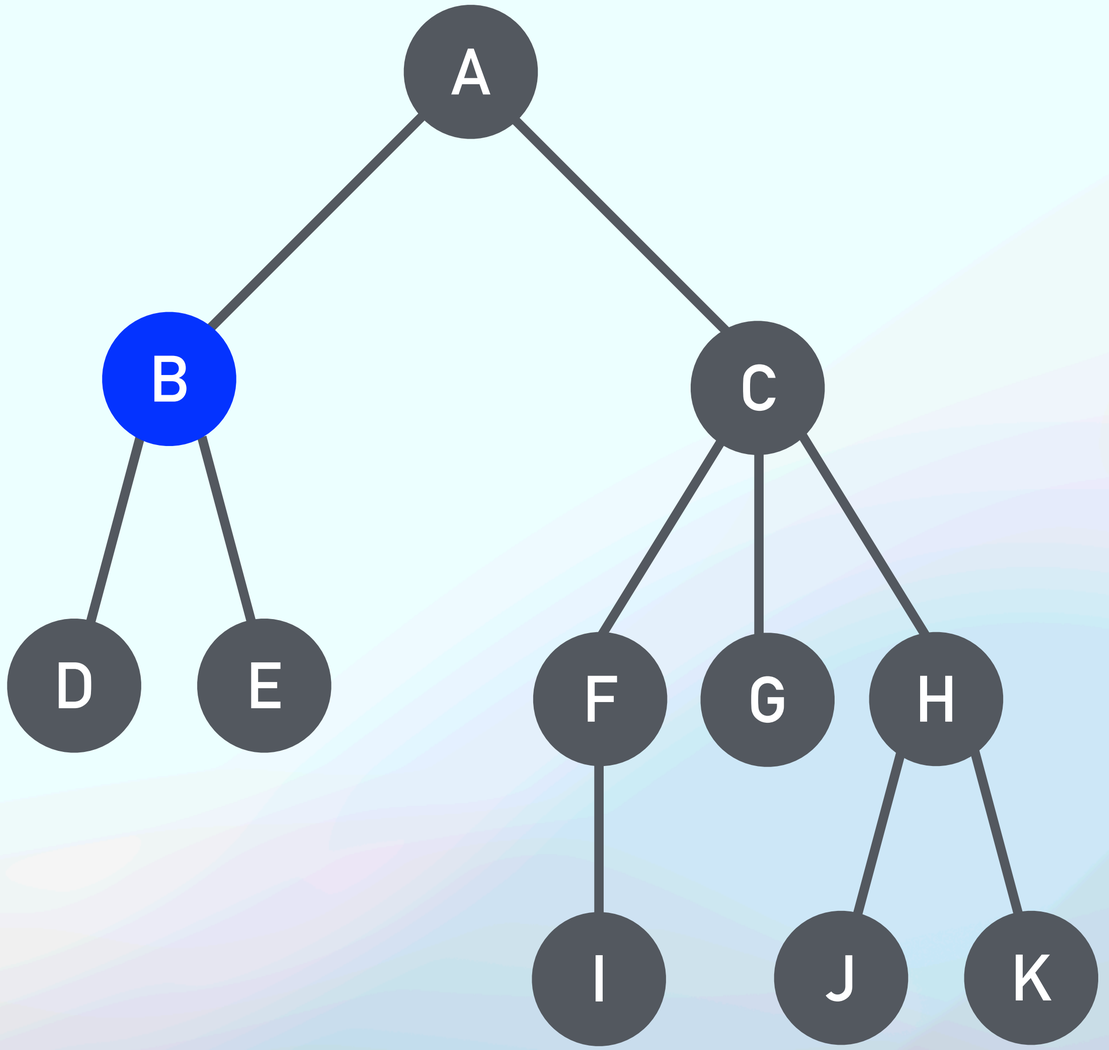
A	None
C	
K	



Tree

Basic Definition — Siblings

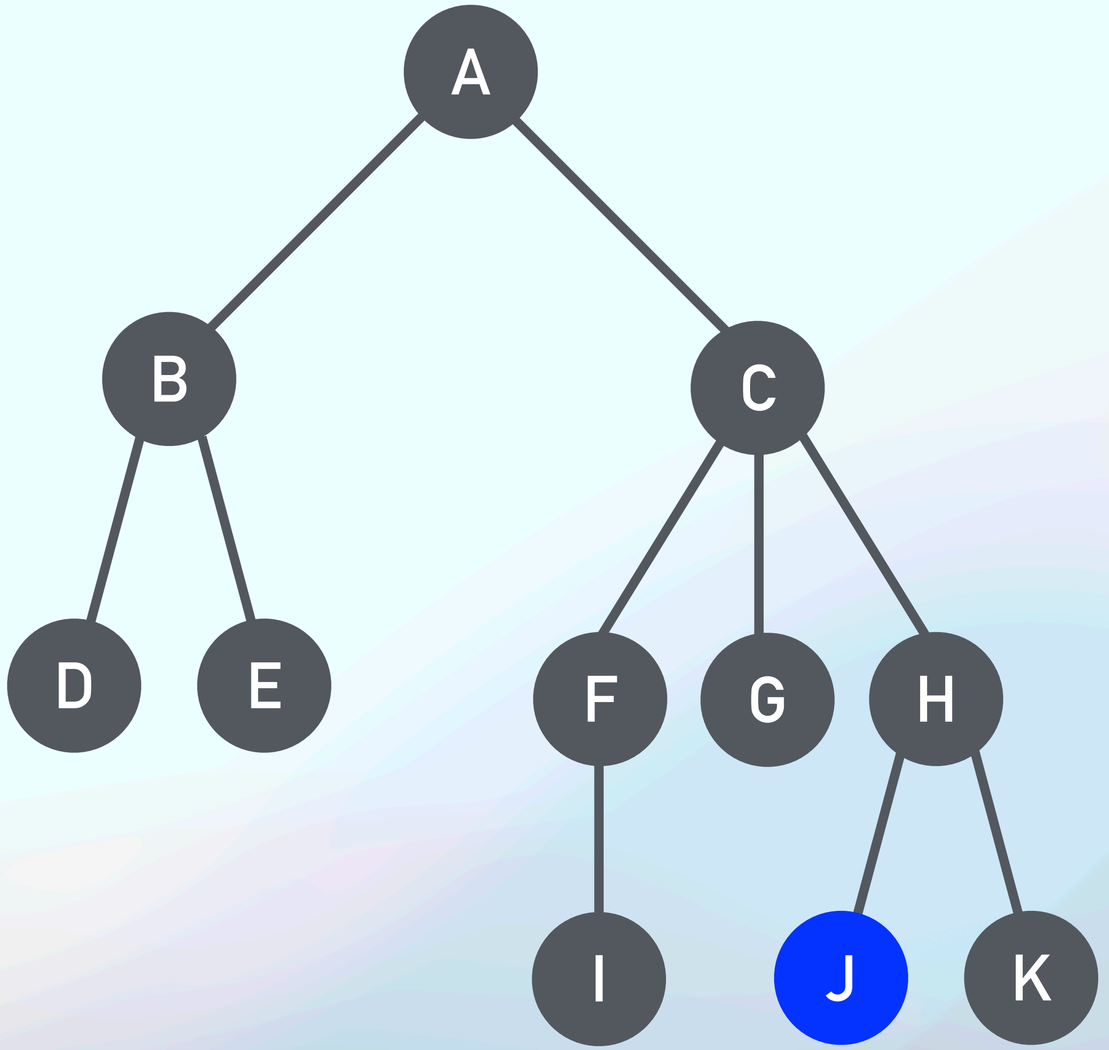
A	None
C	B
K	



Tree

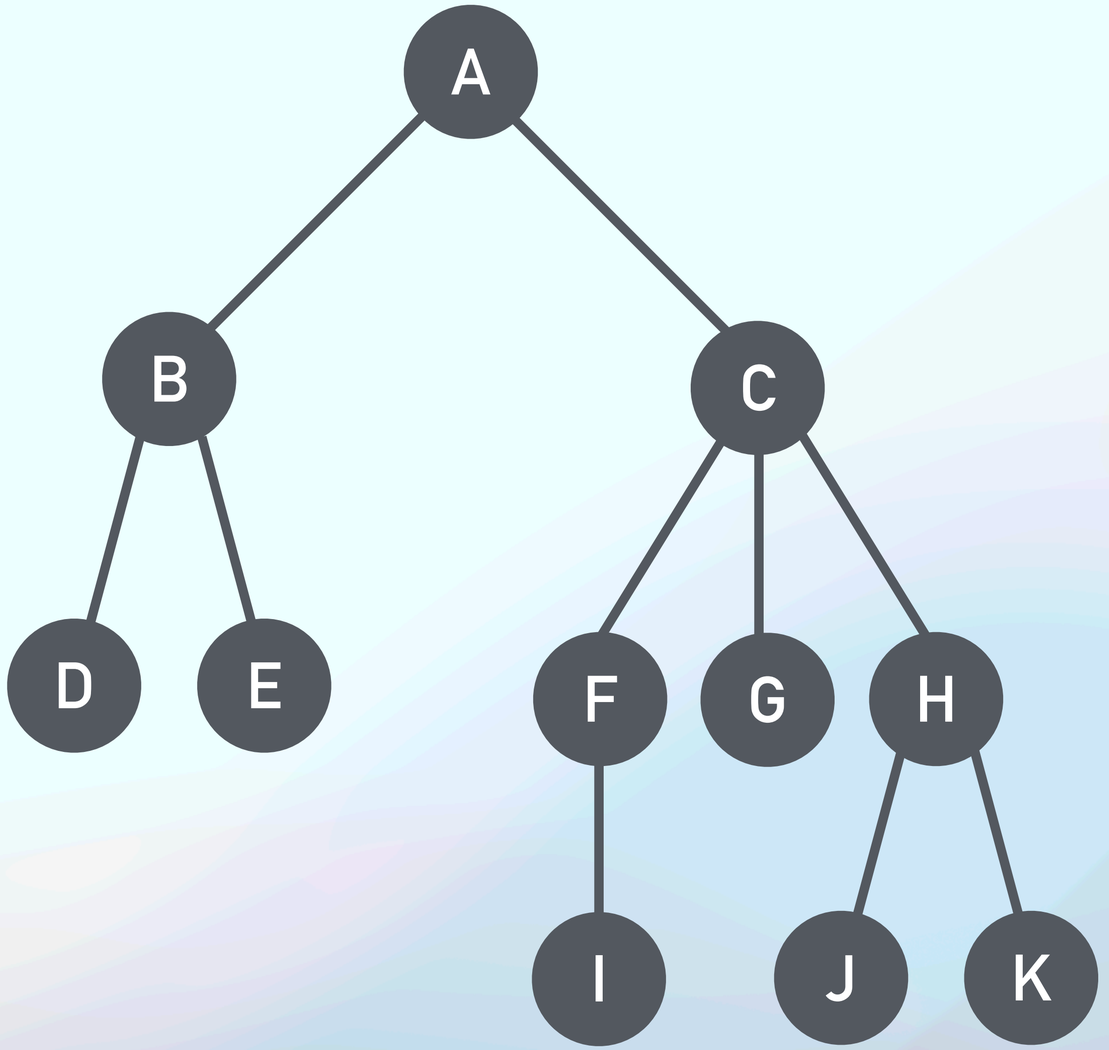
Basic Definition — Siblings

A	None
C	B
K	J



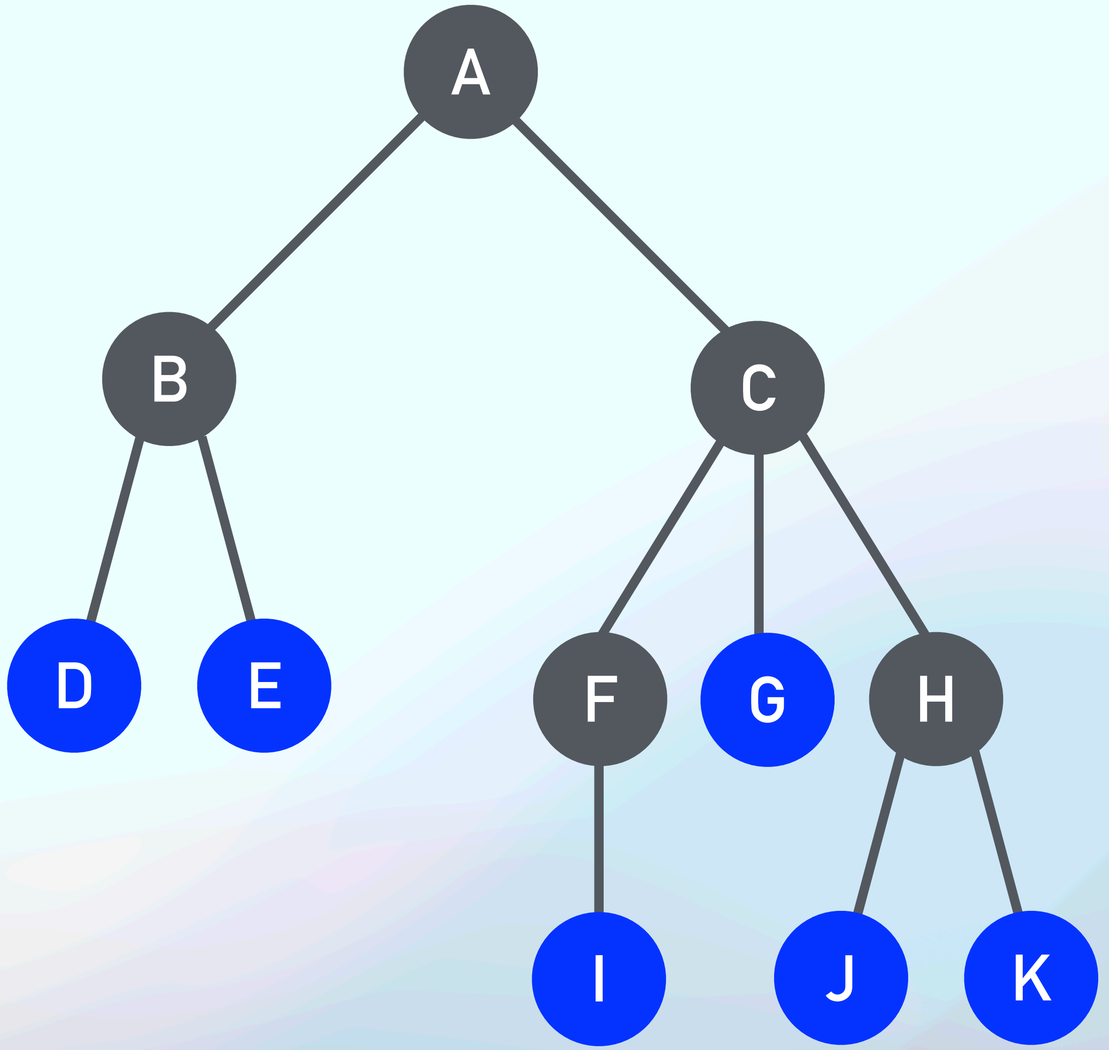
Tree

Basic Definition — Leaf nodes



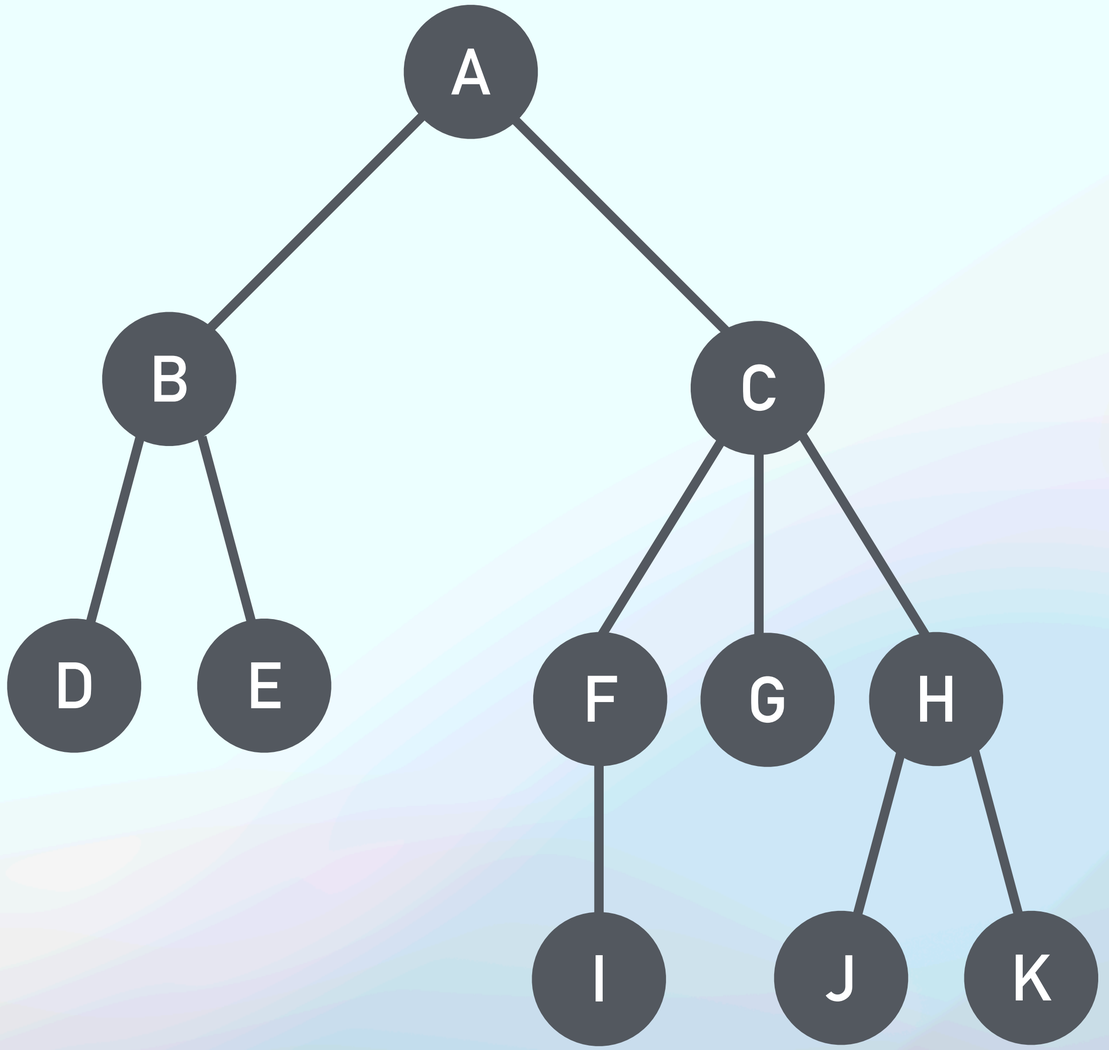
Tree

Basic Definition — Leaf nodes



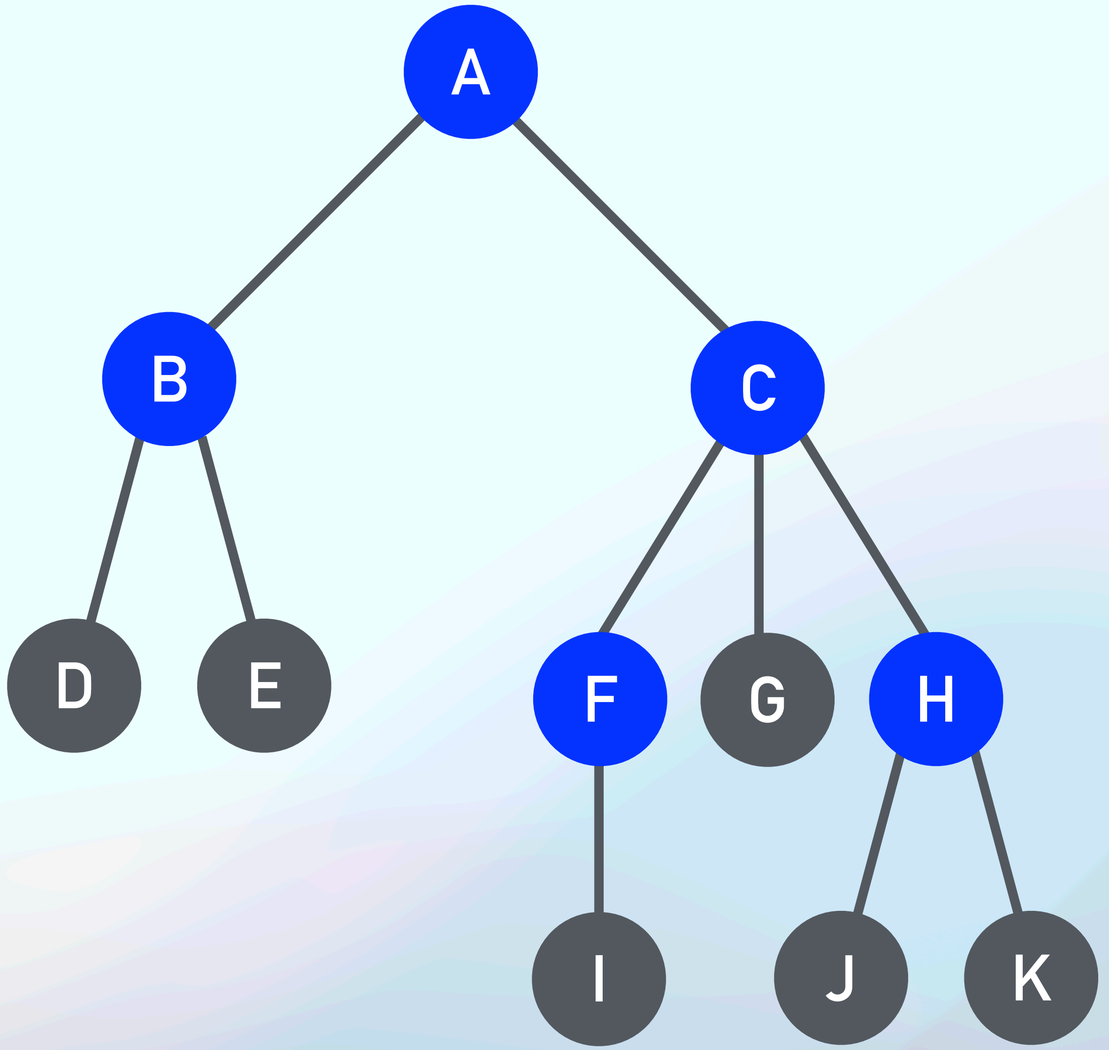
Tree

Basic Definition — Internal nodes



Tree

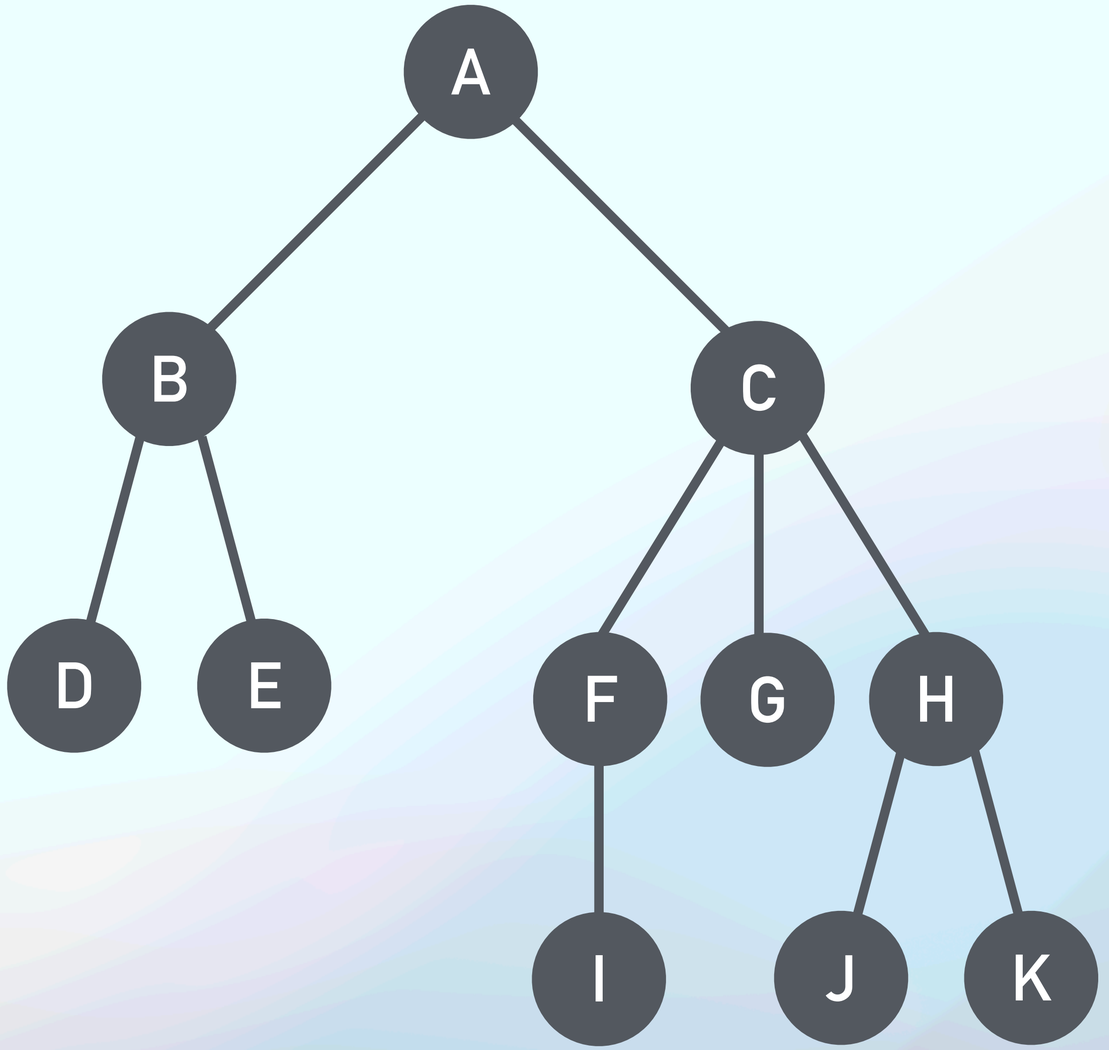
Basic Definition — Internal nodes



Tree

Basic Definition — Path

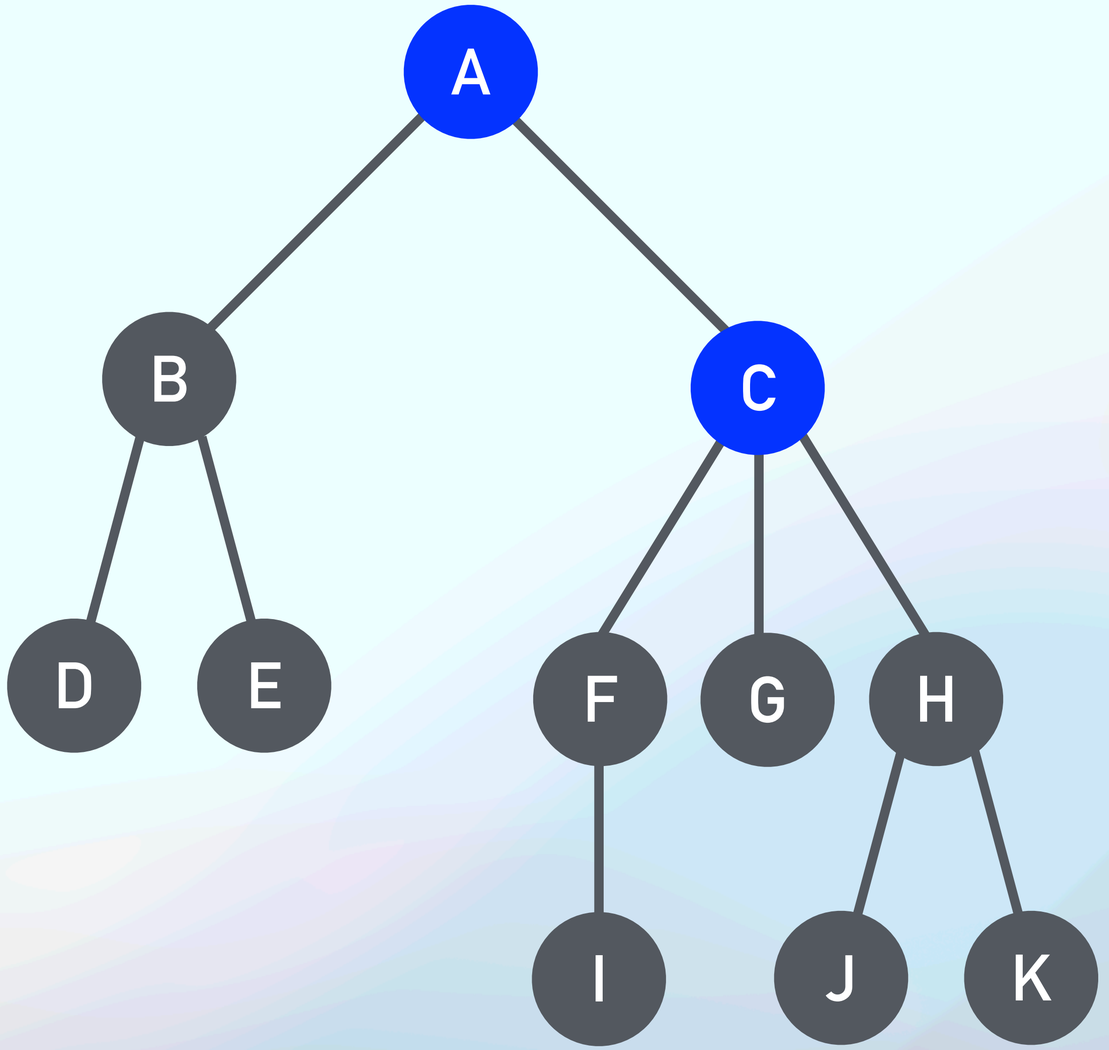
A-C	
A-J	
C-K	



Tree

Basic Definition — Path

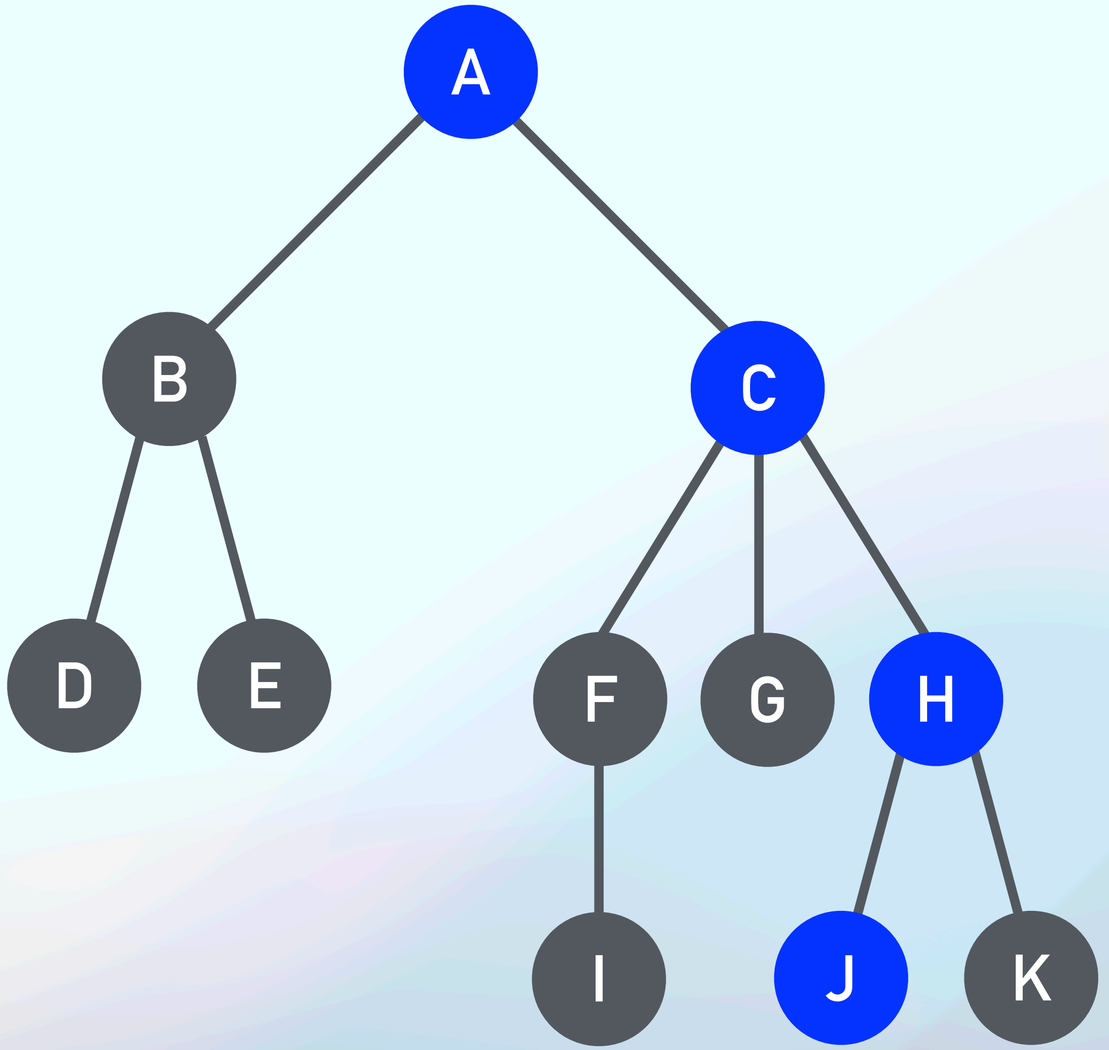
A-C	A-C
A-J	
C-K	



Tree

Basic Definition — Path

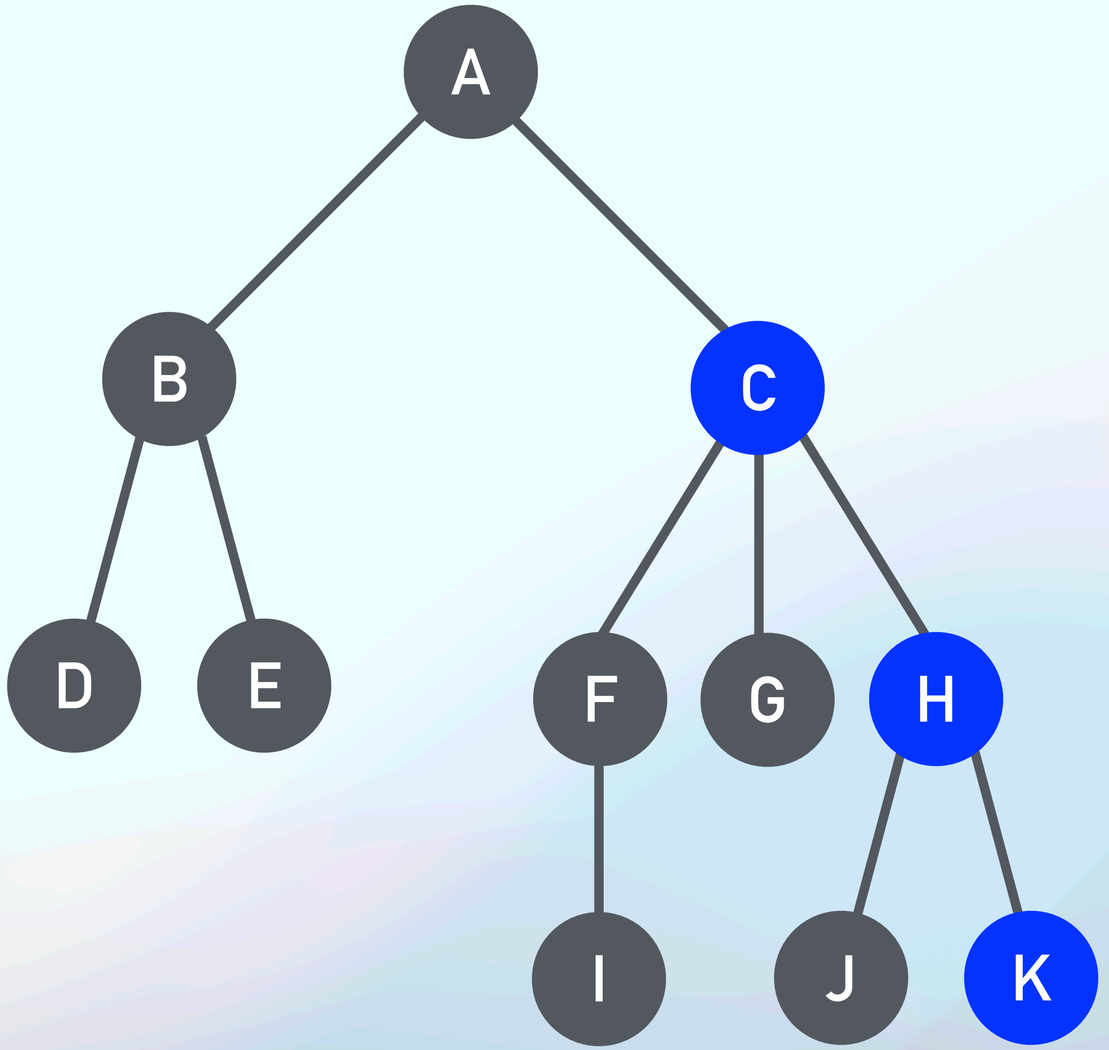
A-C	A-C
A-J	A-C-H-J
C-K	



Tree

Basic Definition — Path

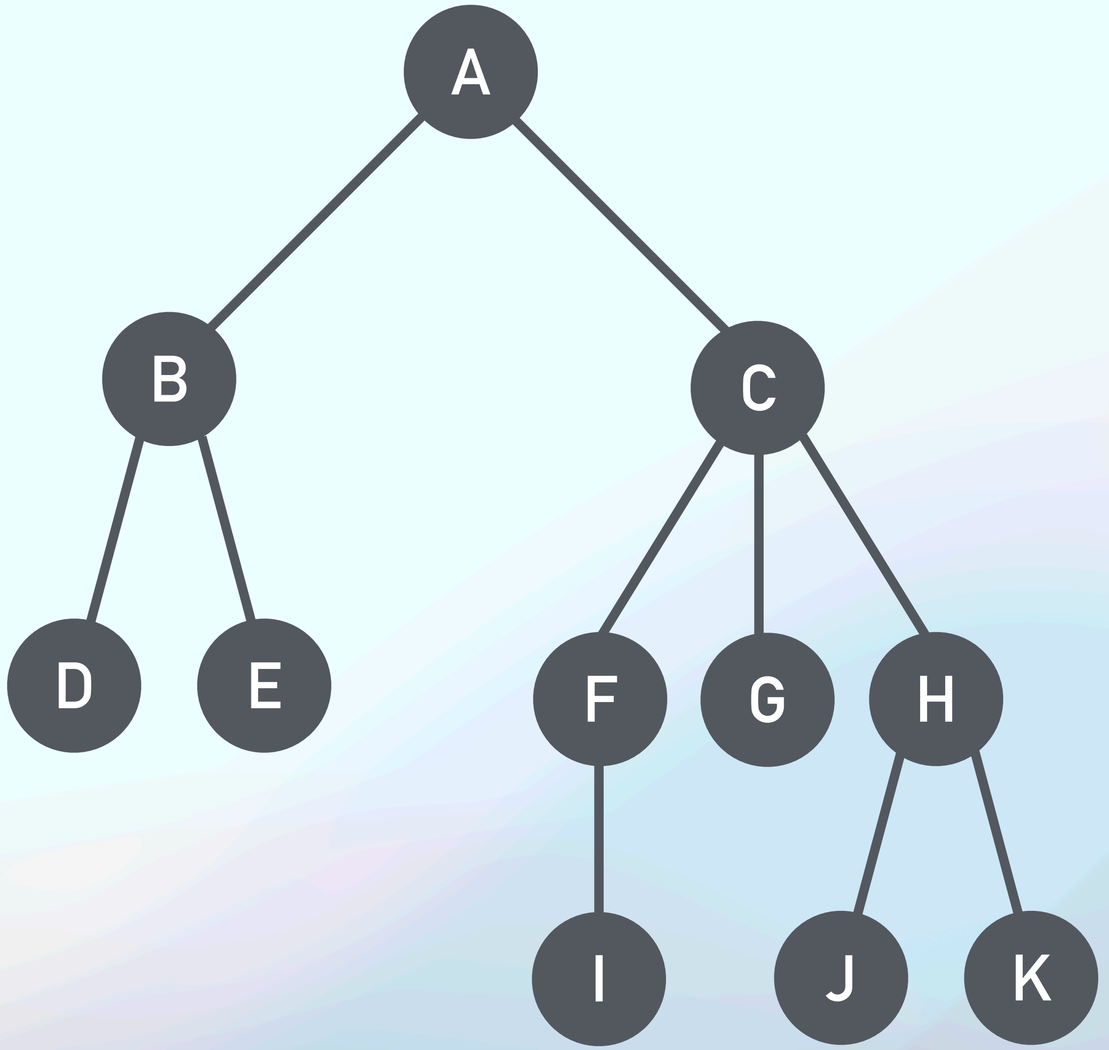
A-C	A-C
A-J	A-C-H-J
C-K	C-H-K



Tree

Basic Definition — Depth, Height

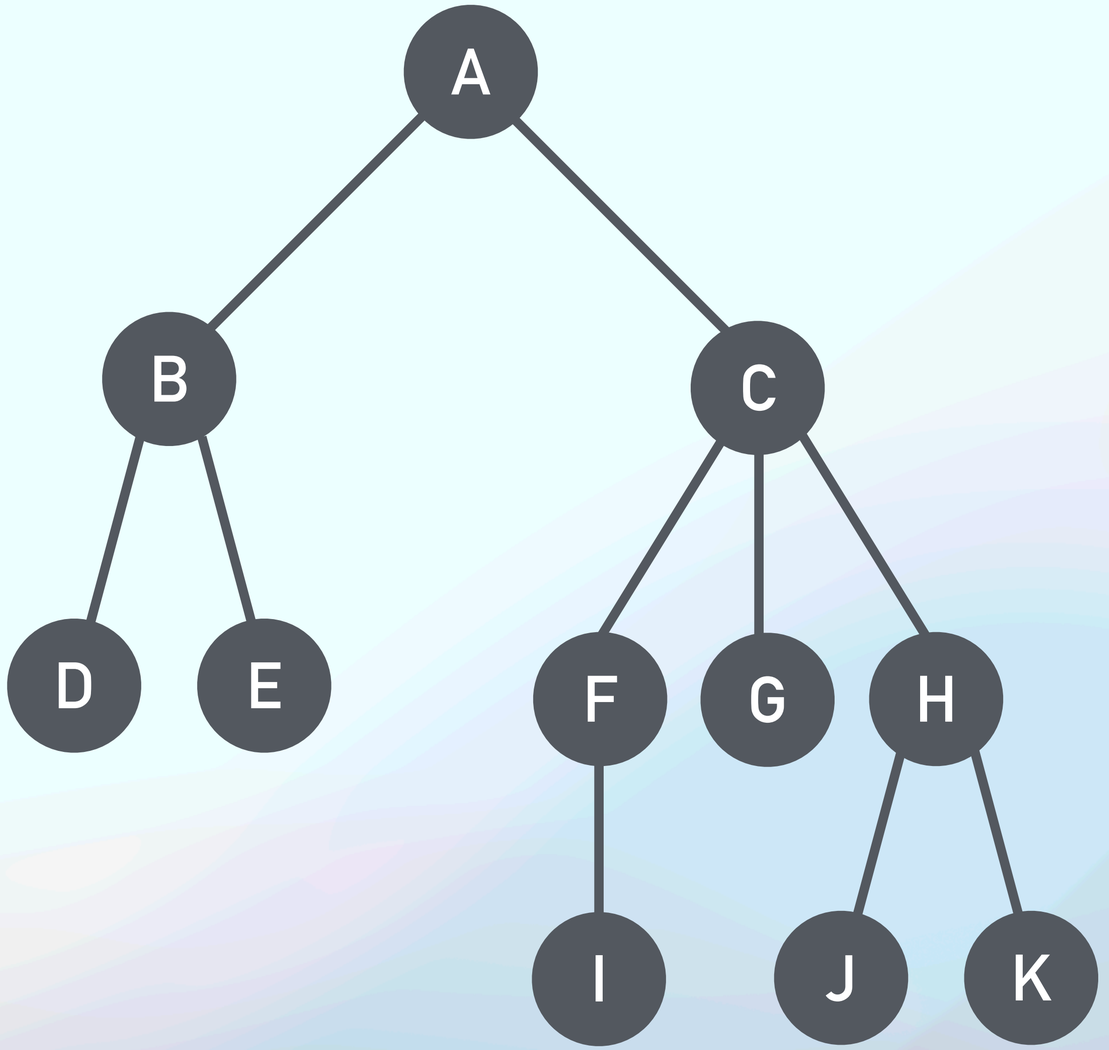
A	
C	
K	



Tree

Basic Definition — Depth, Height

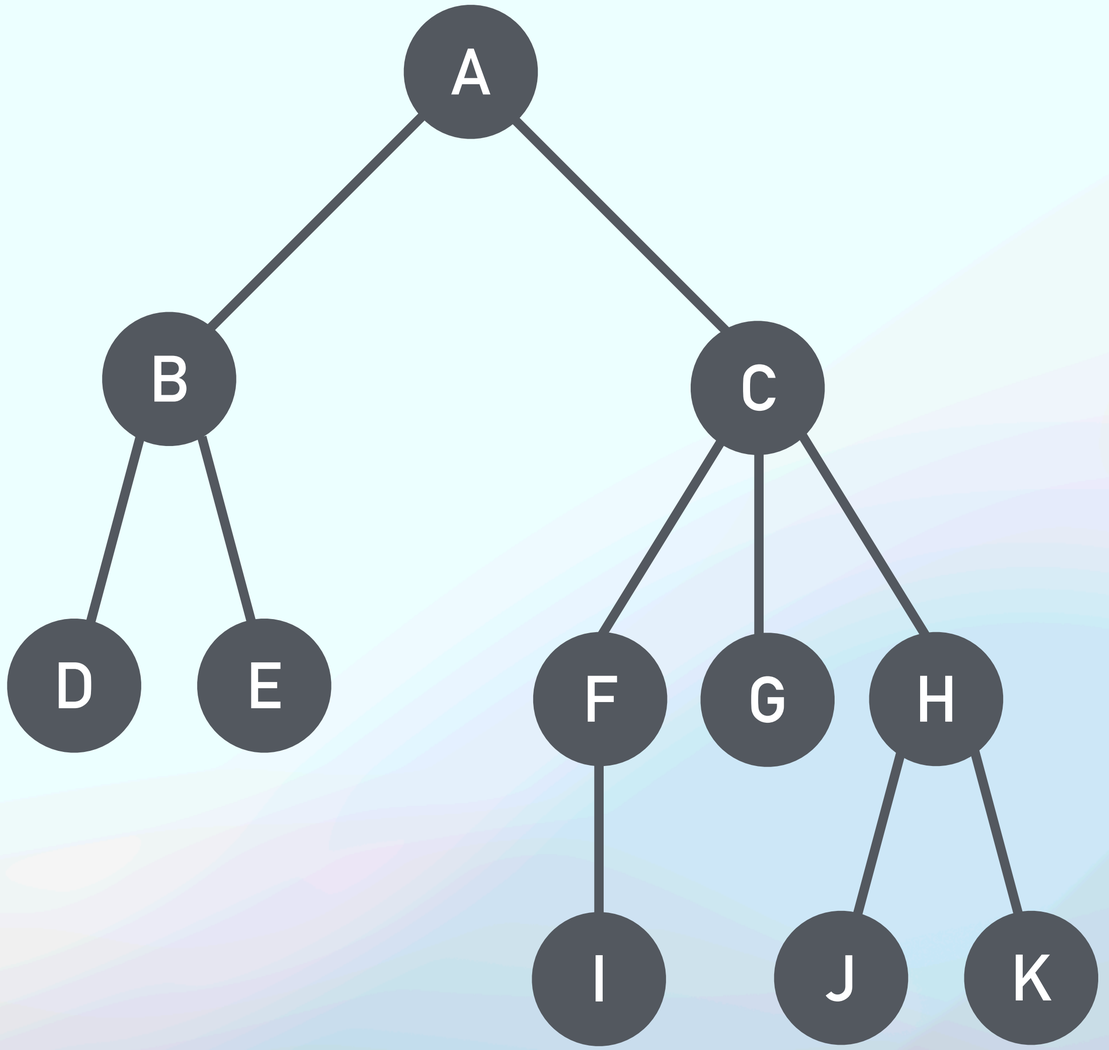
A	0
C	
K	



Tree

Basic Definition — Depth, Height

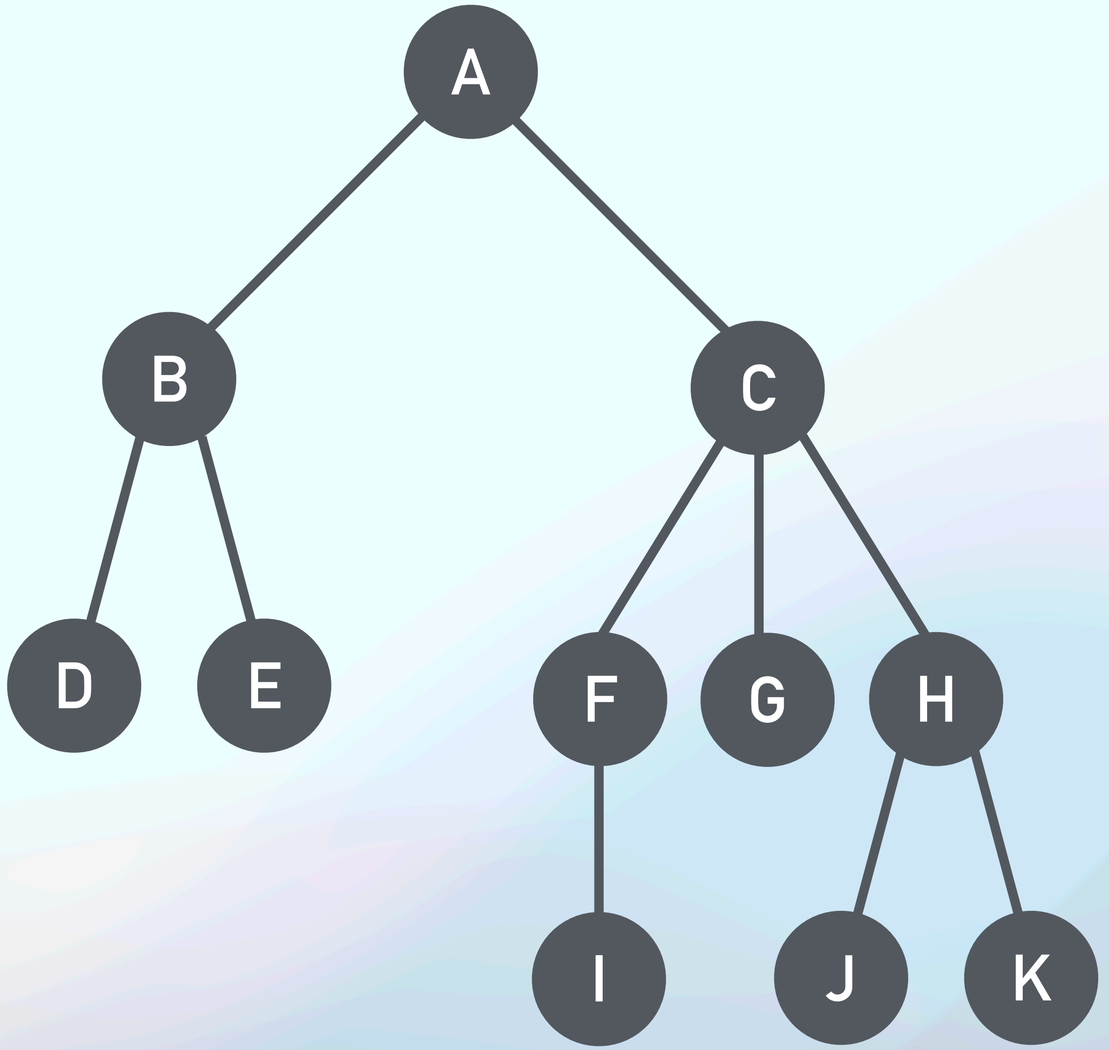
A	0
C	1
K	



Tree

Basic Definition — Depth, Height

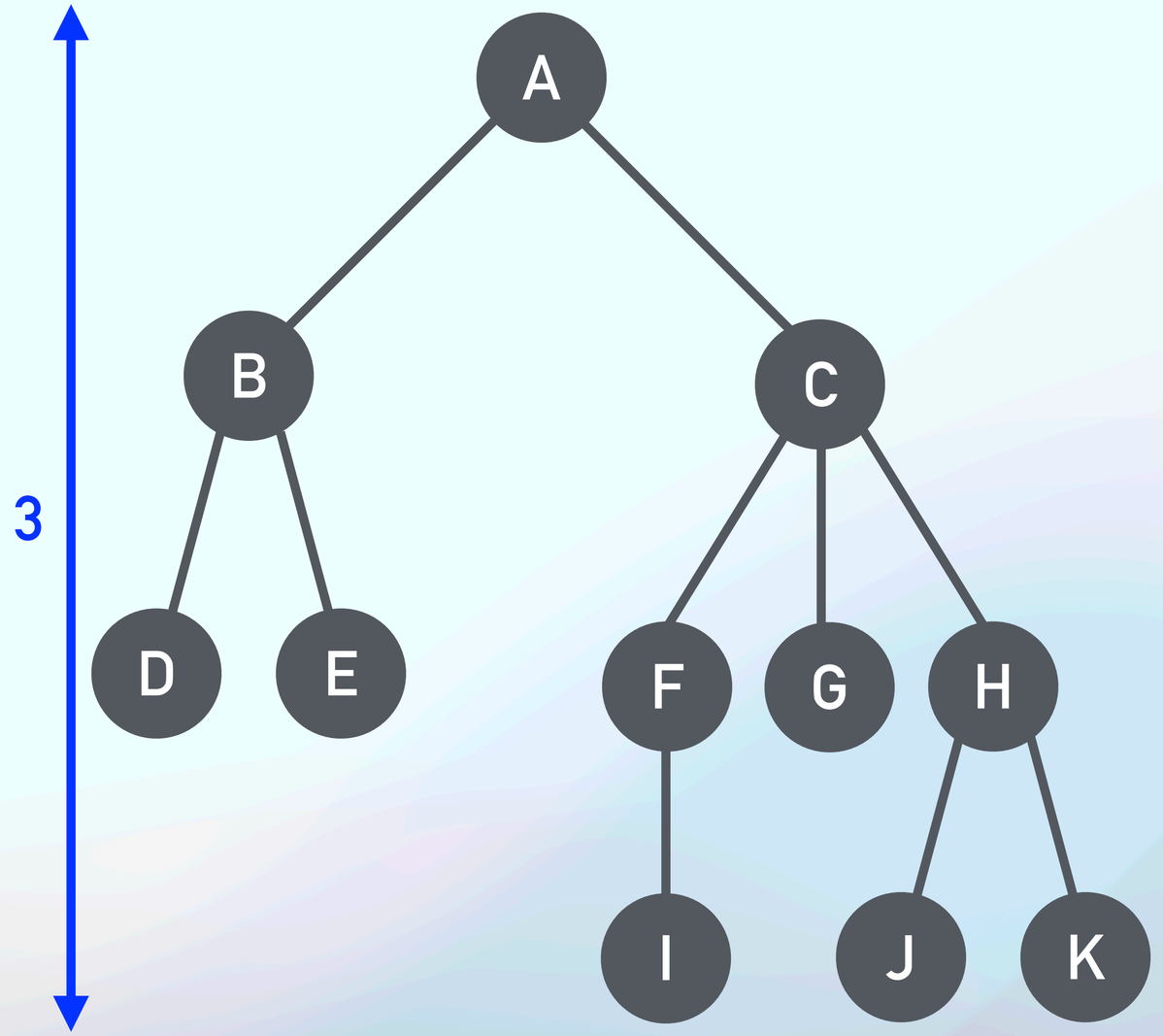
A	0
C	1
K	3



Tree

Basic Definition — Depth, Height

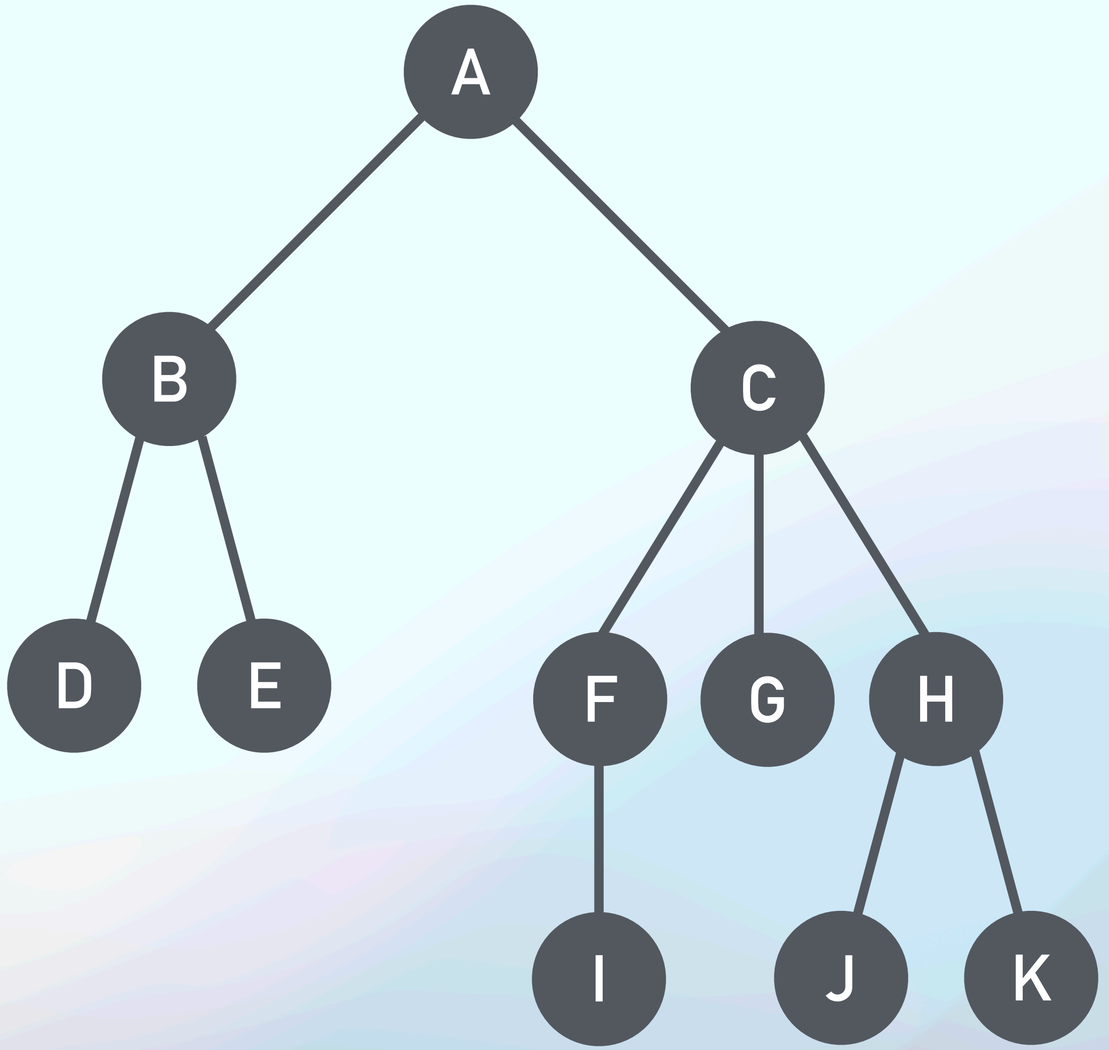
A	0
C	1
K	3



Tree

Basic Definition — Ancestor

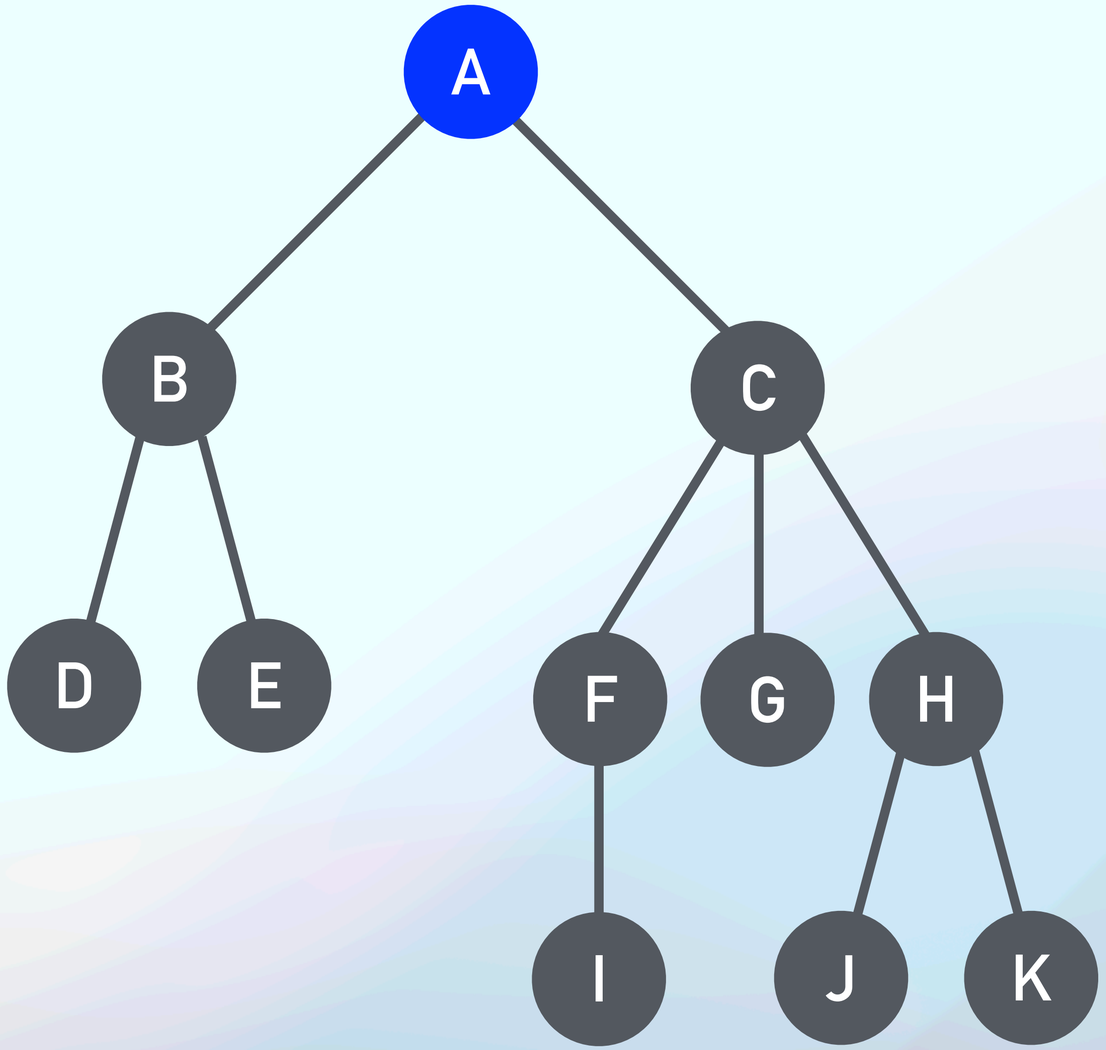
A	
C	
K	



Tree

Basic Definition — Ancestor

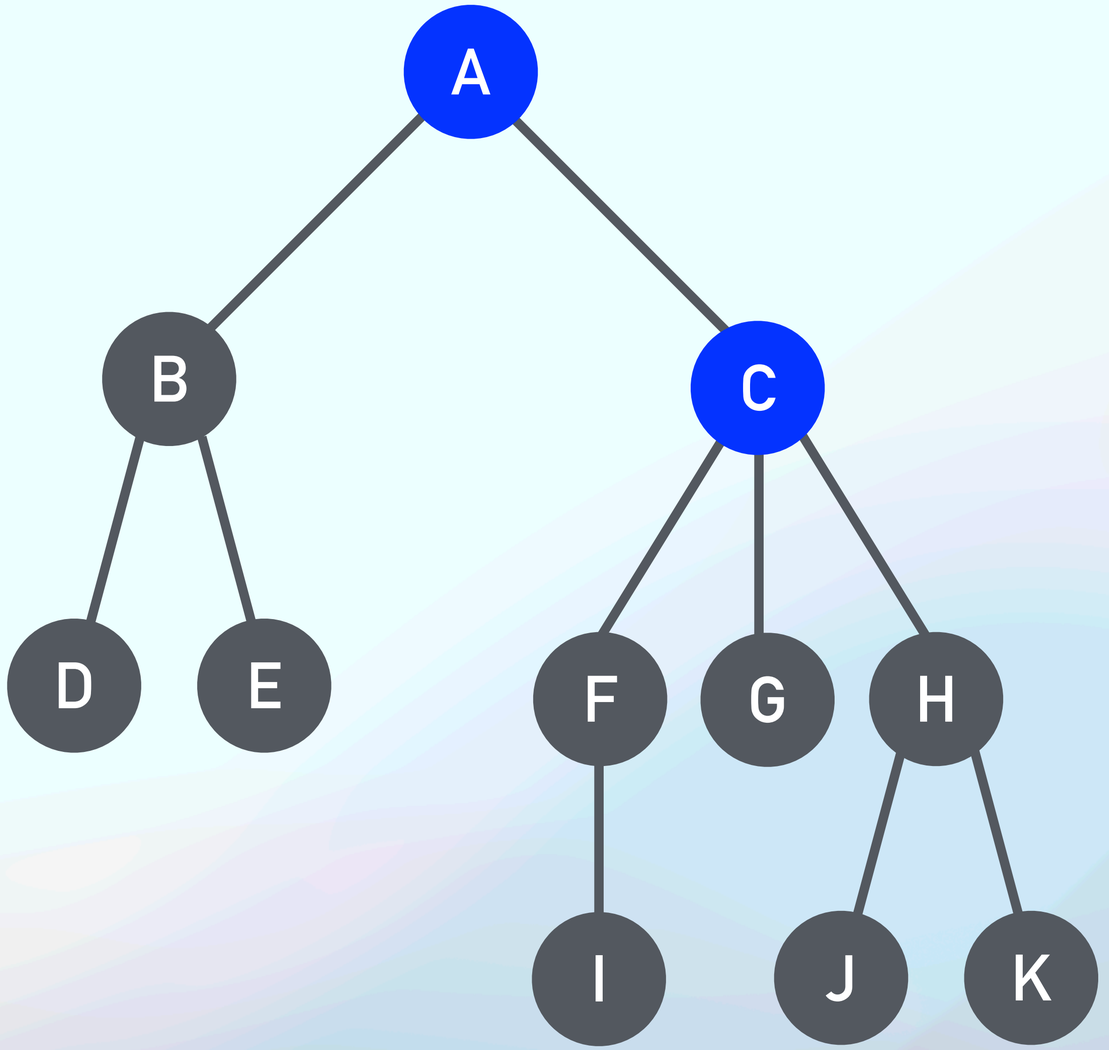
A	A
C	
K	



Tree

Basic Definition — Ancestor

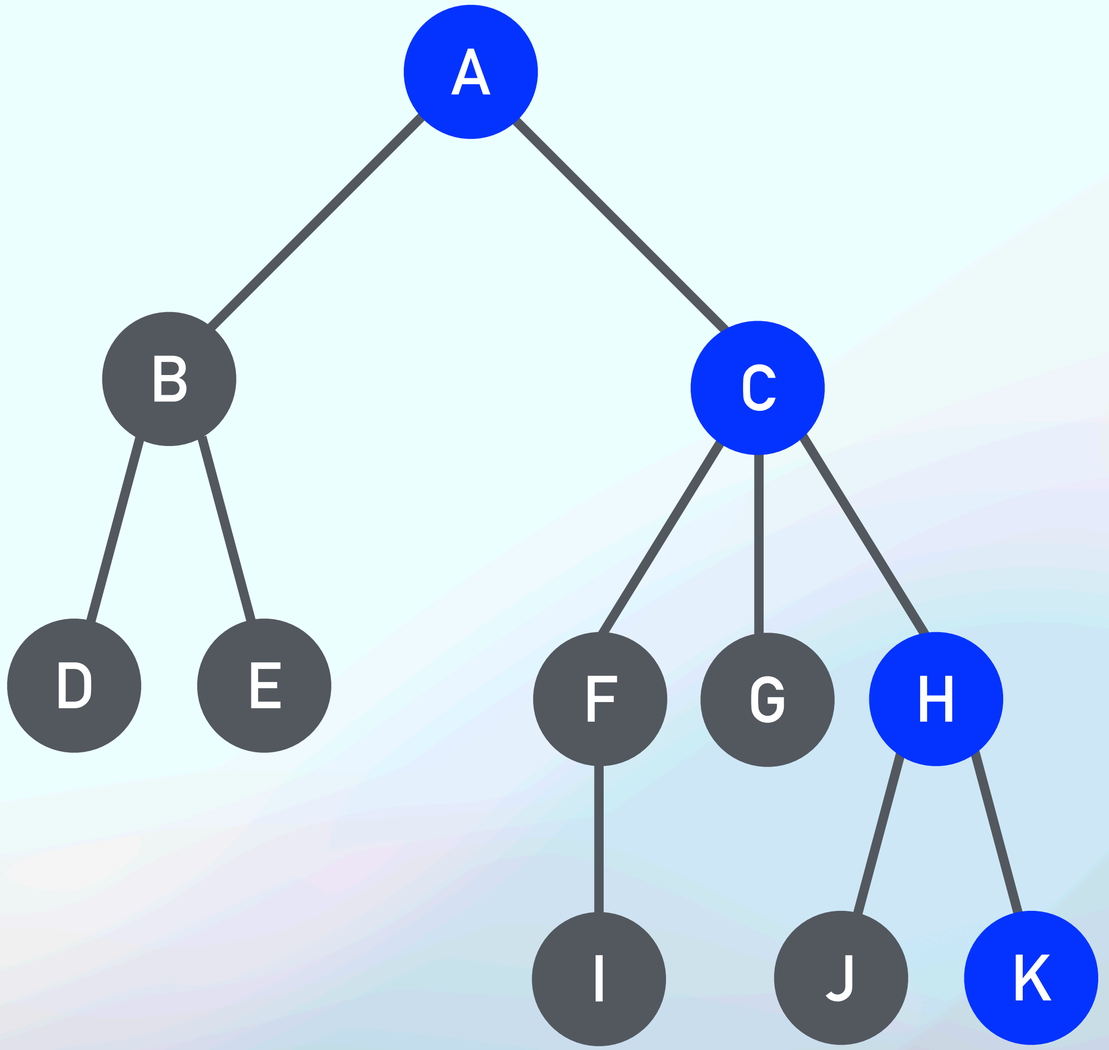
A	A
C	A C
K	



Tree

Basic Definition — Ancestor

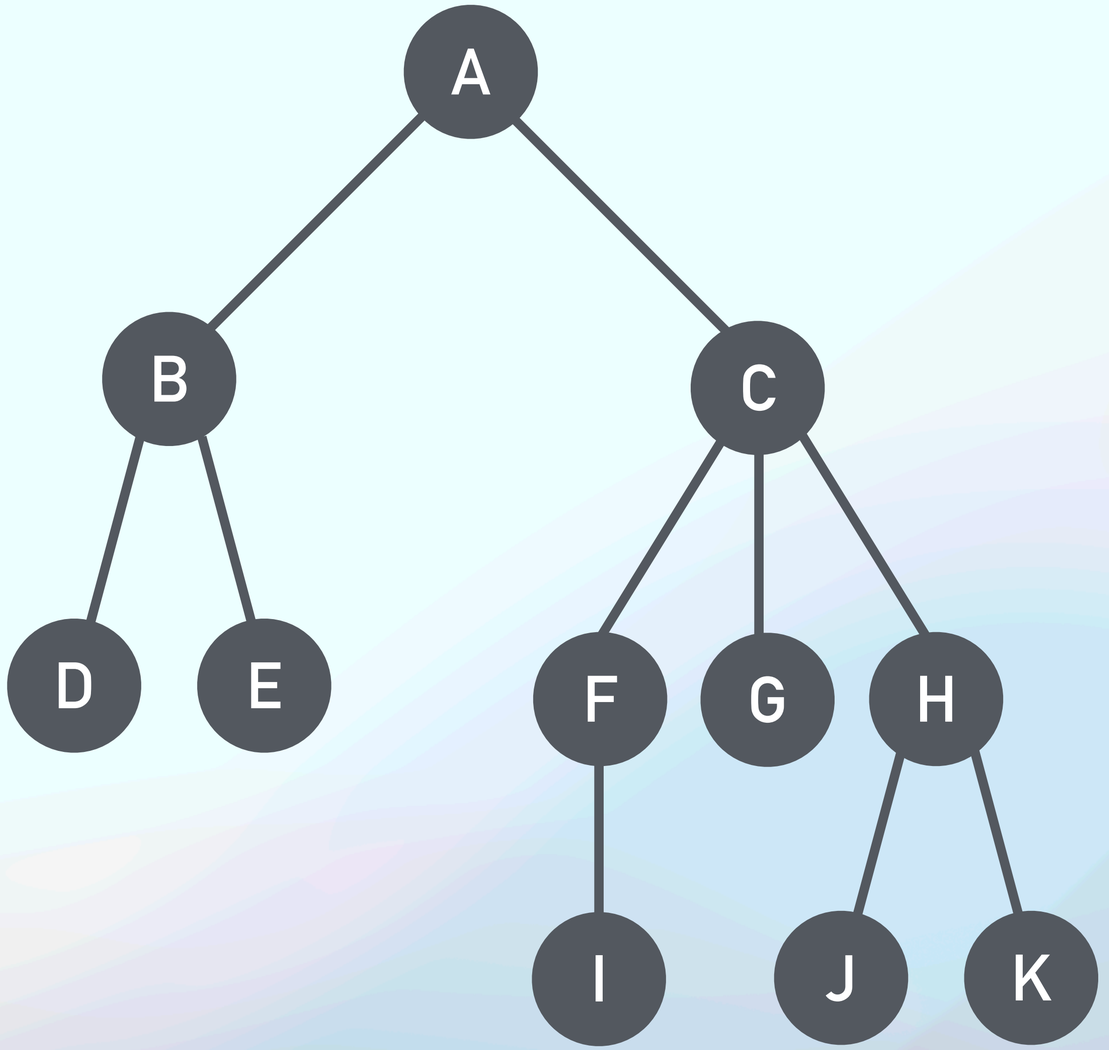
A	A
C	A C
K	A C H K



Tree

Basic Definition — Descendant

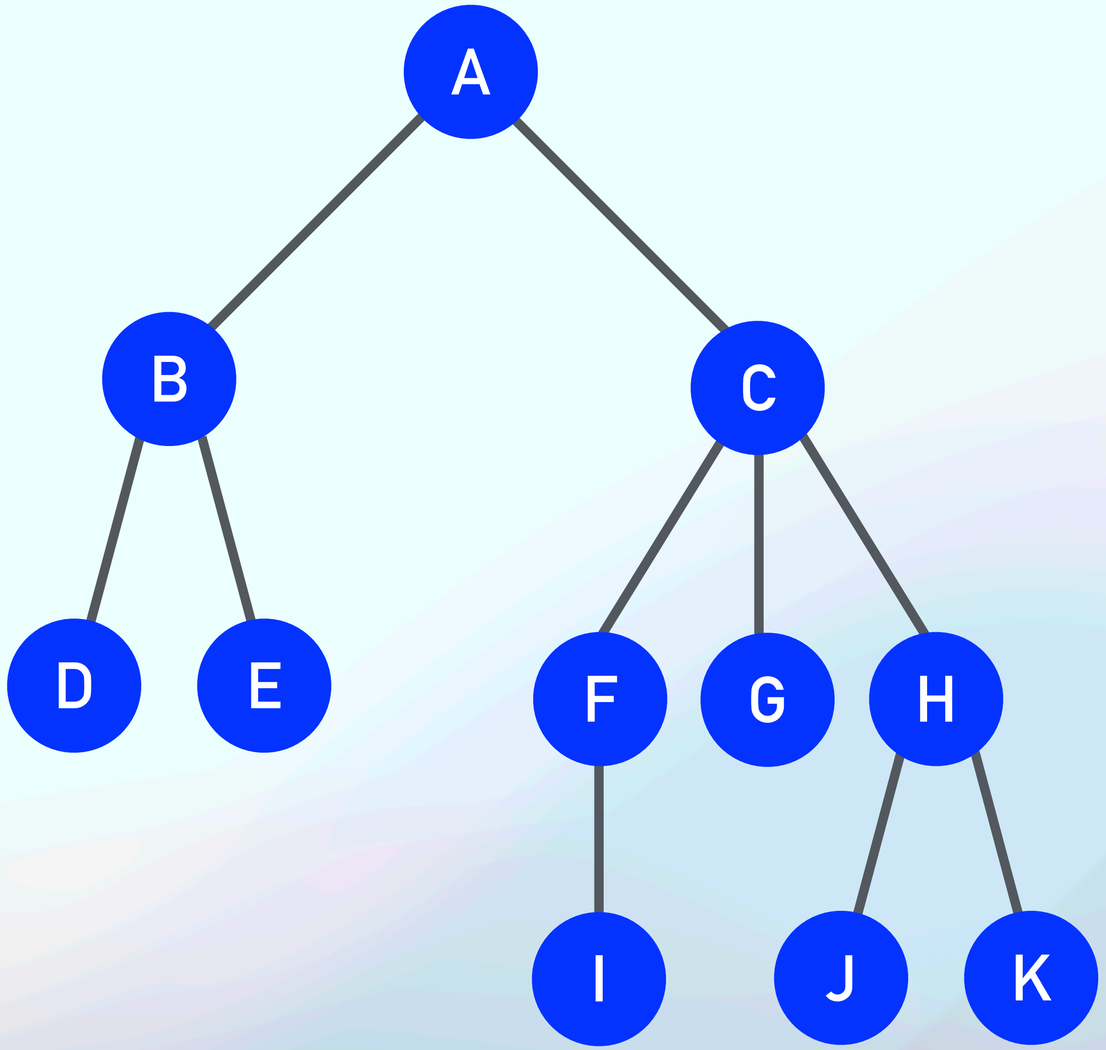
A	
C	
K	



Tree

Basic Definition — Descendant

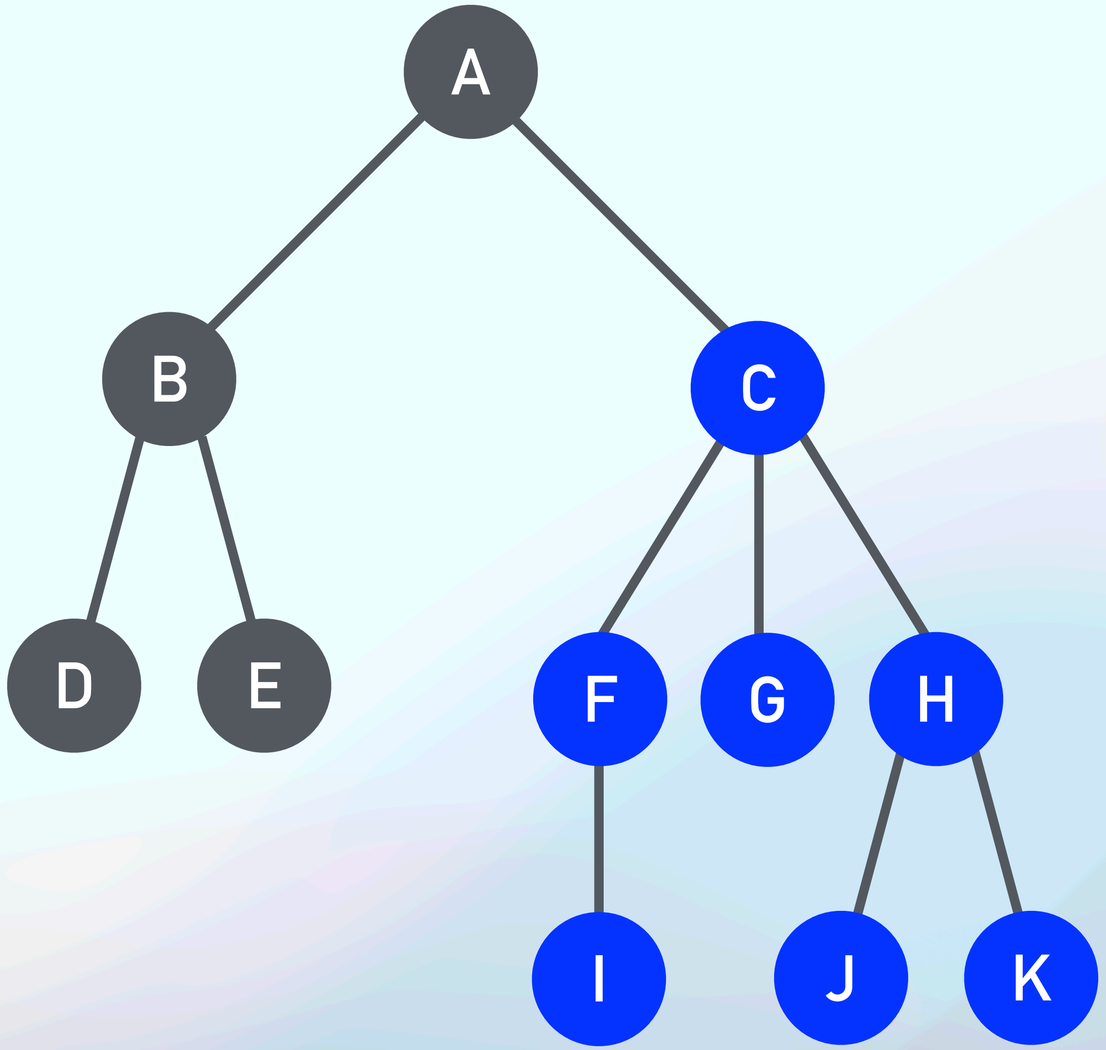
A	A B C D E F G H I J K
C	
K	



Tree

Basic Definition — Descendant

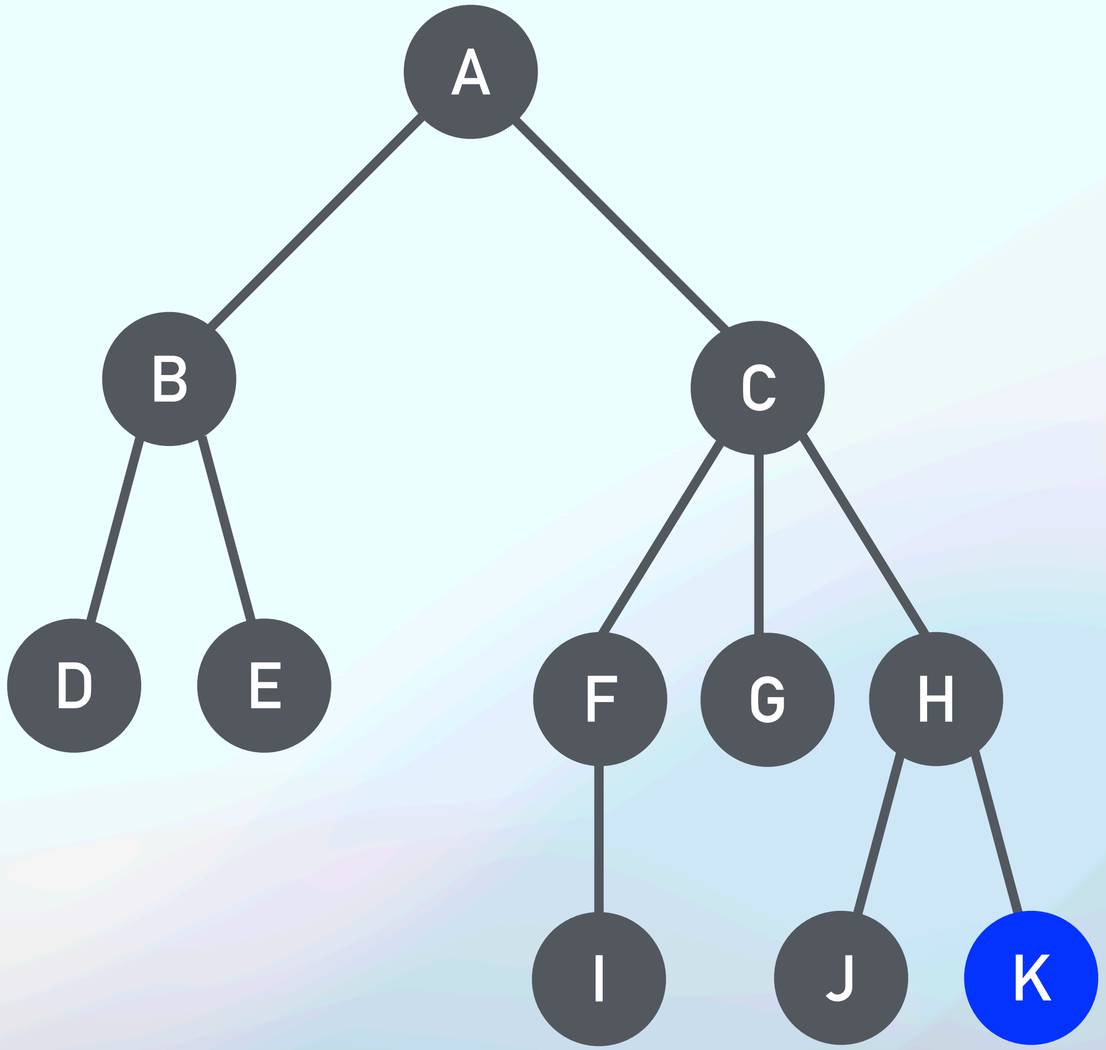
A	A B C D E F G H I J K
C	C F G H I J K
K	



Tree

Basic Definition — Descendant

A	A B C D E F G H I J K
C	C F G H I J K
K	K



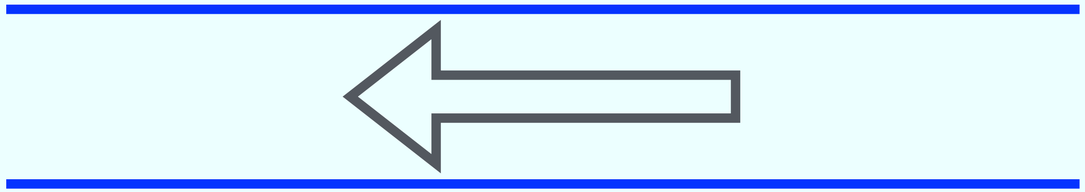
CS101-Quiz5-Review

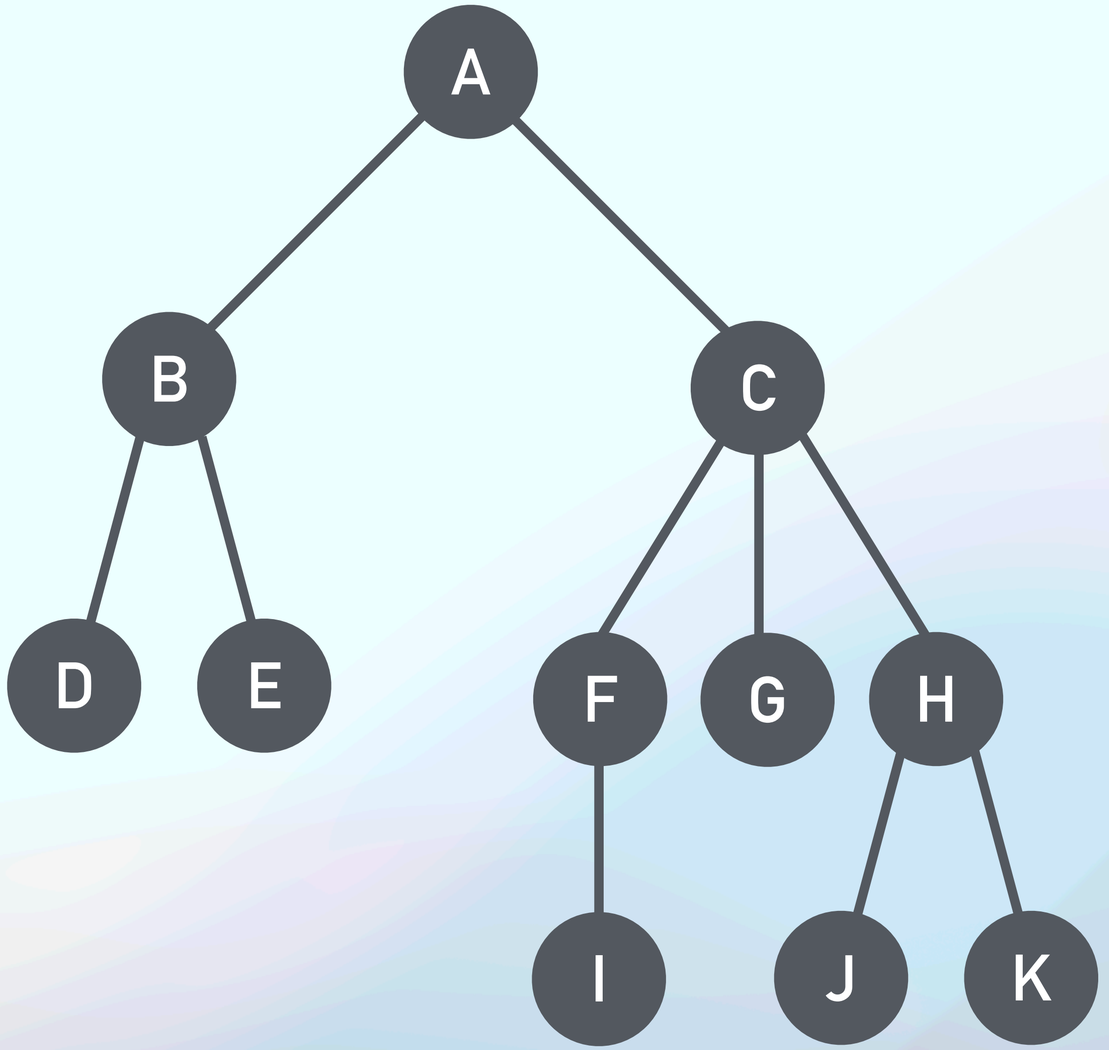
Key Points

1. Tree
2. **Breadth-First and Depth-First Traversal**
3. Binary Tree

Breadth-First Traversal

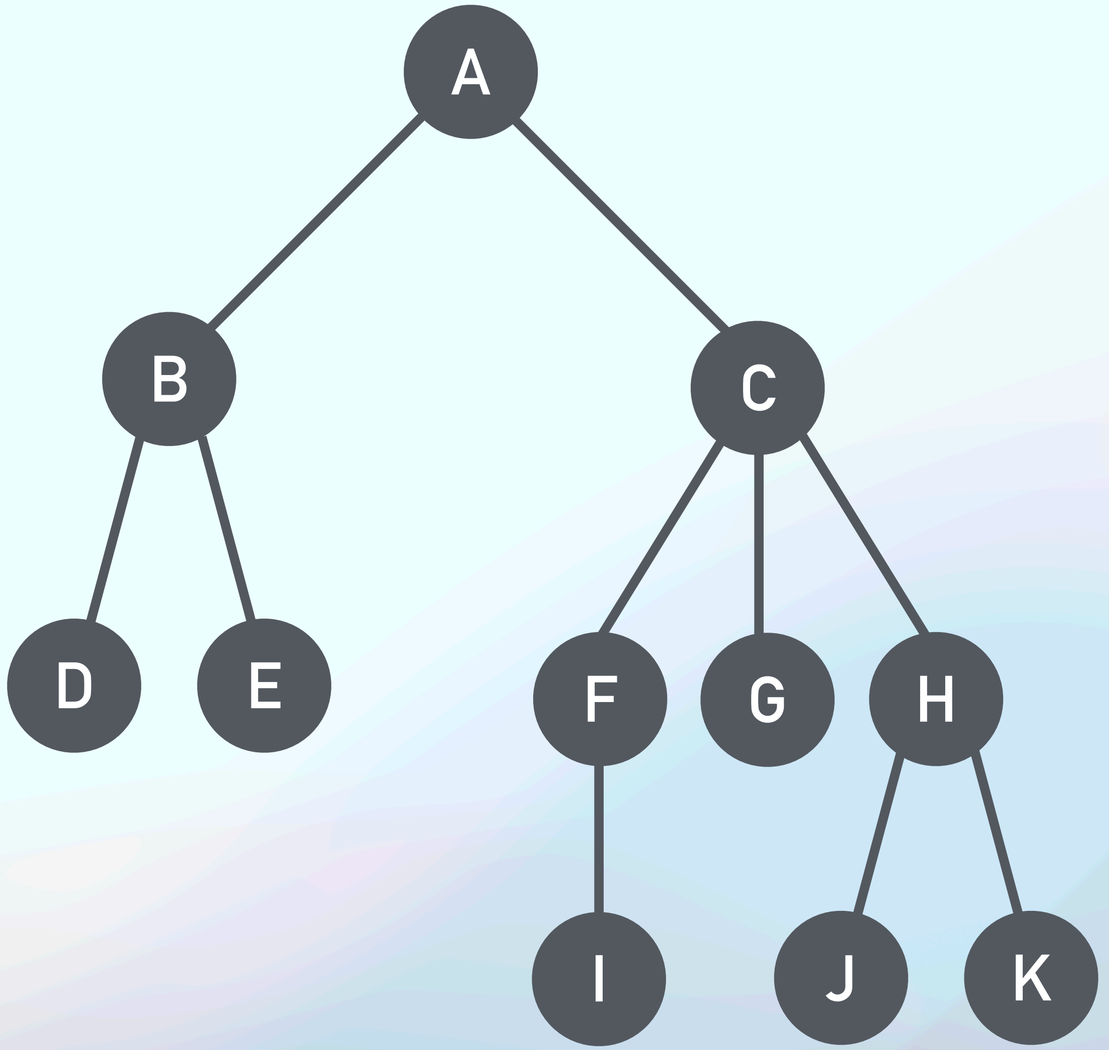
Queue





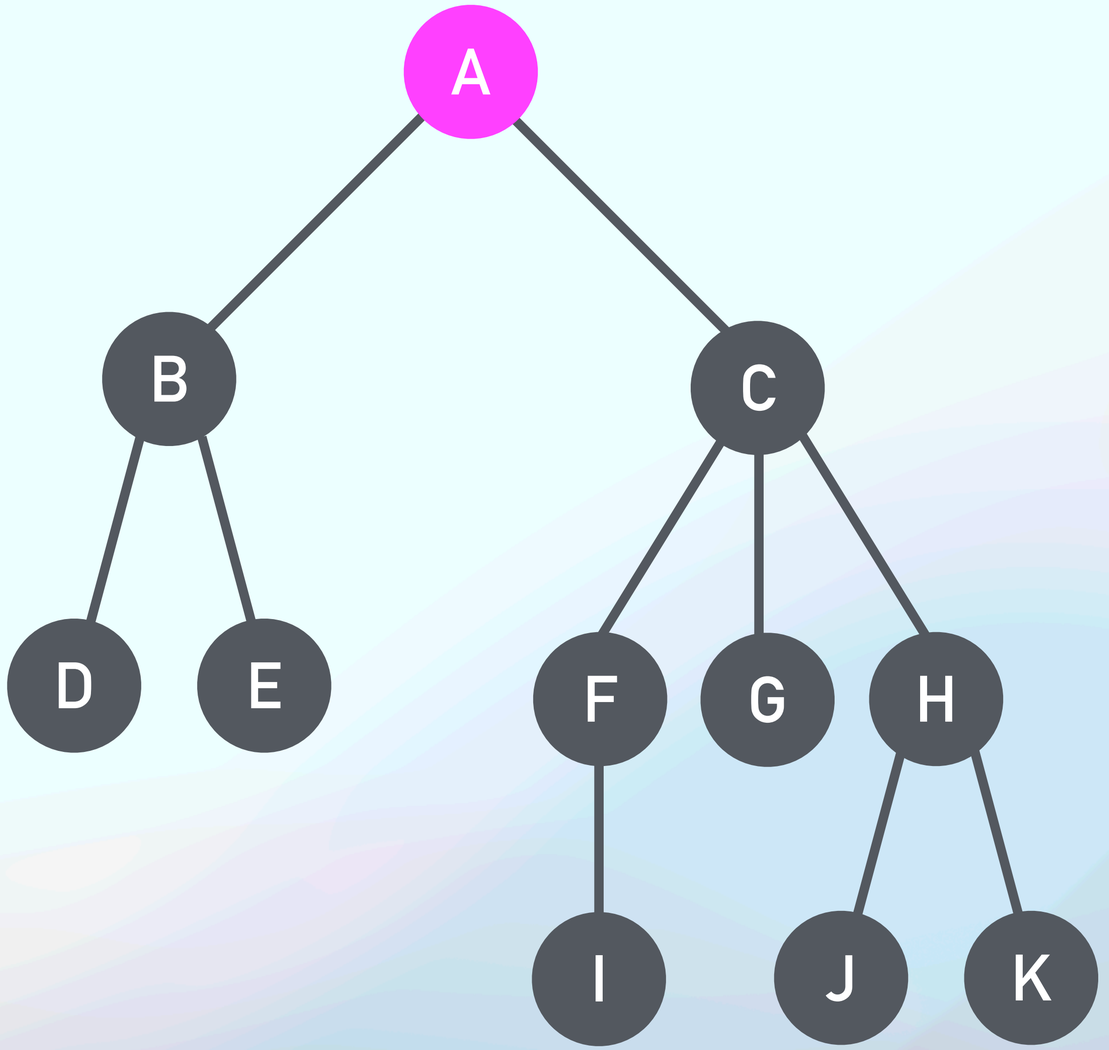
Breadth-First Traversal

Queue



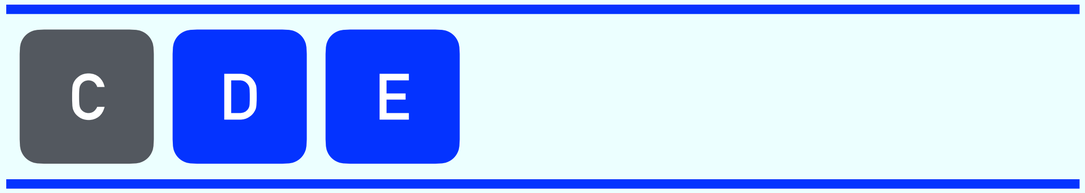
Breadth-First Traversal

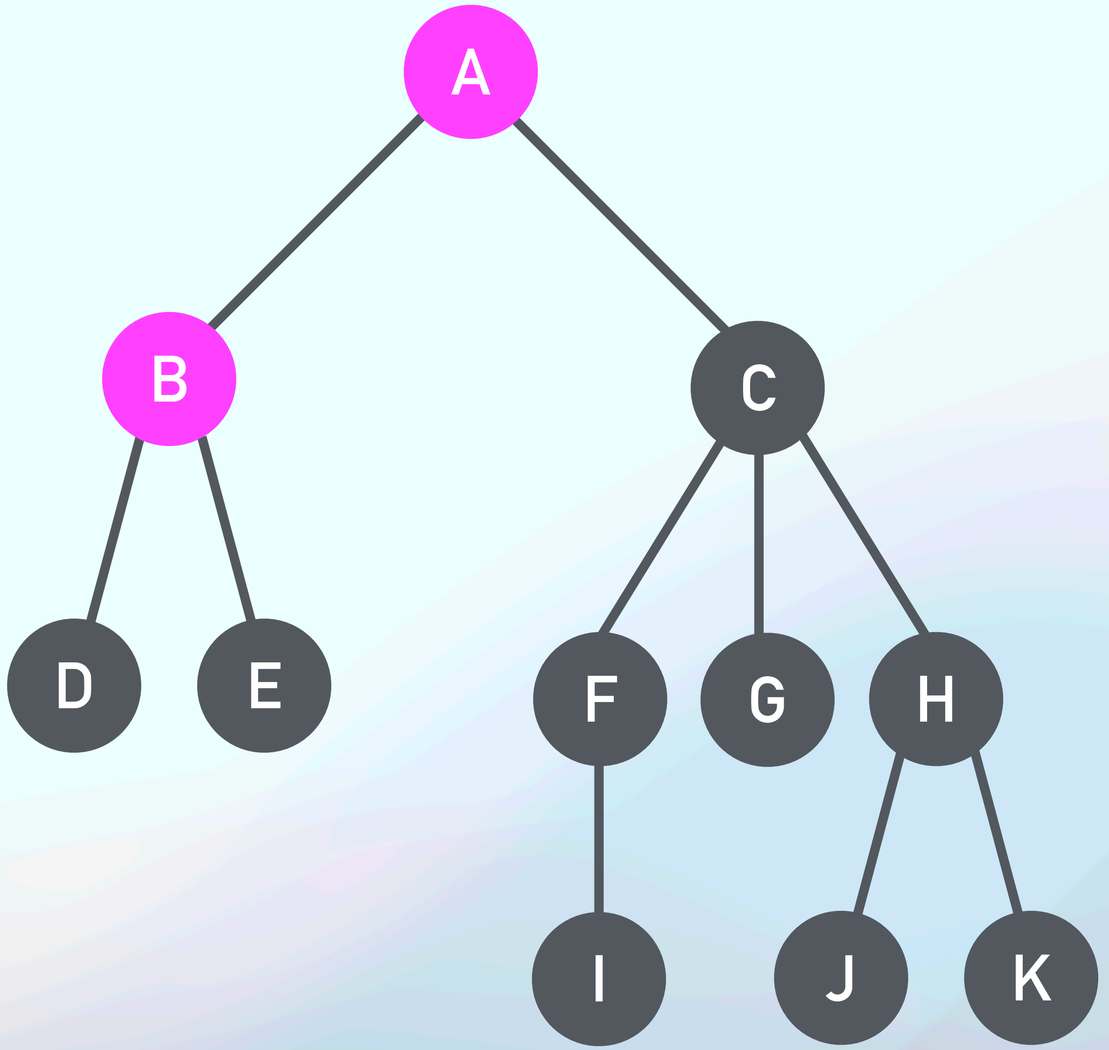
Queue



Breadth-First Traversal

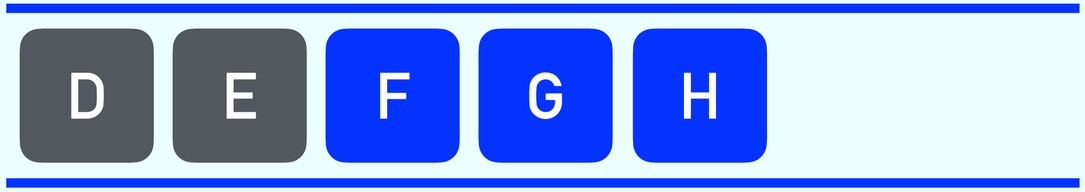
Queue

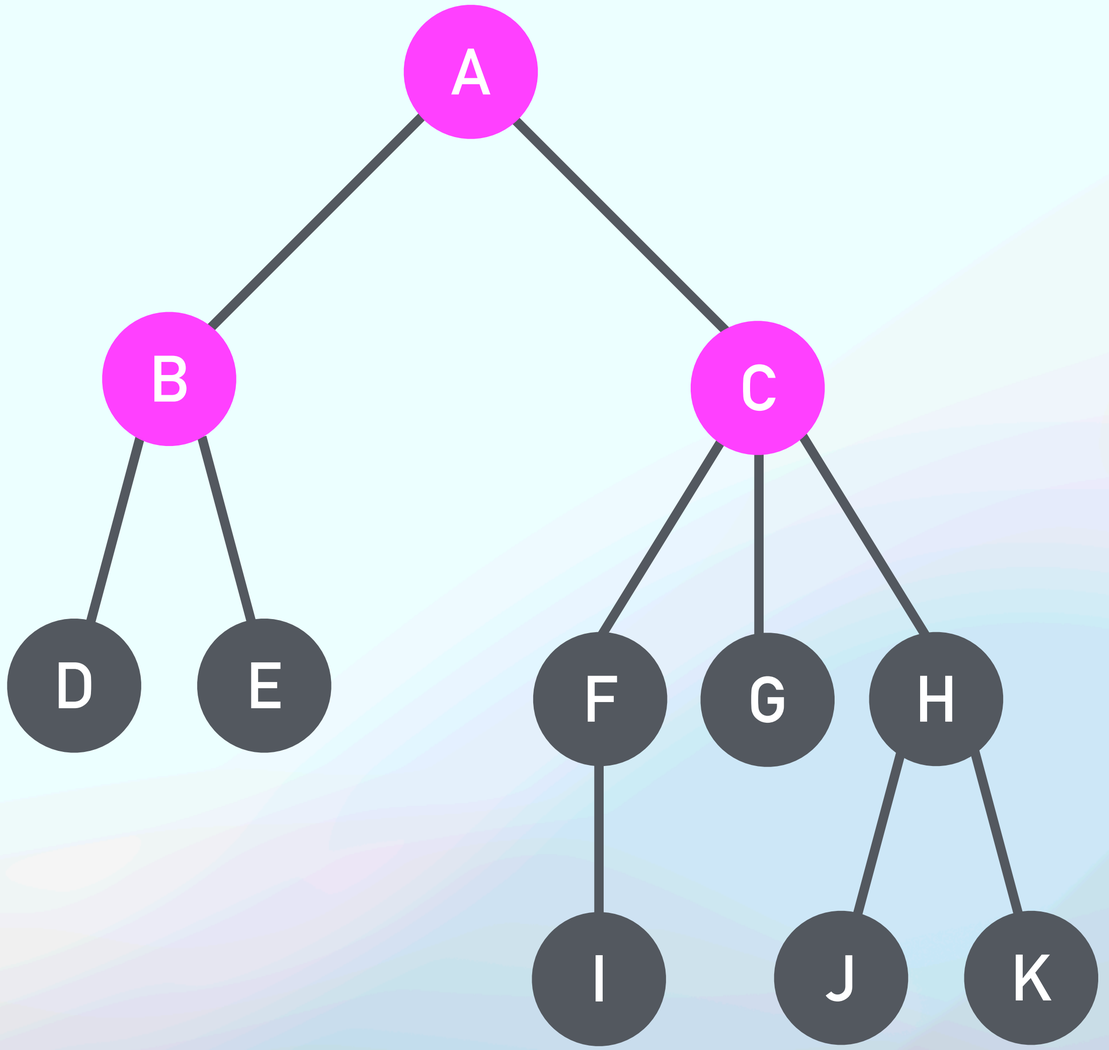




Breadth-First Traversal

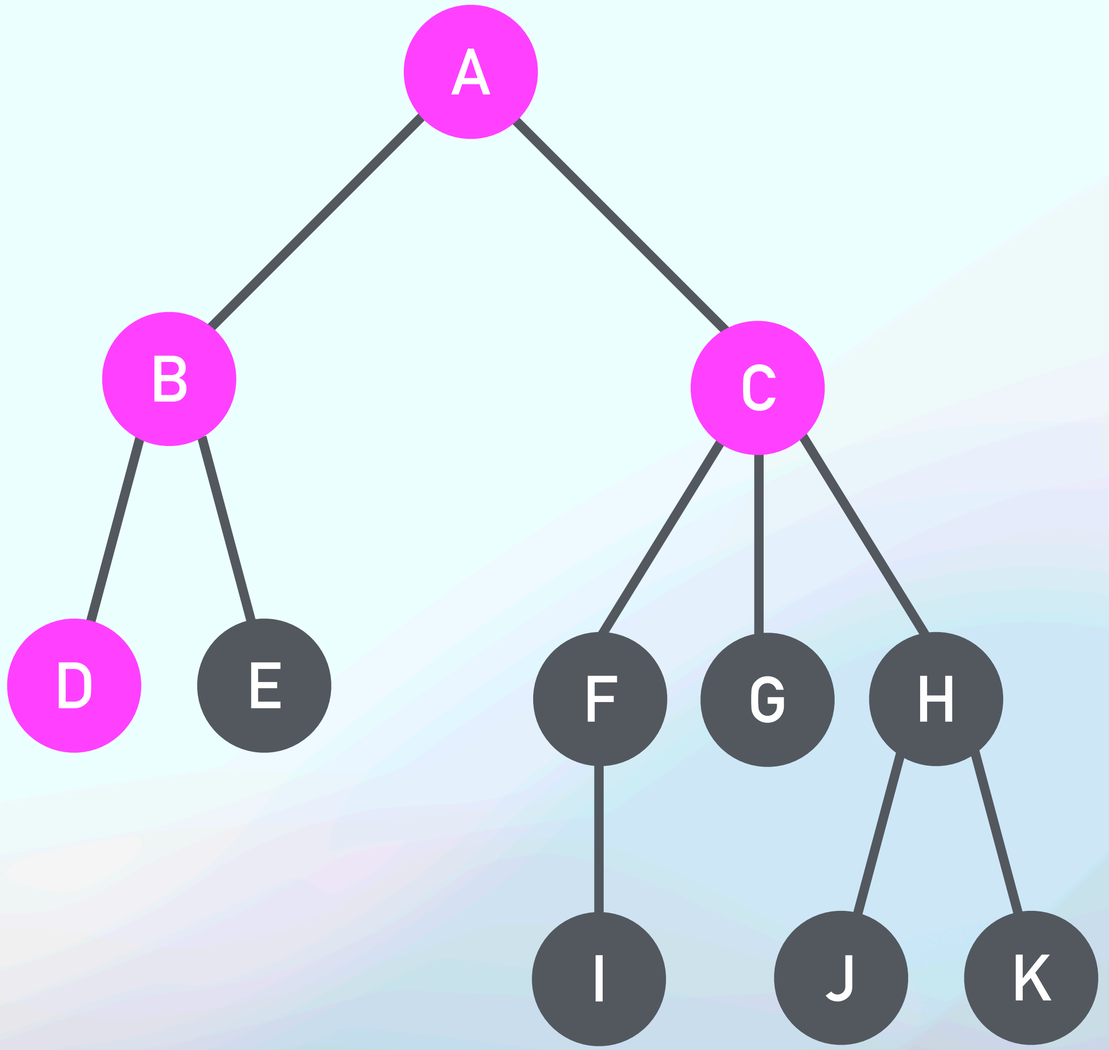
Queue





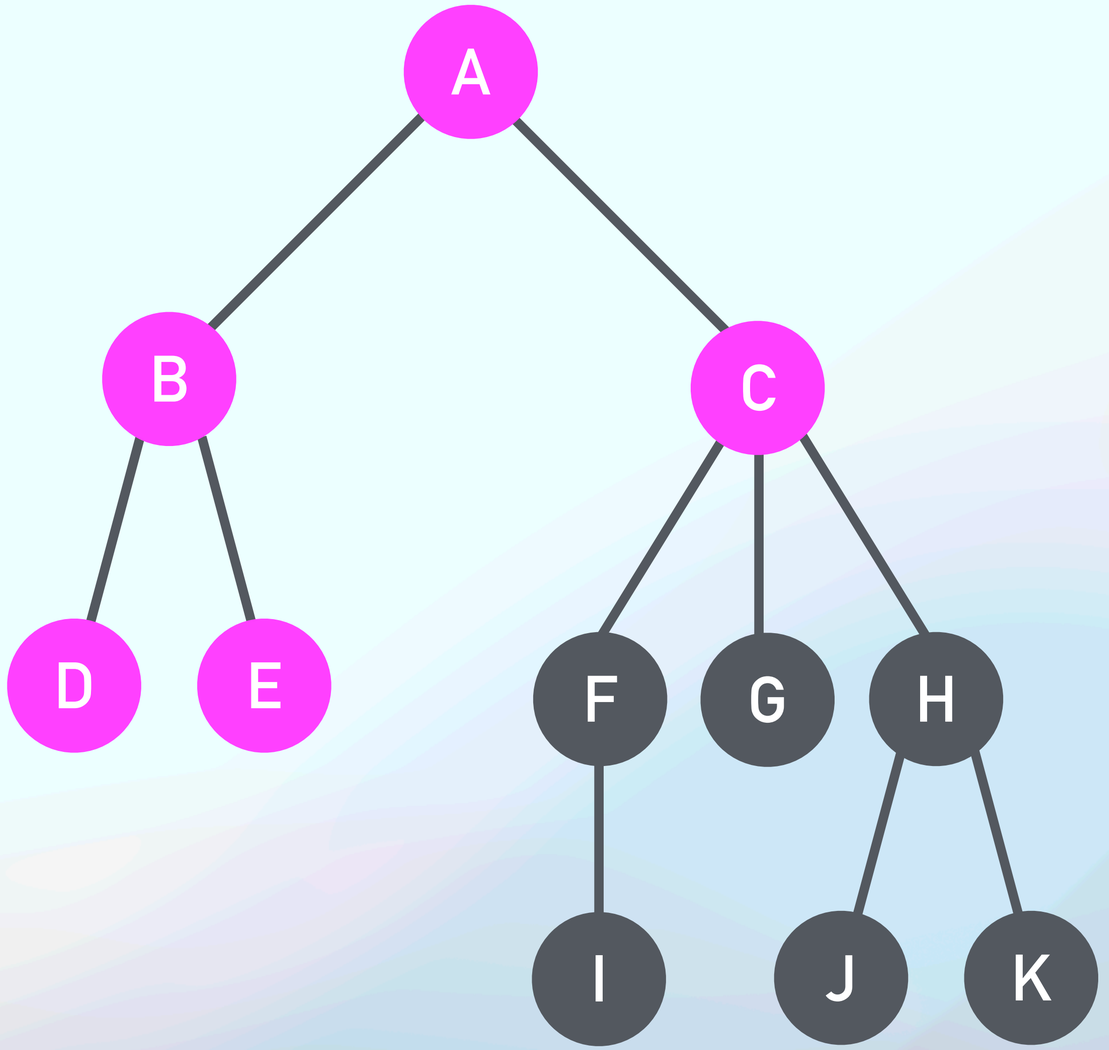
Breadth-First Traversal

Queue



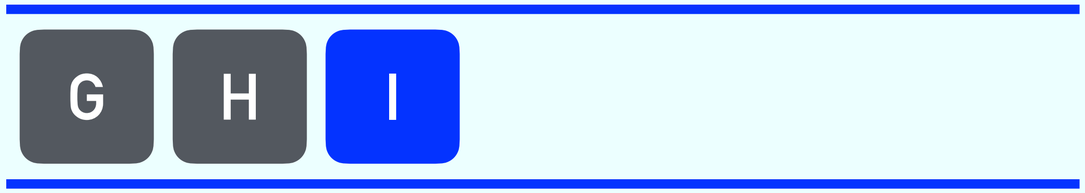
Breadth-First Traversal

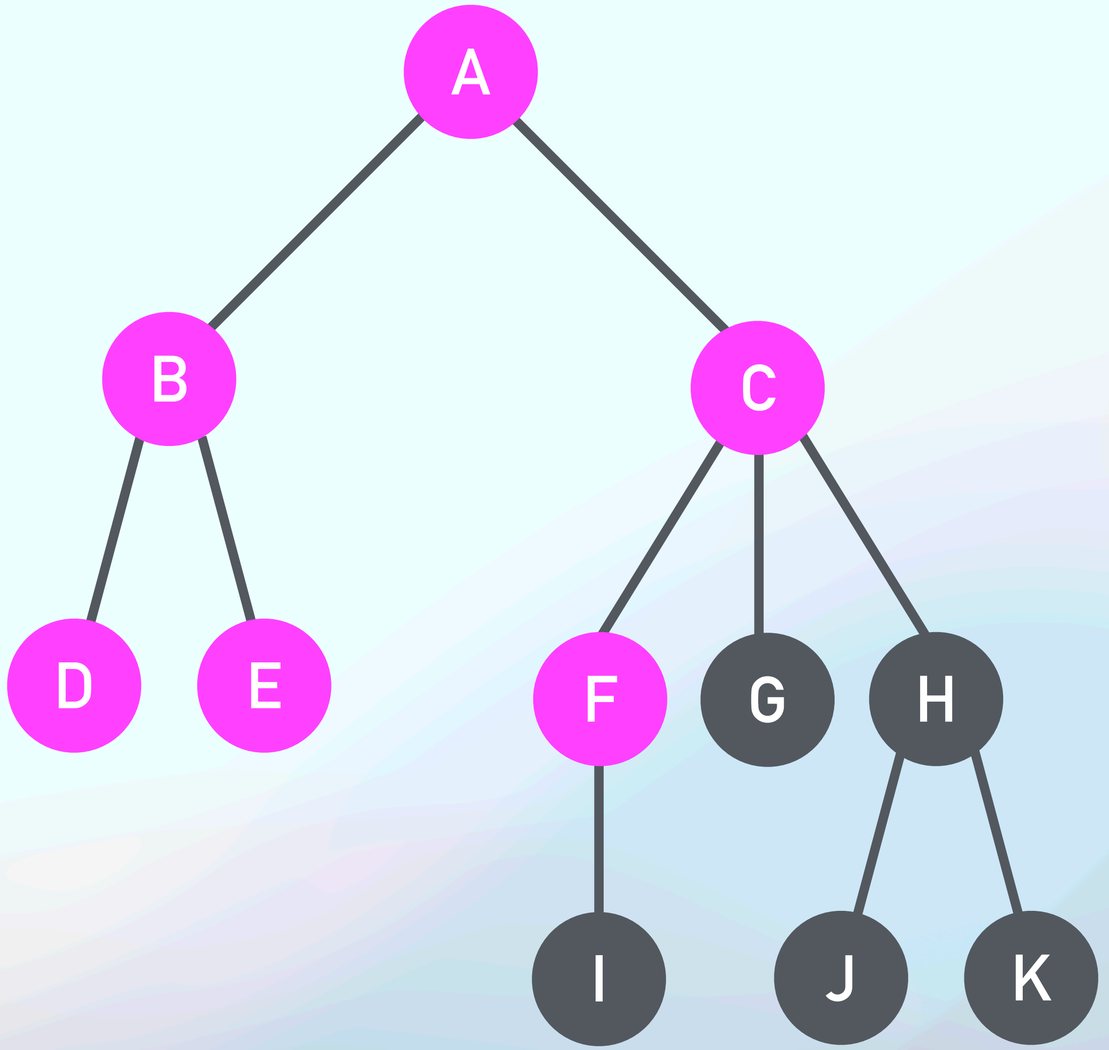
Queue



Breadth-First Traversal

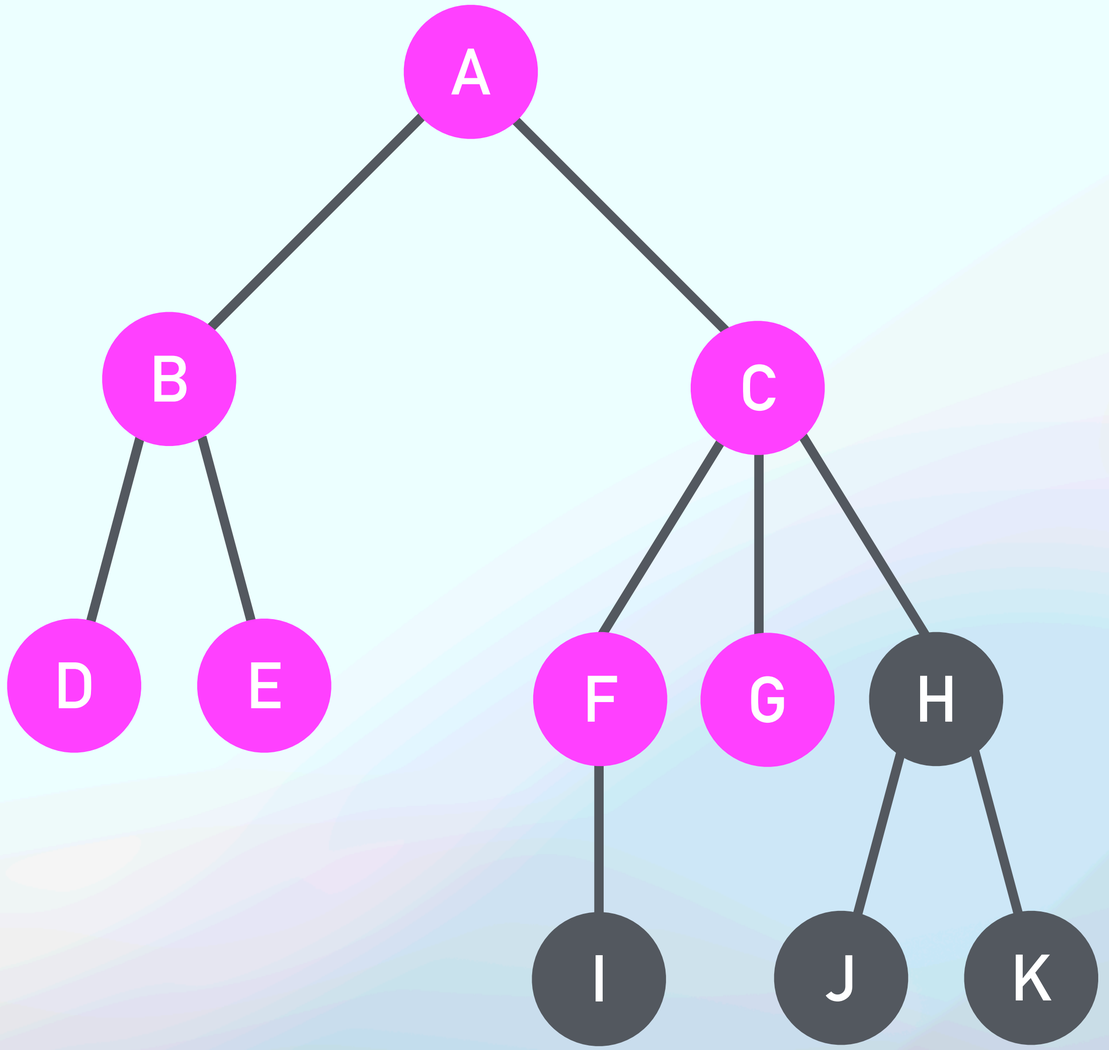
Queue





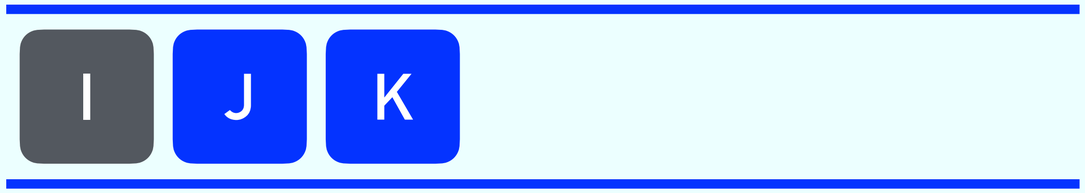
Breadth-First Traversal

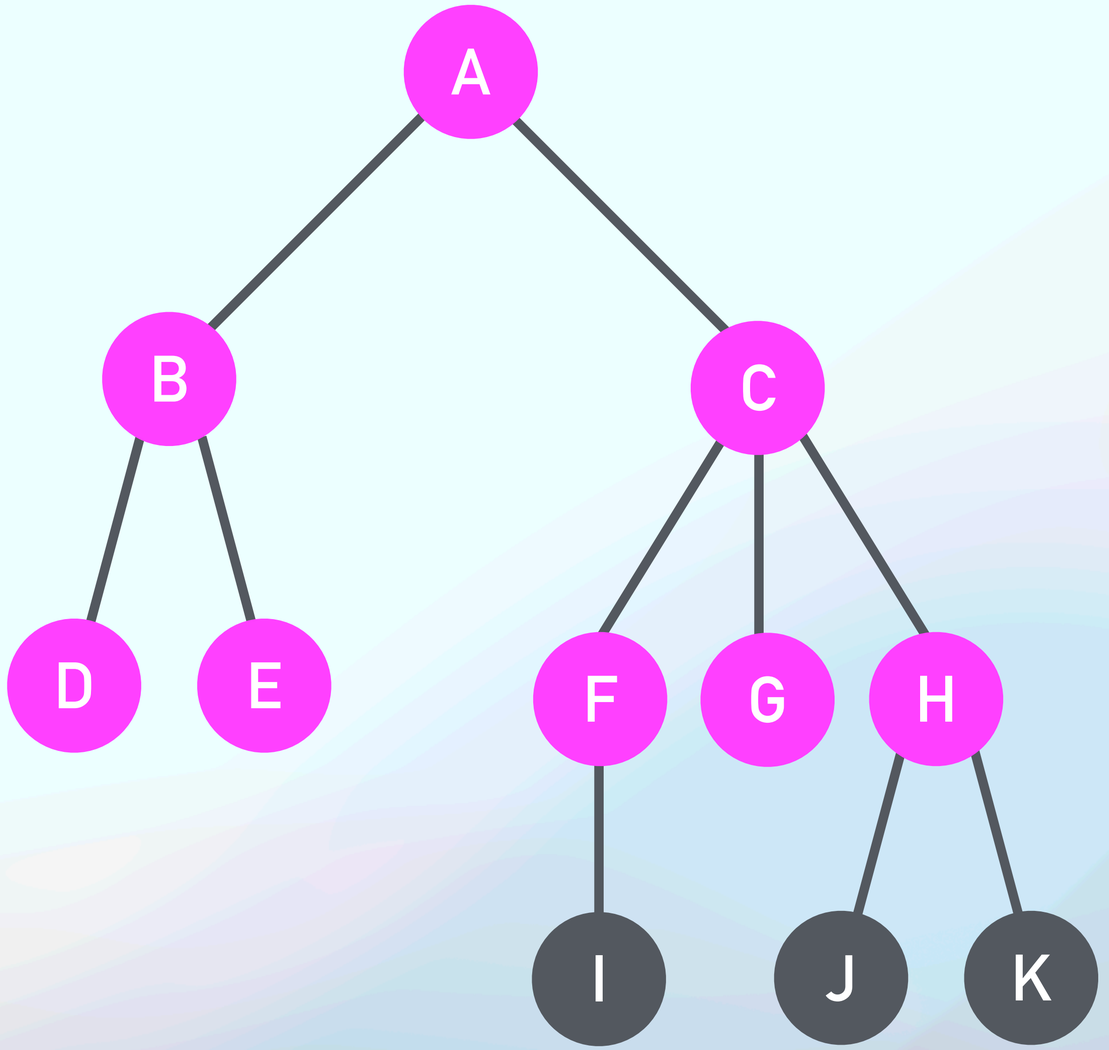
Queue



Breadth-First Traversal

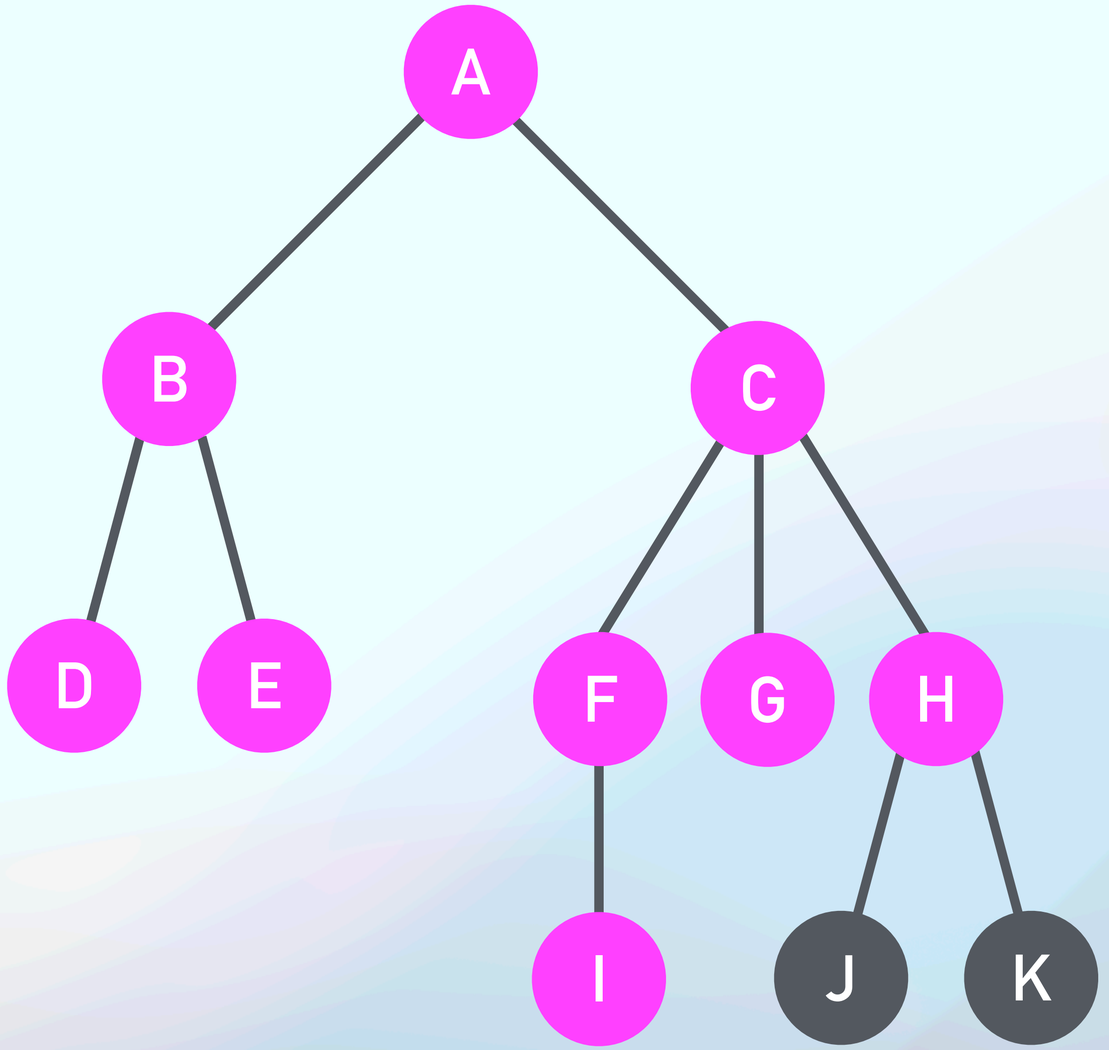
Queue





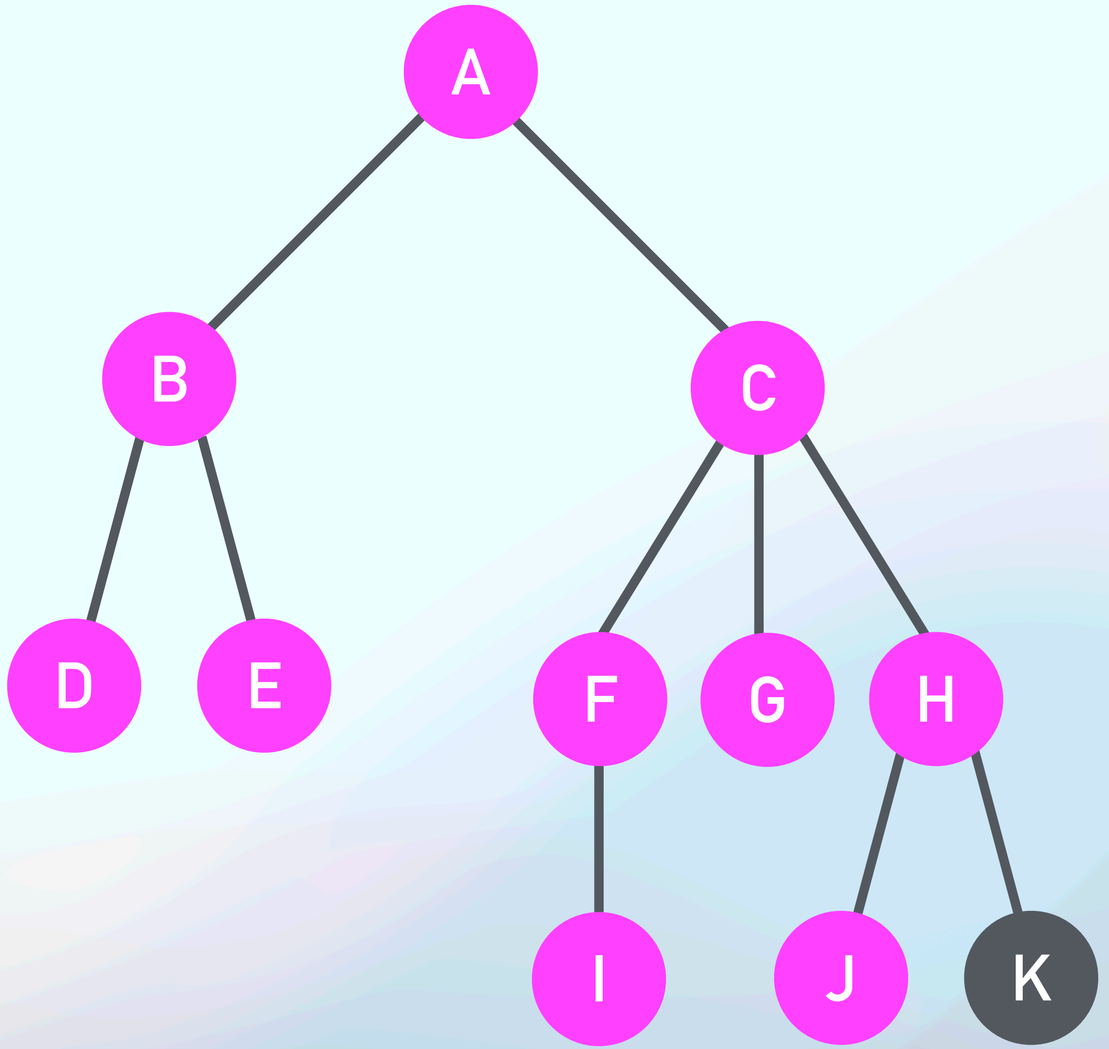
Breadth-First Traversal

Queue



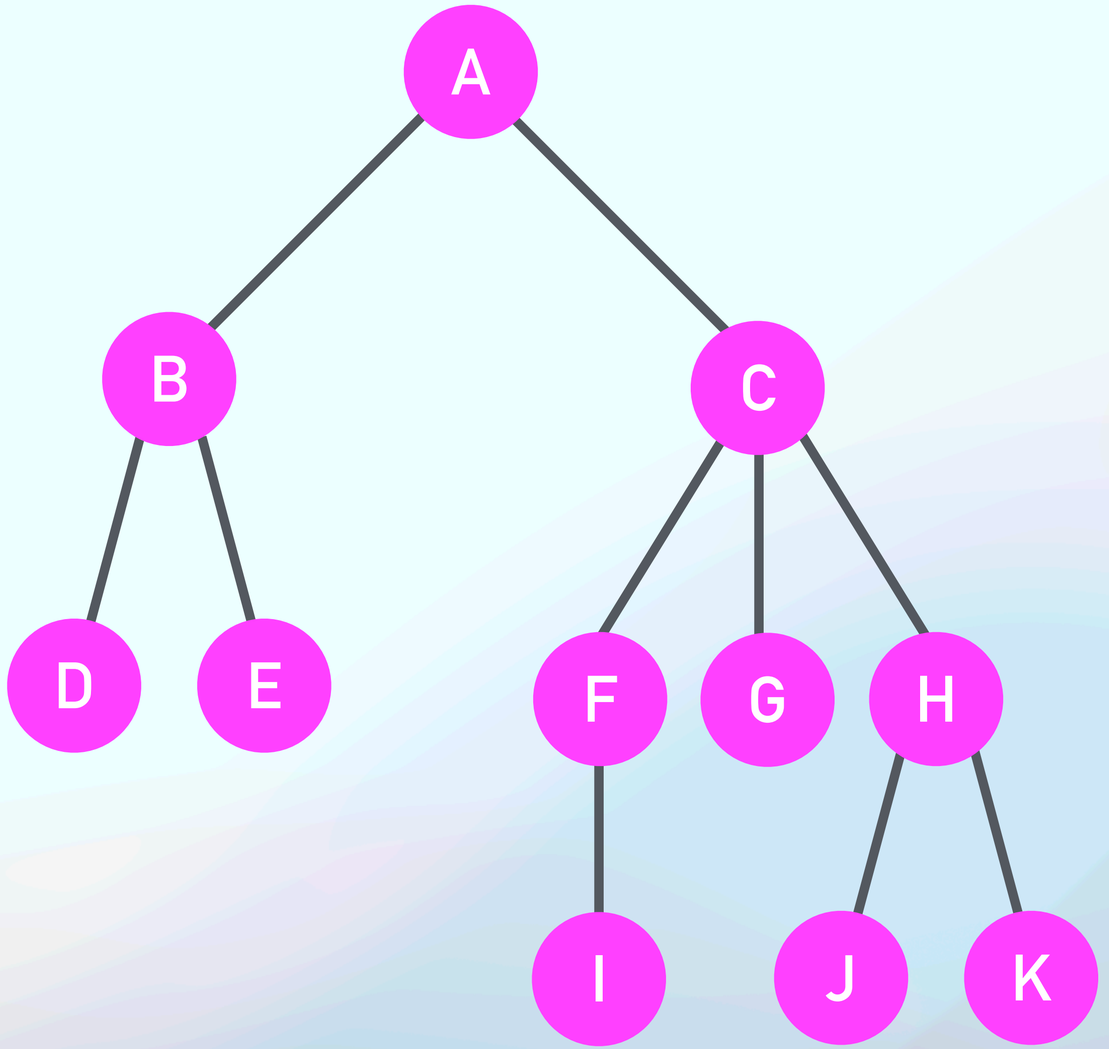
Breadth-First Traversal

Queue



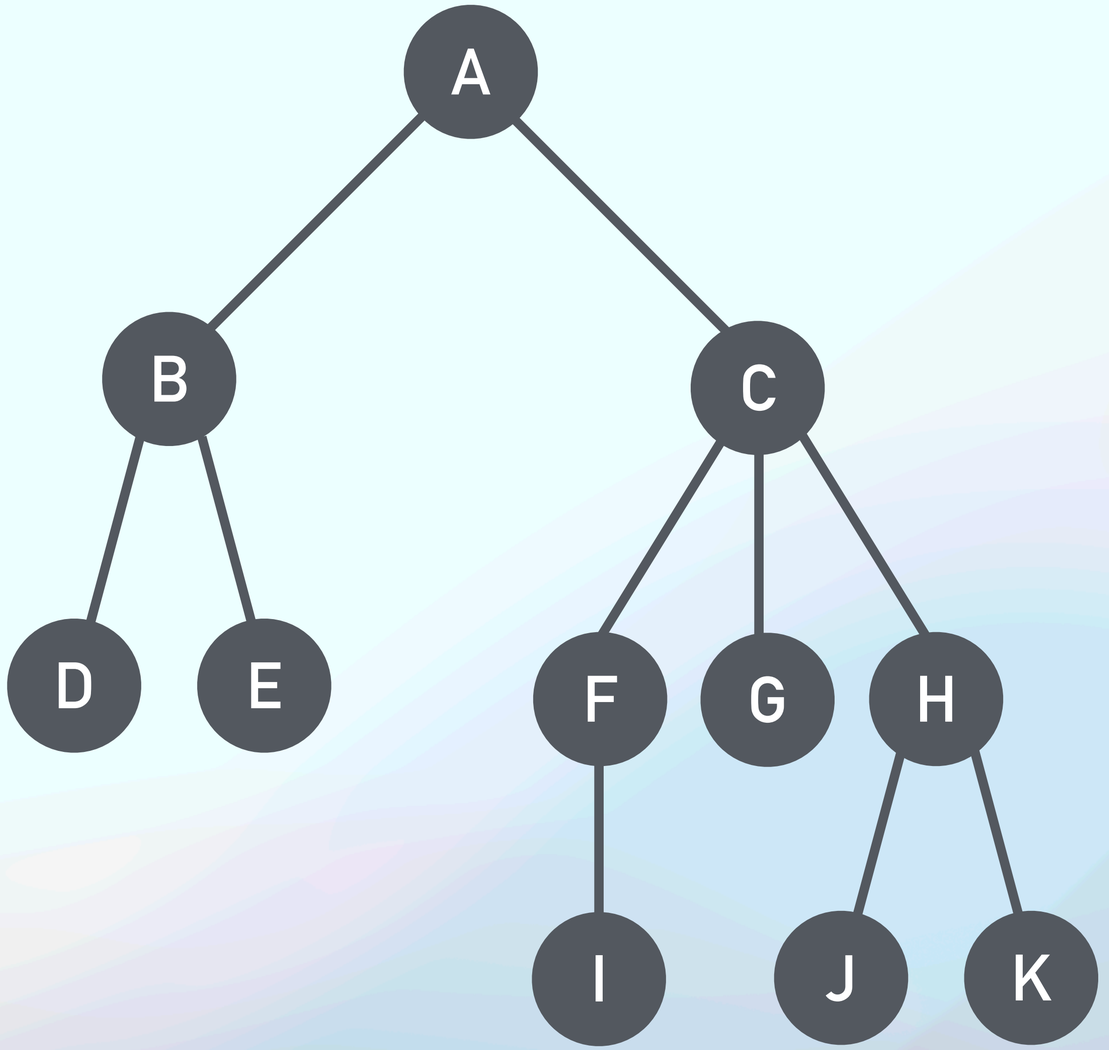
Breadth-First Traversal

Queue



Depth-First Traversal

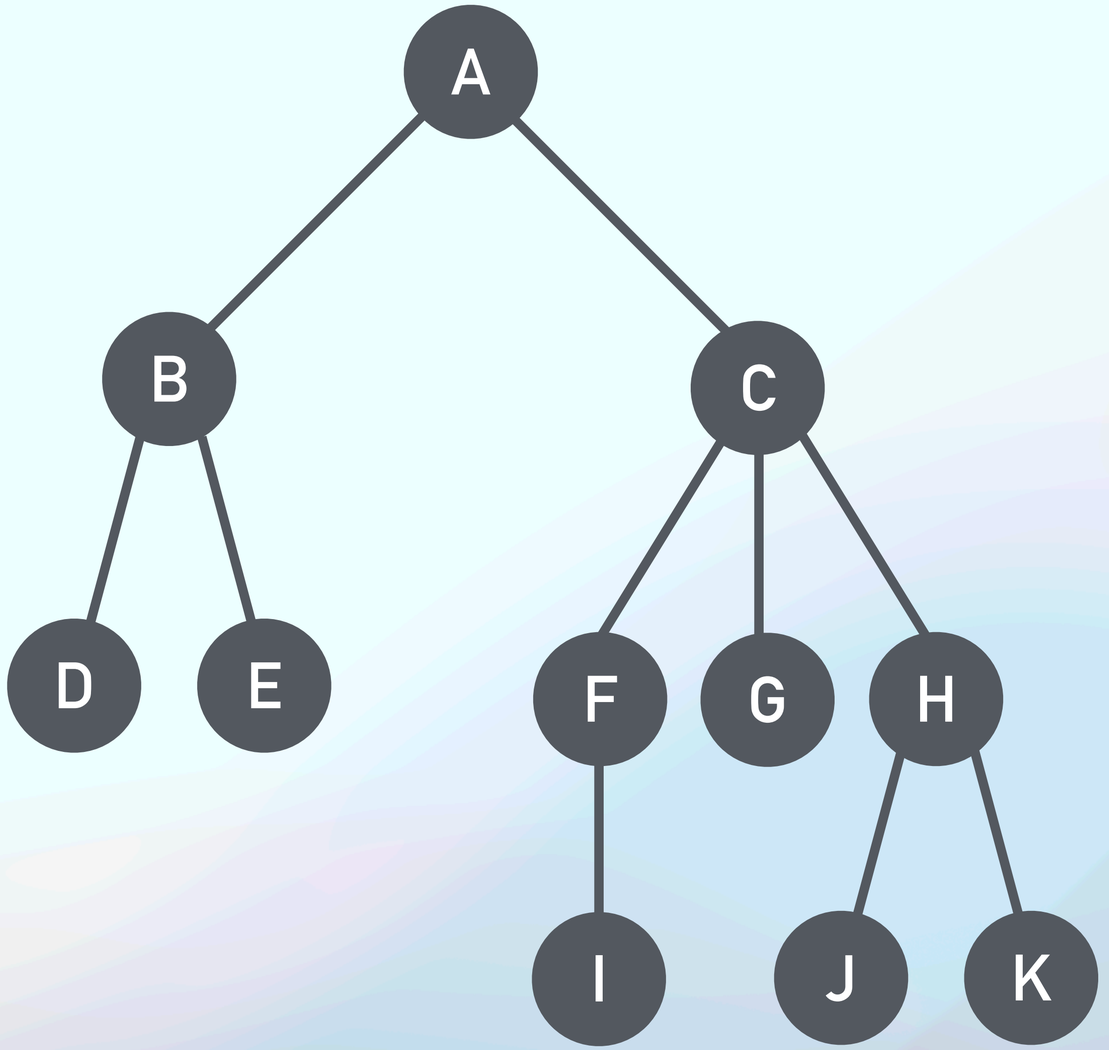
Stack



Push with alphabetical order

Depth-First Traversal

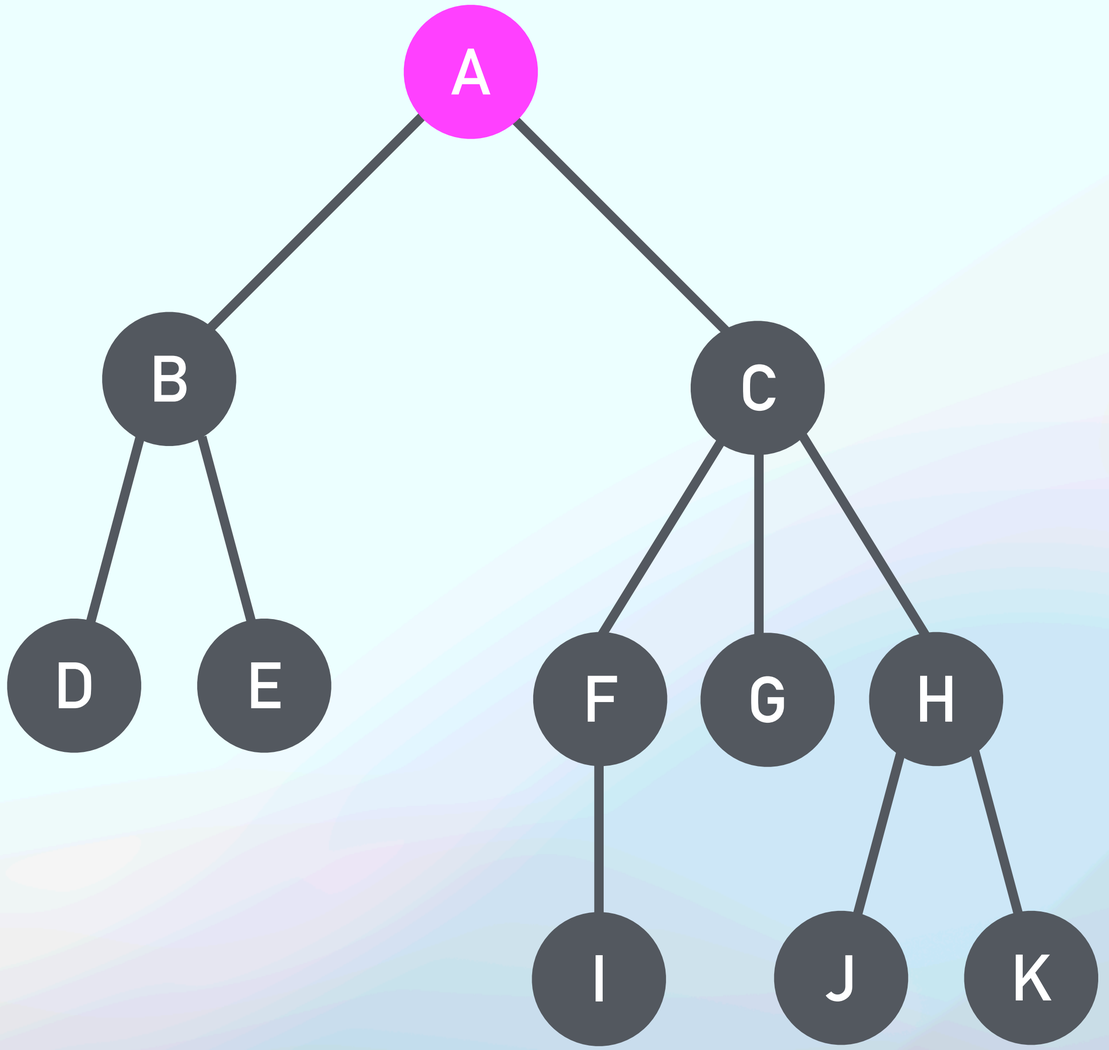
Stack



Push with alphabetical order

Depth-First Traversal

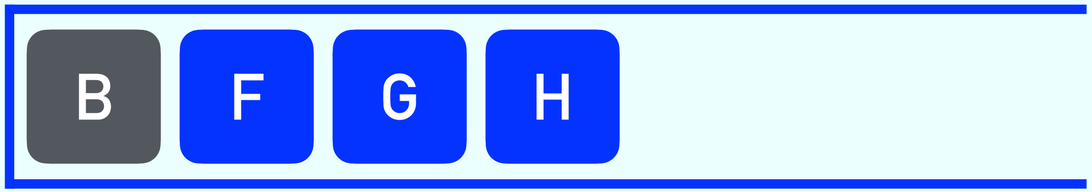
Stack

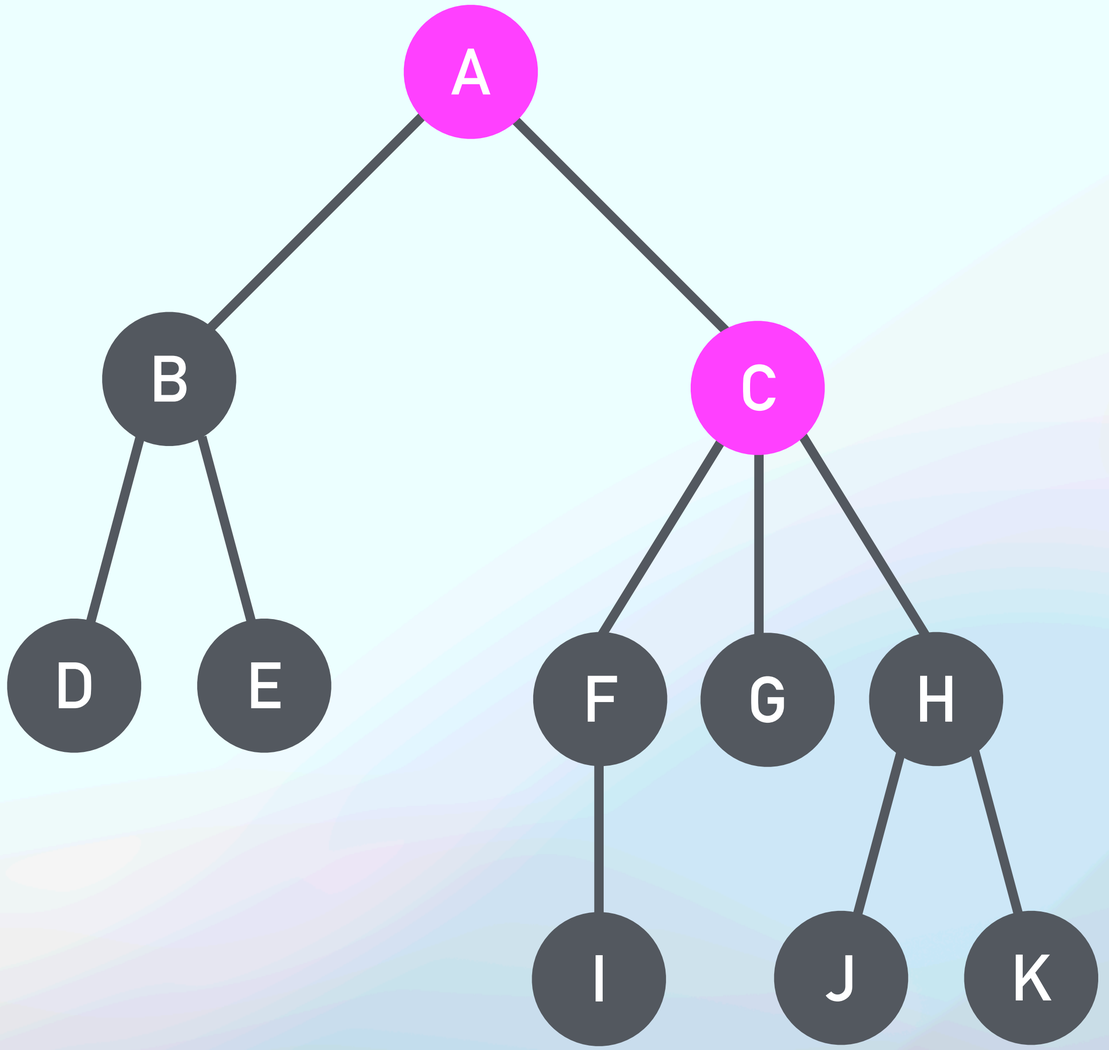


Push with alphabetical order

Depth-First Traversal

Stack

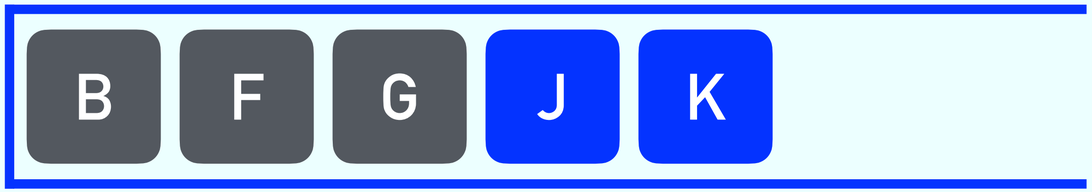


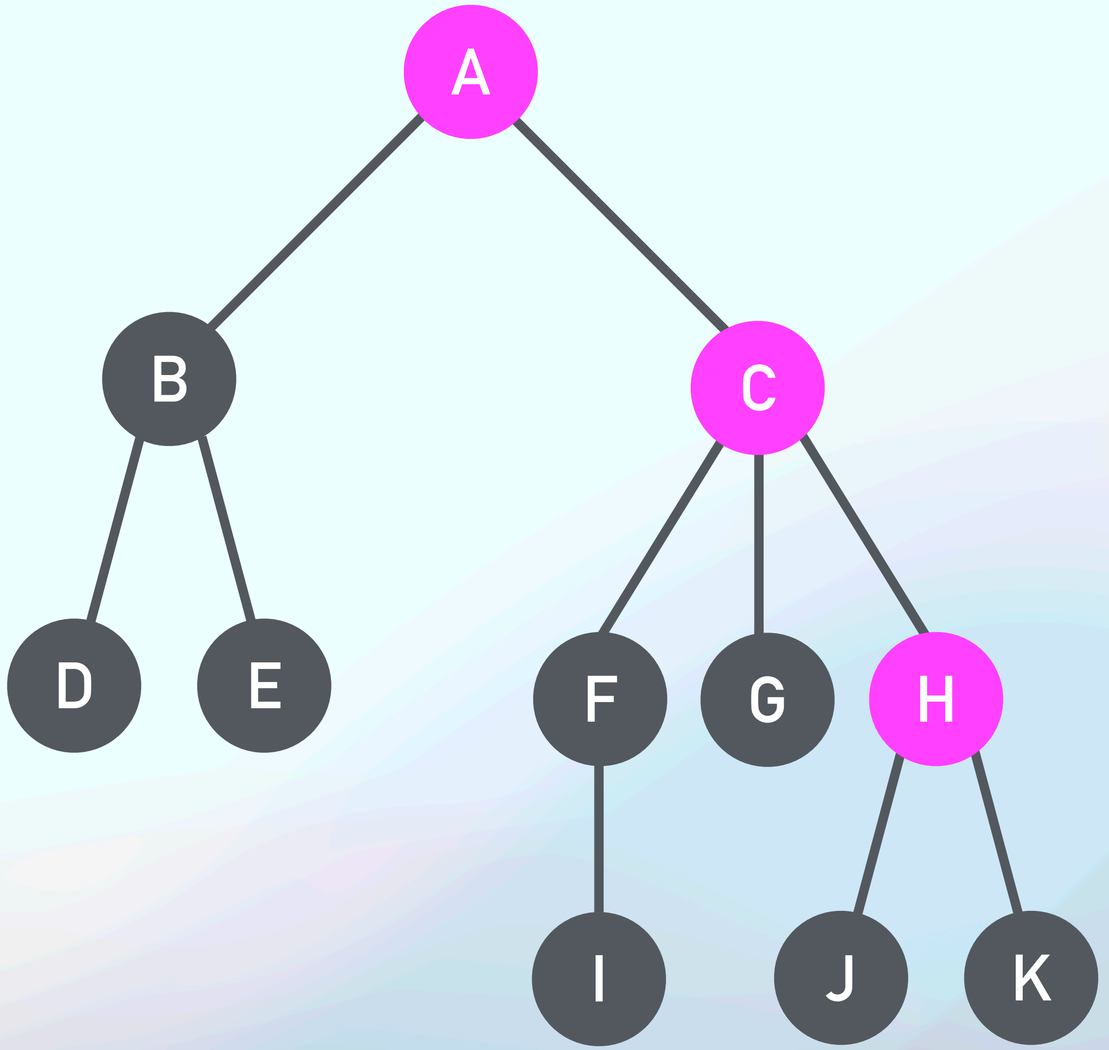


Push with alphabetical order

Depth-First Traversal

Stack

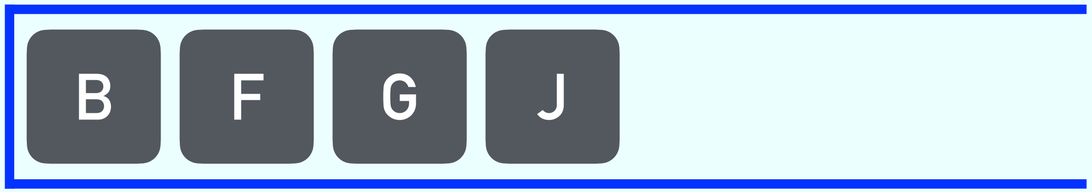


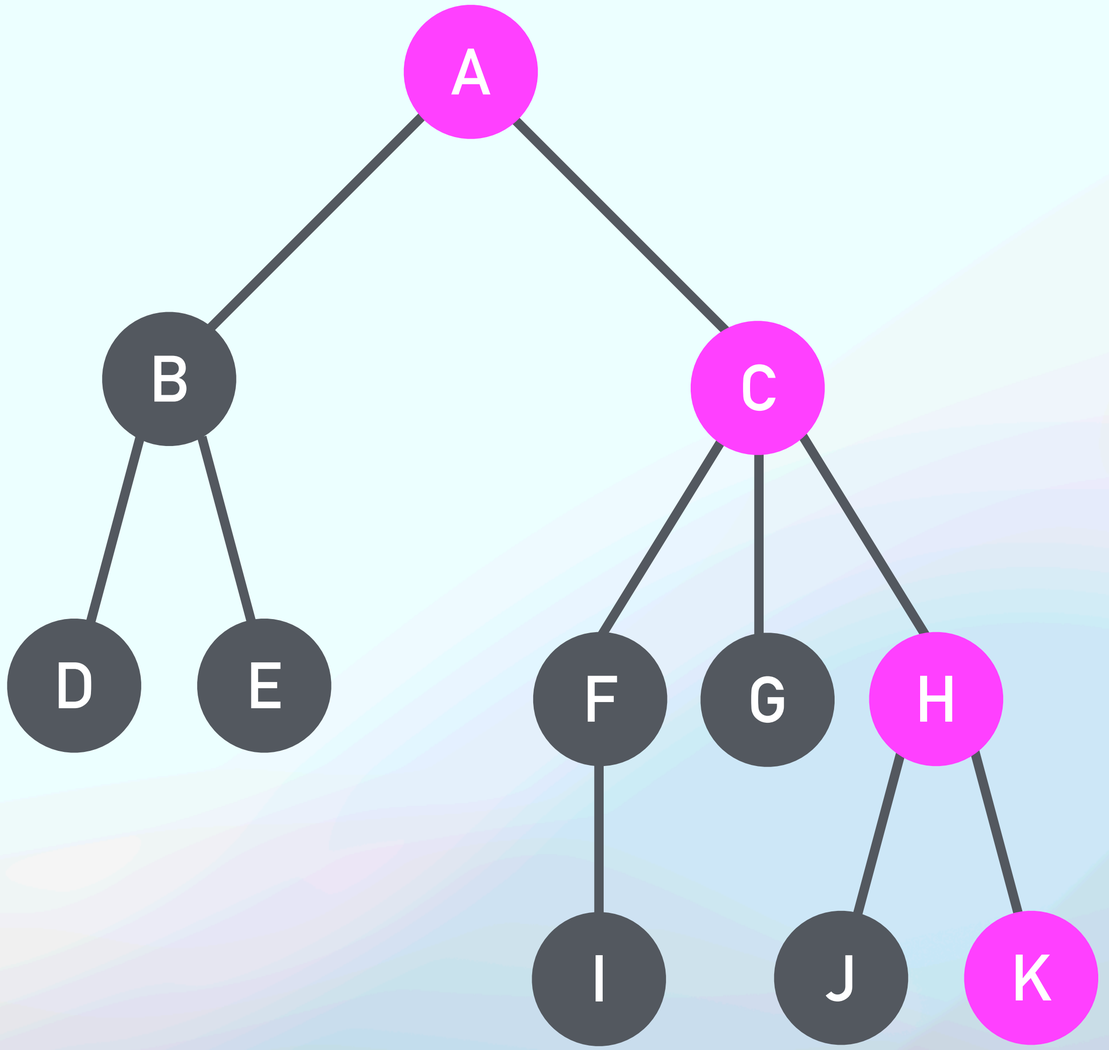


Push with alphabetical order

Depth-First Traversal

Stack

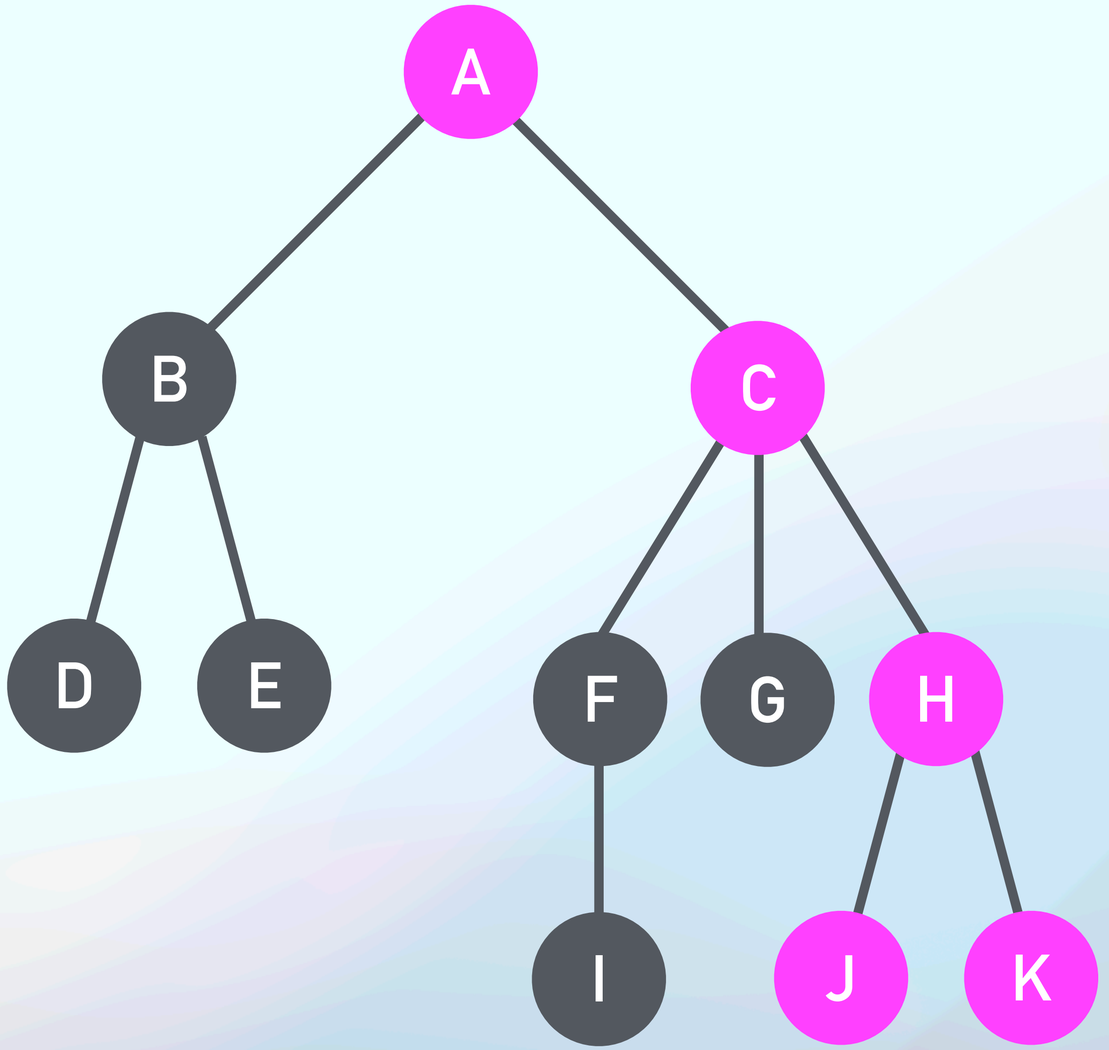




Push with alphabetical order

Depth-First Traversal

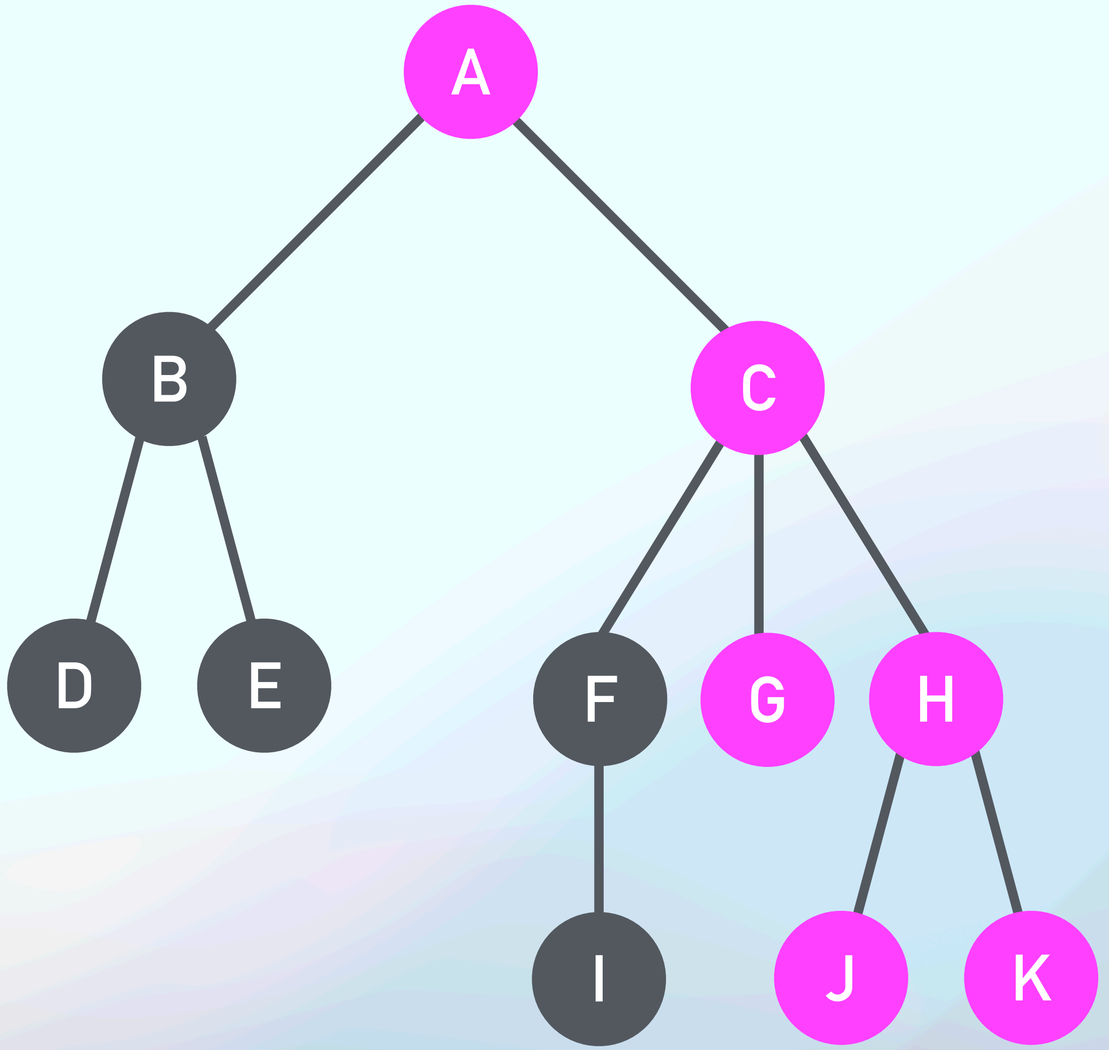
Stack



Push with alphabetical order

Depth-First Traversal

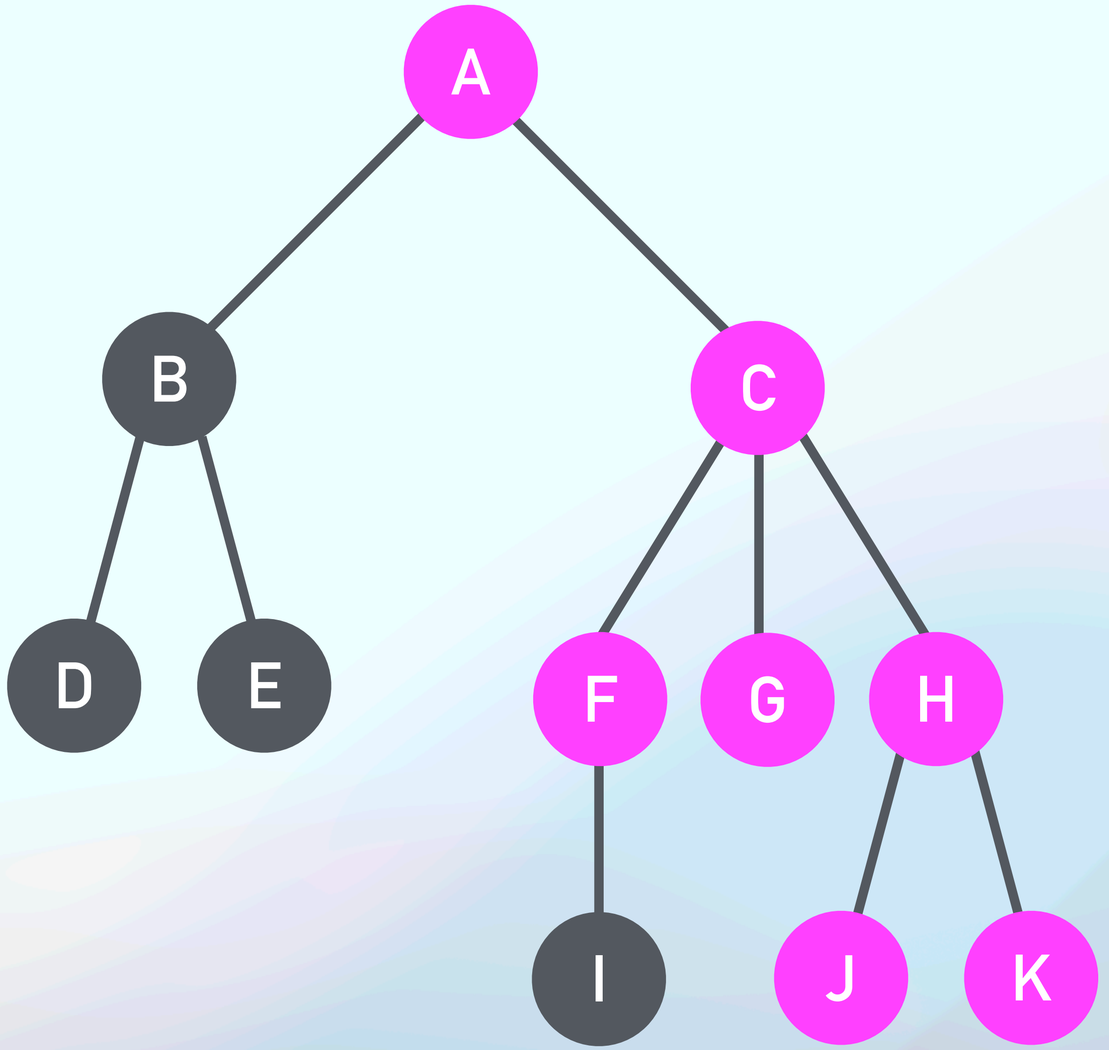
Stack



Push with alphabetical order

Depth-First Traversal

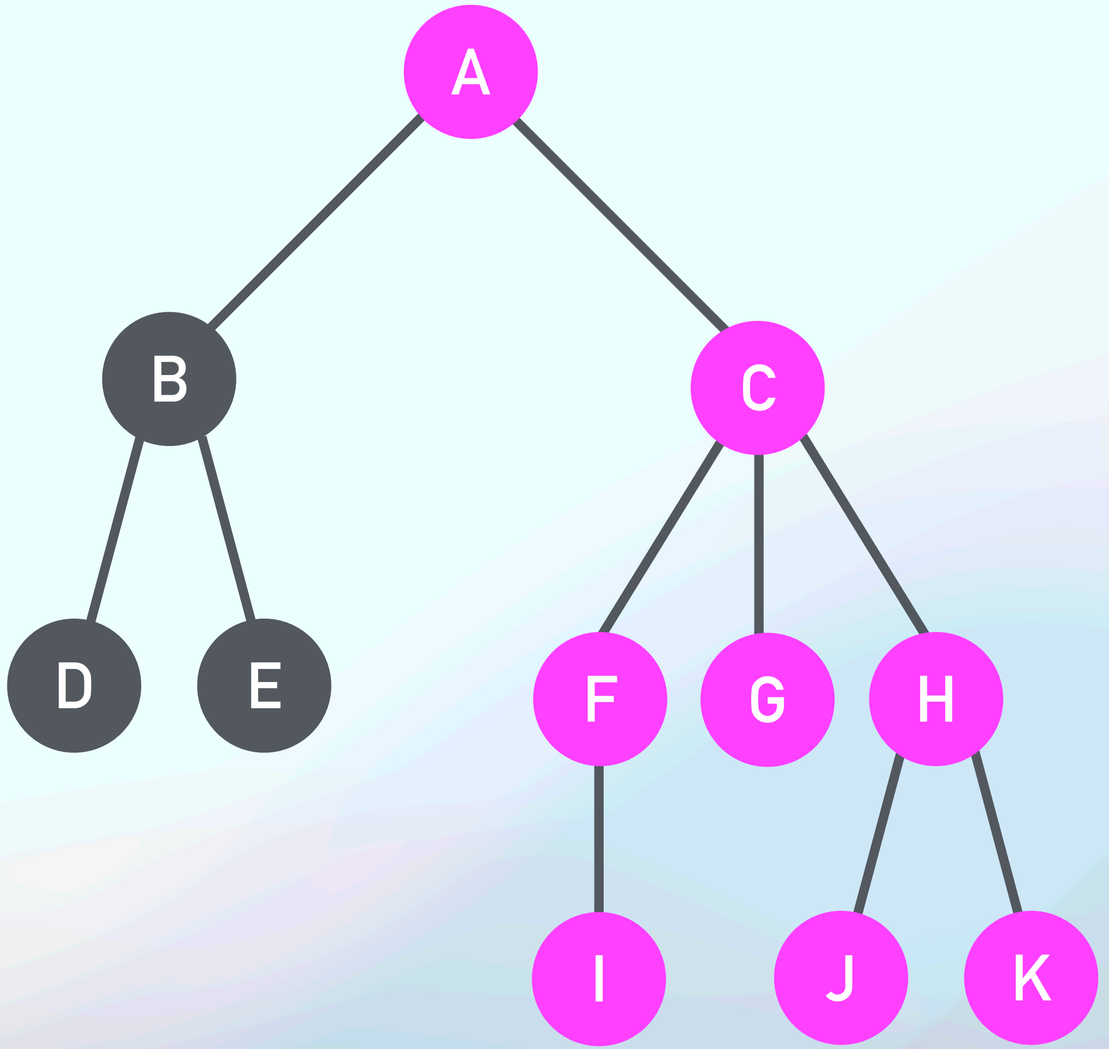
Stack



Push with alphabetical order

Depth-First Traversal

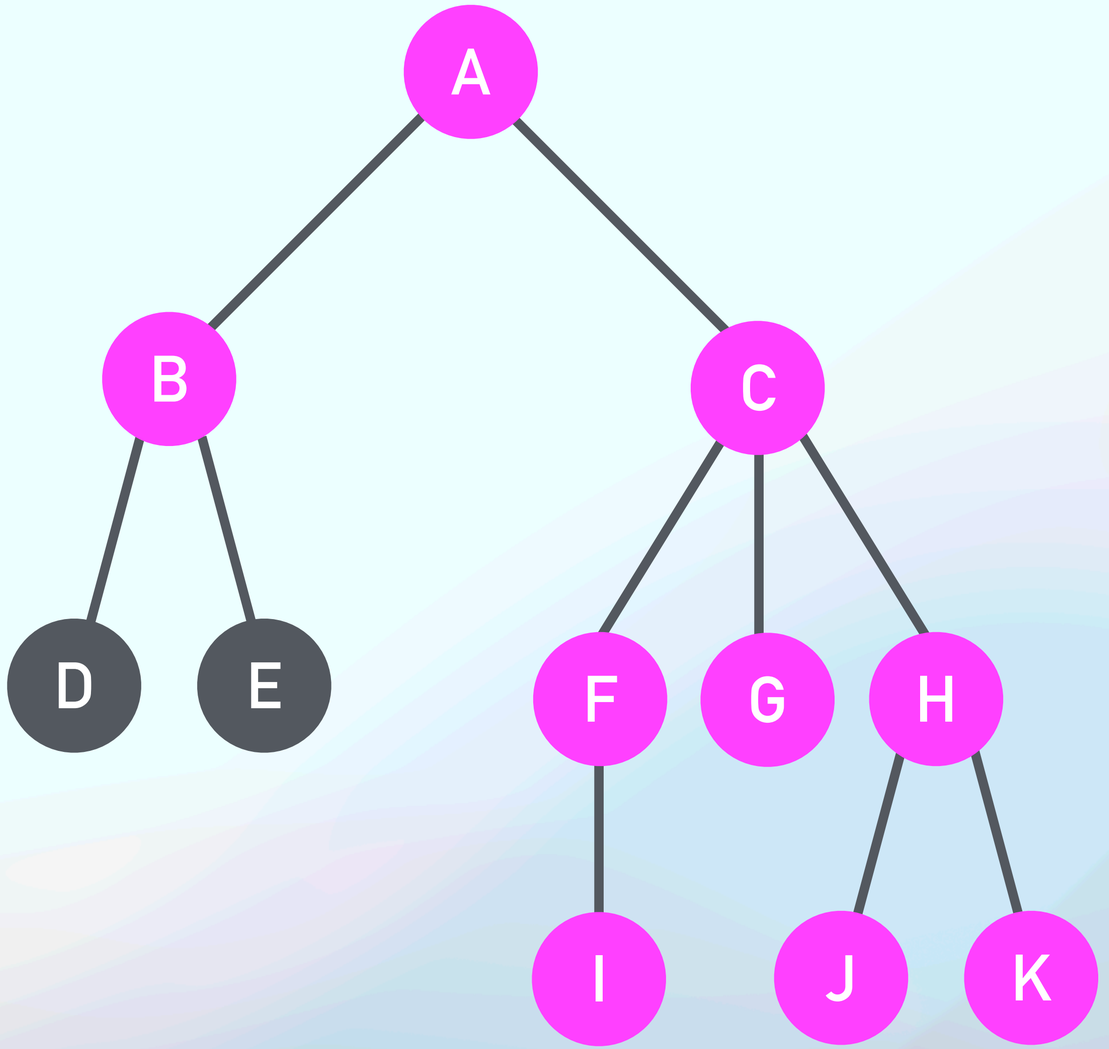
Stack



Push with alphabetical order

Depth-First Traversal

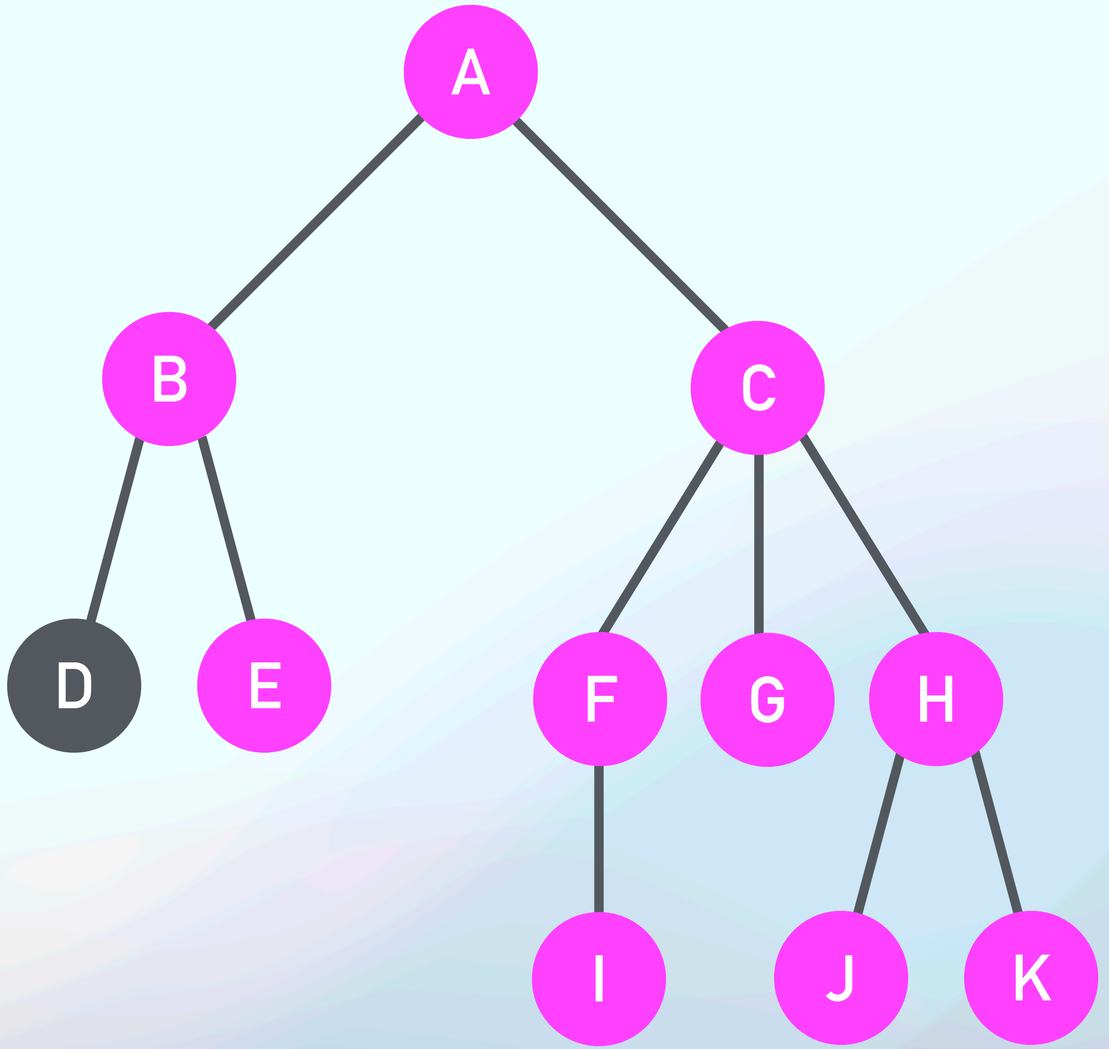
Stack



Push with alphabetical order

Depth-First Traversal

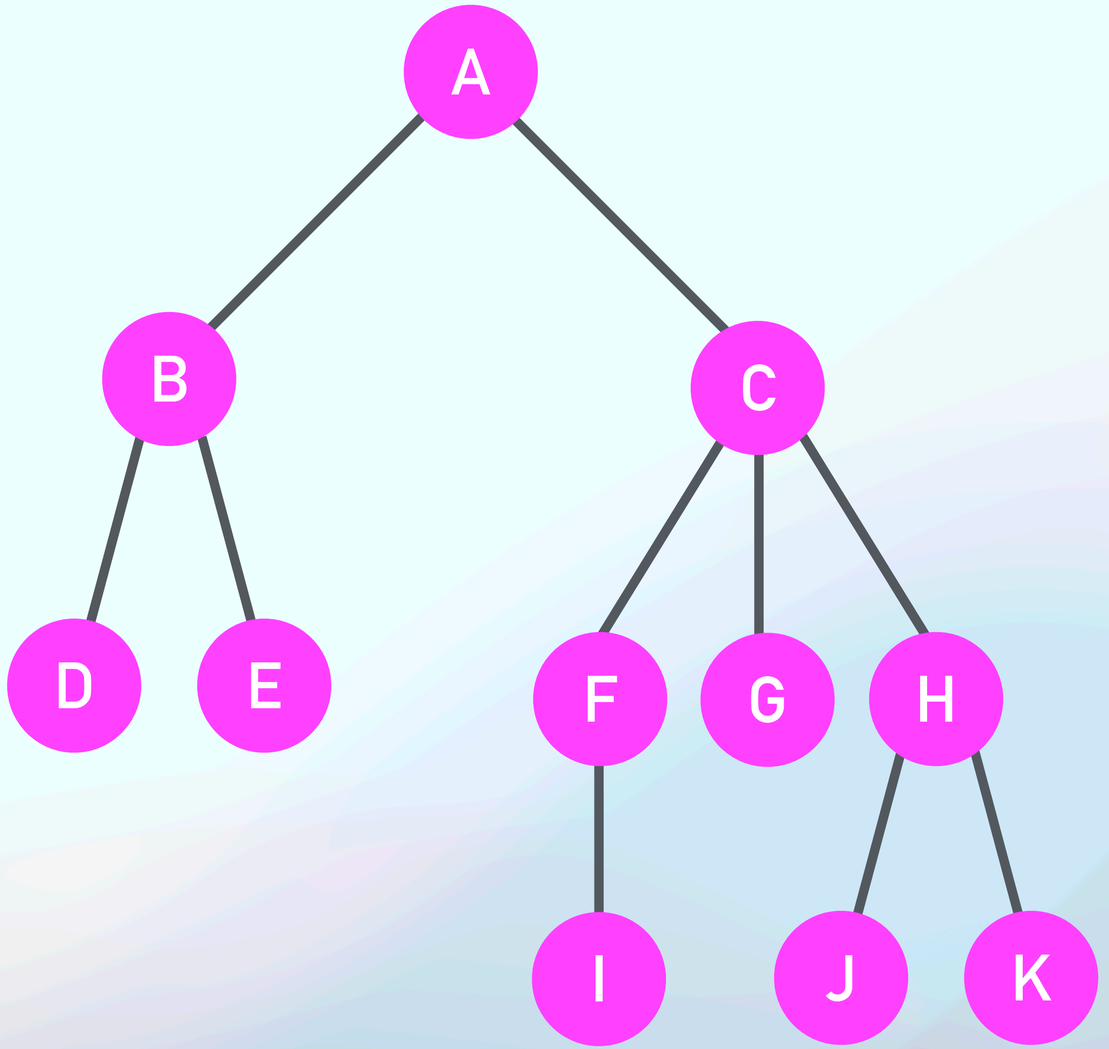
Stack



Push with alphabetical order

Depth-First Traversal

Stack



Push with alphabetical order

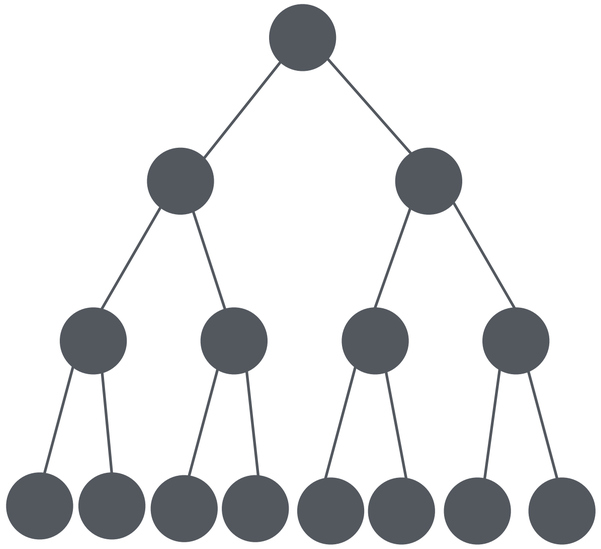
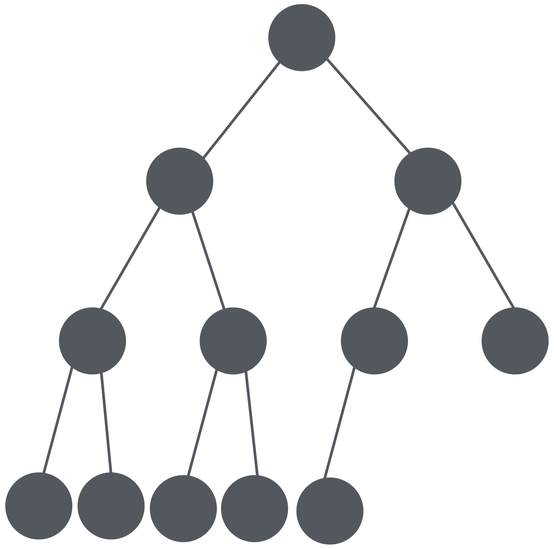
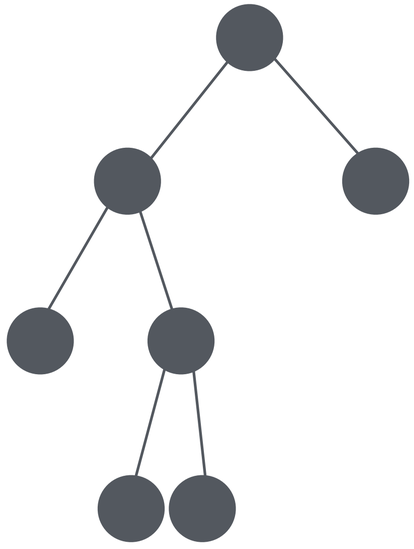
CS101-Quiz5-Review

Key Points

1. Tree
2. Breadth-First and Depth-First Traversal
3. **Binary Tree**

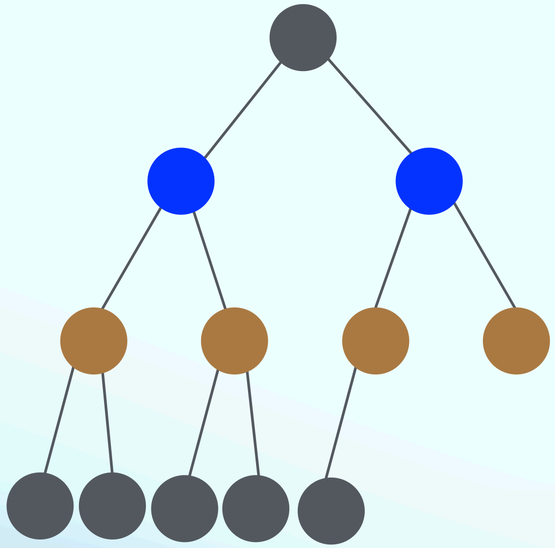
Binary Tree

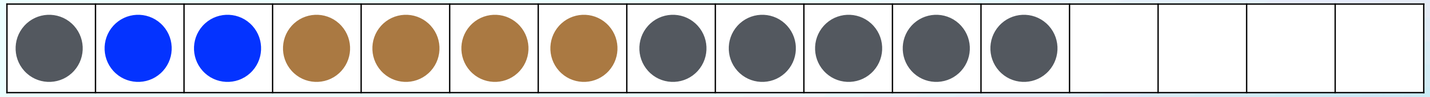
Examples

Perfect Binary Tree	Complete Binary Tree	Full Binary Tree
		
“Perfect”	Breadth-First	Leaf or Full

Binary Tree

Complete Binary Tree — Array Storage





Bina

Comple

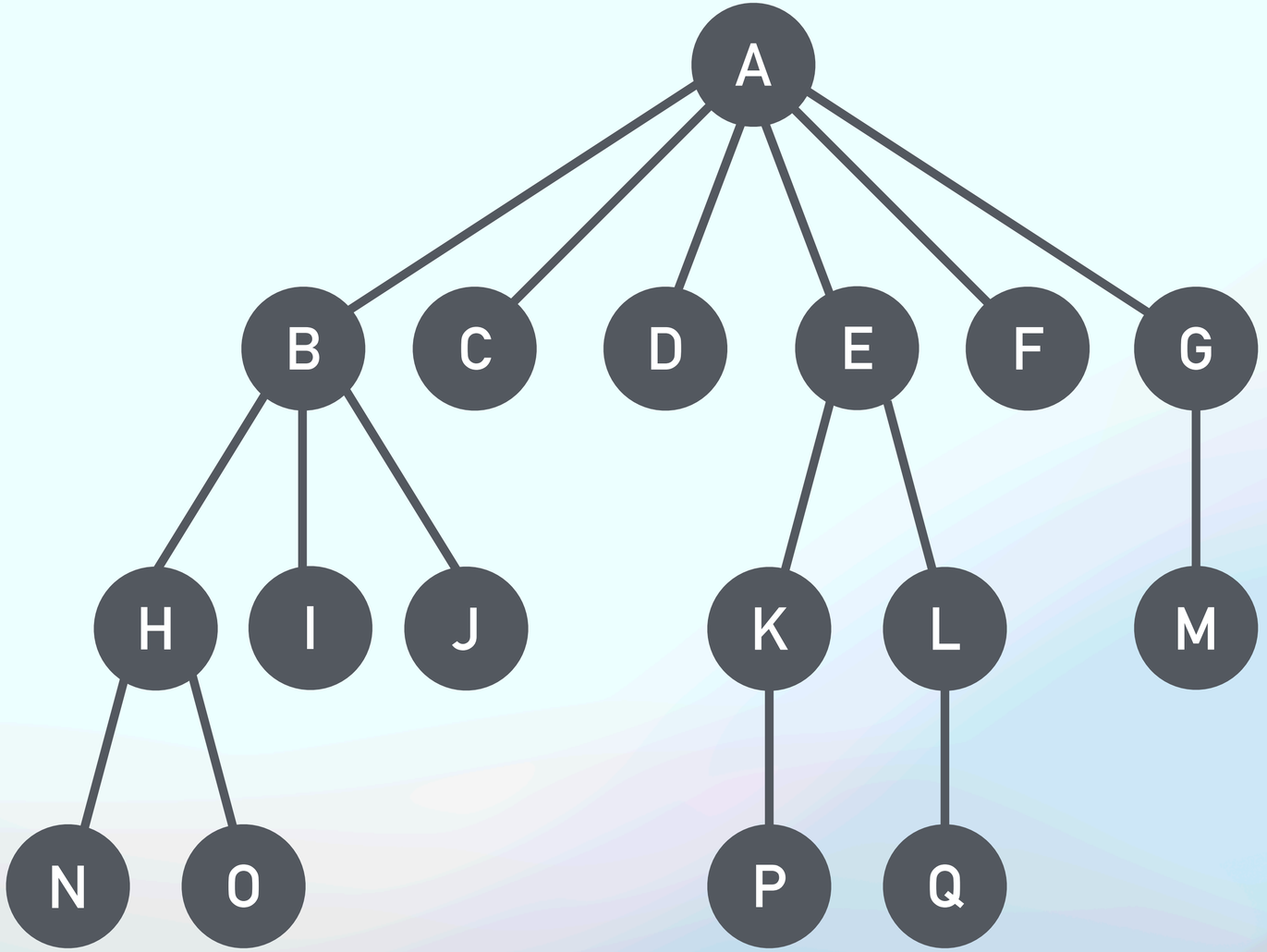
Stora

```
struct Node {
  DataType m_data;
  Node *parent;
  Node *left;
  Node *right;
};

DataType get_data(Node *n) {
  return n->m_data;
}

Node *get_parent(Node *n) {
  return n->parent;
}

Node *get_left(Node *n) {
  return n->left;
}

Node *get_right(Node *n) {
  return n->right;
}
```

```
DataType arr[SIZE];

size_t head = 0;



DataType get_data(size_t idx) {
  return arr[idx];
}

size_t get_parent(size_t idx) {
  return (idx - 1) / 2;
}

size_t get_left(size_t idx) {
  return 2 * idx + 1;
}

size_t get_right(size_t idx) {
  return 2 * idx + 2;
}
```

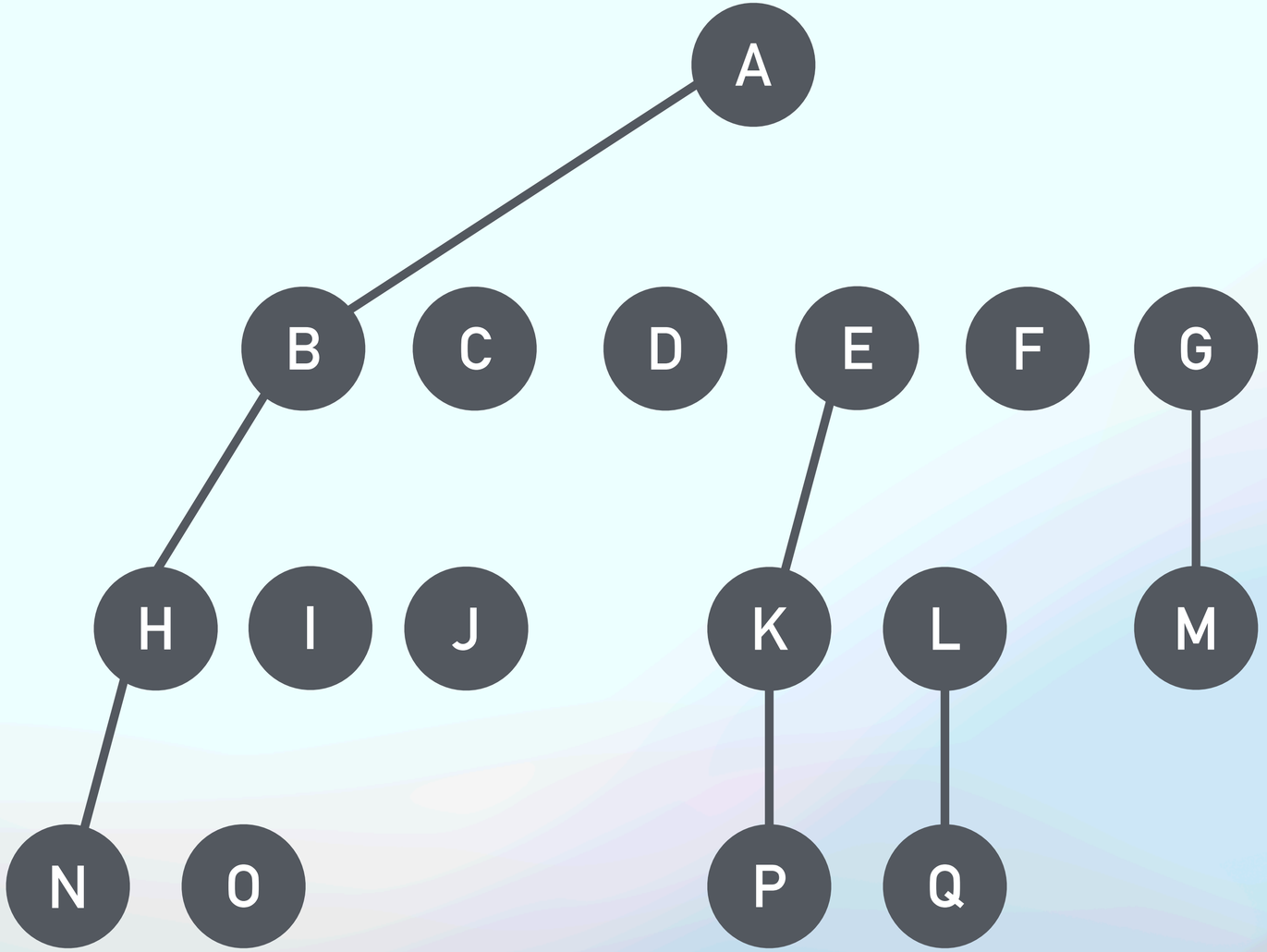
Binary Tree

Left-child right-sibling



Binary Tree

Left-child right-sibling



Binary Tree

Left-child right-sibling