Lecture 12

CSE 331

Sep 27, 2021

Please have a face mask on

Masking requirement

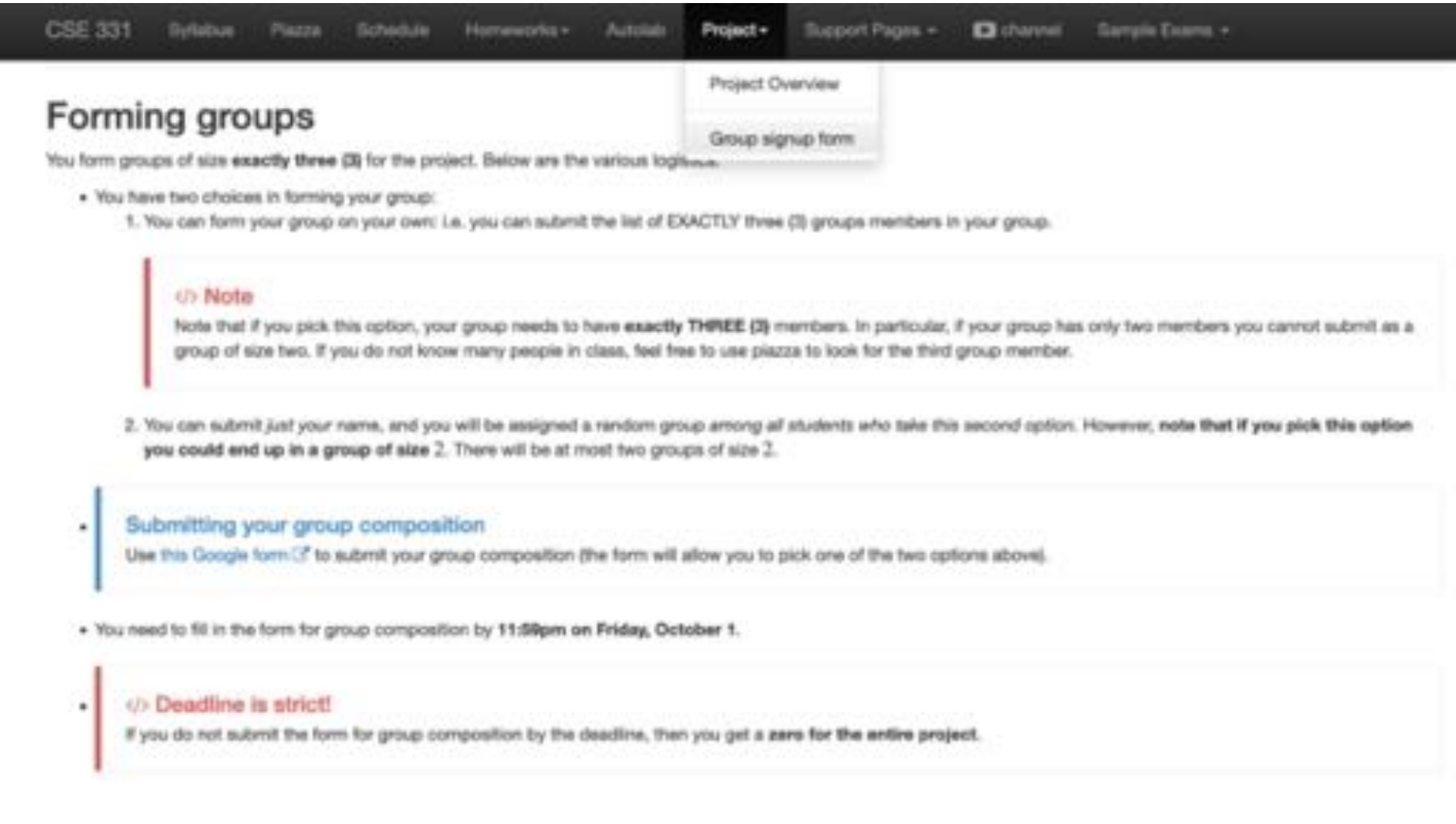
UB requires all students, employees and visitors – regardless of their vaccination status – to wear face coverings while inside campus buildings.

https://www.buffalo.edu/coronavirus/health-and-safety/health-safety-guidelines.html

If you need it, ask for help

Project groups due FRIDAY!

Deadline: Friday, Oct 1, 11:59pm



Upcoming quiz/exams

Quiz 1 Friday NEXT week

Mid-term 1 Monday in TWO weeks

Mid-term 2 Wed two days after Mid-term 1

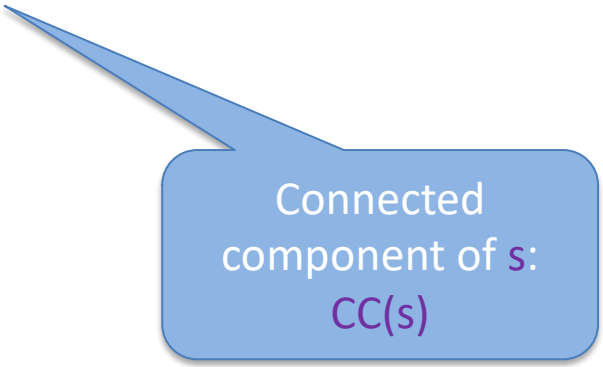
Piazza post (+sample mid-terms) up by Thur. on preparing for mid-terms

Questions?

Connectivity Problem

Input: Graph G = (V,E) and s in V

Output: All t connected to s in G



Breadth First Search (BFS)

Build layers of vertices connected to s

$L_0 = \{s\}$

Assume $L_0,..,L_j$ have been constructed

L_{j+1} set of vertices not chosen yet but are connected to L_j

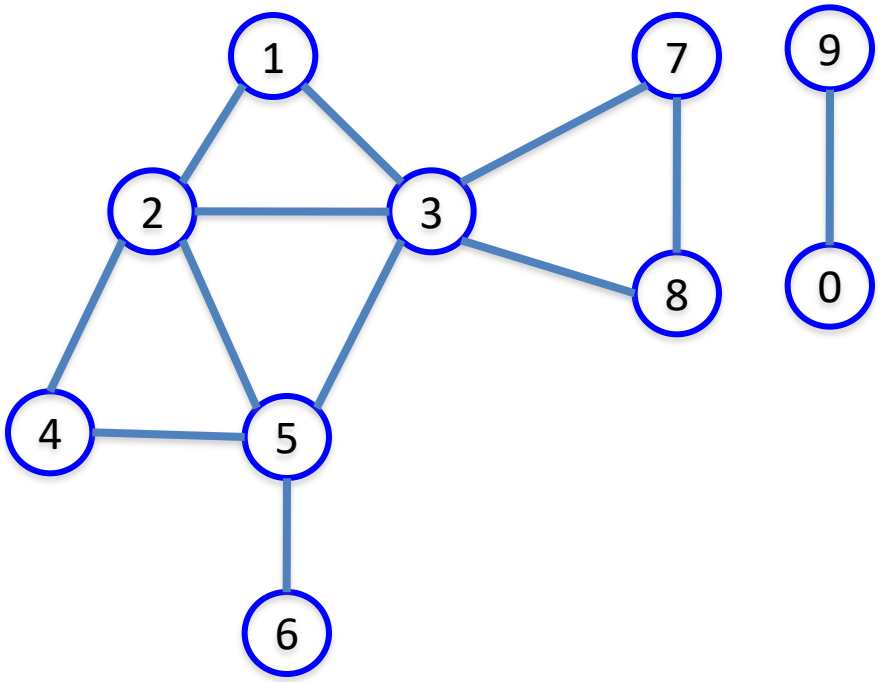
Stop when new layer is empty

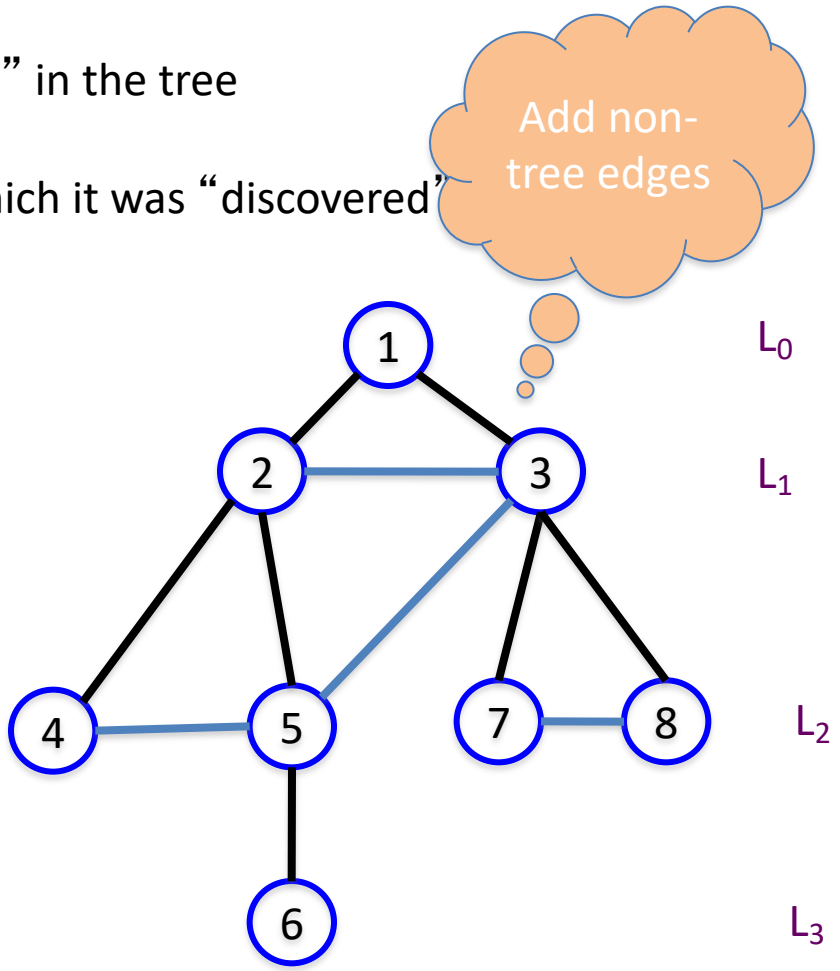
BFS Tree

BFS naturally defines a tree rooted at s

L_j forms the jth "level" in the tree

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



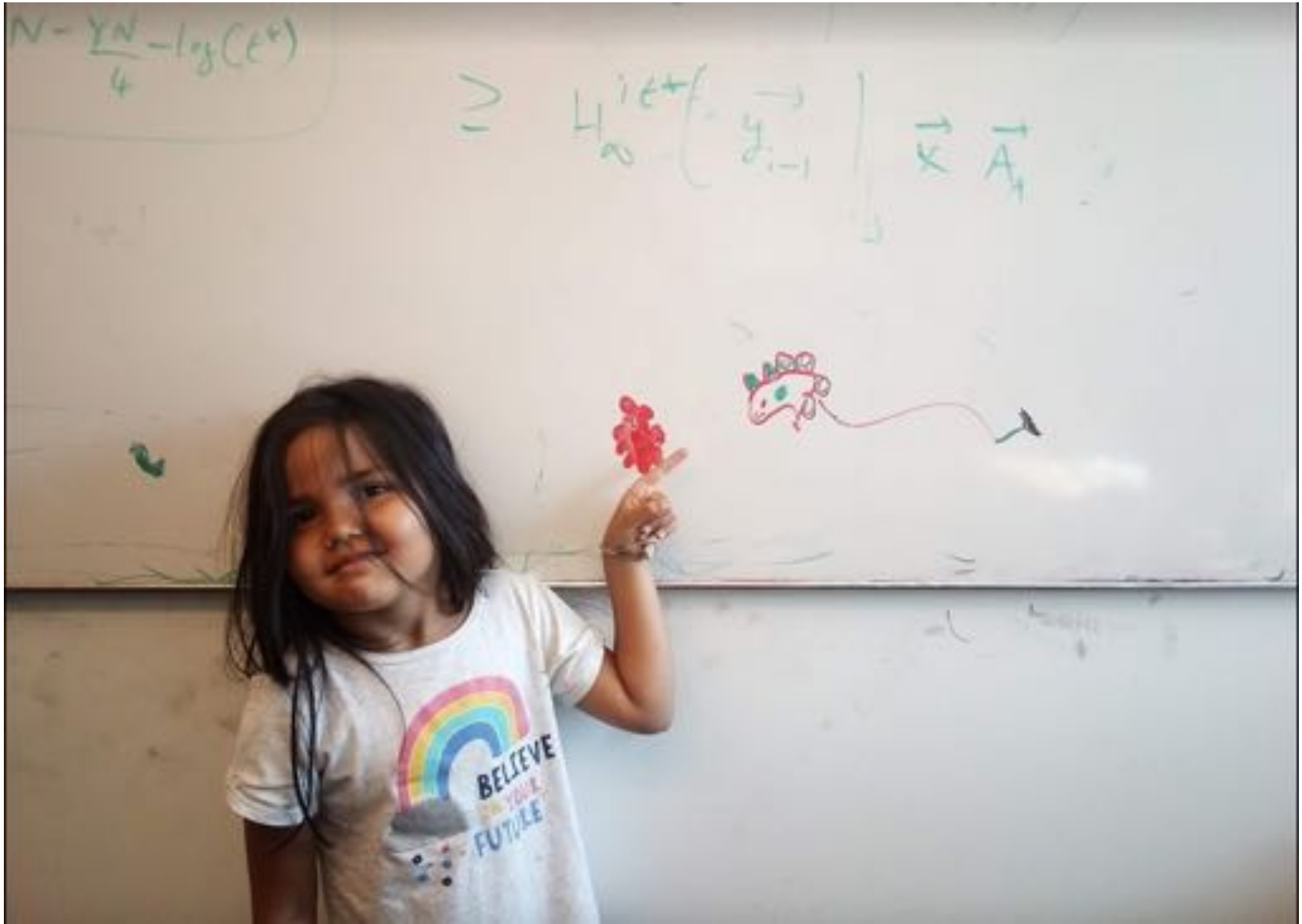


Two facts about BFS trees

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

If u is in L_i then $dist(s,u) = i$

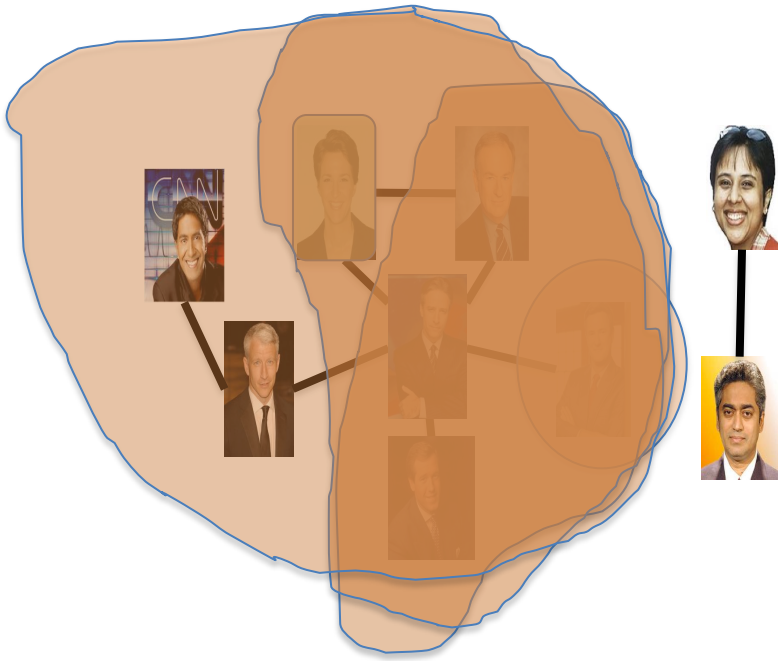
Questions/Comments?



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 $R^* = R$

Argue correctness on the board…

BFS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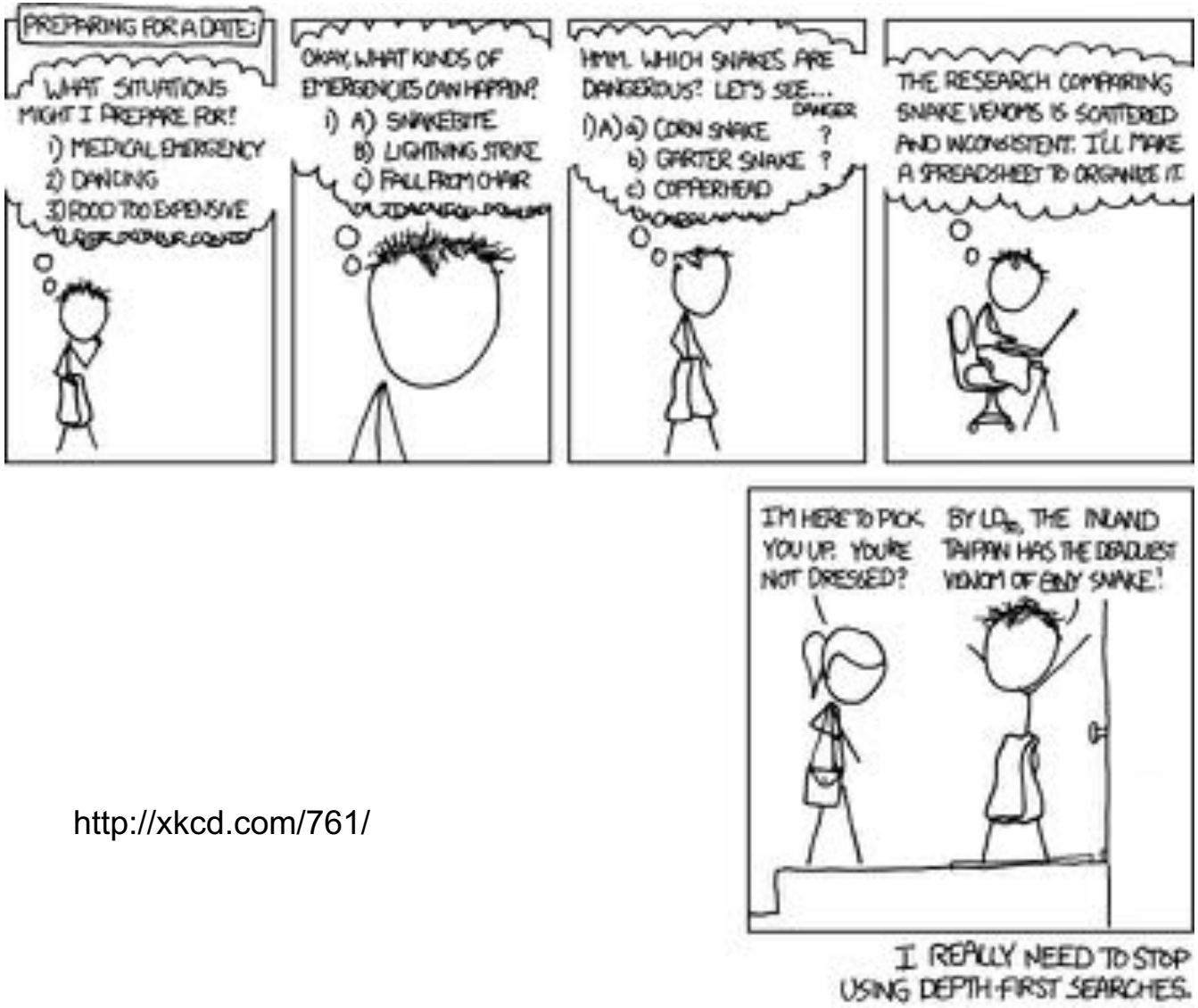
Studies have found that forwarding e-mail can end friendships. Please help spread the word by forwarding this to all friends.

Depth First Search (DFS)



http://xkcd.com/761/

DFS(u)

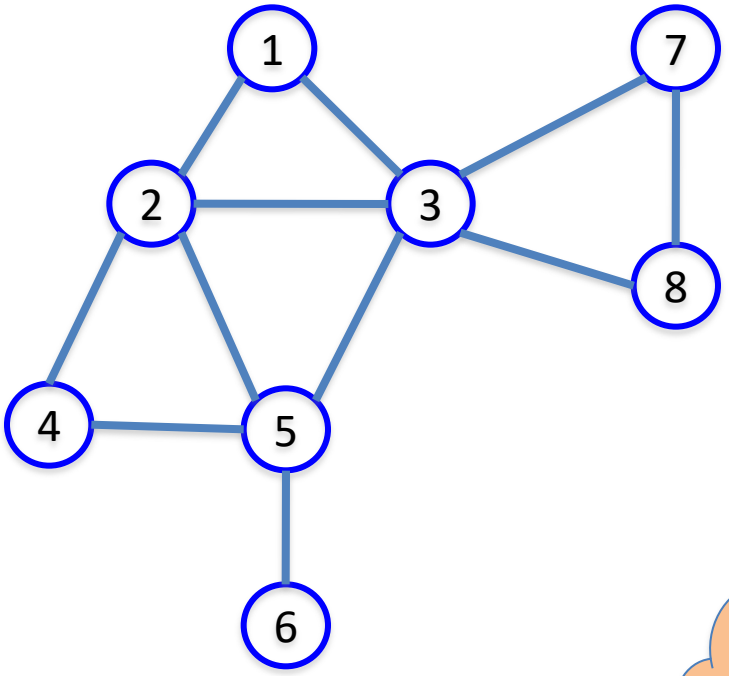
Mark u as explored and add u to R

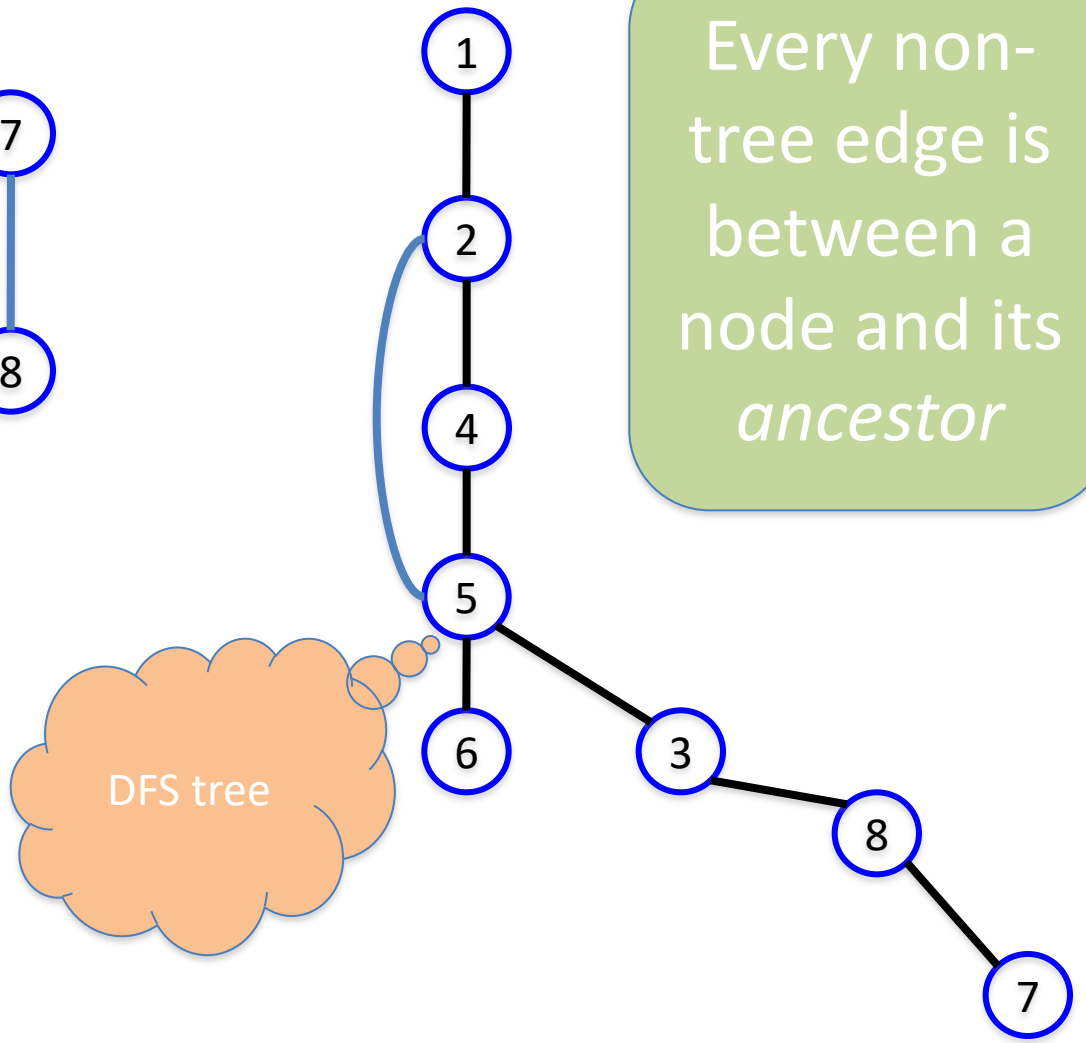
For each edge (u,v)

If v is not explored then DFS(v)

Why is DFS a special case of Explore?

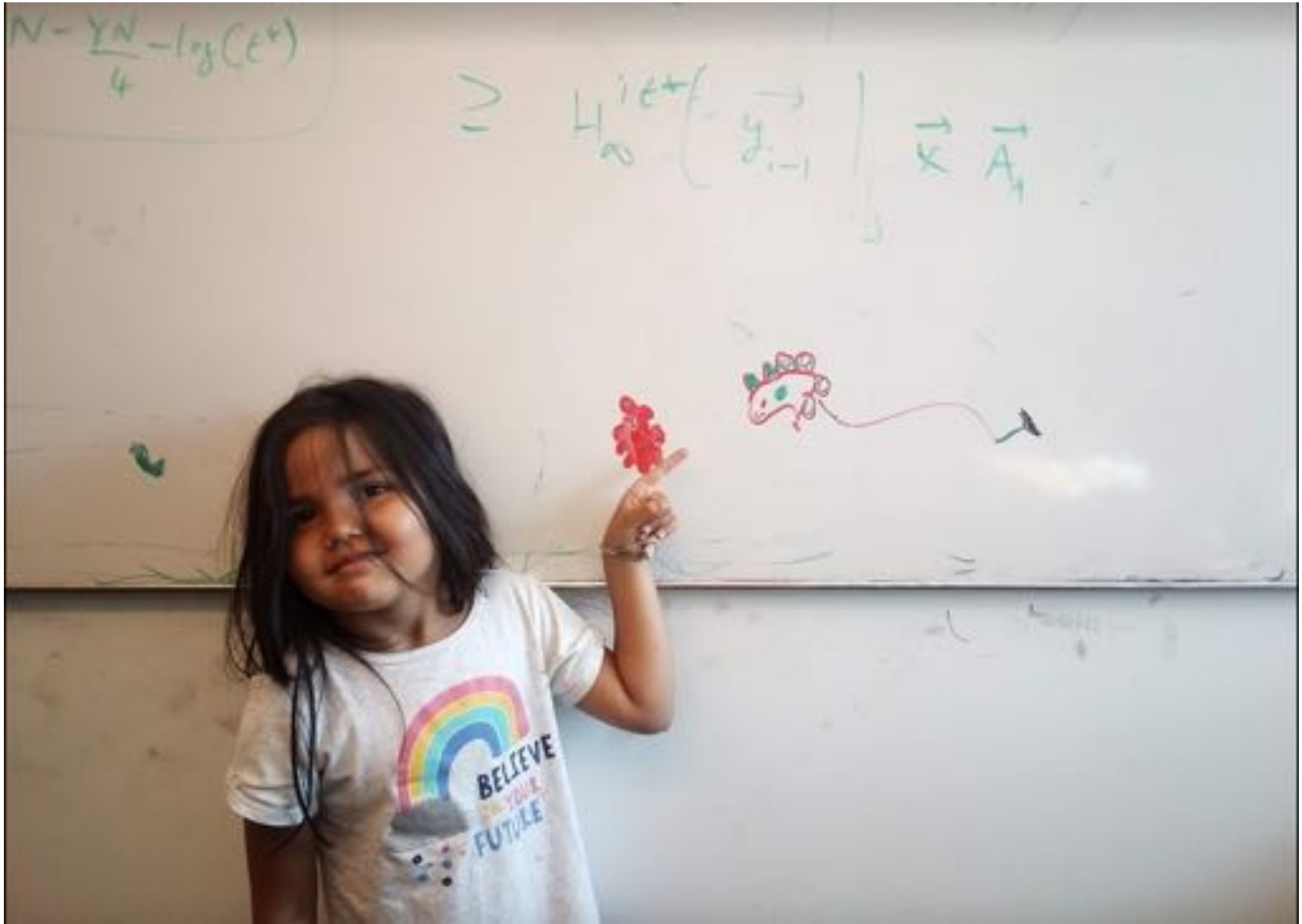
A DFS run





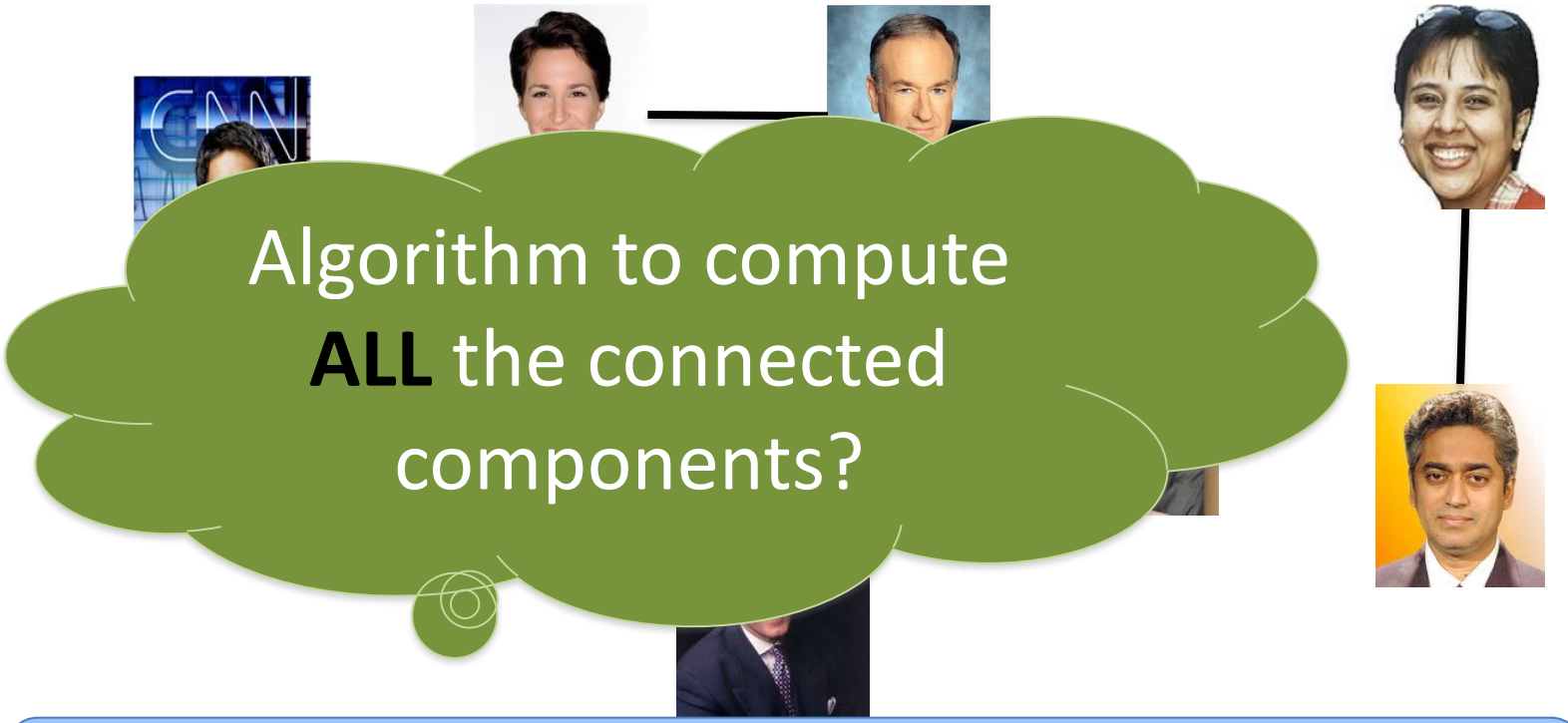
Every non-tree edge is between a node and its *ancestor*

Questions/Comments?



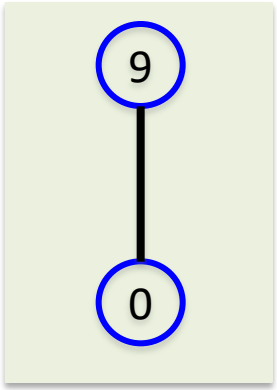
Connected components are disjoint

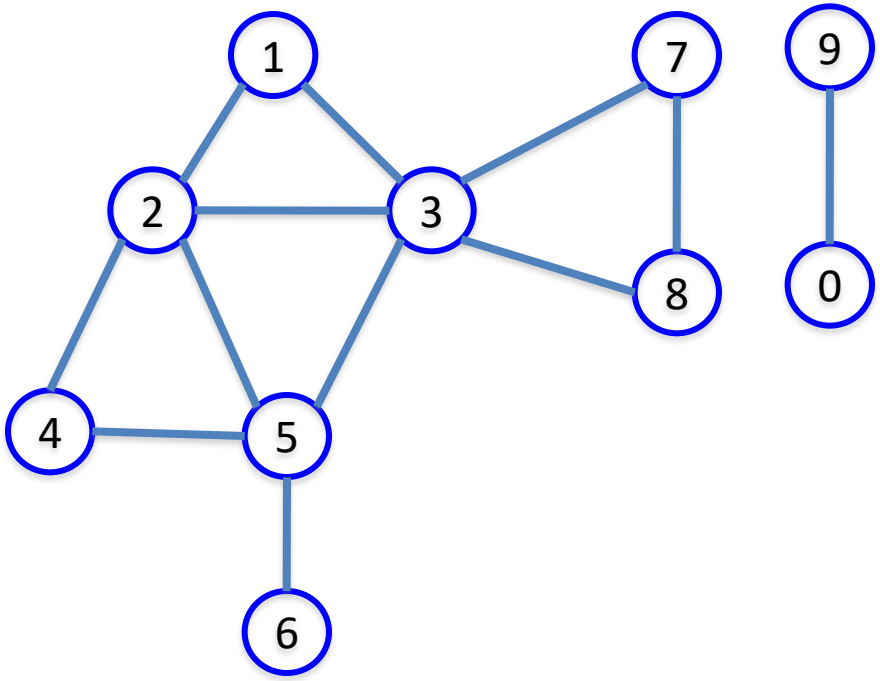
Either Connected components of s and t are the same or are disjoint

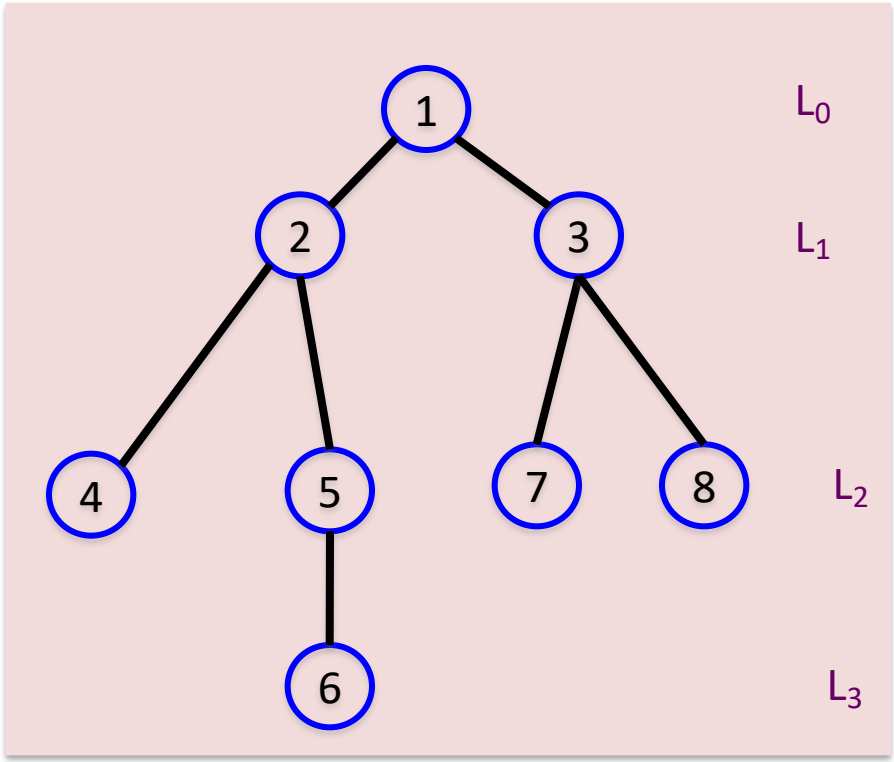


Run BFS on some node s. Then run BFS on t that is not connected to s

Computing all CCs







Questions?