BFS

0. Label the starting vertex V_0 as 0.
1. Let $\{1, \ldots, k\}$ be the set of assigned labels.
2. Find the vertex with the smallest label such that it has an unlabeled neighbor. Label the neighbor $k + 1$.

DFS

0. Label the starting vertex V_0 as 0.
1. Let $\{1, \ldots, k\}$ be the set of assigned labels.
2. Find the vertex with the *largest* label such that it has an unlabeled neighbor. Label the neighbor $k + 1$.

Dijkstra's Algorithm 1

Given a directed graph $G = (V, E)$ where there is a length d_{ij} on each arc (directed edge) from vertex i to vertex j, the assumptions are:

1. $d_{ij} > 0$ for all i, j
2. $d_{ij} \neq d_{ji}$ for some i, j
3. $d_{ij} + d_{jk} \leqq d_{ij}$ for all i, j, k

Dijkstra's Algorithm 2

Properties of paths:

1. The length of a path is at least the length of its subpaths:

$$|\text{Path}| \geq |\text{Subpath}|.$$

2. Given a shortest path between two vertices, any subpath is also a shortest path.
3. Let P_k be the number of arcs (directed egdes) from the starting vertex V_0 to its k^{th} nearest vertex. Then P_k is at most k.

Dijkstra's Algorithm 3

The algorithm:

0. Vertex V_0 is initialized with label ${l_0}^* = 0$.

   For all other vertices V_i:

   $l_i = d_{0,i}$ if V_i is a neighbor of V_0

   $l_i = \infty$ otherwise

1. Pick $l_k = \min_i l_i$, then update $l_k \leftarrow {l_k}^*$.

2. Relax vertex k's neighbors:

   $l_i \leftarrow \min[l_i,\ {l_k}^* + d_{k,i}]$.