Algorithms and Complexity

CS 302

About Me

- Shelby Kimmel (call me Professor Kimmel, Professor)
- **My research:** (quantum) Algorithms and Complexity
- **Academic Background:** Williams undergrad, MIT grad school, University of Maryland postdoc
- **Non-academic Background:** internships at Raytheon, Fulbright (English Teaching Assistant) South Korea

Find a partner or two, and brainstorm as many responses as you can to the following questions:

- What makes an algorithm good?
- What algorithms or algorithmic approaches have you studied in classes?
- What other algorithms have you heard of?

This Class:

Algorithms are important from a practical perspective (when creating programs or software), but they are also crucial for addressing some of the BIG questions of computer science: what can computers do, and what resources do they need to do it?

Learning Goals

- Ability to apply standard algorithmic paradigms to create, analyze runtime, and prove the correctness of algorithms for common, real-world problems.
- Appreciation of the creativity and beauty involved in algorithm design.
- Appreciation of the connection between algorithms and data structures.
- Awareness of the limits of efficient algorithms.

My goal: Help you to learn about algorithms and complexity

- One of the best ways to become a better learner is to develop a **growth mindset**. [Dweck]

Learning from biological perspective

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- Trying to do a task for the first time can sometimes feel unpleasant…

Learning from growth mindset perspective

Fixed Mindset	Growth Mindset
Task A is easy because I'm smart.	This is easy because my brain already has necessary connections.
Task B hard because I'm bad at this type of thinking.	This is hard because I need to create connections in my brain that weren't there before.

Self-test

	Growth Mindset Reaction (1 pt each)	Fixed Mindset Reaction (0 pt each)
Challenges	Embrace	Avoid
Effort	Progress	Problem
Criticism	Helpful	Personal
Failure	Temporary	Evidence of inability
Success of others	Inspiring	Threatening

Take away

- Even if you don't have a growth mindset now, you can develop one, because the brain is malleable!

- Developing a growth mindset will tend to increase your learning (grade) and make learning more enjoyable.

Active Learning

- In class, I will often ask you to solve problems and answer questions. (This helps you to build new connections in your brain.)
- Because you are learning, I don't expect you to answer correctly. Won't be graded on response (other than for participation)
- Opportunity for you to get feedback on whether you understand.
- Opportunity for me to get feedback on whether you understand.

Syllabus – with a partner:

- What are 3 questions you have about the syllabus?
- Questions similar to quiz questions:
  - What is the purpose of Part 2 of the problem set?
  - What is my policy on technology in the classroom?
  - If you have difficulty with a problem set problem, which of the following options are acceptable?
    - go to office hours
    - e-mail me
    - discuss with a classmate
    - look online for solutions
    - do the best you can, then for Part II write a reflection about what you had difficulties with, and why.

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Website tour!

go/cs302

Announcements

- Fill out questionnaire
- Quiz Friday on syllabus
- First problem set due Monday
- Not registered – come talk to me.