

Graph Traversal Worksheet

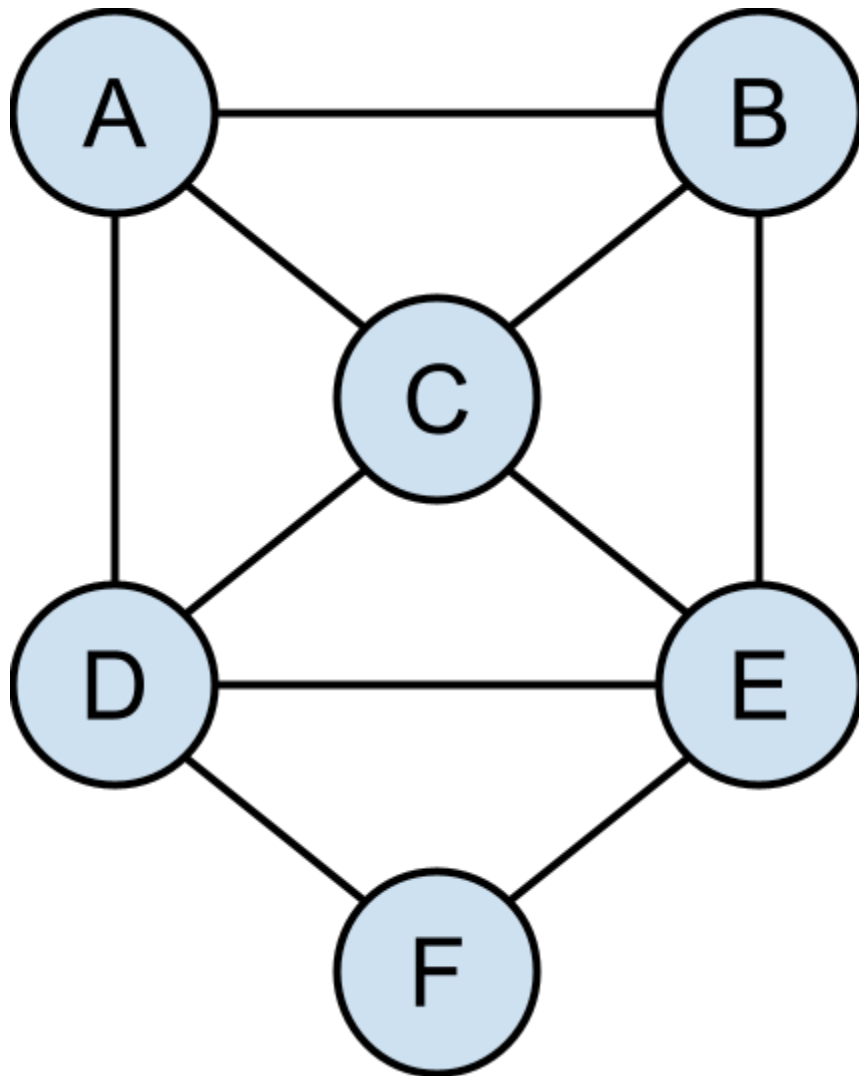
Arjun Chandrasekhar

Overview

1. For each problem, you are given a specific graph representation (either an image, an adjacency matrix, or an adjacency list).
2. Perform both **Breadth-First Search (BFS)** and **Depth-First Search (DFS)** starting from the specified node.
3. **At each step**, write down the current state of the algorithm (including the state of all variables used in the algorithm: queue, visited nodes, stack, etc.).
4. For BFS, **show the state of the queue** and **visited nodes**.
5. For DFS, **show the state of the stack** and **visited nodes**.

Example 1 (Graph Image)

Examine the following graph



Start Node: A

Breadth-First Search (BFS)

Perform BFS starting from node A. Show the state of the queue and visited nodes at each step.

1. Initialize the BFS with an empty queue and an empty visited set.
2. Queue the start node (A).
3. Continue the search until the queue is empty.

Depth-First Search (DFS)

Perform DFS starting from node A. Show the state of the stack and visited nodes at each step.

1. Initialize the DFS with an empty stack and an empty visited set.
2. Push the start node (A) onto the stack.
3. Continue the search until the stack is empty.

Example 2 (Adjacency Matrix)

Consider the following adjacency matrix. **Do not draw the graph!** The purpose of this exercise is to practice conducting a graph traversal when you have access to the same information in the same format the the computer has it:

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

Start Node: C

Breadth-First Search (BFS)

Perform BFS starting from node C. Show the state of the queue and visited nodes at each step.

1. Initialize the BFS with an empty queue and an empty visited set.
2. Queue the start node (C).
3. Continue the search until the queue is empty.

Depth-First Search (DFS)

Perform DFS starting from node C. Show the state of the stack and visited nodes at each step.

1. Initialize the DFS with an empty stack and an empty visited set.
2. Push the start node (C) onto the stack.
3. Continue the search until the stack is empty.

Example 3 (Adjacency List)

Consider the following adjacency list. **Do not draw the graph!** The purpose of this exercise is to practice conducting a graph traversal when you have access to the same information in the same format the the computer has it:

- **A** $\rightarrow$ B, D
- **B** $\rightarrow$ A, C
- **C** $\rightarrow$ B, D, E
- **D** $\rightarrow$ A, C, E, F
- **E** $\rightarrow$ C, D
- **F** $\rightarrow$ D

Start Node: B

Breadth-First Search (BFS)

Perform BFS starting from node B. Show the state of the queue and visited nodes at each step.

1. Initialize the BFS with an empty queue and an empty visited set.
2. Queue the start node (B).
3. Continue the search until the queue is empty.

Depth-First Search (DFS)

Perform DFS starting from node B. Show the state of the stack and visited nodes at each step.

1. Initialize the DFS with an empty stack and an empty visited set.
2. Push the start node (B) onto the stack.
3. Continue the search until the stack is empty.