

Lecture 13

CSE 331

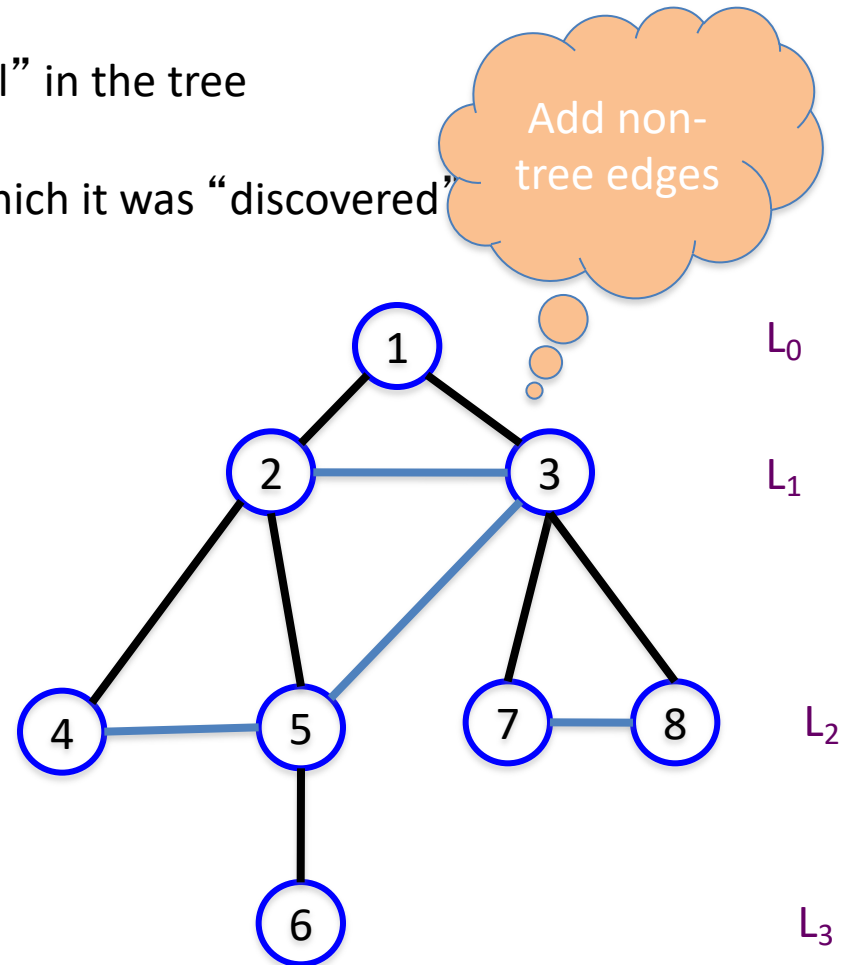
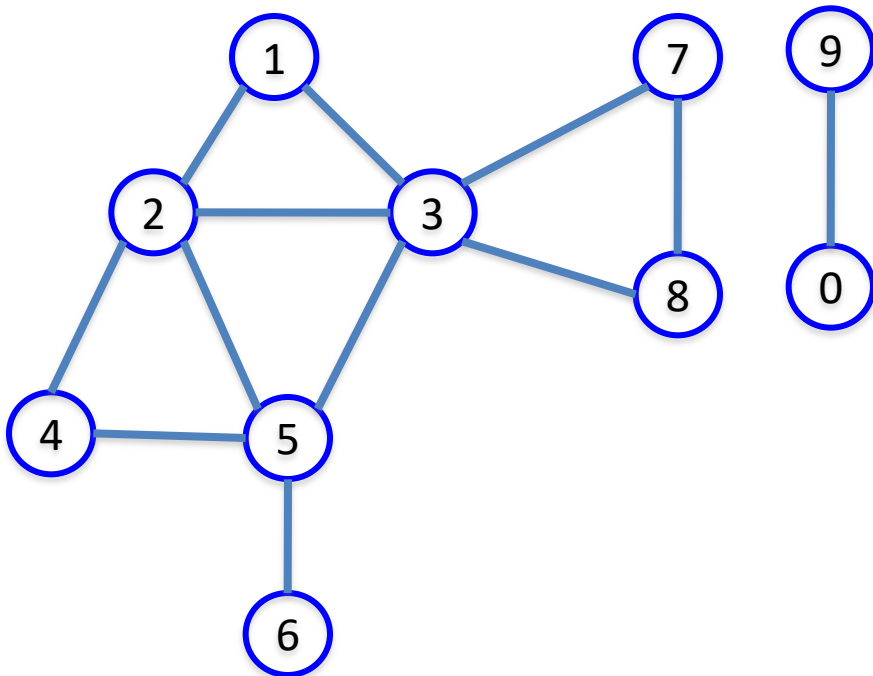
Sep 27, 2023

BFS Tree

BFS naturally defines a tree rooted at s

L_j forms the j th “level” in the tree

u in L_{j+1} is child of v in L_j from which it was “discovered”



Two facts about BFS trees

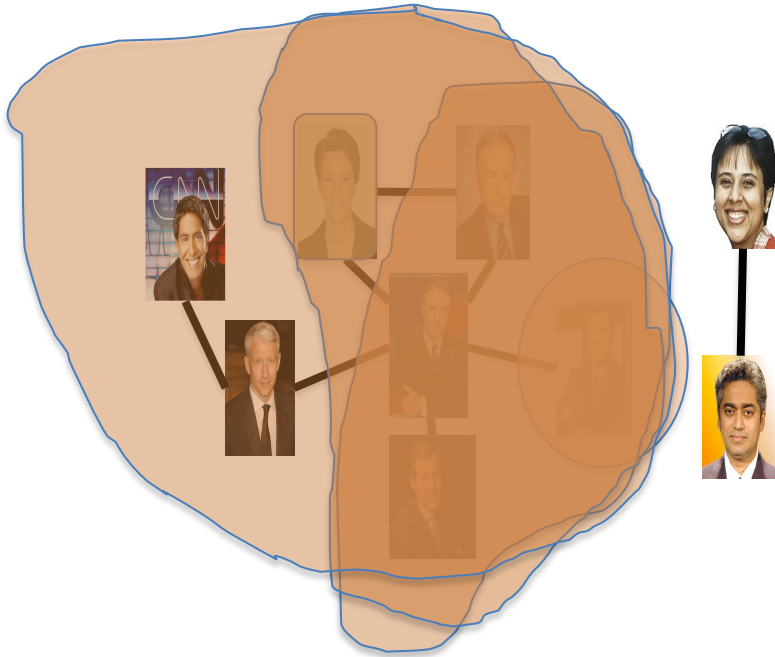
(1) All non-tree edges are in the same or consecutive layer

(2) If u is in L_i then $\text{dist}(s,u) = i$

Rest of today's agenda

Computing Connected component

Computing Connected Component



Explore(s)

Start with $R = \{s\}$

While exists (u,w) edge w not in R and u in R

Add w to R

Output $R^* = R$

BFS (Build layers of vertices)

$L_0 = \{s\}$

Assume L_0, \dots, L_j have been constructed

L_{j+1} set of vertices not chosen yet but are connected to L_j
Stop when new layer is empty

Argue correctness on the board...



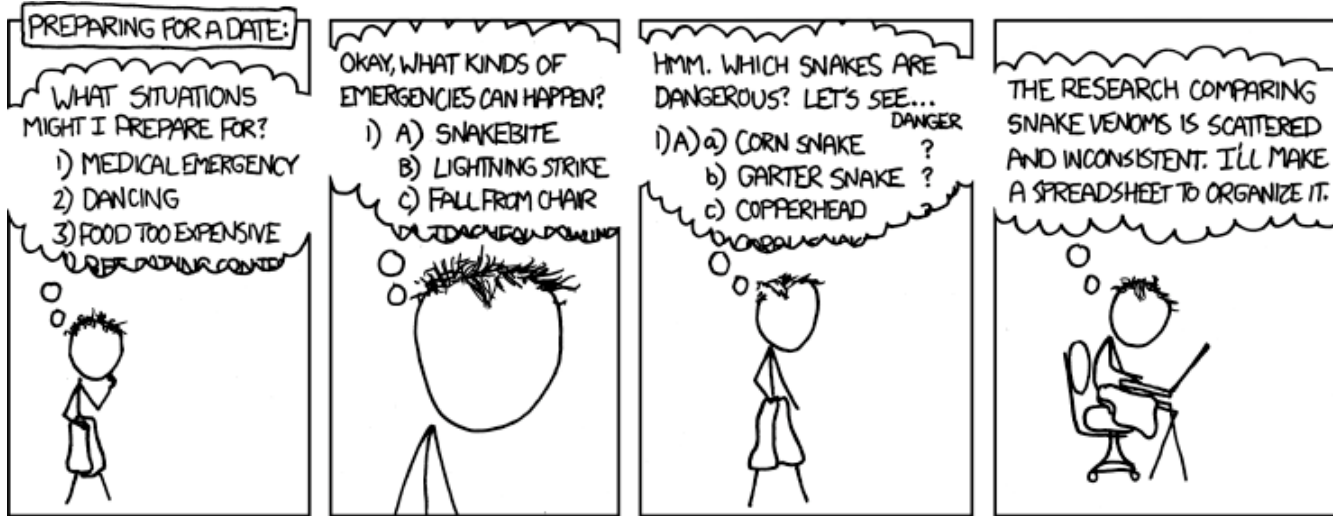
BFS

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search ID: mbcn800

Depth First Search (DFS)



<http://xkcd.com/761/>



I REALLY NEED TO STOP USING DEPTH-FIRST SEARCHES.

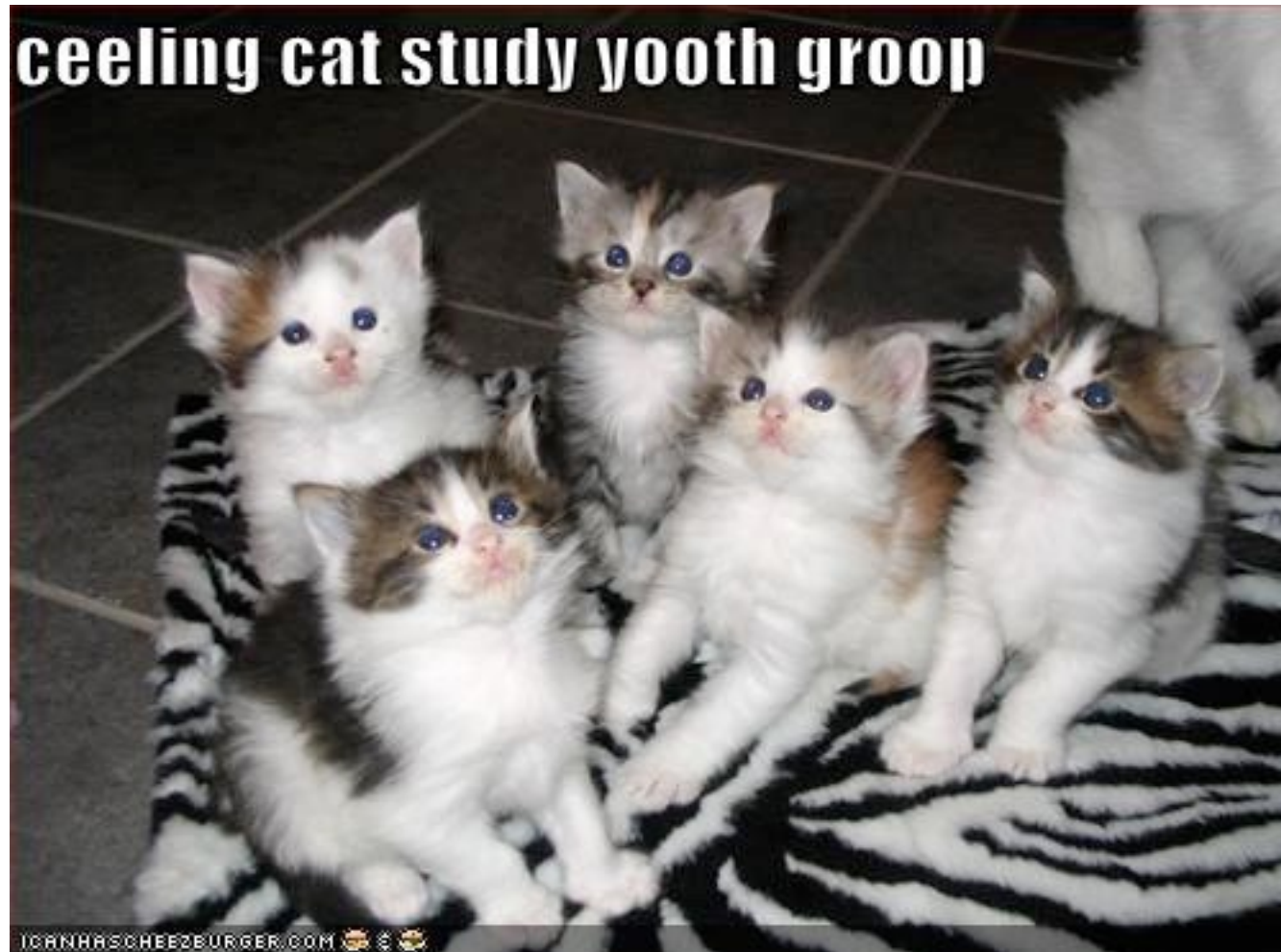
DFS(**u**)

Mark **u** as explored and add **u** to **R**

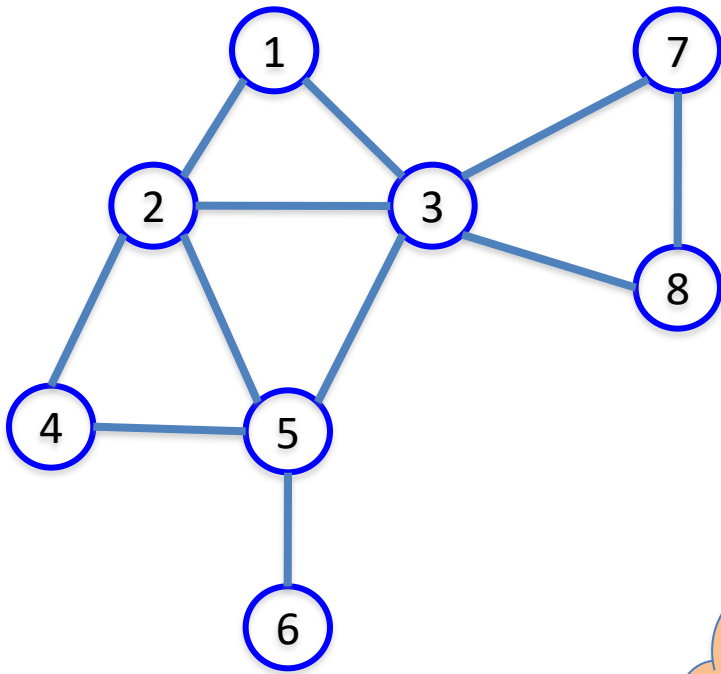
For each edge (**u,v**)

 If **v** is not explored then DFS(**v**)

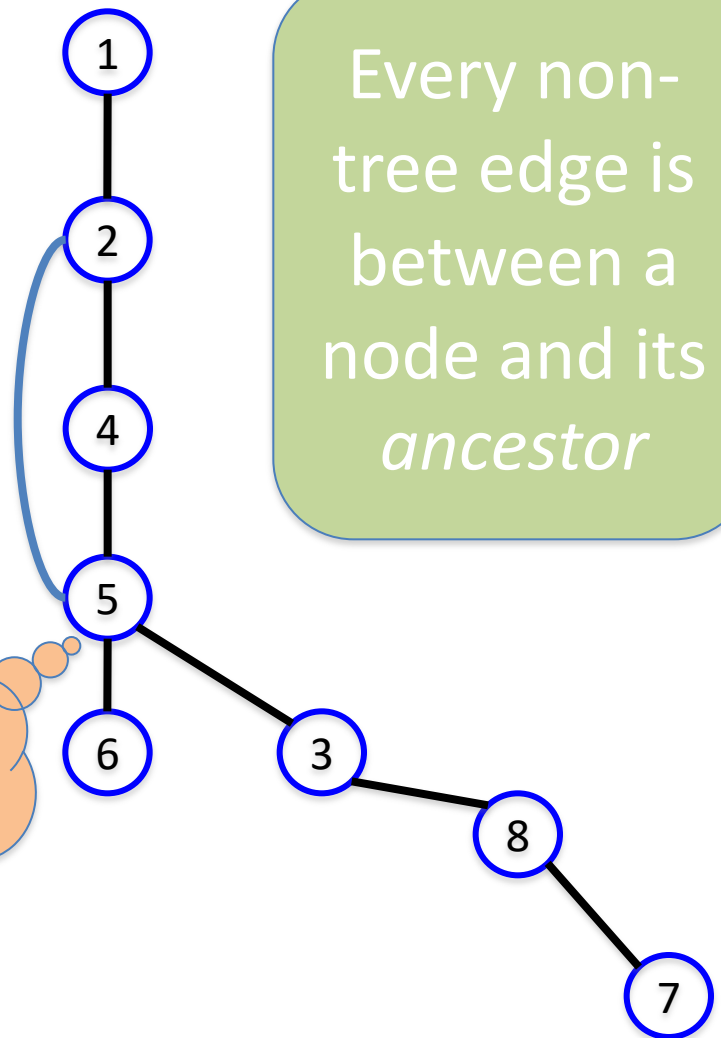
Why is DFS a special case of Explore?



A DFS run

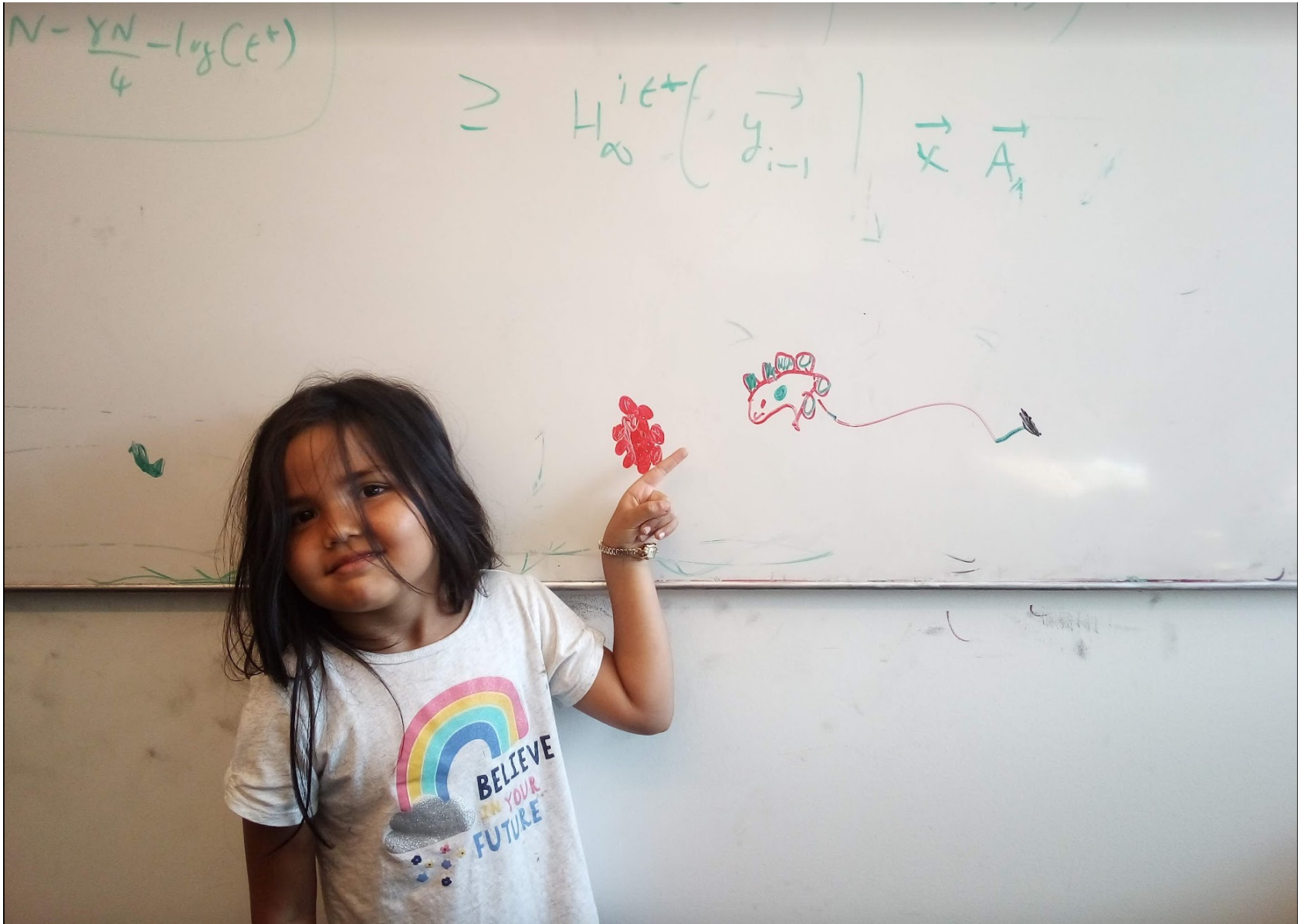


DFS tree



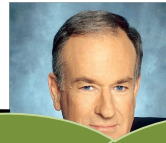
Every non-tree edge is between a node and its *ancestor*

Questions/Comments?



Connected components are disjoint

Either connected components of s and t are the same or are disjoint

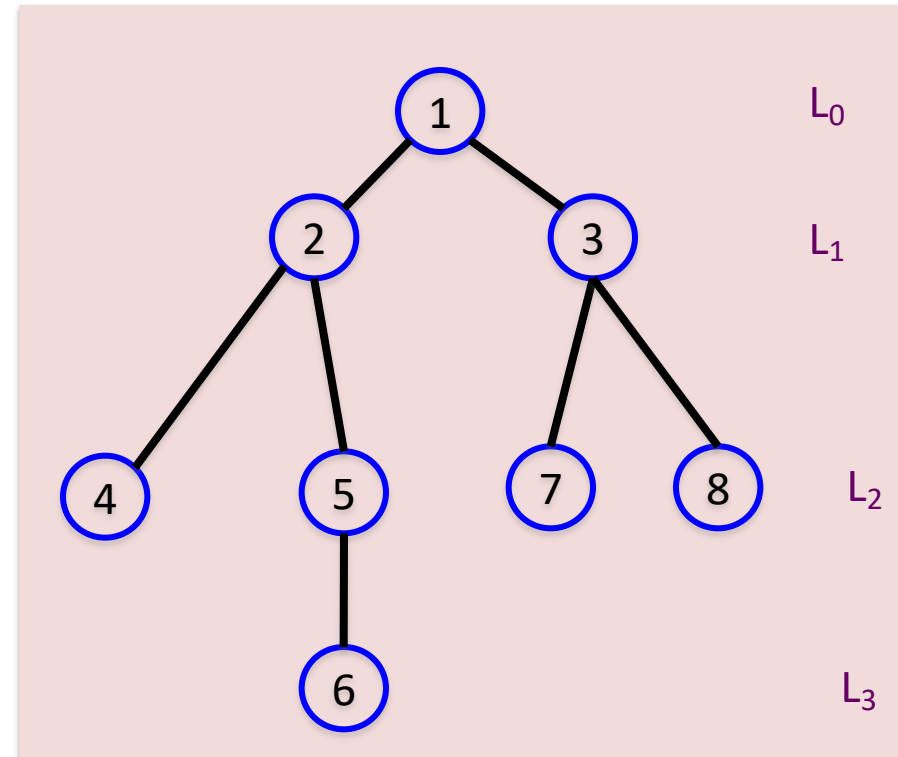
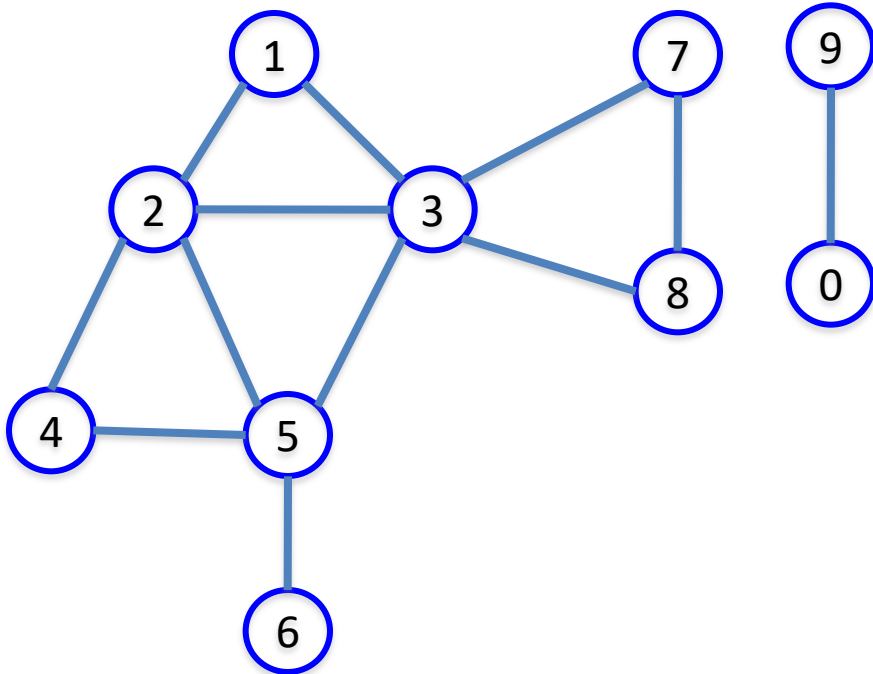
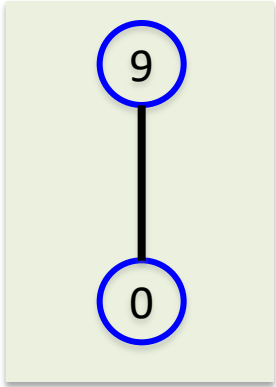


Algorithm to compute
ALL the connected
components?

Can run Explore
instead of BFS

Run BFS on some node s . Then run BFS on t that is not connected to s

Computing all CCs



Questions/Comments?

