Lecture 9

CSE 331

Sep 17, 2018

Mini Project choice due Sep 24

CSE 331 Mini project choices

Fall 2018

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
Chinmayee Bandal, Sarah Peters, Tracy Zheng ()	Dijkstra's Algorithm	Google Maps	Link 1, Link 2
Jonathan Wong, Jacky Eng, Jack Bett (Segmentation Fault)	Linkedin Feed Algorithm	Linkedin Feed Relevance System	Link 1, Link 2, Link 3
Waiwai Kim, John Demetros, Frank Tsai (Autonomous Vehicle)	Deep Deterministic Policy Gradients	Reinforcement Learning in Autonomous Vehicle	Link 1, Link 2, Link 3
Mohammed Shmsuddin, Vencent Feng, Krapi Vani (Group 1)	Data Compression Algorithms	Sound data compression	Link 1
Nicholas Weiser, Matthew Lichtenthal, Vincent Bilotta (TryNotToFail)	Timber Match-Filtering Algorithm	Ancestry	Link 1, Link 2

T/F polls on piazza

poll ☆ stop following 1 views Actions

The first true/false 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 T/F Qs in one after the other.) The way it is going to work is that every Monnesday (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 we will see how well crowd-sourcing works in this context) 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 $a_1, \ldots, a_n$ such that for every $i \in [n]$ (we will use $[n]$ to denote the set of integers $\{1, \ldots, n\}$) we have $a_i \in \{0, 1\}$. 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

#pin

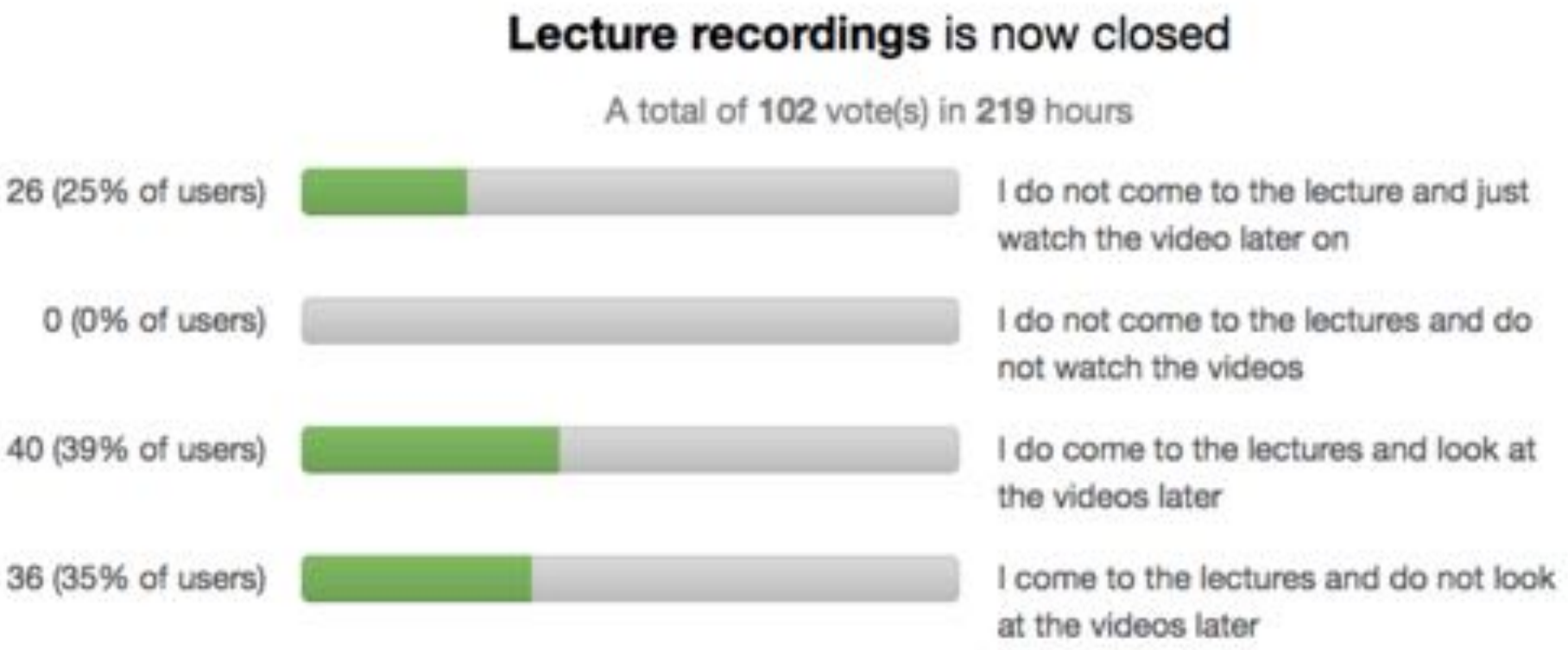
Submit

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**

Lecture Recording poll



Support pages poll

Today's agenda

$O(n^2)$ implementation of the Gale-Shapley algorithm

More practice with run time analysis

Gale-Shapley Algorithm

Intially all men and women are free

While there exists a free woman who can propose

At most n^2 iterations

Let w be such a woman and m be the best man she has not proposed to

w proposes to m

If m is free

(m,w) get engaged

Else (m,w') are engaged

If m prefers w' to w

w remains free

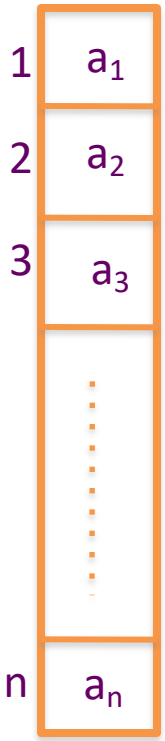
Else

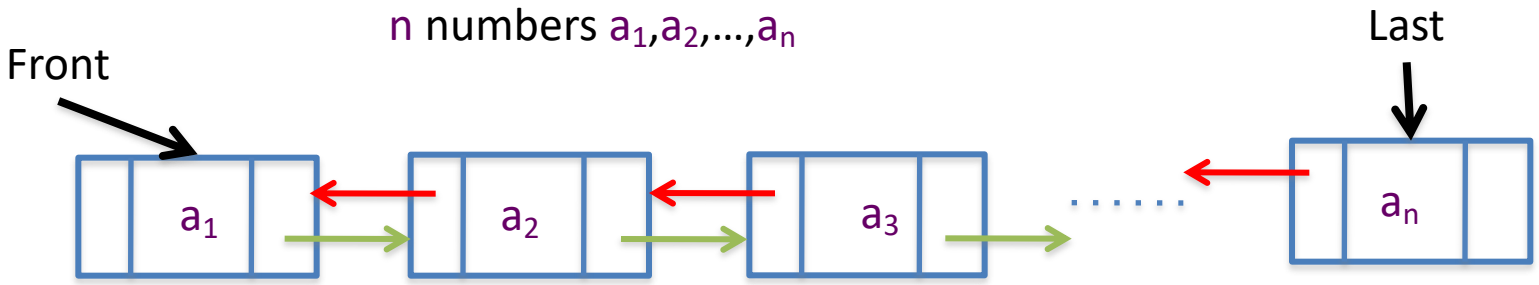
(m,w) get engaged and w' is free

O(1) time implementation

Output the engaged pairs as the final output

Arrays and Linked Lists





	Array	Linked List
Access ith element	O(1)	O(i)
Is e present?	O(n) (O(log n) if sorted)	O(n)
Insert an element	O(n)	O(1) given pointer
Delete an element	O(n)	O(1) given pointer
Static vs Dynamic	Static	Dynamic

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)

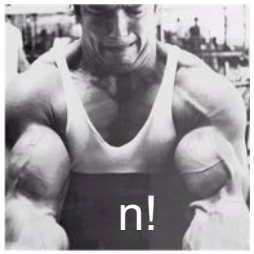
n^2 X (Query/Update(1-4))

Questions?

Puzzle

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

Main Steps in Algorithm Design



Problem Statement

Problem Definition

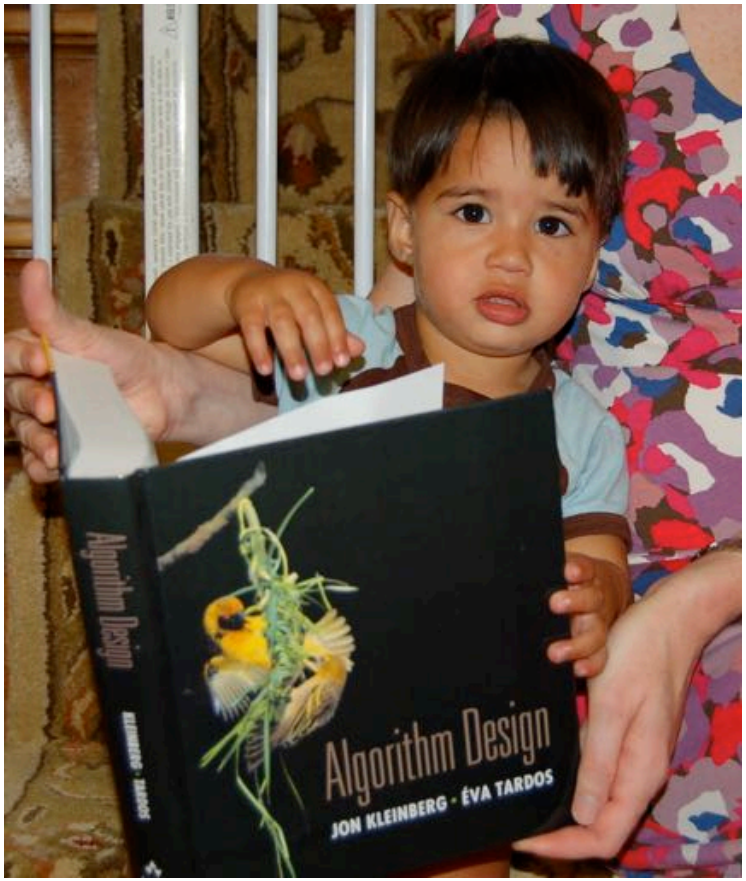
Algorithm

"Implementation"

Analysis

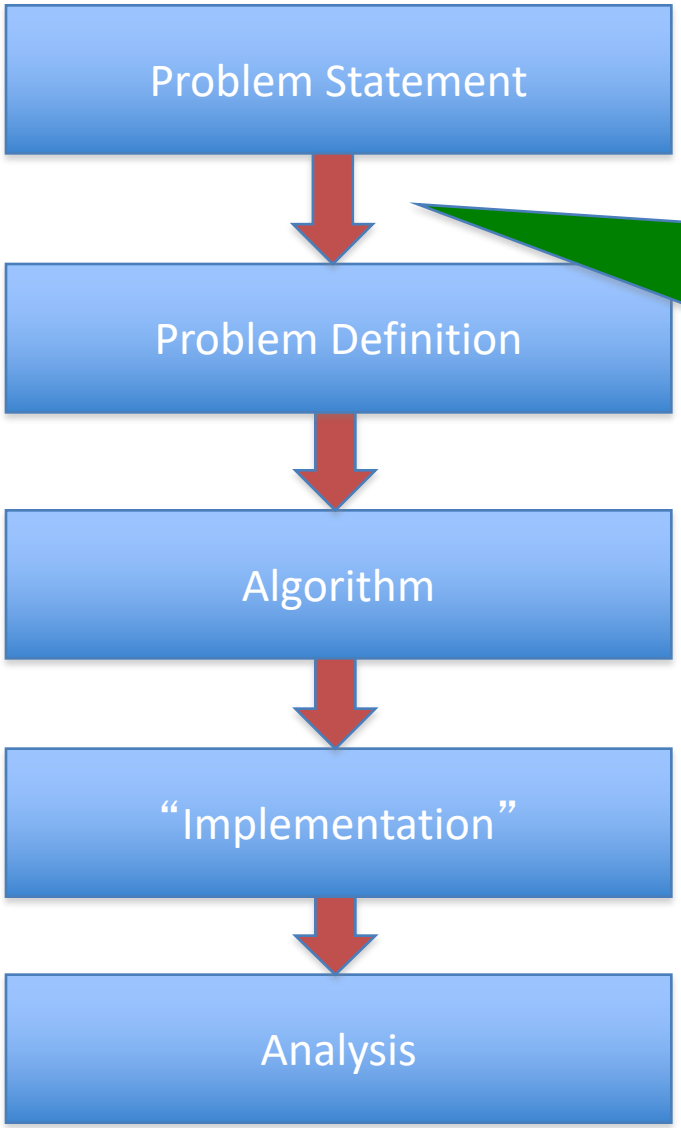
Correctness Analysis

Reading Assignments



Sec 1.1 and Chap. 2 in [KT]

Up Next….



A generic tool to abstract out problems

Graphs

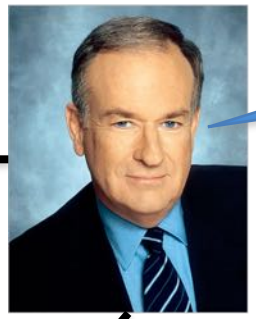
Representation of relation … airs of entities/elements

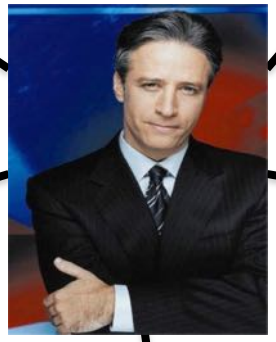
Edge

Vertex/Node

Entities: News hosts

Relationship: Mention in other's program

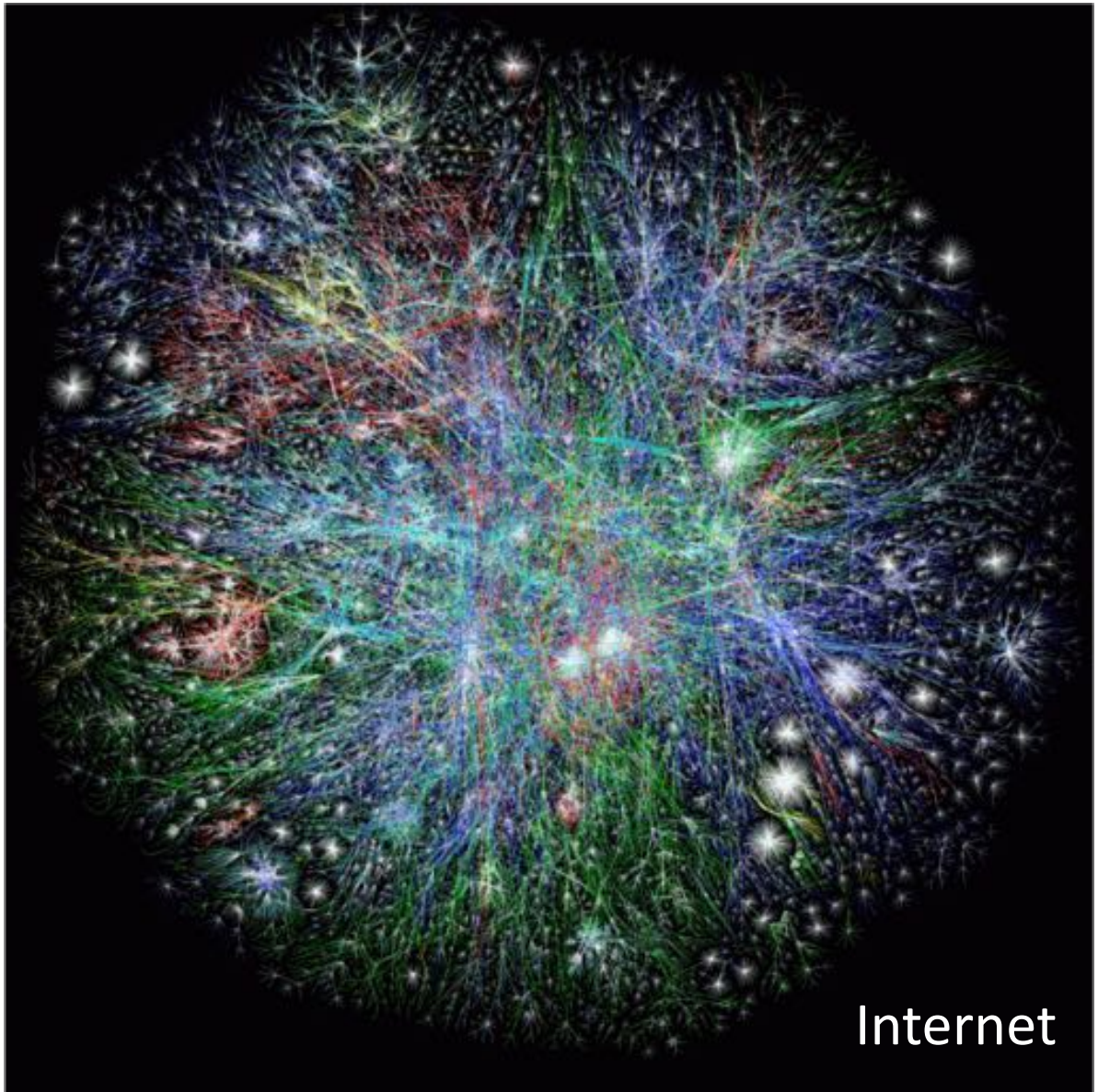




Graphs are omnipresent

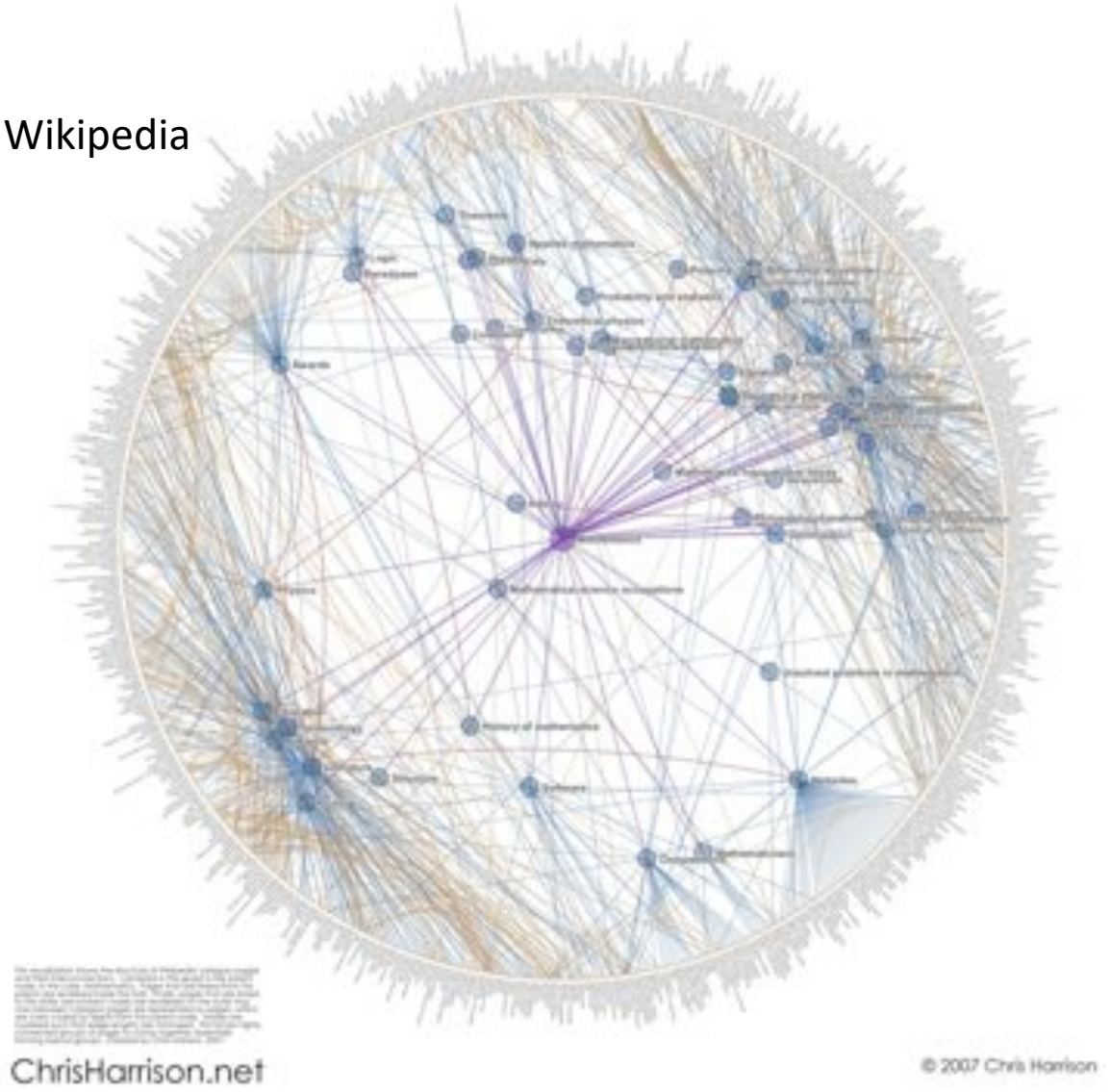
Airline Route maps

What does this graph represent?



And this one?

Math articles on Wikipedia



And this one?