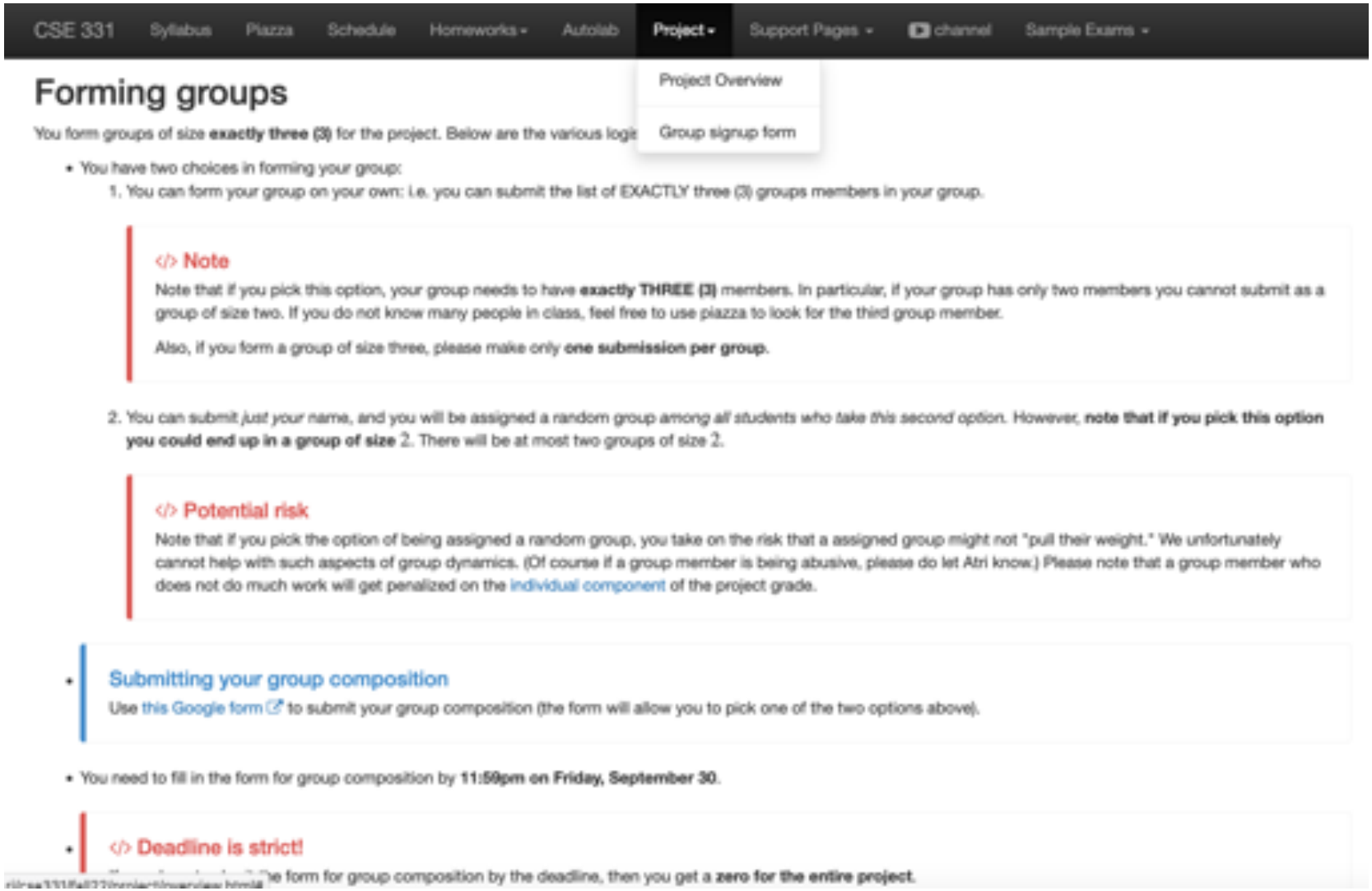
Lecture 10

CSE 331

Sep 21, 2022

Project groups due in <2 weeks

Deadline: Friday, Sep 30, 11:59pm



If you need it, ask for help

Homework 2 out!

Homework 2

Due by **11:30pm, Tuesday, September 27, 2022**.

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

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

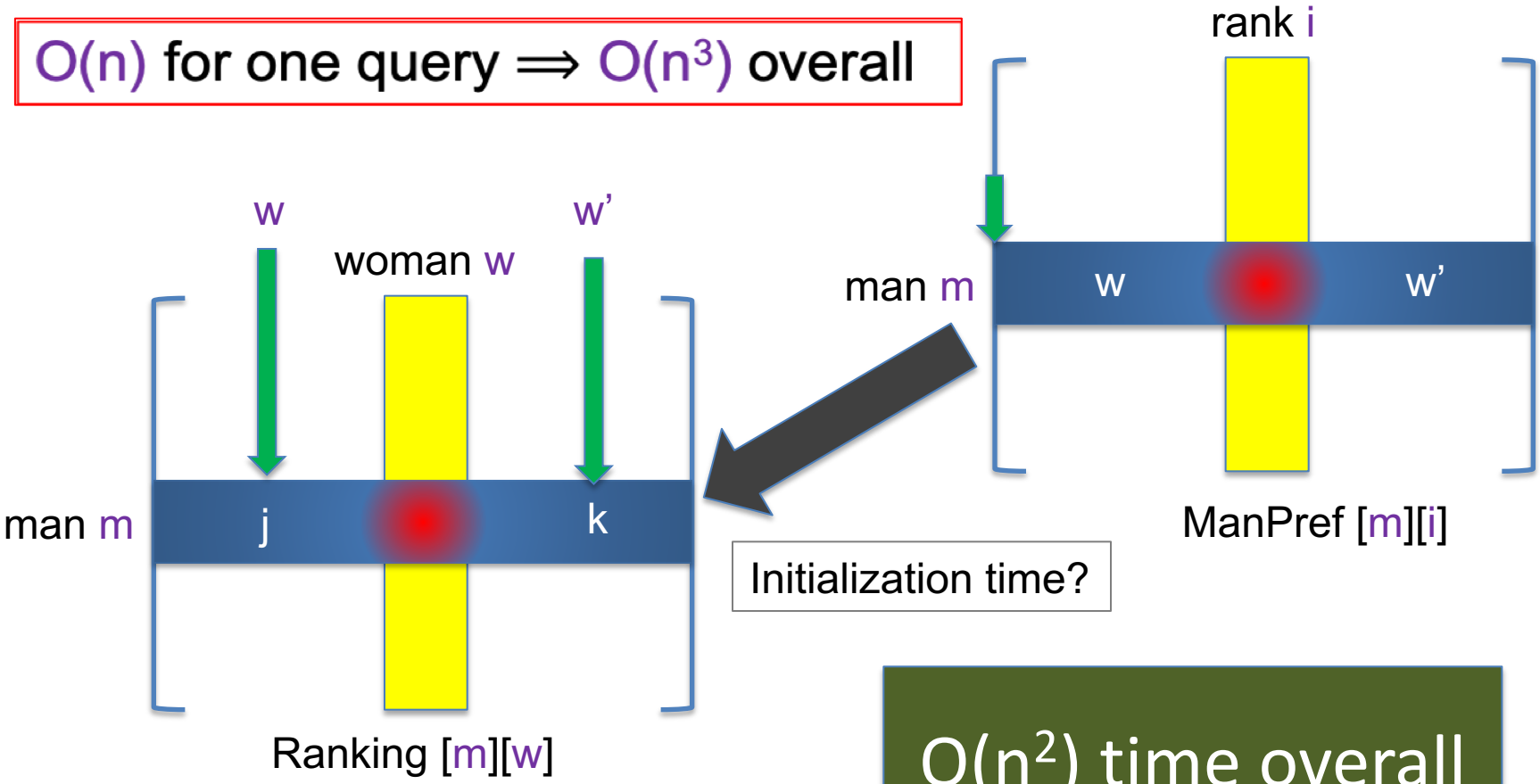
Init(1-4)

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

Questions?

Answering Q4

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



O(n^2) time overall

O(1) query time

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

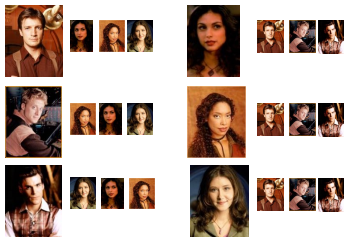
Puzzle

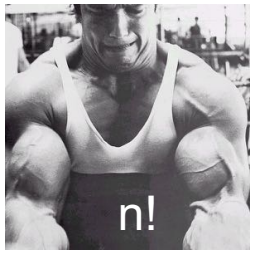
Prove that **any** algorithm for the SMP takes $\Omega(n^2)$ time

Main Steps in Algorithm Design

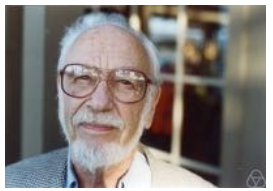
Problem Statement

Problem Definition





Algorithm

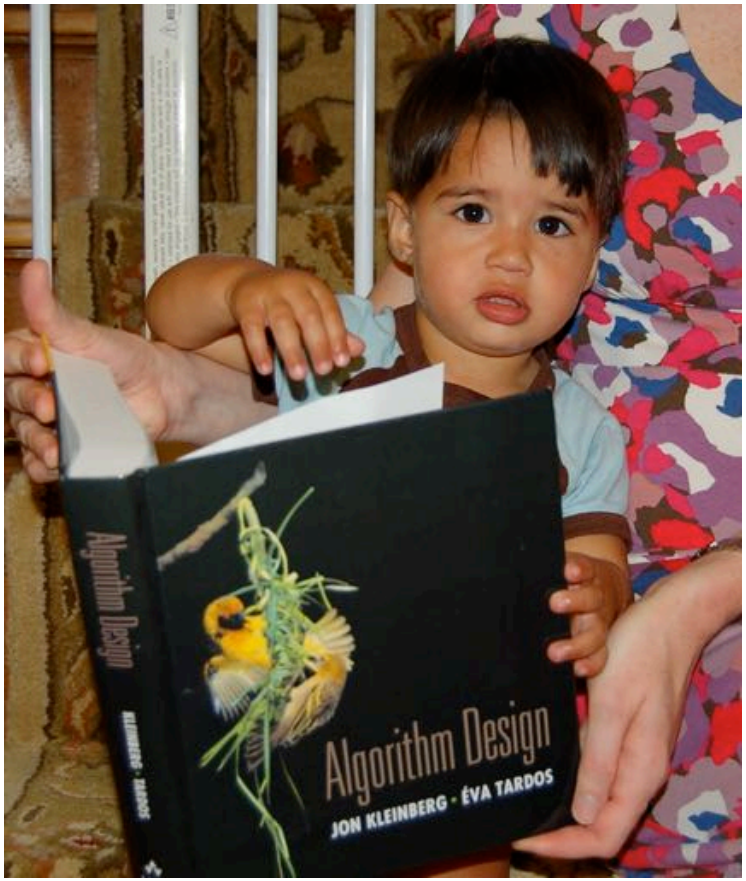


"Implementation"

Analysis

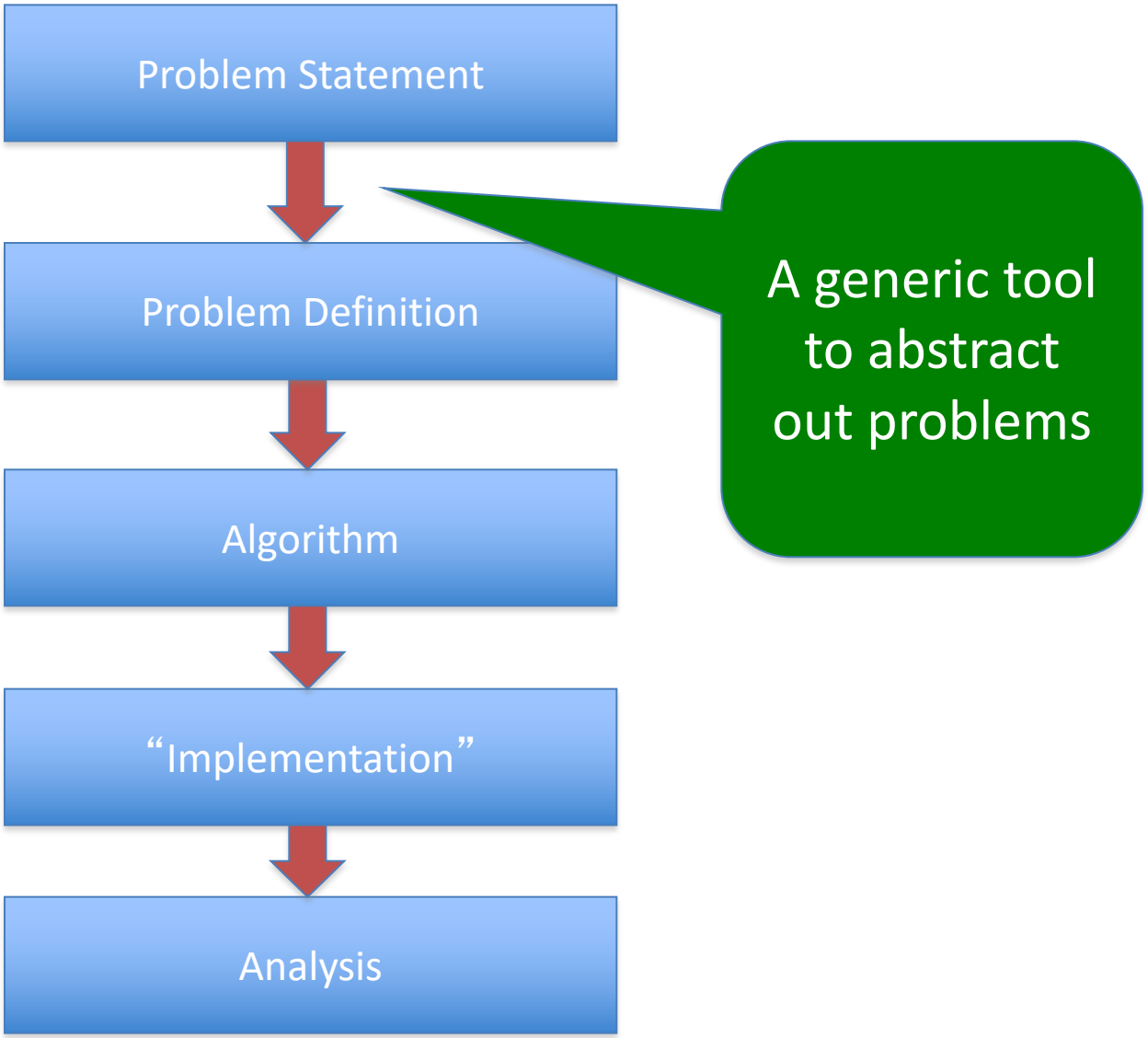
Correctness Analysis

Reading Assignments



Sec 1.1 and Chap. 2 in [KT]

Up Next….

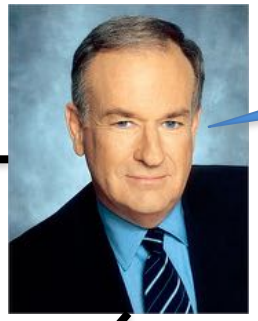

Problem Statement
Problem Definition
Algorithm
“Implementation”
Analysis
A generic tool to abstract out problems

Graphs

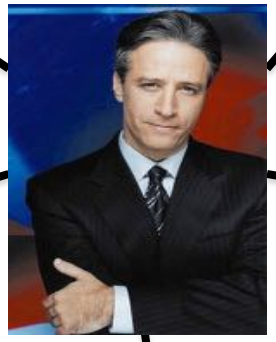
Representation of relation Edge airs of entities/elements

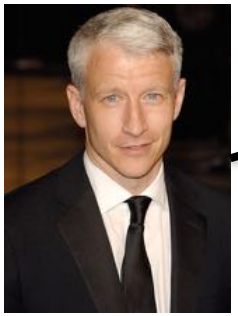
Entities: News hosts

Relationship: Mention in other's program



Vertex/Node

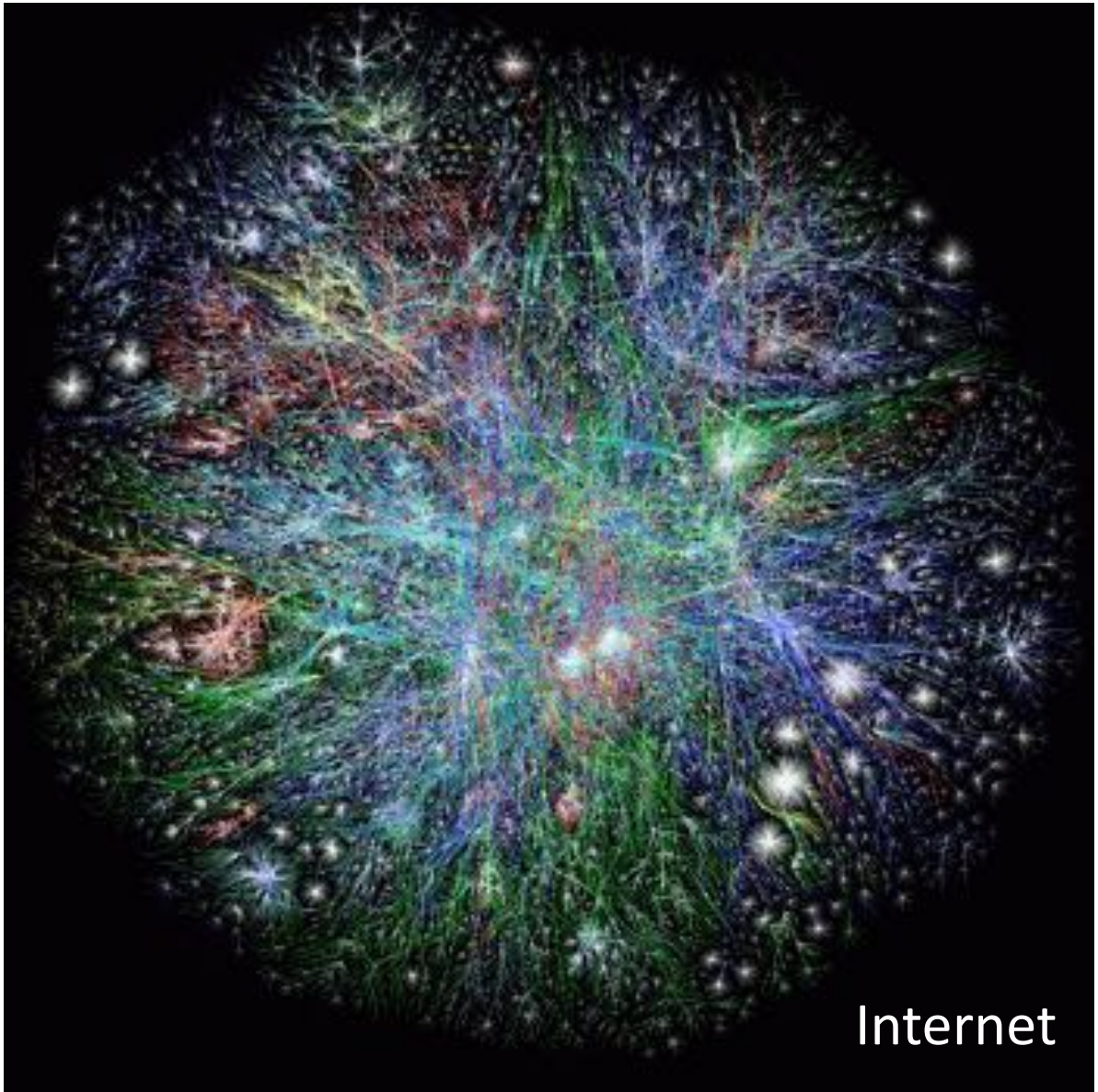




Graphs are omnipresent

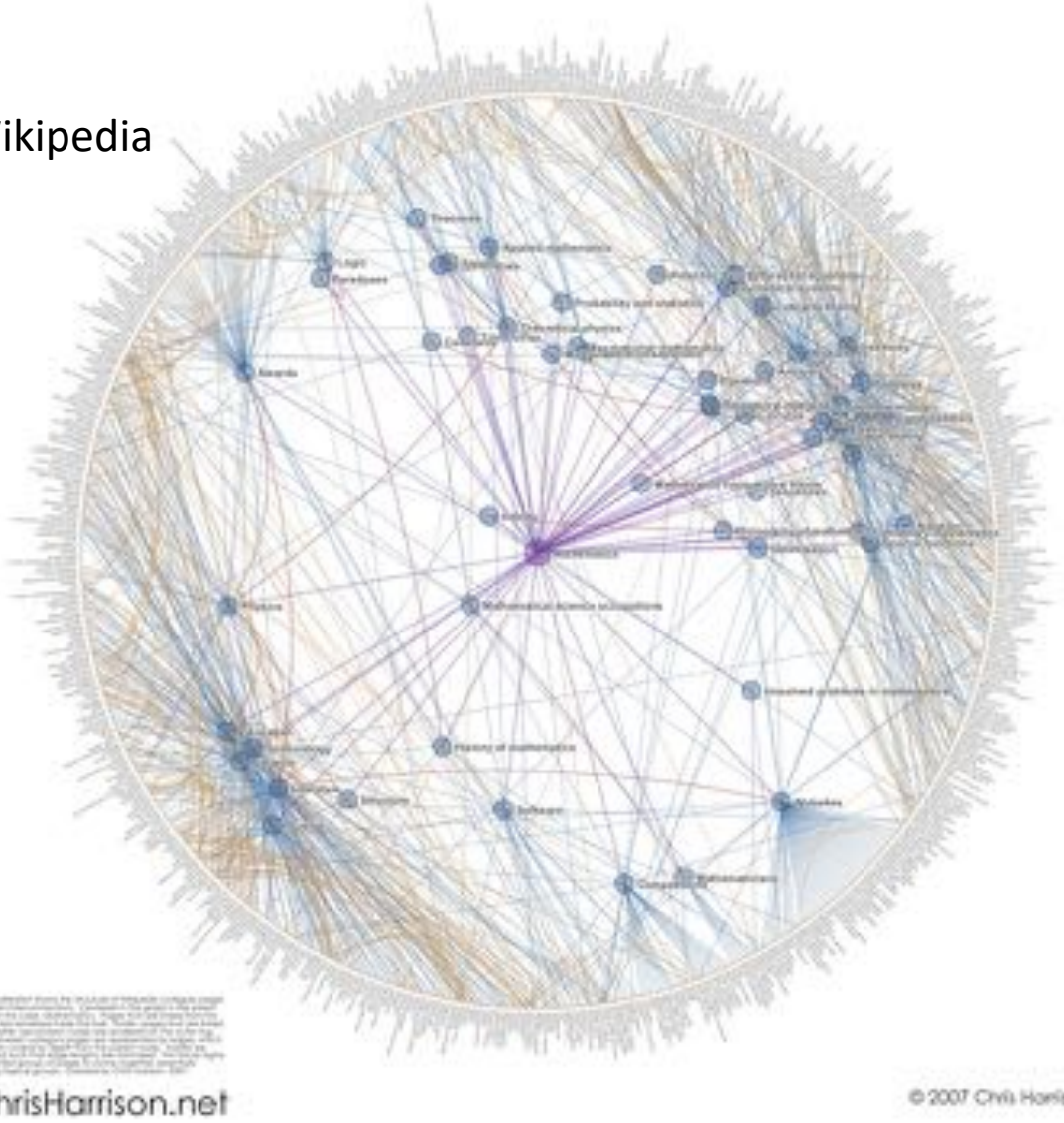
Airline Route maps

What does this graph represent?

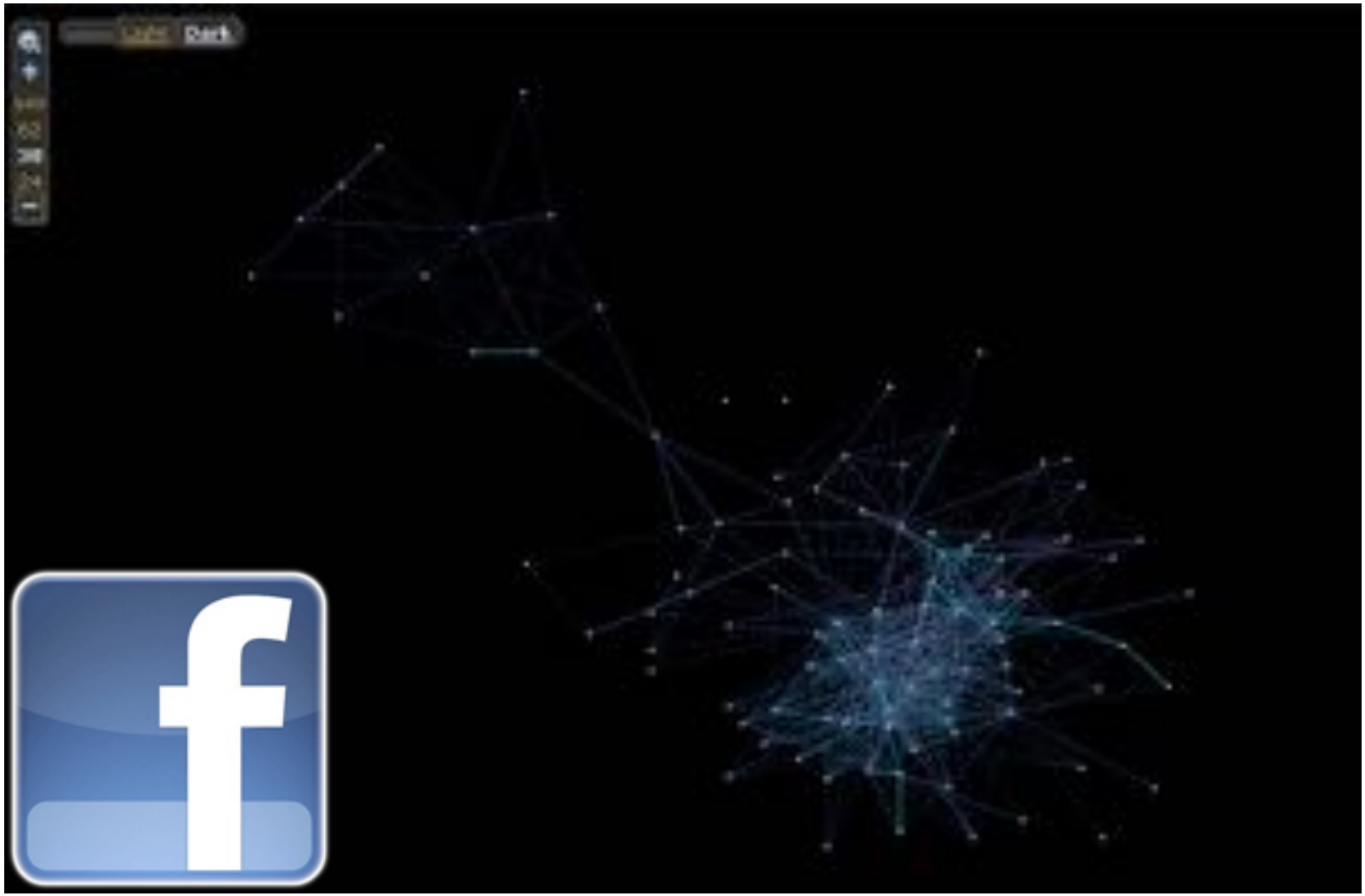


And this one?

Math articles on Wikipedia



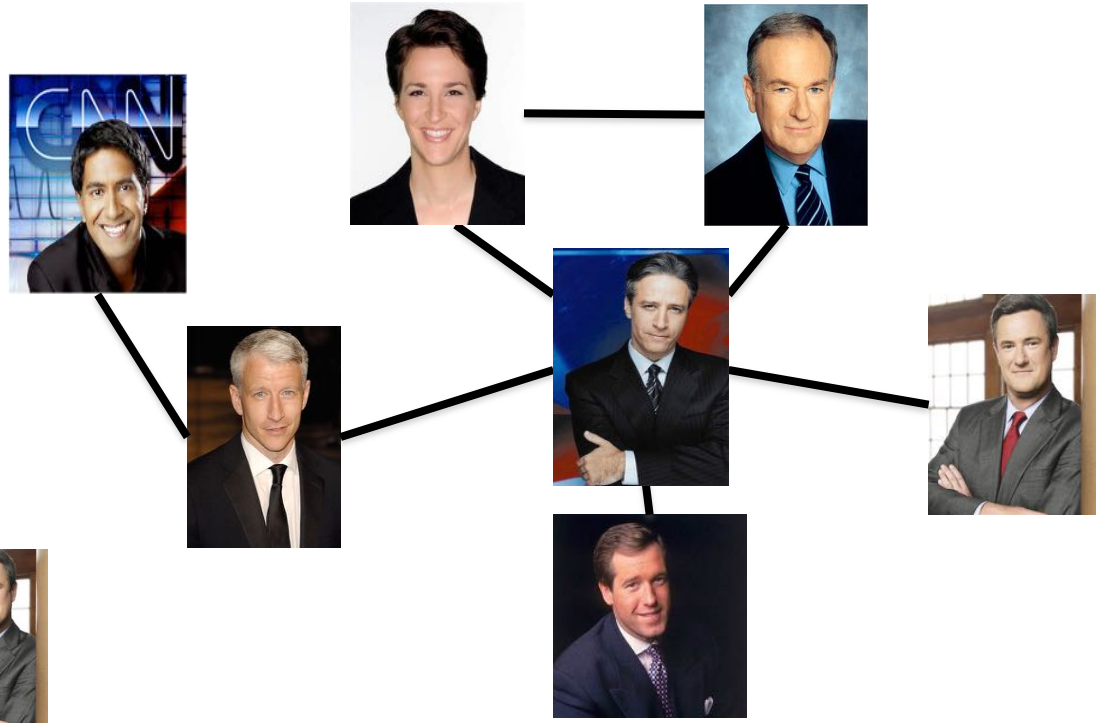
And this one?



Rest of today's agenda

Basic Graph definitions

Paths



Connected

Sequence of vertices connected by edges

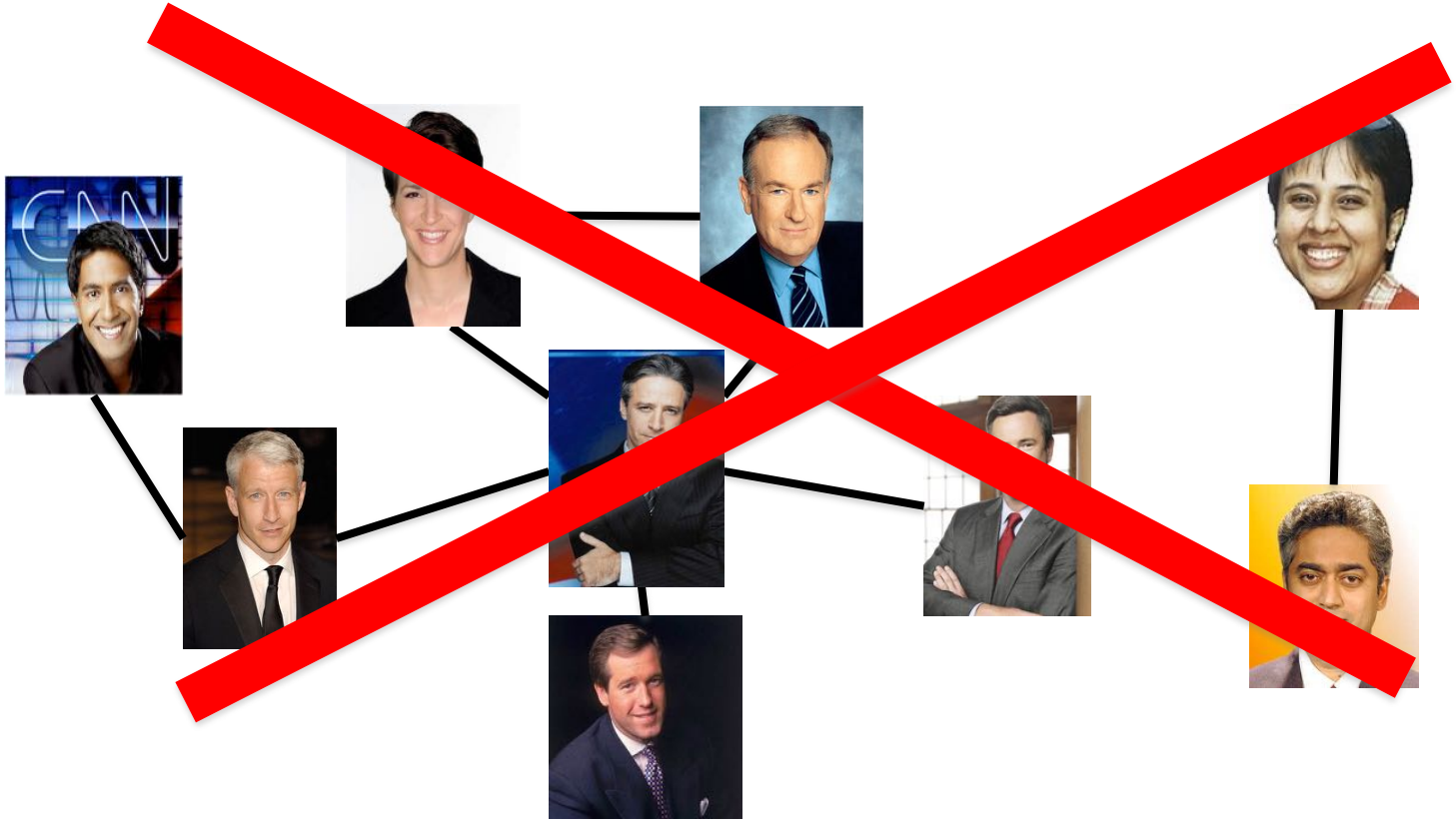
Path length 3

Connectivity

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

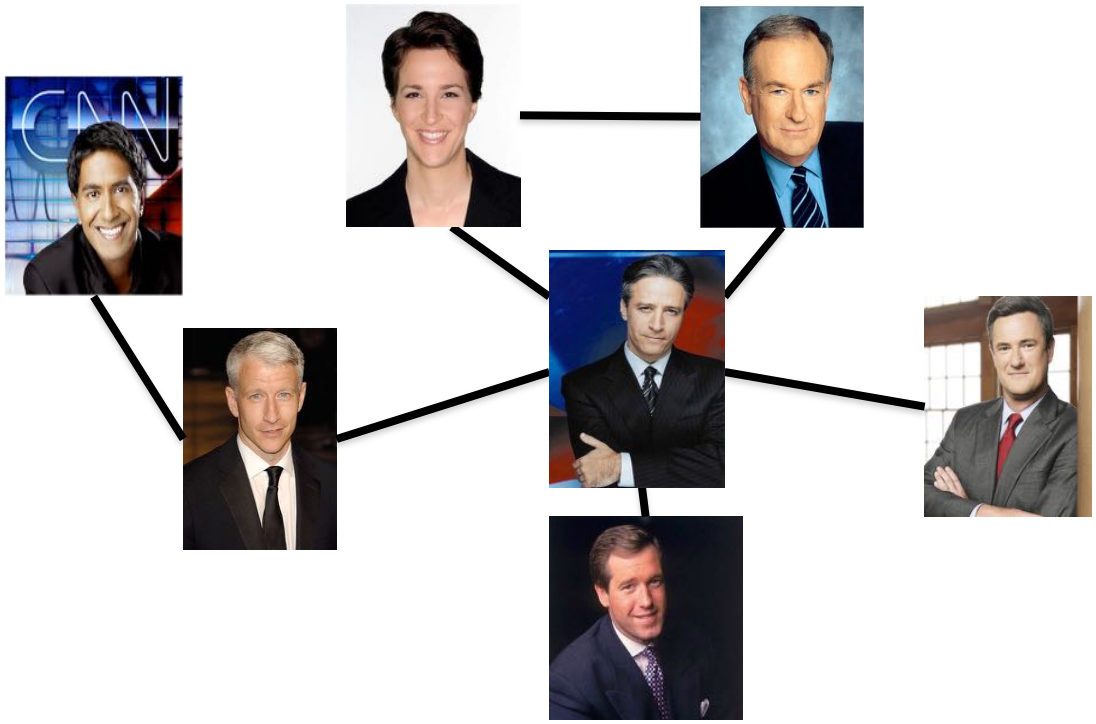
A graph is connected iff all pairs of vertices are connected

Connected Graphs

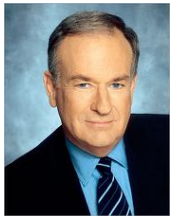
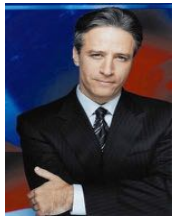


Every pair of vertices has a path between them

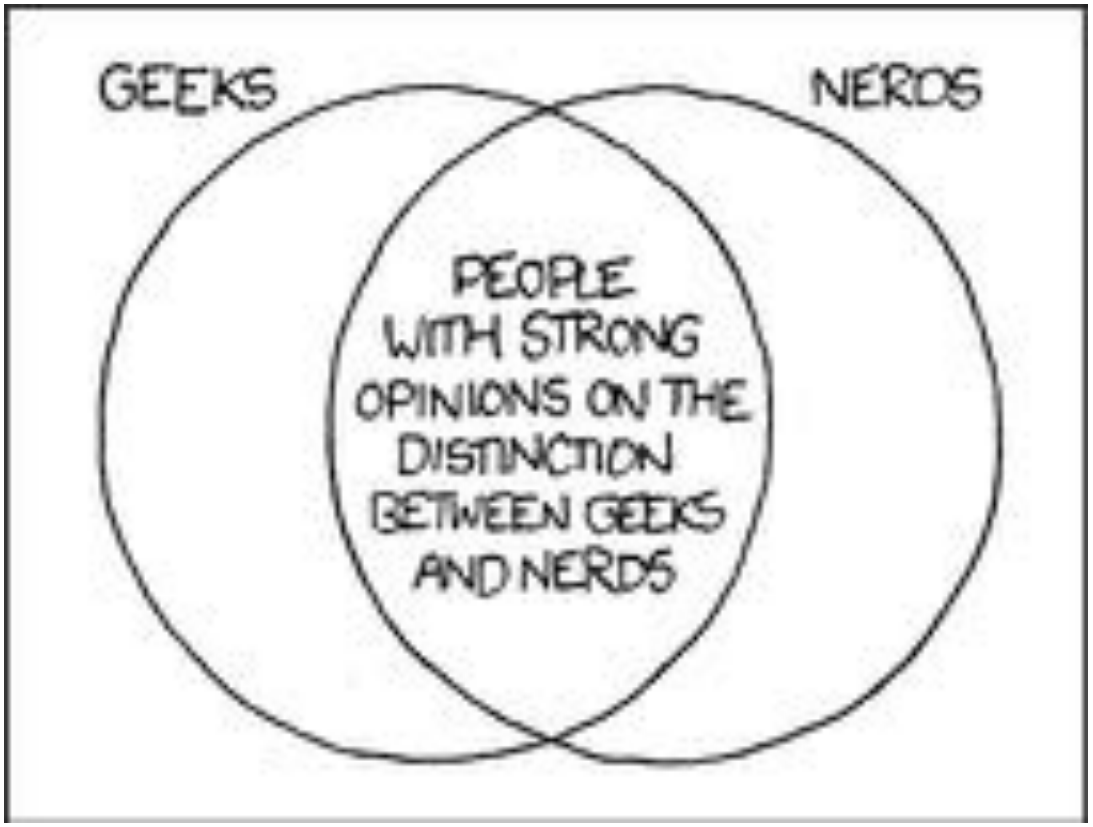
Cycles



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

 ,  ,  , 

Formally define everything



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