Lecture 40

CSE 331

Dec 10, 2021

Please have a face mask on

Masking requirement

Your face mask **must cover** your nose and mouth at all times.

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

Final exam post

Final exam post

I'll start off with some generic comments:

- The final exam will be based on all the material we will see in class up to NP-completeness of k-colorability (we'll most likely finish that stuff by Wednesday, Dec 4).
  - In case you want a head-start we will cover Sections 8.1-8.4 and Section 8.7 in the textbook. For the rest the schedule page details what sections of the book we have already covered.
- Exam will be from **8:30am to 11:00am** on Friday, **Dec 17** in class (**Knox 110**). Note that the exam will be for 2.5 hours and *not 3 hours* as it says on HUB.
  - If you have **three of more exams scheduled on Dec 17**, please contact me **NO later than 5PM on Wednesday, DECEMBER 1.** *If you contact me after Dec 1, I won't be able to accommodate any re-scheduling request.*
- **DO NOT FORGET TO BRING YOUR UB CARD TO THE** EXAM (**@510**)

Next are comments related to **preparing for the finals**:

1. Take a look at the sample final (**@507**) and spend some quality time solving it. Unlike the homeworks, it might be better to try to do this on your own. Unlike the sample mid-term, this one is an actual 331 final exam so in addition to the format, you can also gauge how hard the final exam is going to be (your final exam will be the same ballpark). However as with the sample mid-term, you make deductions about the coverage of topics at your own peril (but see points below). Once you have spent time on it on your own, take a look at the sample final solutions (**@507**).
2. We will have some extra OHs on Mon Dec 15 to Wed Dec 15 (details TBA).
3. The actual final will have the same format as the sample final: The first question will be T/F, 2nd will be T/F with justification, the rest of the three will be longer questions and will ask you to design algorithms (parts of them might be just *analyzing* an algorithm.)
4. For the T/F questions (i.e. the first two questions), anything that was covered in class or recitations or piazza is fair game. If you want to refresh your memory on what was covered, take a look at the schedule page. If you want quick summaries of (almost all) the lectures, review the lecture notes or slides or videos.
5. To get more practice for the T/F questions, review all the T/F polls on piazza (**@235**)
6. For the remaining 3 questions, one will be on greedy algorithms, one will be on divide and conquer algorithms and one will be on dynamic programming. However, note that Chapter 2 and 3 in the book are basic stuff and almost any question in the final could fall under the purview of those two chapters. There will be **at least** one T/F and one T/F with justification Q for the NP-complete material so y'all should definitely focus on those as well but I will not ask any "proof based" Qs on that material.
7. In previous finals, like your mid-terms, there have been questions that are either straight lifts from homeworks or are closely related and this trend will continue in the actual exam (not for **all** questions though). This means that you should review your homeworks (all of them) before the exam. Also make sure to review the support pages and recitation notes.
8. If you are short on time and you are prioritizing the topics to study, keep points 6 and 7 above in mind.
9. Sections in the book that were not covered at all in the class but were handed out as reading assignments or recitation notes: I can also ask any direct questions from them. In addition, it might be useful to read them to get a better feel for the material. In any case once you have read the material covered in class a couple of times, it might do your brain some good to read some different material.
10. You can bring in **two** 8.5"X11" review sheets (you can use both sides on both). Use this judiciously: they can be a very useful tool to note down some weird things you have a hard time remembering and/or noting down specific references. However, do **not** spend a lot of time preparing these sheets: they can be huge time sinks without much payoff.

Next are some suggestions for when you are **in the exam**:

1. Spend 5-10 minutes reading all of the questions in one pass: this'll let the problems germinate in your subconscious until you actually get to solving them.
2. You should have plenty of time for the exam: by my count a well prepared student should be done by spending at most one minute per point, i.e. 100 minutes. The exam will be for 150 minutes, so you will have 50 extra minutes.
3. If you are not sure how to design an algorithm for a problem in the exam I generally recommend the following sequence:
   - Try and see if you can reduce the problem to something you have already seen in class;
   - If not, then try and slightly modify an existing algorithm we have not see;
   - If not, only then try and build an algorithm from scratch.
4. Just to be sure the point above is just a recommendation-- your mileage may vary.
5. Once you reach the exam room, try to relax. Once you are there, you have done all the hard work, stressing out about the exam is not going to make the exam any easier for you. **Relax, it's just an exam!** The worst thing that can happen is you will do a bit

Bring your UB card to final

Interested in TAing CSE 331?

Want to be a UTA for 331 in 2022?

Prof. Akhter be teaching 331 in the upcoming Spring semester and is looking for UTAs. I expect to be teaching 331 again in Fall 2022 (though this is **not** finalized and is subject to change) and will be looking for TAs then as well. So Prof. Akhter and I are looking to jointly interviewing candidates for CSE 331 TAs for 2022 (on zoom tentatively Dec 20-23, 2021).

(As an aside: I also have openings for doing research but I'll post on those once I'm done with all 331 related stuff: i.e. after the grades have been submitted.)

These will be *paid* positions. Time-commitment wise here is what we're looking for
- *Ideally,* you should be able to commit close to 10 hours/week on average. More is of course better!
- Depending on your background (e.g. if you have TAed before), we're willing to be OK with ~5 hours/week on average but no lower than that (and no more than 1-2 TAs with << 10 hrs/week).

A few important points:
- There is *no* formal minimum grade requirement to be a 331 UTA (Of course you don't know your grade by now). For now, we're basically looking for interested students who enjoyed 331 so far and would be excited to help others.

- A large fraction of your current TAs will be TAing CSE 331 this spring (but pretty much all of them will be gone by the summer) so there will be fewer slots for Spring 22 (~5) as compared to Fall 22 (10+).
- Being a 331 UTA is definitely a great experience (feel free to ask one of your TAs!) and also **a great preparation for your interviews -- there is no better way to learn algorithms than to teach it!**
- The application process is basically you presenting an algorithm that is covered in class to a "mock recitation"-- once you apply, we will provide more details on the process.

If you are interested in a UTA position, please fill this form.

Extra OHs next Mon-Wed

Details by later today on piazza

No undecidability on final

Undecidabiliy and Friday lecture

Just wanted to make sure that we are all on the same page here: the topic of undecidability is *not* going to be on the final exam. I spent <10 minutes on it in today's lecture and I do not think it is fair to test y'all on a topic that was covered for such s short period of time (and y'all have not had a HW problem on).

Also as a reminder: once we completed talking about k-colorability in today's lecture, we were done with all the topics that will be on the final exam-- see @508 for more details.

Friday's lecture will of two parts. The first half will be telling you about all of the cool algorithmic stuff we did not have time to talk about this semester (as well as some suggestions on how to explore those areas more).

The 2nd half with be a Q&A session, where y'all can ask me any questions y'all want (preference will be given to 331 related Qs but am happy to answer any questions y'all want). Note that this is **not** a review session: i.e. if no one asks a question, I will not present material :-) So please come prepared with your questions!

`lectures`

Project stuff still due

Fri, Dec 10	Wrapup ▶️F19 ▶️F18	**(Project (Problems 4 & 5 `Coding`) in)**
Mon, Dec 13		**(Project (Problems 4 & 5 `Reflection`) in)** **(Project Survey in)**

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note @553 🔗 ☆ 🔒 ▾   stop following   **44** views

Actions ▾

Project survey now open!

As a reminder that in addition to P4+5 coding and reflection problems, y'all all need to fill in a survey.

The survey was originally supposed to go out tomorrow at noon but I decided to release it earlier just in case if there are any issues, there is enough time to fix.

Along that vein, could some of y'all **please follow the instructions in the survey page and please report back on your experience.** The instructions are at the bottom of the page-- let me know if you run into any issues with the instruction OR if everything works out smoothly.

I do not control the actual submission site so sooner I get bug reports the better! In particular, *if I get a bug report on Monday, I cannot guarantee any fixes before the deadline*. Note that I do **not** expect there to be bugs but some changes were made recently to the website and I'm just being cautious here!
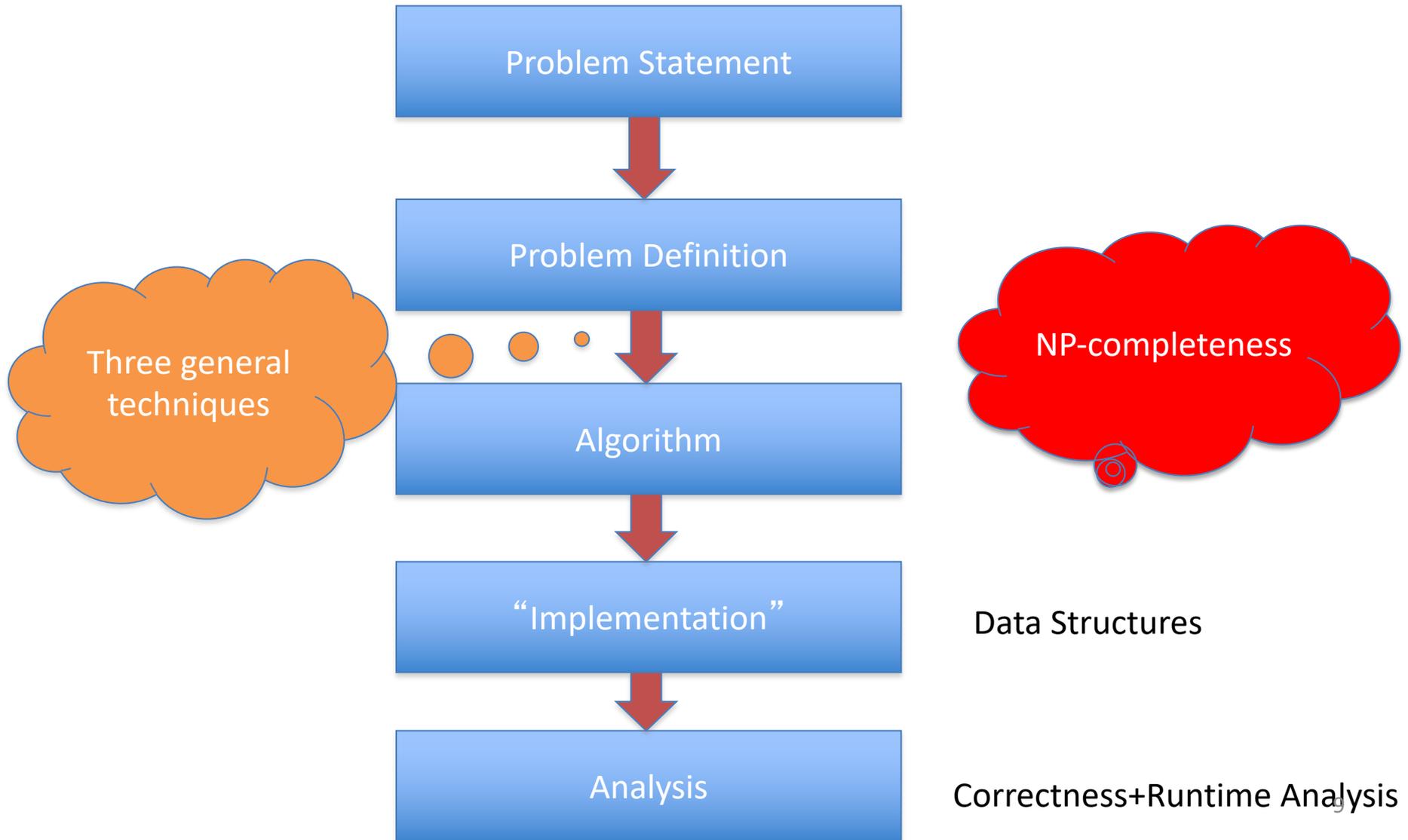
So please check out the system at your earliest convenience and report back in the comment section below-- thanks!

`project`

edit · good note 0   Updated 8 hours ago by Atri Rudra

High level view of CSE 331

Problem Statement

Problem Definition

Three general techniques

Algorithm

NP-completeness

"Implementation"

Data Structures

Analysis

Correctness+Runtime Analysis

Now relax…
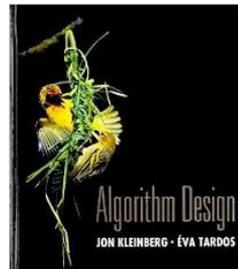

www.carloneworld.it

Randomized algorithms

What is different?

Algorithms can toss coins and make decisions

A Representative Problem

Hashing

Further Reading

Chapter 13 of the textbook

http://calculator.mathcaptain.com/coin-toss-probability-calculator.html

Algorithm Design
JON KLEINBERG · ÉVA TARDOS

CSE 432

Approximation algorithms

Cool twist: NP-hardness of approximations!

What is different?

Algorithms can output a solution that is say 50% as good as the optimal

A Representative Problem

Vertex Cover
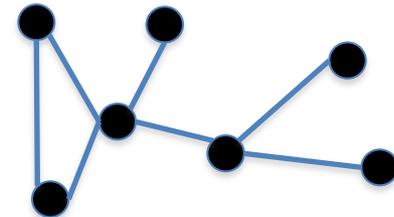
Further Reading
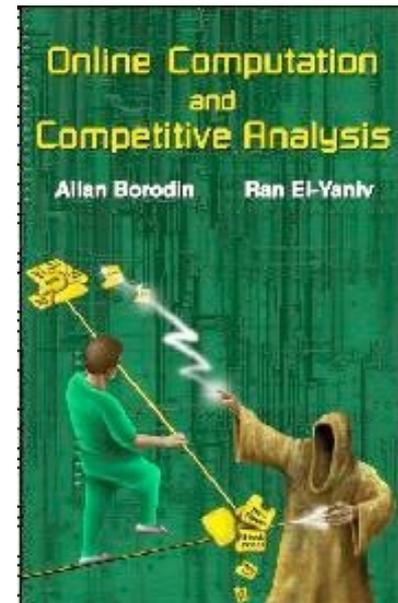
Chapter 12 of the textbook
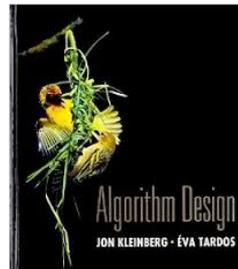
Online algorithms

What is different?

Algorithms have to make decisions before they see all the input

A Representative Problem

Secretary Problem

Further Reading

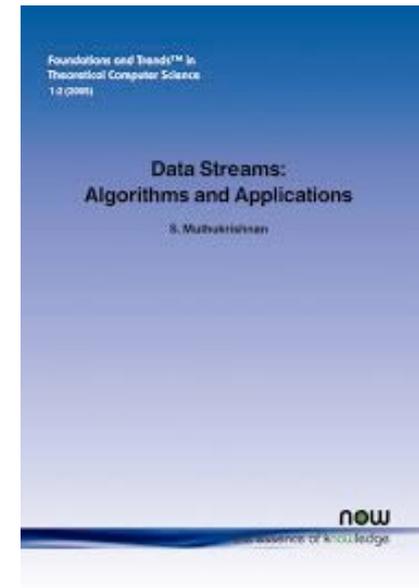# Data streaming algorithms

What is different?

One pass on the input with severely limited memory

A Representative Problem

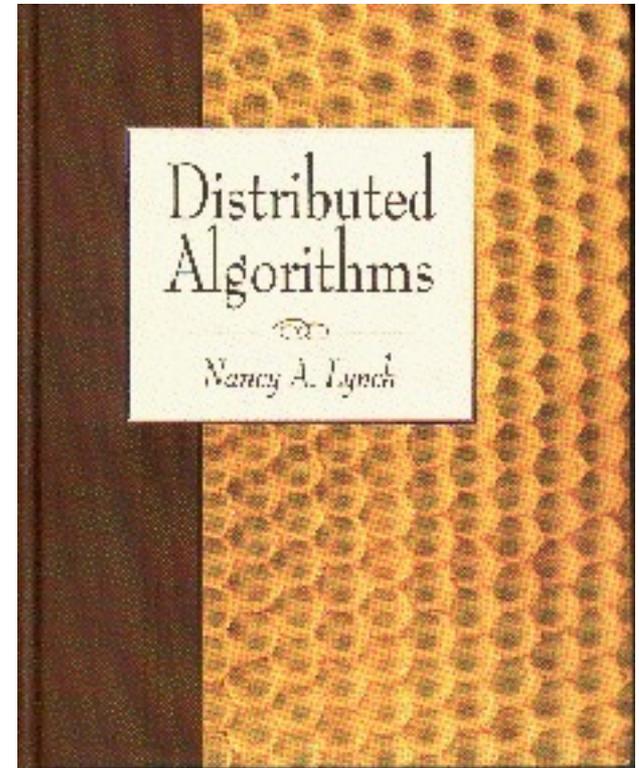Compute the top-10 source IP addresses

Further Reading

Foundations and Trends™ in
Theoretical Computer Science
1-2 (2005)

Data Streams:
Algorithms and Applications

S. Muthukrishnan

now

Distributed algorithms

What is different?

Input is distributed over a network

A Representative Problem

Consensus

Further Reading

Beyond-worst case analysis

What is different?

Analyze algorithms in a more instance specific way

A Representative Problem

Intersect two sorted sets

Further Reading

Algorithms for Data Science

What is different?

Algorithms for non-discrete inputs

A Representative Problem

Compute Eigenvalues

Further Reading

Algorithms and Society
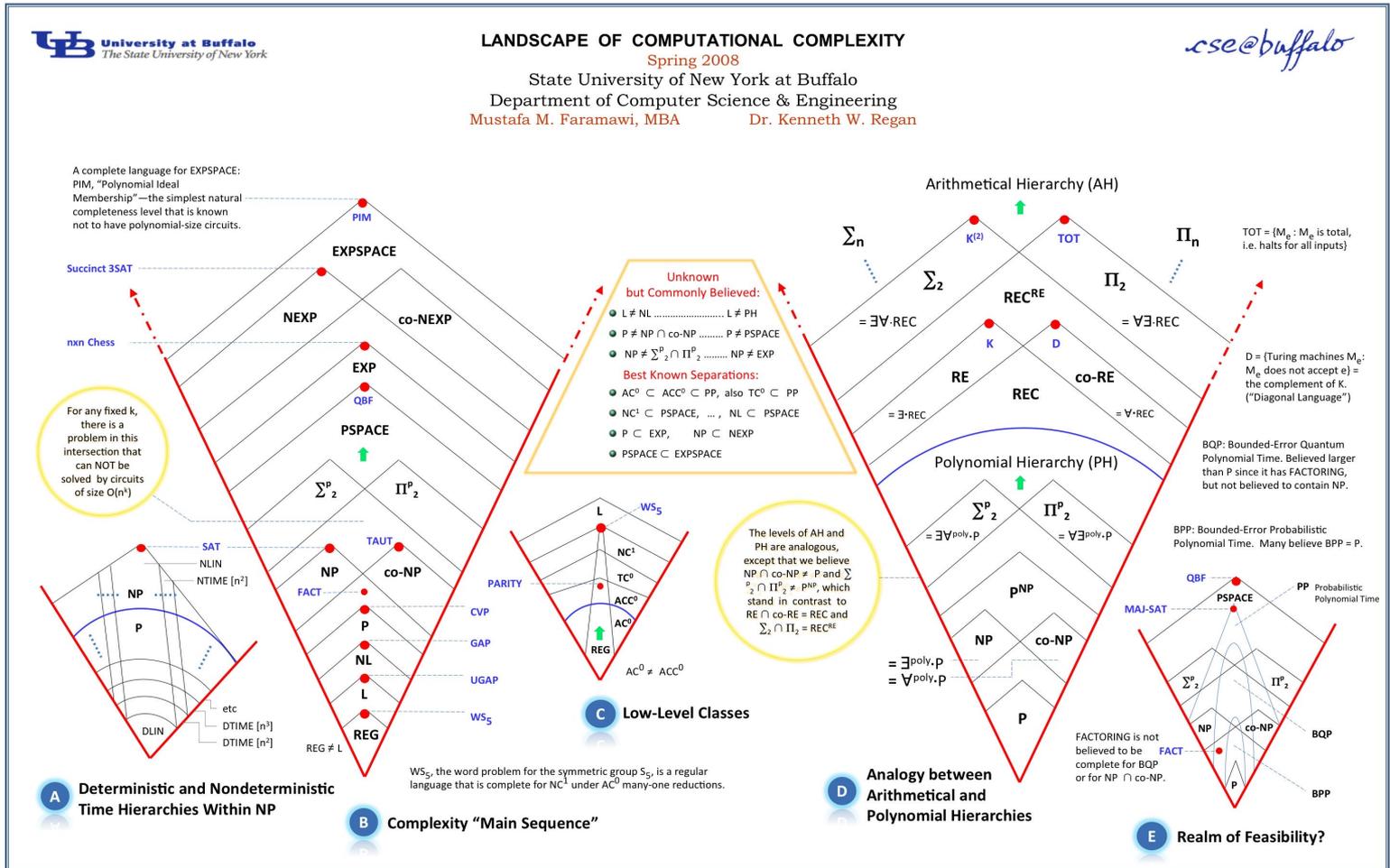
What is different?

Measuring and correcting for harms caused by Algorithms
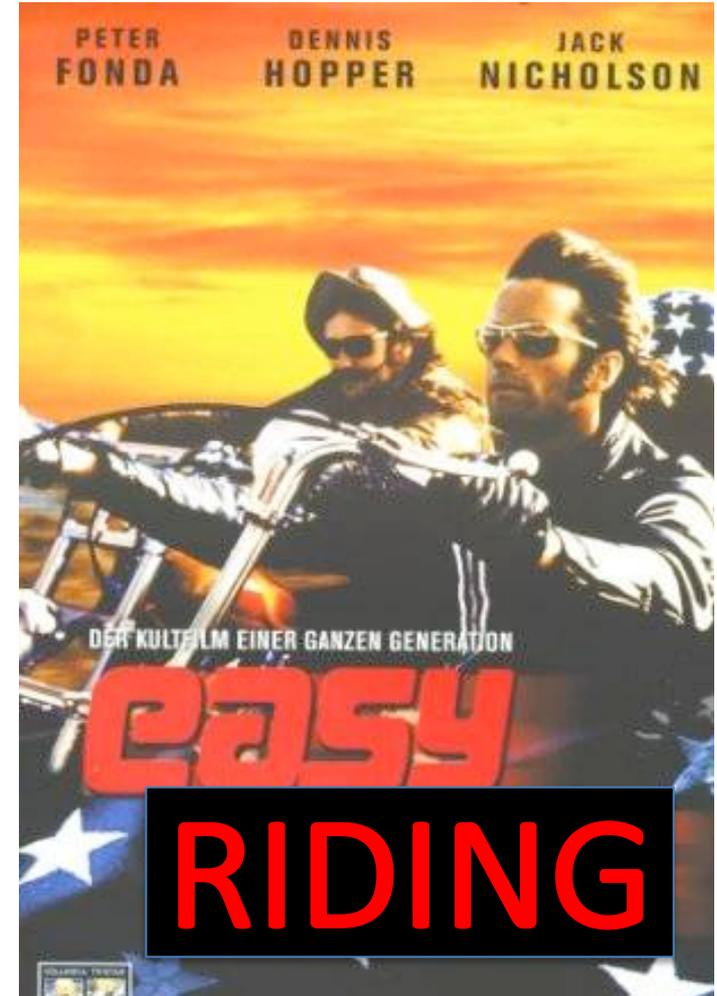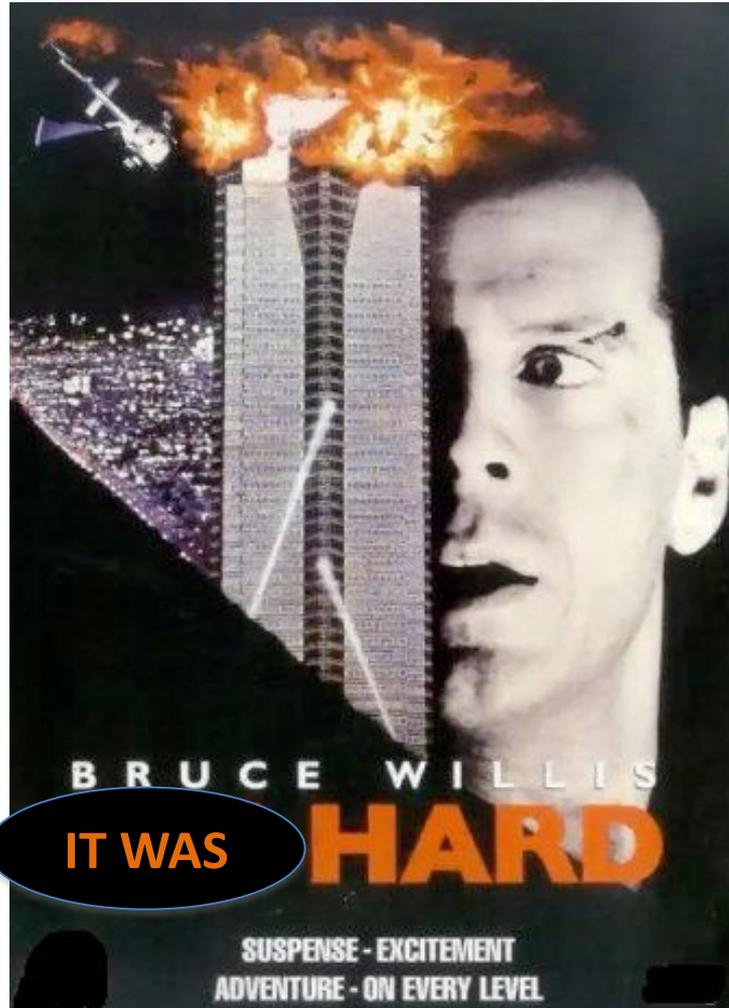
A Representative Problem

Bias in ML

CSE 410 in Spring 22: ML and Society
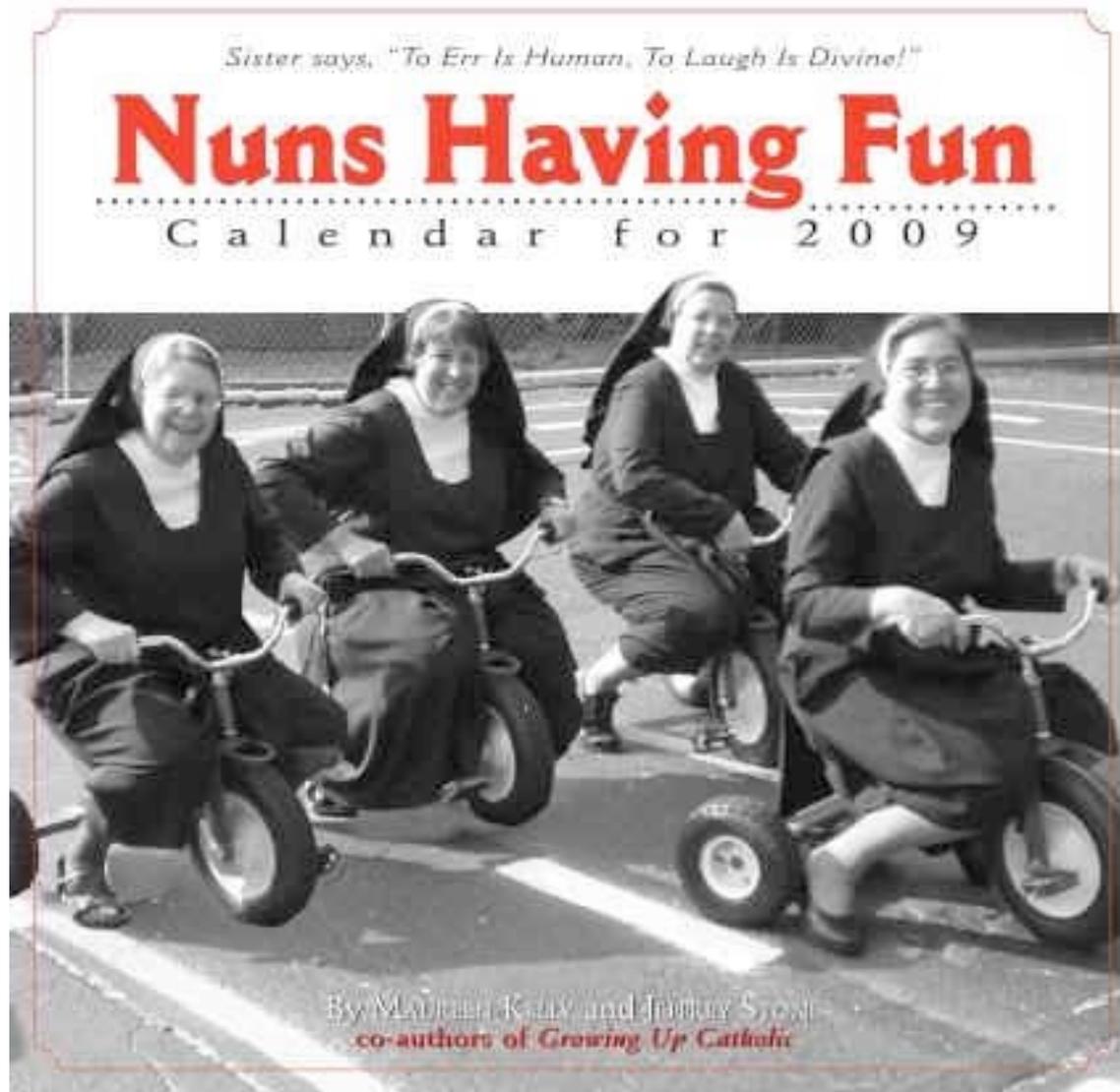
Anything > NP and < undecidability?

LANDSCAPE OF COMPUTATIONAL COMPLEXITY
Spring 2008
State University of New York at Buffalo
Department of Computer Science & Engineering
Mustafa M. Faramawi, MBA   Dr. Kenneth W. Regan

Q & A session

Whatever your impression of the 331

Hopefully it was fun!

Thanks!

Except of course Project P4+5, survey and the final exam