

Lecture 10

CSE 331

Feb 22, 2021

True/False piazza polls

Actions ▾

1st T/F question

Apologies for the delay in getting this started.

The plan is to do a weekly True/False question on piazza. (I'm about 2 weeks late so there will be some additional T/F Qs one after the other this week.) The way it is going to work is that every Monday (or so) I will post a statement in a poll and ask you guys to vote True or False (Please just vote and do not post your justification: yet.) Then after two days, I will give the correct answer and then ask for you guys to construct the correct justification. Note that this is to give you guys more practice for the true/false questions on the exams. So try and work on these on your own so that you gain some practice.

Anyhow, here is the **question for this week**. Is the following statement **True** or **False**?

Given n numbers a_1, \dots, a_n such that for every $i \in [n]$ we have $a_i \in \{0, 1\}$ (we will use $[n]$ to denote the set of integers $\{1, \dots, n\}$). That is, we are given n numbers each of which is a bit. Then we can sort these n numbers in $O(n)$ time.

- True
- False

Submit

You have **not yet** voted.

Revoting is **not allowed**. Select your vote and click submit to register your vote.

Your name will **not be visible to anyone**.

t/f polls

edit · good poll | 0

Updated 4 days ago by A. Erdem Sariyuce

1st T/F question is now closed

A total of 92 vote(s) in 169 hours



Video Project choice due in 11 days (Mar 5)

CSE 331 Video project choices

Spring 2021

Please check the table below before submitting your video 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
Thomas Westpfal, Joyce He, Alex Wang (CodeMonke)	UK's A-Level Grading Algorithm	Ofqual student grading algorithm created to remove grading bias introduced grading bias.	Link 1 , Link 2 , Link 3 , Link 4
Lila Tan, Justin Chan, Alex Yan (crewmates)	Neural Networks	Neural Networks are a series of algorithms that is used for automation of self-driving cars.	Link 1 , Link 2 , Link 3 , Link 4
Joshua Caskie, Katherine Stock, Hannah Wilcox (AI Gore Rhythms)	US News College Ranking Algorithm	The US News college ranking algorithm was created to rank colleges based on certain characteristics.	Link 1 , Link 2 , Link 3 , Link 4
Doohan Ryan, Zimmermann Shawn, Neppalli Chandra (T-Series)	Youtube Algorithm's	Recommendation of content or videos to viewers based on what the user is consuming on Youtube.	Link 1 , Link 2 , Link 3 , Link 4
Elston Lau, Edmund Wu, Kurt Su (The Triad)	Deepfake Algorithm	How algorithms can fake a person's face and voice	Link 1 , Link 2 , Link 3 , Link 4

HW 2 has been posted

Homework 2

Due by **8:00pm, Friday, February 26, 2021.**

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

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

Check the [week 4 recitation notes](#) for this homework.

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](#)

Submission

You will **NOT** submit this question. This is for you to get into thinking more about asymptotic analysis.

Question 1 (Reformer) [50 points]

Solutions to HW1

Posted on piazza (see the videos!)

Questions?

Implementation Steps

(0) How to represent the input?

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

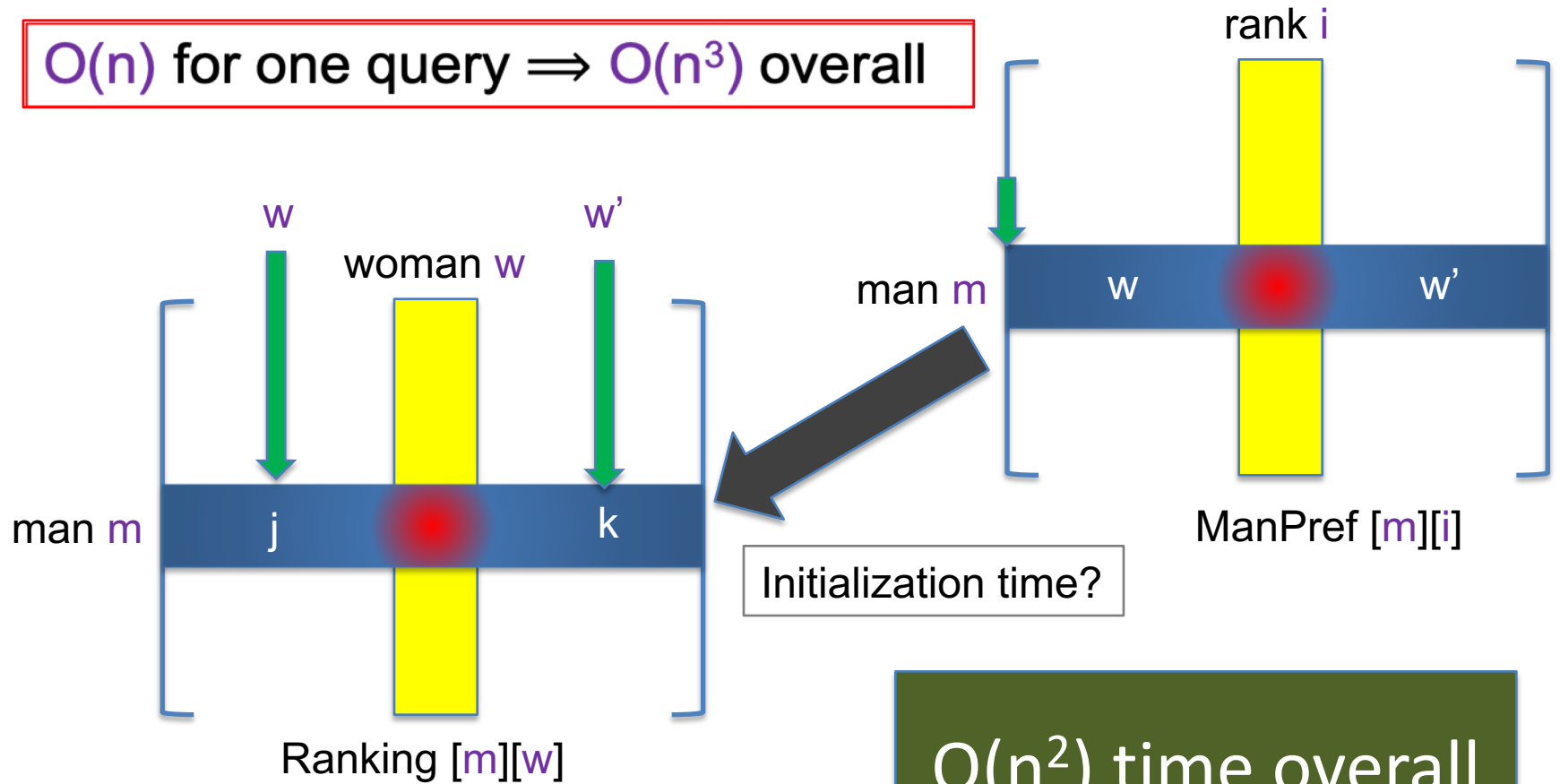
(2) How would w pick her best unproposed man m ?

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

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

Answering Q4

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



$O(1)$ query time

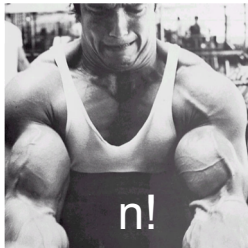
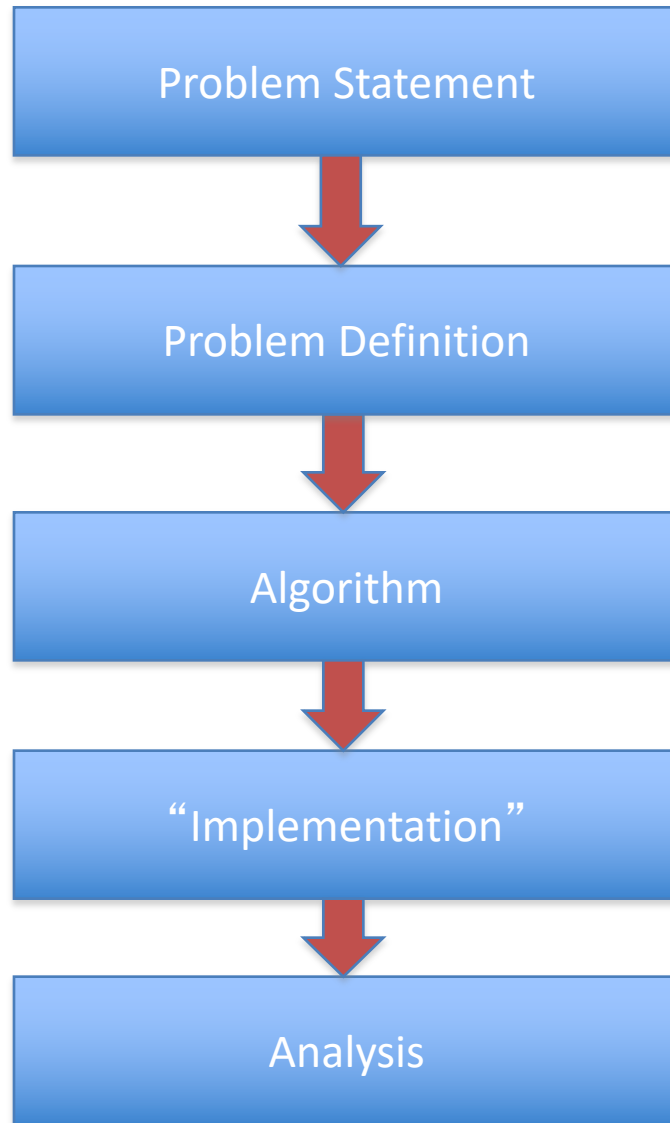
$O(n^2)$ time overall

(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

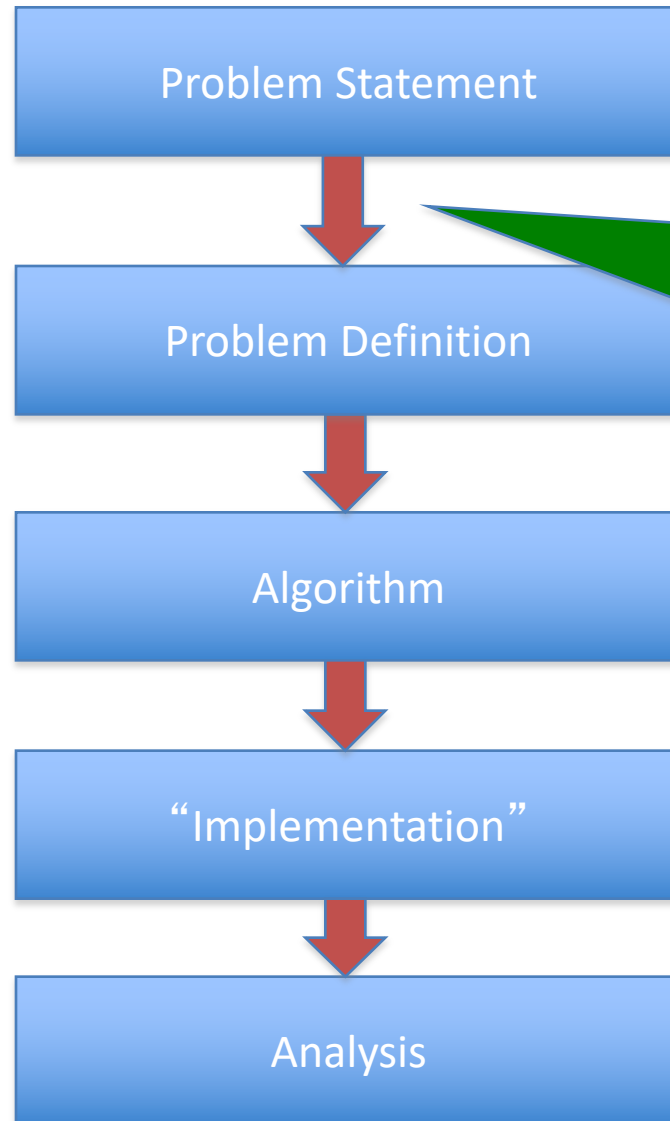


Correctness Analysis

Reading Assignments

Sec 1.1 and Chap. 2 in [KT]

Up Next....



A generic tool
to abstract
out problems

Graphs

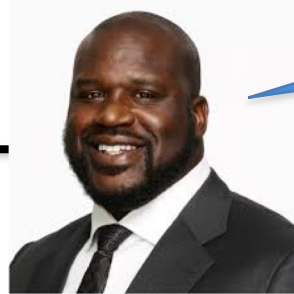
Representation of relationship pairs of entities/elements

Entities:
NBA players

Relationship: Played together



kobe bryant



shaq o'neal



lebron james



kevin love



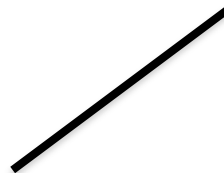
anthony davis



kyrie irving

Edge

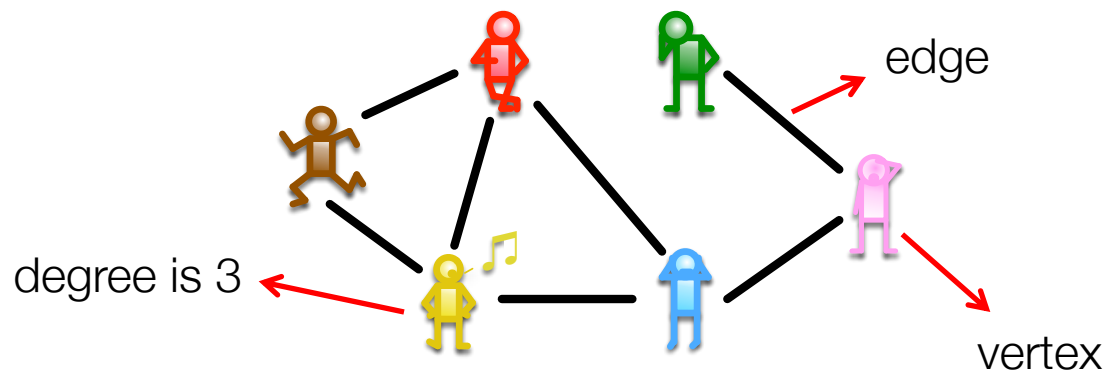
Vertex/Node



Graphs

- Distinct entities: Nodes (or vertices)
- Connections: Links (or edges)

Network	Vertex	Edge
Internet	Computer or router	Cable or wireless data connection
World Wide Web	Web page	Hyperlink
Citation network	Article, patent, or legal case	Citation
Power grid	Generating station or substation	Transmission line
Friendship network	Person	Friendship
Metabolic network	Metabolite	Metabolic reaction
Neural network	Neuron	Synapse
Food web	Species	Predation



Graphs are omnipresent

jetBlue

HAPPY JETTING

Airline Route maps

Español • Help • Speak up

Book travel

Manage your flights

Travel deals

Where we jet

TrueBlue® program

Buffalo, NY [BUF]

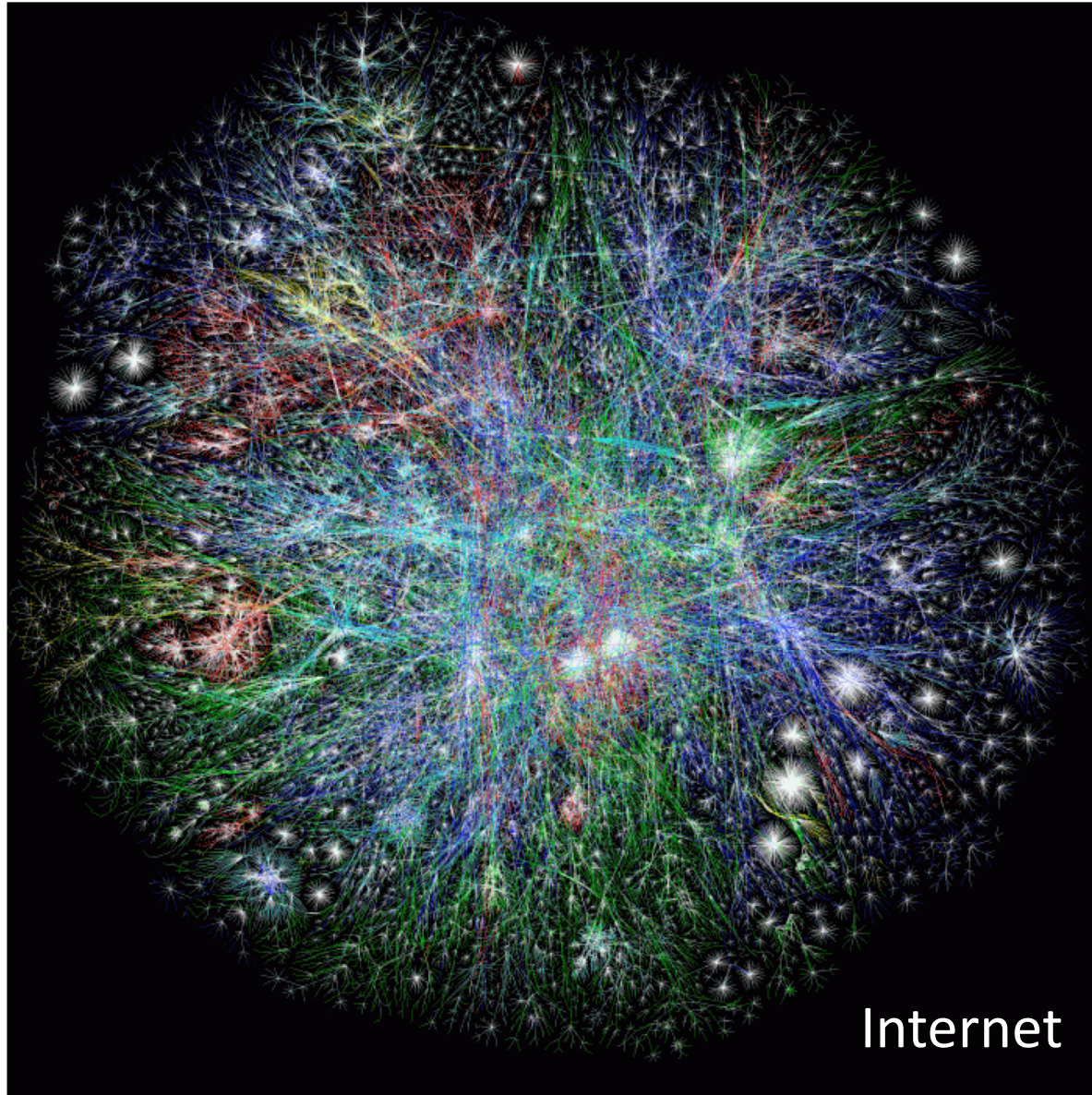
All Destinations

Nonstop Flights Only

Clear Map

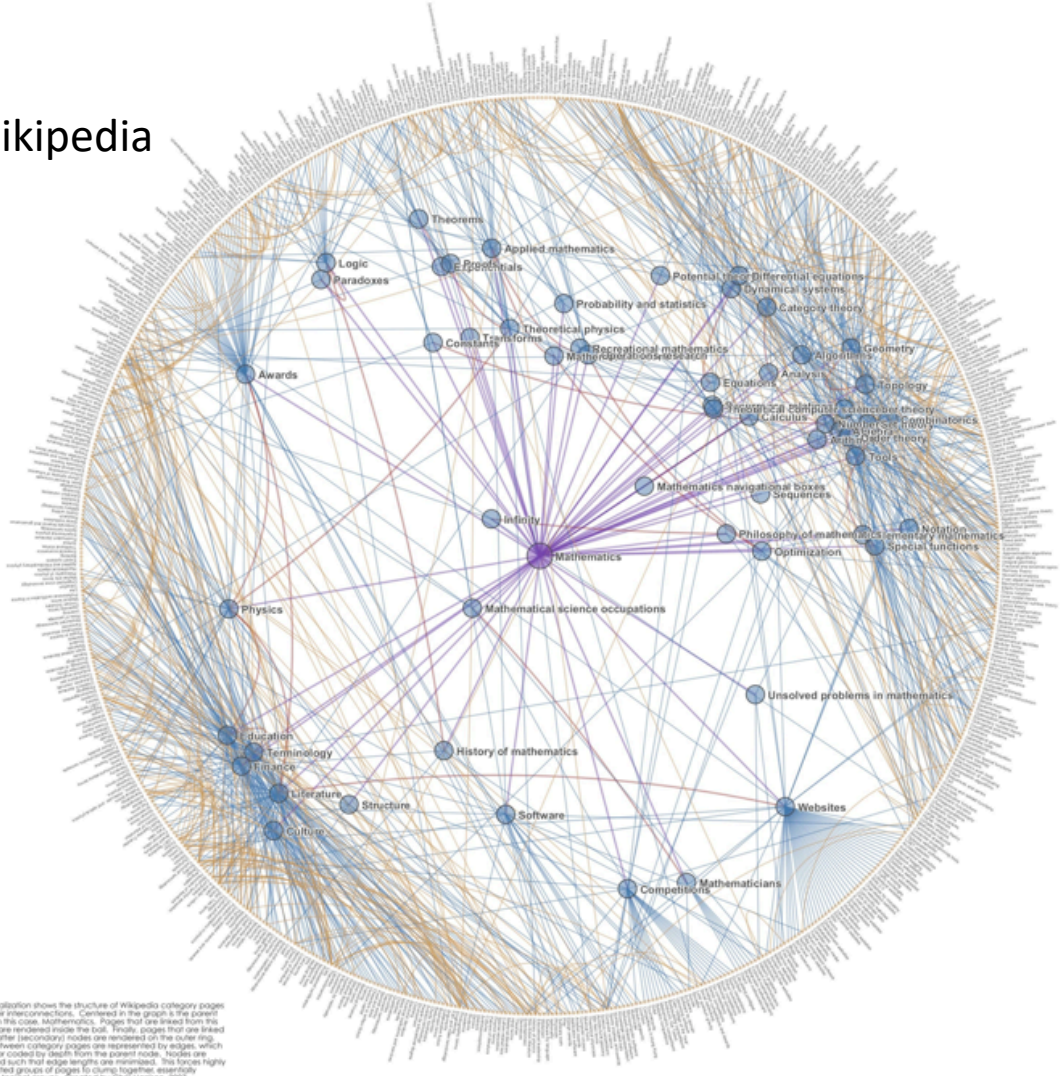


What does this graph represent?



And this one?

Math articles on Wikipedia



Rest of today's agenda

Basic Graph definitions