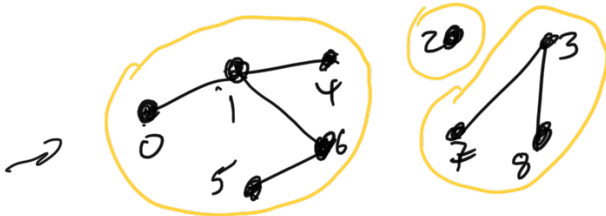


## Lecture 2:

### Connected components + Depth First Search



Connected components:

$[0, 1, 4, 5, 6], [2], [3, 7, 8]$

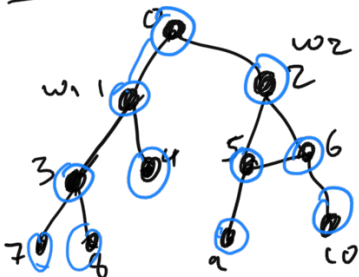
Def: Connected component is a maximal collection of vertices such that any pair can be joined by a path of edges.

Def: A graph  $G$  is connected if it has just one connected component

Q: How do we determine if  $G$  is connected (we'll answer today)

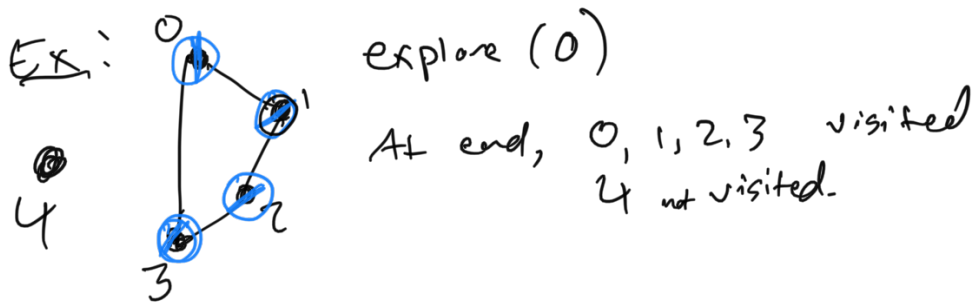
Q: How do we find list of connected components? (Project 3)

Algorithm: Depth-First search/exploration



Pseudocode For Depth First Exploration  
 $0\ 1\ 3\ 7\ 8\ 4\ 2\ 5\ 6\ 11$   
 explore( $v$ ):

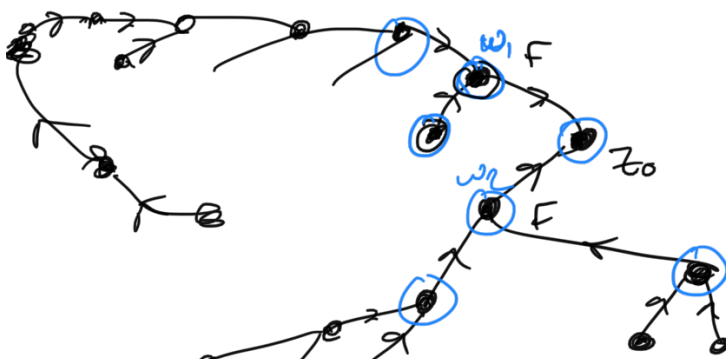
- Label  $v$  as visited.
- Generate a list of neighbours of  $v$ ,  $w_1, w_2, \dots, w_n$
- For each  $w_i$  that has not yet been visited, explore( $w_i$ ) (recursive call)



To implement:

- Decide how to represent Graph (we'll use adjacency matrix)
- Produce a list of neighbours
- Keep track of which vertices have been visited

Ex (Project 2) Iterated Inverse Images



$iim(z_0, N)$ :  
 $iim(w_1, N-1)$   
 $iim(w_2, N-1)$



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