

Lecture 12

CSE 331

Sep 23, 2019

If you need it, ask for help



Mini Project group due next Monday!

CSE 331 Mini project choices

Fall 2019

Please check the table below before submitting your mini project team composition to make sure your case study is not being used by another group. Case studies are assigned on a first come first serve basis.

Around 180 of you still need to do this!

Group	Chosen Algorithm	Case Study	Links
Daniel Shekhtman, William Nicholson, Andrew Quinonez (D's Get Degrees)	PageRank	Manipulation of PageRank for nefarious purposes	Link 1 , Link 2 , Link 3 , Link 4
Jordan Clemons, Chris Burton, Christopher Perez (Group 1)	Pagerank	Google's use of Pagerank in sorting search results	Link 1 , Link 2
Moulid Ahmed, Shrishty Shivani Jha, Shreya Lakhkar (ACE-MA)	Spotify Recommendation	Machine Learning Algorithm	Link 1 , Link 2 , Link 3
Justin Henderson, Hannah Wlasowicz, Judy Mei (PizzaTime)	Aes 256	ransomware	Link 1
Gillian Marcus, Jason Niu, Sharon Stack (2n ² (//pls substitute caret for a superscript))	Deep Neural Networks for YT Recommendations	Social Media Targeted Advertising	Link 1 , Link 2 , Link 3 , Link 4
Jiwon Choi, Matthew Ferrera, Winnie Zheng (The	Dijkstra's Algorithm	Maps/ Transportation Routes	Link 1 , Link 2 ,

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, \dots, L_j have been constructed

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

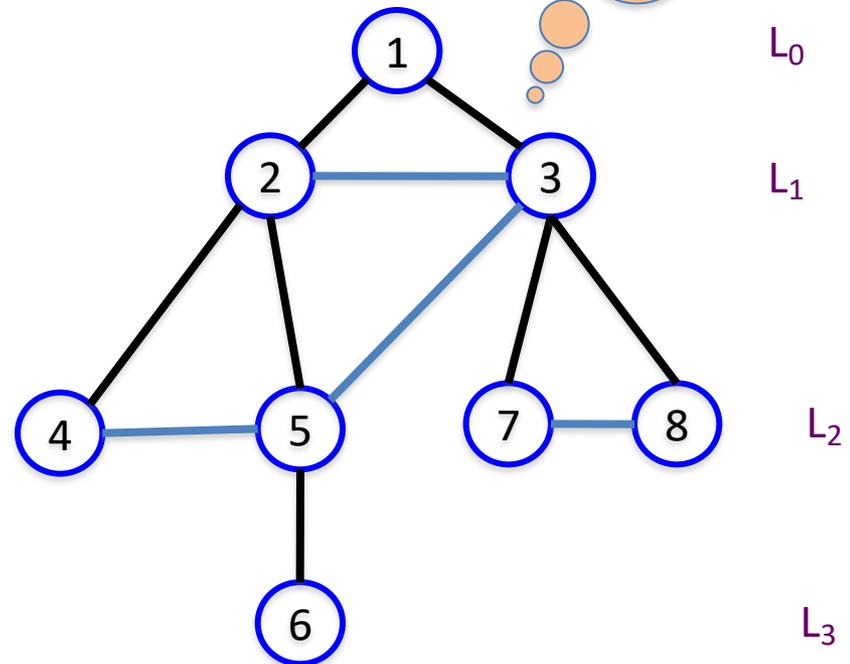
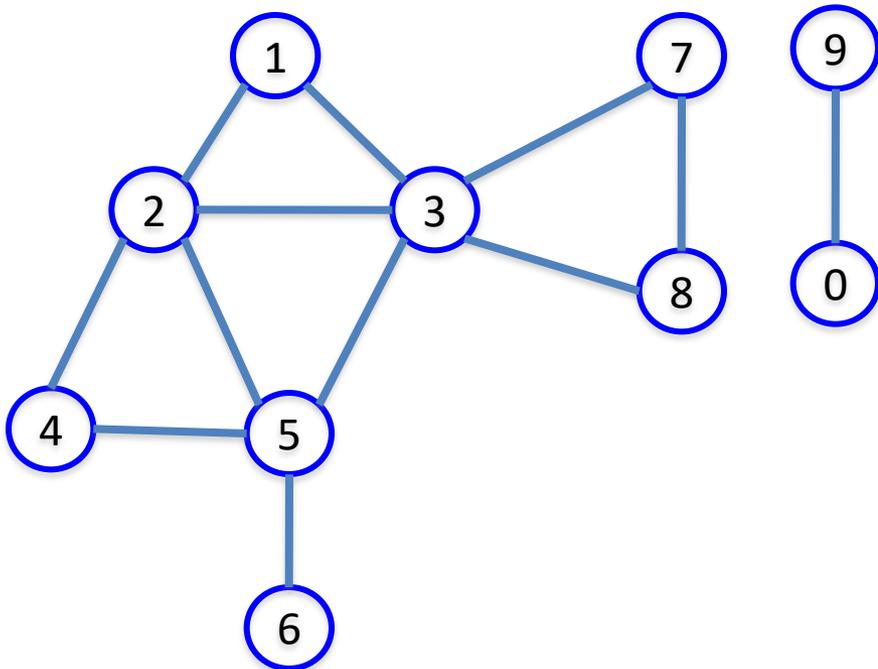
Stop when new layer is empty

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

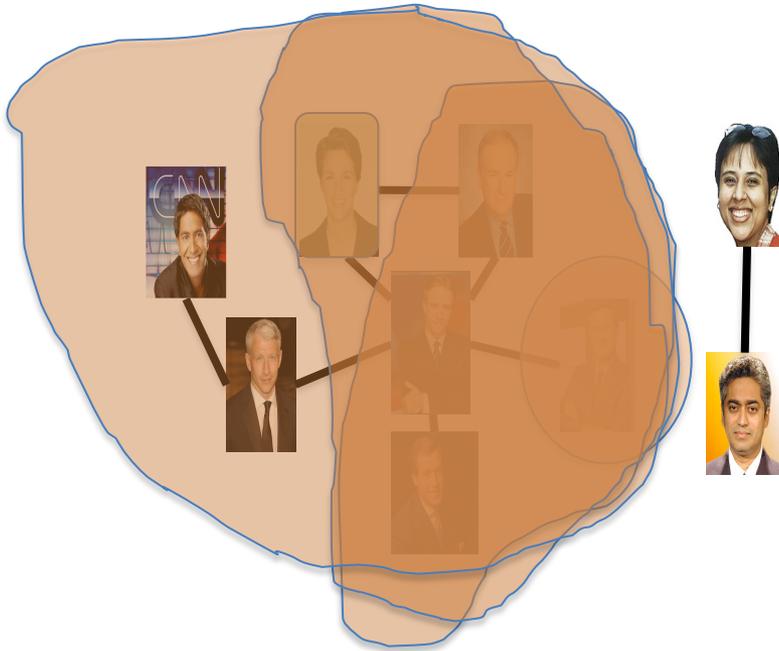
All non-tree edges are in the same or consecutive layer

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

Today's agenda

Computing Connected component

Computing Connected Component



Explore(s)

Start with $R = \{s\}$

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

Add v to R

Output $R^* = R$

Questions?



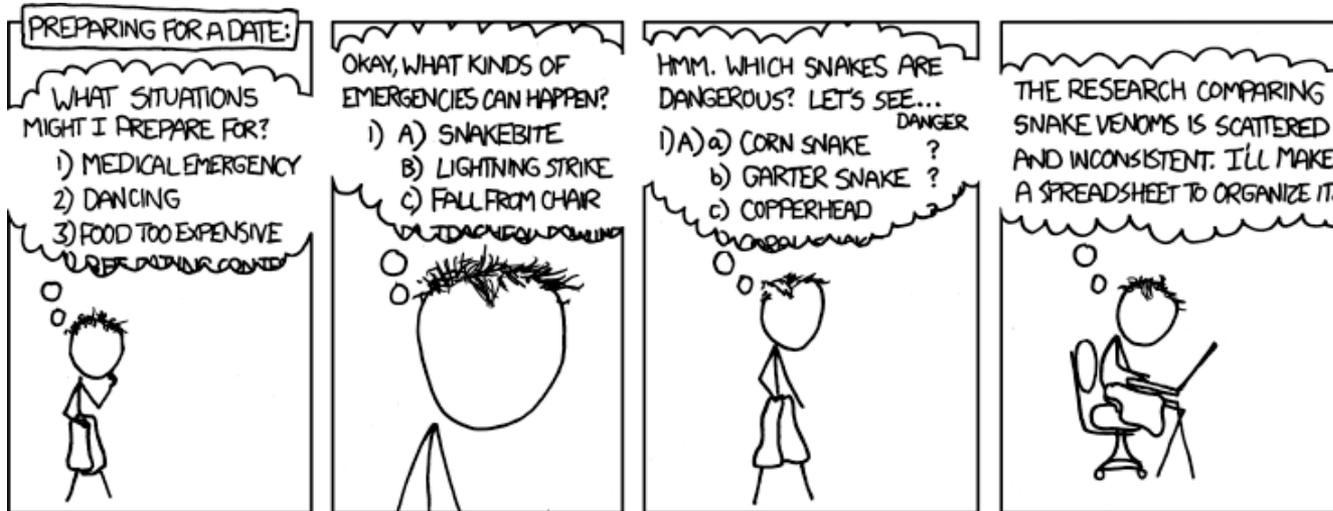
BFS

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search ID: mbcn800

Depth First Search (DFS)



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



I REALLY NEED TO STOP USING DEPTH-FIRST SEARCHES.

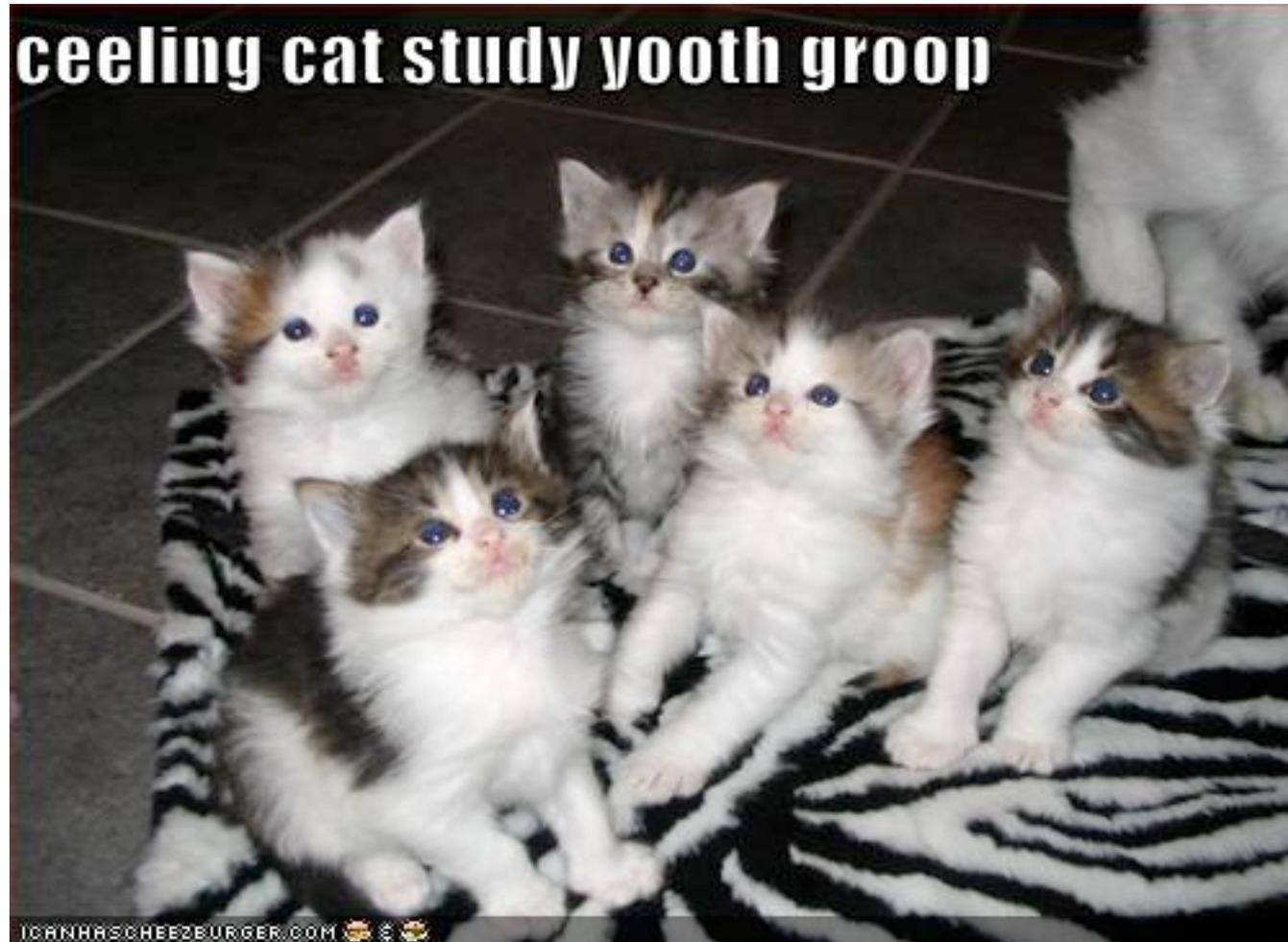
DFS(u)

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

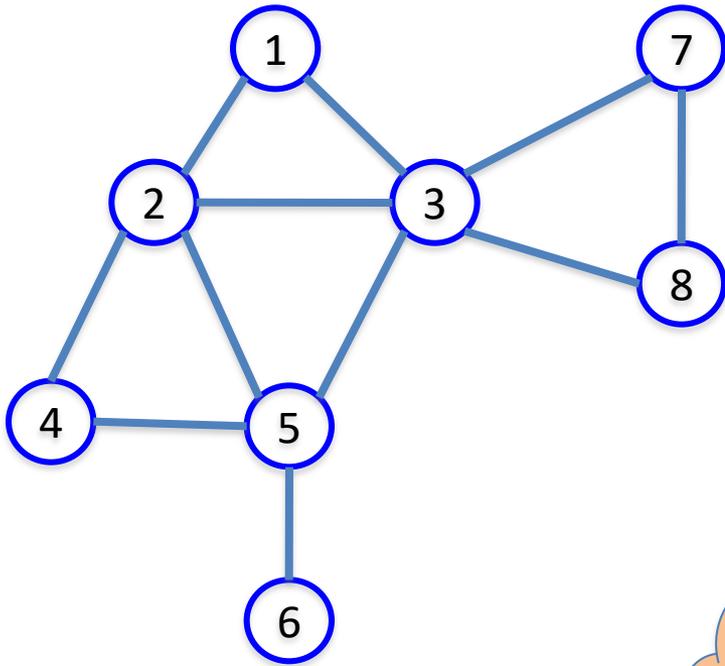
For each edge (u,**v**)

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

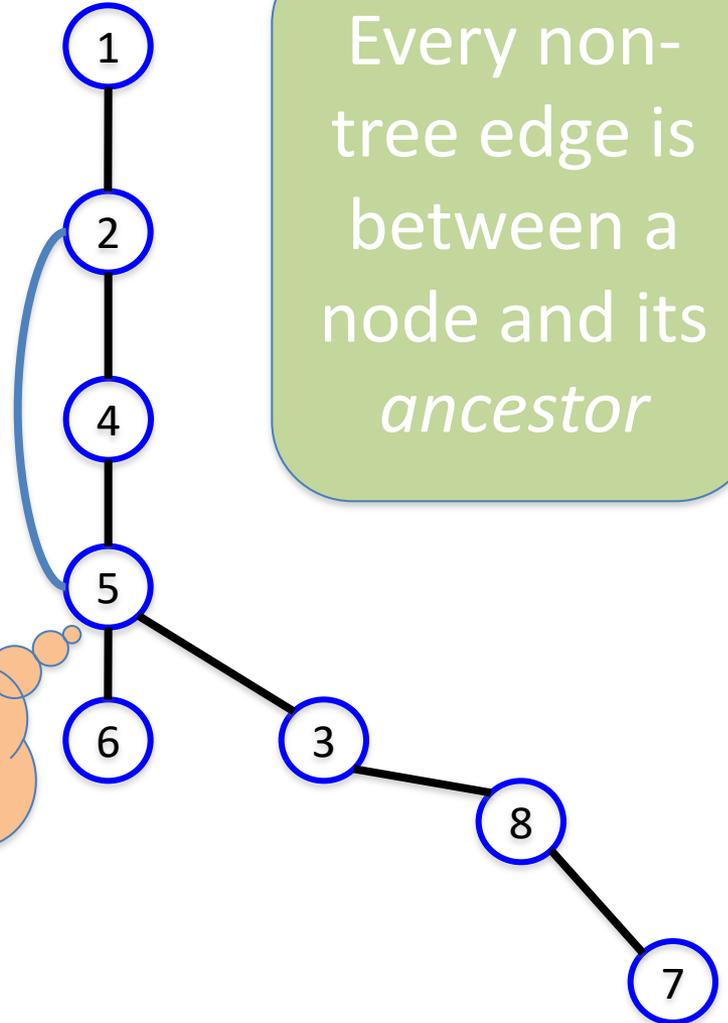
Why is DFS a special case of Explore?



A DFS run



DFS tree



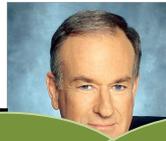
Every non-tree edge is between a node and its *ancestor*

Questions?



Connected components are disjoint

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



Algorithm to compute
ALL the connected
components?

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