Syllabus Walkthrough

CSE 331

Aug 26, 2023

Make sure you are on Piazza

https://piazza.com/buffalo/fall2023/cse331/

Access to Autolab

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**

I DO NOT HAVE ANY PATIENCE WITH ANY CHEATING :

YOU WILL GET A GRADE REDUCTION IN THE COURSE

FOR YOUR FIRST MISTAKE

Withdrawing a suspect submission

Withdrawing a submission for academic integrity violation

Sometime mistakes can happen so you have the **option of withdrawing any of your Homework submission with 24 HOURS of the assignment deadline**. You can do this by sending Atri an email, e.g. by using the following template (thanks to Oliver Kennedy ☒ for providing us the template):

> **Email template for withdrawing submission**
>
> Dear Dr. Rudra/Atri,
>
> I wish to inform you that I have violated CSE 331 policies on my submission for Question X on Homeworks/Assignment N. I wish to withdraw my submission to preserve academic integrity.
>
> J.Q. Student
> Person #12345678
> UBIT: jqstuden
>
>
> Sincerely, J

On receiving the above email, I will assign J a 0 on Question X on Homeworks/Assignment N but disregard any Academic Integrity issues with the problematic submission. Note that J is not required to present any details on how they violated academic integrity.

Use of ChatGPT is not allowed

AT Why should I not use you to do my algorithms course homework?

While I can certainly help you understand concepts and provide explanations related to your algorithms course, there are several reasons why you shouldn't solely rely on me to do your homework:

1. **Academic Integrity:** Using external sources to complete your assignments without understanding the material yourself violates the principles of academic integrity. It's important to learn and demonstrate your knowledge honestly.
2. **Learning:** The primary goal of your course is to learn and understand the material. Relying solely on my answers without engaging with the material will hinder your learning and your ability to apply the concepts in real-world scenarios.
3. **Long-Term Retention:** Active engagement with the material, including struggling through problems and solving them on your own, enhances your understanding and retention of the content. Passive reading or copying solutions does not provide the same benefits.
4. **Exams and Practical Application:** If your course includes exams or projects that test your problem-solving skills, simply copying answers won't prepare you for those assessments. You need to be able to apply your knowledge independently.
5. **Conceptual Understanding:** Algorithms often involve complex concepts. Simply having an answer isn't enough; you need to understand why a particular approach works and how it relates to the broader context of the subject.

6. **Feedback and Improvement:** Making mistakes is an essential part of learning. When you attempt problems on your own, you can receive feedback from instructors or peers, which helps you identify areas for improvement.
7. **Career Preparedness:** Algorithms and problem-solving skills are often crucial in technical interviews and real-world applications. If you haven't practiced solving problems on your own, you might struggle in job interviews or when faced with practical challenges.
8. **Uniqueness of Assignments:** Homework assignments can vary in their requirements. If you rely on pre-generated solutions, you might miss out on tailoring your answers to the specific instructions of your assignment.
9. **Ethical Considerations:** While seeking help is acceptable, outsourcing the entire problem-solving process to an AI raises ethical concerns, especially if it's done to a degree that undermines the learning process.

It's okay to seek help and clarification on concepts, but make sure you're actively engaging with the material and attempting problems on your own. This will not only benefit your learning but also your overall academic and professional growth.

In spirit of trust but verify

TAs will have access to a database of ChatGPT answers to cross check

It's no fun failing any of you but **use of ChatGPT will result in an F**

Use of ChatGPT is not allowed

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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([8,6,7,5,3,0,9]   **);**

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

Sort

var output =   **;**

Output from the function.

output console

Coding jobs will be done by AI

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

It happened sooner than expected

So am I doomed?

There will still be room for high level *algorithmic* thinking!
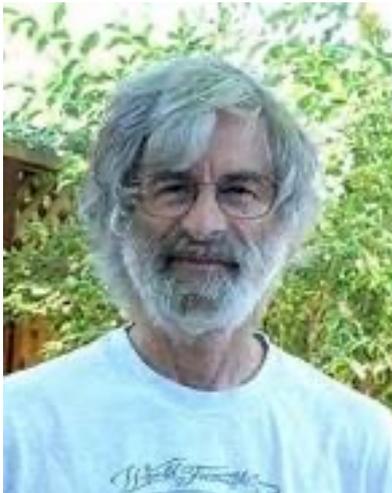
If You're Not Writing a Program, Don't Use a Programming Language

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.**

Read the syllabus CAREFULLY!

CSE 331 Syllabus

Algorithms and Complexity

Fall 2023

Time and location: **Mondays, Wednesdays** and **Fridays, 11:00-11:50am**, **NSC** ☐ **201**.

⚠ Under Construction
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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.

In spirit of trust but verify

Syllabus Quiz

Options		Due: **December 12th 2023, 1:29 pm EST (UTC -05:00)**
View handin history		Last day to handin: **December 12th 2023, 1:29 pm EST (UTC -05:00)**
Download handout		

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

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

Question 2: Penalty for academic violation in CSE 331 is an automatic

○   warning and a chance to make-up
○   [A zero in the assignment AND a letter grade reduction (for first violation across all CSE courses) and an F in the course (for 2nd violation across all CSE courses)] OR [If ChatGPT is involved then an F in the course]
○   A zero in the corresponding assignment and nothing else

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.

Please follow COVID-19 policies

COVID-19

COVID-19 related policies and guidelines

Please follow UB/SUNY protocols regarding COVID-19. This page has an overview of updates and policies ☑.

Specifically, please note the following parts of the Student Compliance Policy for COVID-19 Public Health Behavior Expectations ☑:

- Students are required to stay home if they are sick.
- Should a student need to miss class due to illness, isolation or quarantine, they are required to notify their faculty to make arrangements to make up missed work.
  - *Atri's note:* Please note though that since we drop the lowest two homeworks, there will be **no** extension/makeup for late homeworks. But we can schedule a makeup exam if you need to miss it due to medical reasons.

Lectures, recitations, quizzes and exams will be held in-person. There will be a mix of in-person and virtual office hours. These are subject to change based on current UB/SUNY policies.

Lectures will be videotaped
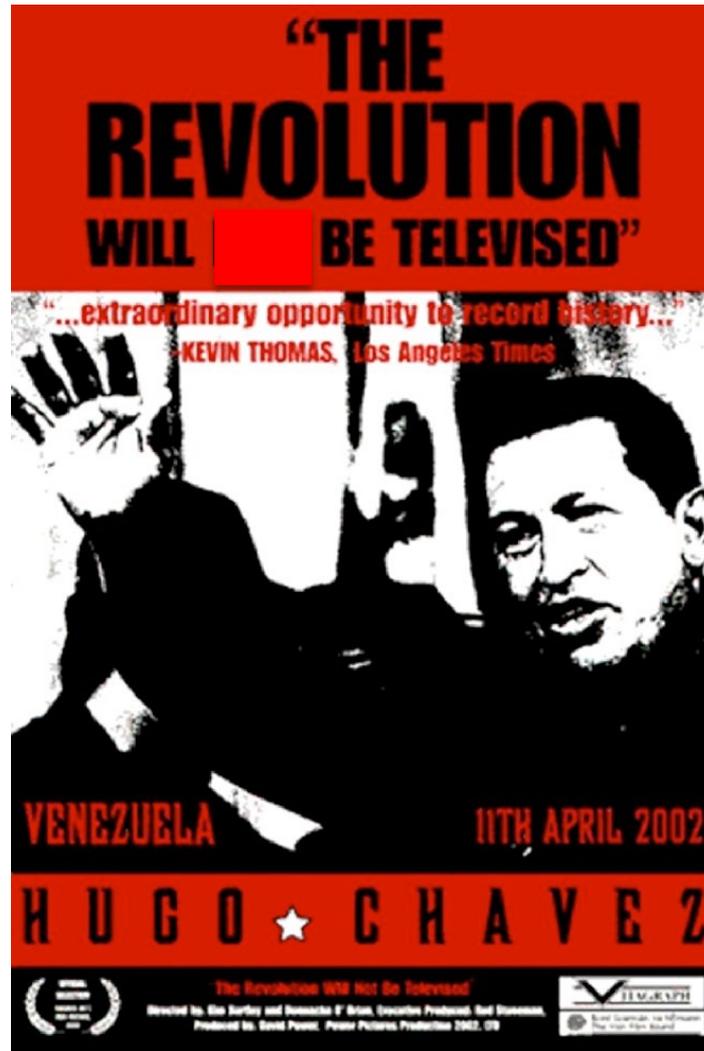
One Stop Shop for the Course

CSE 331

Fall 2023

http://www-student.cse.buffalo.edu/~atri/cse331/fall23/index.html

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CSE 331 events

Today ◄ ► Aug 20 – 26, 2023 ▾   🖶 Print **Week** Month Agenda ▾

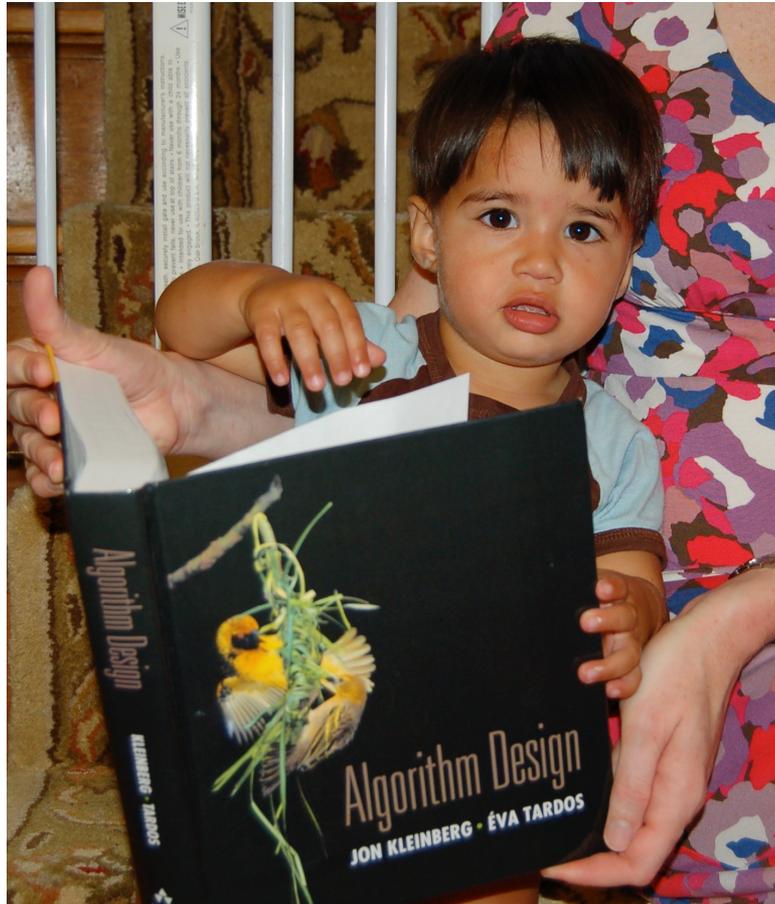|	Sun 8/20	Mon 8/21	Tue 8/22	Wed 8/23	Thu 8/24	Fri 8/25	Sat 8/26
5am							
6am							
7am							
8am							
9am							
10am							

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

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, Atri did not pay them to say these things.)

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

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⚠ 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

More information on the quiz

CSE 331 Syllabus

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Autolab

https://autolab.cse.buffalo.edu/

You can submit the following now

CSE 331: Algorithms and Complexity (f23)

Section: **N**
Number of grace days remaining: **0**

COURSE WEBSITE   GRADEBOOK

Assessments

Quiz

Syllabus Quiz

If you were registered by 10pm on Friday, Aug 18 you should be on Autolab

Grading break-down

Grading Policy

Here is the split of grades:

Course Component	% of grade
Project	10%
Homeworks	27%
Quizzes	3%
Exams	60%

Changes from Fall 2022

HWs are worth (a bit) less and exams are worth (a bit) more

Quiz scores can only be replaced with score on T/F Qs on final exam

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!

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

Health Services ↗

4350 Maple Road (at Sweet Home Rd.) , ☎ 716-829-3316

Health Promotion ↗

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

TA Office hours

YOU decide!

Recitations

Are on for this week!
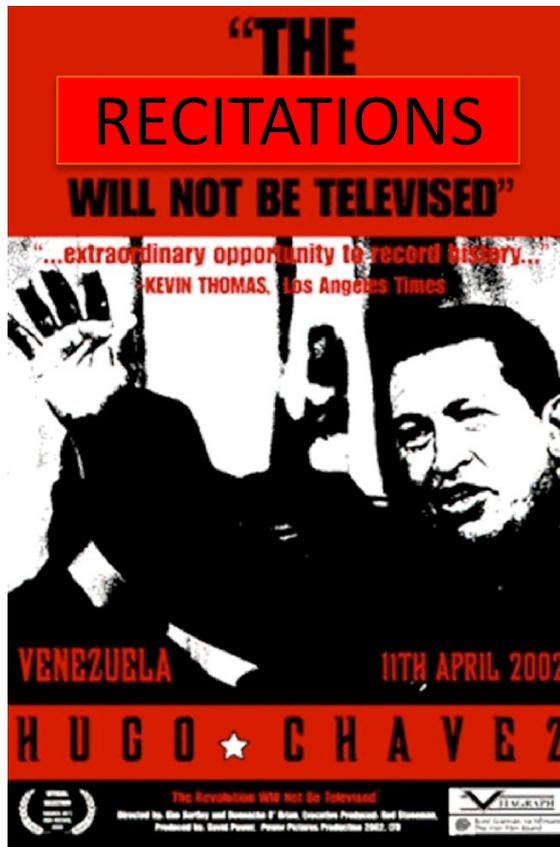
Please stick to your recitation section

At least for the first month since all sections are full

Exams

Mid term (two parts)

Wed, **Oct 18** and Fri, **Oct 20**. Usual place and time.

Final exam

Wed, **Dec 13**. NSC 201, **12:00-2:30pm**

The HW structure

Three questions

DROP lowest
TWO Q1, Q2,
Q3 scores

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 11:30pm on Tuesdays

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

- 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 ☑

Proof Idea vs. Proof Details

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

Always start off with the ideas. Just smashing random keys on the keyboards won't get you anywhere with writing code and certainly would not help with proofs. In the real world, a user of your library doesn't care about the details; just wants to know how to use it. Similarly, in your proof and algorithm ideas, briefly explain what you're doing, how it works and why it should work. For example, if you're using contradiction in the proof details; just state that you use contradiction on a specific property (but do specify which property).

In the algorithm and proof details, be as detailed as you can be and try to avoid loopholes (more explained below).

~2 month long project!

Individual Component

At the end of the project, you will rate your own and your other group member's contribution to the project. For more details, please see the project page.

Individual Component Grade

The individual component of your project will be worth 5% of your grade.

Surveys to Individual component of project grade

Your survey scores will be converted into a fractional score $\rho \in [0, 2]$. We will reveal the exact algorithm after the surveys are submitted but roughly if everyone in the group did equal work (as reflected by the survey responses), then all group members will have $\rho = 1$. Otherwise, those that did more work will have a ρ value closer to 2 and those that did less will have ρ value closer to 0.

The survey part of the grade will be calculated as $\rho \cdot$ `group score`, where `group score` is the sum of the coding and reflection components. If this score exceeds 5%, it will be capped at 6%.

ⓘ 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 can

1. 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~~ like 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 issu~~e~~

If you still prefer to use your own system, w~~ith~~ ~~the~~ ~~dep~~artmental server above before submitting to Autolab.

There *might* be a how to use Unix session in week 2

poll @8 ⊕ ★ 🔒 ▾   stop following   **4 views**

Actions ▾

If you plan to use C++~~for progra~~~~~estion~~

There will be on programming question per homework. You can submit your code in any ~~~~ ~~~~d Python. If you plan to use Java or Python then you can ignore the rest of this post/poll.

If you plan to use C++, please first read the section titled *If you plan to use C++* in the Autolab page and then come back to this poll.

Please choose the option below on whether you would prefer to have dedicated office hours where you can get help setup things so that you can use the department linux servers to test your C++ code.

○ I do not plan on using C++

○ I plan to use C++ AND am comfortable running C++ from command line and NO office hours are needed

○ I plan to use C++ AND would LIKE to attend an office hour for help with departmental server setup
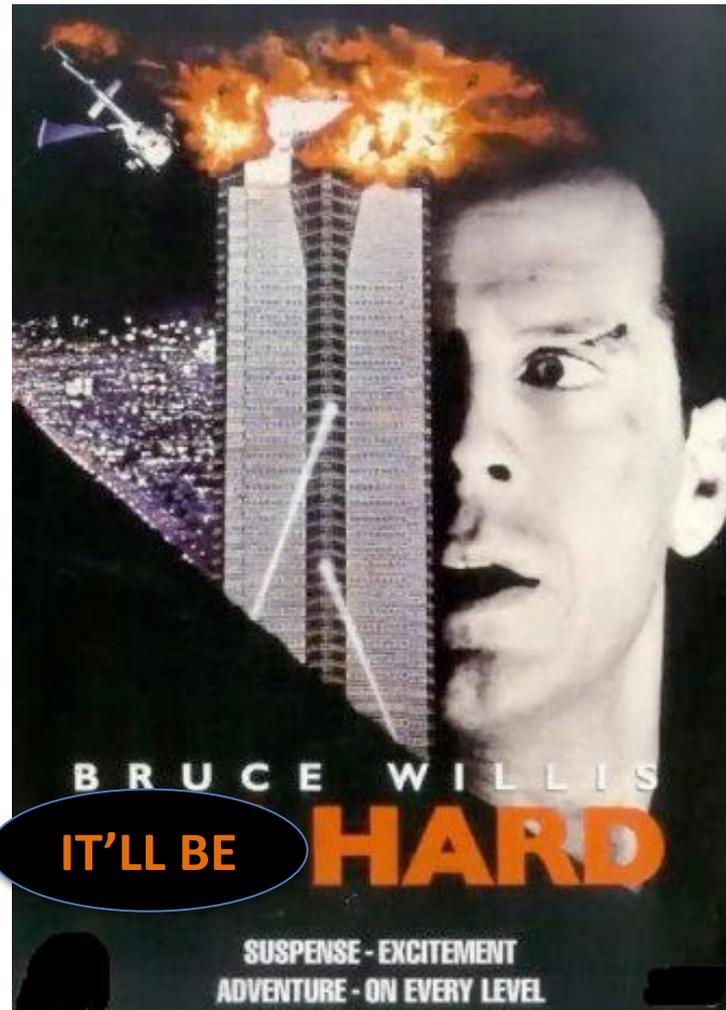
Please select one option

Submit

Questions/Comments?

Bit more about the course

We'll do loads of

{proofs

Writing down your thought process formally and precisely!

An incorrect "proof"

A more subtle incorrect "proof"

Brad Pitt had a beard

waleg.com

Every goat has a beard

animaldiversity.org

Hence, Brad Pitt is a goat.

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 90.00000000000000000000%

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
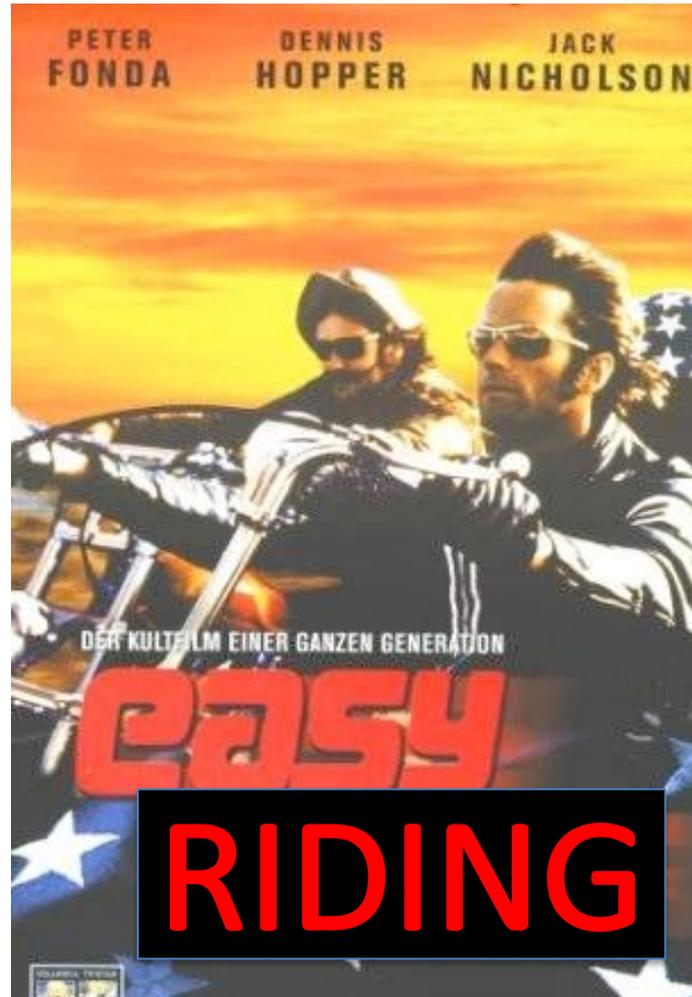
What we'll strive to do

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 two Q1, Q2 and Q3 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

The cautionary tale has a silver lining…

C in undergrad algorithms

Ph.D. in algorithms/complexity

The only way to do well is to work hard