Welcome to CSCI 256: Algorithm Design and Analysis

Quick Logistics

- Please mute yourself if you are on the zoom call!
- Students want to see the slides; if you are unmuted and make a noise it will switch to your camera
- Make sure your ID on the call is your name
- Let me know if there are issues. In the worst case this will be posted on Glow, and you can view it later.

Recording

- All lectures will be recorded and posted on Glow
- Be aware that you're being recorded if you are on the Zoom call
- If you do not want your face/voice shown, you should disable video and ask questions via chat
- If you're worried about the last couple minutes, send me an email. I'll probably be able to edit you out

Introductions

- I’m Sam
- (Can also call me Prof. McCauley or Prof. Sam or something if more comfortable)

- Office: TPL 315
- Office hours Wed 3-5PM, Fri 2-4PM over Zoom
  - Not this week
- Link forthcoming

- Can also contact me via Slack

Dealing with Covid

- Probably not the first time you've heard some of this
- My goal: support your personal strategy for dealing with Covid risks
  - Some of you may not come to campus
  - Some may be on campus, but may not come to class
  - Some may feel it is worth it to come to class
- The goal of the following is to support you regardless of your strategy

Attendance

- You are *required* to join class synchronously (Regular unexecuted absences are not allowed)

- Also part of participation grade

- Can be remote or in-person

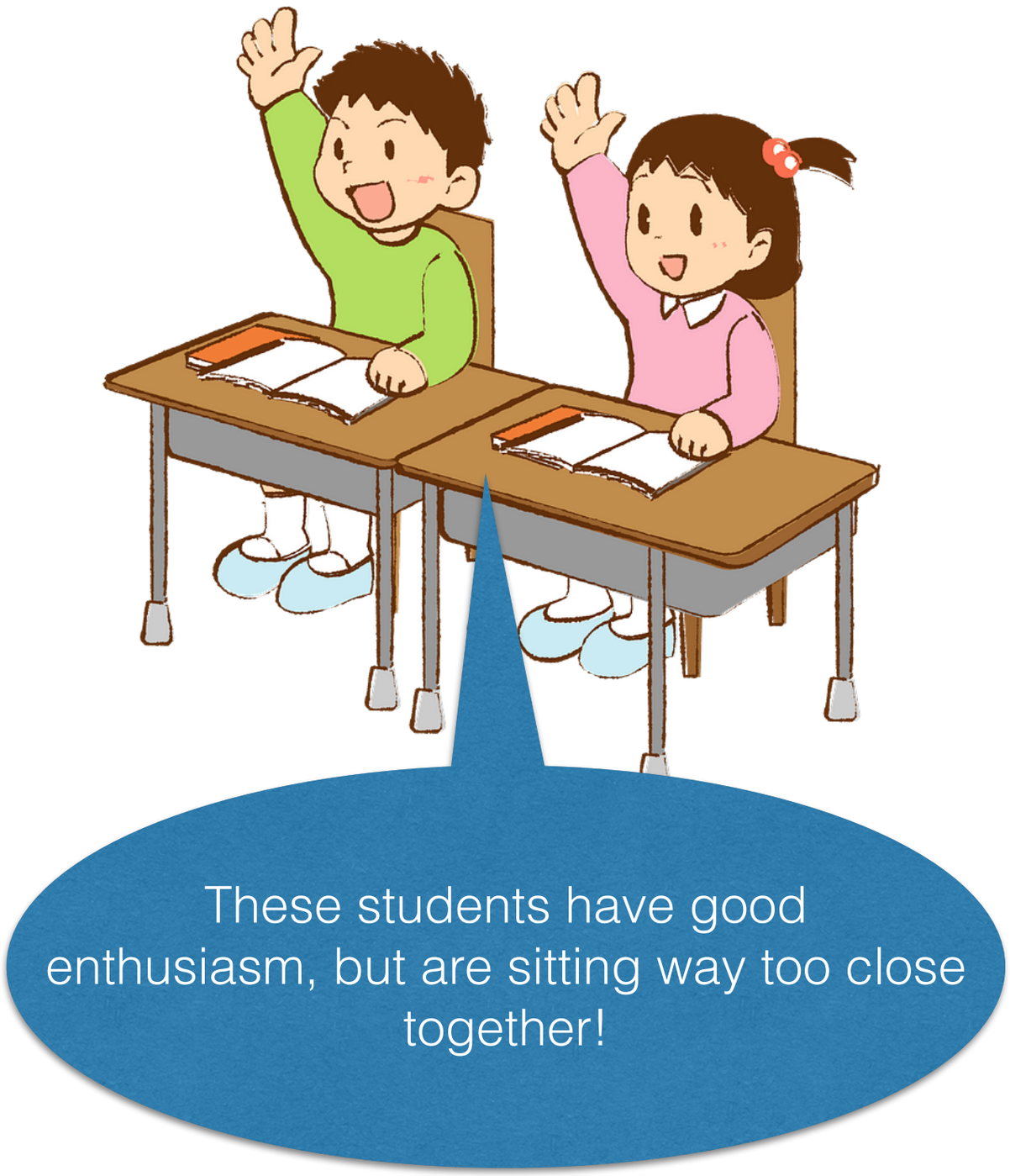
  - Can change at any time

- If you're not able to join, just email me

- Let me know if you anticipate long-term difficulties

Being in Class

- Please don’t move desks
- Sit far apart; not immediately in front of me if possible
- Laptops OK, joining the zoom call is OK
- We are going to be very strict with the rules when arriving to and departing from class

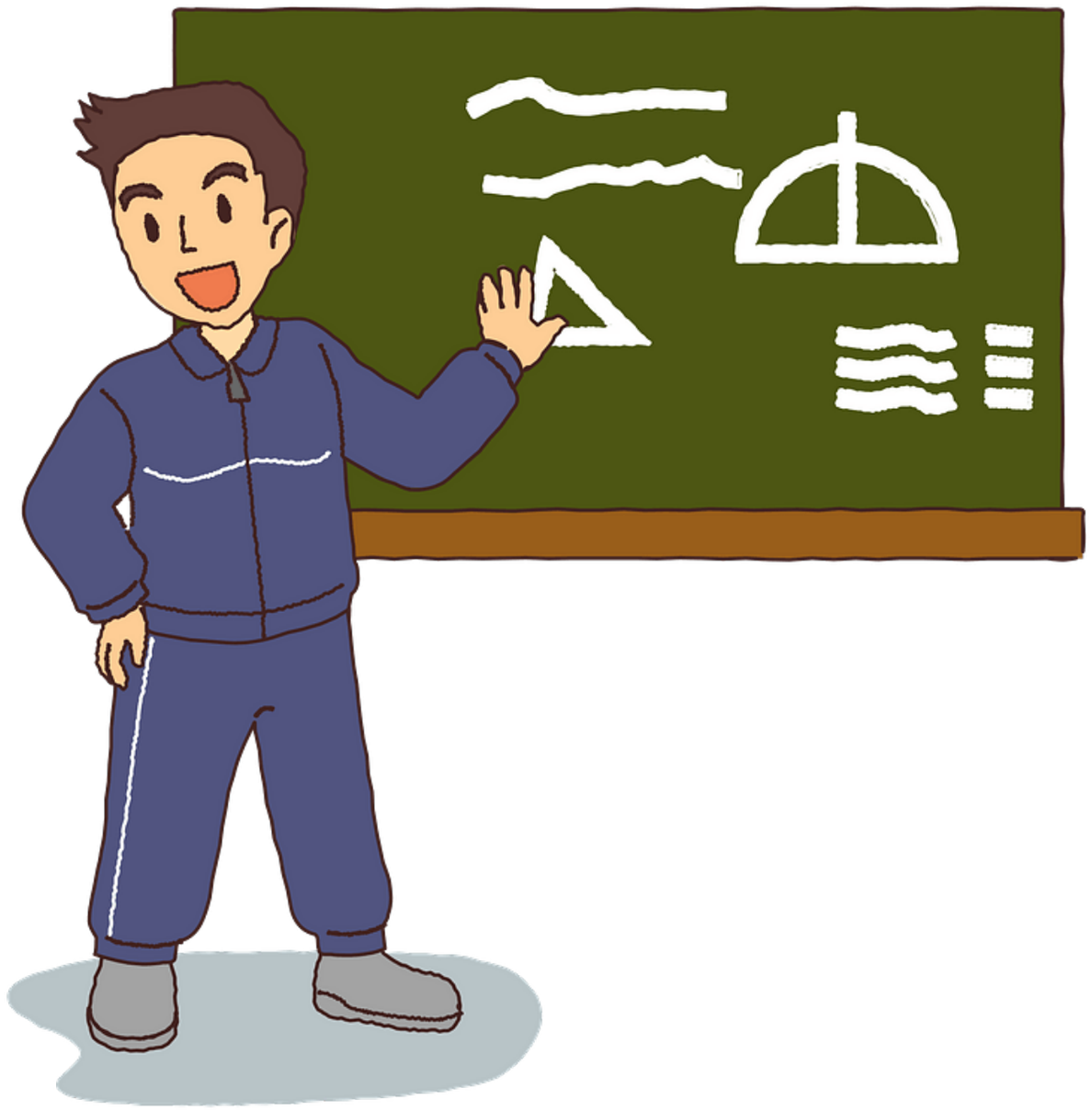


Board Work

- I believe our classroom does not have a blackboard

- Slides will be projected in front of the class and broadcast over zoom

- Similarly, we'll use (effectively) a digital blackboard for examples



Asking Questions

- Can be done in person
- Can ask verbally over Zoom
- Can also ask via text in Zoom
    - (OK even if you're in class, though I do like hearing your voices)

Next Two Weeks

- Unfortunately I had to leave the state
- It looks like I'll need to quarantine for 14 days, so we'll be fully remote until Sep 28
- We will do Zoom lectures in the meantime, and start in-person lectures for those interested on Sep 28

Any questions about Covid/ remote learning?

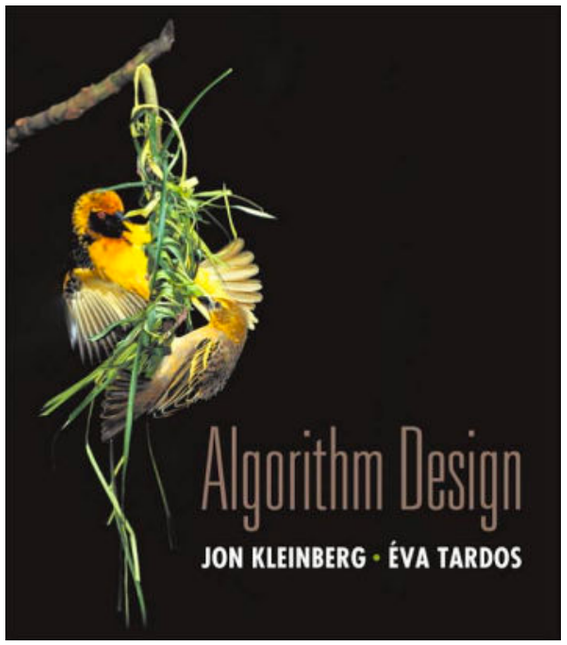
TAs and Help

Teaching Assistants

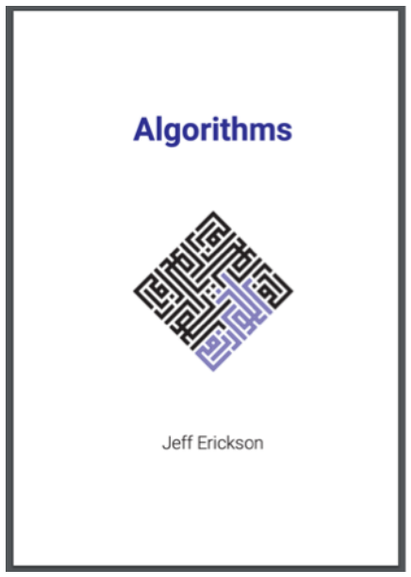
- Our TAs are: Kiersten Campbell, Nicholas Gonzalez, Tai Heinrichs, Jonathan Rogers, Peter Zhao
- They’re here to help! Be willing to ask questions
- TA office hours will be posted soon
- Entirely over zoom
- TAs are particularly helpful for proofs and latex

Course Logistics

Textbooks:



Three copies reserved in the Schow library for reference



Available online at http://jeffe.cs.illinois.edu/teaching/algorithms/

Slides: Kleinberg and Tardos book has excellent slides for reference that I'll also be borrowing a lot from.

Course Logistics

Grading breakup:

- Weekly problem sets (50%)
- Midterm (20%)
    - Date TBA (will set soon)
    - 24 hour take-home
- Final (25%)
    - 24 hr take-home final
    - Comprehensive

Class participation (5%), includes attendance.*

*Missing class when you are feeling ill is not only acceptable, but encouraged.

About Class Participation

- **I like interaction in my classes!**
- Many ways to participate:
  - Ask questions! (there are no bad questions in my class)
  - Answer questions (no wrong answers in my class)
  - Talk to me after class/office hours
  - Slack participation
- Classes work best when we all learn from each other

Bottom line: *Help create a vibrant, positive and inclusive classroom environment!*

About Problem Sets

- Must be typeset in LaTeX **using template provided**
- Anonymized grading: No name/ID on homework
- Use LaTeX template provided (each question on a new page)
- PDF must be submitted via Gradescope
    - **IMPORTANT.** Assign questions to each page of the PDF
- Register on Gradescope using course code: **M58NG3**
- Review handout on Problem Set Advice
- Assignments will usually be released on Thursdays and due the **following Thursday at 11 pm**
- Assignment 0 is out this afternoon! Due **Thursday Sep 17**
- Class introduction form is due Sunday!

Late Days & Late Work

- Any late work will be penalized 20% per day
    - After 24 hours, need to email me your work
- Late work may be graded late as well
- Please email me if there is a reason why you cannot turn your work in on time
- I am going to be very flexible this semester
- I also want to avoid *consistent* delays
- We'll talk if it comes to that—my goal is to ensure that you keep up with the class, while understanding that logistics can be difficult this semester

Academic Honesty Policies

- See the syllabus
- Gist:
  - Collaboration is encouraged but *you should never submit a solution that you do not understand*
    - Don’t write while discussing; talk at a high level and write down the ideas afterwards
    - Always cite your sources and collaborators
      - Cite sources/collaborators in the last section labeled “Acknowledgements” in template
      - Do not miss this part!
    - No collaboration on exams

Academic Honesty Policies

**I didn't full understand dynamic programming in class…
These MIT notes online look good, maybe I will read them to prepare for the assignment**

Academic Honesty Policies

**I didn't full understand dynamic programming in class…
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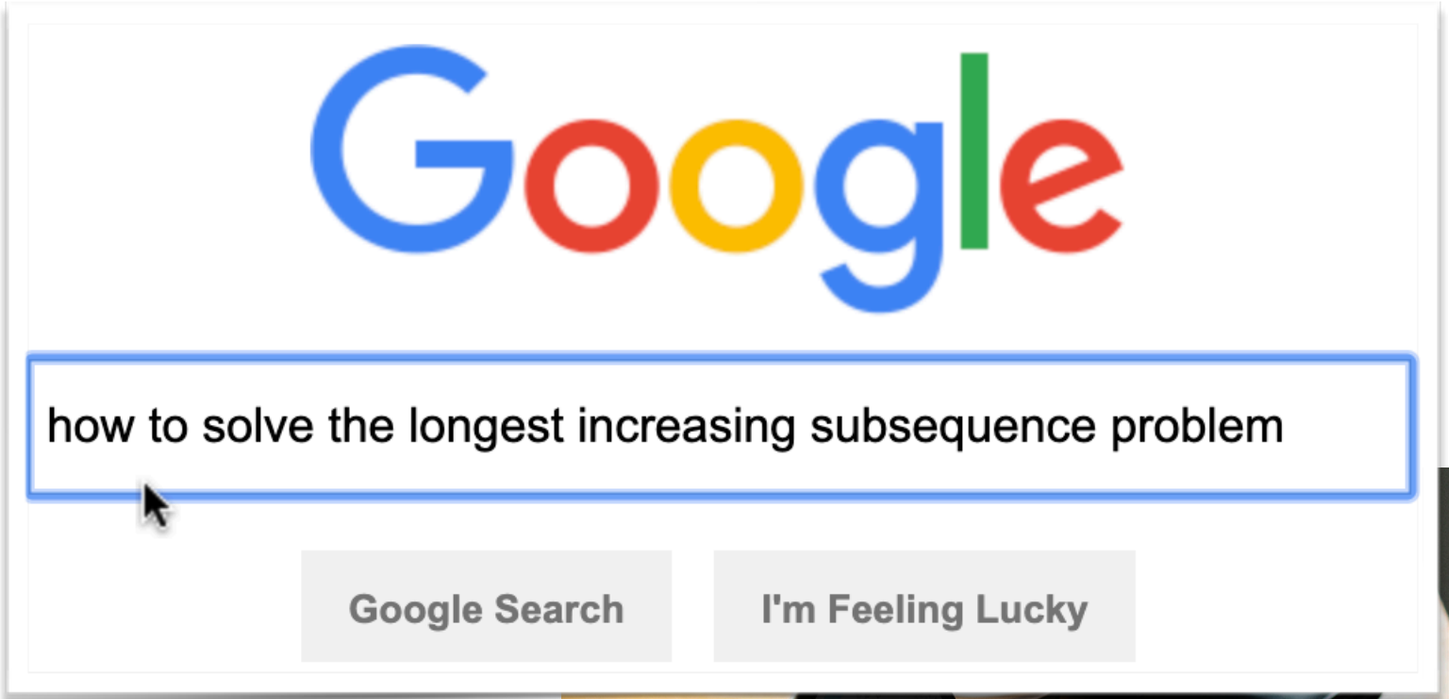
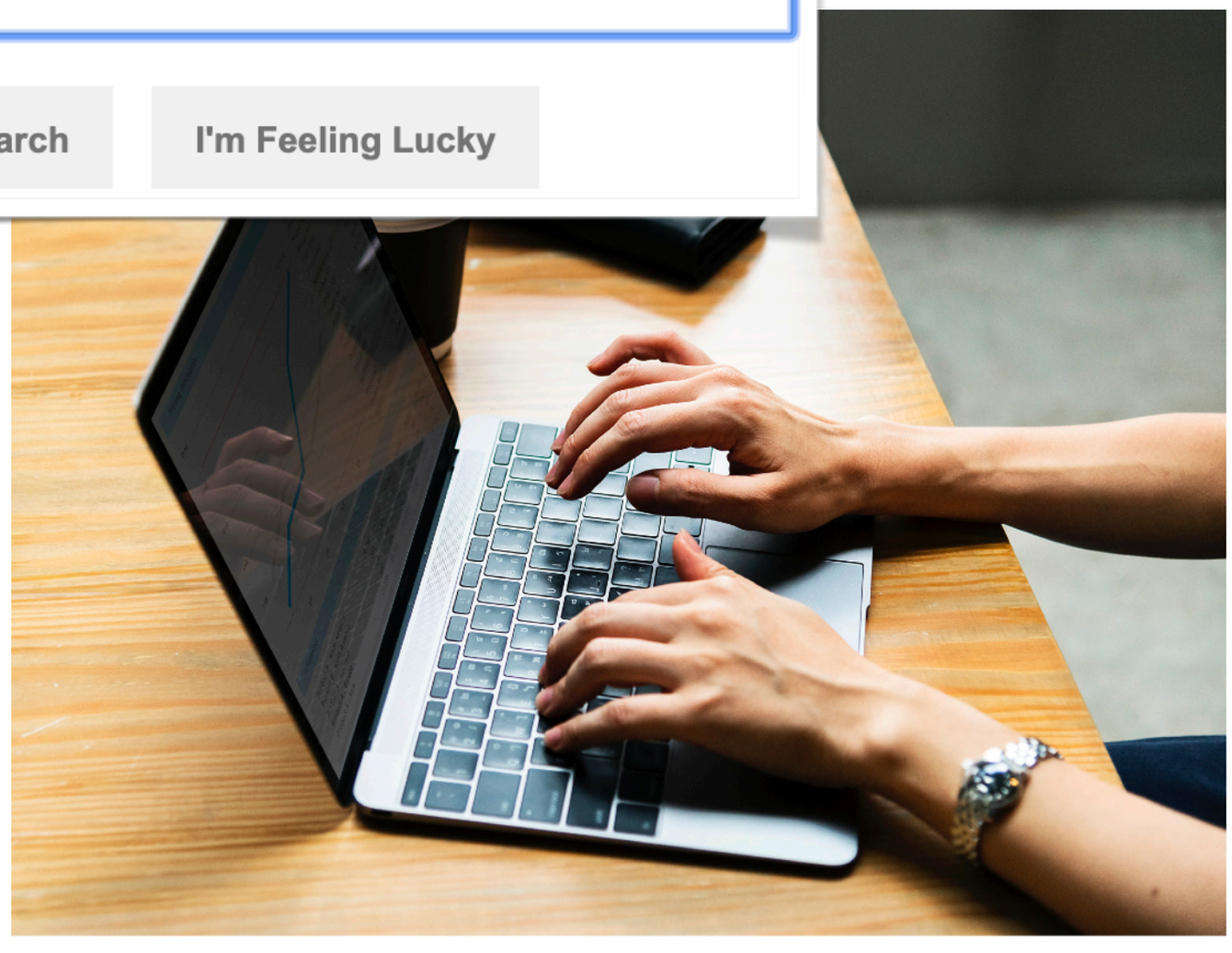
This is not ideal but ok if you cite

Academic Honesty Policies





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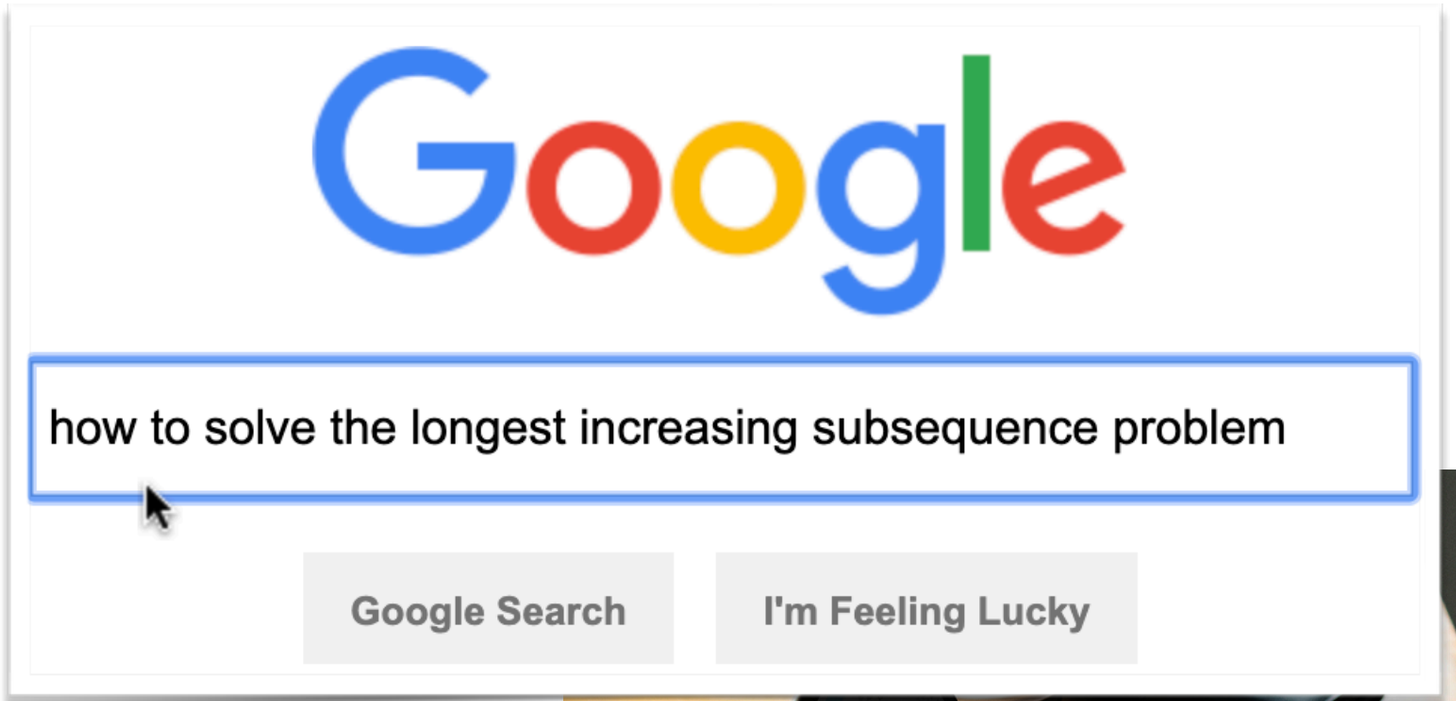
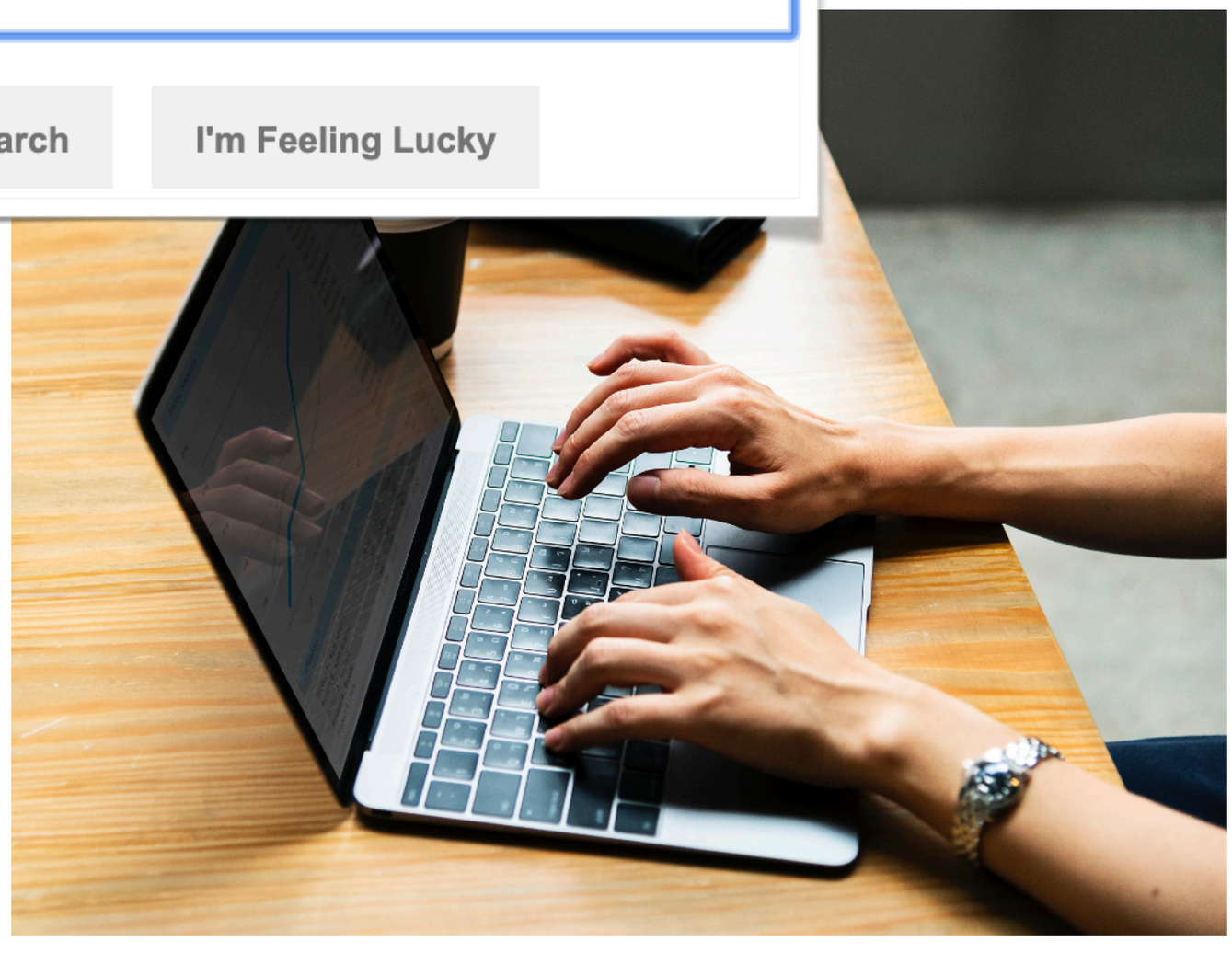


This is NOT OK!
(even if you cite)



Academic Honesty Policies

What strategy did you use for Question 3?

I reduced the problem to network flows

Academic Honesty Policies

What strategy did you use for Question 3?

I reduced the problem to network flows

This is OK! (if you cite)

Academic Honesty Policies

Can you show me your solution to Question 3

Sure

Academic Honesty Policies

Can you show me your solution to Question 3

Sure

This is NOT OK!
(even if you cite)

Advice on Collaboration

- Problem set advice:
    - HW problems tend to have solutions that require some insight to discover
    - “If you immediately start working on the assignments in a group, you will miss out on the opportunity to come up with these insights on your own.”
    - Attempting problems yourself first is the single most important practice for the exams
- Completeness gets a great deal of partial credit on assignments; a close-but-not-quite attempt should get quite a lot of partial credit

Other Course Policies

- **Regrades on gradescope**
  - Use only to rectify grading: correct answer marked as incorrect—not for partial credit
  - Up to 3 regrade requests allowed on Gradescope
  - Capped to discourage misuse

Quick Gradescope Demo

Key Gradescope Points

- Don’t enter your name! If you do it won’t be anonymous
- (We’ll grade based on email. Make sure you sign up with your Williams email.)
- Remember to assign pages to problems
    - This makes our lives easier, and also helps with anonymous grading

Quick Overleaf Demo

Key Overleaf Points

- Overleaf is just cloud software to help with latex
- I'll release a video on how to use latex (with overleaf) on Monday
- Two ways to get the assignment going:
  - Use read-only link and duplicate project, or
  - Copy-paste the text

Lots going on!

- Partially due to the remote semester, there's a lot going on: zoom, slack, gradescope, overleaf, etc.

- I'll send an email right after class to help you keep track of what needs to happen in the next couple days

- I'll probably delay the assignment 0 deadline to Saturday

- Any questions?

What to Expect from this Class

- **Expect challenging and fun problems**
  - Expect to spend a lot of time playing with the problems!
  - Sense of accomplishment on finally solving them
- **Expect to make mistakes**
  - Making mistakes is the best way to learn
  - If you knew everything, you wouldn't be in this class
- **Expect to go out of your comfort zone**
  - Learning is uncomfortable, but in a good way
  - Common and OK to be frustrated by false starts!
- **Expect to develop "algorithmic thinking"**

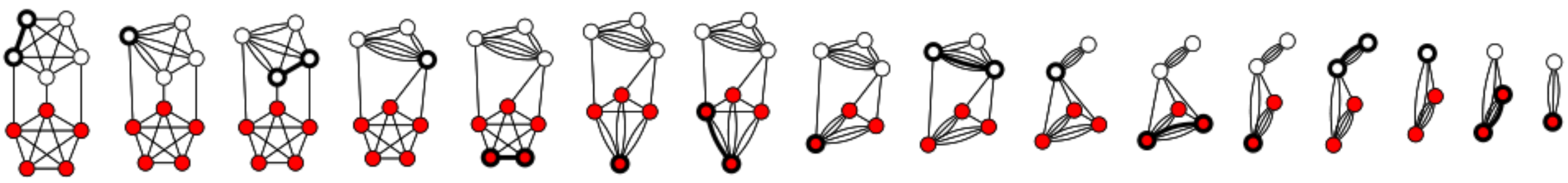
Practice with CS Proofs

- Huge component of this class (the “Analysis” part of the course name)
- We will learn how to write computer science proofs
    - Sometimes different than mathematics proofs
- Programming assignment vs proofs: common roadblock: how do you know your proof is “correct”?
    - **No autochecker for proofs!** Need to debug yourself
        - Go line by line and ask “why is this true?”
    - Ask me or TAs for guidance
    - You’ll build more intuition with practice

The Course

Algorithms!

- I’m looking forward to teaching this
- In CS 136, you (likely) learned: almost any computational problem can be solved by breaking into small, digestible pieces
- You hopefully also learned: the asymptotic performance of those pieces can have a very significant impact
- In this class we take this further
  - How can we solve problems efficiently?
  - More advanced techniques to solve more difficult problems
  - Known algorithms and how to use them



Other Things Along the Way

- Proofs and algorithmic invariants
    - *Why* does this algorithm work?
    - What can we say is *always* true about this problem?
    - Useful way of computational thinking, useful way to help explain your ideas to others
- Latex! Very useful tool (just like git)

Course Outline

- Graphs: Matching & Traversals
- Greedy, Divide & Conquer
- Dynamic Programming
- Reductions: Network Flow and NP-hardness
- Randomized and Approximation Algorithms

Any Questions?