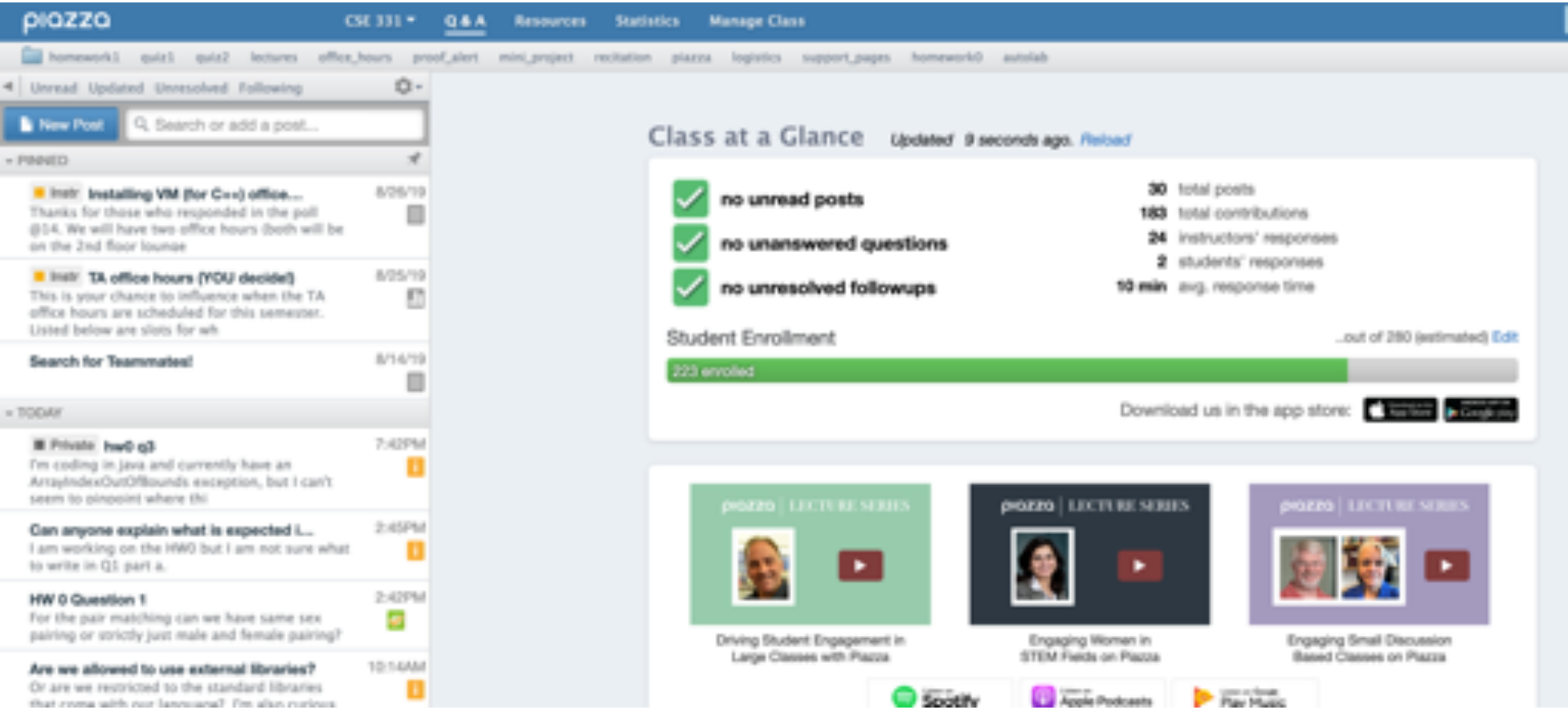
Lecture 2

CSE 331

Aug 28, 2019

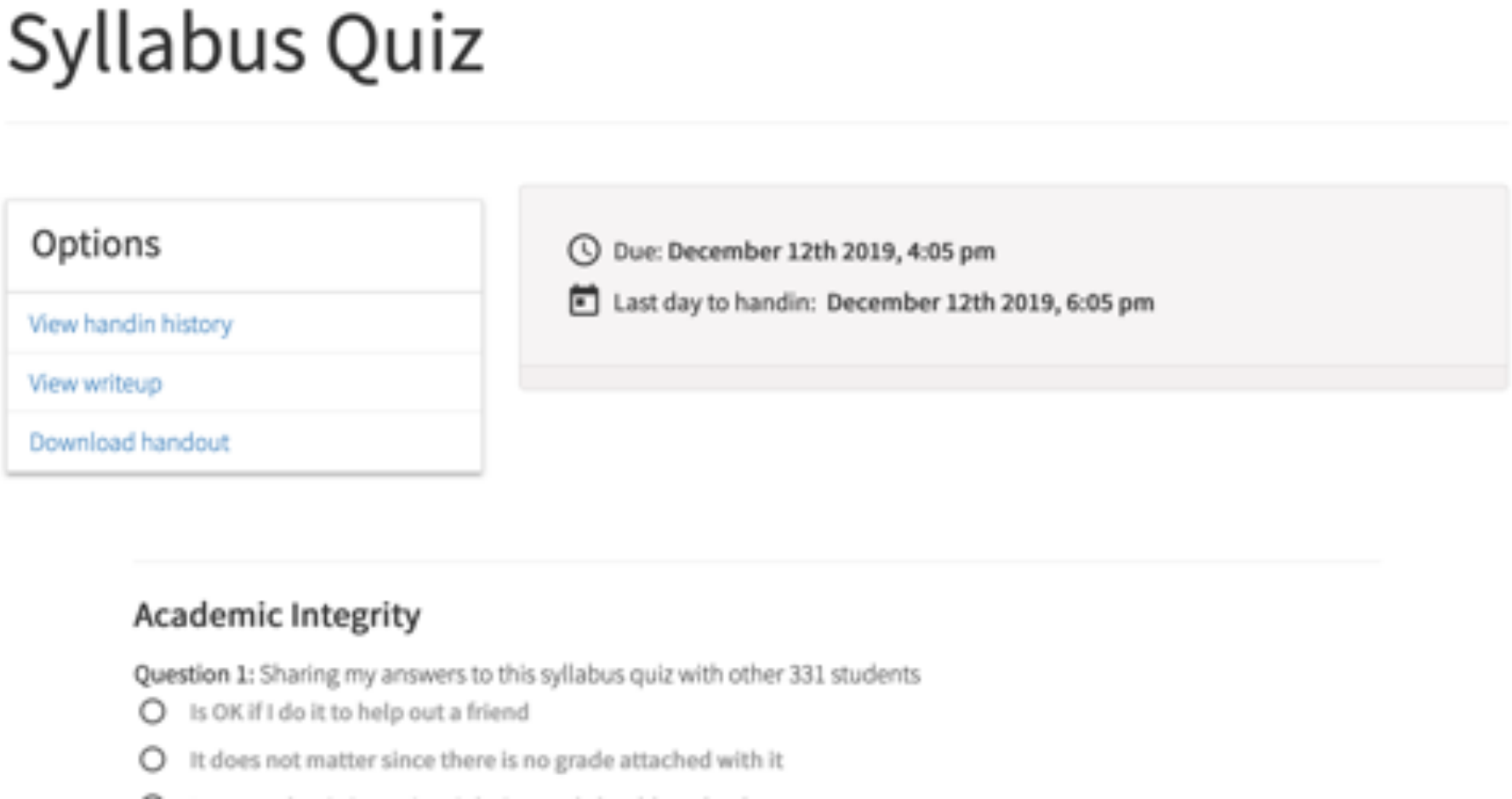
Enroll on Piazza



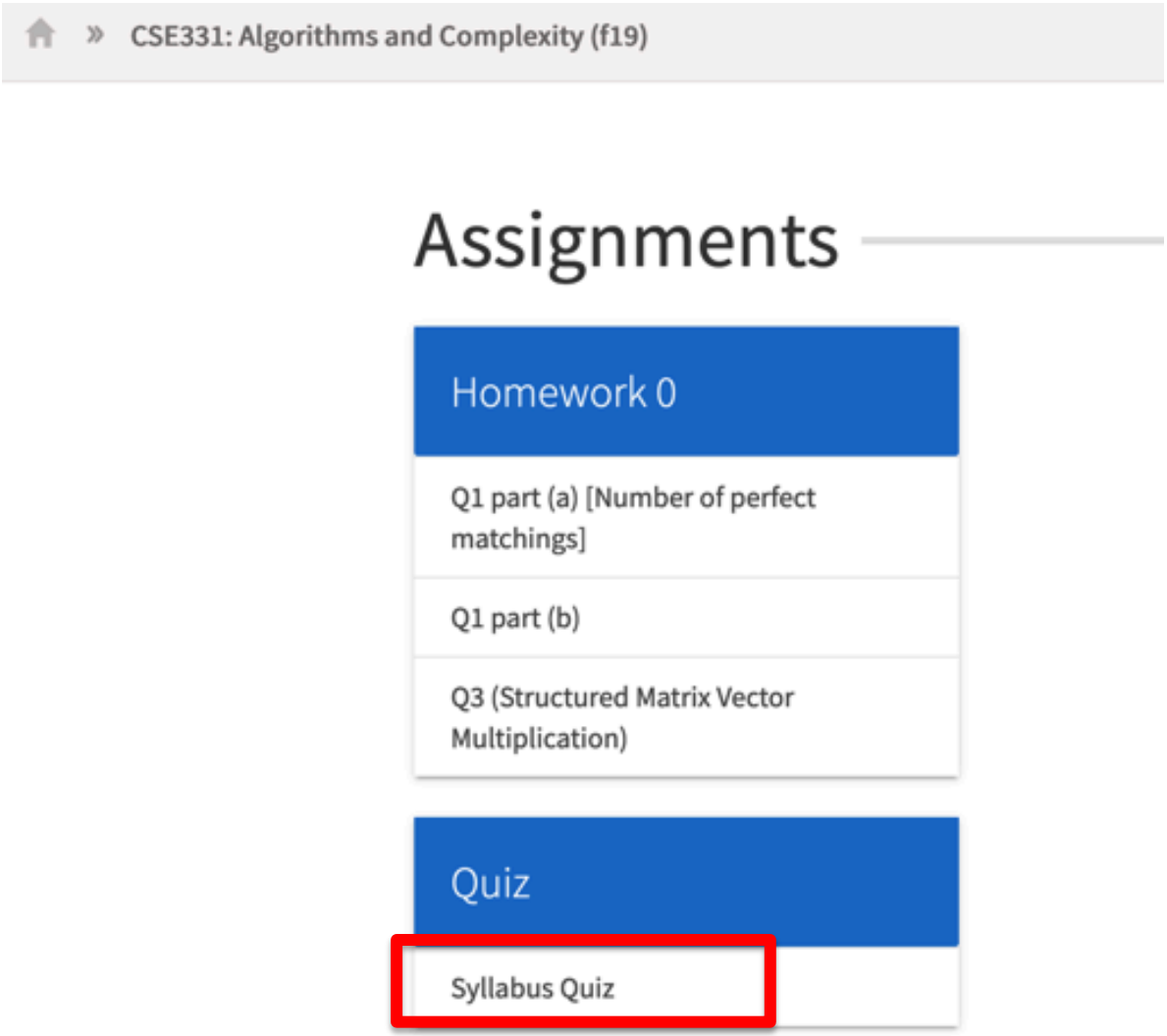
https://piazza.com/buffalo/fall2019/cse331/

Read the syllabus CAREFULLY!

No graded material will be handed back till you pass the syllabus quiz!

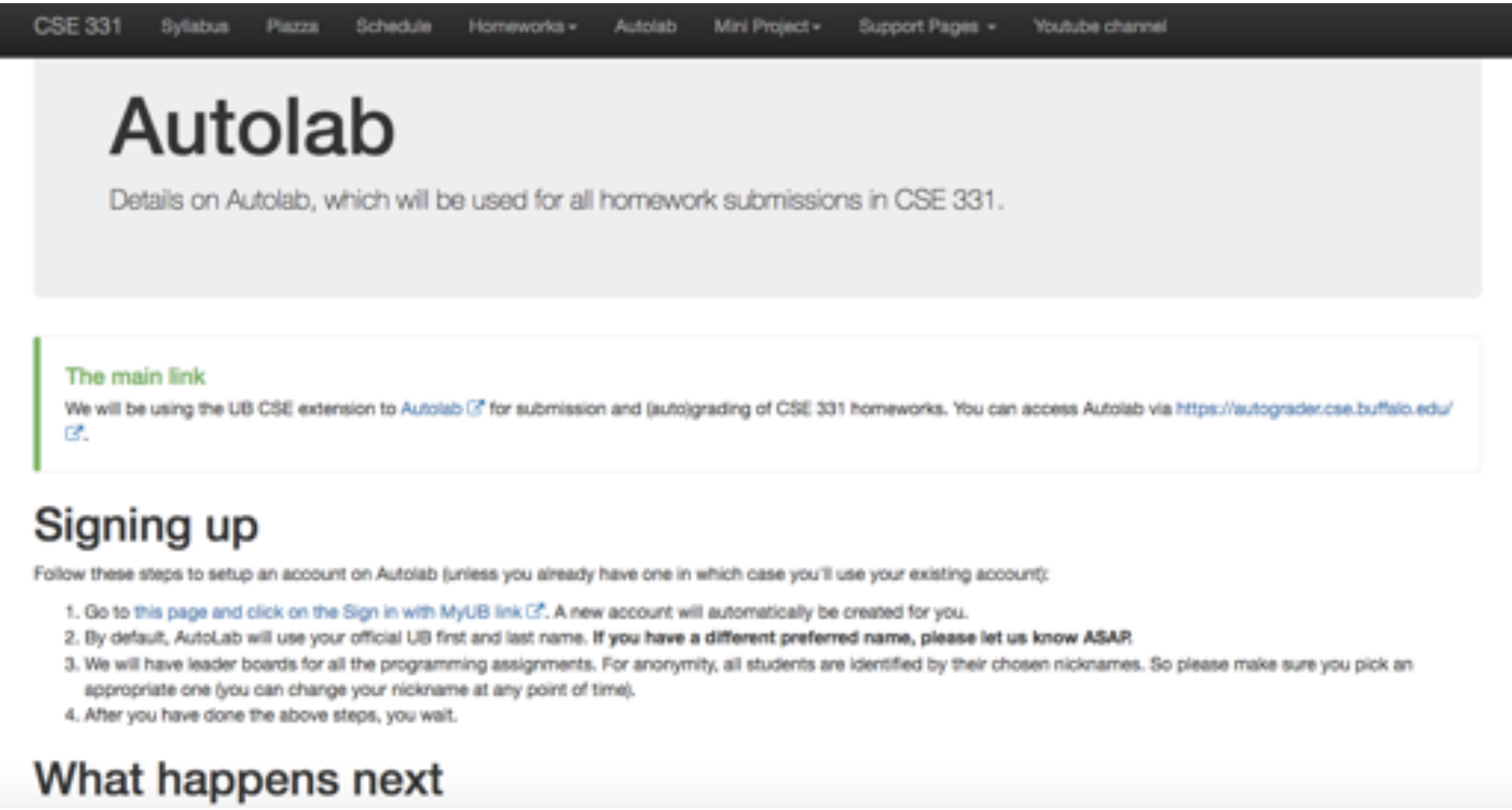


You can submit the following now



You should be on Autolab now

Autolab FAQ



CSE 331 Syllabus Piazza Schedule Homeworks Autolab Mini Project Support Pages Youtube channel

Autolab

Details on Autolab, which will be used for all homework submissions in CSE 331.

The main link

We will be using the UB CSE extension to Autolab for submission and (auto)grading of CSE 331 homeworks. You can access Autolab via https://autograder.cse.buffalo.edu/.

Signing up

Follow these steps to setup an account on Autolab (unless you already have one in which case you'll use your existing account):

1. Go to this page and click on the Sign in with MyUB link. A new account will automatically be created for you.
2. By default, AutoLab will use your official UB first and last name. **If you have a different preferred name, please let us know ASAP.**
3. We will have leader boards for all the programming assignments. For anonymity, all students are identified by their chosen nicknames. So please make sure you pick an appropriate one (you can change your nickname at any point of time).
4. After you have done the above steps, you wait.

What happens next

Allowed Sources

Allowed sources

You can **ONLY** use the following sources for reference once you start working on the homework problems:

1. **the Kleinberg-Tardos textbook**,

> ### Other textbooks are not allowed
>
> While you can use other textbooks (e.g. those listed in the syllabus) to better understand the lecture material, you **cannot** use them once you start working on the homeworks.

2. **any material linked from this webpage or the CSE 331 piazza page (including any discussion in the Q&A section)**,

> ### One-click rule
>
> When using webpages that are allowed as sources, you **cannot** click on link on that source. (Otherwise within a constant number of clicks one can reach any webpage one wants.)

3. **specific *mathematical* result from a previous course**,
4. **anything discussed in the lectures, recitations and/or office hours** and
5. **any notes that you might have taken during class or recitation.**

> ### Everything else is not allowed
>
> Note that the above list covers all the allowed sources and **everything else is not allowed**. In particular, *YOU ARE NOT SUPPOSED TO SEARCH FOR SOLUTIONS ON THE*

… even for programming Q

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- All discussions and posts on piazza.

Basic programming references

C++ Sources

- cppreference.com (and all pages within the website).

Java Sources

- Oracle Java Documentation (and all pages within the website).

Python Sources

- Python 3.5.2 documentation (and all pages within the website).

Asymptotic Analysis

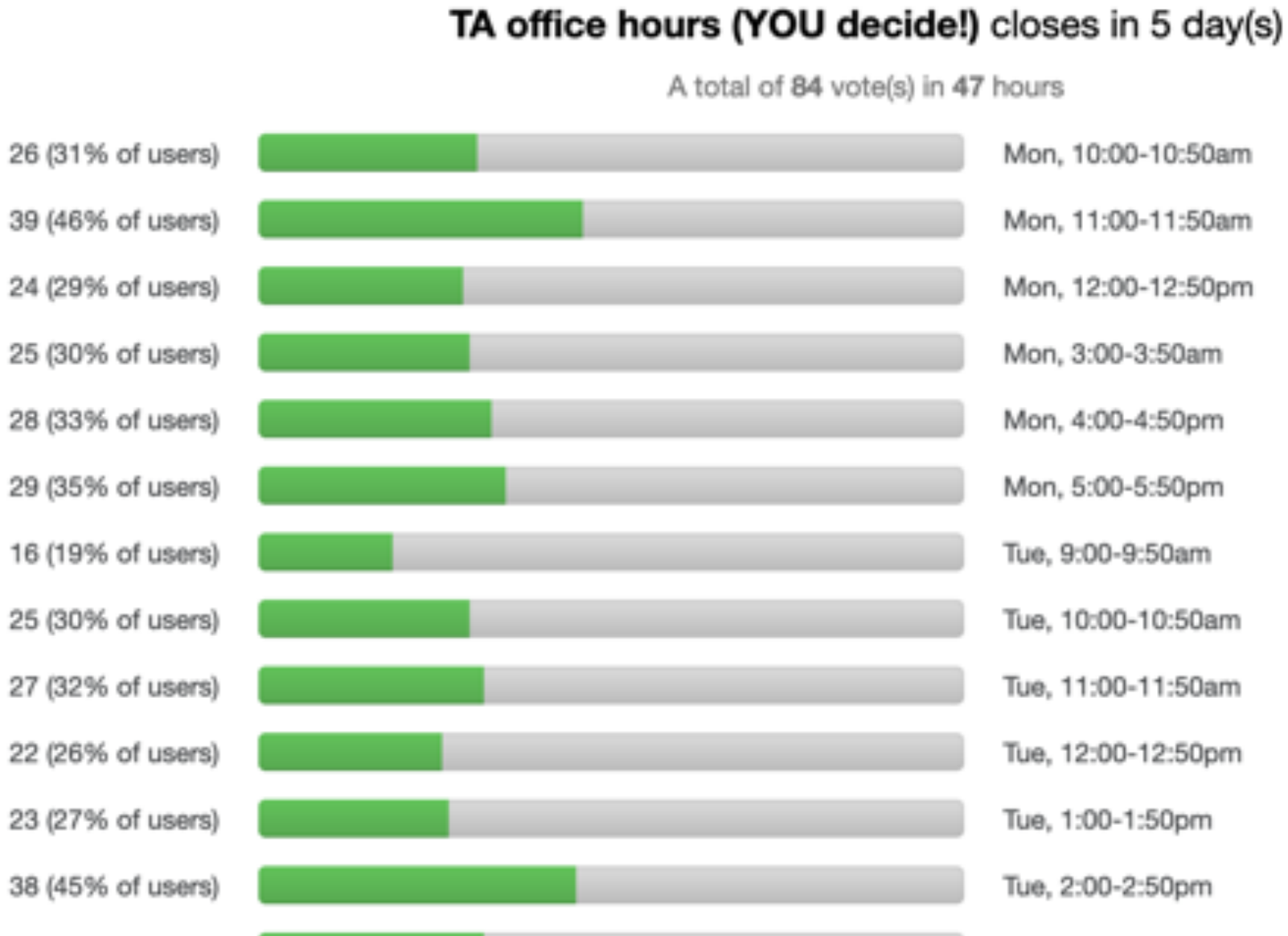
- Big-O cheat sheet.

Wikipedia Pages

Below are some approved Wikipedia pages (in addition to those that are already linked to in other pages in the CSE 331 Fall 2018 web page.

- Gale Shapley algorithm.
- DFS.
- Dijkstra's Algorithm.
- Prim's algorithm

TA Office hours finalized today



Questions/Comments?

Why should I care ?

Coding jobs will be done by AI

stacksort

In a recent xkcd's alt text, Randall Munroe suggested **stacksort**, a sort that searches StackOverflow for sorting functions and runs them until it returns the correct answer. So, I made it. If you like running arbitrary code in your browser, try it out.

Like (or hate) it? Comment on HackerNews

stackoverflow_sort(
Try a list of numbers, a string, a list of words or json.

[8,6,7,5,3,0,9]

);

Sort

var output =
Output from the function.

;

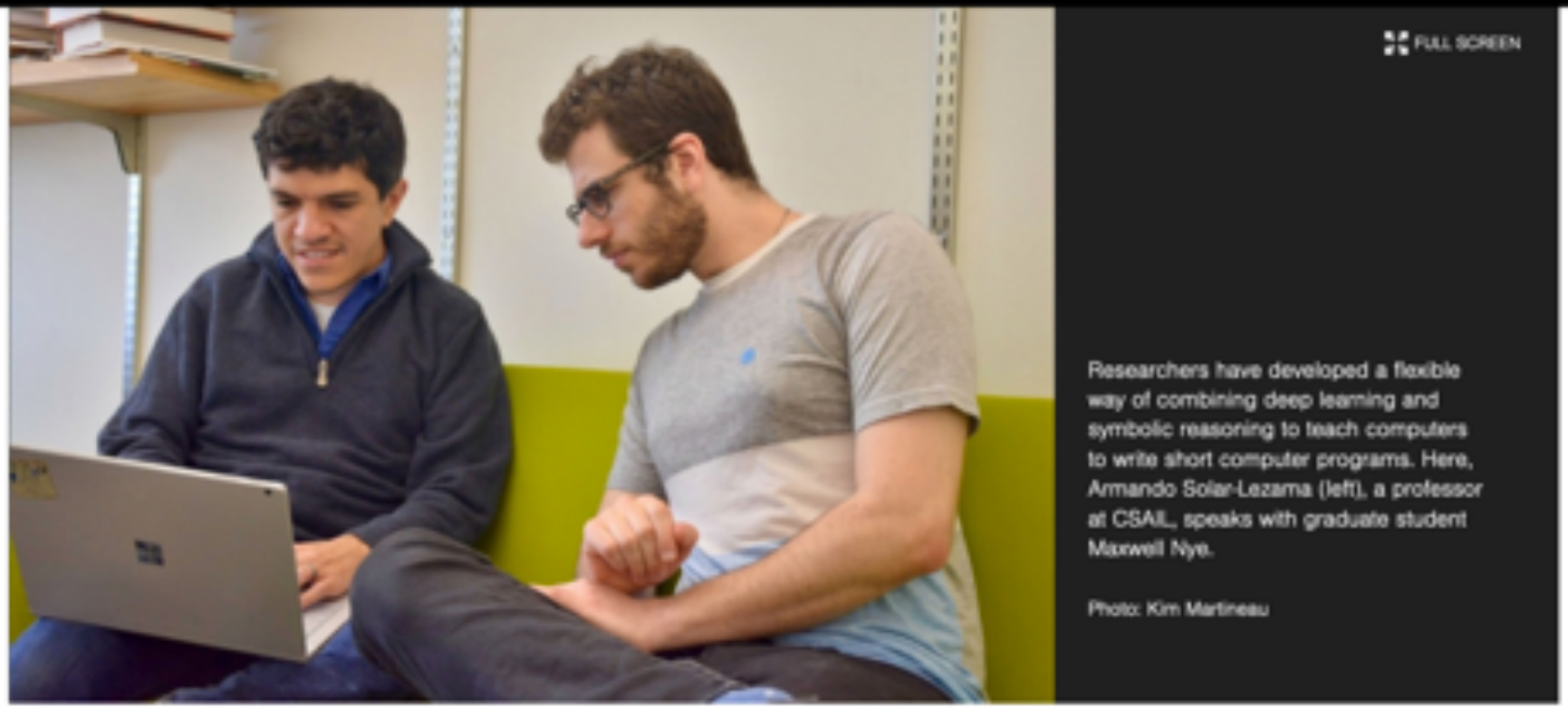
output console

Coding jobs will be done by AI

MIT News

ON CAMPUS AND AROUND THE WORLD

Browse or Search



FULL SCREEN

Researchers have developed a flexible way of combining deep learning and symbolic reasoning to teach computers to write short computer programs. Here, Armando Solar-Lezama (left), a professor at CSAIL, speaks with graduate student Maxwell Nye.

Photo: Kim Martineau

Toward artificial intelligence that learns to write code

Researchers combine deep learning and symbolic reasoning for a more flexible way

So am I doomed?

There will still be room for high level *algorithmic* thinking!

European Association for Theoretical Computer Science

HOME ABOUT SEARCH CURRENT ARCHIVES

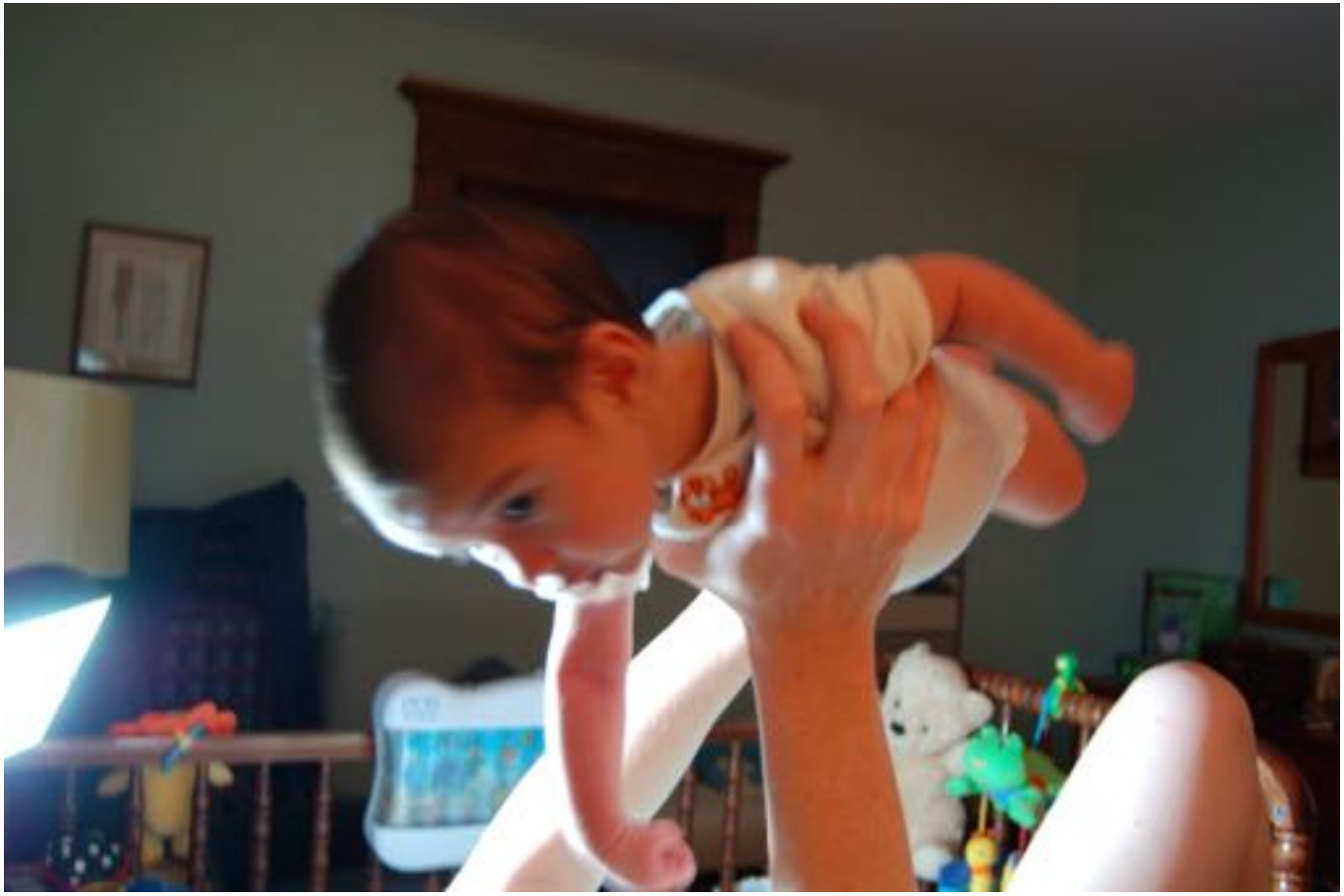
Home > No 125: June 2018 > **Lamport**

If You're Not Writing a Program, Don't Use a Programming Language

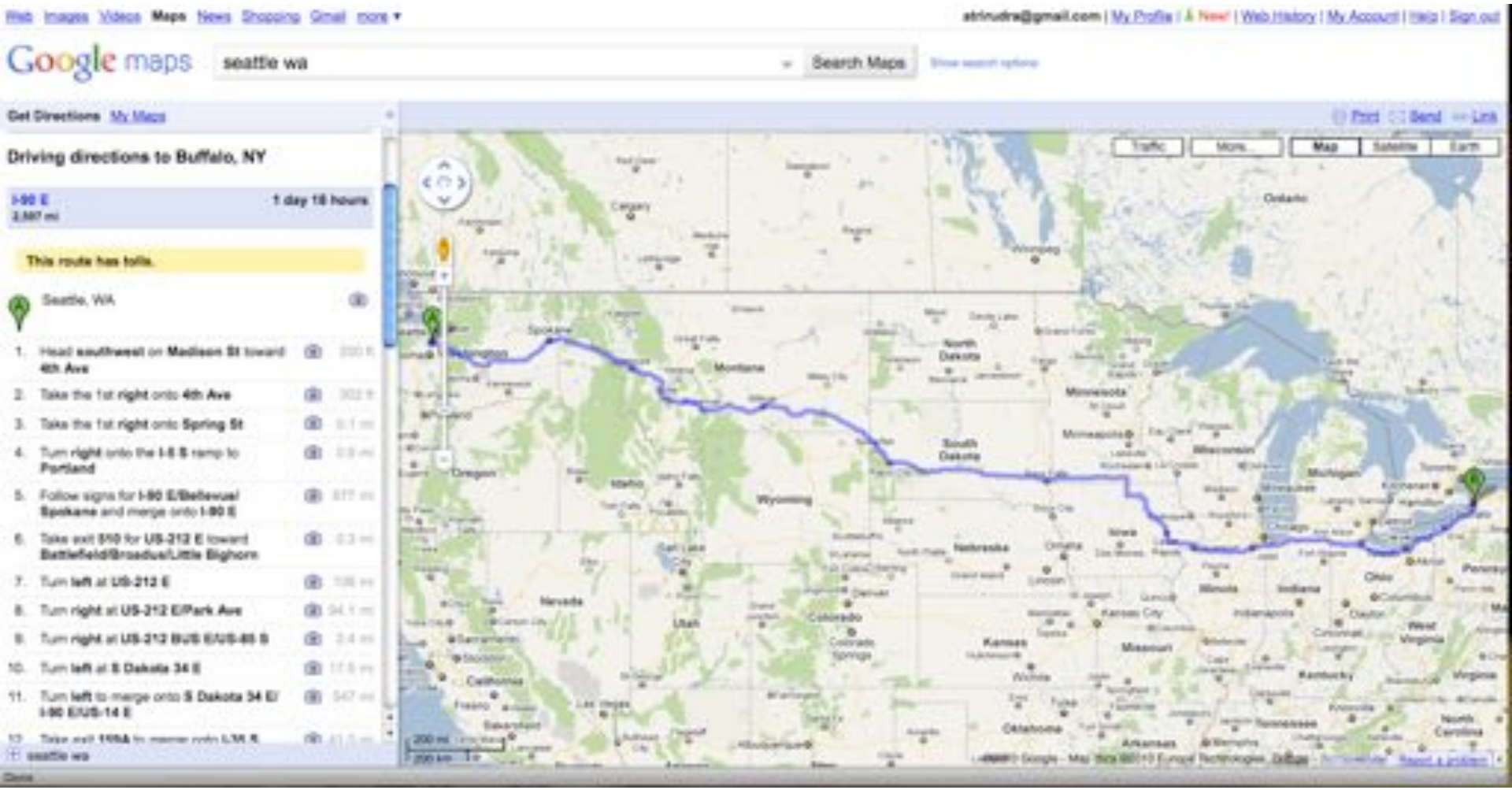
Leslie Lamport, Distributed Computing & Education Column by Juraj Hromkovic, Stefan Schmid

Today, programming is generally equated with coding. It's hard to convince students who want to write code that they should learn to think mathematically, above the code level, about what they're doing. Perhaps the following observation will give them pause. ***It's quite likely that during their lifetime, machine learning will completely change the nature of programming. The programming languages they are now using will seem as quaint as Cobol, and the coding skills they are learning will be of little use. But mathematics will remain the queen of science, and the ability to think mathematically will always be useful.***

Let the fun begin!

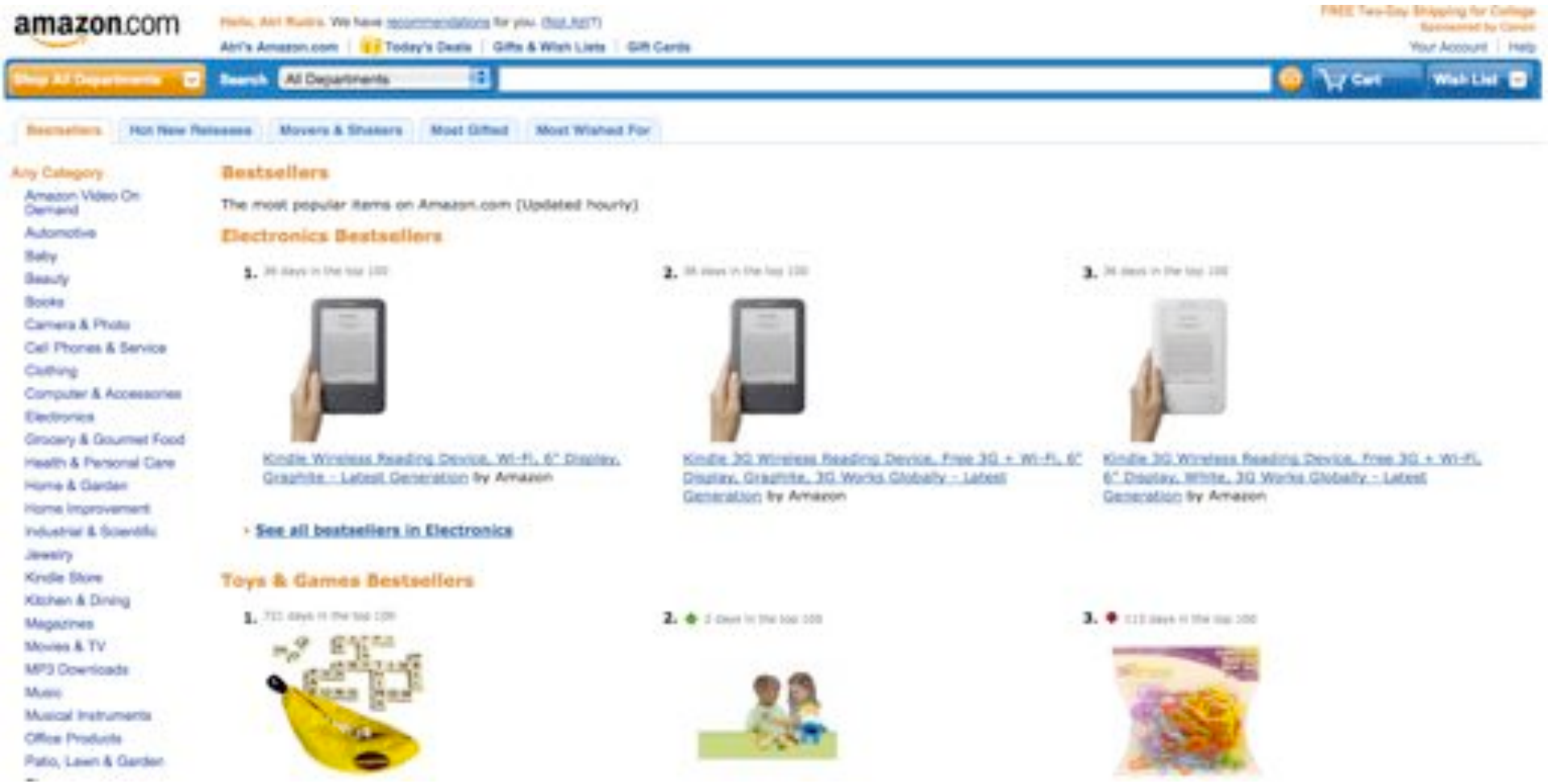


Why care about algorithms?



Driving directions

Why care about algorithms?

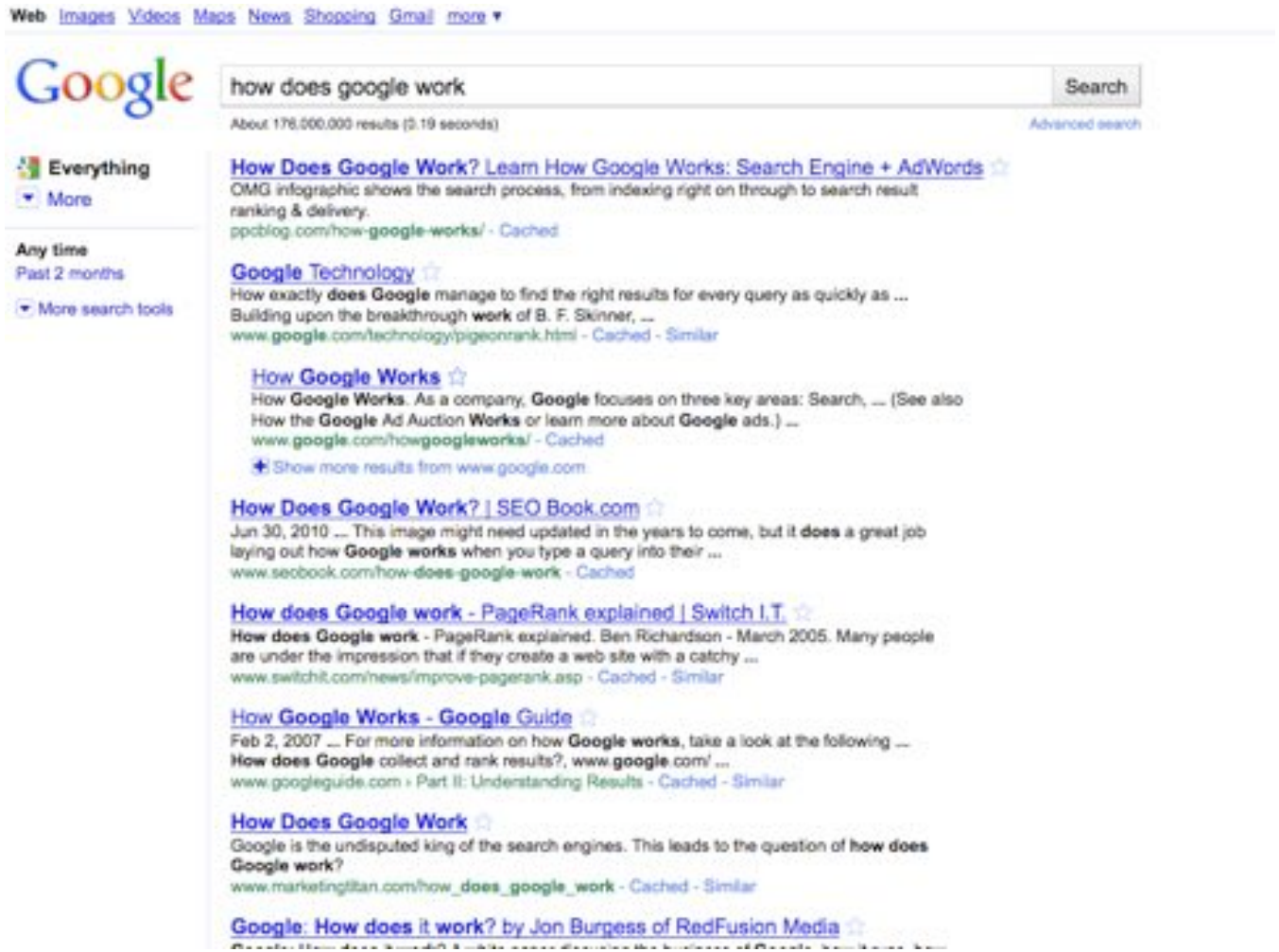


Computing Bestsellers on the fly

Why care about algorithms?

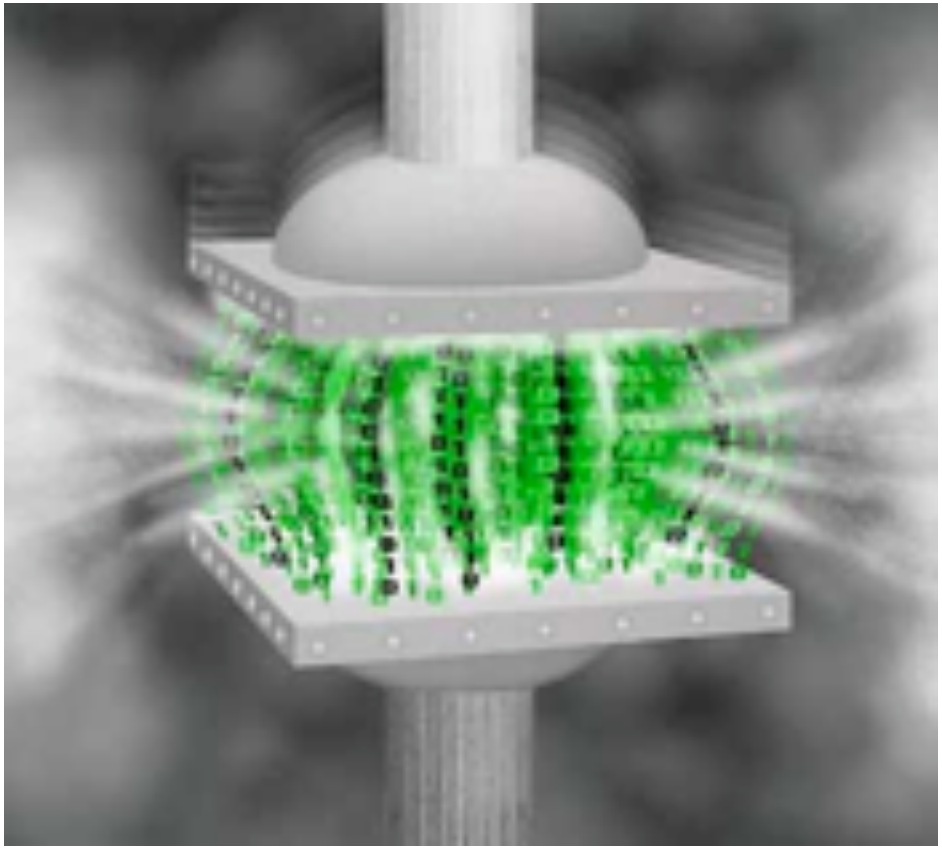
Booking cheapest air tickets

Why care about algorithms?



Google searches

Why care about algorithms?



http://www.di.ens.fr/~cherniav/teaching.html

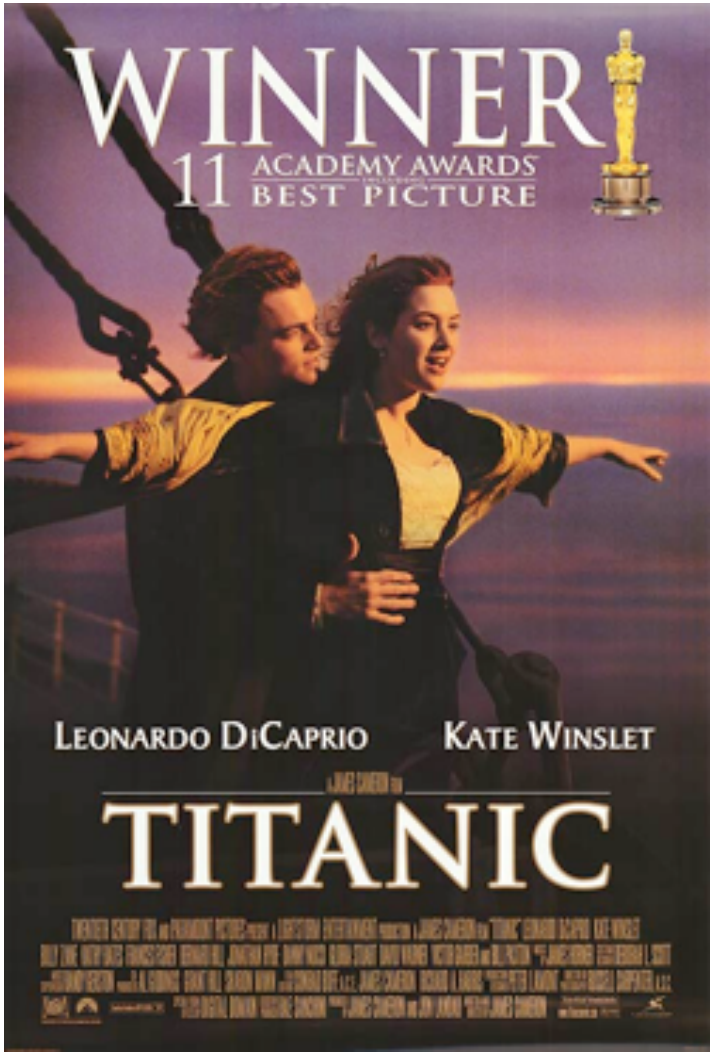
Data compression

Why care about algorithms?

http://www.switched.com/2010/02/11/fix-dvd-scratches-using-a-banana-and-toothpaste/ courtesy: Unplgd

Error correction

(And I could) go on…



http://www.movieposter.com/poster/MPW-33672/Titanic.html

Find out for yourself

Mini project: Video on ethical impacts of algorithm. Groups of size = 3

CSE 331 Mini Project

Fall 2019

Details and motivations for the mini project.

Under Construction

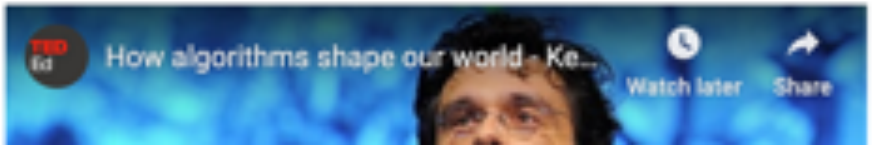
This page is still under construction. In particular, nothing here is final while this sign still remains here.

Motivation

CSE 331 is primarily concerned with the technical aspects of algorithms: how to design them and then how to analyze their correctness and runtime. However, algorithms are pervasive in our world and is common place in many aspects of society. The main aim of the mini-project is to have you explore in some depth social implications of algorithms.

Just to give two examples for such implications:

- Algorithms are pervasive in financial transactions and these algorithms have consequences beyond just trading:



Questions/Comments?

Who is Algorithm named after?

Abū ʿAbd Allāh Muhammad ibn Mūsā al-Khwārizmī

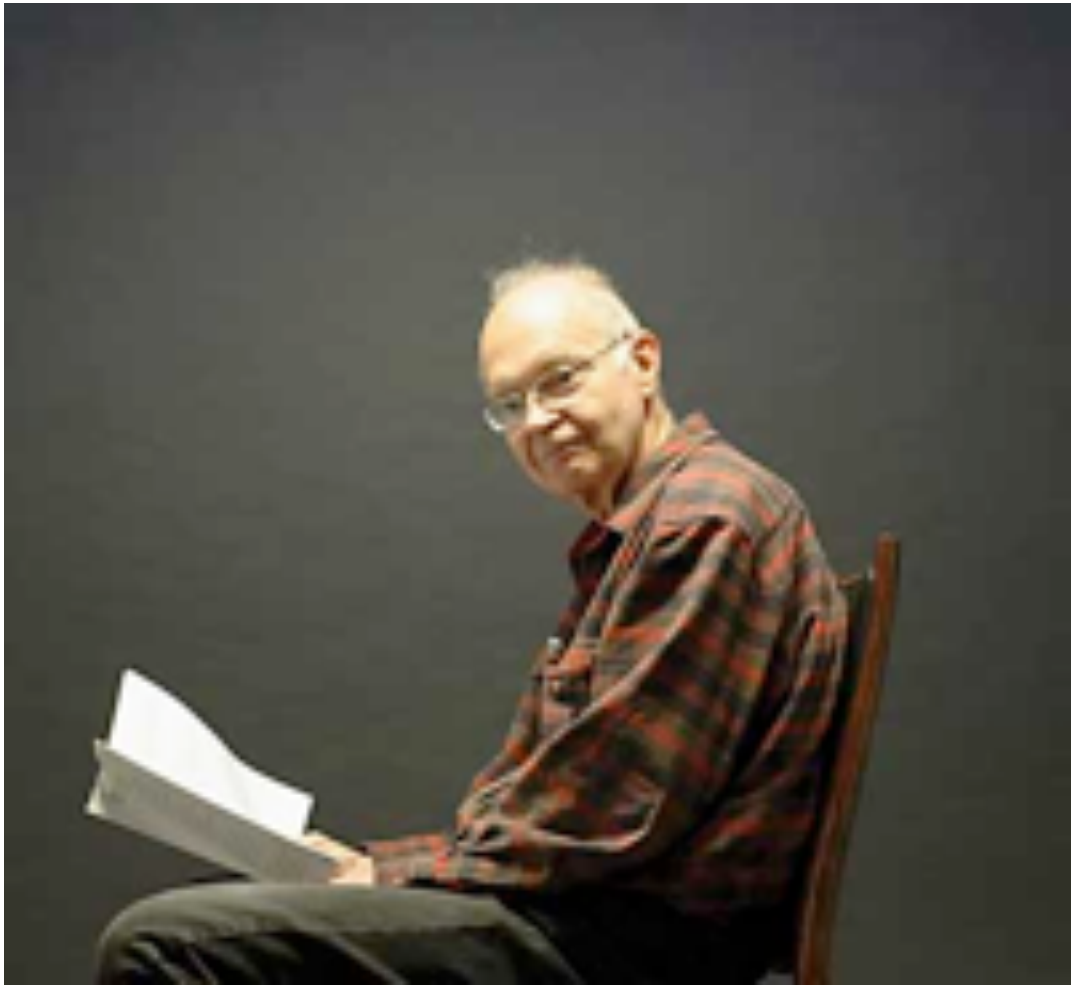
9th century Persian astronomer/mathematician

825 AD: “On Calculation with Arabic Numerals”

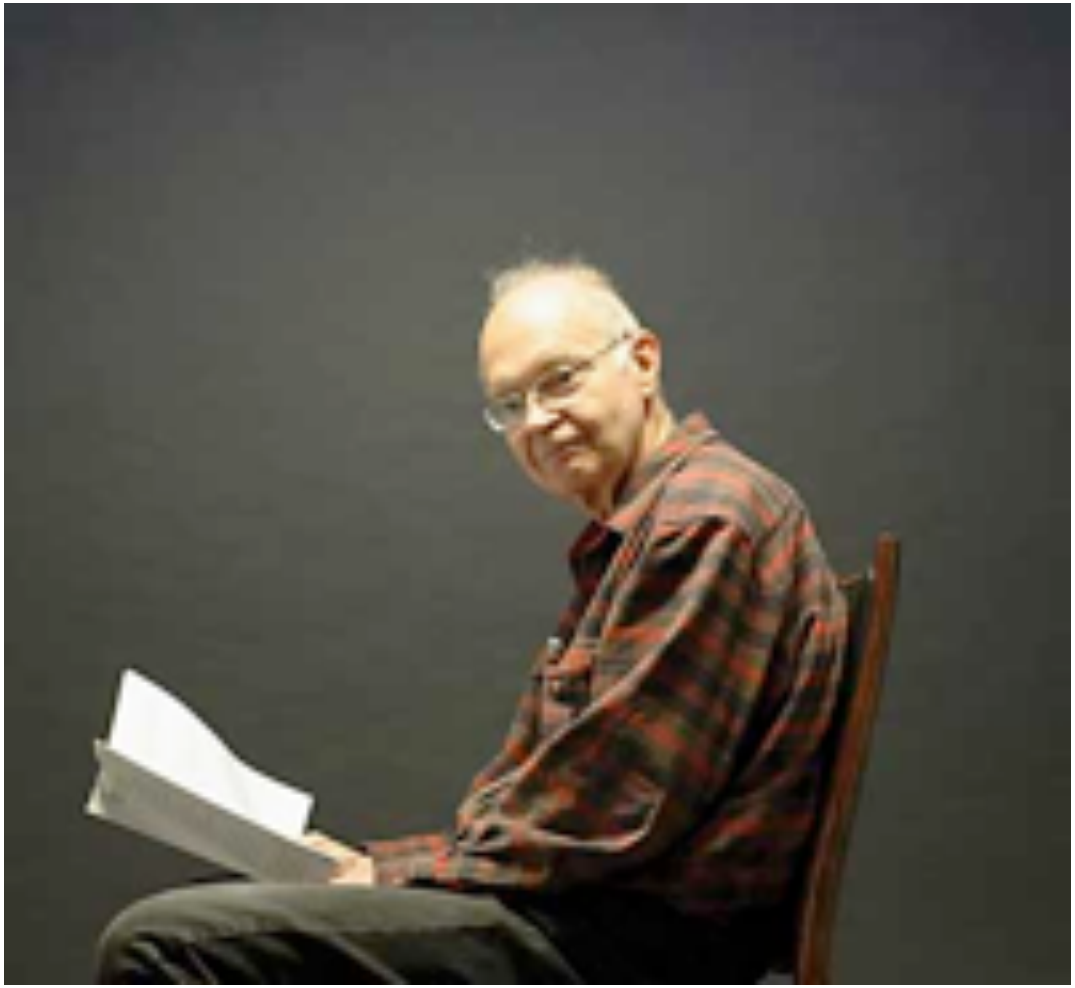
Latin translation 12th century

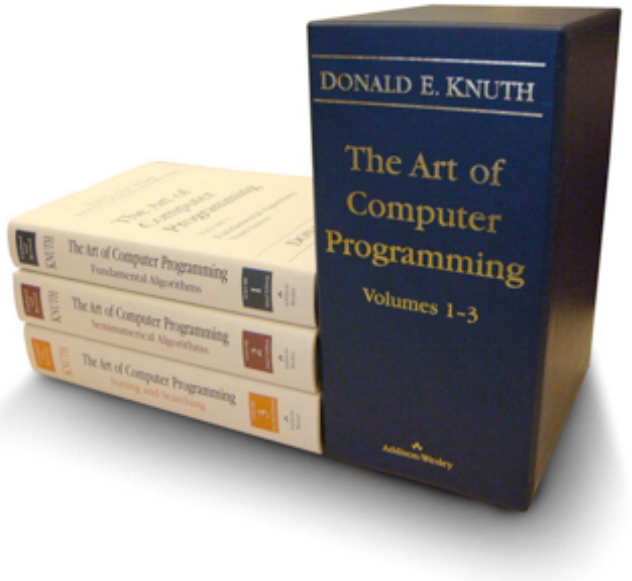
“Algorithmi de numero Indorum”

What are Algorithms?

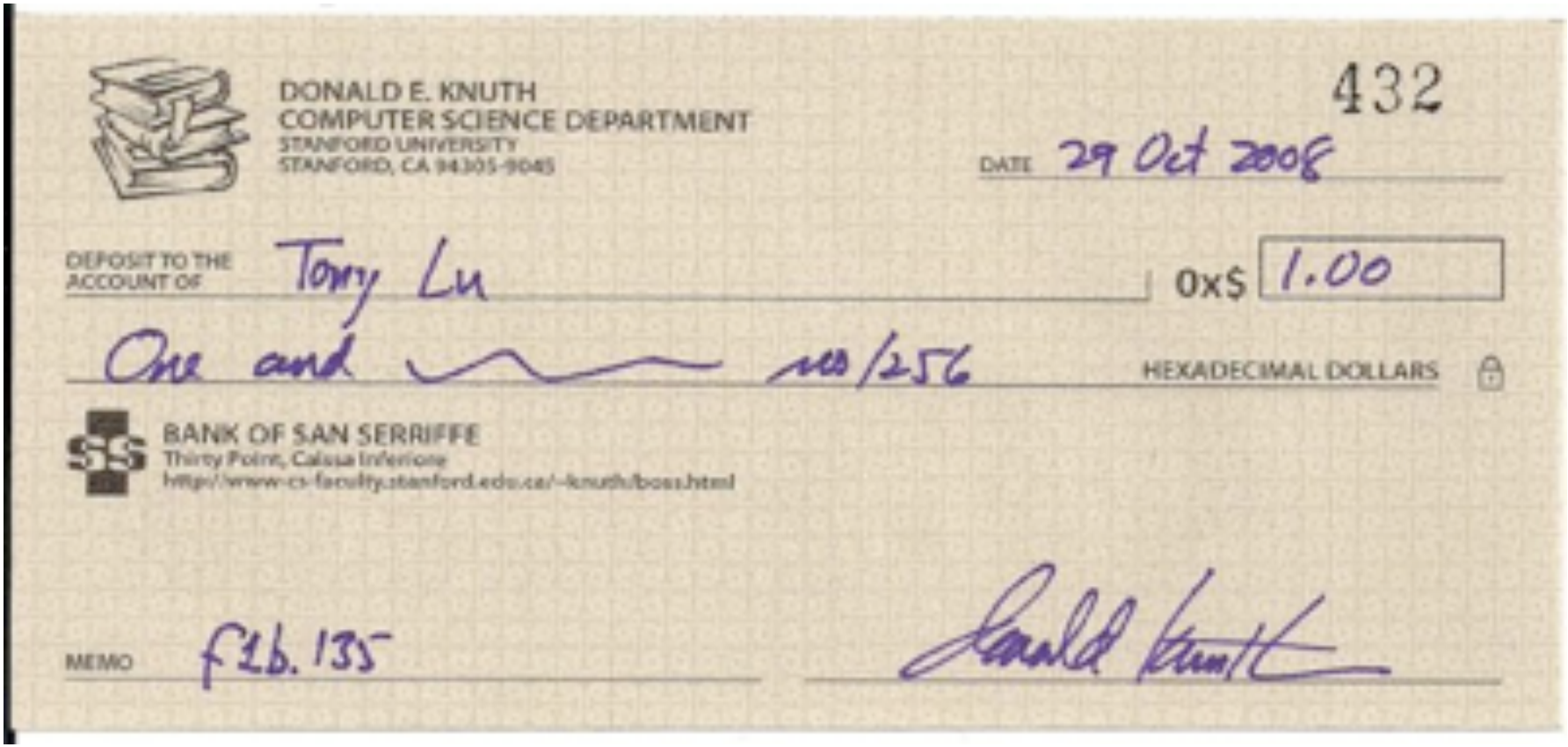


Don Knuth





Don Knuth Reward Checks



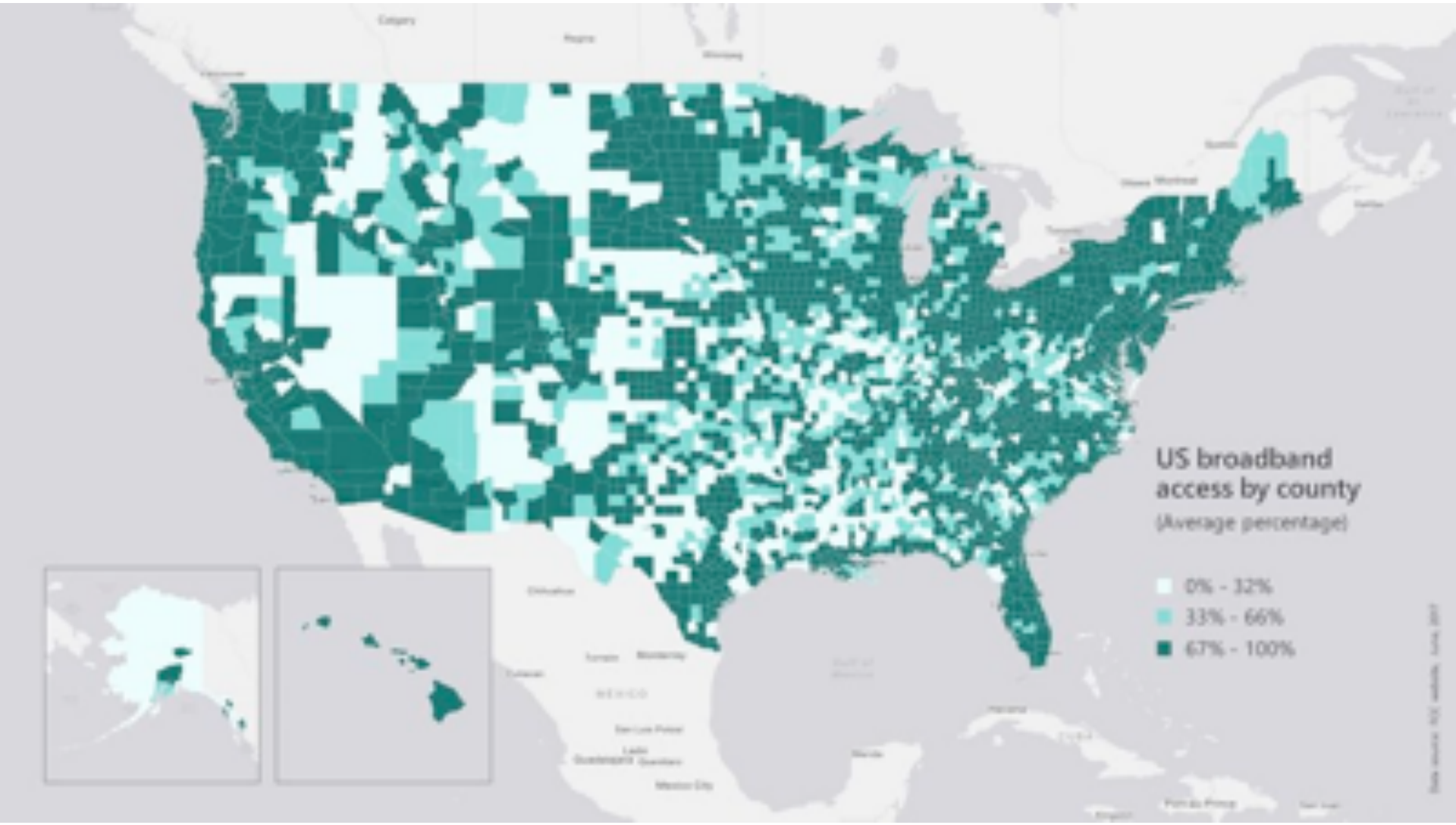
http://www.flickr.com/photos/32184482@N03/3010989157/

Knuth's Definition

An algorithm is a finite, definitive, effective procedure with some input and some output

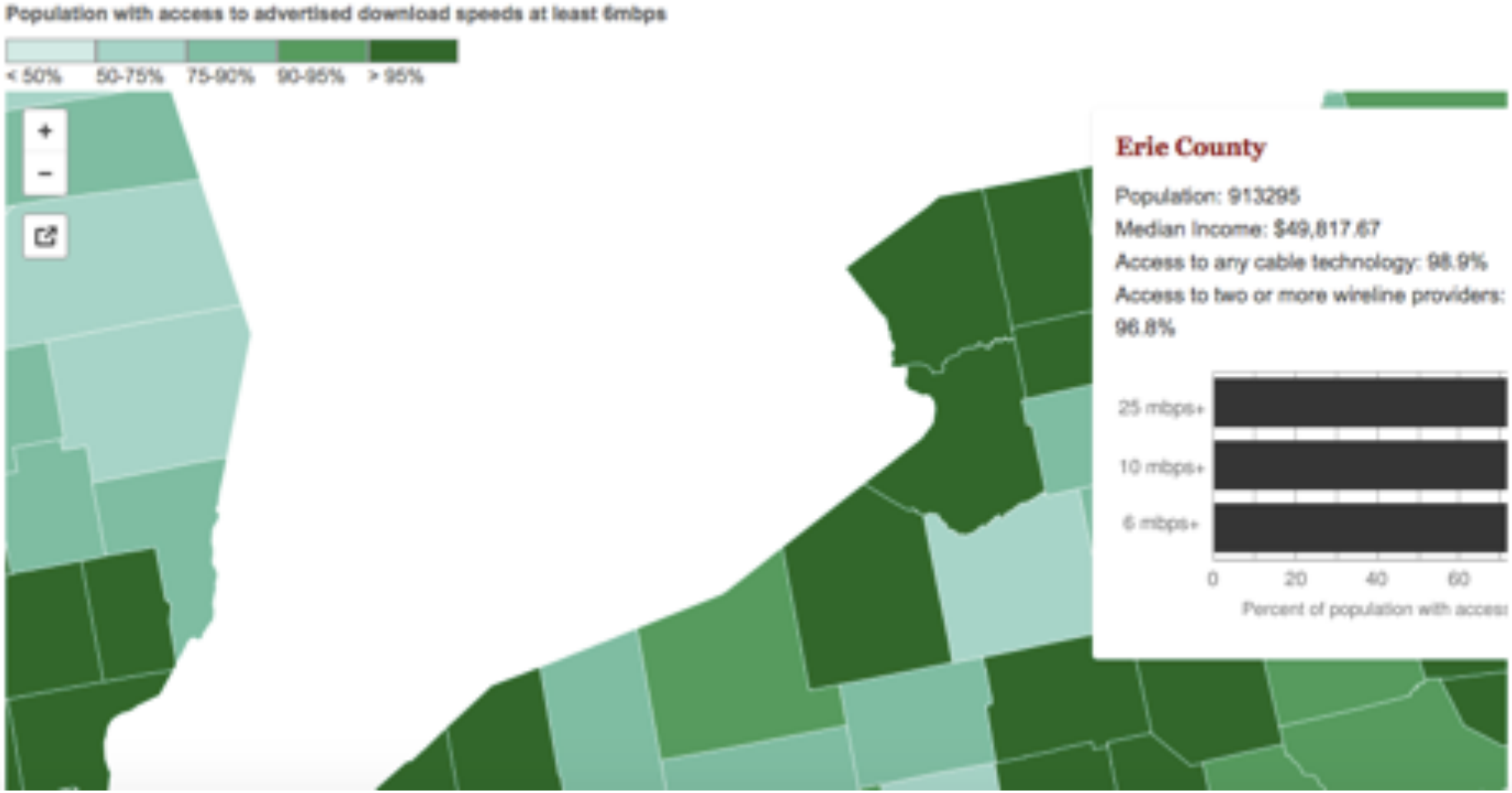
Remember: Stick with your group

Broadband access



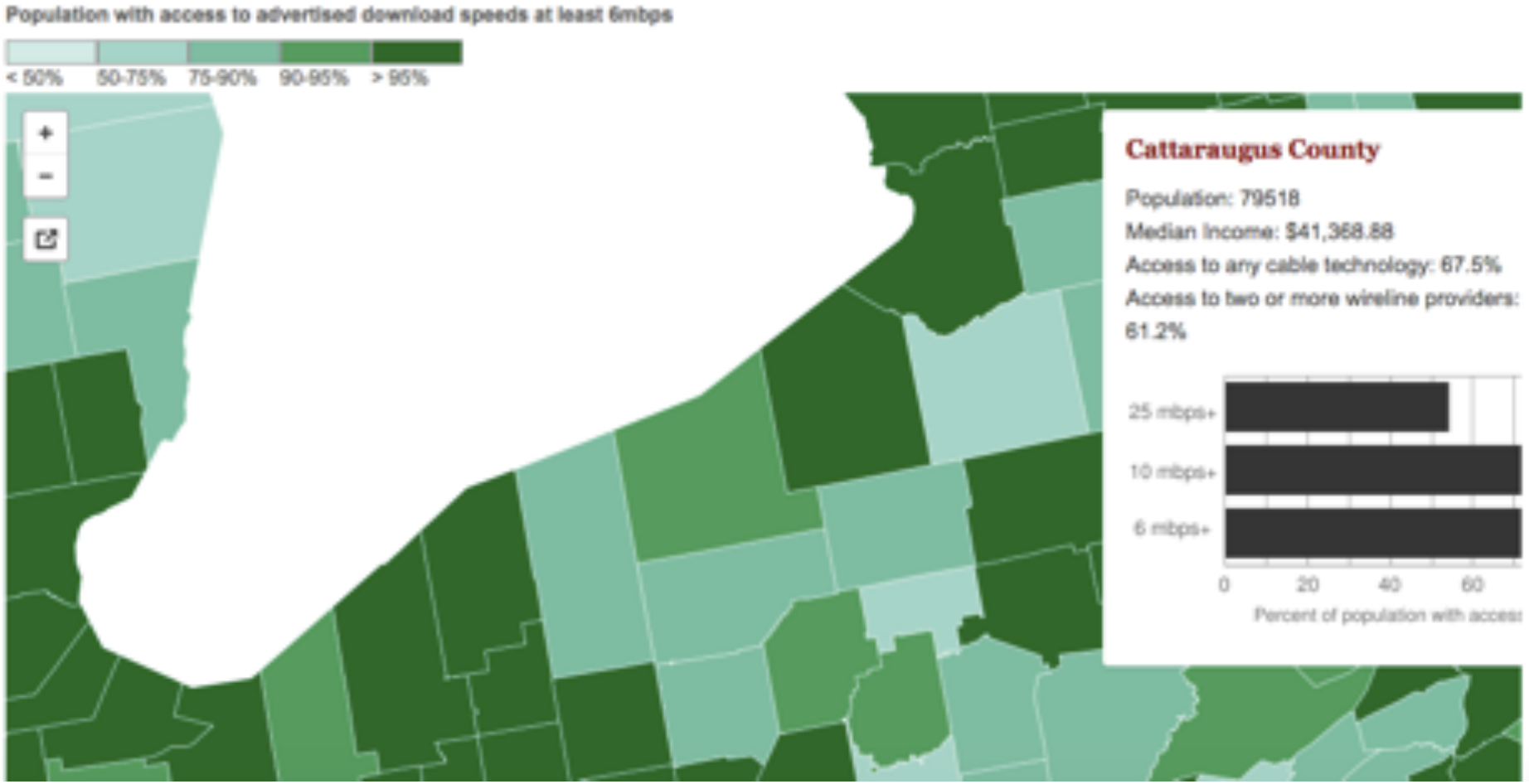
https://assets.bwbx.io/images/users/iqjWHBFdfxIU/iZSjibxE1KJs/v1/800x-1.jpg

Erie county is reasonably good



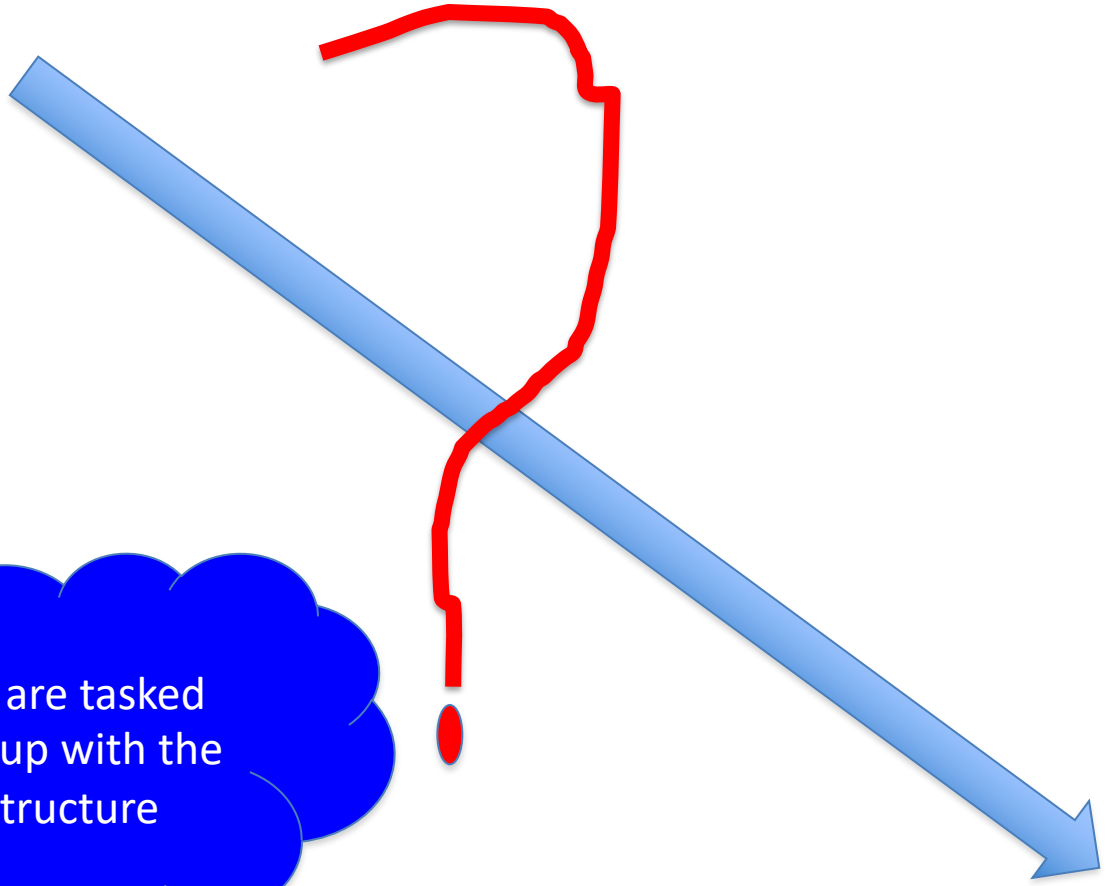
http://www.governing.com/gov-data/broadband-speeds-availability.html

One county over



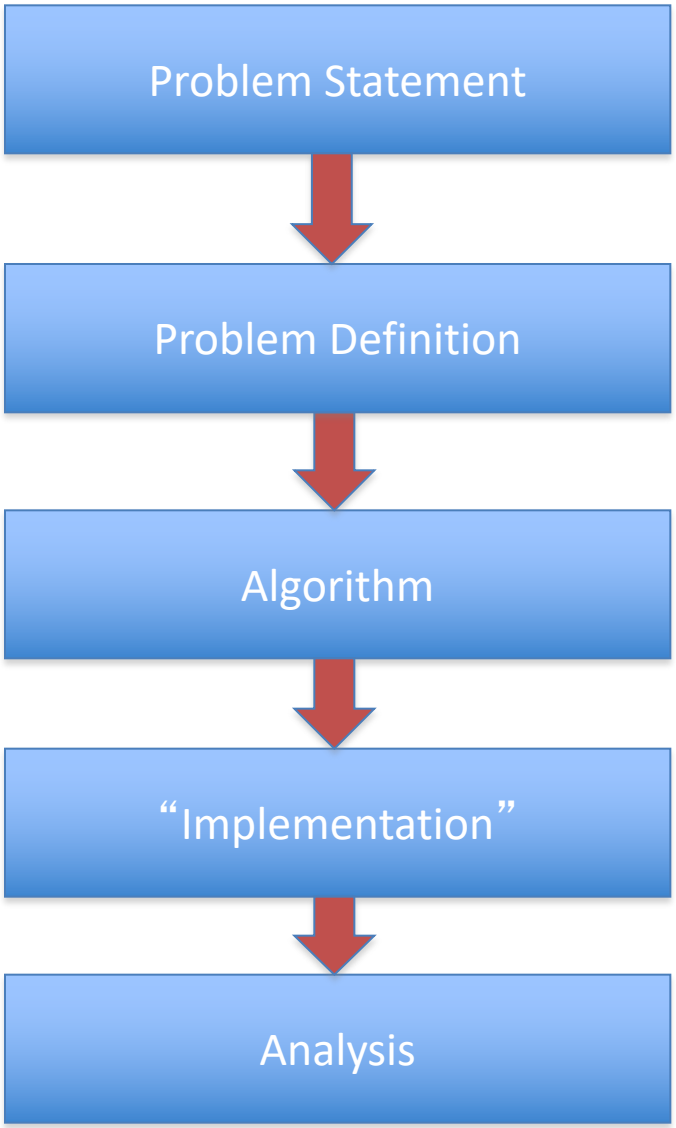
http://www.governing.com/gov-data/broadband-speeds-availability.html

Make broadband more available



Say you are tasked to come up with the infrastructure

Main Steps in Algorithm Design



Real world problem

Precise mathematical def

Data Structures

Correctness/Run time

Worst-case analysis

Correctness should hold for every valid input

Resource usage by the worst-possible input

Questions/Comments?

National Resident Matching

(Screen) Docs are coming to BUF

What can go wrong?

The situation is unstable!

What happens in real life

Preferences

NRMP
National Resident Matching Program

Information

NRMP
National Resident Matching Program

Preferences

NRMP
National Resident Matching Program

NRMP plays matchmaker

Stable Matching Problem

David Gale

Lloyd Shapley