**Week 10: Network Flow and Linear Programming**

1. **ford\_fulkerson**:

* **Guide**:
  + Ford-Fulkerson works by repeatedly sending flow along paths from source to sink, updating the capacities of forward and backward edges accordingly.
* **Pseudocode**:

FUNCTION ford\_fulkerson(graph, source, sink) SET flow TO 0 SET parent TO ARRAY OF SIZE length(graph) INITIALIZED WITH -1

WHILE bfs(graph, source, sink, parent) RETURNS TRUE  
 SET path\_flow TO INFINITY  
  
 // Find minimum flow in the found path  
 SET s TO sink  
 WHILE s IS NOT EQUAL TO source  
 SET path\_flow TO MINIMUM of path\_flow AND graph[parent[s]][s]  
 SET s TO parent[s]  
  
 // Update residual capacities and reverse edges  
 SET v TO sink  
 WHILE v IS NOT EQUAL TO source  
 SET u TO parent[v]  
 DECREASE graph[u][v] BY path\_flow  
 INCREASE graph[v][u] BY path\_flow  
 SET v TO parent[v]  
  
 INCREASE flow BY path\_flow  
  
RETURN flow

FUNCTION bfs(graph, source, sink, parent) SET visited TO ARRAY OF SIZE length(graph) INITIALIZED WITH FALSE SET queue TO ARRAY CONTAINING source SET visited[source] TO TRUE

WHILE queue IS NOT EMPTY  
 SET u TO first element in queue  
 REMOVE u from queue  
  
 FOR EACH index i AND value val in graph[u]  
 IF visited[i] IS FALSE AND val > 0  
 ADD i TO queue  
 SET visited[i] TO TRUE  
 SET parent[i] TO u  
  
RETURN visited[sink]