Welcome

to

CSE 331

Please have a face mask on

Masking requirement

UB requires all students, employees and visitors – regardless of their vaccination status – to wear face coverings while inside campus buildings.

https://www.buffalo.edu/coronavirus/health-and-safety/health-safety-guidelines.html

Let’s do some introductions

TAs first

Robert

Alex

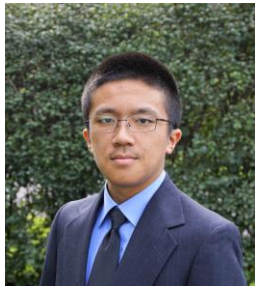
Asif

Snigdha

Ben

Aman

Connor



Joseph

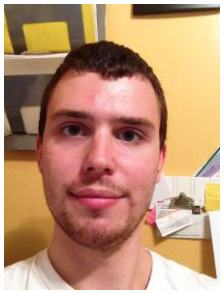
Megan

Nick

James

Trevor

Felipe



Michael

Prathamesh

Lectures will be videotaped

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

About Me

Nasrin Akhter

nasrinak@buffalo.edu

Office: Davis 303

Office hours: M W 4:10-5:00PM ET

If you'd like to meet via Zoom, here is the meeting link:
https://buffalo.zoom.us/j/92008530869?pwd=cEwrYi9VMkZ2YlpKall4SGhHWUtSZz09

Contact us all at

cse-331-staff@buffalo.edu

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

CSE 331 in times of COVID

Lectures and recitations will be in-person

Office hours will be a mix of in-person and virtual locations

Exams and Quizzes will be in-person

Questions/Comments?

Handouts for today

Syllabus (online)

Homework Policy document (online)

One Stop Shop for the Course

CSE 331 | Syllabus | Piazza | Schedule | Homeworks | Autolab | Project | Support Pages | channel

CSE 331

Spring 2022

https://cse.buffalo.edu/~nasrinak/cse331/spr22/index.html

Under Construction

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

CSE331 Events - Spring 2022

Today | February 2022 | Print | Week | Month | Agenda

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	31 3pm CSE 331 Lecture	Feb 1	2 3pm CSE 331 Lecture	3	4 3pm CSE 331 Lecture	5
6	7 3pm CSE 331 Lecture 3pm CSE 331 Lecture	8	9 3pm CSE 331 Lecture	10	11 3pm CSE 331 Lecture	12

Three things to remember

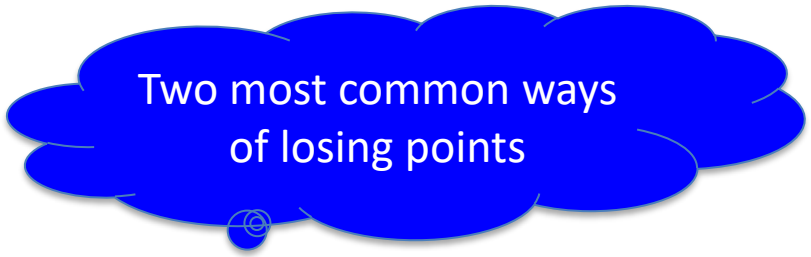
WORK HARD!

DO NOT CHEAT!

READ CAREFULLY!

Wait.. What???

Make sure you follow submission instructions.



Make sure you read problem statements carefully.

Advice from 331 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, nobody paid them to say these things.)

https://cse.buffalo.edu/~nasrinak/cse331/support/advice/index.html

The class is structured to your advantage

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

CSE 331 Support Pages

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.

Algorithm and proof details are the implementation inside the source (`.cc`) file. They are simply the detailed technical algorithm/ proof of the idea that was outlined.

> More on the idea vs details divide

Academic Dishonesty

All your submissions must be your own work

Penalty:

Minimum: A **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.**

IN FACT, NO EXCUSE OR NO AMOUNT OF ARGUMENT WILL WORK:

YOU WILL GET A GRADE REDUCTION IN THE COURSE

FOR YOUR FIRST MISTAKE

Read the syllabus CAREFULLY!

Syllabus Quiz

Admin Options

CA Options

Options

View handin history

View writeup

Download handout

Due: **May 16th 2022, 2:12 pm**

Last day to handin: **May 16th 2022, 4:12 pm**

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

More information on the quiz

CSE 331 Syllabus

Algorithms and Complexity

Spring 2022

Time and location: **Mondays, Wednesdays** and **Fridays, 3:00-3:50pm**, **Cooke 121**.

Under Construction

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

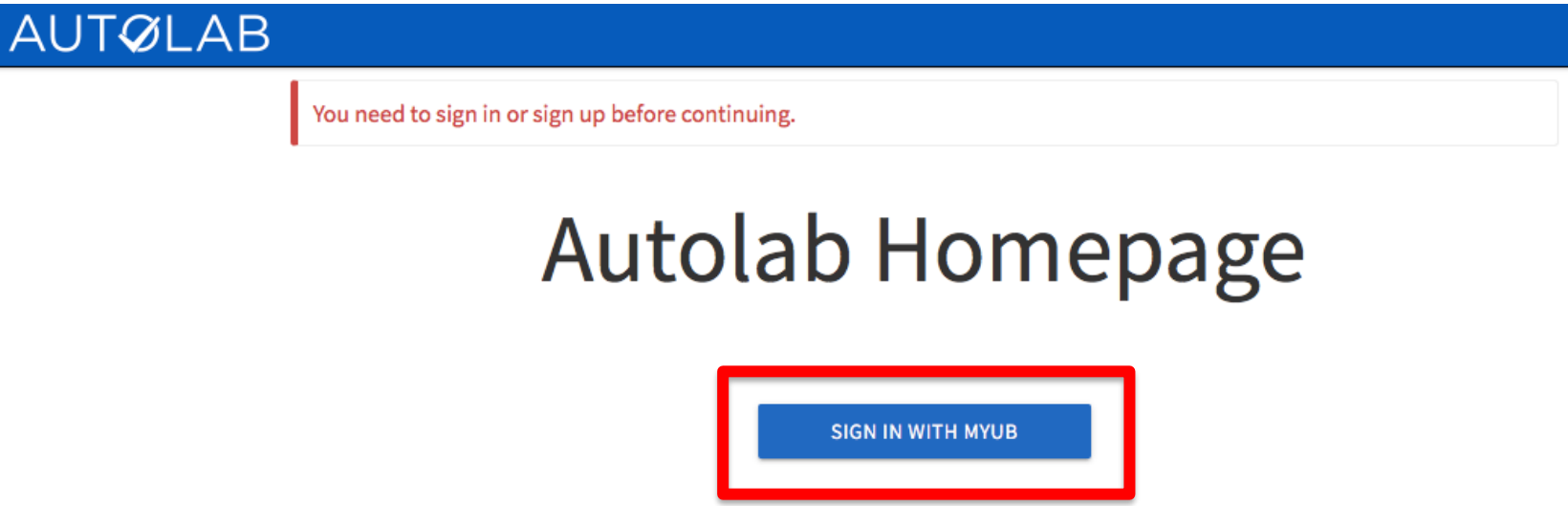
Please note

It is **your responsibility** to make sure you read and understand the contents of this syllabus. If you have any questions, please contact the instructor.

Acknowledgment

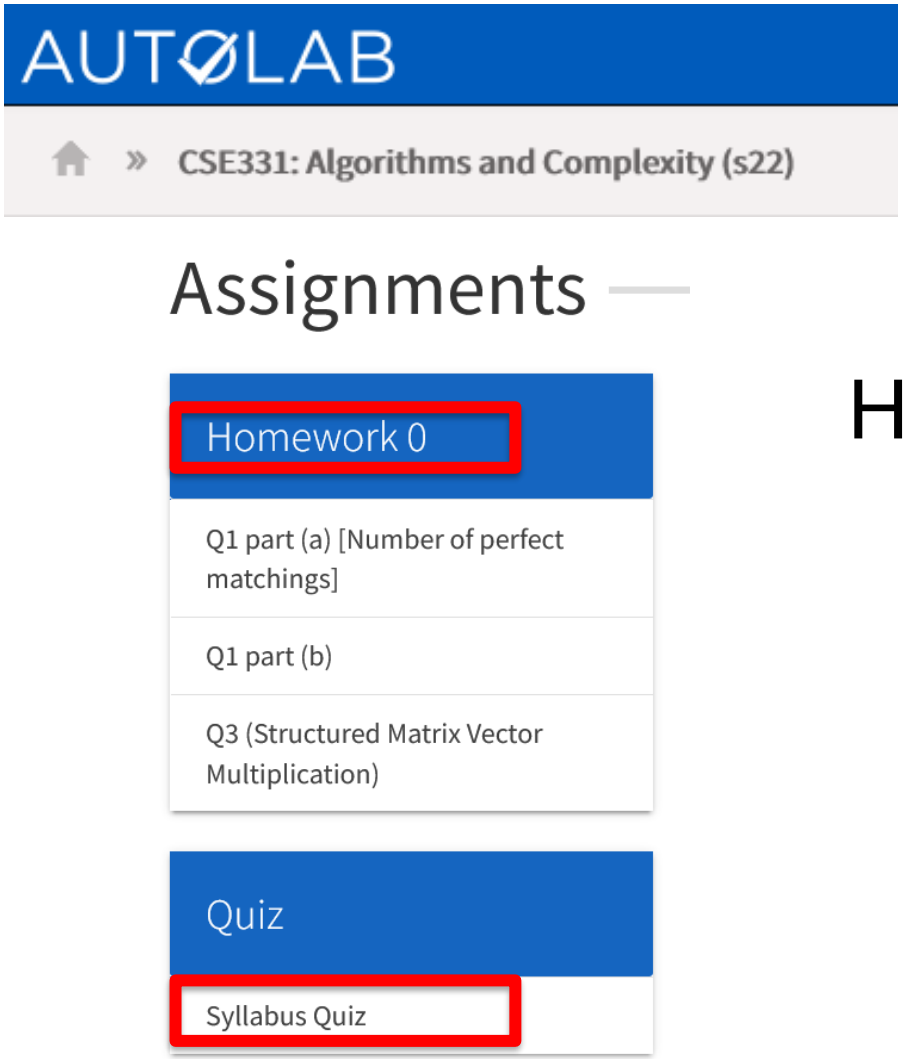
Once you have read the syllabus carefully, please fill in the Syllabus quiz on Autolab. As an incentive for you to fill in this form, **you will not receive any feedback on your assignments till you successfully answer AT LEAST 18 out of the 20 questions in the quiz**. (You can attempt the quiz as many times as you want.) Note that in addition to this syllabus, the quiz will also ask questions based on the homework policies.

Autolab



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

You can submit the following now



HW0 is out!

Grading break-down

Grading Policy

Here is the split of grades:

Course Component	% of grade
Project	10%
Homeworks	30%
Quizzes	3%
Exams	57%

Questions/Comments?

Pre-requisites

Required (officially)

- CSE 250, [CSE 191 or MTH 311] and MTH 142
- At least a C- (this is recommended)

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

Critical Campus Resources

Sexual Violence

UB is committed to providing a safe learning environment free of all forms of discrimination and sexual harassment, including sexual assault, domestic and dating violence and stalking. If you have experienced gender-based violence (intimate partner violence, attempted or completed sexual assault, harassment, coercion, stalking, etc.), UB has resources to help. This includes academic accommodations, health and counseling services, housing accommodations, helping with legal protective orders, and assistance with reporting the incident to police or other UB officials if you so choose. Please contact UB's Title IX Coordinator at 716-645-2266 for more information. For confidential assistance, you may also contact a Crisis Services Campus Advocate at 716-796-4399.

Mental Health

As a student you may experience a range of issues that can cause barriers to learning or reduce your ability to participate in daily activities. These might include strained relationships, anxiety, high levels of stress, alcohol/drug problems, feeling down, health concerns, or unwanted sexual experiences. Counseling, Health Services, and Health Promotion are here to help with these or other issues you may experience. You can learn more about these programs and services by contacting:

Counseling Services

- 120 Richmond Quad (North Campus), 716-645-2720
- 202 Michael Hall (South Campus), 716-829-5800

Health Services

Michael Hall (South Campus), 716-829-3316

Health Promotion

114 Student Union (North Campus), 716-645-2837

TA Office hours

YOU decide!

poll @7

stop following 107 views

Actions

Vote to Select Your TA Office Hours! (Closes on Wed, at 2pm)

Please select all the time slots below that you will able to attend (even if for part of the time) for TA office hours. If you do not have preference for in-person vs. virtual please pick BOTH options (but if you have a strong preference please pick the in-peron or virtual option). Recall that homeworks are due on Friday at 8pm.

We'll pick the top choices (subject to TA availability) to provide about 25 to 30 hours of OH. The poll will close on Wednesday (2/2) at 2pm.

Please note that the TA office hours start 2nd week.

NOTE: Even though the poll displays "closes in 7 days", this poll will close on Wednesday at 2pm.

- ☐ Mondays, 9-10am (in-person)
- ☐ Mondays, 10-11am (in-person)
- ☐ Mondays, 10-11am (virtual)

Vote to Select Your TA Office Hours! (Closes on Wed, at 2pm)

closes in 5 day(s)

A total of **50** vote(s) in **25** hours

Recitations

Are on for this week!

Please stick to your recitation section

Exams

Mid term (two parts)

Tentative dates:

Mon, **March 14** and Wed, **March 16**, 2021. Usual place and time.

Final exam

Wednesday, **May 18**, 2022. Cooke 121, **3:30-6:30pm**

The HW structure

Three questions

Q1 and Q2 are proof based while Q3 is programming

Q1 worth 50 points

The hard proof based Q2 and programming Q3 worth 25 points each

HWs due by 8:00pm on Fridays
A few exceptional cases: HW0, HW8
Please keep an eye on the schedule

Project

Acknowledgment

The development of this project was supported by a Mozilla Responsible Computer Science award. The support is gratefully acknowledged.

Project has three parts

Your project will have three parts:

1. Do five **programming problems** that involves making tradeoffs between various choices among which some have ethical dimensions. This will be a group assignment.
2. Each programming question will be paired with (a series of) **reflection questions** that involves you writing down and reflecting on some of the design decisions you made in the corresponding programming problem. In particular, these questions will ask you to reflect on the societal and ethical implications of your decisions. This will also be a group assignment.
3. At the end of the project, each group member will fill in a **survey** rating their own and their other group member's contribution to the project.

C++ vs Java/Python

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

Our recommendation

> **! If you do not follow one of our recommended C++ setups, you are on your own**
>
> We present three options for you to code in C++. You are of course welcome to use your own system **but if you do so, we will not be able to provide ANY help**.
>
> In previous years students have reported that our C++ template code (as is) would not run on their own C++ setup (typically an IDE). If this happens we cannot help you figure out how to modify the template code on your machine.

We recommend three ways to go about coding in C++ for CSE 331, sorted in what we recommend most to least (though the second and the third options *should* work OK):

1. This option is the best one since the Virtual Machine (VM) image matches the system being run on Autolab:

> **Use the VM image used in CSE 220**
>
> We recommend that you use the VM image used in CSE 220 that is maintained by Professor Ethan Blanton.
>
> If you have questions on Ethan's setup, please do **NOT** contact him: email `cse-331-staff@buffalo.edu` instead.
>
> If you still prefer to use your own system, we would recommend that you still test your code in the VM system above before submitting to Autolab.
>
> The only potential drawback is that virtual machines might not work well on the latest Apple machines. If this is true for you, please use the next option.

> **If you use the VMWare option above**
>
> If you decide to use the VMWare virtual machine, then you'll need a license, which you can get from UB. If you already have one, then you should be all set. If you need a license **please email me ASAP**.

C++ vs Java/Python

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

2. In case the above VM option does not work for you, then we recommend that you use a departmental server by `ssh`ing into it:

> ### Use a departmental server
>
> Login to one of the departmental servers accessible by students and then run your code in there. Pick one of the servers that are described as `General compute server for short, interactive timeshare jobs`. `timberlake.cse.buffalo.edu` is one commonly used by students.
>
> Unlike the VM options, you will need Internet to access the servers. Also unlike our first recommended option, the environment on departmental servers will not match the one on Autolab exactly but we do not expect this is to an issue.
>
> If you still prefer to use your own system, we would recommend that you still test your code on a departmental server above before submitting to Autolab.

C++ vs Java/Python

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

https://cse.buffalo.edu/apps/devices/

Devices

Description | Hardware | Administration

Hardware

Index	Hostname	Model	OS	Arch	CPU	Memory
1.	cerf.cse.buffalo.edu		Ubuntu	x86_64	48 x 1 GHz	67 GB
2.	coldplay.cse.buffalo.edu	Dell PowerEdge 1800	FreeBSD	i386	4 x 2.7 GHz	4.0 GB
3.	metallica.cse.buffalo.edu	Dell PowerEdge R720	CentOS	x86_64	2 x 2.7 GHz	128.0 GB
4.	silversun.cse.buffalo.edu	Virtual Machine	Ubuntu	x86_64	4 x vCPU	8.0 GB
5.	styx.cse.buffalo.edu	Dell PowerEdge R410	CentOS	x86_64	2 x 2.27 GHz	32.0 GB
6.	timberlake.cse.buffalo.edu	Dell PowerEdge 610	CentOS	x86_64	2 x 2.4 GHz	32.0 GB
7.	turing.cse.buffalo.edu	Oracle Sun Server X4-2L	Ubuntu	x86_64	32 x 1.5 GHz	27 GB

C++ vs Java/Python

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

```
C:\Users\windows>ssh nasrinak@turing.cse.buffalo.edu
nasrinak@turing.cse.buffalo.edu's password:
Welcome to Ubuntu 20.04.3 LTS (GNU/Linux 5.4.0-96-generic x86_64)
```

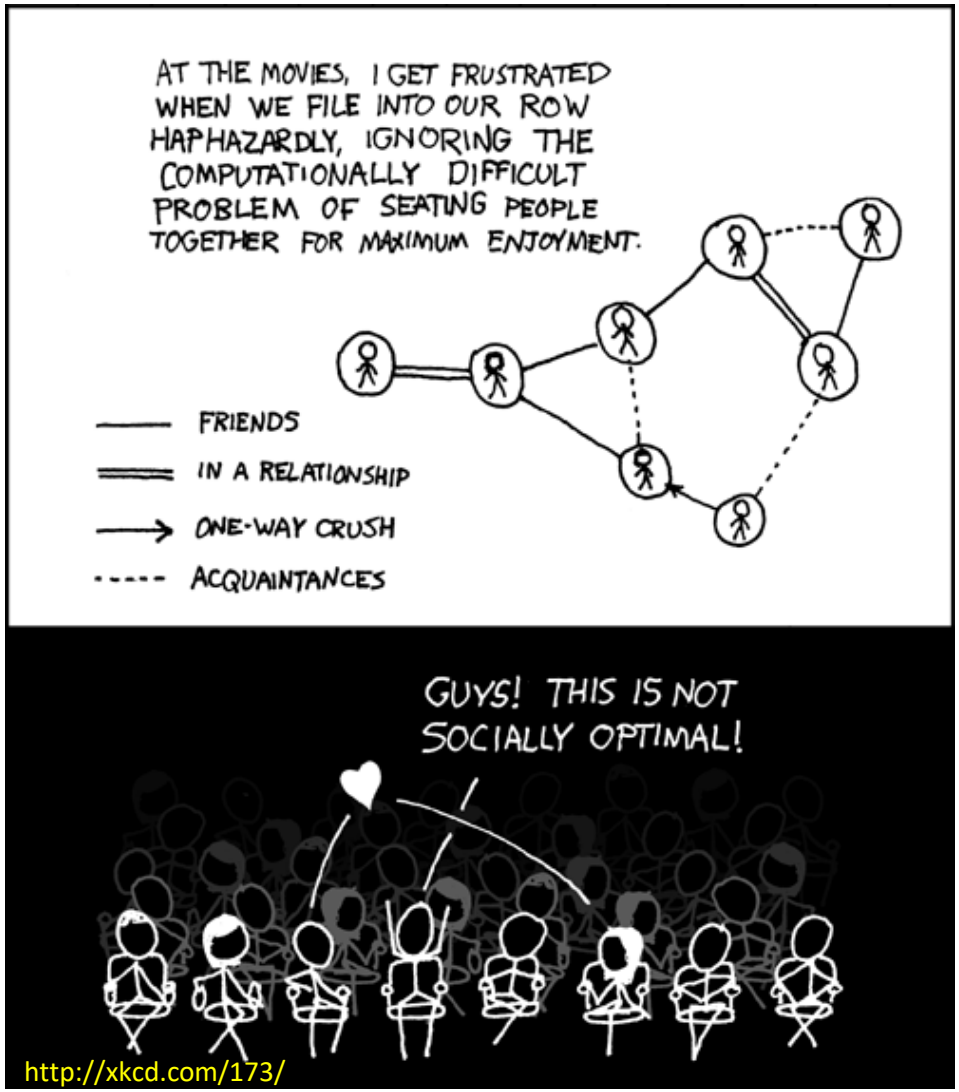
```
Last login: Tue Jan 18 15:37:21 2022 from 128.205.245.208

turing {~} > _
```

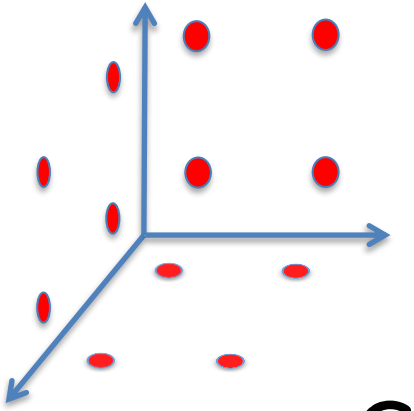
```
turing {~/331/hw0} > ls
a.out  Driver.cpp  HW0Utility.h  Solution.cpp  testcases  Utility.h
turing {~/331/hw0} > g++ -std=c++11 Driver.cpp
turing {~/331/hw0} > ./a.out testcases/in
input1.txt  input2.txt  input5.txt
turing {~/331/hw0} > ./a.out testcases/input1.txt
```

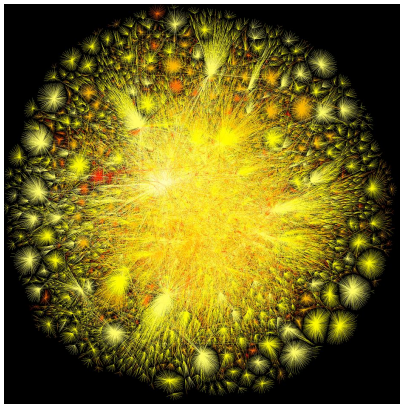
Questions/Comments?

This course: how to solve problems!



Why should I care ?





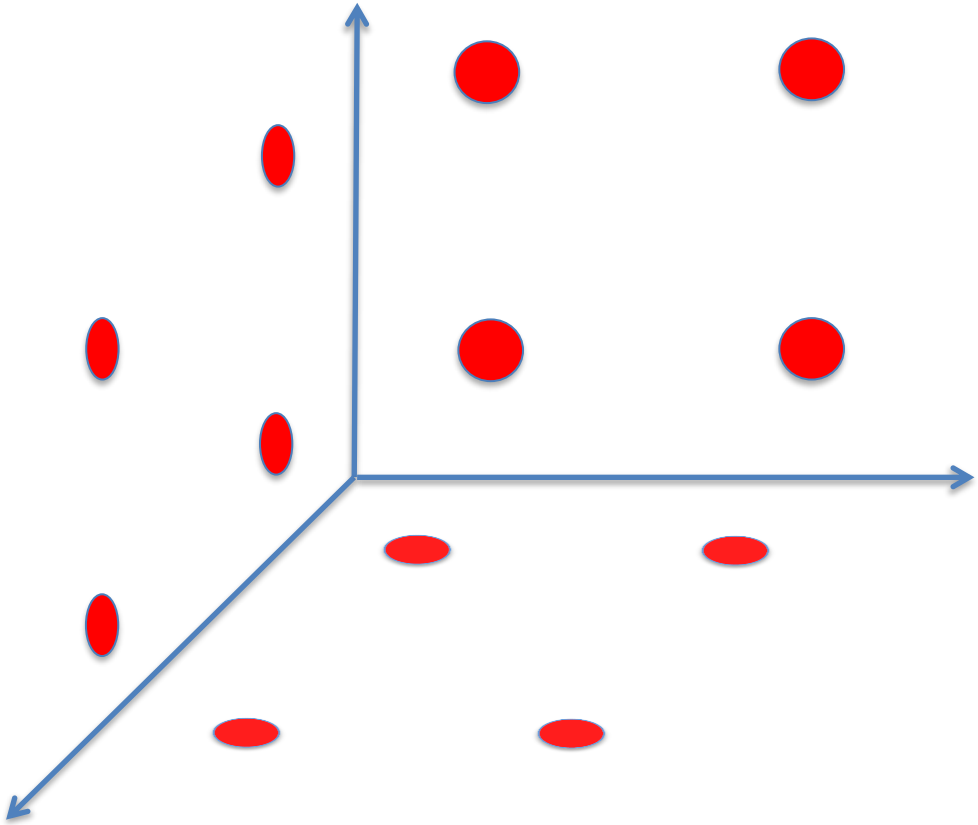
Combining Shadows to Understanding the network

relationalAI

rAI

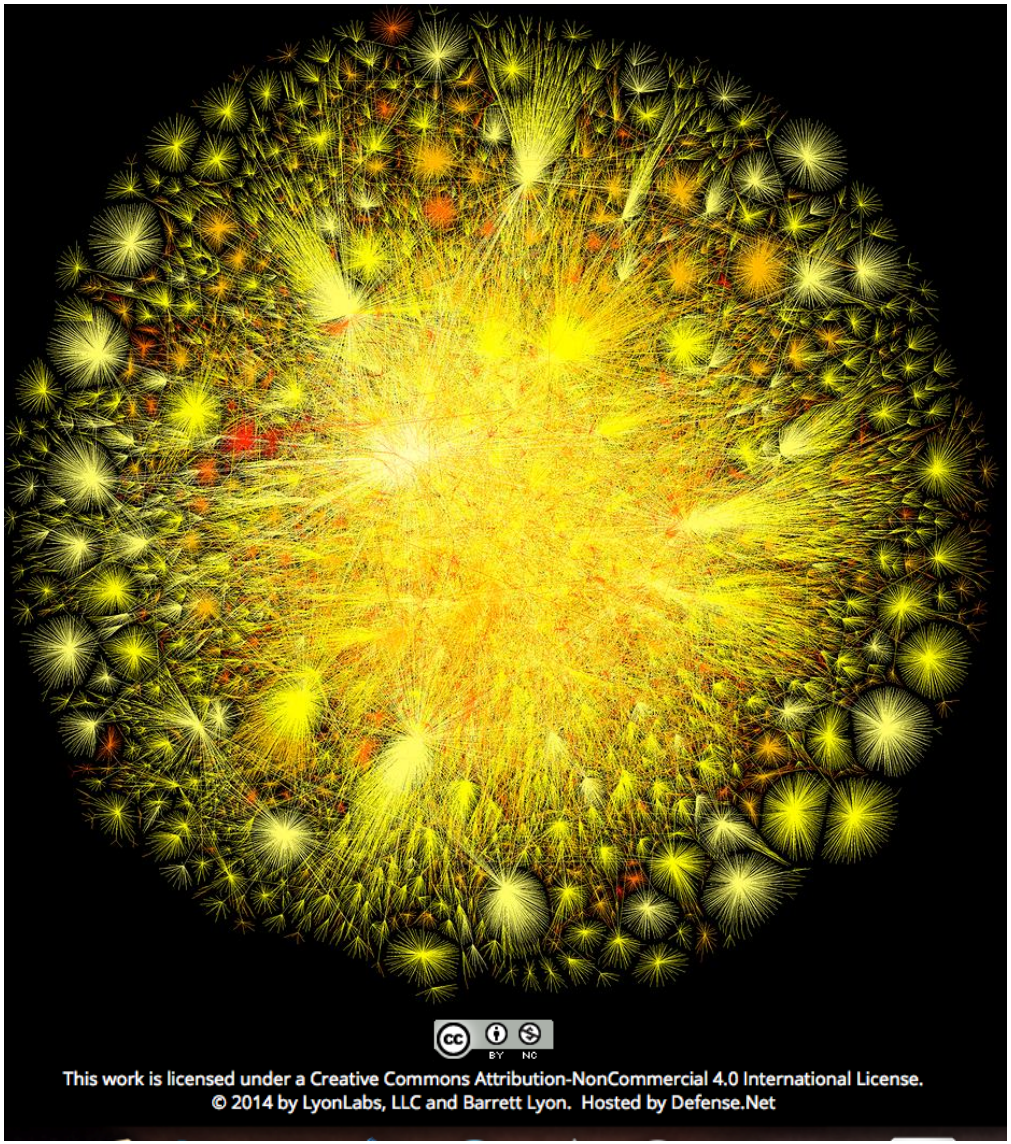
Stanford University

The key technical problem

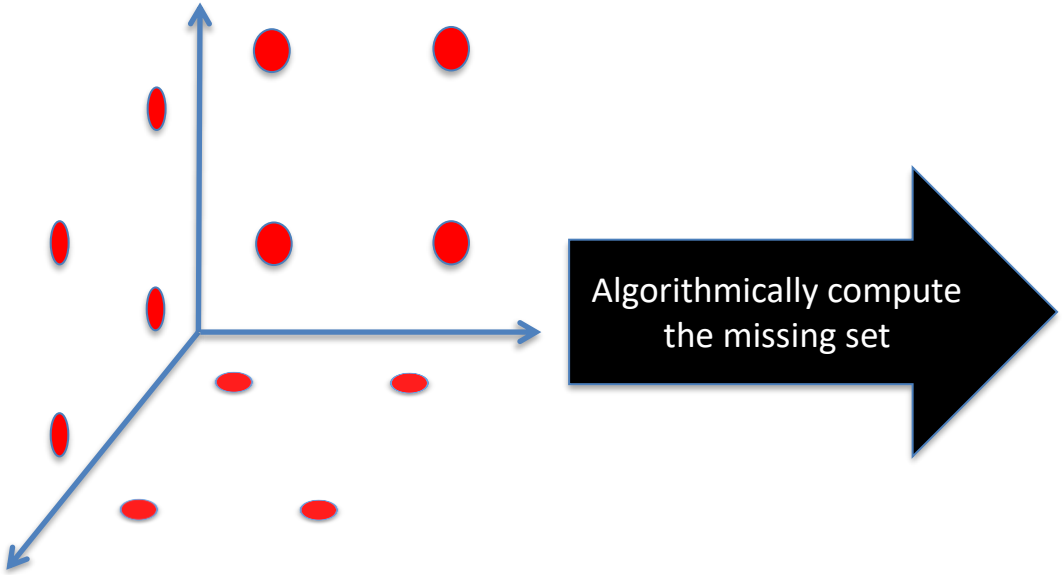


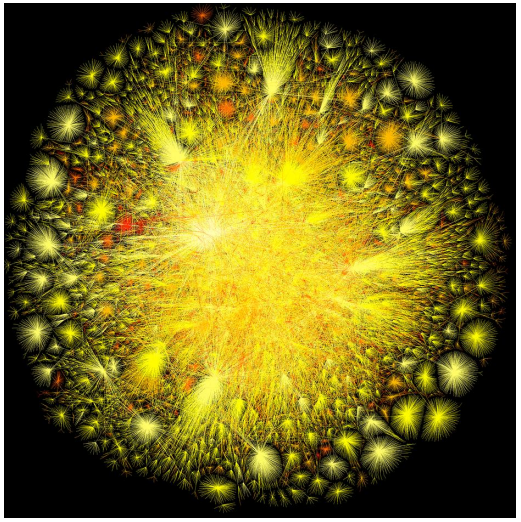
Given the three projections, what is the largest size of the original set of points?

Detecting Communities



Conquering Shadows to Conquering the Internet





The proof is in the performance

EMPTYHEADED

10x faster

ORACLE

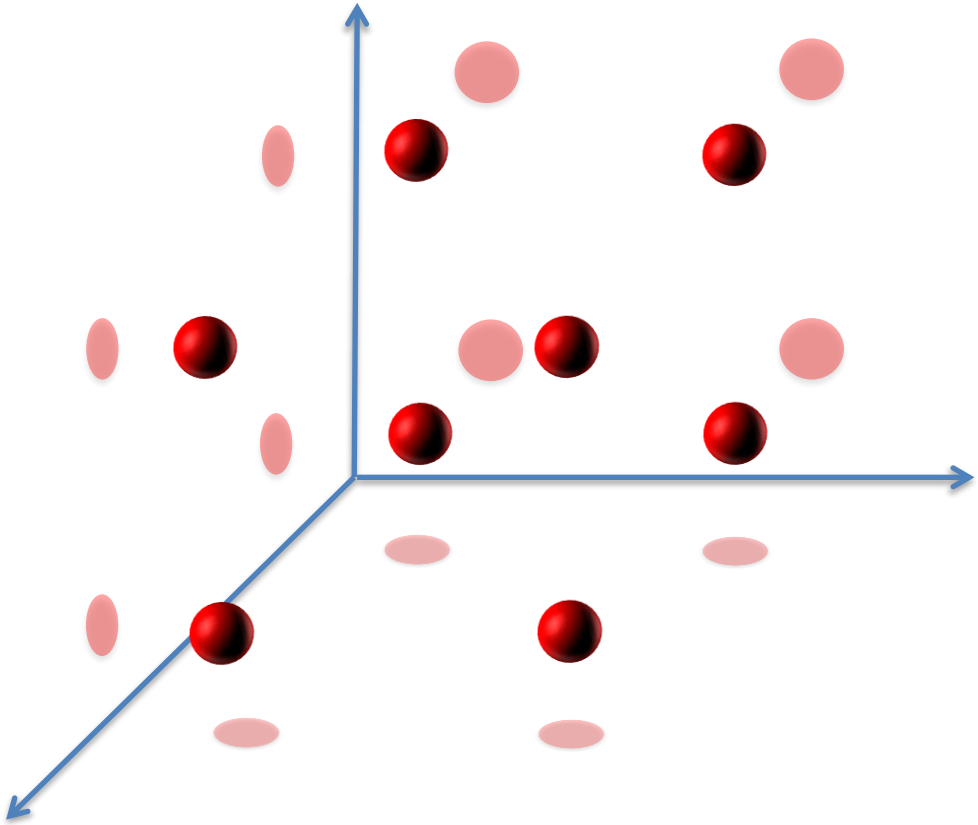
Dato GraphLab

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.”**

Coding jobs will be done by AI

stack**sort**

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.

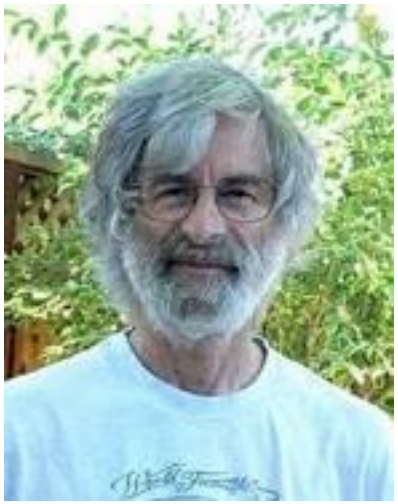
Photo: Kim Martineau

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.***

Questions/Comments?