Graph algorithms

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- Denoted by $G(E, V)$

Graph example

Example of a graph. Graph consists of nodes connected by lines.

Examples of graph algorithms

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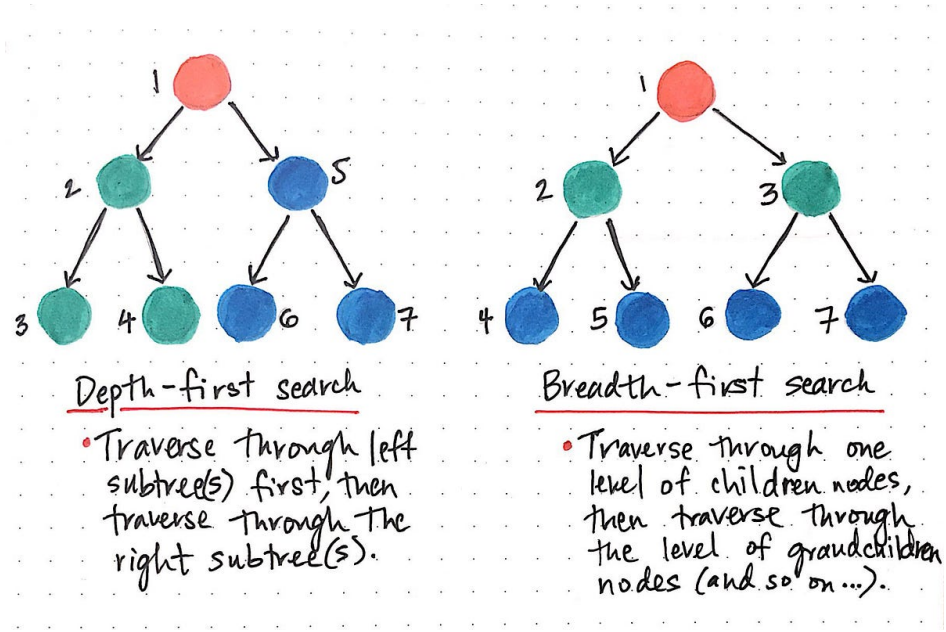
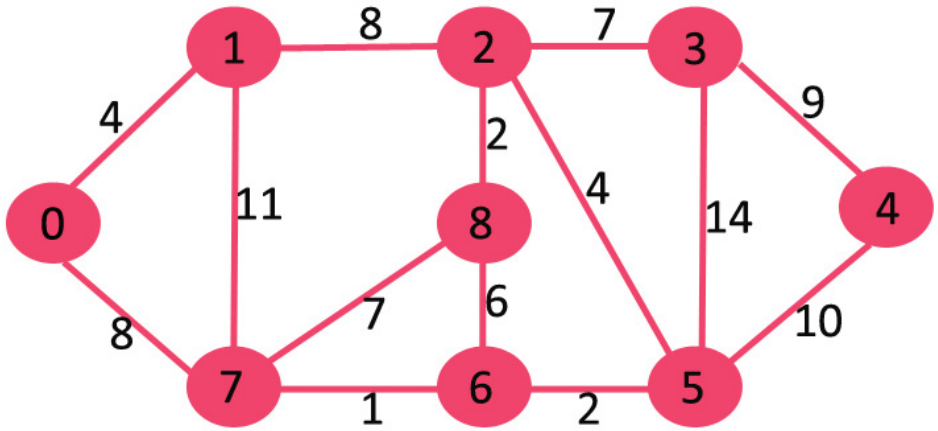


Depth-first and breadth-first searches visualized

Dijkstra's algorithm

- Used in weighted graphs
- Finds the shortest path in between nodes



Example of a weighted graph

Complexity

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- Where E is the number of edges and V is the number of vertices

Pseudocode

```
   Input: G,V
   Output: distance[ ], previous[ ]
1: foreach vertex V in G do
2:     distance[V] ← inf
3:     previous[V] ← null
4:     if V ≠ S then
5:         add V to Priority Queue Q
6:     end if
7:     distance[S] ← 0
8: end foreach
9: while Q is not empty do
10:    U ← Extract MIN from Q
11:    foreach unvisited neighbour V of U do
12:        tempDistance ←
           distance[u] + edge_weight(U, V)
13:        if tempDistance < distance[V] then
14:            distance[V] ← tempDistance
15:            previous[V] ← U
16:        end if
17:    end foreach
18: end while
19: return distance[ ], previous [ ]
```

Sources

- https://towardsdatascience.com/10-graph-algorithms-visually-explained-e57faa1336f3
- https://www.programiz.com/dsa/dijkstra-algorithm
- https://www.baeldung.com/cs/dijkstra-time-complexity
- https://www.geeksforgeeks.org/graph-data-structure-and-algorithms/

Thank you for your attention