Lecture 8

CSE 331

Feb 17, 2020

True/False piazza polls

The first 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 3 weeks late so there will be three additional
guys to vote True or False. (Please just vote and do not post your justification: yet.) Then after two days, I will give
justification. Note that this is to give you guys more practice for the true/false questions on the exams. So try and

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

Given n numbers $a_1, \ldots, a_n$ such that for every $i \in [n]$ (we will use $[n]$ to denote the set of integers $\{1, \ldots, n\}$

- ◯ True
- ◯ False

Submit

Mini Project choice due in 11 days (Feb 28)

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.

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

HW 2 has been posted

Homework 2

Due by **8:00am, Monday, February 24, 2020**.

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

Submission

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

Question 1 (Home-wrecker) [50 points]

Solutions to HW1

Handed out at the end of the lecture

Questions?

Implementation Steps

(0) How to represent the input?

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

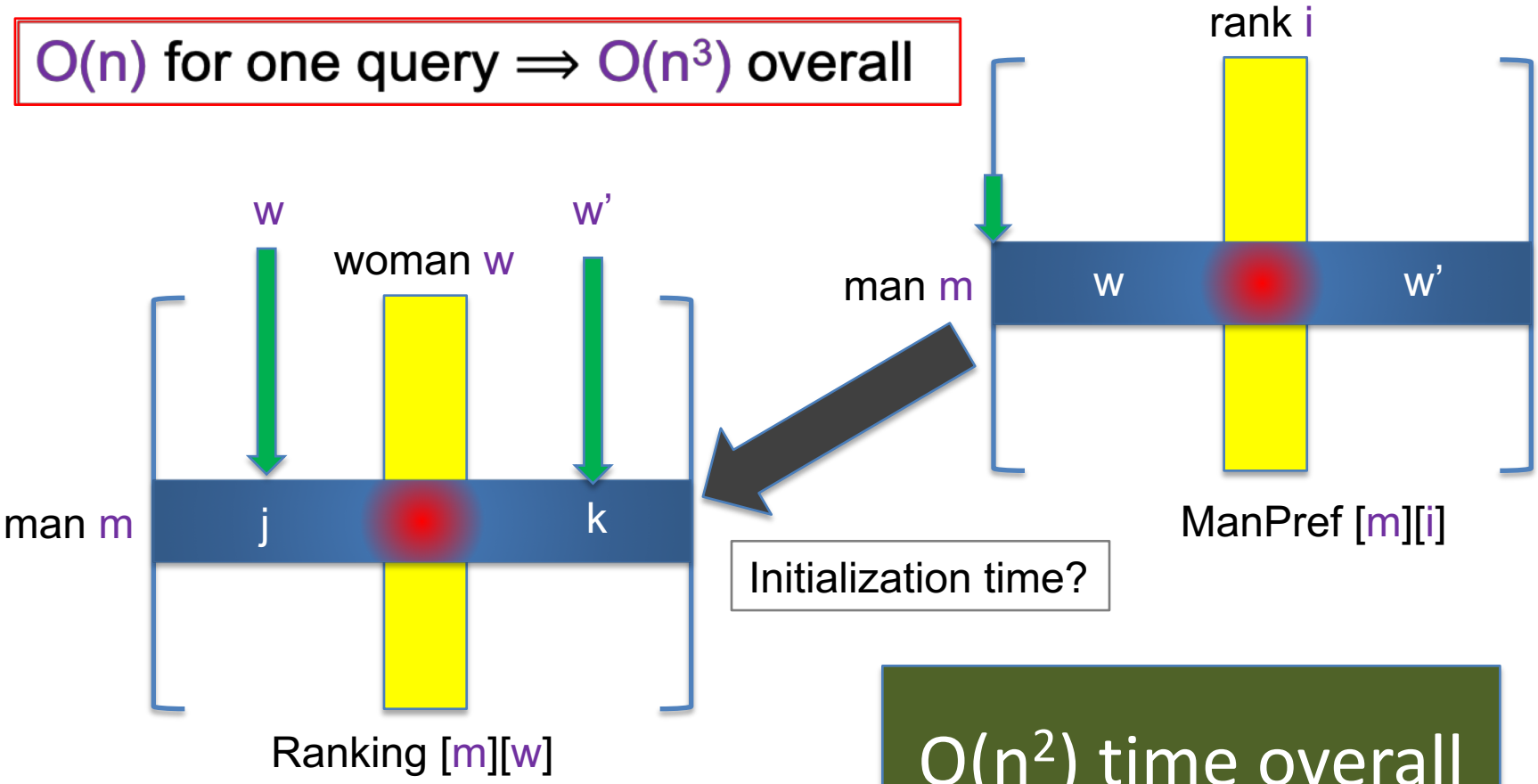
(2) How would w pick her best unproposed man m?

(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 $\Longrightarrow$ $O(n^3)$ overall



$O(n^2)$ time overall

O(1) query time

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

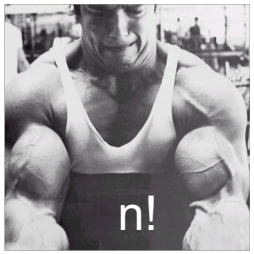
Puzzle

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

Main Steps in Algorithm Design

Problem Statement

Problem Definition



Algorithm

"Implementation"

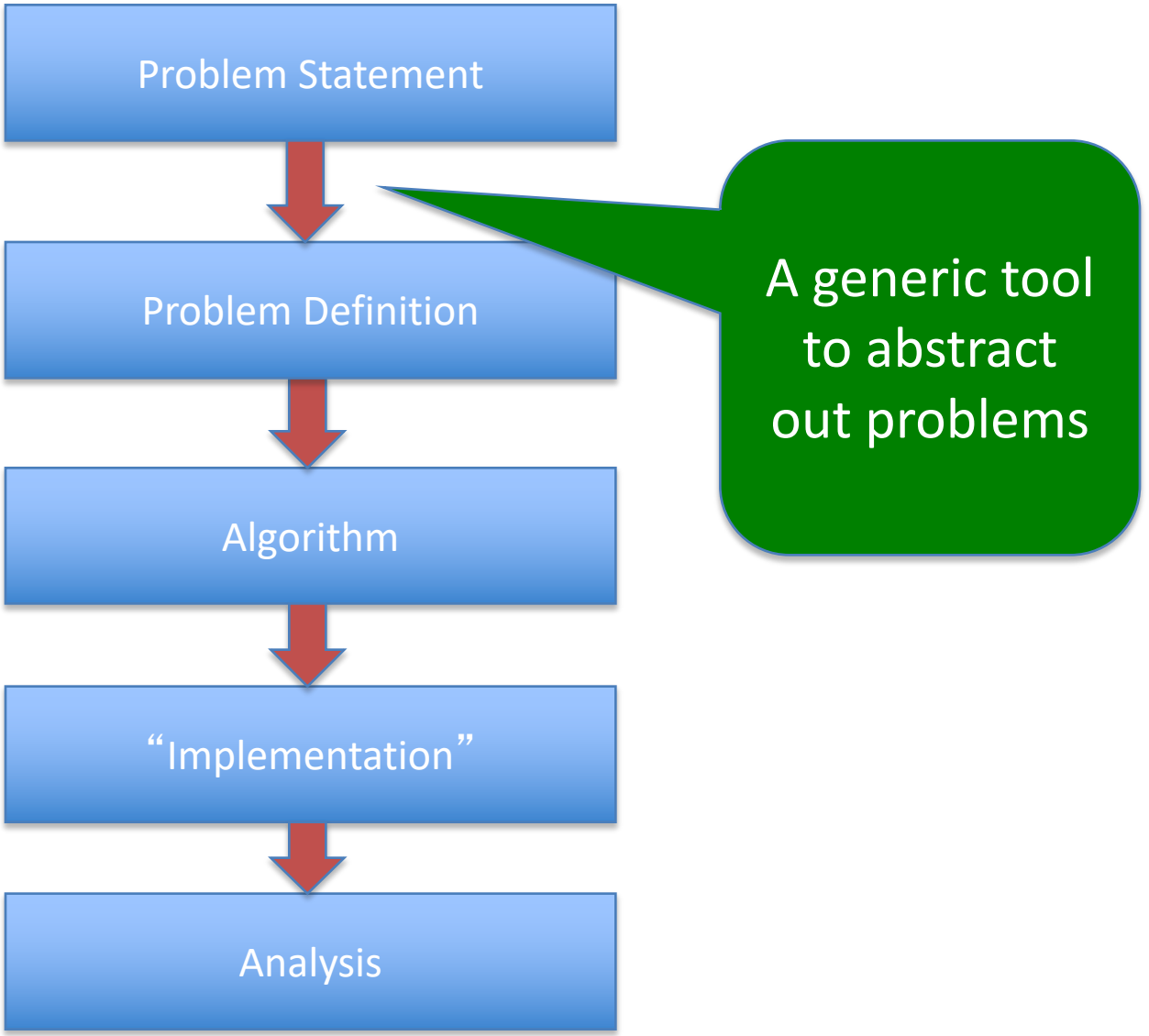
Analysis

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

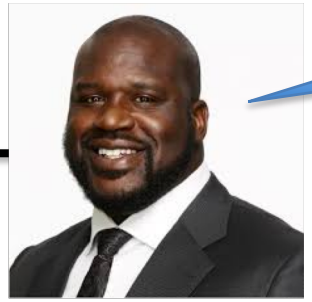
Graphs

Representation of relation[illegible] Edge [illegible]airs of entities/elements

Entities:
NBA players

Relationship: Played together

kobe bryant



Vertex/Node

shaq o'neal

anthony davis

lebron james

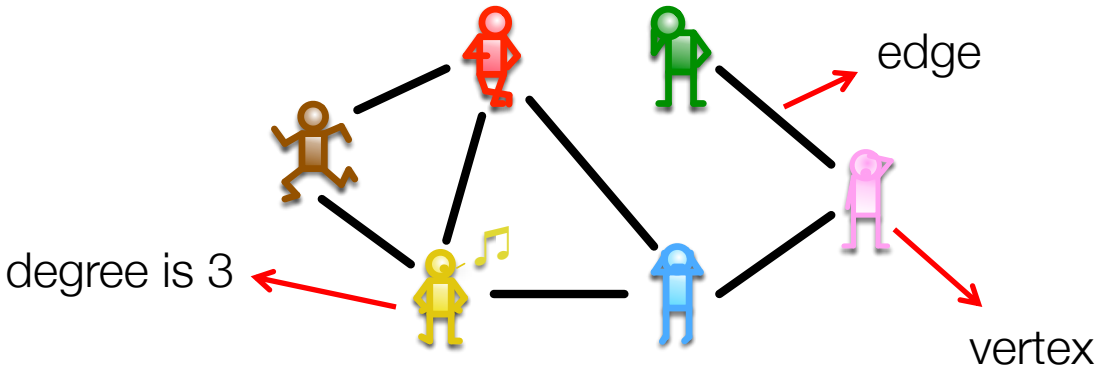
kyrie irving

kevin love

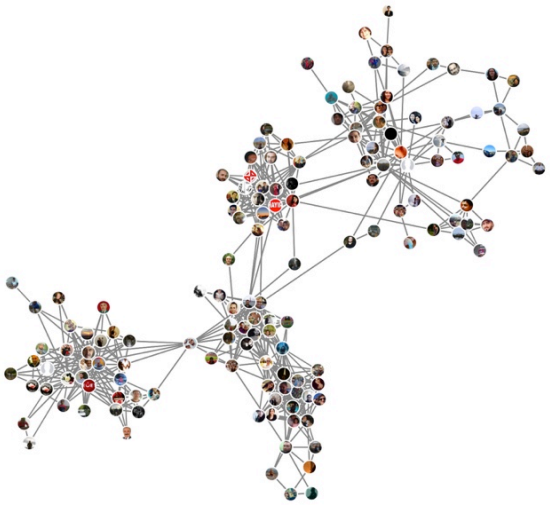
Graphs

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

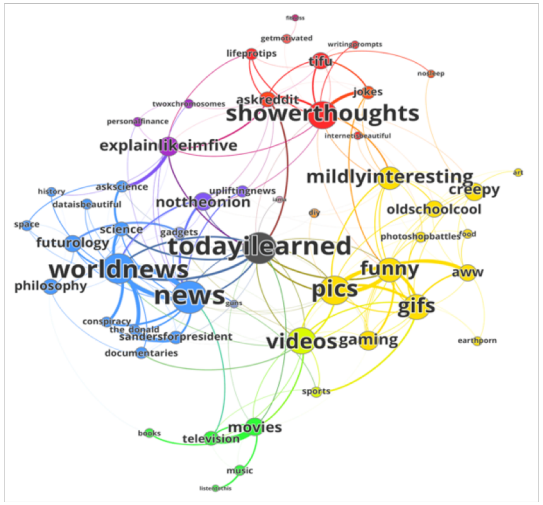
Network	Vertex	Edge
Internet	Computer or router	Cable or wireless data connection
World Wide Web	Web page	Hyperlink
Citation network	Article, patent, or legal case	Citation
Power grid	Generating station or substation	Transmission line
Friendship network	Person	Friendship
Metabolic network	Metabolite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



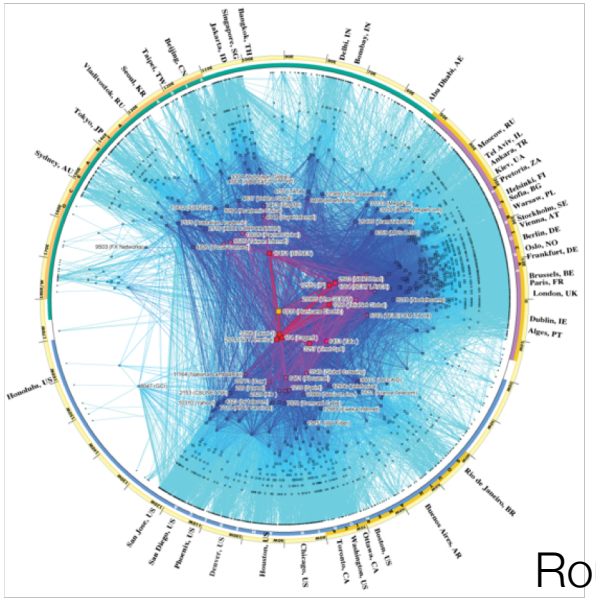
Graphs are everywhere!



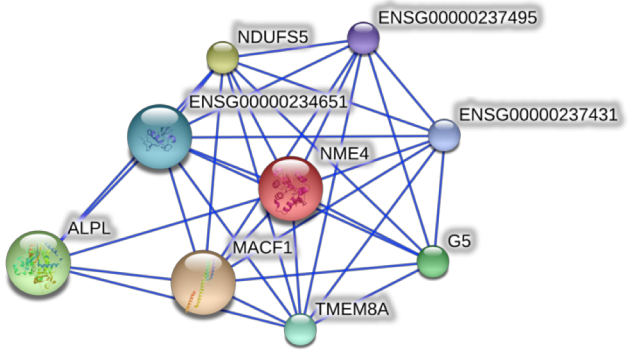
Social



Information



Routers

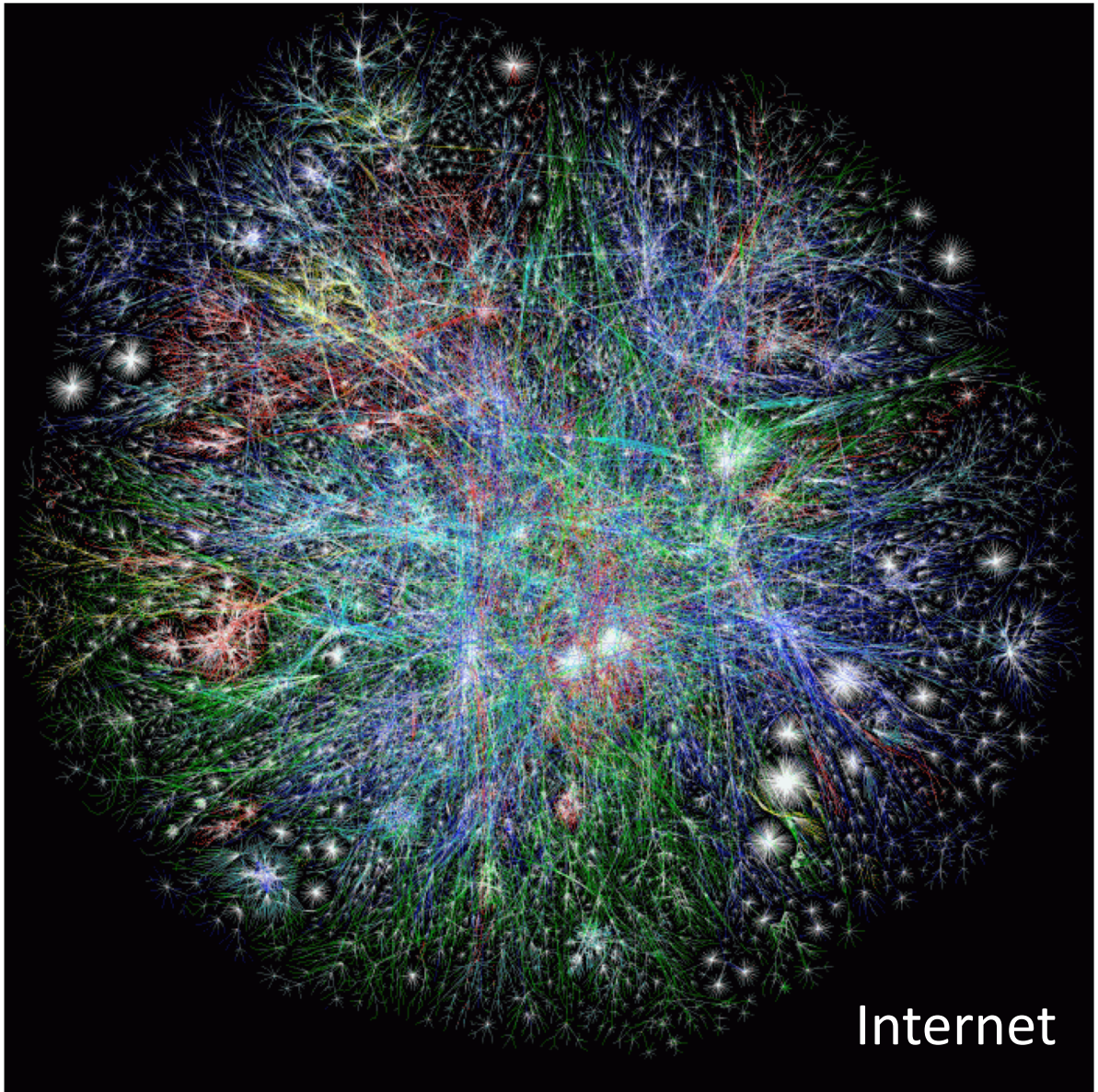


Protein-interaction

Graphs are omnipresent

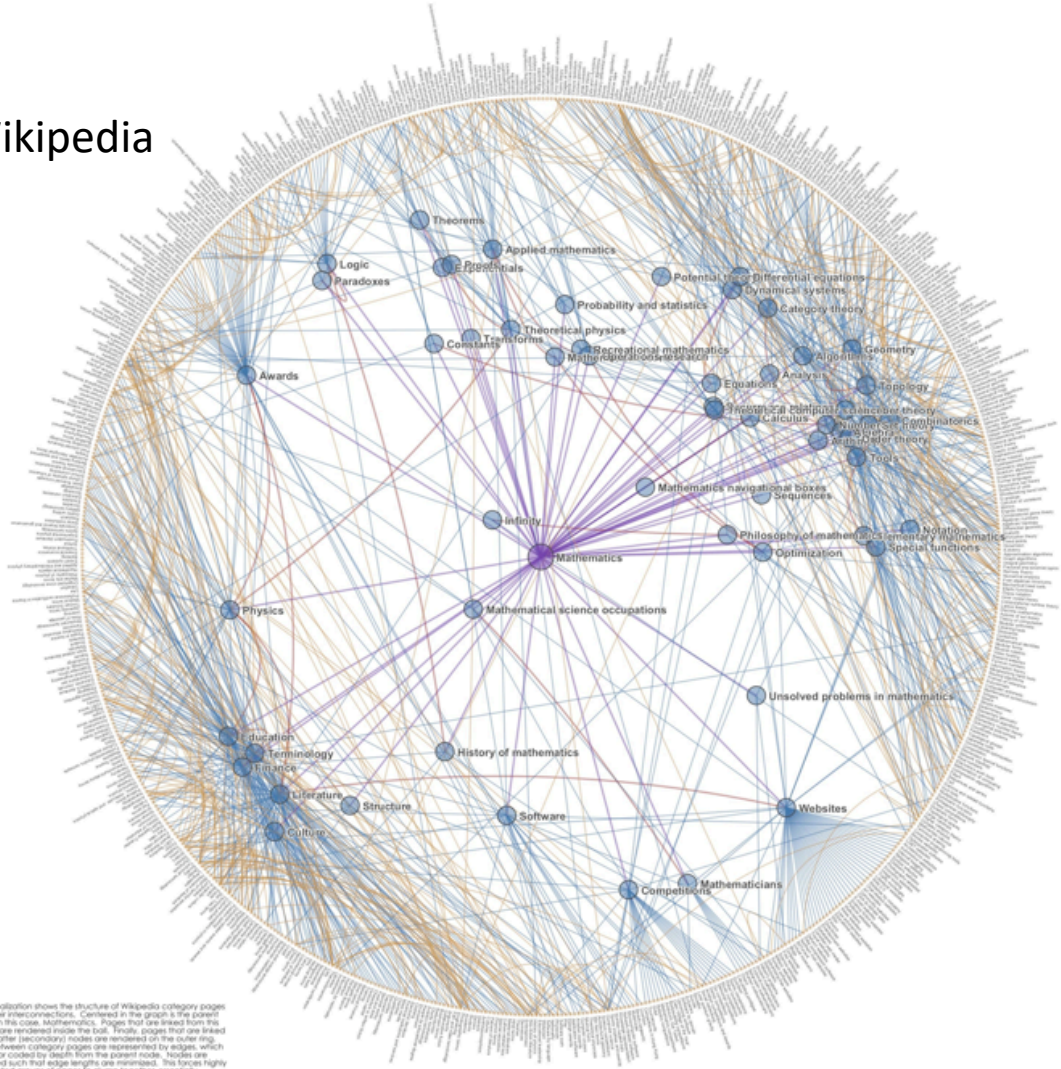
Airline Route maps

What does this graph represent?



And this one?

Math articles on Wikipedia



This visualization shows the structure of Wikipedia category pages and their interconnections. Centered in the graph is the parent node, in this case, Mathematics. Pages that are linked from this parent are rendered inside the ball. Finally, pages that are linked to the latter (secondary) nodes are rendered on the outer ring. Links between category pages are represented by edges, which are color coded by depth from the parent node. Nodes are clustered such that edge lengths are minimized. This forces highly connected groups of pages to clump together, essentially forming topical groups. Created by Chris Harrison, 2007.

ChrisHarrison.net

Rest of today's agenda

Basic Graph definitions