

Lecture 9

CSE 331

Sep 16, 2019

HW 1 post-mortem

note ☆

stop following

102 views

Do a post-mortem on Homework 1

Now that it has been more than a day after HW 1 is due, I would recommend that you look back and assess how you went about working on homework 1. Figure out what worked well and what did not. And then make a plan for how you would approach homework 2 better.

Of course this would depend pretty much on you as an individual but here are some questions, **in no particular order**, for y'all to ponder on (with some of our comments in *italics*):

- **Did you start early enough?**
 - *We recommend that you start working on the homework on Friday the homework is handed out itself. And distribute your hours over the week rather than wait to start till Wednesday (or gasp! Thursday).*
- **Did you go to the recitations AND read the recitation notes?**
 - *Both of them help you a lot towards answering Q1(a) and Q2(a) so they are highly recommended.*
- **Did you work on the questions in correct order?**
 - *We have the current order based on what we think is most beneficial to you. In particular, we want y'all to focus more on the proof based questions, which is why they come before the programming question. But perhaps a different order would work better for you?*
- **Did you get help when you got stuck?**
 - *If you were stuck at a problem for a long time did you ask for help on piazza? Did you go to one of the office hours?*
- **Did you work on all the problems alone?**
 - *While working on all the problem by yourself will be good for you in the long run (since you are developing your proofs/algorithms skills), in the interest of time we recommend that you at least collaborate on Q2 (b).*
- **(If you submitted HW 0), did you get enough feedback?**
 - *(This is going to be true for all homeworks so extrapolate this advice for future homeworks.) If you lost points, did you understand why you lost points? if not, did you go talk with the TA who graded your submission to ask why?*
 - *If you did understand why you lost points, did you figure out how you could have changed your thought process (and hence your solution) to get a level 0? If not, did you talk with a TA to get their thoughts on how they would change your solution to make it correct?*
- **Did you go an office hours early enough?**
 - *We recommend that you think about a problem early enough so that you can go to an office hours before Wednesday, when the office hours have relatively low traffic.*

If you need it, ask for help



Advice from TAs

CSE 331 Advice from TAs

Where students who took CSE 331 and became TAs share their experiences of how to fully utilize the class to your advantage. (And no, Atri did not pay them to say these things.)

A Under Construction

This is a living document that will get updated over time. However, all the advice below is valid and you should pay attention to them!

The class is structured to your advantage

Utilize the before, during and after aspects of the course to their fullest.

Do the assigned readings before coming to class and if you get time even watch lecture videos from previous years. Atri will give you plenty of time during lecture to ask questions about the readings or the lecture itself. And of course get the most out of the assignments (Explained further below).

The assignments are separated into different parts for your convenience.

Questions 1 and 2

For Q1 and Q2, think of the algorithm and proof ideas as things that go inside a header (`.h`) file. They are the high level overview of how you are approaching the problem; you don't have to be very technical here. For example, listing out all the steps in your algorithm, what proof technique are you using, what property of the algorithm are you induction on, etc.

True/False piazza polls



poll ★

[stop following](#)

90 views

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 additional T/F Qs 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, \dots, a_n such that for every $i \in [n]$ (we will use $[n]$ to denote the set of integers $\{1, \dots, n\}$) 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**.

t/f poll

Mini Project choice due in 2 weeks

CSE 331 Mini project choices

Fall 2019

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
Daniel Shekhtman, William Nicholson, Andrew Quinonez (D's Get Degrees)	PageRank	PageRank	Link 1 , Link 2 , Link 3 , Link 4
Jordan Clemons, Chris Burton, Christopher Perez (Group 1)	Pagerank ALREADY TAKEN-- PLEASE CHOOSE ANOTHER CASE STUDY	Google's use of Pagerank in sorting search results	Link 1 , Link 2
Moulid Ahmed, Shrishty Shivani Jha, Shreya Lakhkar (ACE-MA)	Spotify Recommendation	Machine Learning Algorithm	Link 1 , Link 2 , Link 3
Justin Henderson, Hannah Wlasowicz, Judy Mei (PizzaTime)	Aes 256	ransomware	Link 1
Gillian Marcus, Jason Niu, Sharon Stack (2n^2 (//pls substitute caret for a superscript))	Deep Neural Networks for YT Recommendations	Social Media Targeted Advertising	Link 1 , Link 2 , Link 3 , Link 4
.Iiwon Choi. Matthew Ferrera. Winnie Zheng (The	Dijkstra's Algorithm	Mans/ Transportation Routes	Link 1 . Link 2 . Link

Your UBIT ID is

xyz if your email ID is xyz@buffalo.edu

NOT

xyz@buffalo.edu

Your UB person number

Today's agenda

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

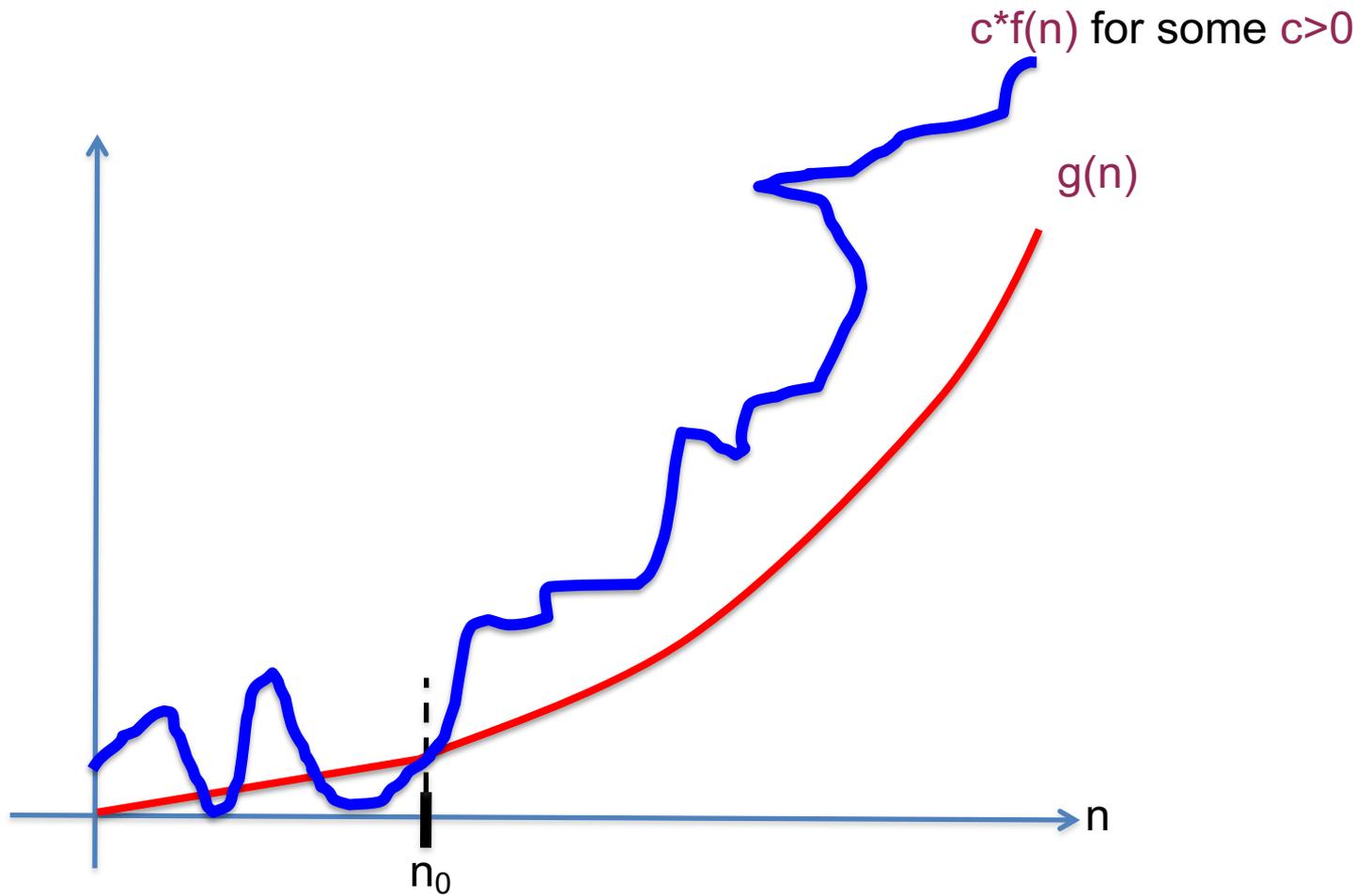
Some practice with run time analysis



Questions?



$g(n)$ is $O(f(n))$



Properties of O (and Ω)

Transitive

g is $O(f)$ and f is $O(h)$ then
 g is $O(h)$

```
Step 1 // O(n) time  
Step 2 // O(n) time
```

Additive

g is $O(h)$ and f is $O(h)$ then
 $g+f$ is $O(h)$

Overall:
 $O(n)$ time

Multiplicative

g is $O(h_1)$ and f is $O(h_2)$ then
 $g*f$ is $O(h_1*h_2)$

Overall:
 $O(n^2)$ time

```
While (loop condition) //  $O(n^2)$  iterations  
  Stuff happens //  $O(1)$  time
```

Gale-Shapley Algorithm

Initially all men and women are **free**

At most n^2 iterations

While there exists a free woman who can propose

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**

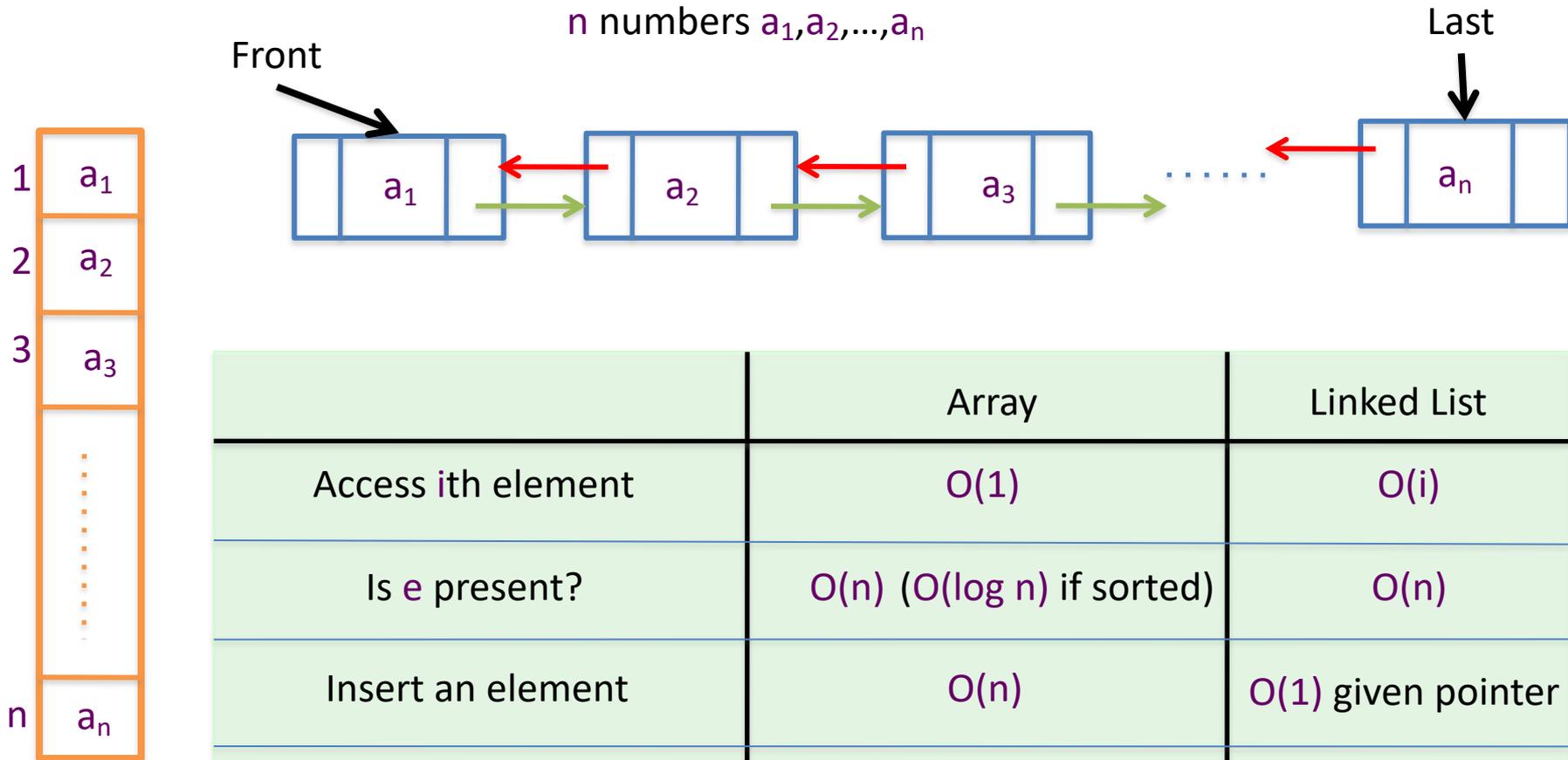
Else

(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 i th 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



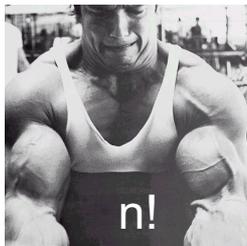
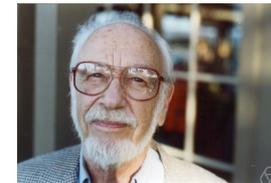
Algorithm



“Implementation”

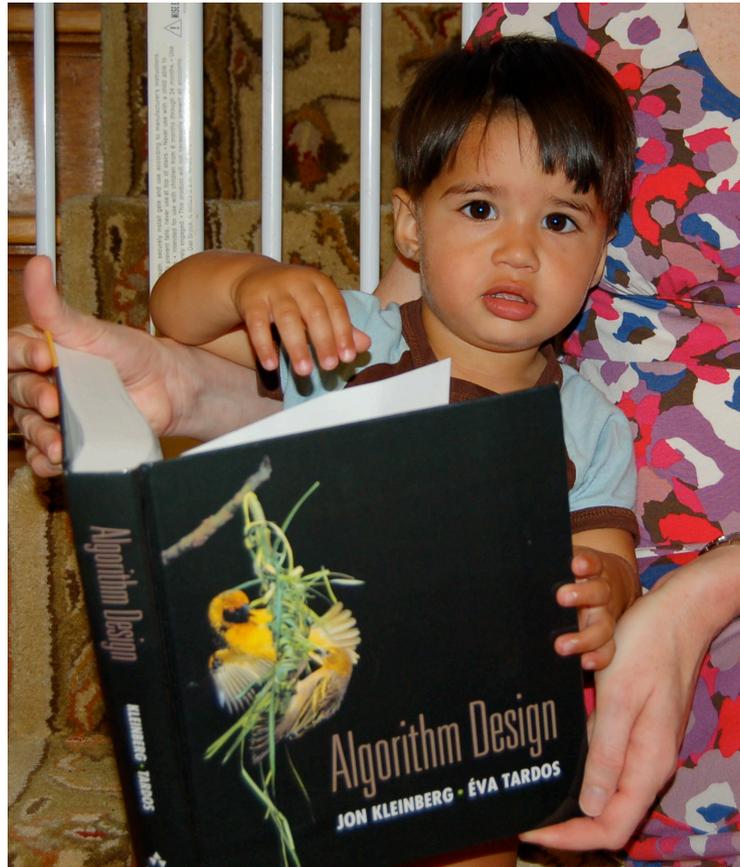


Analysis



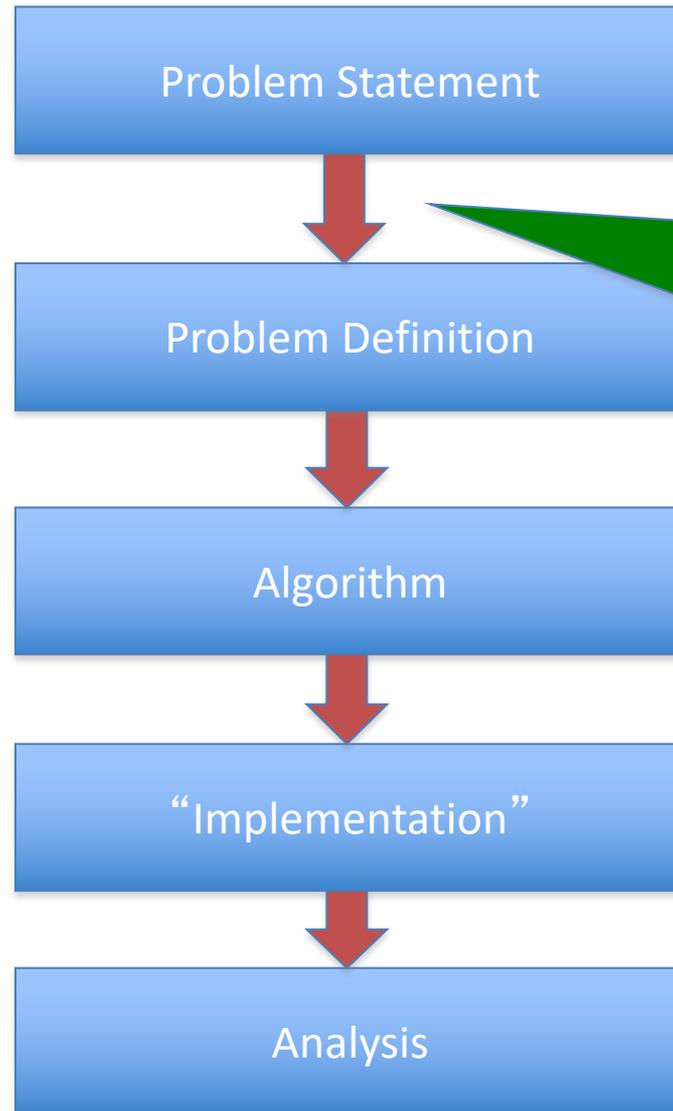
Correctness Analysis

Reading Assignments



Sec 1.1 and Chap. 2 in [KT]

Up Next....

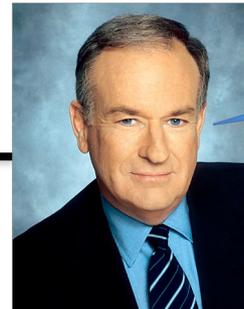


A generic tool
to abstract
out problems

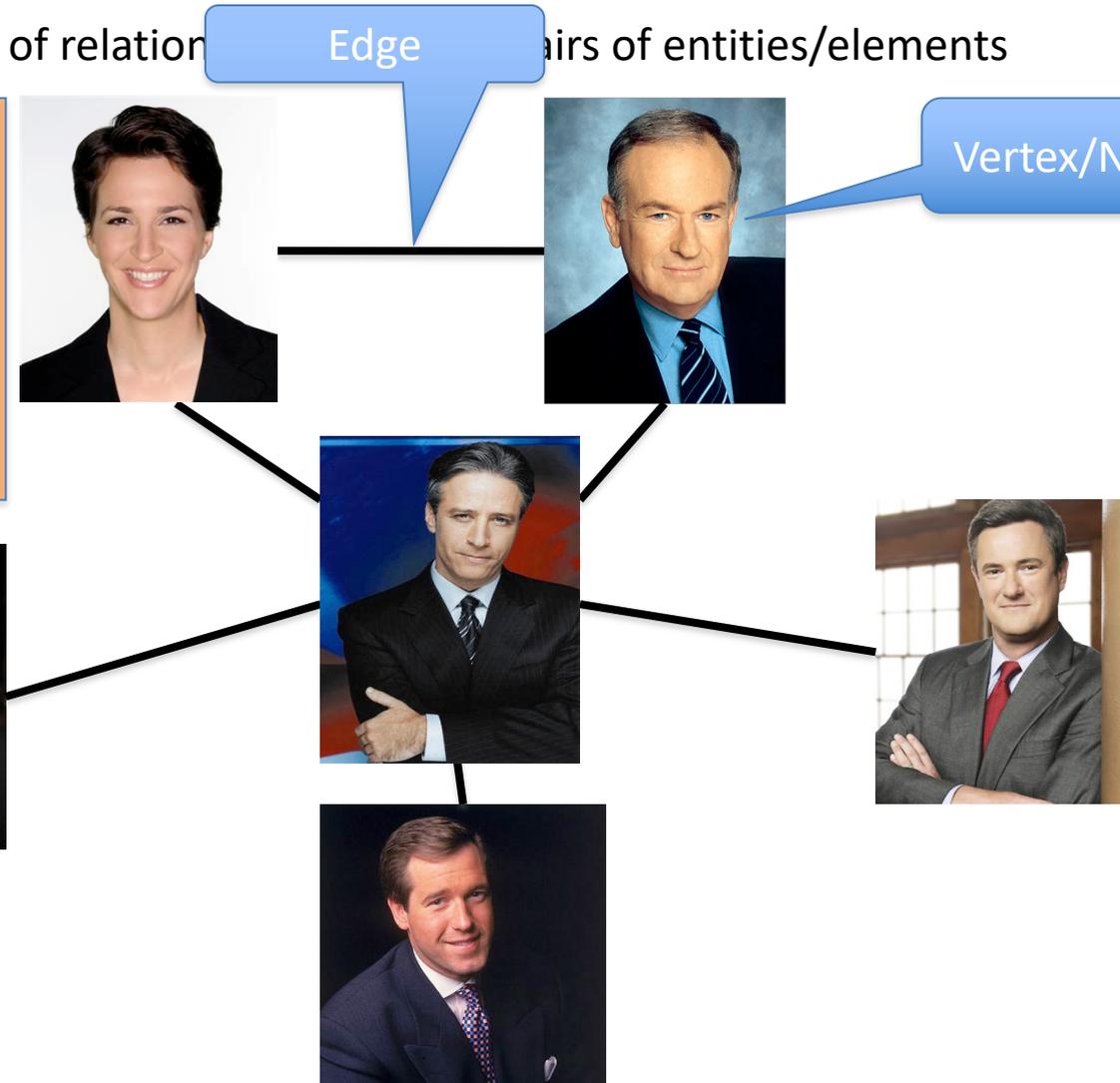
Graphs

Representation of relation **Edge** pairs of entities/elements

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



Vertex/Node



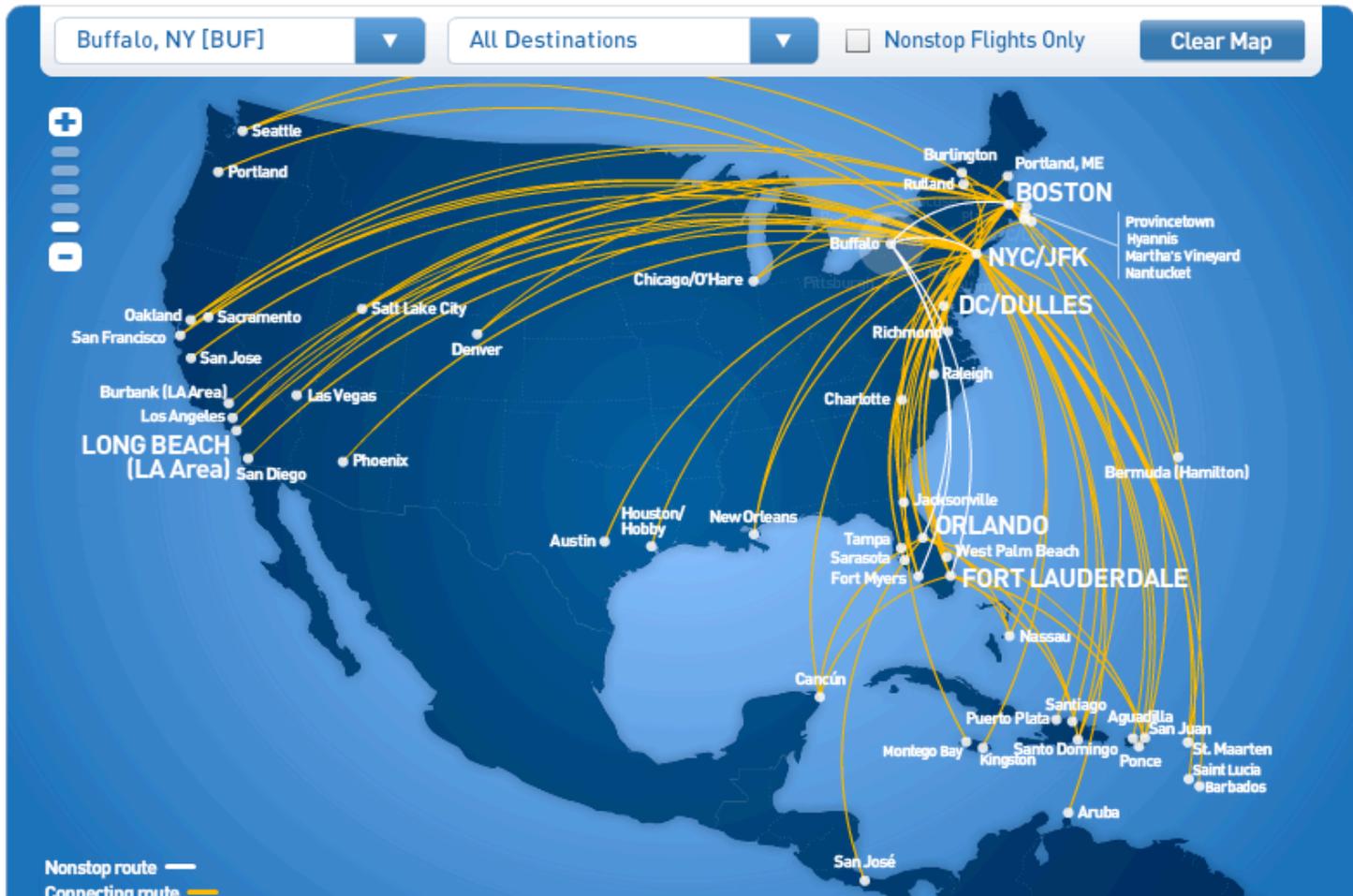
Graphs are omnipresent



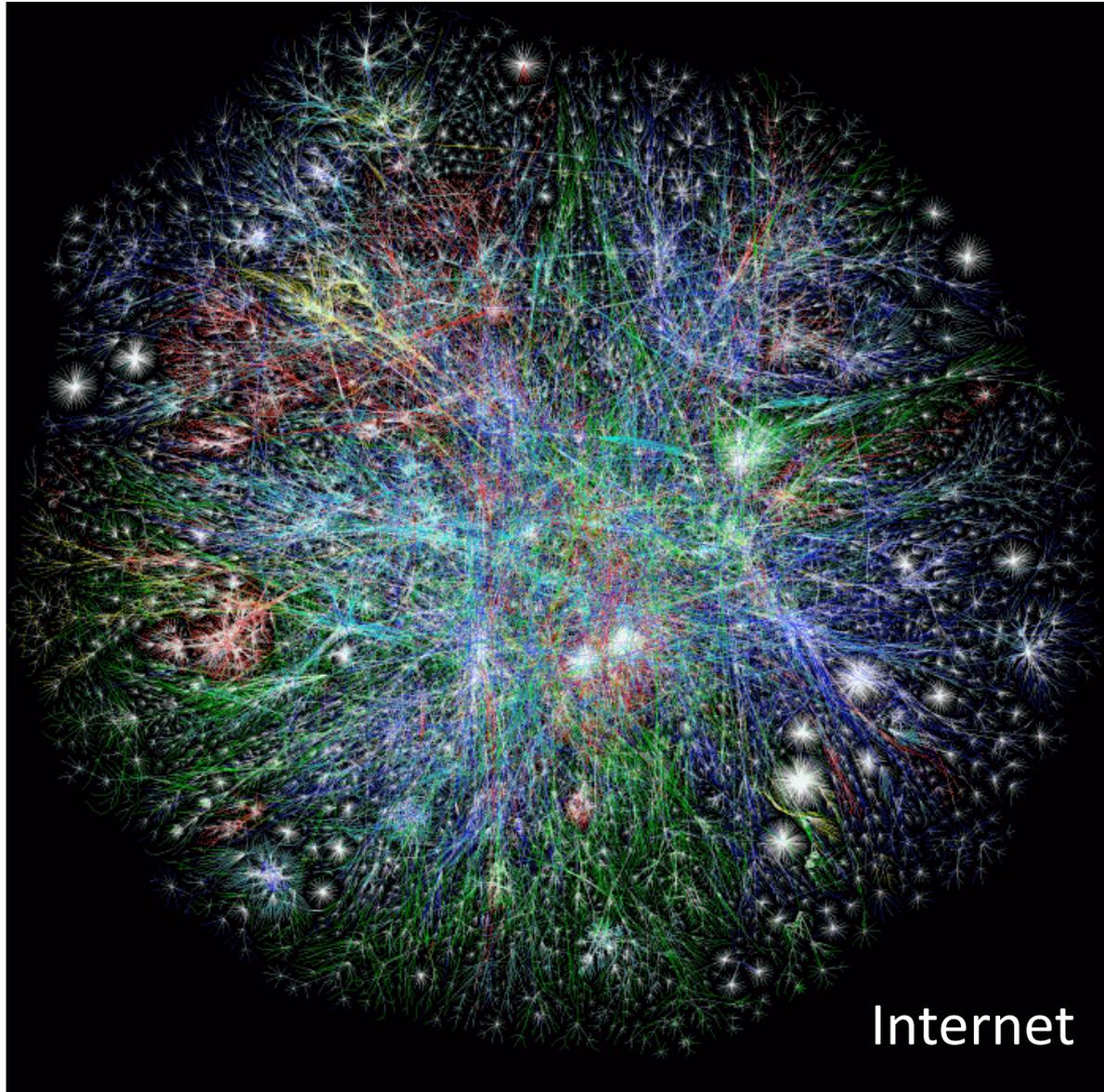
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Airline Route maps

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What does this graph represent?



And this one?

