COMPUTER SCIENCE 126

Fall 2024

https://www.princeton.edu/~cos126

PRINCETON UNIVERSITY

brought to you by

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Instructor

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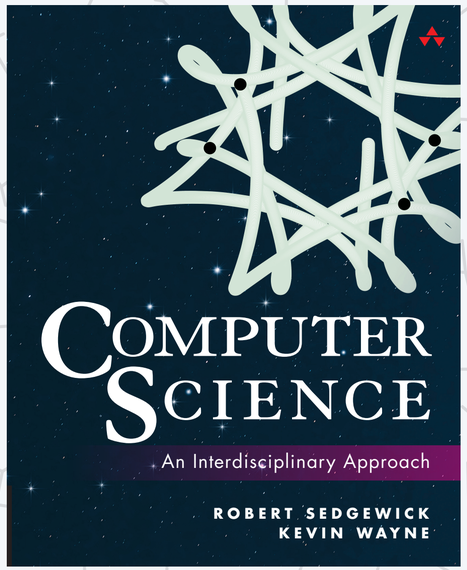
FINE PRINT

We will be recording lectures and making them available to students in Canvas.

Because of privacy, compliance, and legal considerations, you may not record or redistribute recordings of this class.

Lecture slides available from course website:
`https://www.cs.princeton.edu/courses/cos126/schedule`

Robert Sedgewick | Kevin Wayne



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COS 126, Fall 2024

- *digital revolution*
- *course mechanics*
- *course resources*

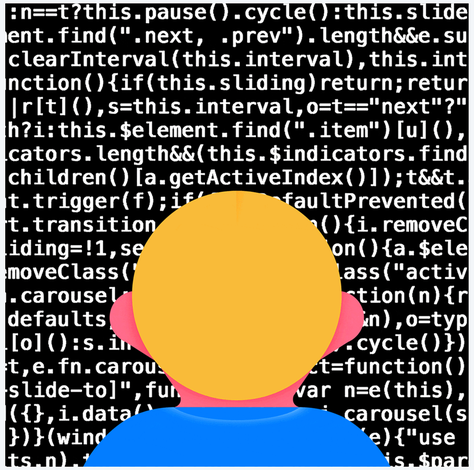
COS 126 course objectives

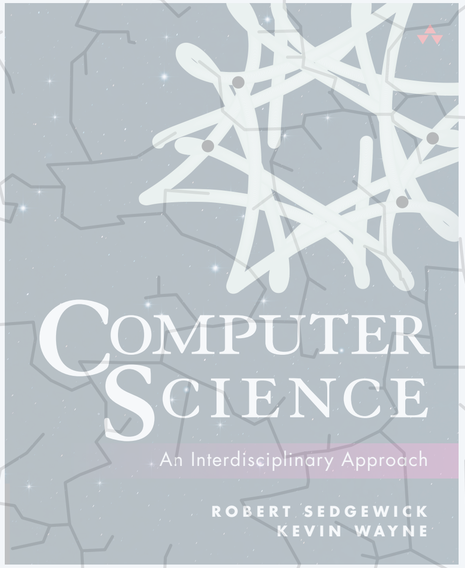
Goal 1. Read, write, and reason about computer programs.

Goal 2. Apply concepts to science, engineering, and beyond.

Goal 3. Understand key ideas underlying computation and computer systems.

topic	examples
elements of programming	*built-in data types, conditionals, loops, arrays, I/O*
functions	*user-defined functions, modularity, recursion*
object-oriented programming	*user-defined types, encapsulation, immutability*
algorithms and data structures	*sorting, searching, collections*
computer science	*theory of computing, machine learning*
design of computers	*machine language, boolean logic, circuits*





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COS 126, FALL 2024

- *digital revolution*
- *course mechanics*
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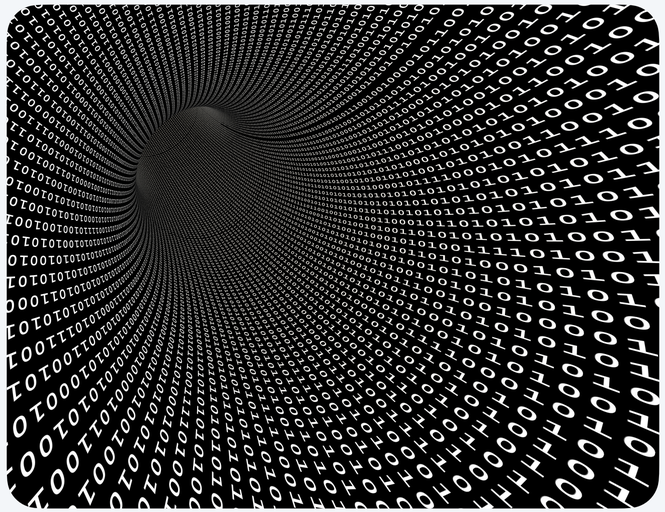
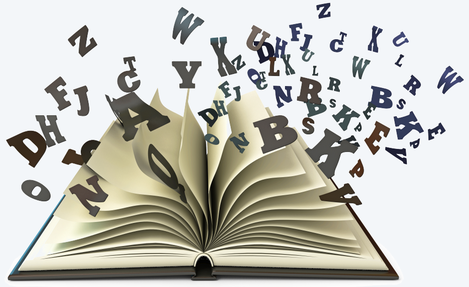
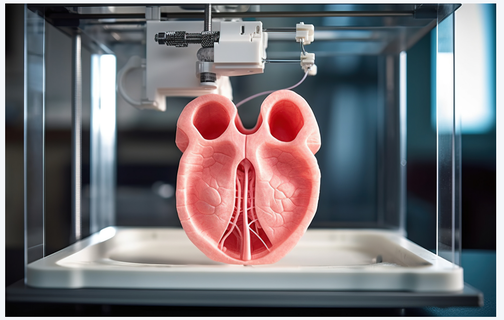
The digital revolution

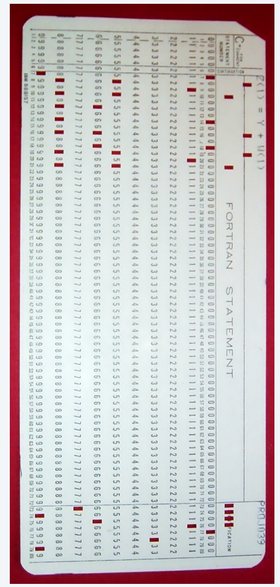
Key idea. "Everything" can be encoded as a sequence of bits (0s and 1s).

- Numbers and text.
- Pictures, songs, and movies.
- Biometrics.
- 3D objects.
- Computer programs.
- …









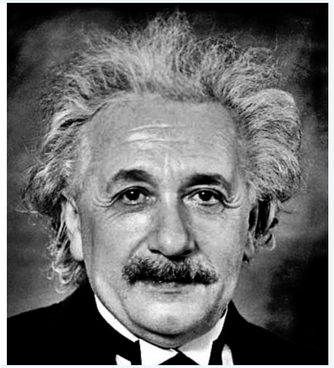
The digital revolution

Key idea. "Everything" can be encoded as a sequence of bits (0s and 1s).

Innovation 1. You can program computers to process bits.

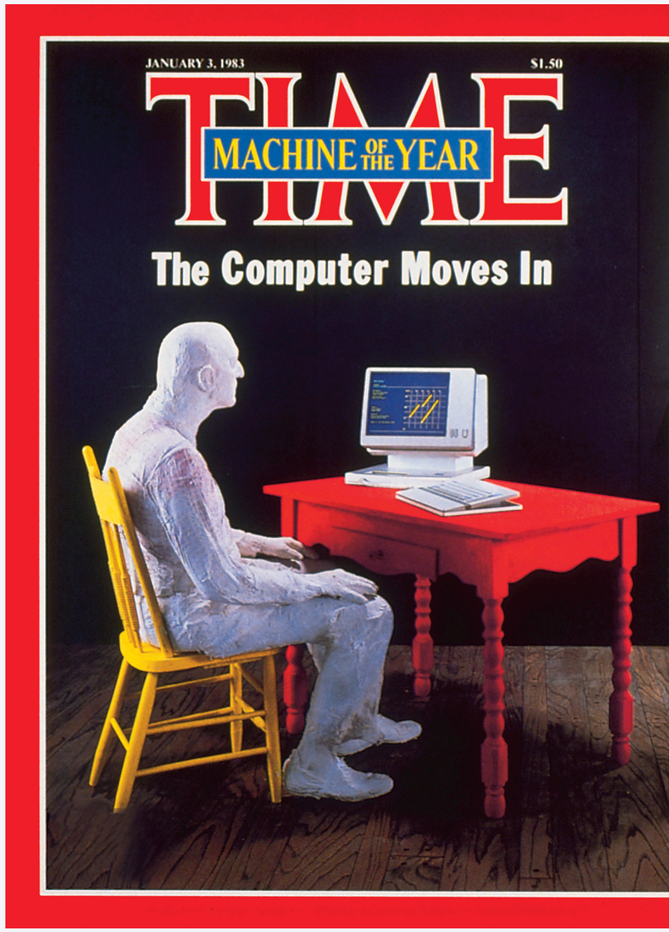
Innovation 2. Devices can use the Internet to send and receive bits.

> " *Computers are incredibly fast, accurate, and stupid; humans are incredibly slow, inaccurate, and brilliant; together they are powerful beyond imagination.* "
>
> — *widely misattributed to Albert Einstein*



Computers are transforming society

From the way we work …



Computers are transforming society

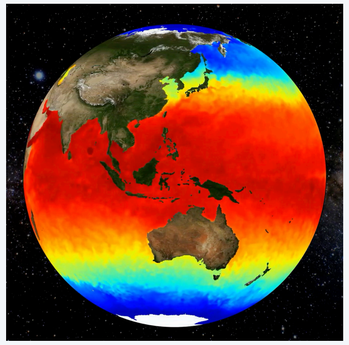
… to the way we live.

Computers are transforming society

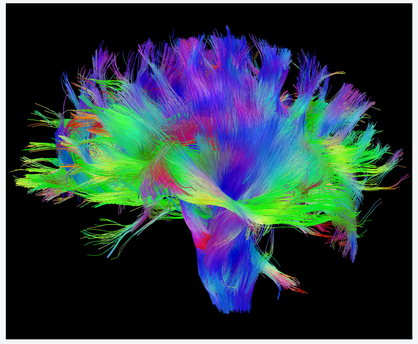
From the “new” economy …

Computers are transforming society

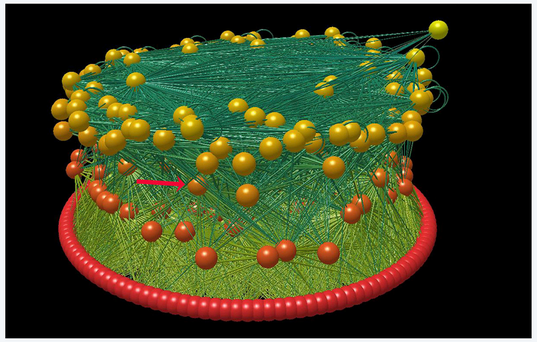
… to the way we do science and engineering.



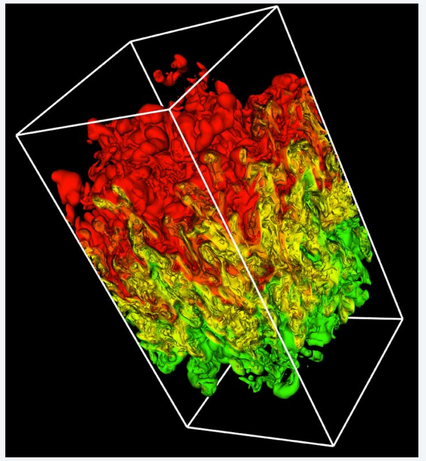
ocean modeling



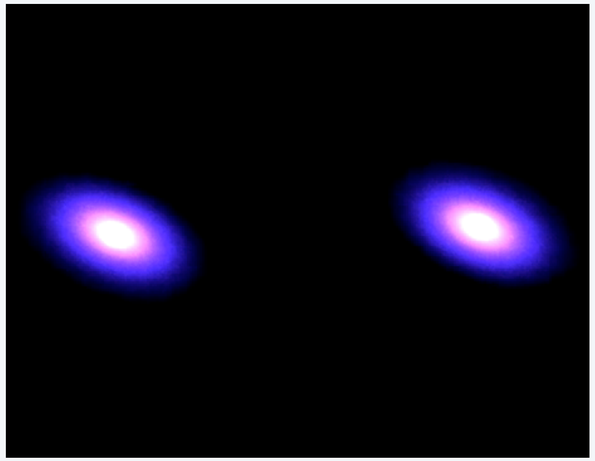
diffusion MRI of brain



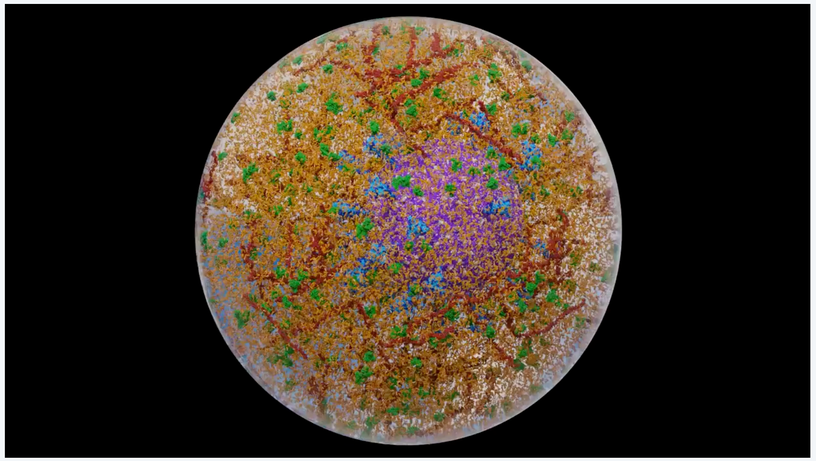
ancestral Pueblo food web



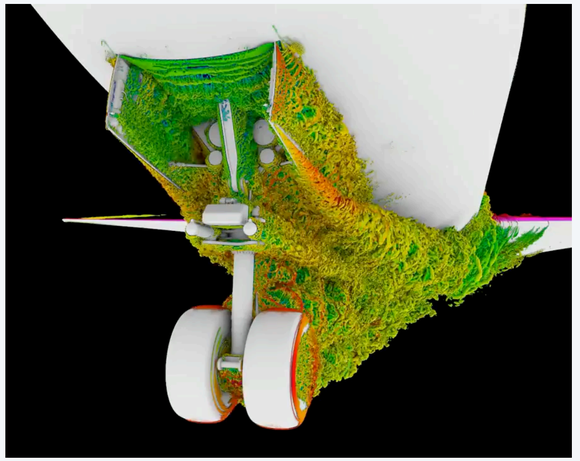
nuclear physics



colliding galaxies



an aerosol droplet containing coronavirus

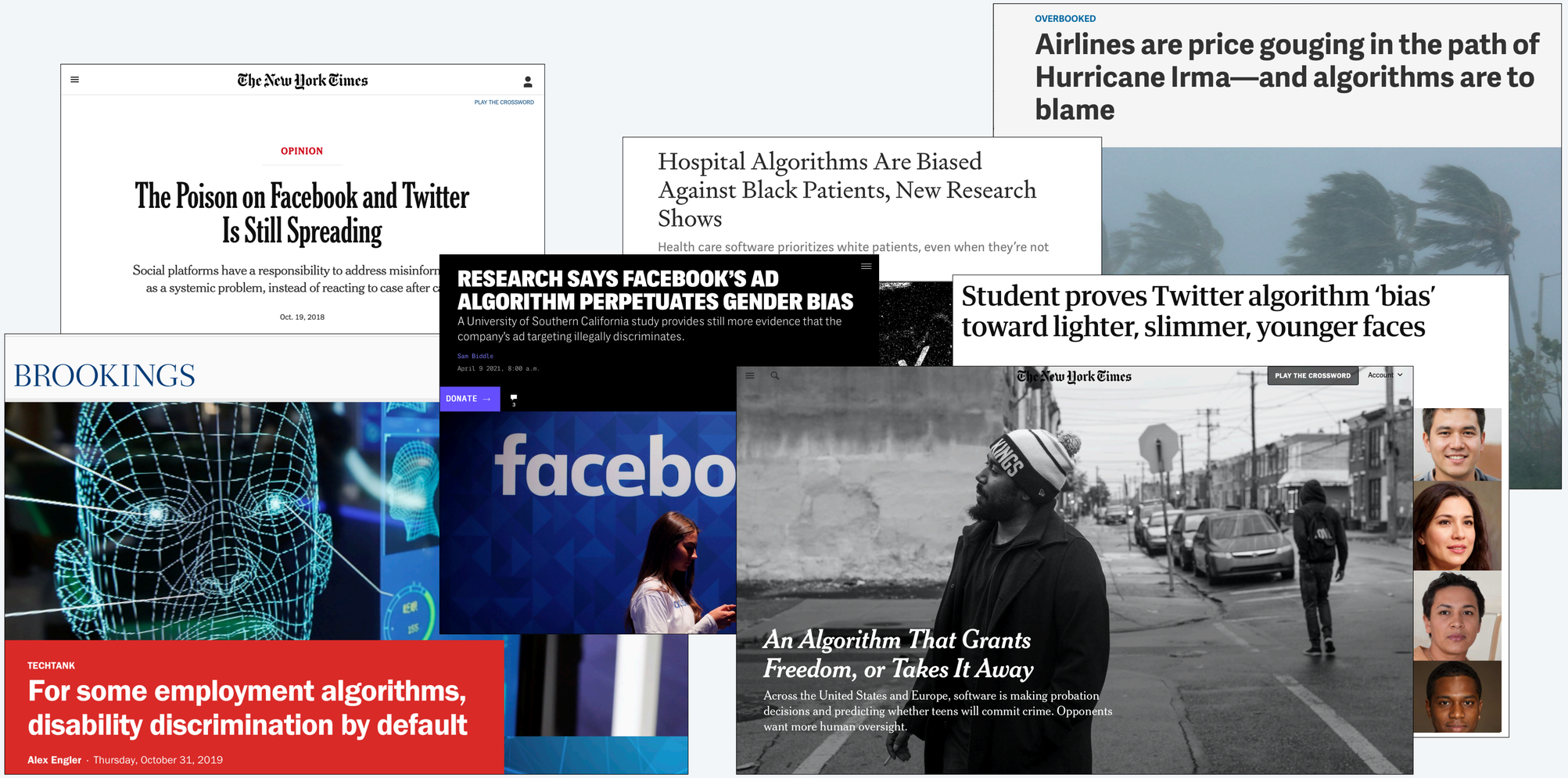


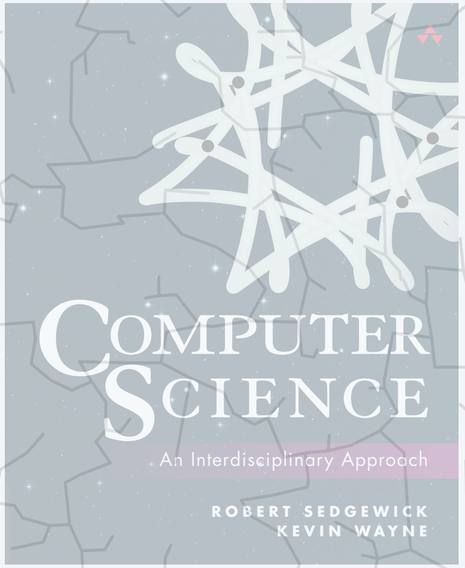
airflow over landing gear

The digital revolution has only just begun

Welcome aboard. You're already a consumer. Now, become a creator!

In the service of humanity. Use your new superpower responsibly!





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COS 126, Fall 2024

- *digital revolution*
- *course mechanics*
- *course resources*

Lectures

Live lectures. [MW 1:30–2:50pm] Introduce new material.

Questions. You are encouraged and expected to participate.

- Raise your hand and ask a question. ← *carpe diem*!
- Ask (anonymously) in Ed. ← *course staff will monitor forum (may answer or share with class)*

Electronic devices. Permitted *only* to support lecture.

viewing slides, taking notes, iClickers, …

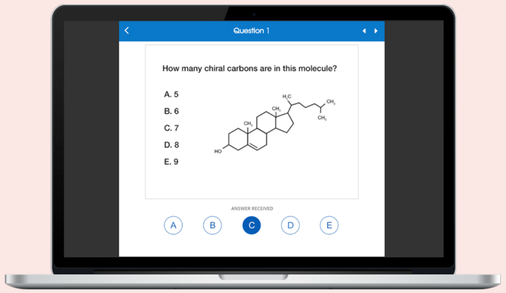
Intro to COS 126: quiz 1

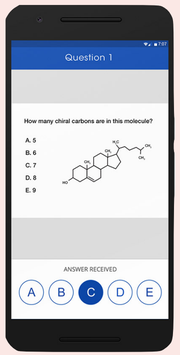
iClicker. To earn participation credit:

- Create iClicker Cloud account. ← *use Canvas-preferred email*
- Register for course.
- Answer multiple choice questions during lecture.

https://www.iclicker.com

Which iClicker device are you using?





A. Web

B. iPhone

C. Android

Precepts

Active learning. Discussion, problem solving, pair programming, …

- 50-minute precepts.
- 80-minute precepts.

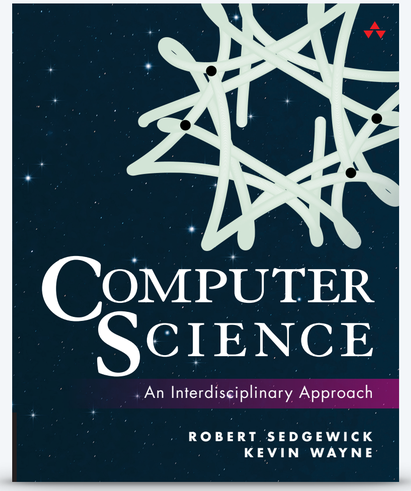
← *same content; different pace*

- Raspberry Pi precept (P13).

if interested, see Prof. Alan Kaplan after class

Course textbook

Textbook readings (required). *Computer Science: An Interdisciplinary Approach*
by R. Sedgewick and K. Wayne, Addison-Wesley Professional, 2016.



Grading A+

Programming assignments (37.5%). Assigned weekly.

Final project (7.5%). Capstone programming assignment.

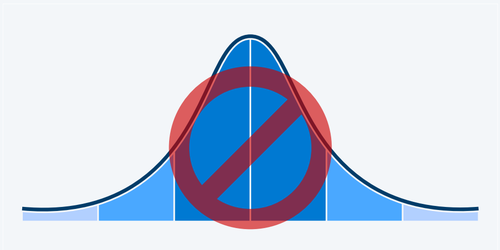
Exams (50%).

- Two written exams.
- One programming exam.

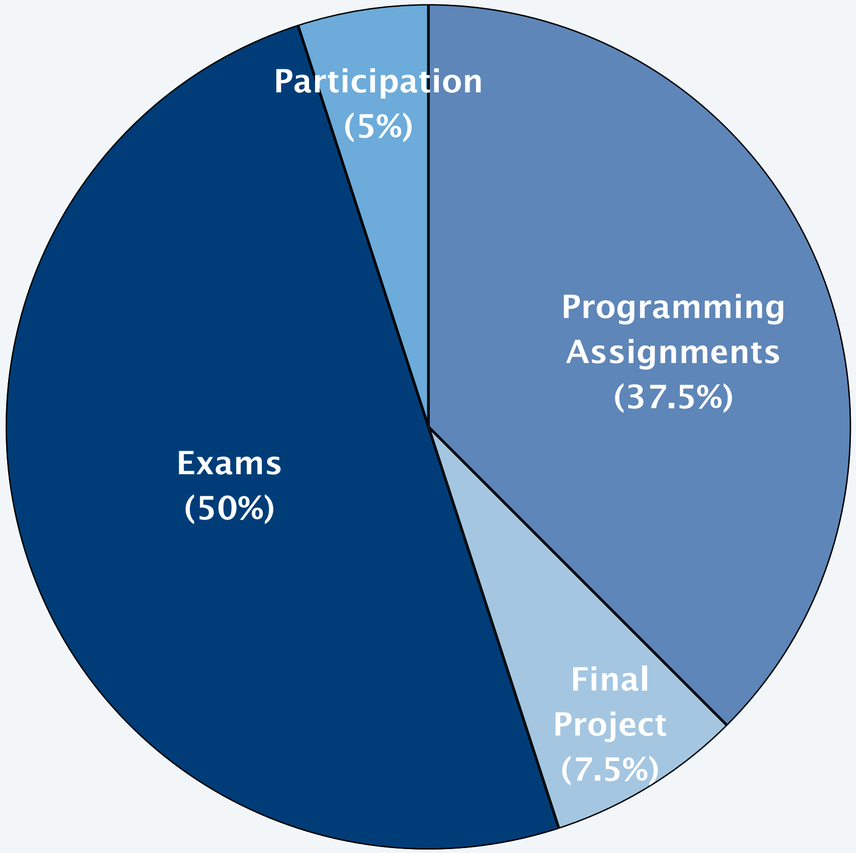
← *during lecture time slot (mark your calendars)*

Participation (5%). Participate in lectures/precepts.

Course grades. Uncurved (no rounding).



grade	percentage
A	93.00
A–	90.00
B+	87.00
⋮	⋮



Programming assignments

Programming. An essential part of the experience in learning CS.

Desiderata.

- Illustrate a fundamental CS concept.
- Apply a new programming construct.
- Highlight the role of computation in an important domain.
- You solve the problem from scratch, on your own computer!

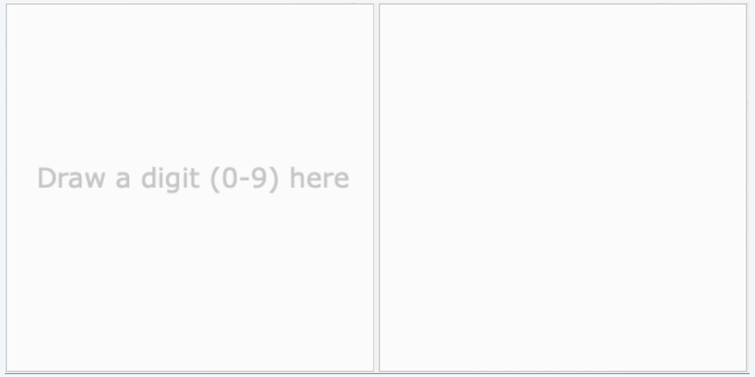
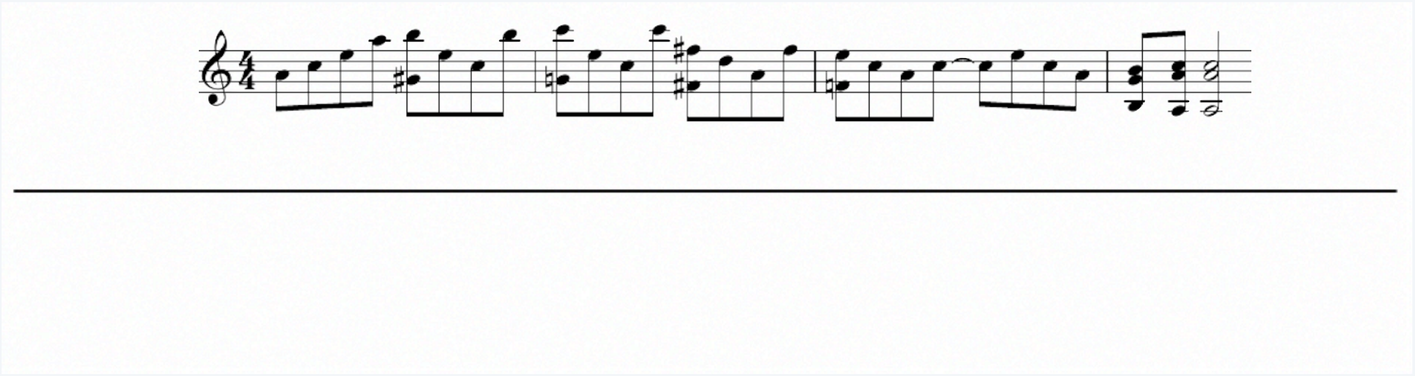


Image Classifier
(assignment 6)



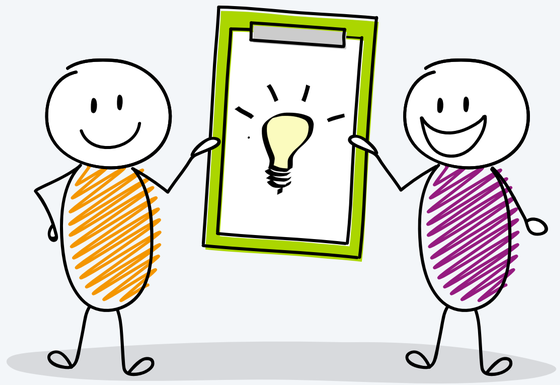
Guitar Hero
(assignment 7)

Programming assignments: collaboration policies

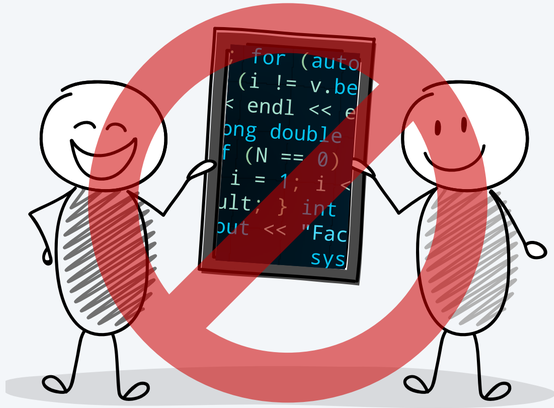
Executive summary.

- Do discuss concepts with others.
- Do acknowledge any collaboration with others.
- Do partner with a classmate (on designated assignments).
- Do not copy code from others (or generative AI tools).

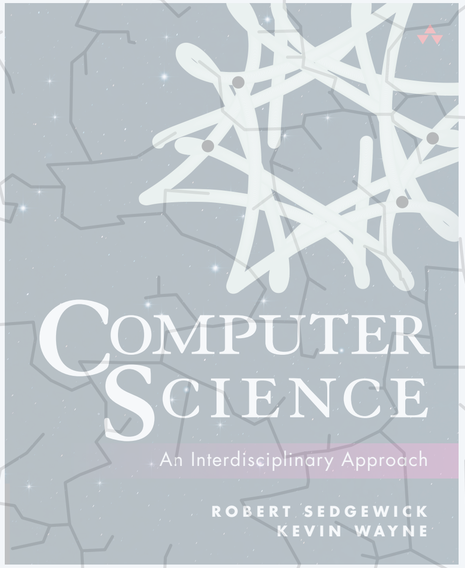
Full details. See course syllabus.



share ideas



not code



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COS 126, FALL 2024

- *digital revolution*
- *course mechanics*
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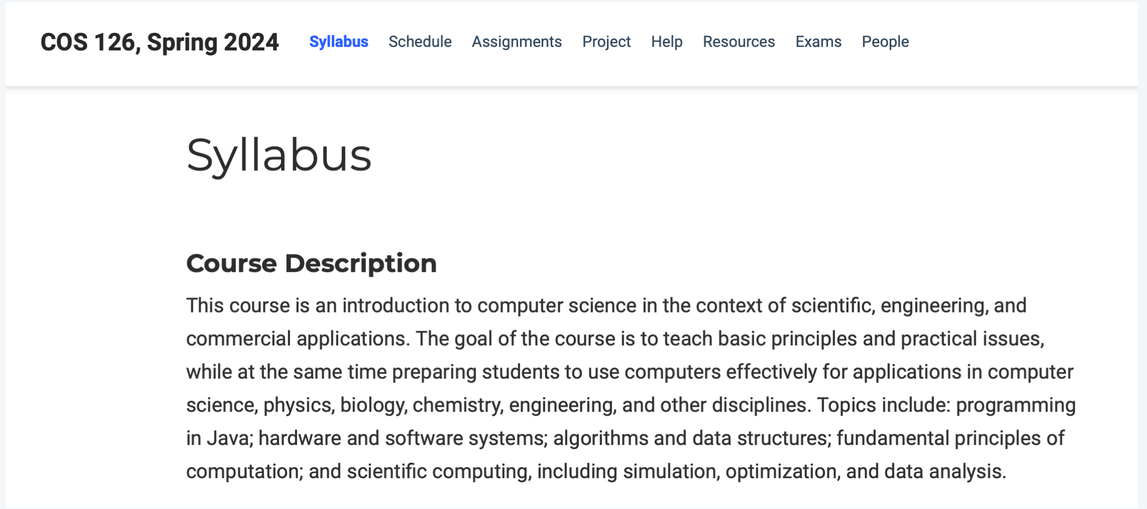
Resources (web)

Course website.

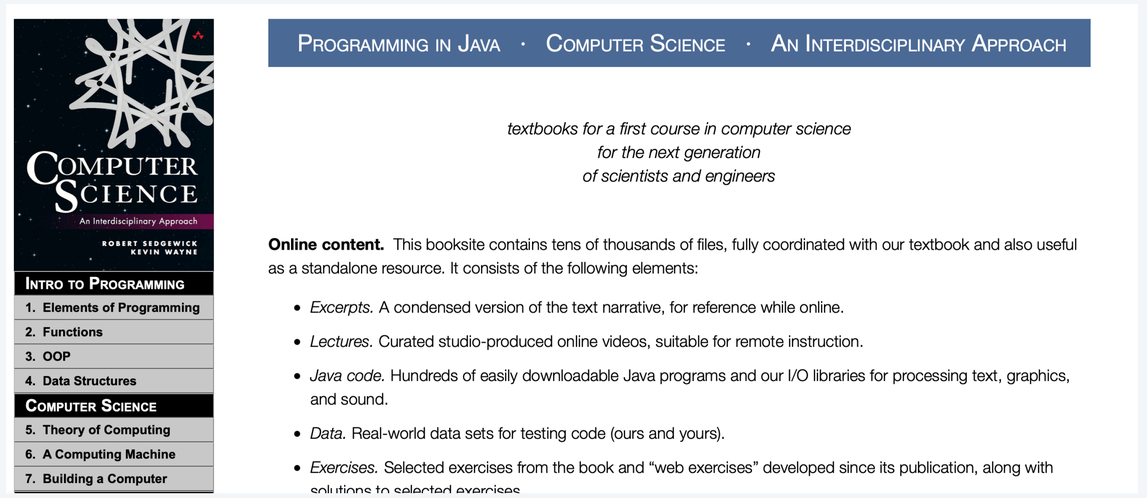
- Syllabus and course policies.
- Lecture slides.
- Programming assignments.
- Exam archive.
- Getting help.
- …



https://www.princeton.edu/~cos126

Booksite.

- Download code from book.
- Brief summary of content.
- For use while online.



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Resources (people)

Ed Discussion forum. ⟵ *please use Ed, not email*

- Quick questions.
- Read Ed Discussion FAQ for etiquette.

https://edstem.org/us/courses/60428

Office hours. ⟵ *protip: attend*

- Longer discussions.
- See course website for schedule.

https://www.princeton.edu/~cos126

Intro COS Lab. ⟵ *opens Friday*

- Run by undergrads.
- For help with debugging.

https://introlab.cs.princeton.edu

McGraw group drop-in study halls.

- Led by undergrads.
- For help with concepts.

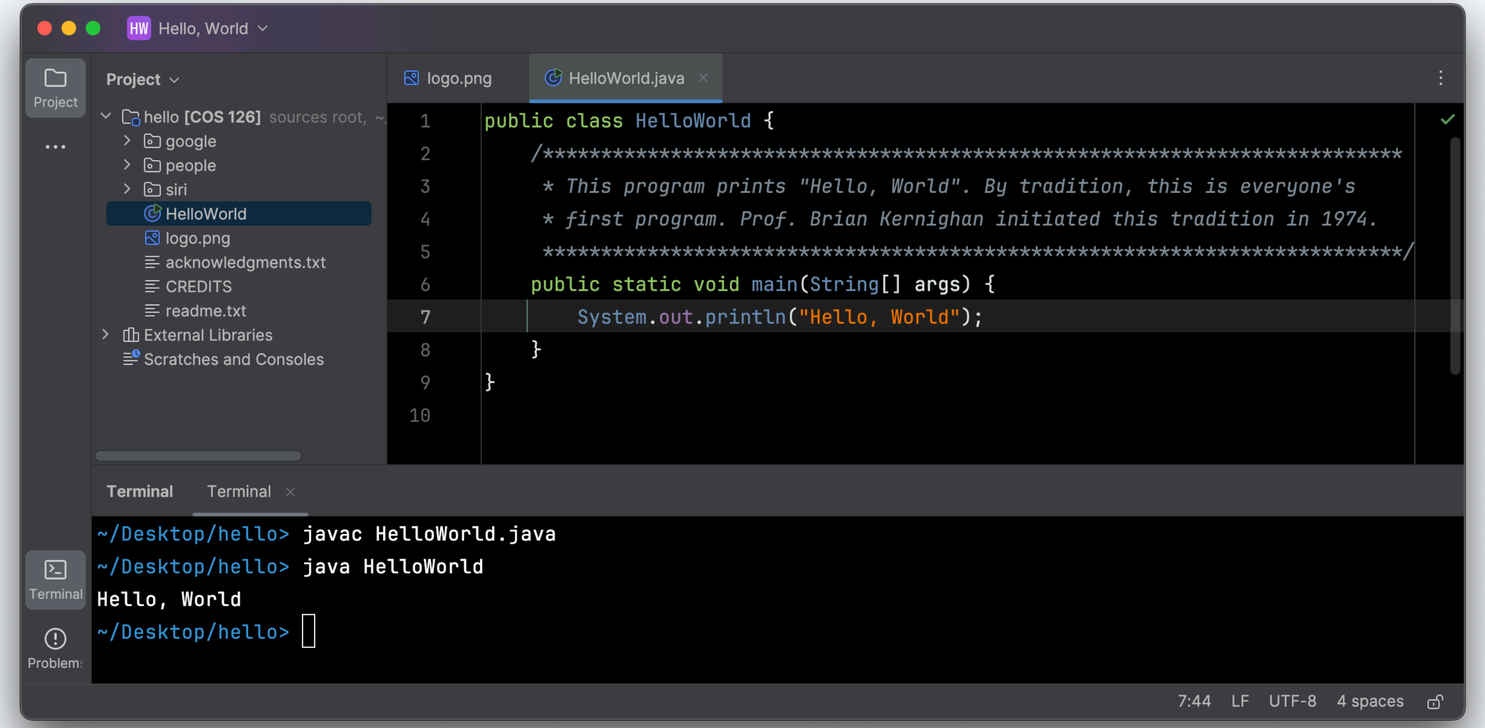
The McGraw Center *for Teaching & Learning*

https://mcgraw.princeton.edu/undergraduates

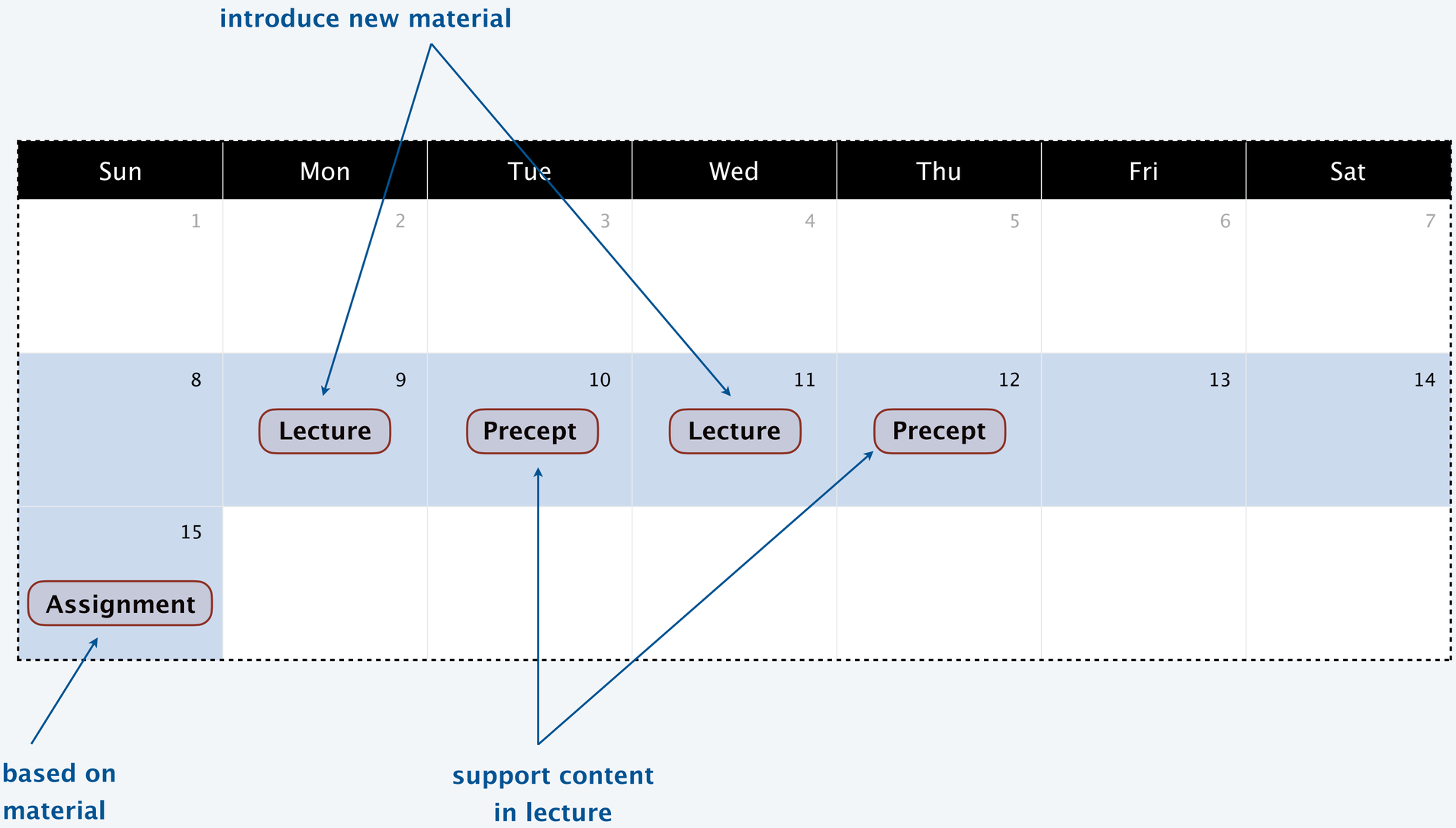
Resources (programming environment)

Recommended IDE. Custom IntelliJ 2024.2 environment. ← *use our fall 2024 version (see lab TAs for troubleshooting)*

- Embedded Bash terminal.
- Autoformat, autoimport, autocomplete, …
- Continuous code inspection.
- ~~AI assistant.~~ ← *not in this course*
- …



A typical week



Q&A

raise your hand and ask

or ask anonymously on Ed
(use ❤️ to upvote)

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