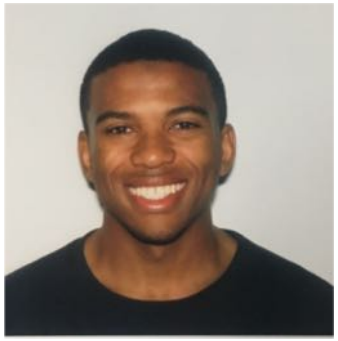

Welcome
to
CSE 331

Let’s do some introductions

http://www.zazzle.com/warning_teaching_assistant_bag-149882665435161818

TAs first



Iman

Mark

Steven

Chris

Charles

Stephen

Angus

Aniruddha

Mehmet

Alejandro

Lectures will be videotaped

http://www.imdb.com/title/tt0363510/mediaviewer/rm2499681792

About Me

Atri Rudra

atri@buffalo.edu

Office: 319 Davis

Office hours: Mon and Wed, 1:00-1:50pm

OH starts today

Contact us all at

cse-331-staff@buffalo.edu

TAs will not respond to individual emails (except for re-grading requests)

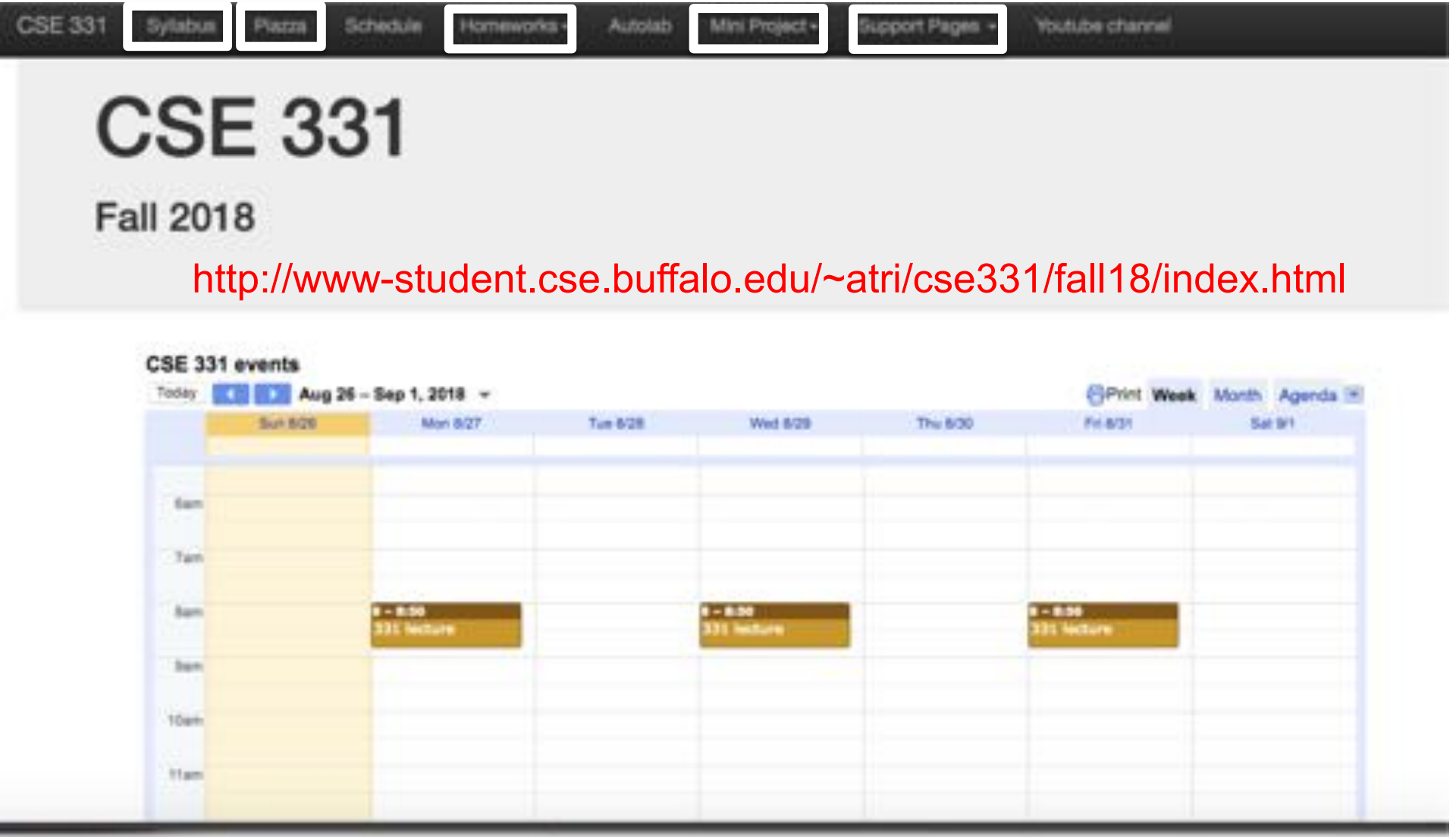
Handouts for today

Syllabus (online)

Homework Policy document (online)

Homework 0 (online)

One Stop Shop for the Course



Homework 0 (Optional)

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

HW 0

Allowed Sources

Homework Policies

Homewo

Due by **11:59pm, Thursday, August 30, 2018**.

Due: this Thursday

Make sure you follow all the homework policies.

All submissions should be done via Autolab

Submitting HW 0 is optional. However, we do encourage you to submit to get familiar with Autolab and to get some feedback.

What is a proof?

The goal of this question is to present a gentle start to proofs. In particular, the idea is to highlight a common mistake students make while writing proofs.

The Problem

Consider the following "proof":

- Brad Pitt has a beard:

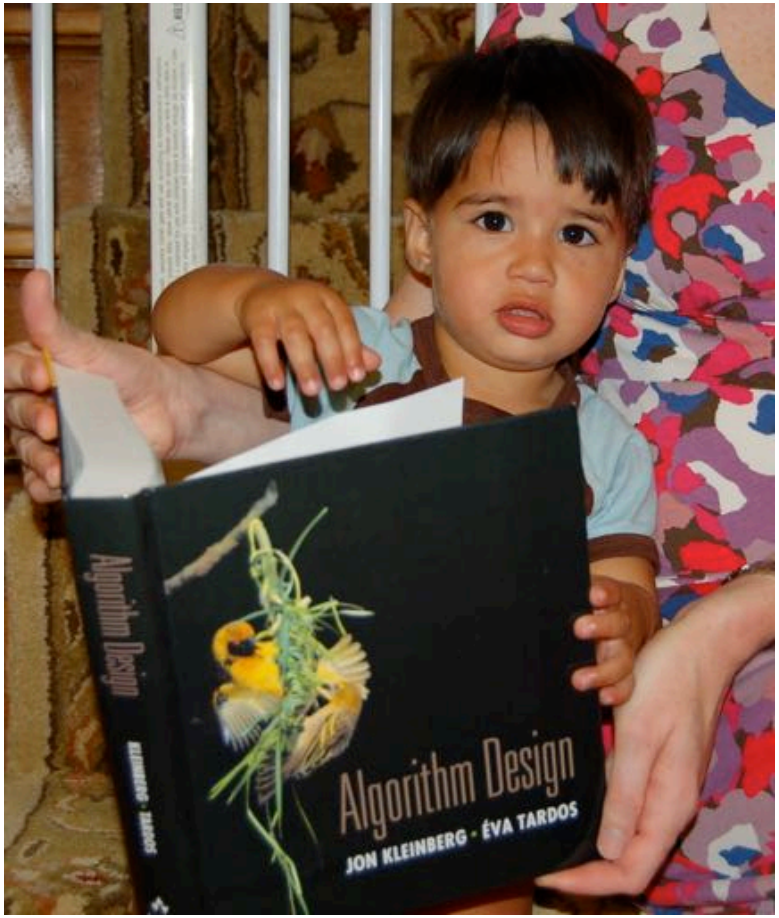
Three things to remember

WORK HARD!

DO NOT CHEAT!

READ CAREFULLY!

Wait.. What???



Make sure you follow submission instructions

Two most common ways of losing points

Make sure you read problem statements carefully

Academic Dishonesty

All your submissions must be your own work

Penalty:

Minimum: An **grade reduction in course**

Possible: **F** (or higher penalty) if warranted

YOUR responsibility to know what is cheating, plagiarism etc.

If not sure, come talk to me

Excuses like "I have a job," "This was OK earlier/in my country," "This course is hard," etc. **WON'T WORK**

I DO NOT HAVE ANY PATIENCE WITH ANY CHEATING :

YOU WILL GET A GRADE REDUCTION IN THE COURSE

FOR YOUR FIRST MISTAKE

Read the syllabus CAREFULLY!

Syllabus Quiz

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

Options

View handin history

View writeup

Download handout

Due: **December 7th 2018, 9:06 pm**

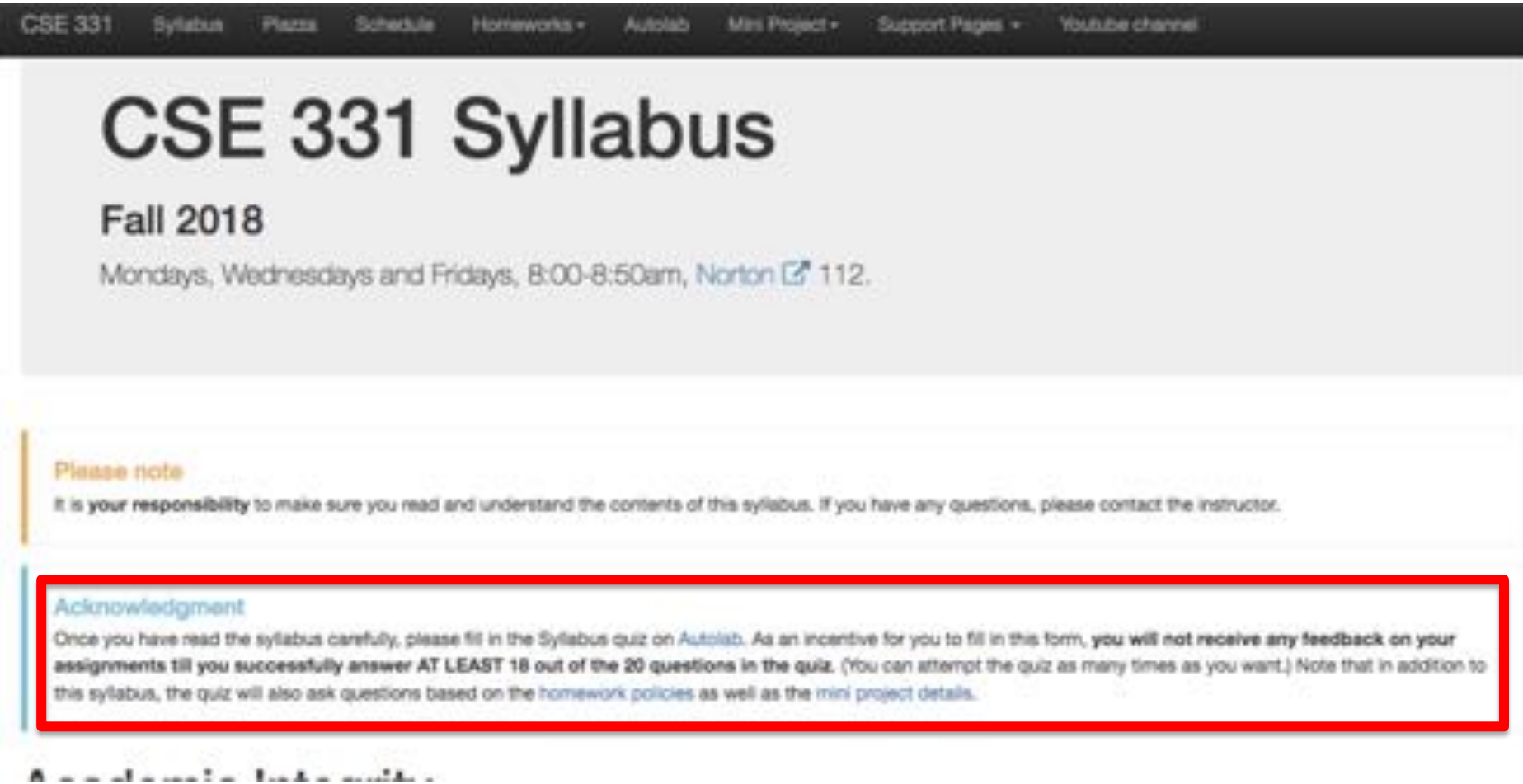
Last day to handin: **December 7th 2018, 9:06 pm**

Academic Integrity

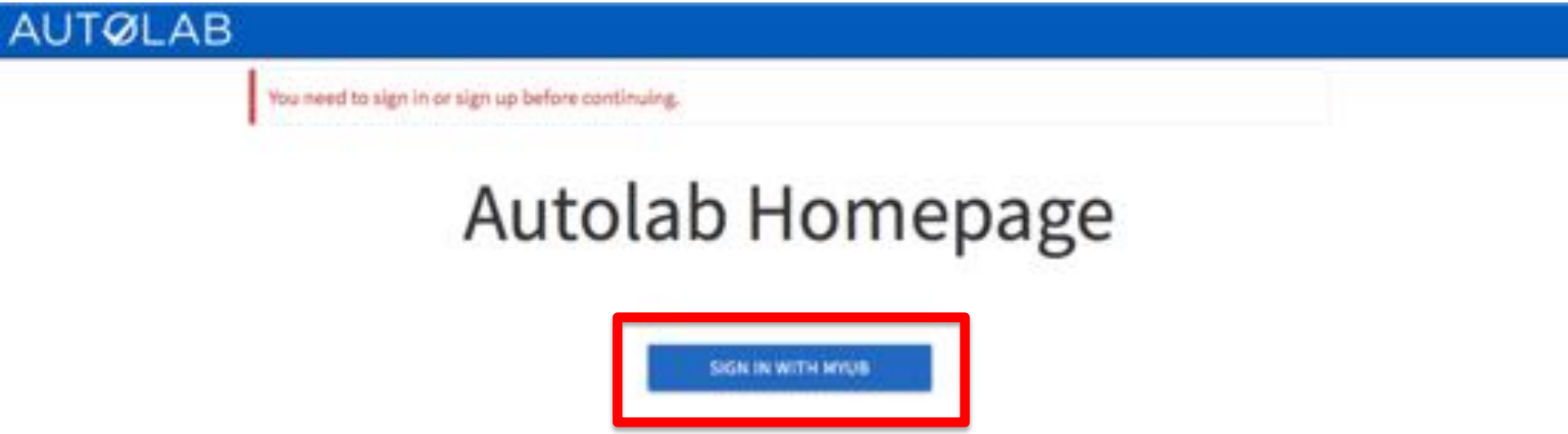
Question 1: Sharing my answers to this syllabus quiz with other 331 students

- ○ Is OK if I do it to help out a friend
- ○ It does not matter since there is no grade attached with it
- ○ Is an academic integrity violation and should not be done
- ○ Is an academic integrity violation but I can take the chance

More information on the quiz

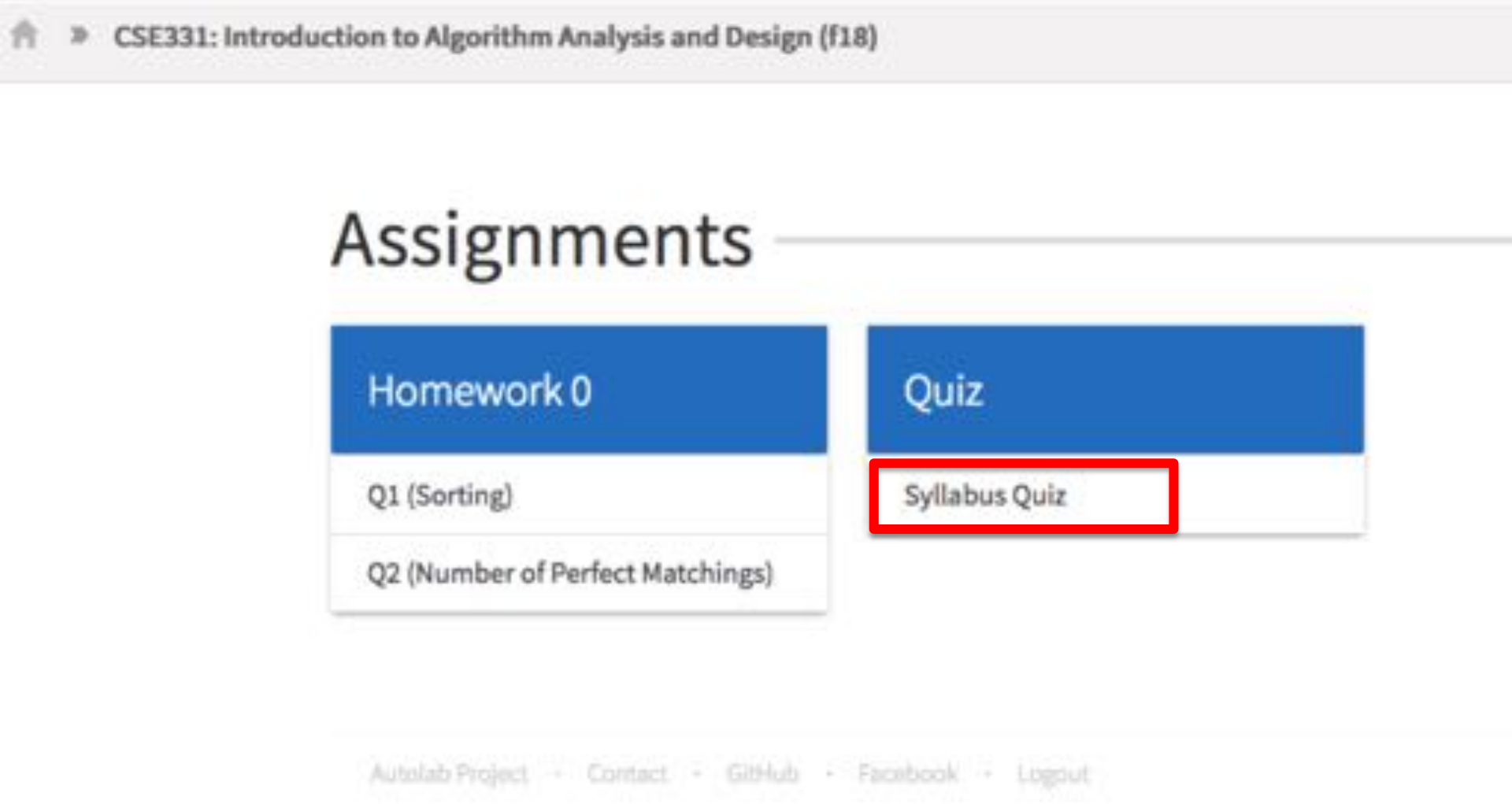


Autolab



https://autograder.cse.buffalo.edu/

You can submit the following now



If you were registered by 9pm on Monday, Aug 20 you should be on Autolab

Grading break-down

Grading Policy

Here is the split of grades:

Course Component	% of grade
Mini project	6%
Homeworks	31%
Quizzes	3%
Exams	60%

Pre-requisites

Required (officially)

- CSE 250, CSE 191 and MTH 142
- At least a C-

Required (for practical purposes)

- Comfort with proofs
- Willingness to work hard!

Accessibility Resources

Information included in the syllabus

In short, let me know and consult with Accessibility Resources

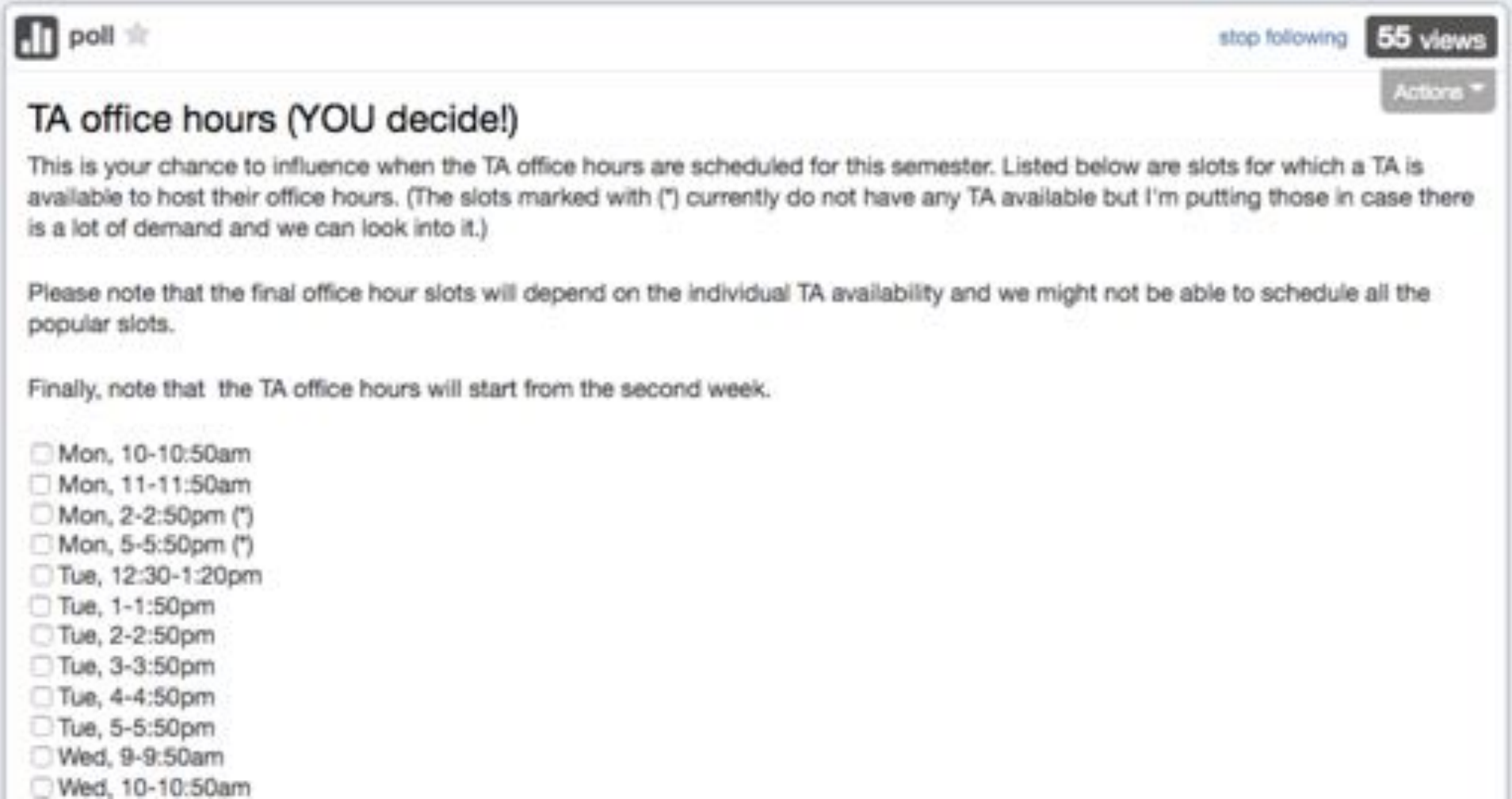
Preferred Name

If you prefer using name diff from UB records

Let me know and we'll make a note of it.

TA Office hours

YOU decide!


poll

stop following 55 views

Actions

TA office hours (YOU decide!)

This is your chance to influence when the TA office hours are scheduled for this semester. Listed below are slots for which a TA is available to host their office hours. (The slots marked with (*) currently do not have any TA available but I'm putting those in case there is a lot of demand and we can look into it.)

Please note that the final office hour slots will depend on the individual TA availability and we might not be able to schedule all the popular slots.

Finally, note that the TA office hours will start from the second week.

- ☐ Mon, 10-10:50am
- ☐ Mon, 11-11:50am
- ☐ Mon, 2-2:50pm (*)
- ☐ Mon, 5-5:50pm (*)
- ☐ Tue, 12:30-1:20pm
- ☐ Tue, 1-1:50pm
- ☐ Tue, 2-2:50pm
- ☐ Tue, 3-3:50pm
- ☐ Tue, 4-4:50pm
- ☐ Tue, 5-5:50pm
- ☐ Wed, 9-9:50am
- ☐ Wed, 10-10:50am

Recitations

Are on for this week!

Exams

Mid term (two parts)

Mon, **Oct 15** and Wed, **Oct 17**, 2018. Usual place and time.

Final exam

Mon, **Dec 10**, 2018. Norton 112, **8:30-11:00am**

Things new to HWs in Fall 18

Proof based questions (Q2 + 3) will have part (a) and part (b)

Recitations will essentially show you how to solve part (a)

You can feedback on your part (a) solutions in TA office hours

Part (b) you are on your own

HWs due by 11:59pm on Thursdays

Other new things in Fall 18

1-on-1 meeting slots with TA (details later in the week)

Some of the algorithms we will develop via examples in lectures

C++ vs Java/Python

Use Java/Python if as you just as comfortable with as C++

Use a VM with g++ installed for Ubuntu

We recommend that you install a VM that runs `g++` on Ubuntu. In particular, we recommend that you use Jaric Zola's VM system that he created for his CSE 250 course.
If you have questions on Jaric's setup, please do **NOT** contact him: email `cse-331-staff@buffalo.edu` instead.

If you still prefer using your own system, we would still recommend that you test your code in the VM system above before submitting to Autolab.

poll

stop following 24 views

Actions

Help with installing VM for C++ (special office hours)

If you need some help installing the VM setup for submitting in C++:

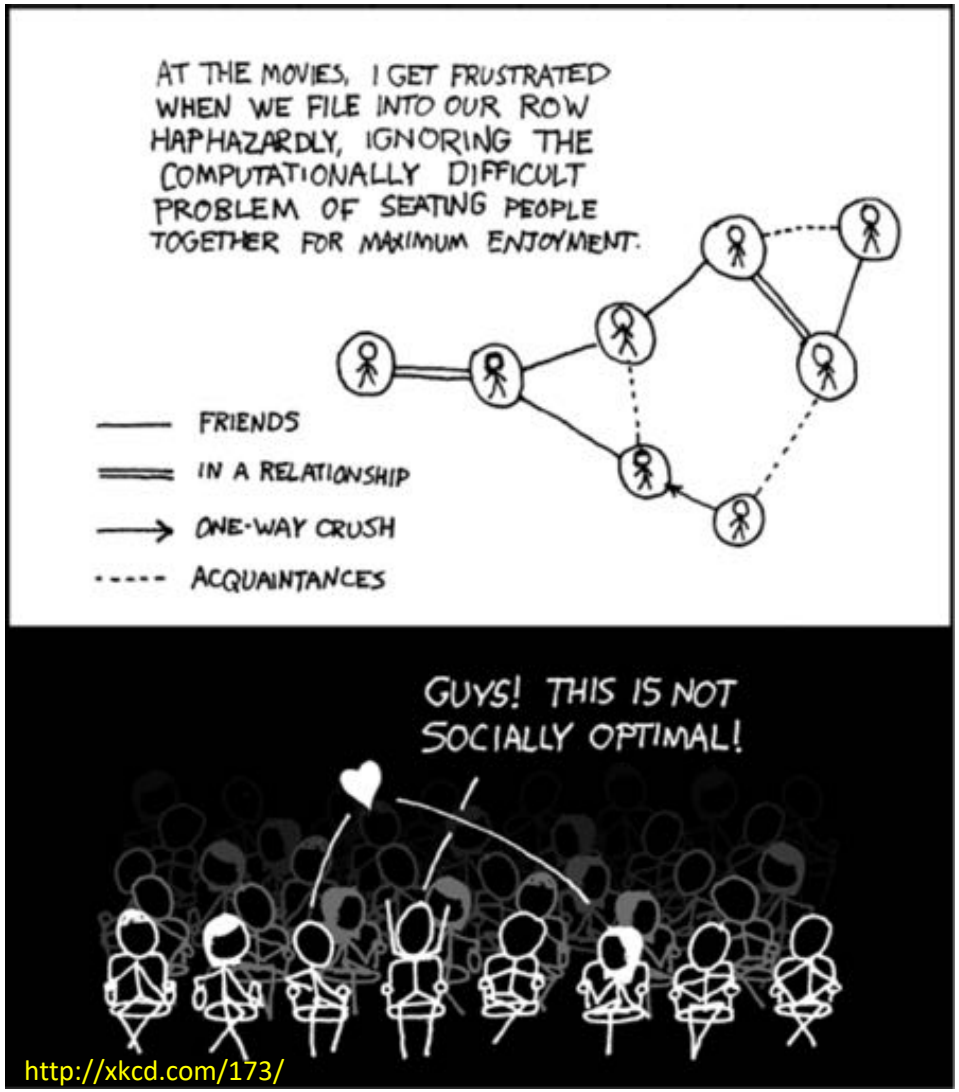
http://www-student.cse.buffalo.edu/~atri/cse331/fall18/autolab.html

please select the times below that would work for you for some extra office hours. We will pick some of the most popular hour-long slots for Tuesday (August 28) and Wednesday (August 29). I would highly recommend that you try to install the vagrant system *before* you come to these office hours so that you can use the office hours to get help with trouble-shooting.

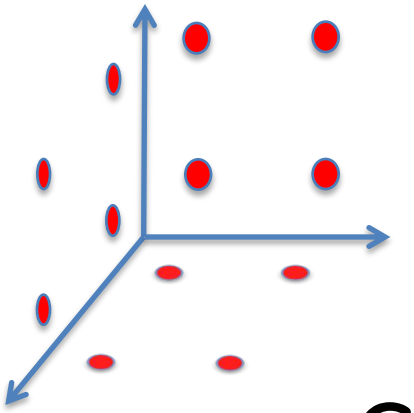
These slots are especially meant for transfer students who might not have had much practice working with linux/unix systems and have primarily use Windows as their main OS. Of course, these slots are open to anyone who needs help with this (even if you are not a transfer student!)

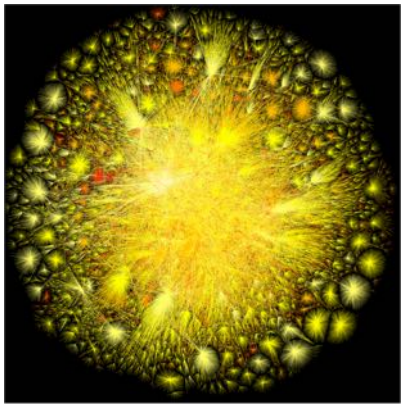
Please note that these office hours are just for help in installing the VM to run C++. The regular office hours will start from next week

This course: how to solve problems!

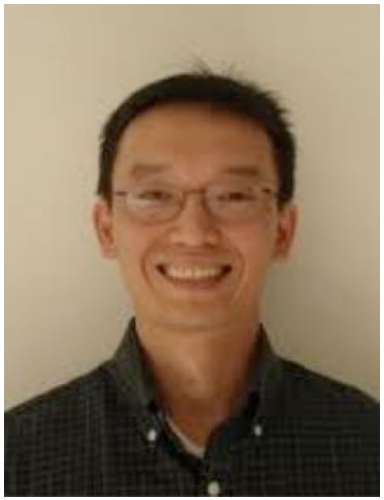


Why should I care ?





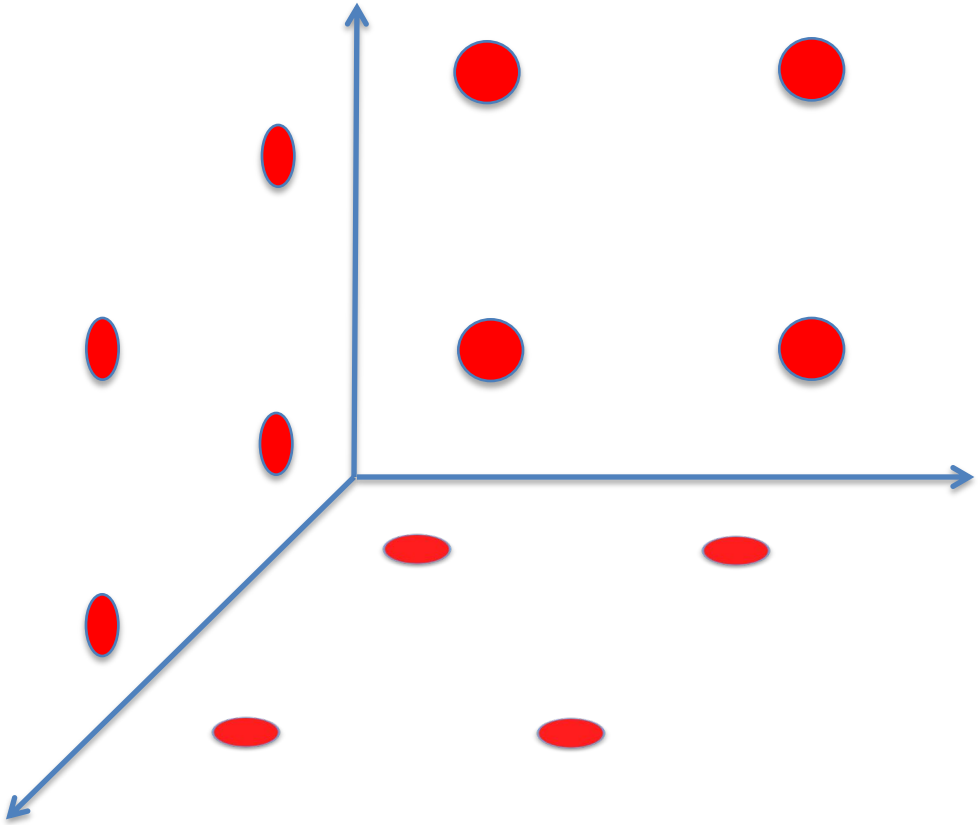
Combining Shadows to Understanding the network



LogicBlox

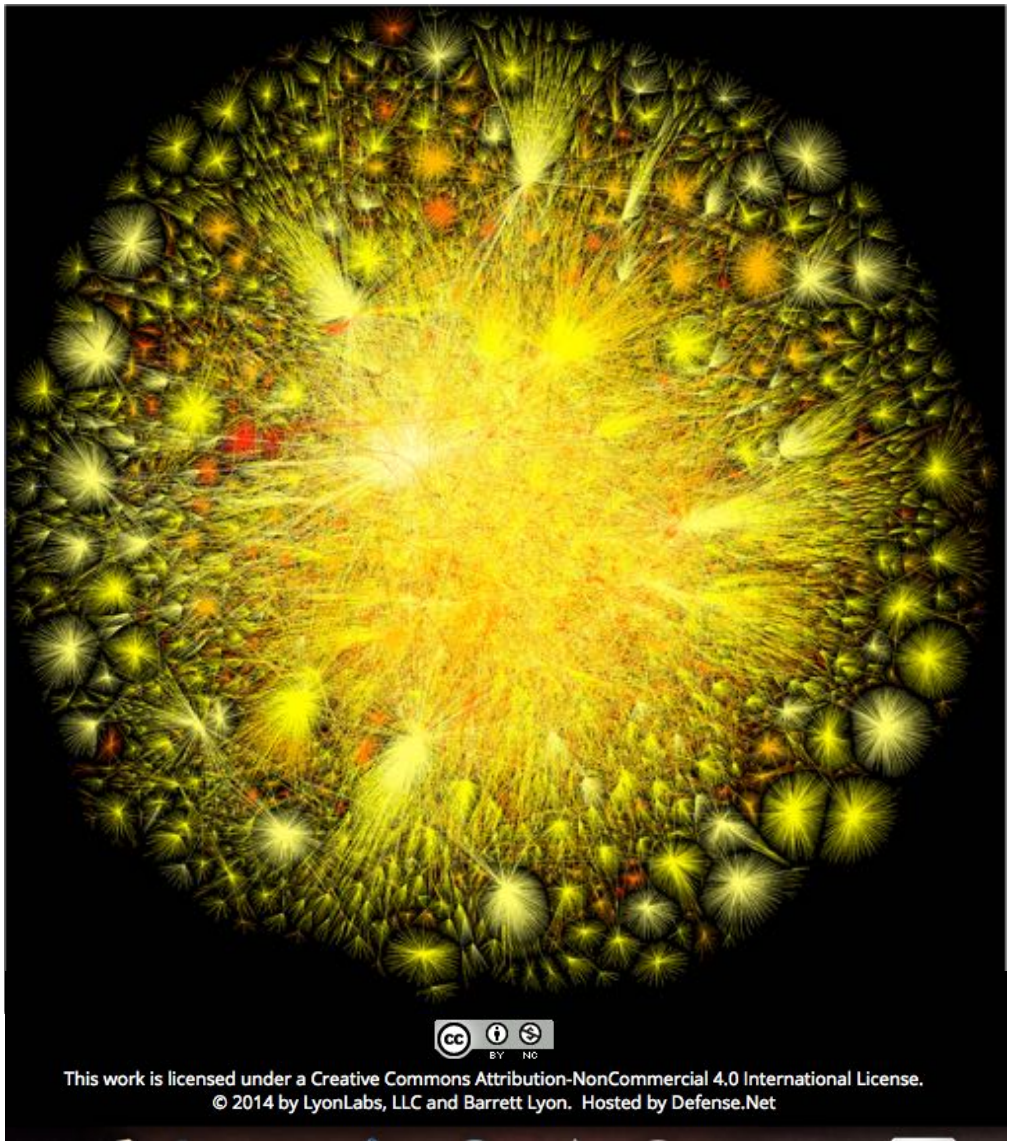
Stanford University

The key technical problem

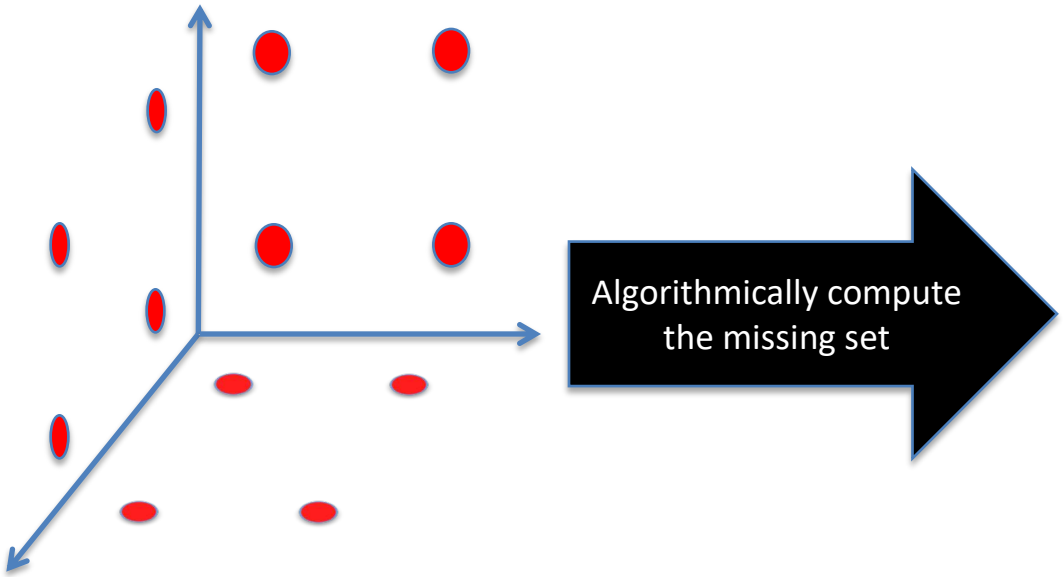


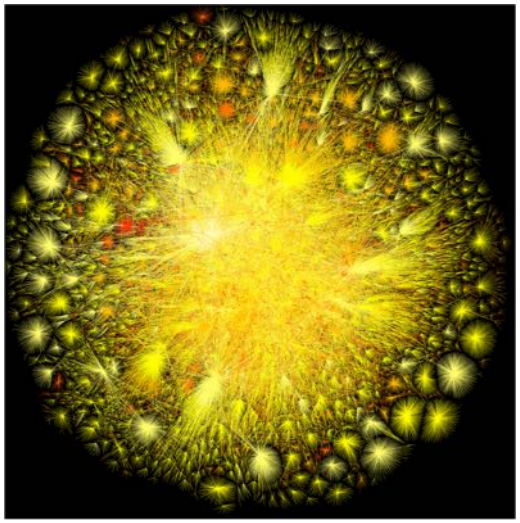
Given the three projections, what is the largest size of the original set of points?

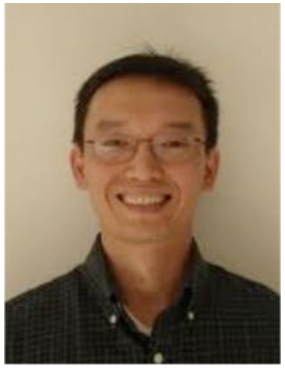
Detecting Communities



Conquering Shadows to Conquering the Internet







The proof is in the performance

EMPTYHEADED




10x faster

ORACLE

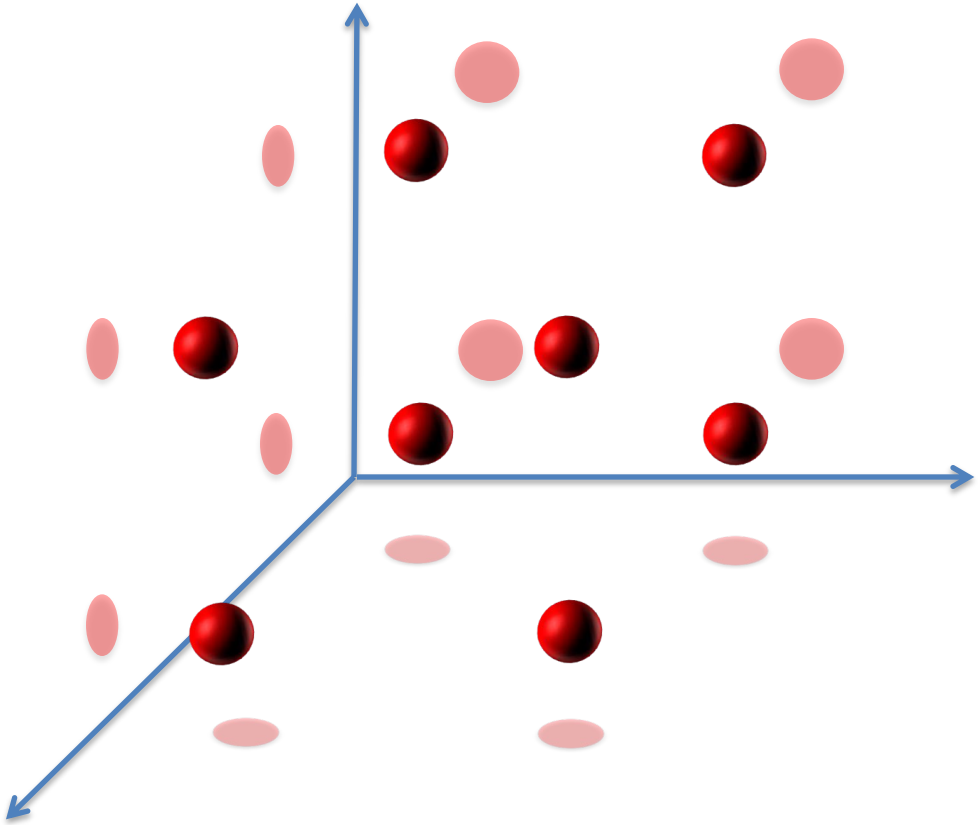
Dato GraphLab

LogicBlox

SNAP

Better algorithm with little hacking will beat a worse algorithm with tons of hacking

The key technical problem



Highly trivial: $4^3 = 64$

Still trivial: $4^2 = 16$

Correct answer: $4^{1.5} = 8$

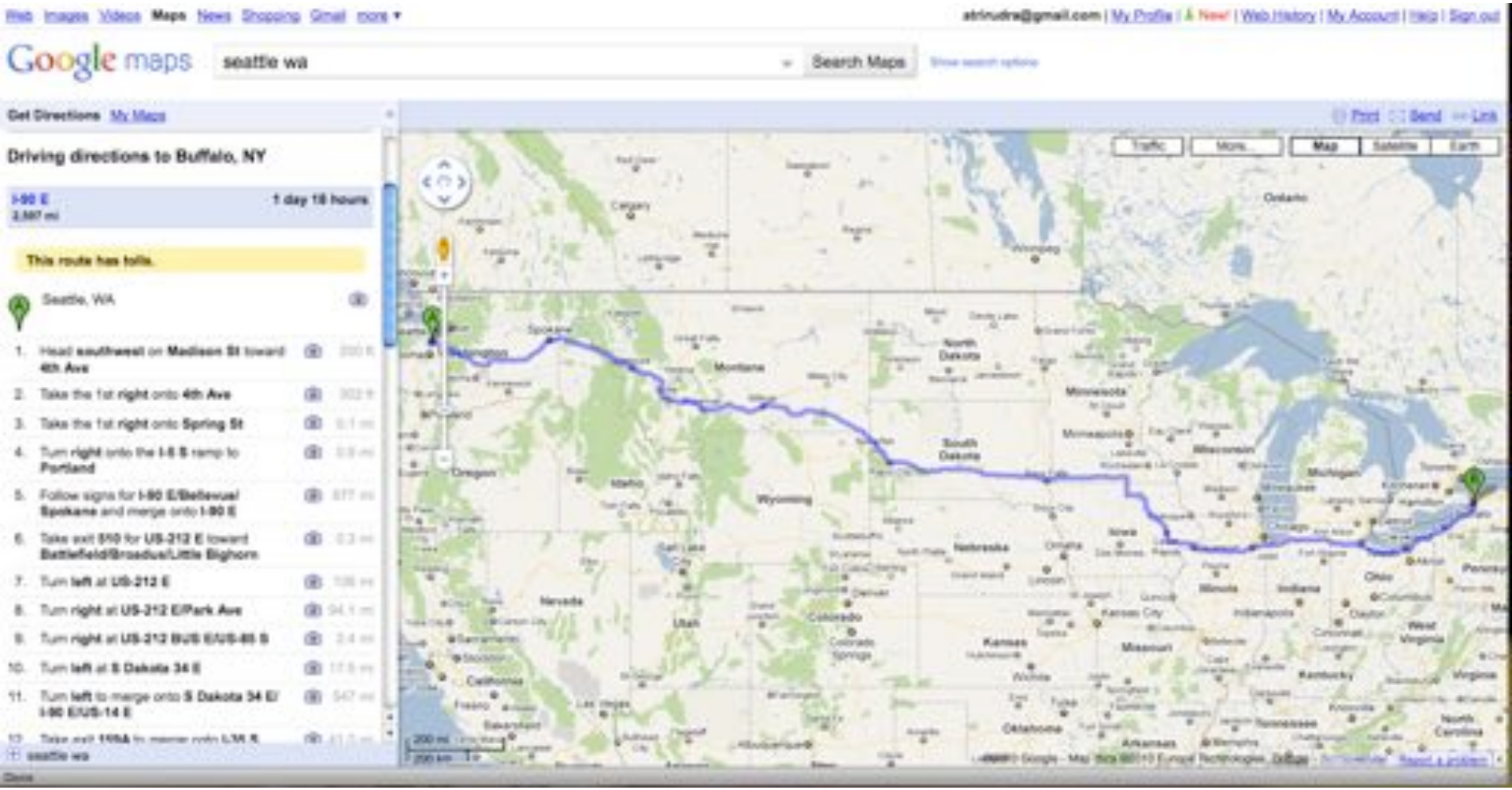
If detecting communities is not for you

From someone who got a Google job

“You can let your algorithms class know that the phone interviews are essentially like **a difficult algorithms test**.

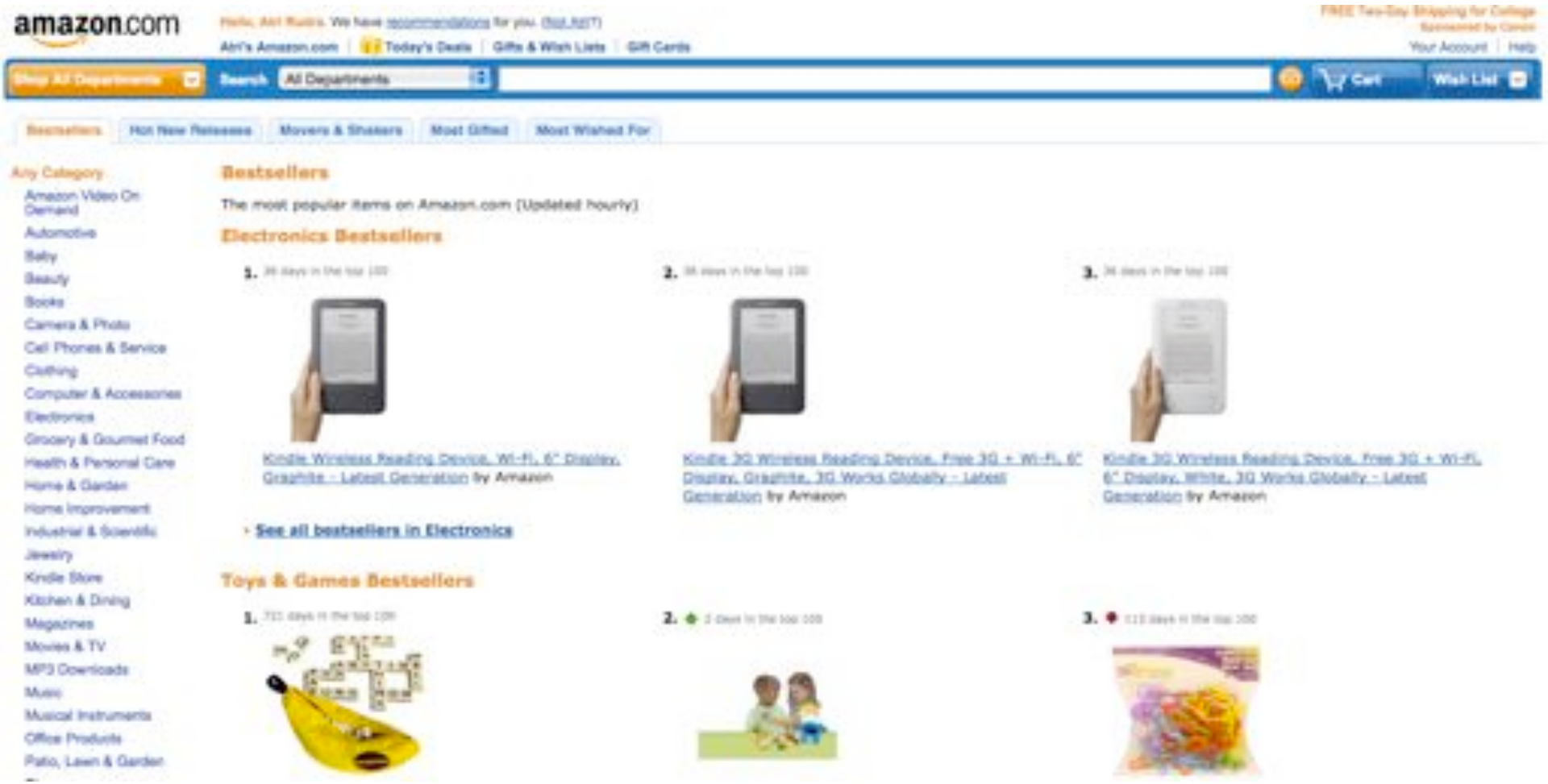
Lots of data structures, specifying the algorithm, analyzing the run time and space requirements... And all on the phone and **you're supposed to talk through your thought process**.”

Why care about algorithms?



Driving directions

Why care about algorithms?

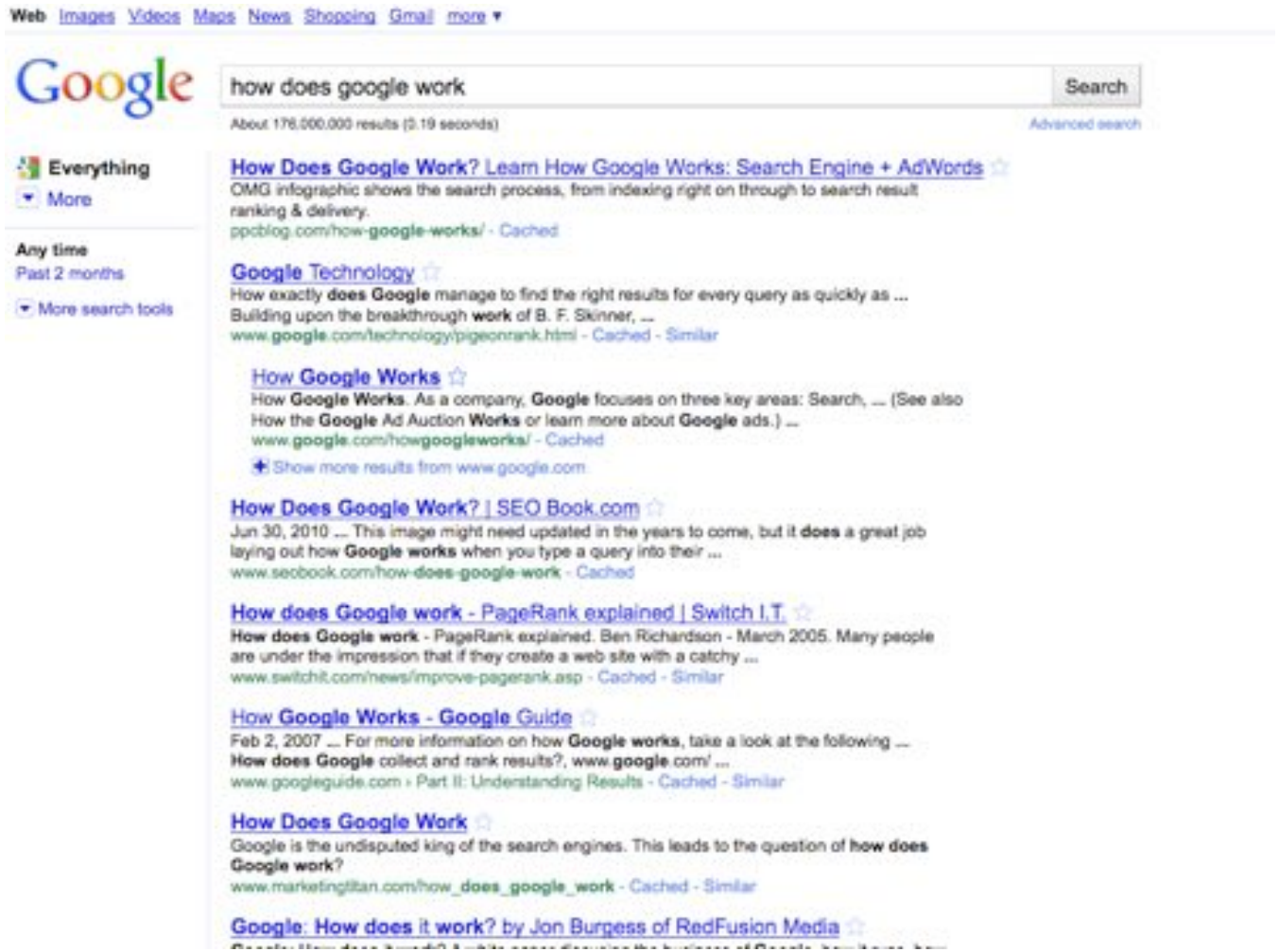


Computing Bestsellers on the fly

Why care about algorithms?

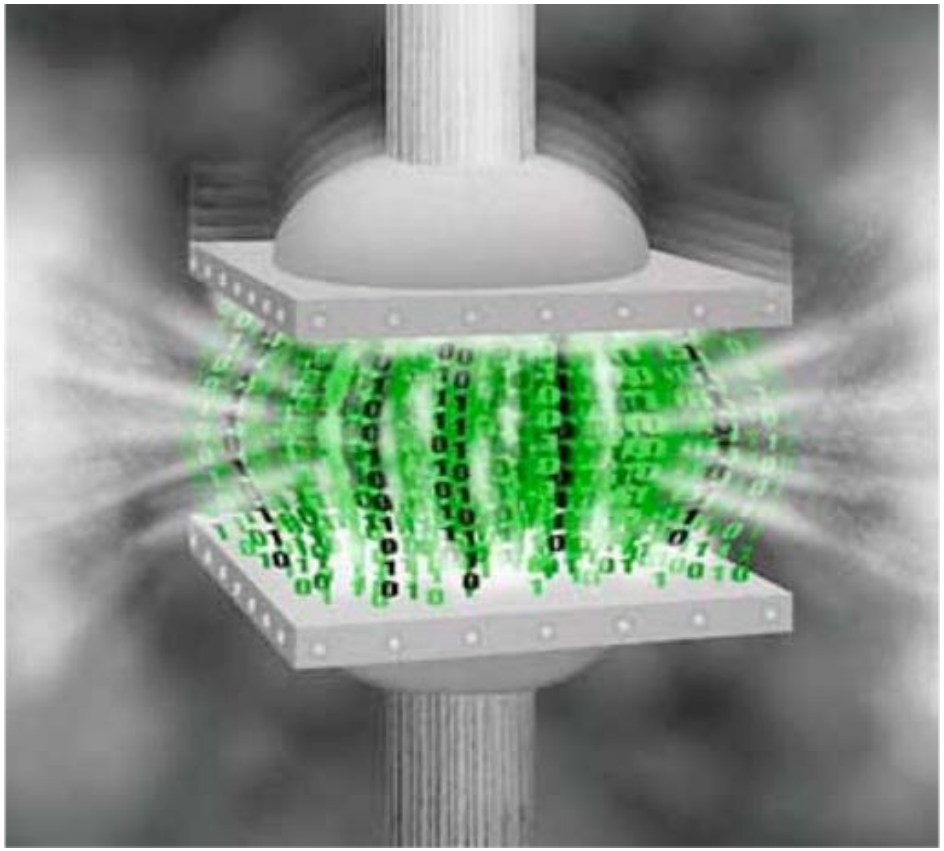
Booking cheapest air tickets

Why care about algorithms?



Google searches

Why care about algorithms?



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

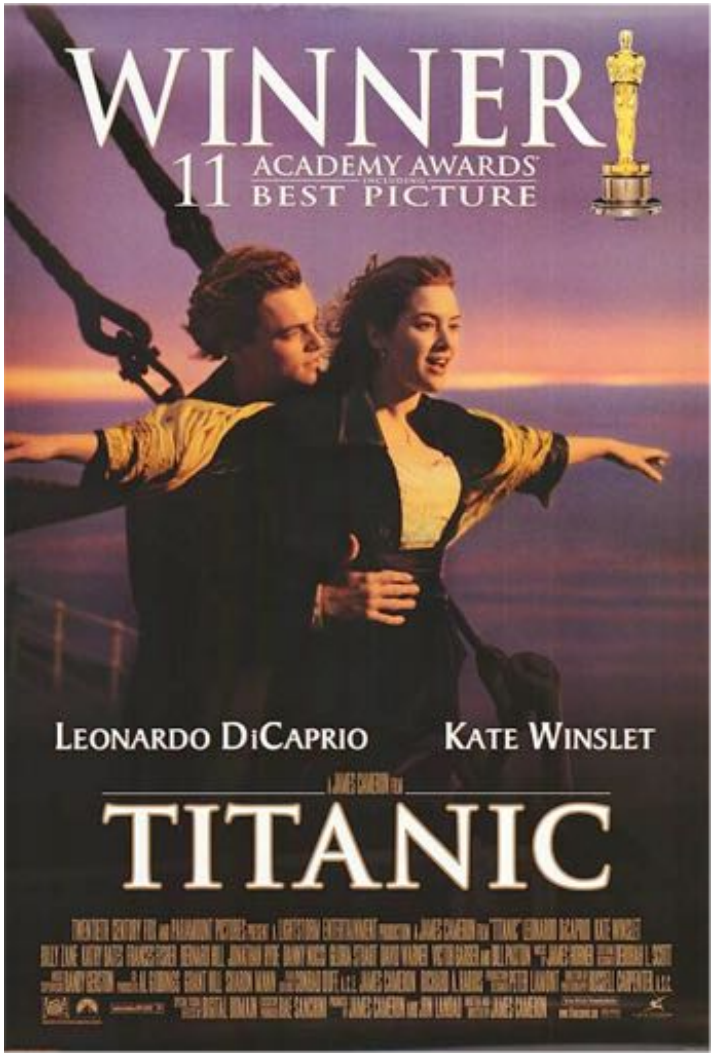
Data compression

Why care about algorithms?

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

Error correction

(And I could) go on…



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

Find out for yourself

Mini project: Video on social impact of algorithm. Groups of size = 3

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

CSE 331 Mini Project

Fall 2018

Details and motivations for the mini project.

Motivation

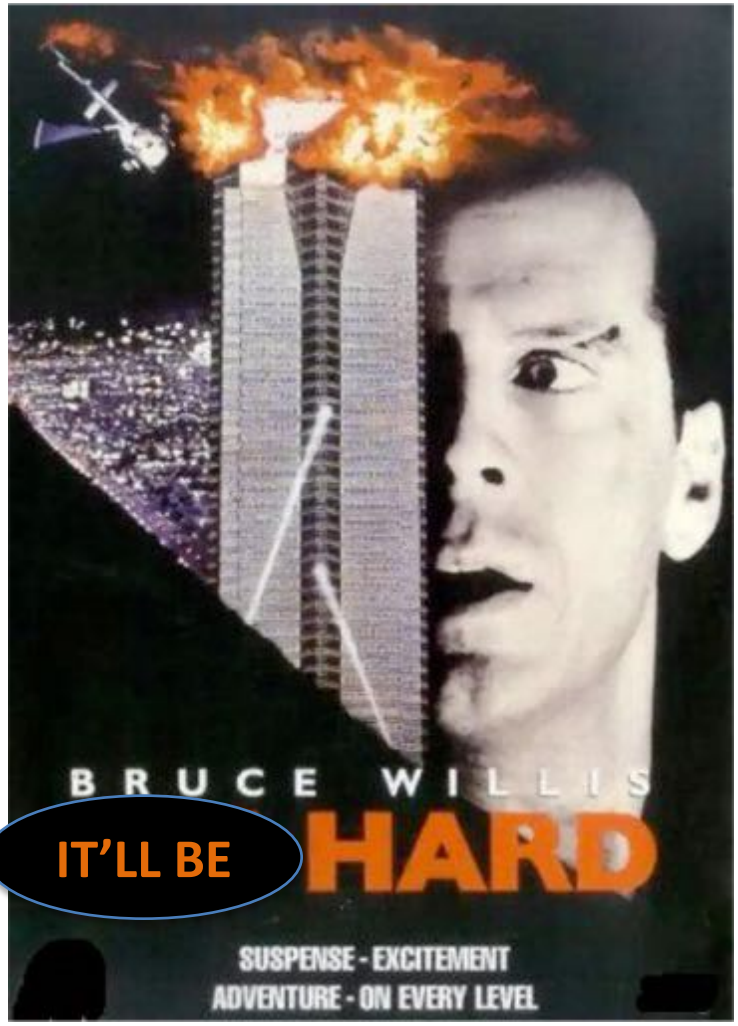
CSE 331 is primarily concerned with the technical aspects of algorithms: how to design them and then how to analyze their correctness and runtime. However, algorithms are pervasive in our world and is common place in many aspects of society. The main aim of the mini-project is to have you explore in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

Just to give two examples for such implications:

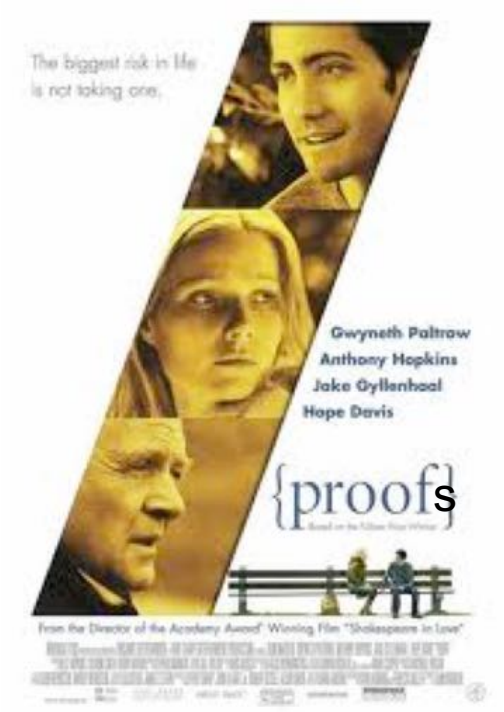
- Algorithms are pervasive in financial transactions and these algorithms have consequences beyond just trading:

Questions/Comments?

Now about the course



We'll do loads of



http://www.impawards.com/2005/proof.html

Writing down your thought process formally and precisely!

The language of proofs

Brad Pitt had a beard

waleg.com

Every goat has a beard

animaldiversity.org

Hence, Brad Pitt is a goat.

Why do proofs?

Makes you think logically about problems and solutions

From a friend who works on Google Maps:

> Proving that the algorithm I am implementing is correct helps me identify corner cases

CSE 331 Support Pages

Why should we do proofs?

We will focus a lot on proofs in CSE 331. In this document I will motivate why doing proofs is good even though you might not do proofs for a living. While doing this, we will also go through examples of how to write algorithm ideas and details as well as proof ideas and details (which you will need to write in your homework solutions).

Some reasons to do proofs

In this section, I will lay out some reasons why I think it is beneficial for you guys to do proofs. The first two are probably more along the lines of "if you do proofs for a living" situation. The rest of the reasons should be valid for all of you. I will try and make the reasons as concrete as possible: in the next section, we will consider algorithms for the specific problem of generating all permutations (recall that we previously had punted on designing an algorithm for this problem).

Sometimes you might not have a choice

One of the easiest way to verify an algorithm idea you have is to code up the algorithm and then test it on some (say random) inputs. However, sometimes this might not be a choice. E.g. if you work on Quantum Computing, then you do not have a quantum computer to run your quantum code on! So currently pretty much the only choice you have is to *prove* that your algorithm is indeed correct. For example, one of the crowning achievements of quantum computing is Shor's algorithm to computes the factors of large numbers efficiently on a quantum computer (that recall does not exist yet!). (You might also want to read Scott Aaronson's high level description of Shor's algorithm.) The reason why factoring large numbers is important is that if one can solve this problem efficiently then one can break the RSA cryptosystem. RSA is used everywhere (e.g. when you use your credit card online, RSA is used to make the transaction secure), so this is a big deal.

http://www-student.cse.buffalo.edu/~atri/cse331/support/proofs/index.html

A common complaint

Your examples in class look nothing like HW questions.

True because….

zazzle.com

False because…

HWs and exams will test your **understanding** of the material

To get an A in the class

Have to get at least 90.000000000000000000000%

Rest graded on the curve

A cautionary tale…

When I was an undergrad

Took algorithms as a sophomore

Understood all the lectures

Did not study outside of lectures

(We had no homeworks)

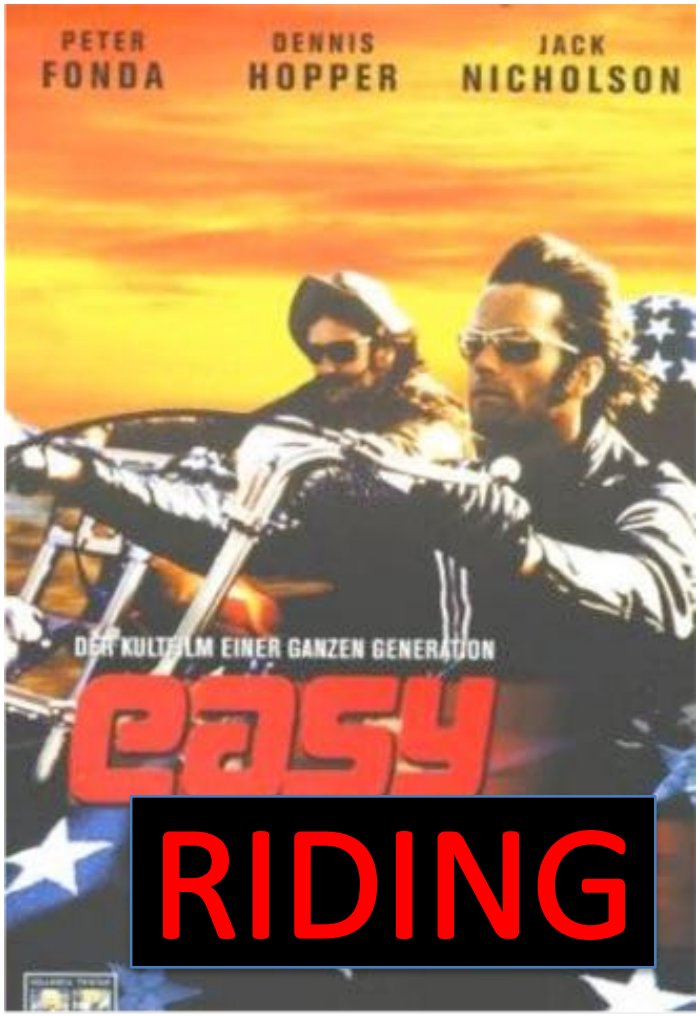
Did decent on the mid-term

Nearly flunked the finals

Got a **C**

Questions/Comments?

How we will make 331



What we'll strive to do

Help you with your questions and/or doubts

If need be, email us for time outside of regular office hours

We’re not mind readers

If you need it, ask for help

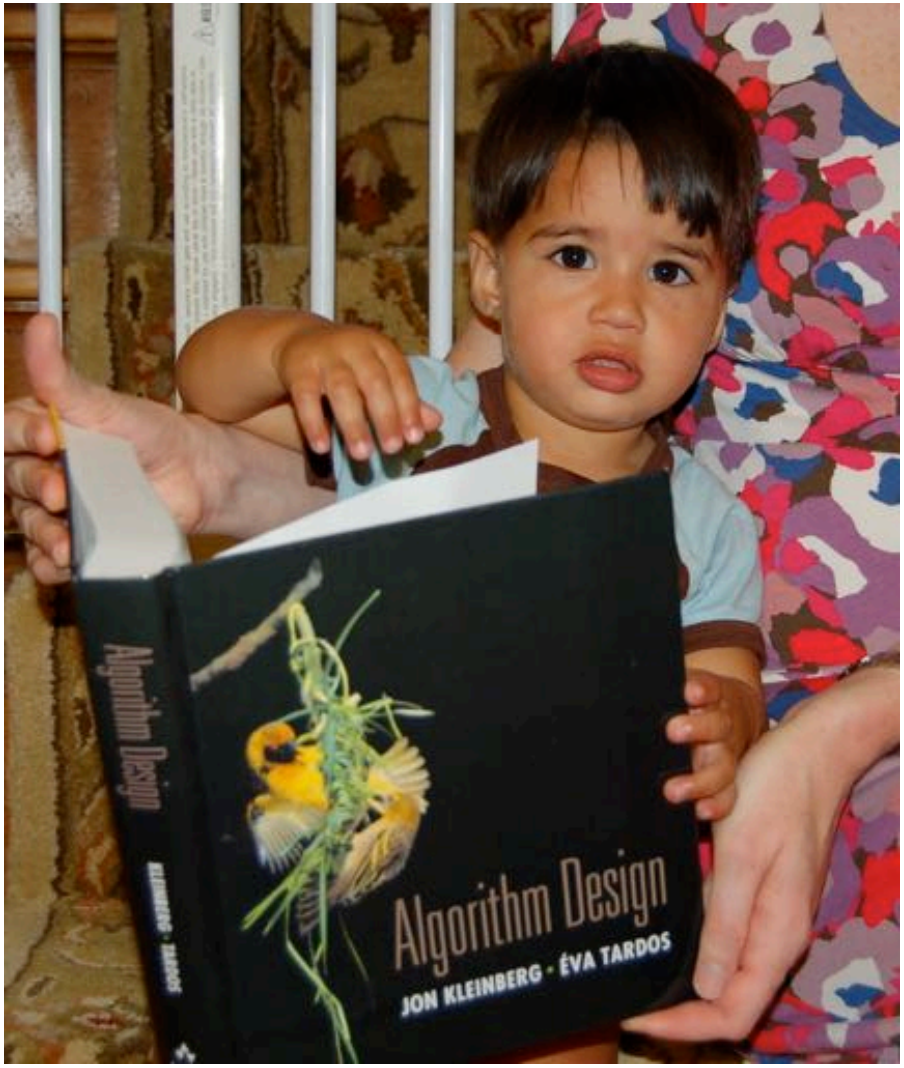
More chances to recover

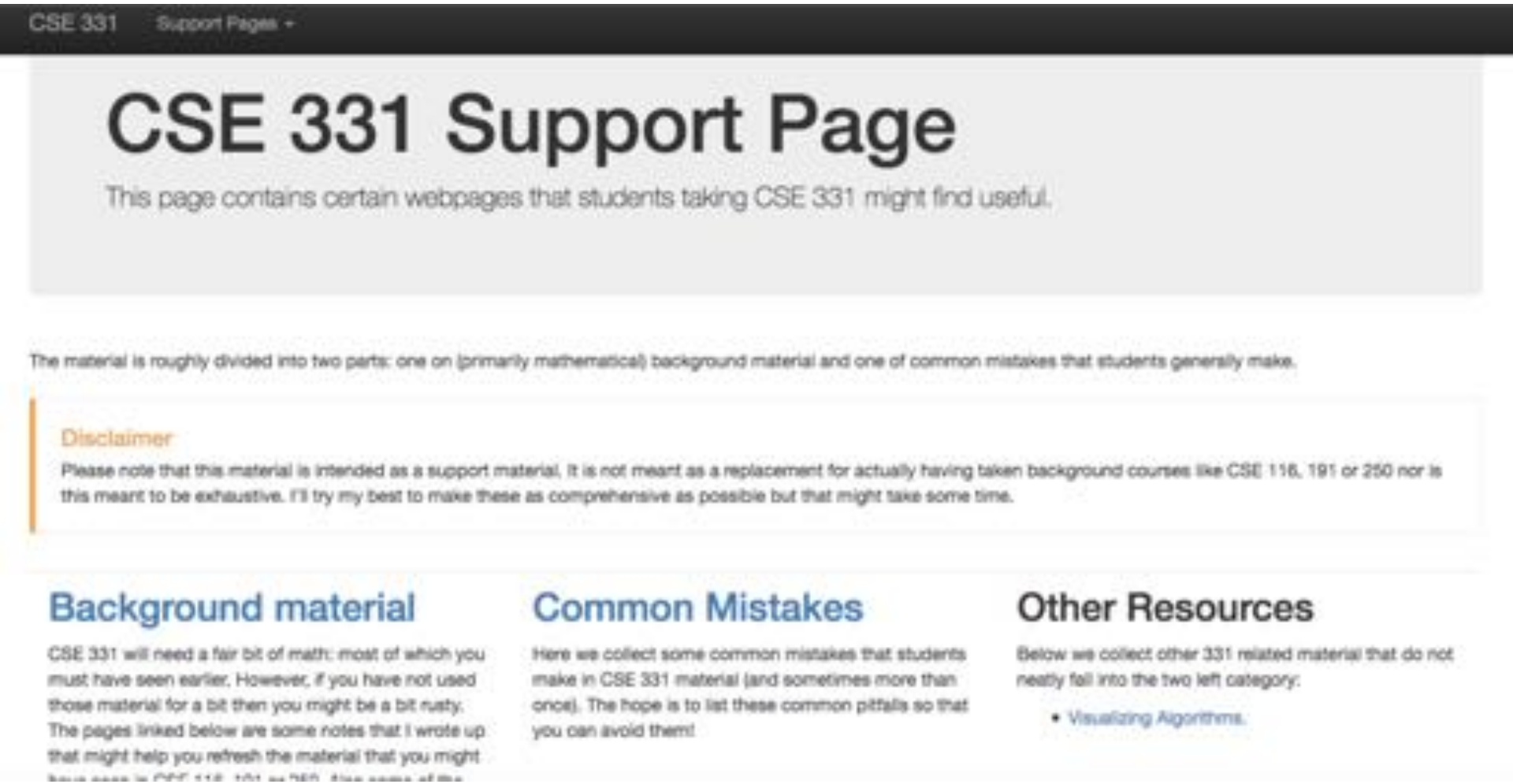
Lowest three HW scores will be dropped

If you do better on the final exam than the mid-term exam

then only final exam score will count

Follow the Textbook





http://www-student.cse.buffalo.edu/~atri/cse331/support/index.html

The cautionary tale has asilver lining…

C in undergrad algorithms

Ph.D. in algorithms/complexity

The only way to do well is to work hard