Lecture 13

CSE 331

Sep 25, 2019

If you need it, ask for help
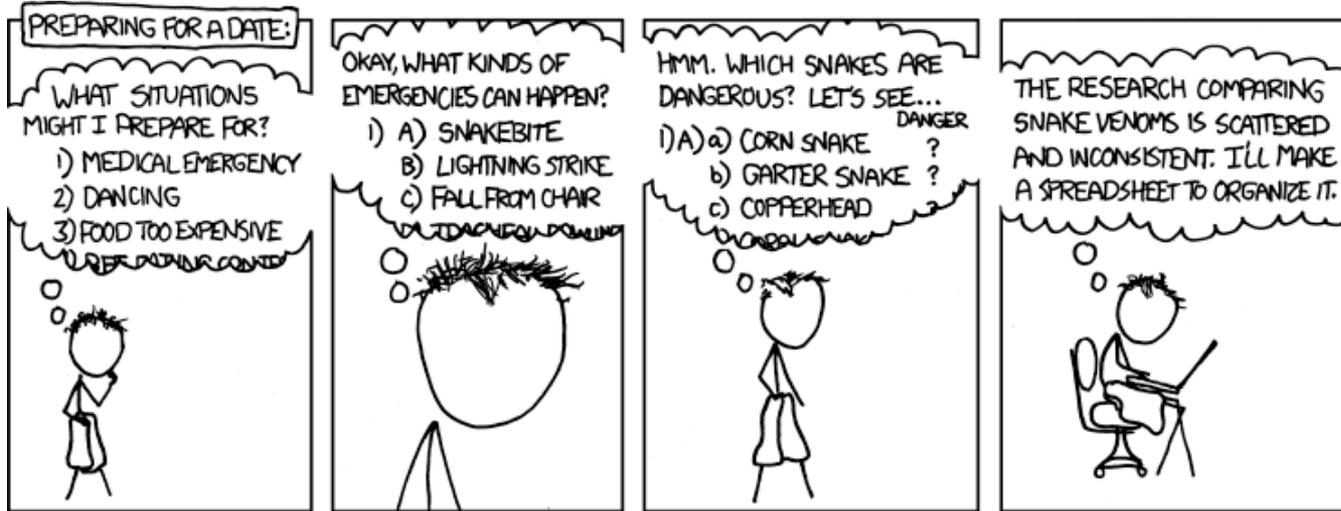
Mini Project group due Monday!

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.

| 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,

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)

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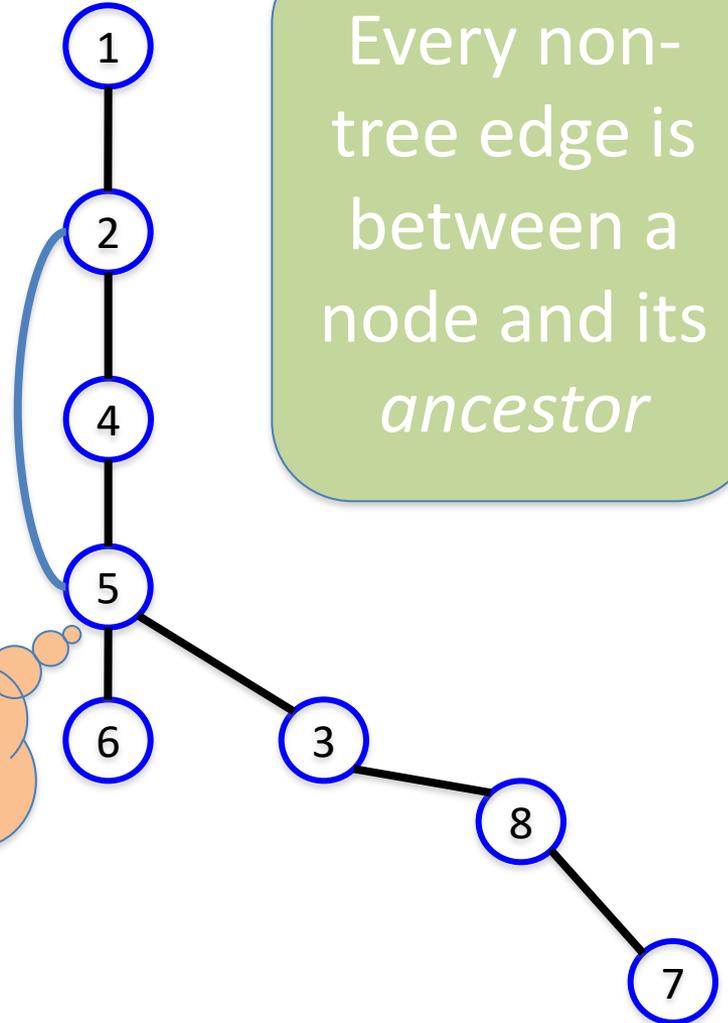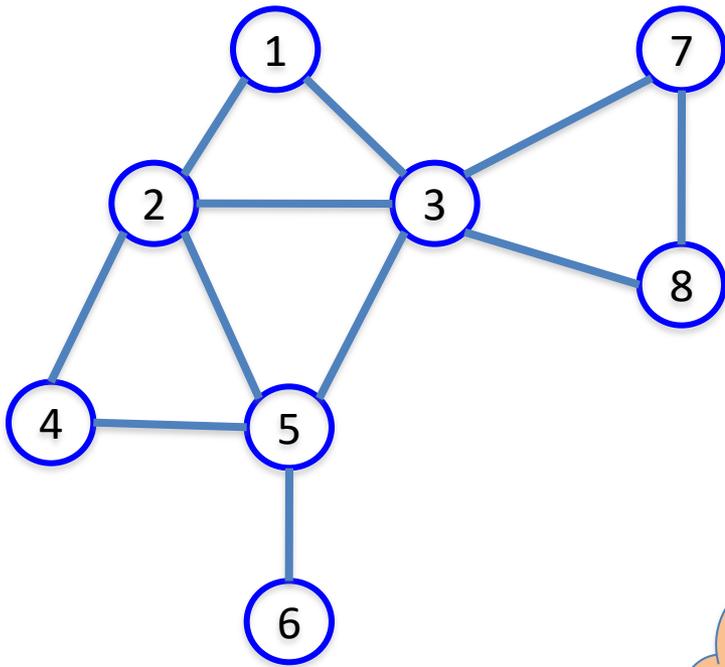
Every non-tree edge is between a node and its *ancestor*

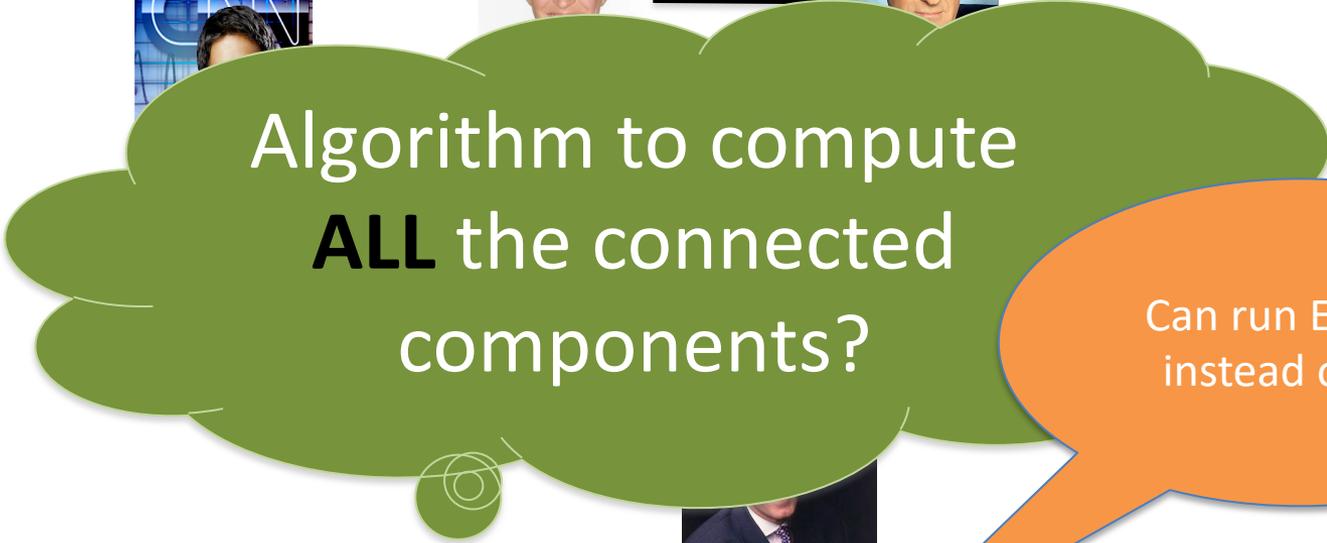DFS tree

Questions?

Please submit the correct parts

Homework 3

Q1 part (a) [Seating ADFs]

Q1 part (b)

Q2 part (a) [Average vs. Max]

Q2 part (b)

Q3 (Computing Distances)

You WILL lose points if you submit say your Q1(a) to Q2(a) to Q1(b)

Connected components are disjoint

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

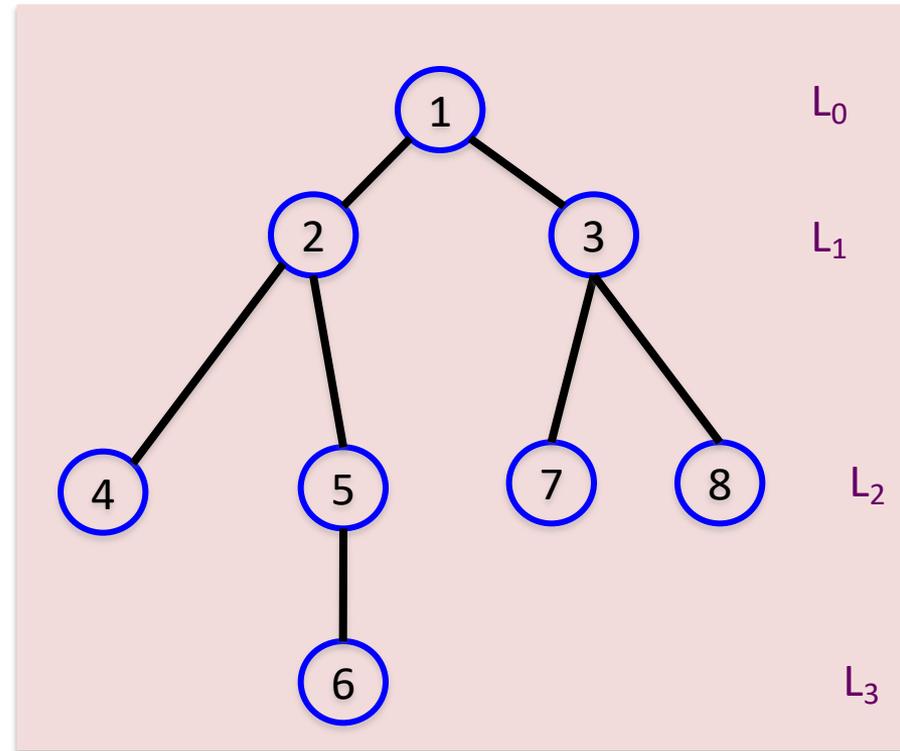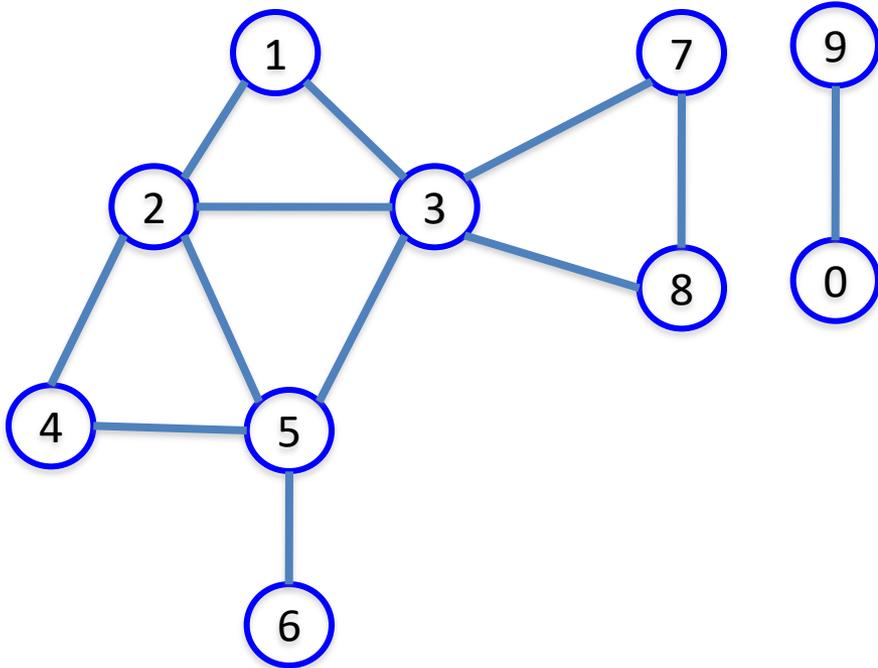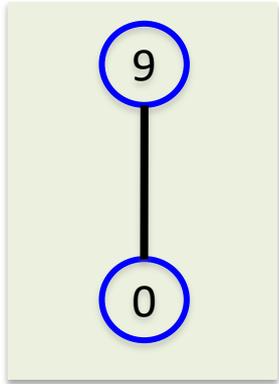Algorithm to compute **ALL** the connected components?

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?

Today's agenda

Run-time analysis of BFS (DFS)
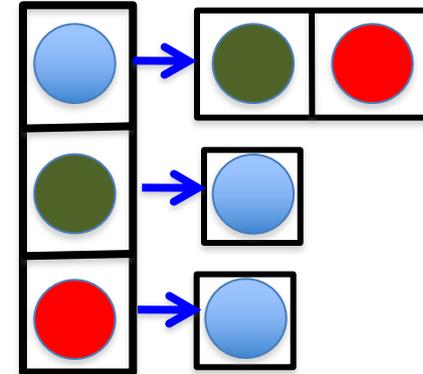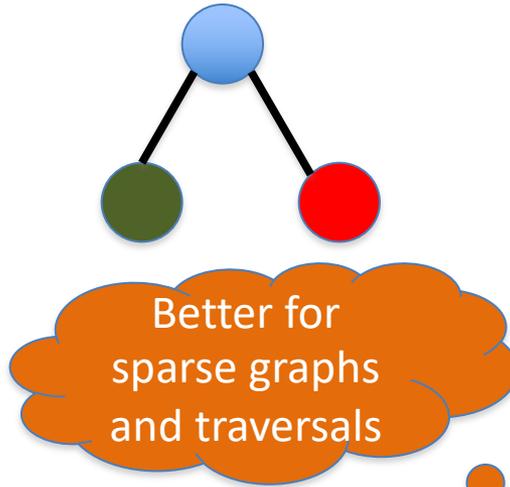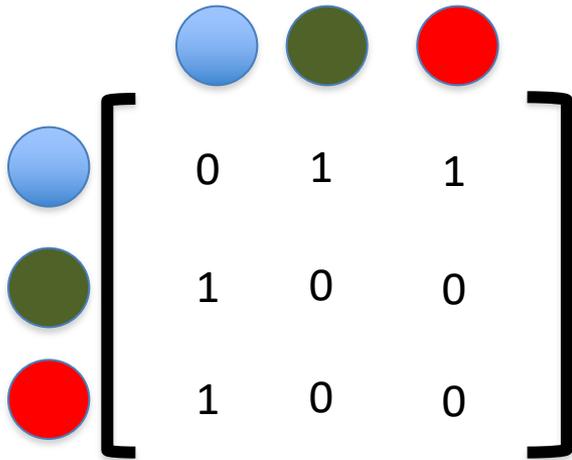
Stacks and Queues

Last in First out

First in First out

But first…

How do we represent graphs?

Graph representations

Better for sparse graphs and traversals

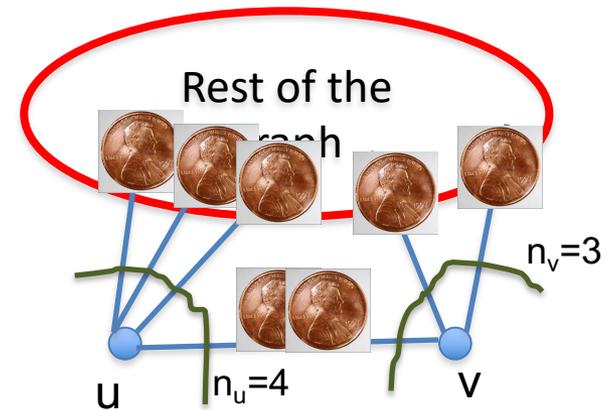| Adjacency matrix		Adjacency List
O(1)	(u,v) in E?	O(n) [O(n_v)]
O(n)	All neighbors of u?	O(n_u)
O(n^2)	Space?	O(m+n)

Questions?

2·# edges = sum of # neighbors

$$2m = \sum_{u \in V} n_u$$

Give 2 pennies to each edge

Total # of pennies = 2m

Each edges gives one penny to its end points

# of pennies u receives = n_u

Rest of the graph

$n_v = 3$

$n_u = 4$

u

v

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

Use linked lists

Use CC[v] array

Rest of Today's agenda

Space complexity of Adjacency list representation

Quick run time analysis for BFS

Quick run time analysis for DFS (and Queue version of BFS)