



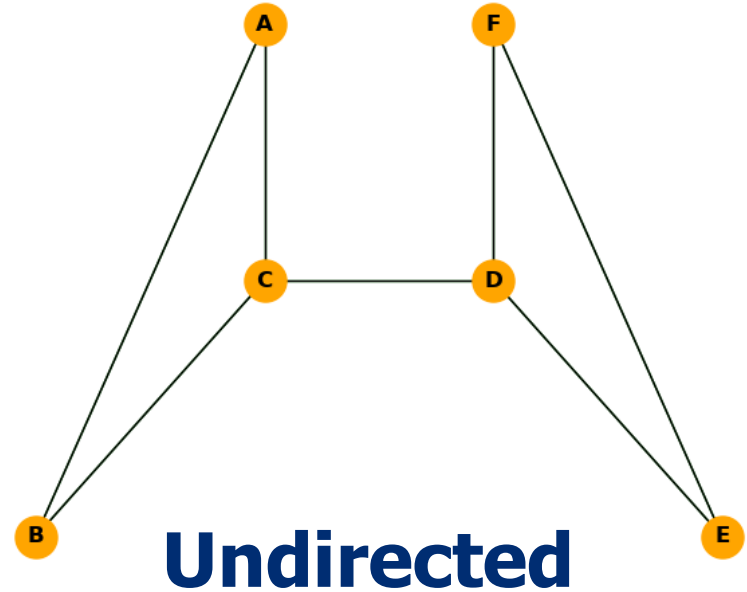
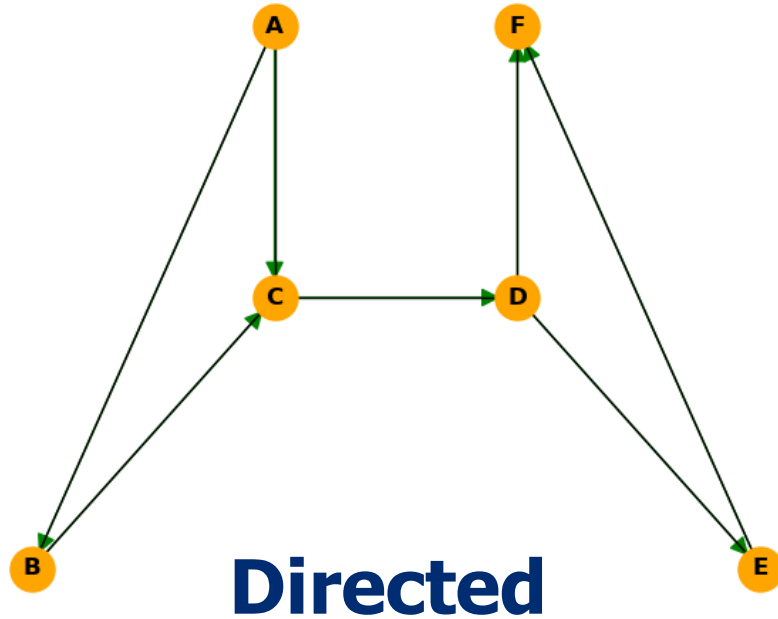
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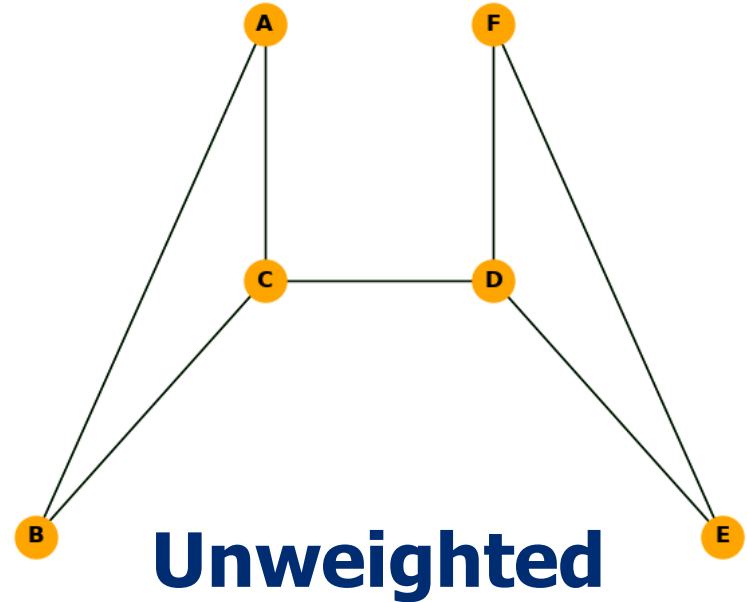
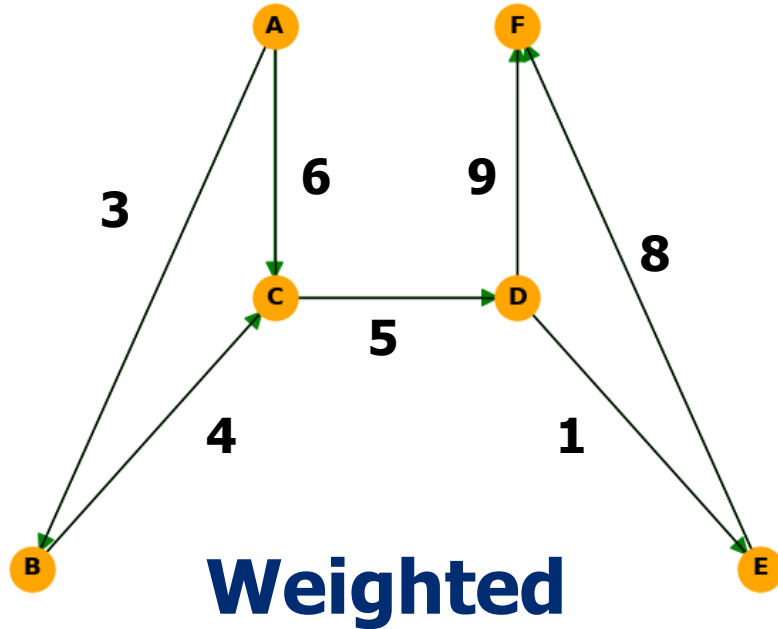
Algorithms for Data Science

Graph Algorithms: Mathematical Foundations

Graph Foundations

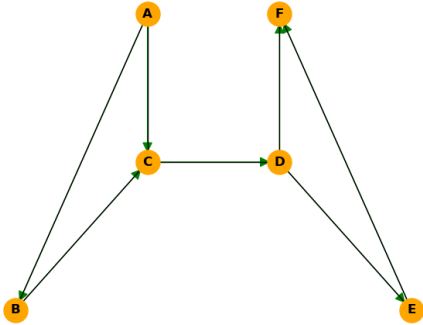


Graph Foundations



Graph Representations

Graphical



Adjacency Matrix

	A	B	C	D	E	F
A	0	1	1	0	0	0
B	0	0	1	0	0	0
C	0	0	0	1	0	0
D	0	0	0	0	1	1
E	0	0	0	0	0	1
F	0	0	0	0	0	0

Adjacency List

A -> B, C

B -> C

C -> D

D -> E, F

E -> F

F -> (No connections)

Complexity

Operation	Adjacency List $O()$	Adjacency Matrix $O()$
Edge Lookup	$O(V)$	$O(1)$
Graph Traversal (BFS/DFS)	$O(V + E)$	$O(V^2)$
Adding an Edge	$O(1)$	$O(1)$
Removing an Edge	$O(V)$	$O(1)$
Finding All Neighbors	$O(\text{degree}(V))$	$O(V)$
Space Complexity	$O(V + E)$	$O(V^2)$



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