Lecture 13

CSE 331

Feb 24, 2020

Mini Project group due this Friday!

CSE 331 Mini project choices

Spring 2020

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.

94 of you still need to do this!

Group	Chosen Algorithm	Case Study	Links
Tiffany Tate, Joyce Sommer, Robbie Wilkowski (Team TJR)	Predicitve Text Algothrim	Predictive text algorithms are a class of algorithms used to autocomplete/finish words and sentences (e.g. Smart Compose on Gmail).	Link 1, Link 2, Link 3, Link 4
John Tantillo, Joe Brown, Jacob Snyderman (Fingerprinty thingy mabob)	NGI Algorithms with a focus in the AFIT algorithm	Identifying fingerprints and matching them to fingerprints on file	Link 1, Link 2, Link 3, Link 4
Steven Jiang, Yang Wenxuan, Steven Quan (od grease)	Facial Recognition Algorithm	Security, Face ID, Camera Focus, Spying	Link 1, Link 2, Link 3, Link 4
Jason Britto, Michael Carlow, Eliza Koster (Codeville)	Pagerank	Pagerank is used to rank webpages on the google search engine	Link 1, Link 2, Link 3, Link 4
Victoria Dib, Tyler Anatole, Nicholas MacRae (DefinitelyNotBiased)	COMPAS recidivism Algorithim	COMPAS Algorithim, is a case management and decision support tool used by U.S. courts to assess the likelihood of a defendant becoming a recidivist.	Link 1, Link 2, Link 3, Link 4
Yangtao Chen, Zhiwei Qu, Liang Dong (Hands On The Wheel !)	image recognition algorithm	Uber self-driving vehicles algorithm	Link 1, Link 2, Link 3, Link 4
Alex Wojewoda, Daeyoung Jeong, Aiden Xie (AJAX)	Item-to-Item Collaborative Filtering	Amazon recommendations are based on a customer's previous history	Link 1, Link 2, Link 3, Link 4

Homeworks

- Read carefully!
  - **Unnecessary wordings are deliberate**
  - You should understand the problem first!!

- Start early!
  - **If you started last night for HW 2, you're doing it wrong!!**
  - At least read the questions over the weekend
    - And check the recitation notes

- Attend recitations!
  - **We (almost) give answers for Q1.a and Q2.a**
  - So that you can go for Q1.b and Q2.b

- Discuss with your friends!
  - Only Q1 and Q2 (Only proof ideas)

- ASK!
  - I had one student in my OH last Monday!! (And two in Wed's)

- Submit pdf to AutoLab
  - Not .doc, .docx, .txt …
  - And make sure AutoLab displays it correctly

BFS
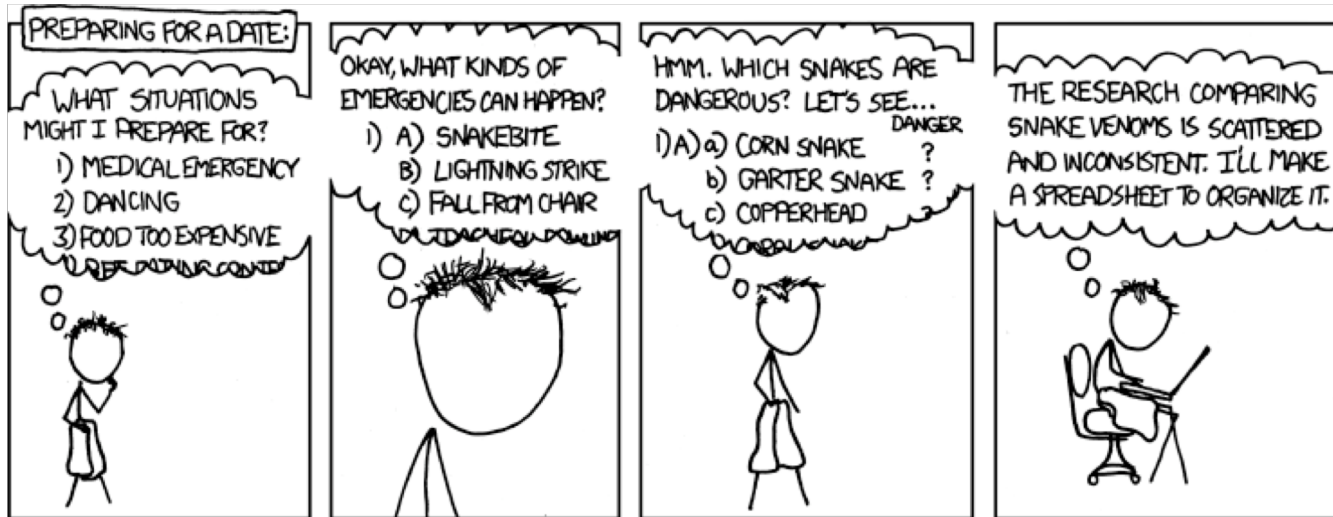
Depth First Search (DFS)

http://xkcd.com/761/

DFS(u)
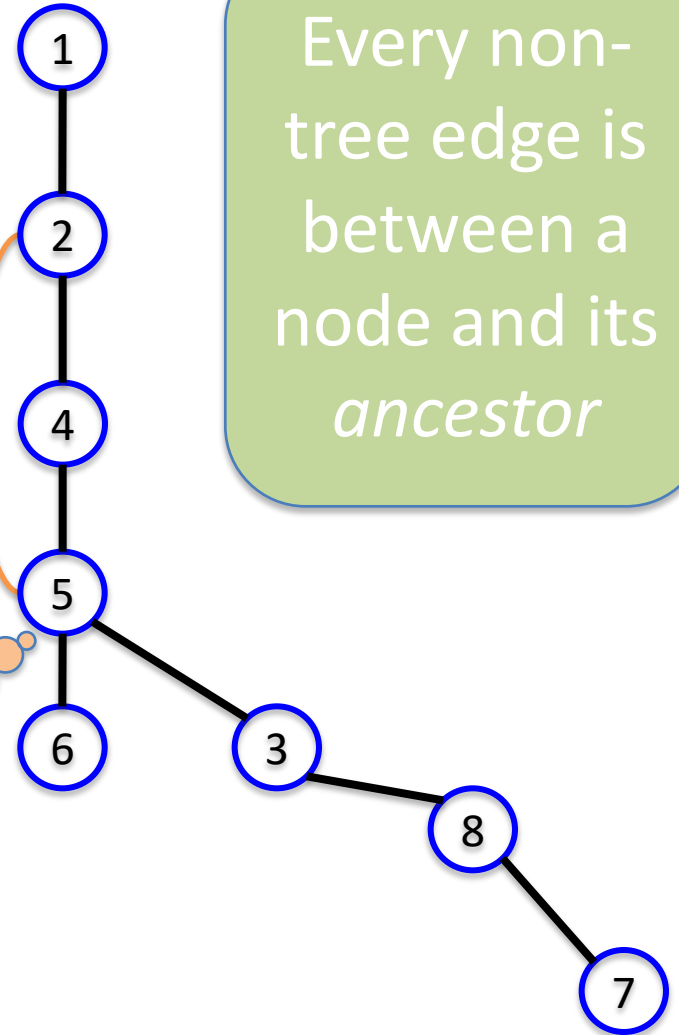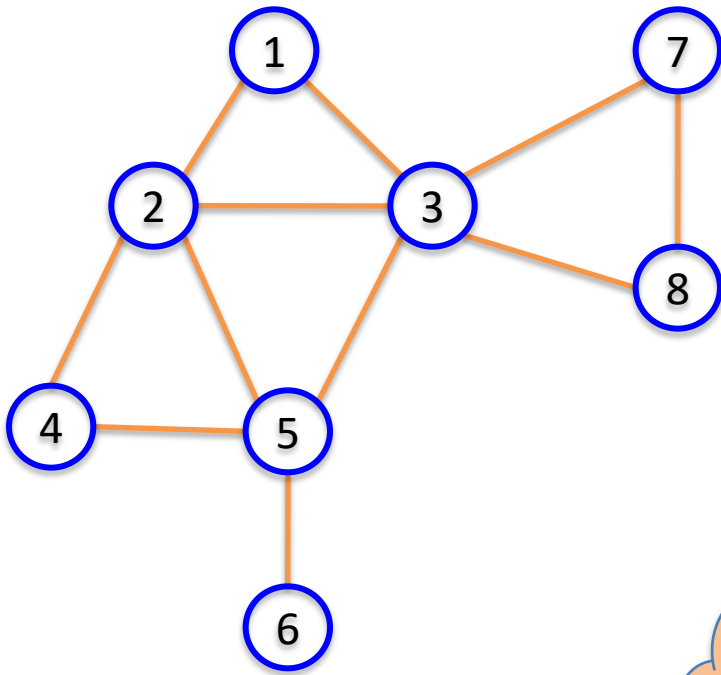
Mark u as explored and add u to R

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*
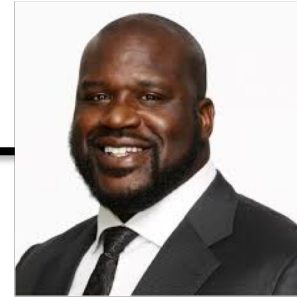
DFS tree

Questions?
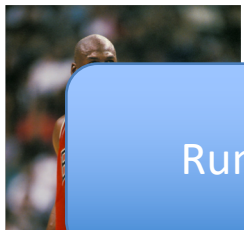
Connected components are disjoint

steve nash

kobe bryant

shaq o'neal

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

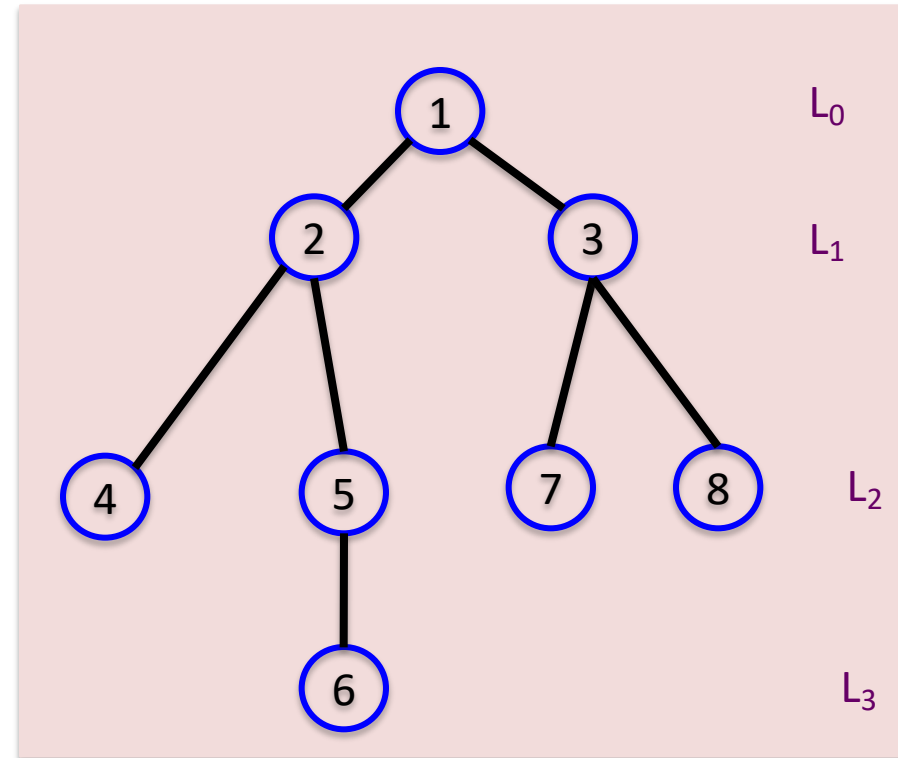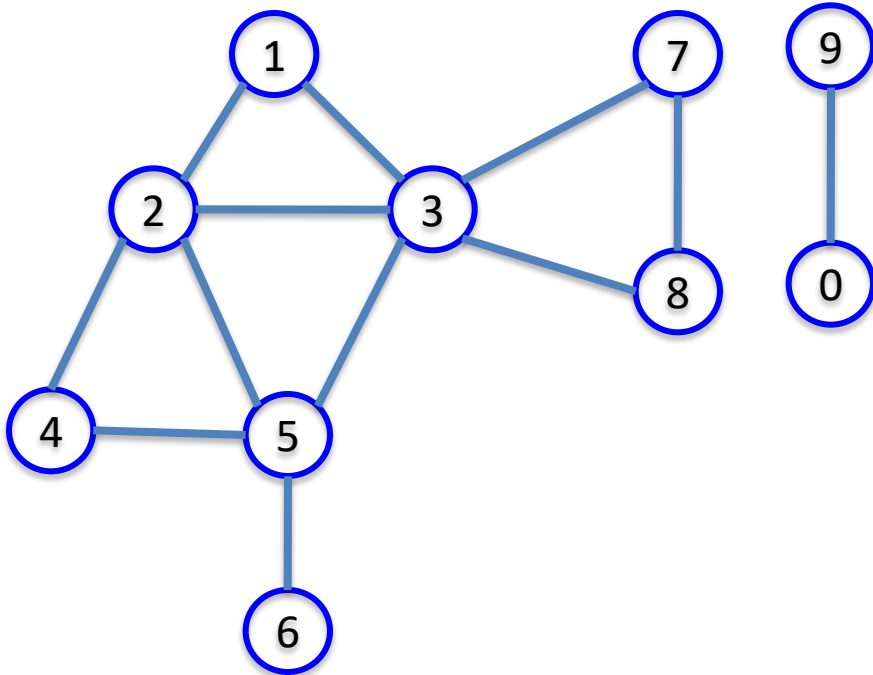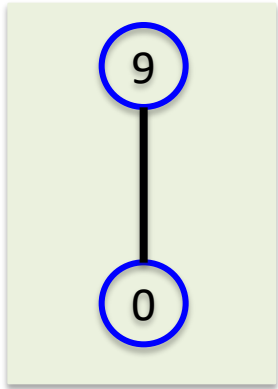Can run Explore instead of BFS

michael jordan

scottie pippen

kyrie irving

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)

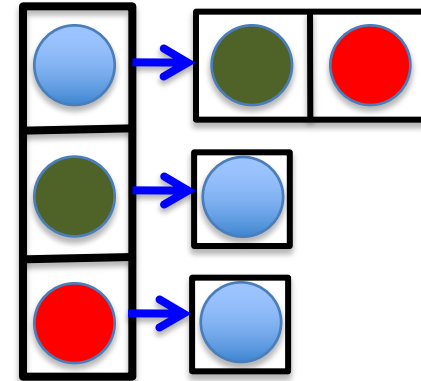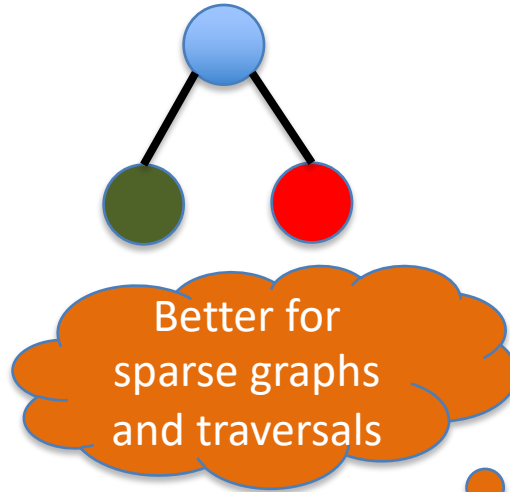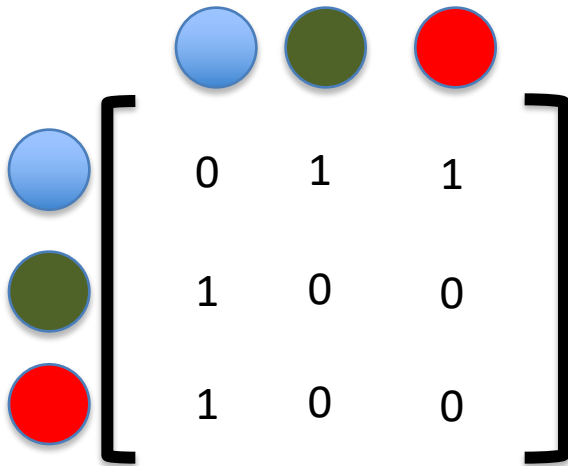# Stacks and Queues

Last in First out

First in First out

But first…

How do we represent graphs?

Graph representations

Better for sparse graphs and traversals

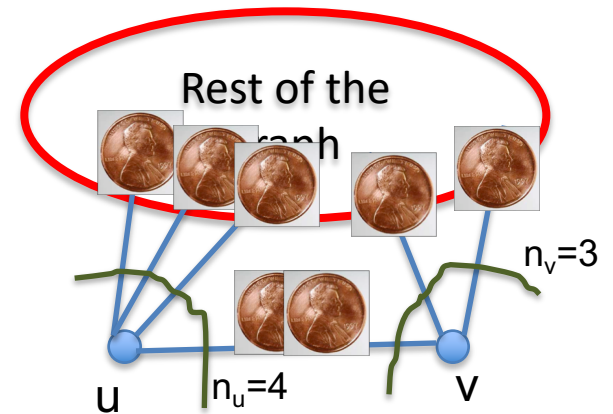| Adjacency matrix		Adjacency List
O(1)	(u,v) in E?	O(n) [O(n_v)]
O(n)	All neighbors of u?	O(n_u)
O(n^2)	Space?	O(m+n)

Questions?

2·# edges = sum of # neighbors

$$2m = \Sigma_{u \text{ in } V} n_u$$

Give 2 pennies to each edge

    Total # of pennies = 2m

Rest of the graph

$n_v = 3$

$n_u = 4$

u   v

Each edges gives one penny to its end points

    # of pennies u receives = n_u

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)