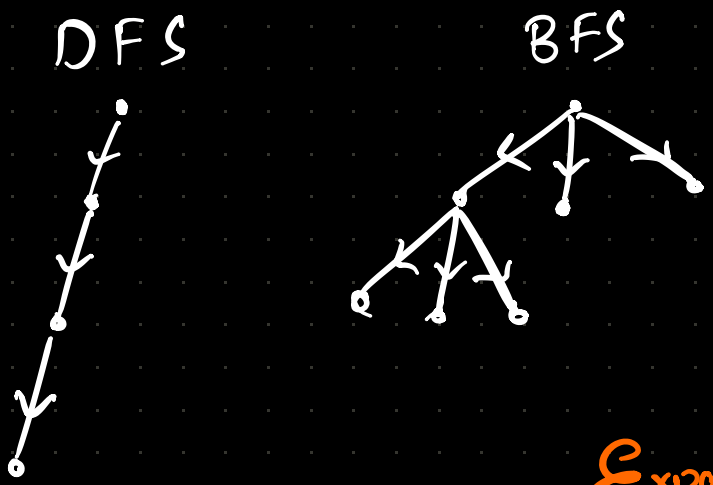
Breadth-First Search (BFS)



The search tree is built level-by-level starting from the root.

Expand the vertex:

evaluating all the neighbors of the vertex at once. This ACTION is called "expanding the vertex."

Tree Edges:

(visited, non-visited)

Non-Tree Edges:

(visited, visited)

* Since the vertices are explored level-by-level this is a LEVEL-ORDERED TRAVERSAL, and a queue is the datastructure used to store the neighbors of each vertex.

* QUEUE Contains the vertices at a particular level.

u —> $u.color$: {white, Gray, Black}

$u.d$: 'distance' from root.

'No. of edges' from s to u in BFS Tree.

(level no.) Root - level = 0 //

BFS (G, s)

① For each $u \in V - \{s\}$

$u.color = White;$

$u.d = \infty;$

$u.p = NULL;$

② $s.color = Gray;$

$s.d = 0;$

$s.p = NULL;$

③ Enqueue (Q, s) { insert the start vertex s in Q }

while $(Q \neq \phi)$

u = Dequeue (Q)

For each $v \in Adj(u)$

if $(v.color == White)$

$v.color = Gray$

$v.d = v.d + 1$

$v.p = u$

Enqueue (Q, v)

u.color = Black

$\Rightarrow u = p.v$

u is the parent of v in the BFS Tree

* The p attribute in each vertex will form the BFS Tree.