

Lecture 10

CSE 331

Sep 22, 2021

Please have a face mask on

Masking requirement



UR 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>

Register project groups < 2weeks

Deadline: Friday, Oct 1, 11:59pm

CSE 331 Syllabus Piazza Schedule Homeworks + Autolab **Project +** Support Pages + channel Sample Exams +

Forming groups

You form groups of size **exactly three (3)** for the project. Below are the various options.

Project Overview

Group signup form

- You have two choices in forming your group:

1. You can form your group on your own: i.e. you can submit the list of **EXACTLY three (3)** groups members in your group.

Note

Note that if you pick this option, your group needs to have **exactly THREE (3)** members. In particular, if your group has only two members you cannot submit as a group of size two. If you do not know many people in class, feel free to use piazza to look for the third group member.

2. You can submit *just your name*, and you will be assigned a random group among all students who take this second option. However, **note that if you pick this option you could end up in a group of size 2**. There will be at most two groups of size 2.

Submitting your group composition

Use this [Google form](#) to submit your group composition (the form will allow you to pick one of the two options above).

- You need to fill in the form for group composition by **11:59pm on Friday, October 1**.

Deadline is strict!

If you do not submit the form for group composition by the deadline, then you get a **zero for the entire project**.

If you need it, ask for help



Homework 2 out!

Homework 2

Due by **8:00am, Wednesday, September 29, 2021.**

Make sure you follow all the [homework policies](#).

All submissions should be done via [Autolab](#).

Sample Problem

The Problem

This problem is just to get you thinking about asymptotic analysis and input sizes.

An integer $n \geq 2$ is a prime, if the only divisors it has is 1 and n . Consider the following algorithm to check if the given number n is prime or not:

For every integer $2 \leq i \leq \sqrt{n}$, check if i divides n . If so declare n to be not a prime. If no such i exists, declare n to be a prime.

What is the function $f(n)$ such that the algorithm above has running time $\Theta(f(n))$? Is this a polynomial running time— justify your answer. (A tangential question: Why is the algorithm correct?)

[Click here for the Solution](#)

HW 1 solutions

note @158   stop following 0 views

Solutions to HW 1 (+HW2 out)

Here is a link to solutions for HW 1: <https://buffalo.box.com/s/b0Inrv9idetqaw9rjy0mcei98t1h83>

Please note that downloading is disabled and please do not share the link with anyone else.

On a related note, HW2 is up: <http://www-student.cse.buffalo.edu/~gry/cse331/fall21/hws/hw2/index.html>

[homework 1](#) [homework 2](#)

 good note 

Updated just now by Aki Rusko

Implementation Steps

(0) How to represent the input?

(1) How do we find a free woman w ?

(2) How would w pick her best unproposed man m ?

(3) How do we know who m is engaged to?

(4) How do we decide if m prefers w' to w ?

Overall running time

Init(1-4)



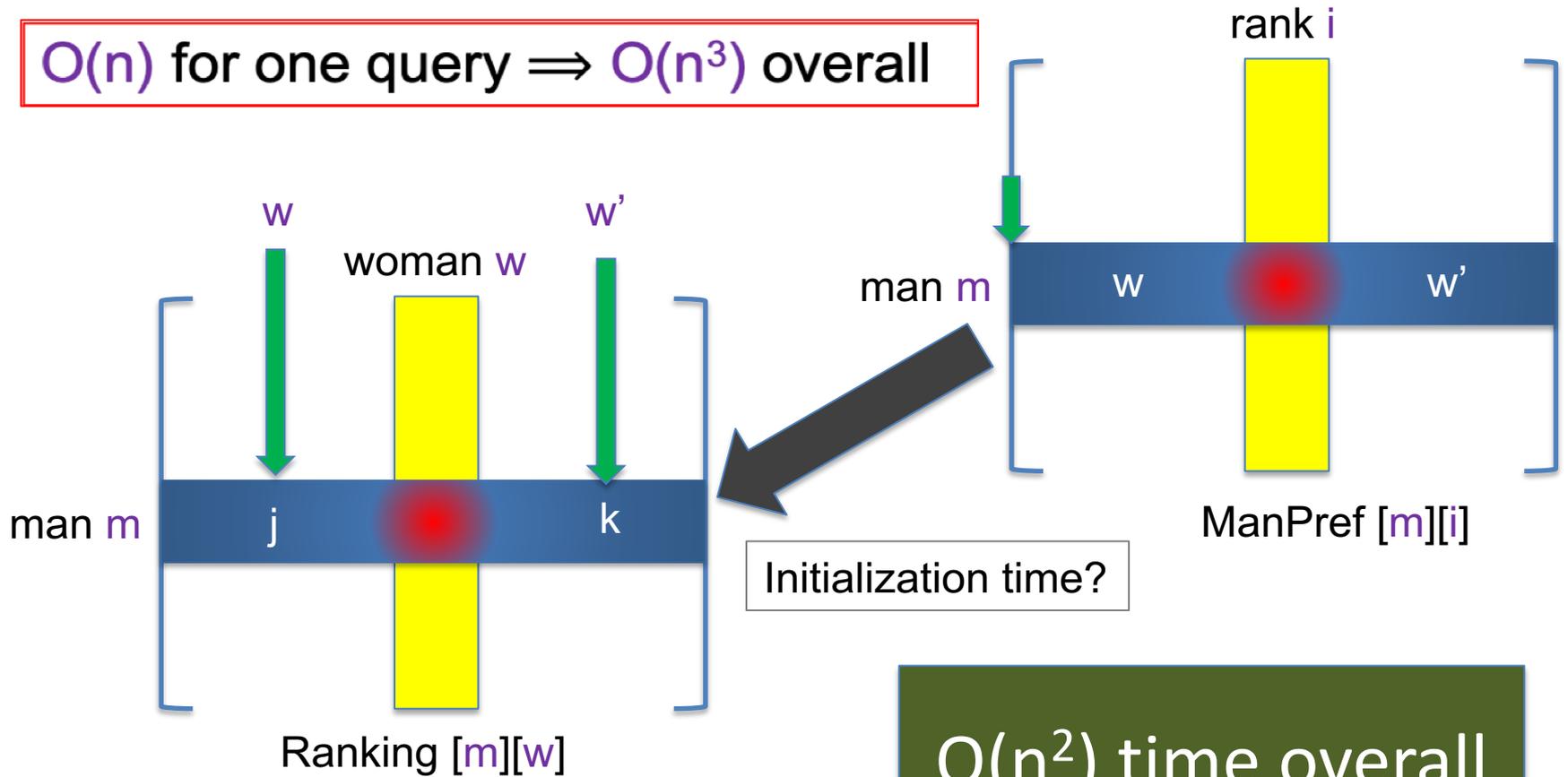
n^2 X (Query/Update(1-4))

Questions?



Answering Q4

$O(n)$ for one query $\Rightarrow O(n^3)$ overall



$O(1)$ query time

$O(n^2)$ time overall

(4) How do we decide if **m** prefers **w'** to **w**?

Puzzle

Prove that **any** algorithm for the SMP takes $\Omega(n^2)$ time

Main Steps in Algorithm Design

Problem Statement



Problem Definition



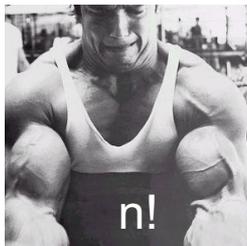
Algorithm



“Implementation”

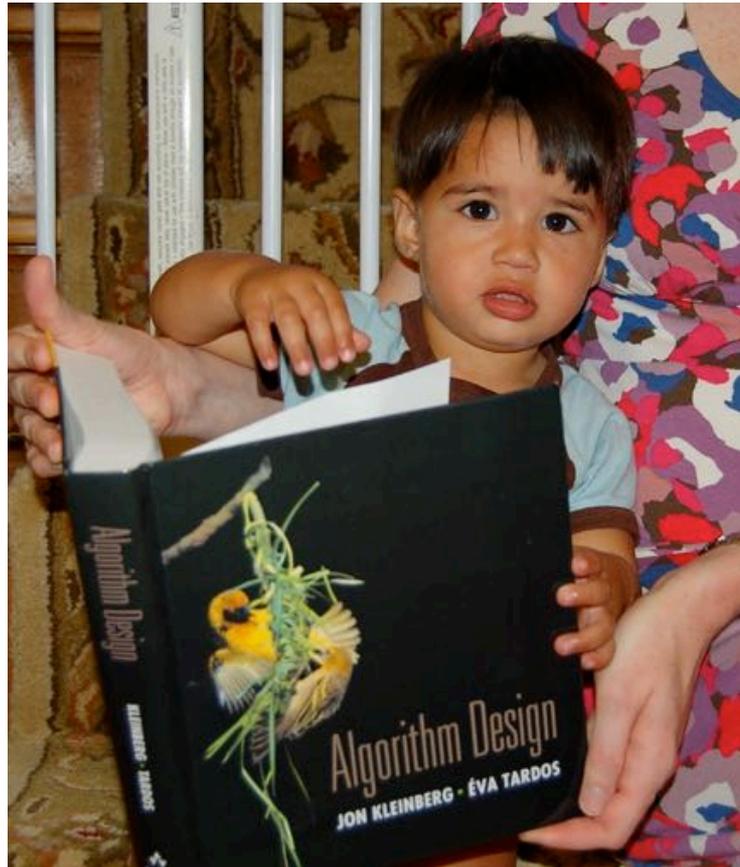


Analysis



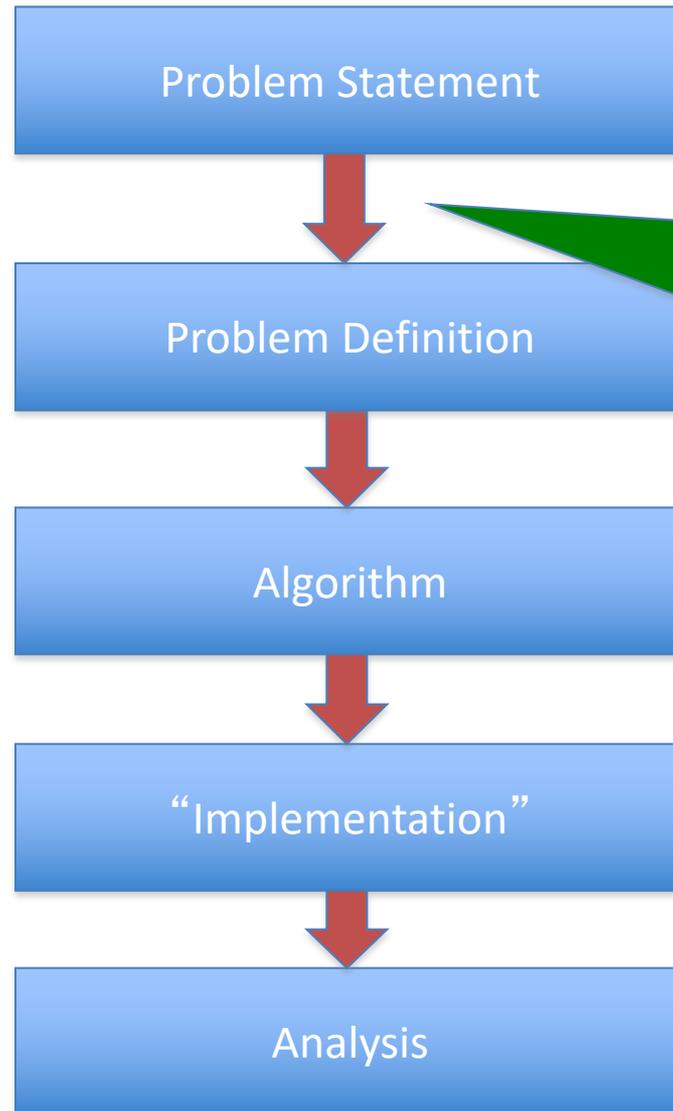
Correctness Analysis

Reading Assignments



Sec 1.1 and Chap. 2 in [KT]

Up Next....

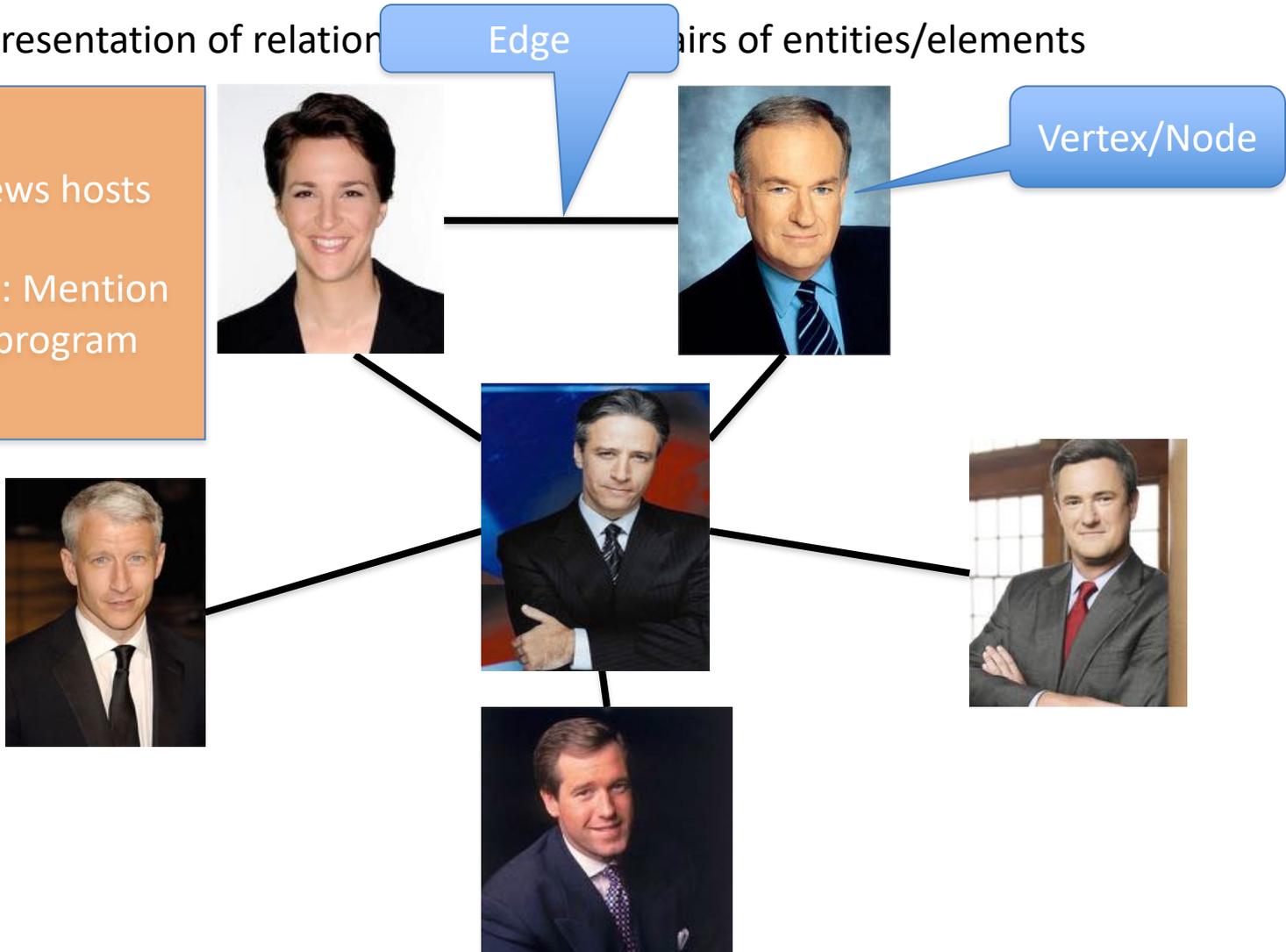


A generic tool
to abstract
out problems

Graphs

Representation of relationships between pairs of entities/elements

Entities: News hosts
Relationship: Mention
in other's program



Graphs are omnipresent

jetBlue

HAPPY JETTING

Español • Help • Speak up

Airline Route maps

Book travel

Manage your flights

Travel deals

Where we jet

TrueBlue® program

Buffalo, NY [BUF]

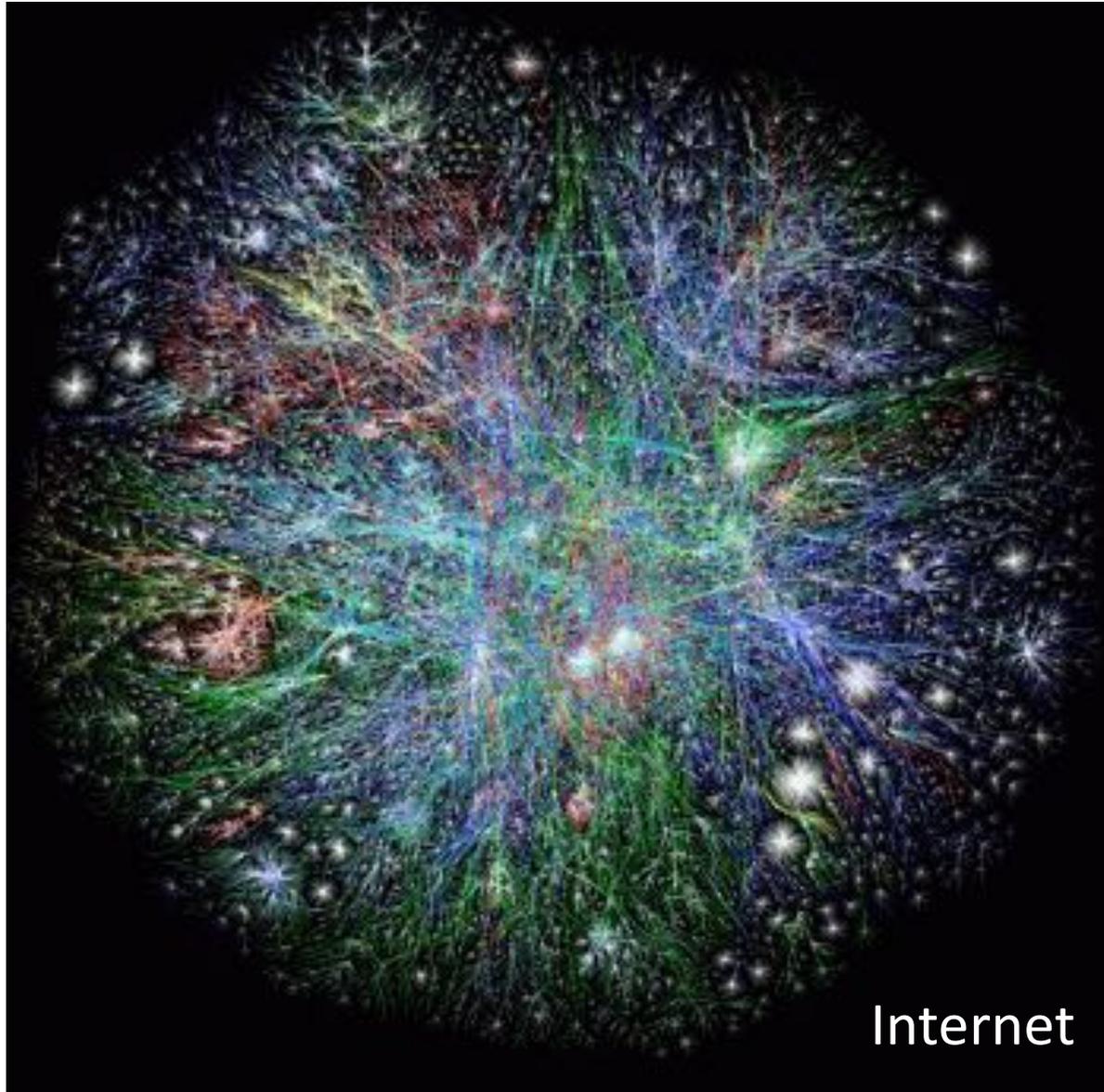
All Destinations

Nonstop Flights Only

Clear Map

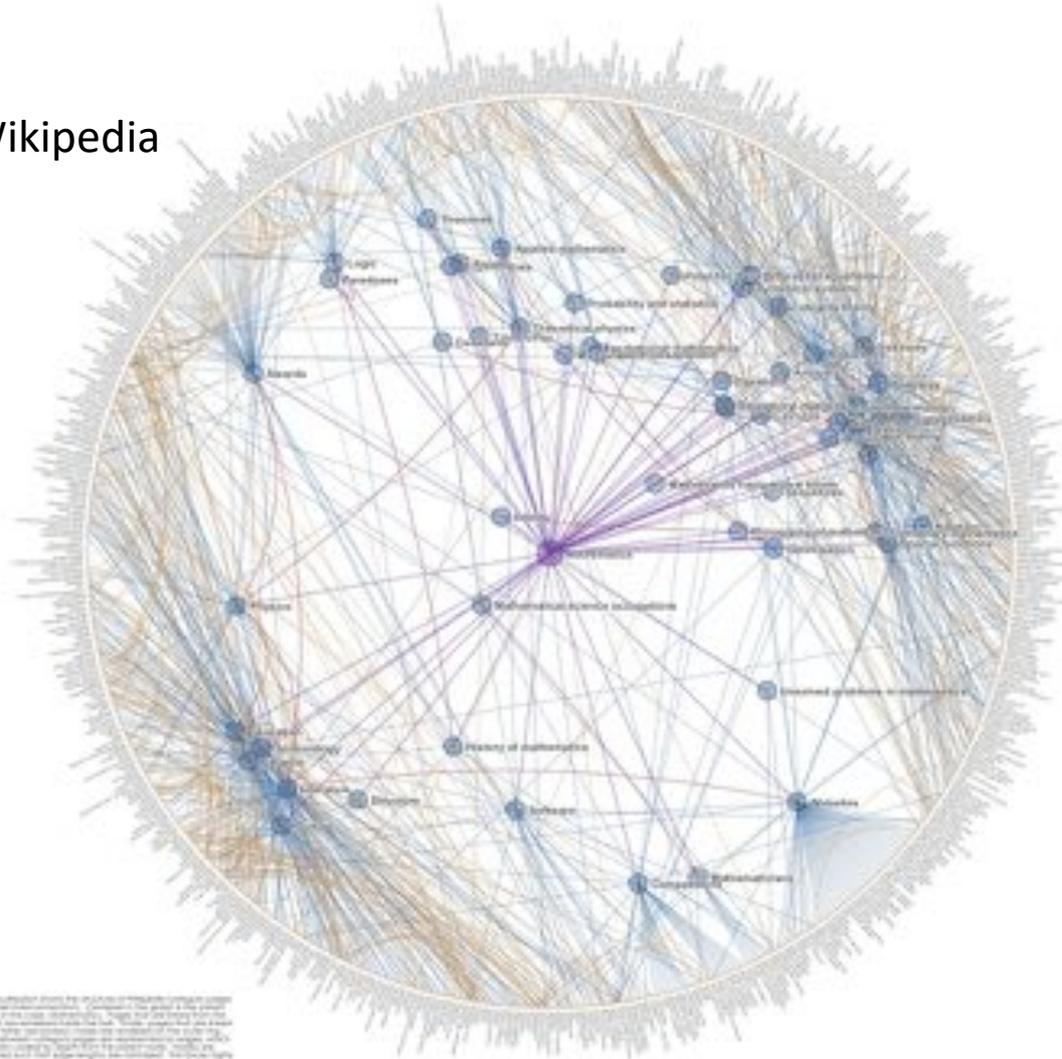


What does this graph represent?



And this one?

Math articles on Wikipedia



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And this one?



Rest of today's agenda

Basic Graph definitions

Paths



Sequence of vertices connected by edges

Connected



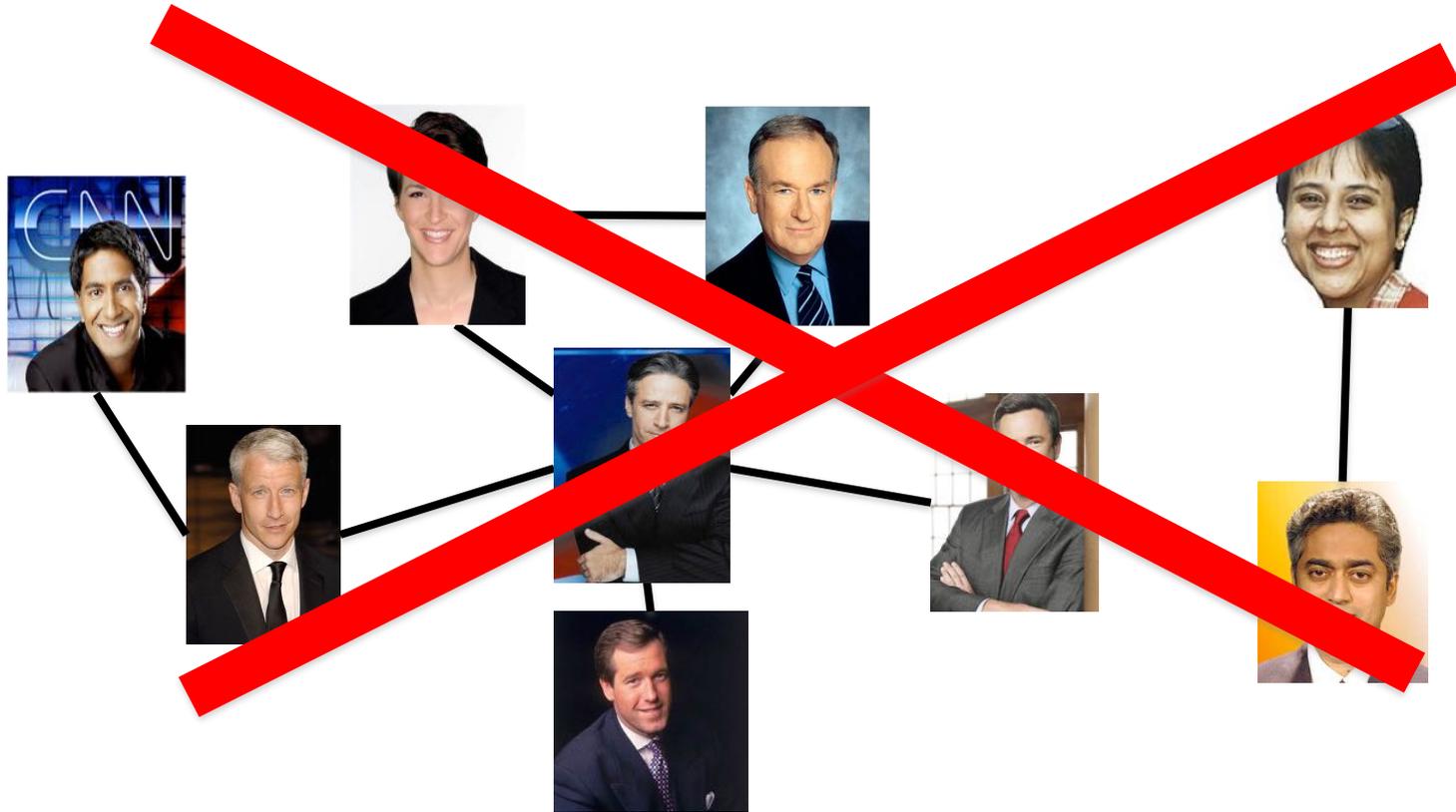
Path length 3

Connectivity

u and w are connected iff there is a path between them

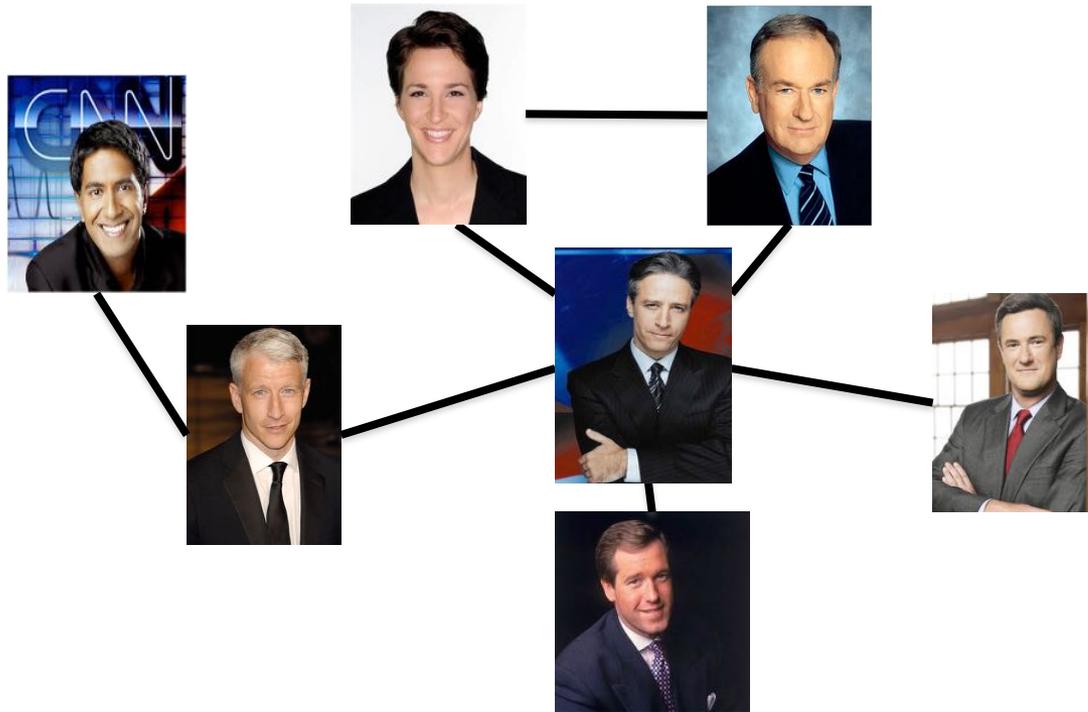
A graph is connected iff all pairs of vertices are connected

Connected Graphs



Every pair of vertices has a path between them

Cycles

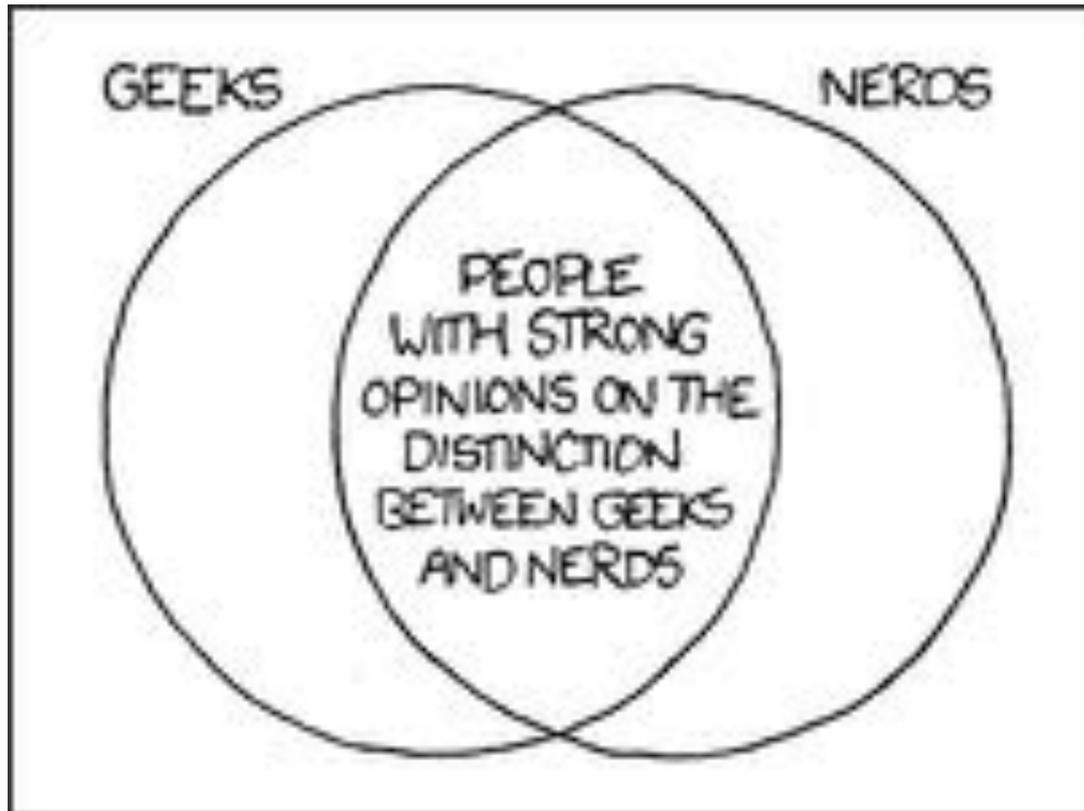


Sequence of k vertices connected by edges, first $k-1$ are distinct





Formally define everything



http://imgs.xkcd.com/comics/geeks_and_nerds.png