

COMPUTER SCIENCE

126

Fall 2025



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



PRINCETON
UNIVERSITY

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Daniel Williams



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Abhishek Joshi

FINE PRINT

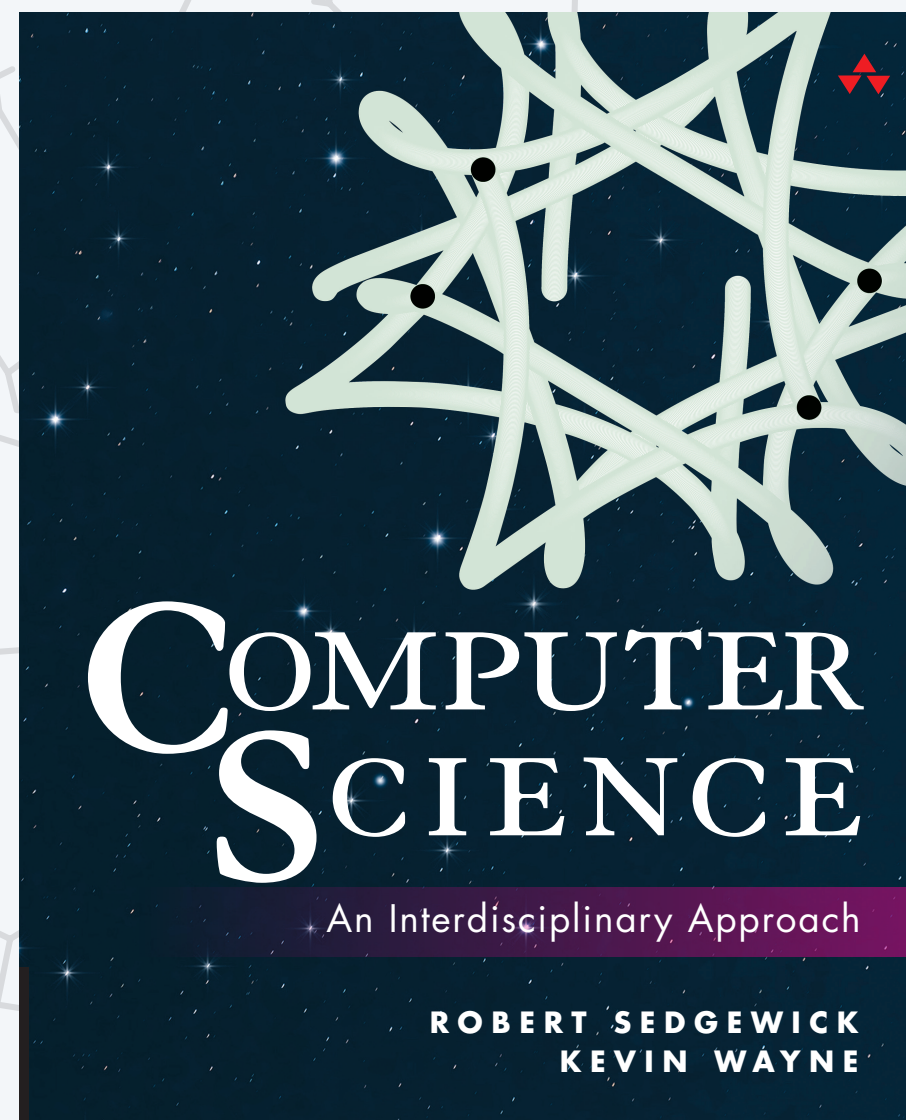


Lecture slides available from Schedule page on course website:

<https://www.cs.princeton.edu/courses/cos126/schedule>

We will be recording lectures and posting in Canvas.

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



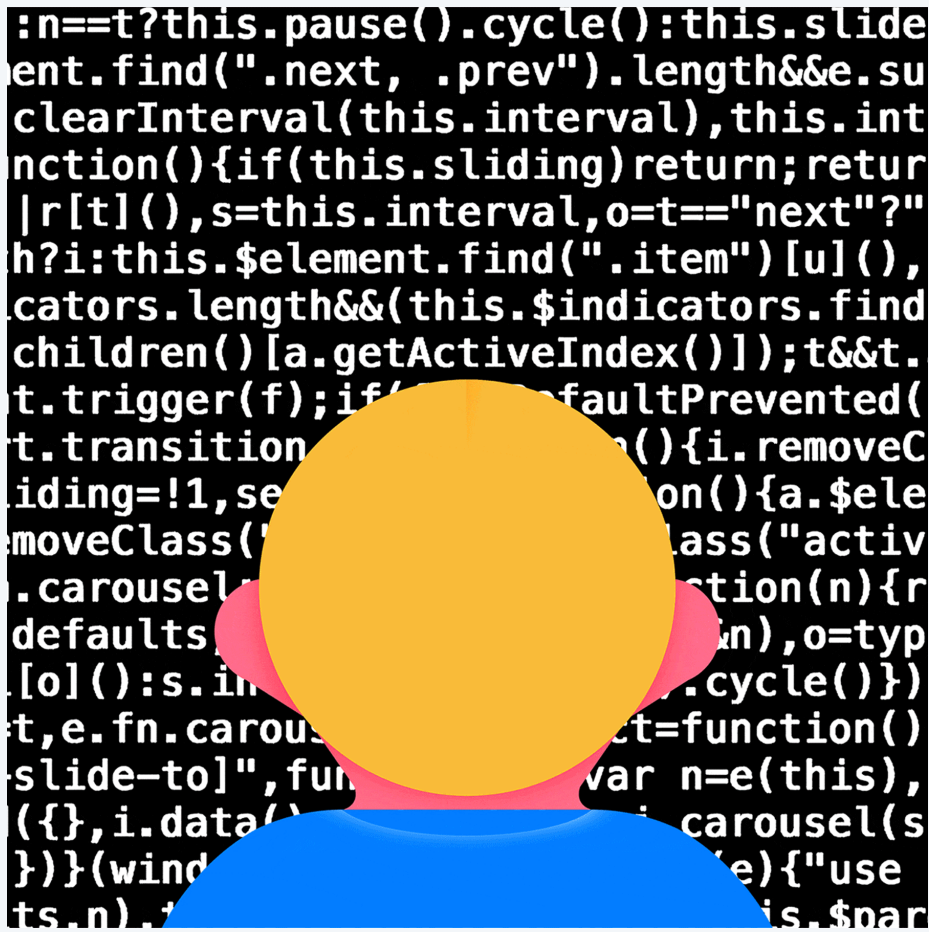
<https://introcs.cs.princeton.edu>

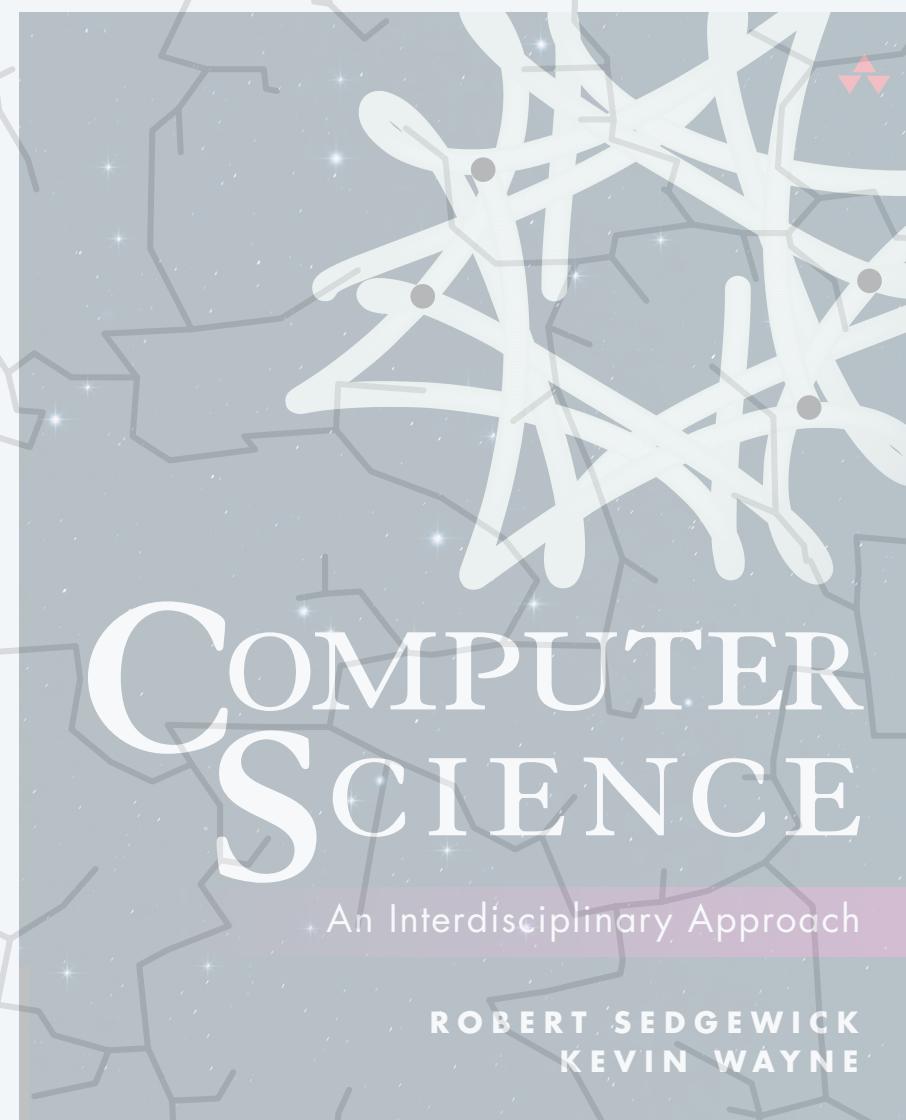
COS 126, FALL 2025

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

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





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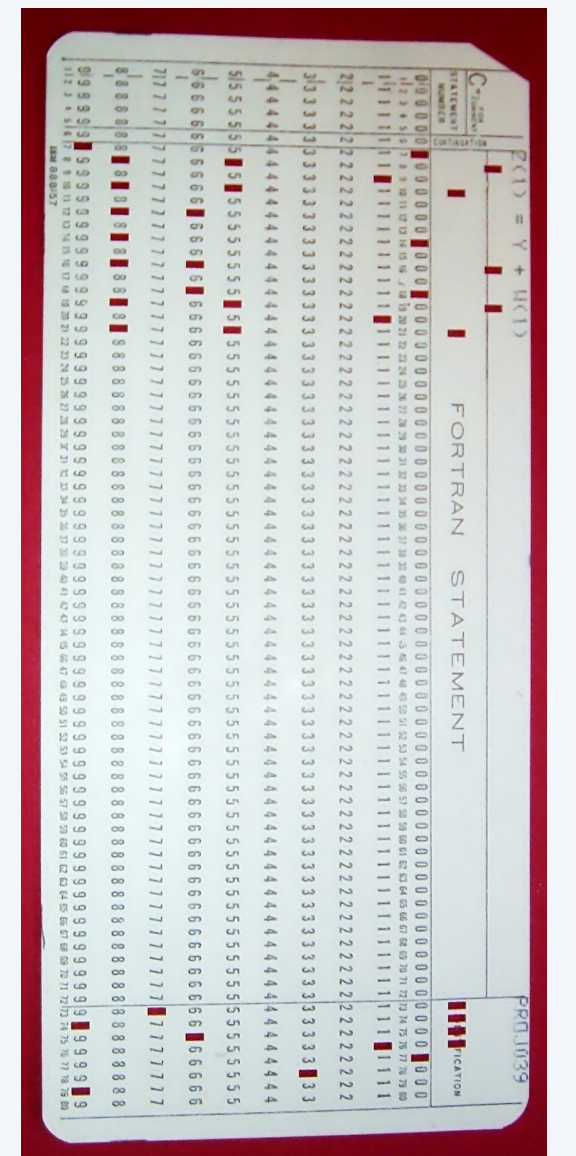
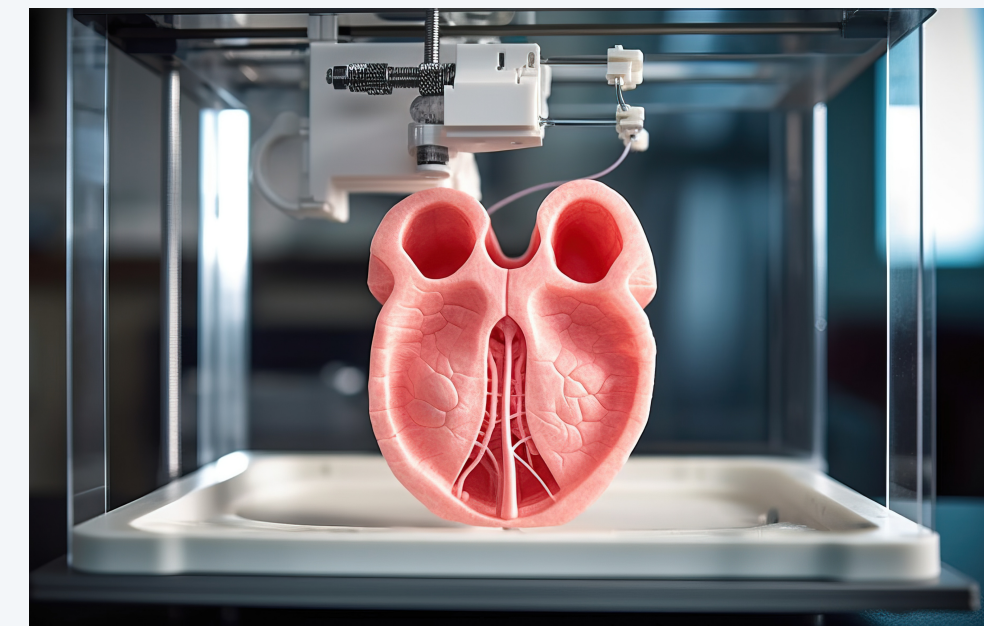
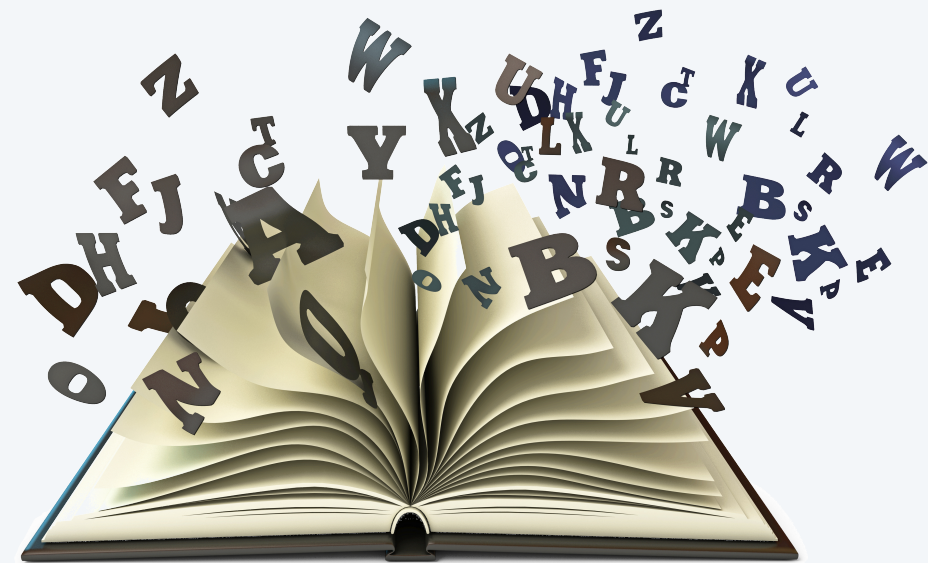
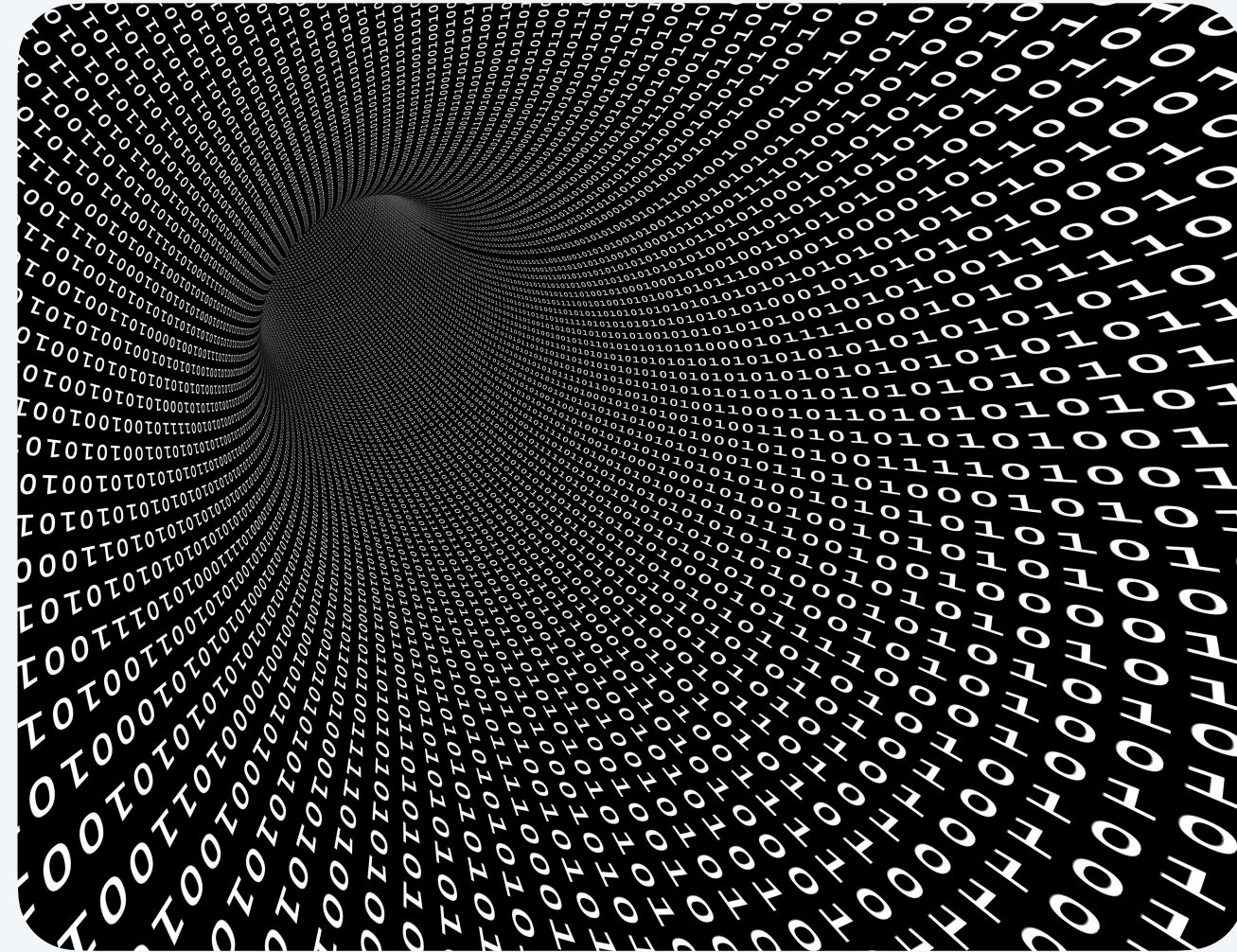
COS 126, FALL 2025

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

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

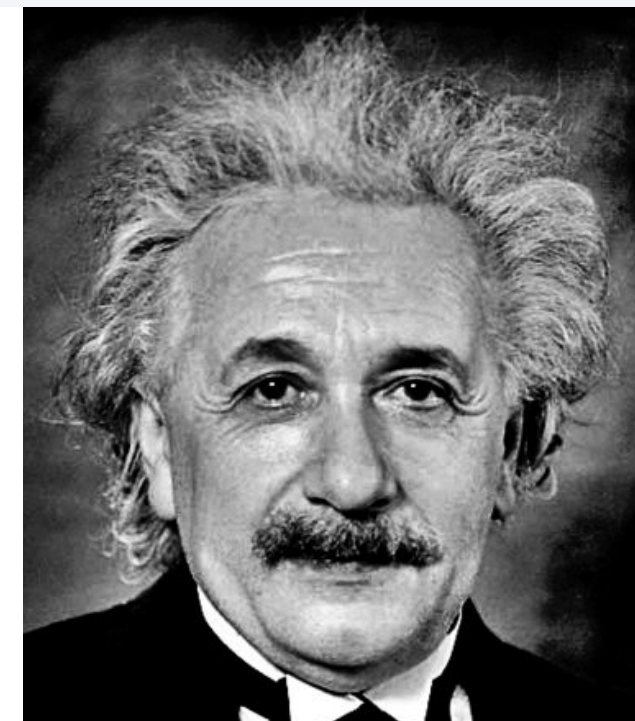
Key idea. “Everything” can be encoded as a sequence of **bits** (0s and 1s).

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

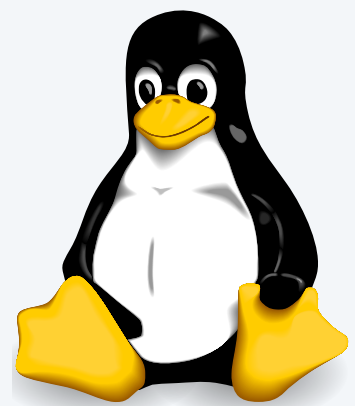
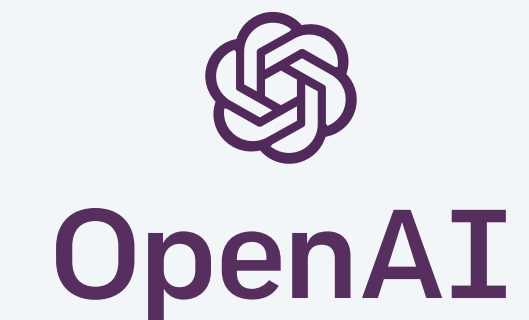


Computers are transforming society

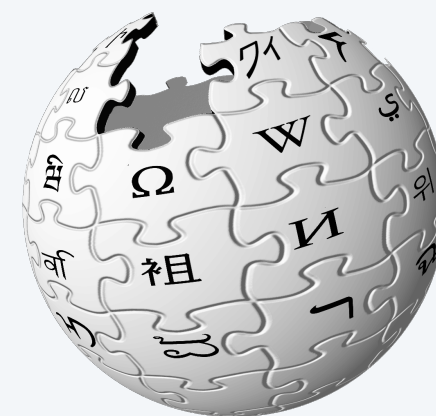
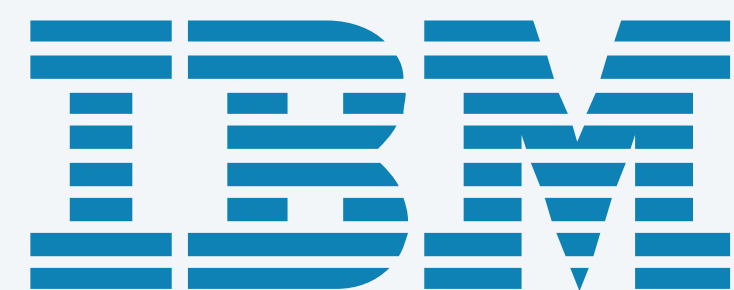
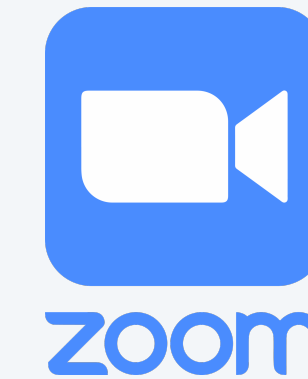
From the way we work ...



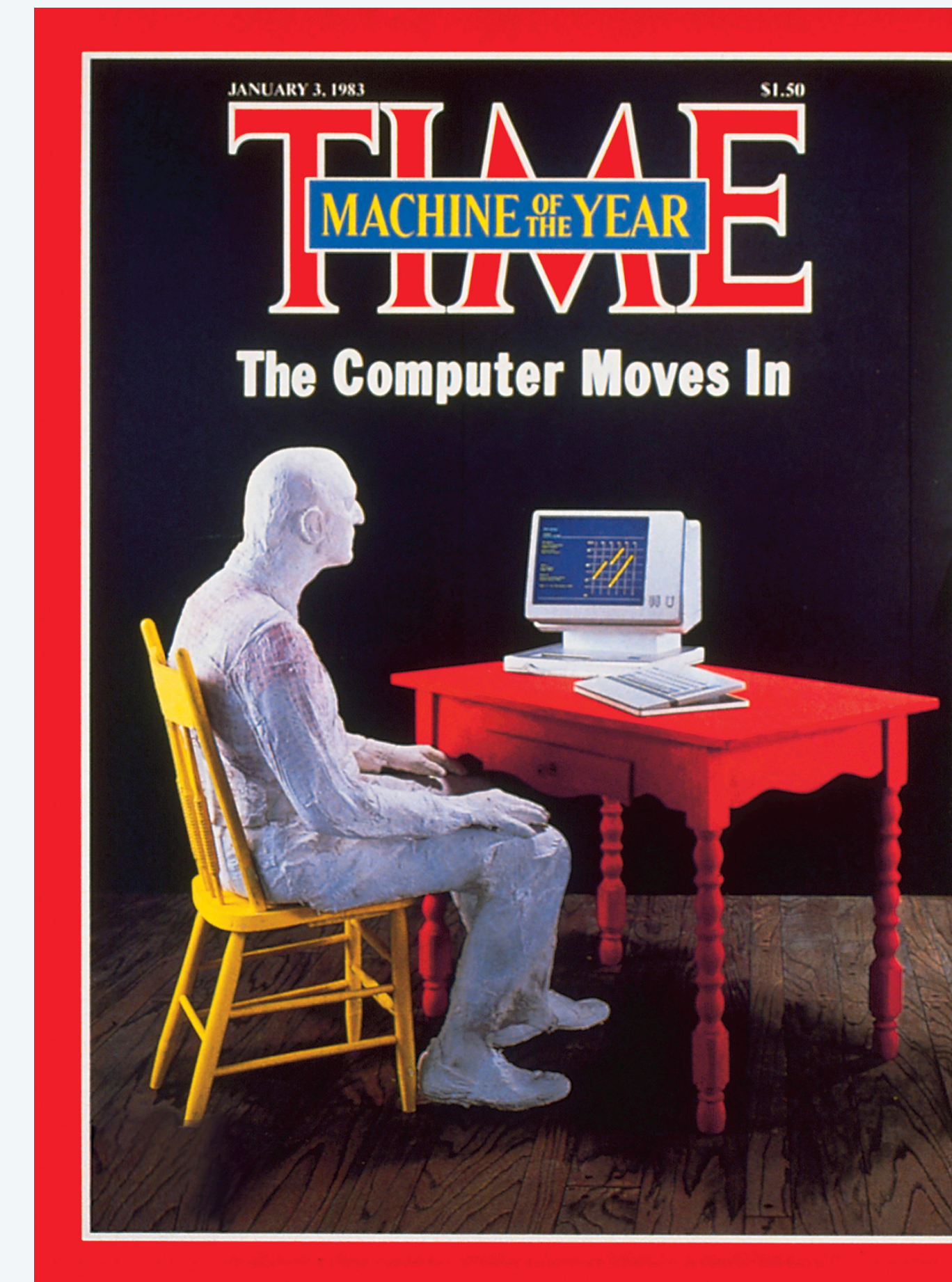
Microsoft[®]



PeopleSoft[®]

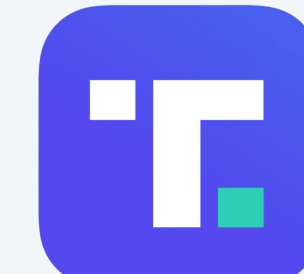
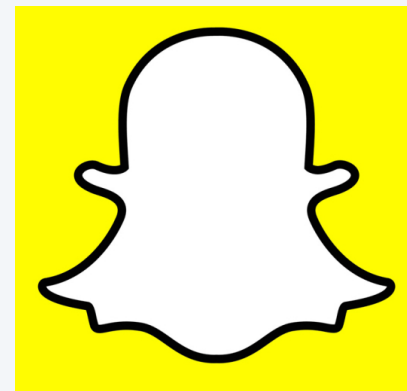
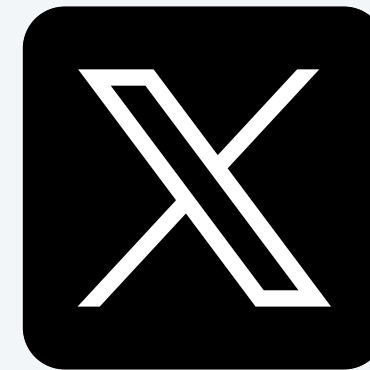


ORACLE[®]



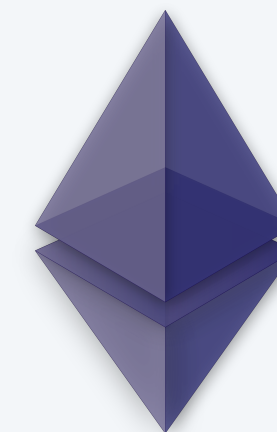
Computers are transforming society

... to the way we live.



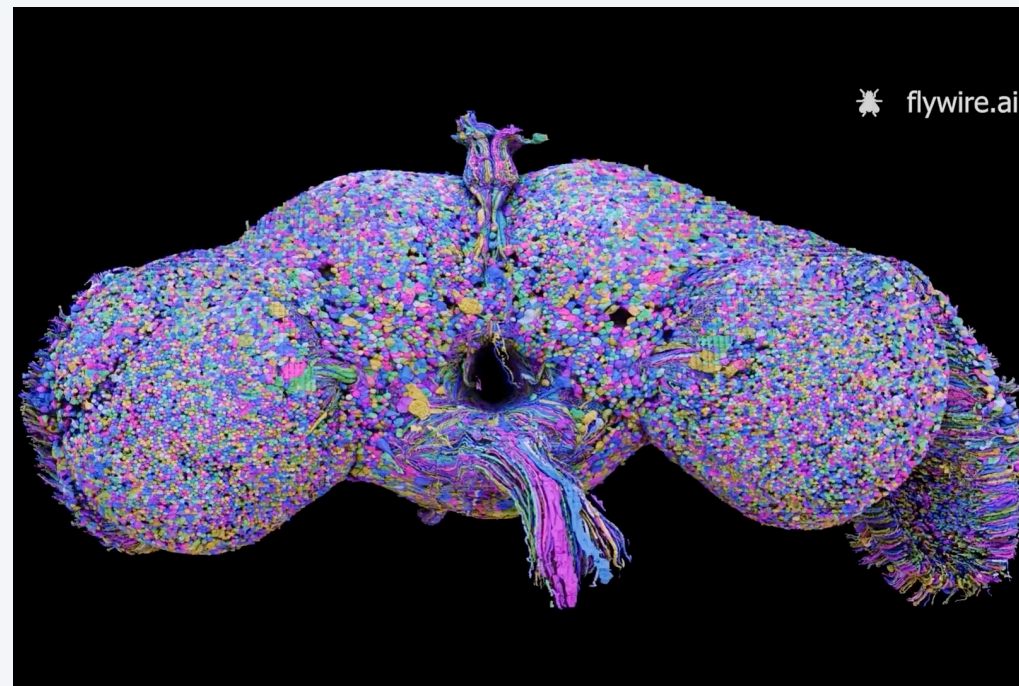
Computers are transforming society

From the “new” economy ...

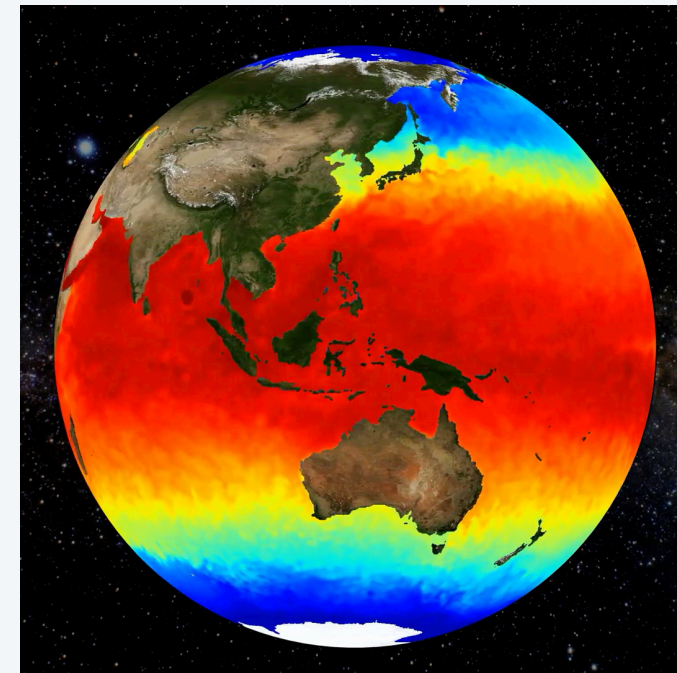


Computers are transforming society

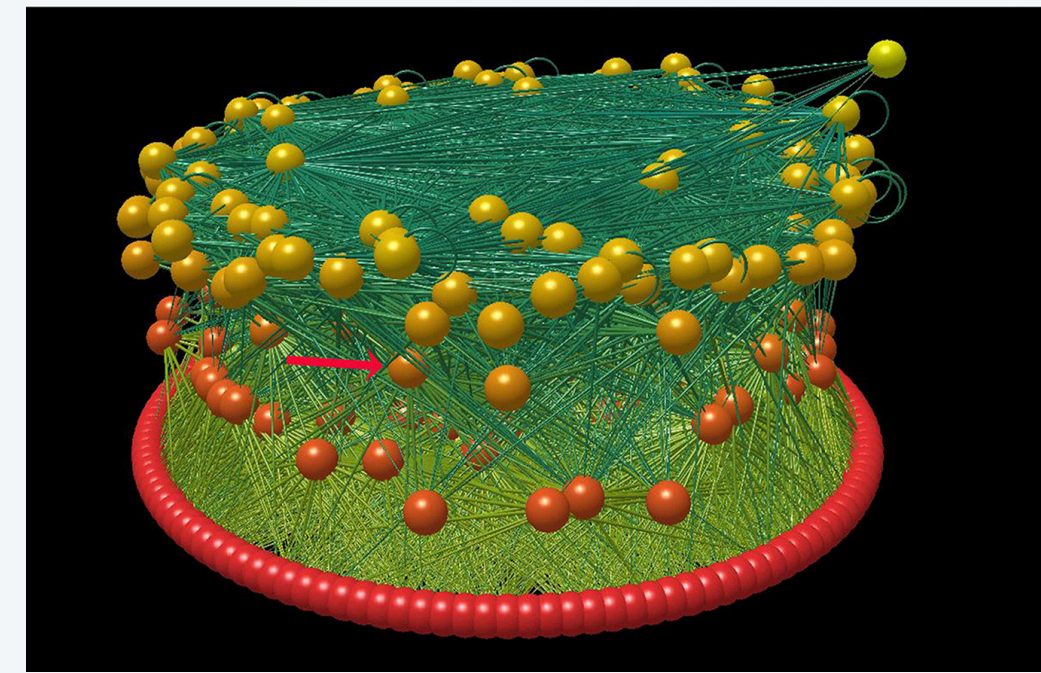
... to the way we do science and engineering.



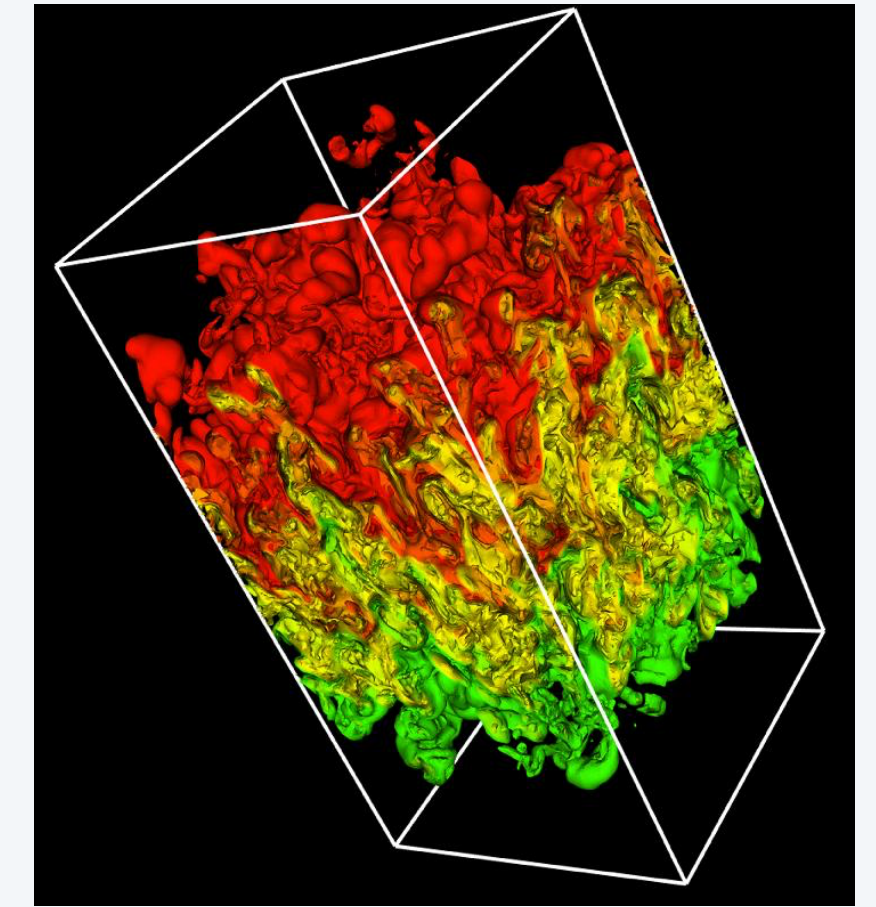
diffusion MRI of brain



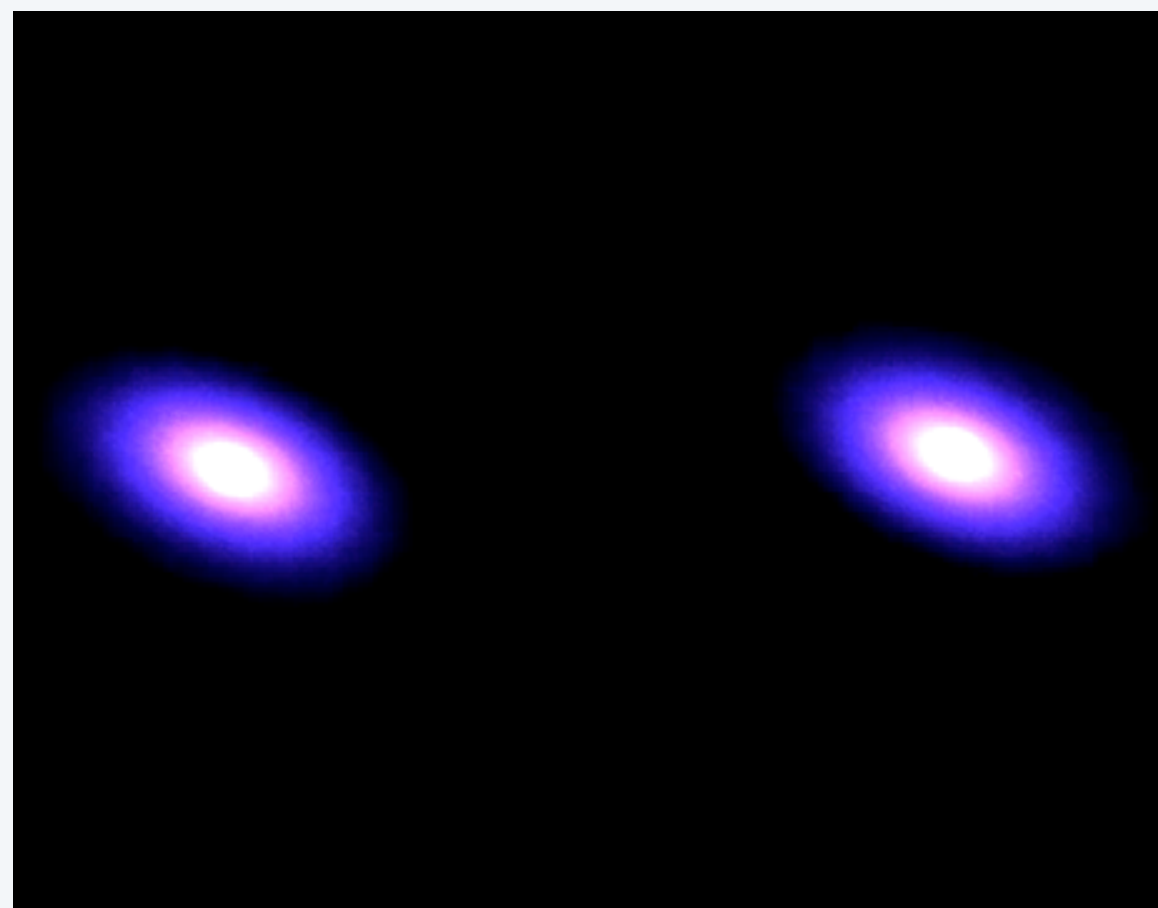
ocean modeling



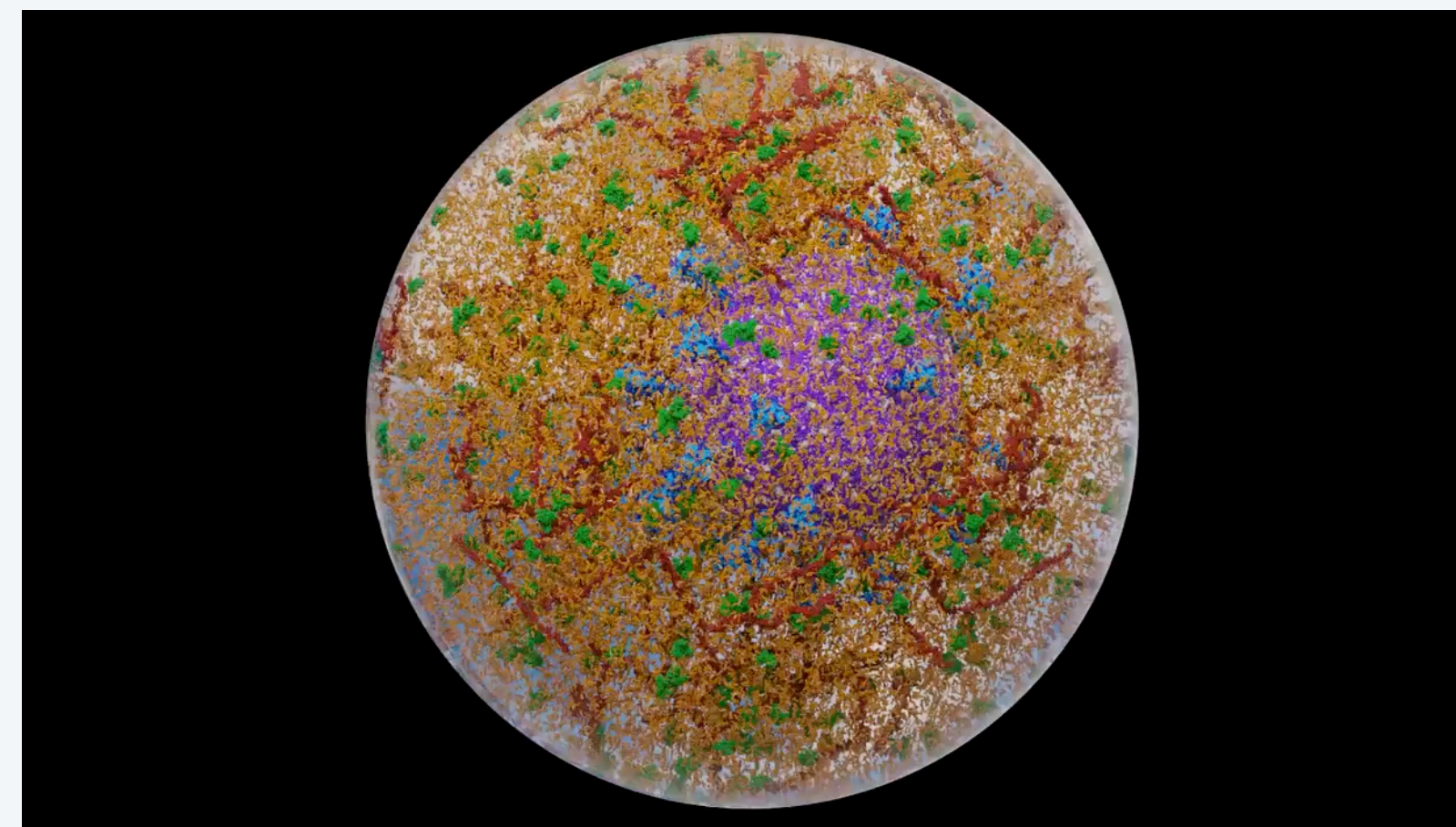
ancestral Pueblo food web



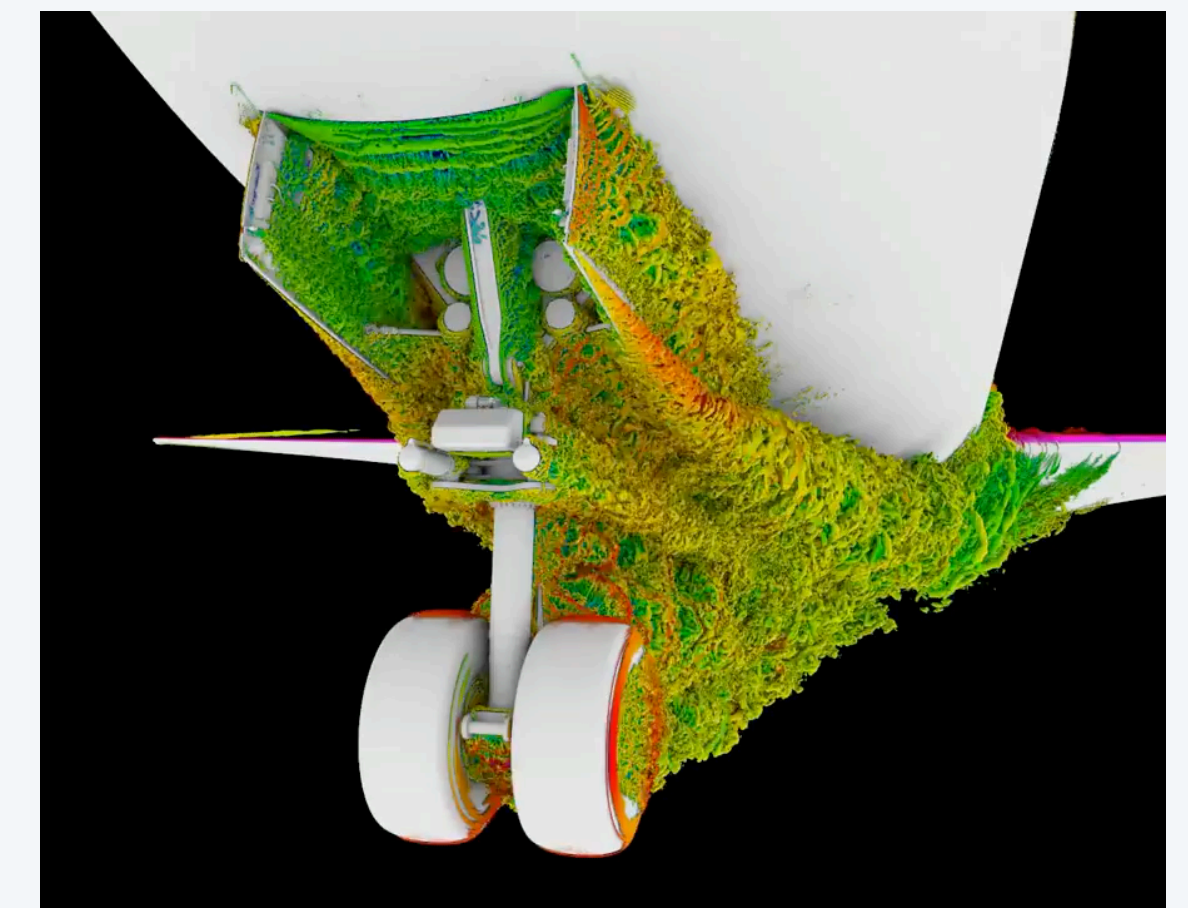
nuclear physics



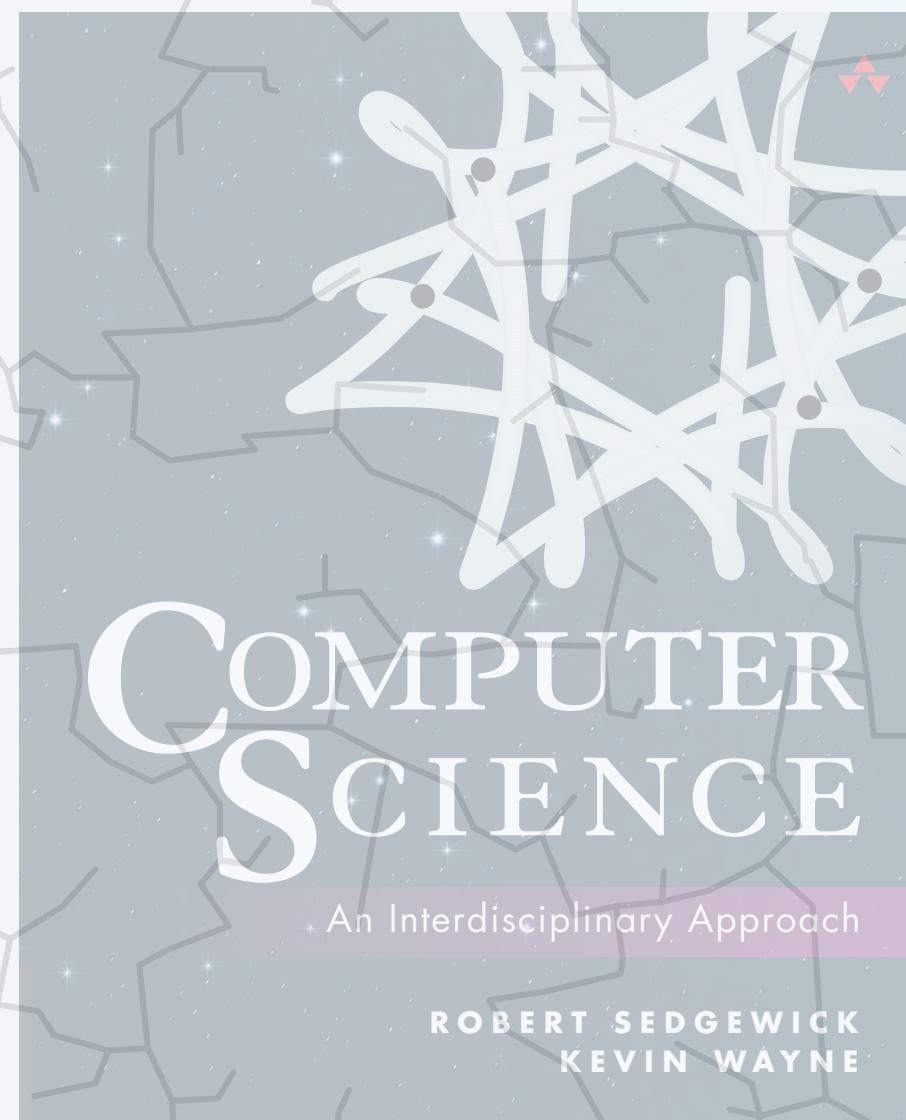
colliding galaxies



an aerosol droplet containing coronavirus



airflow over landing gear



<https://introcs.cs.princeton.edu>

COS 126, FALL 2025

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

Lectures

Live lectures. [MW 1:20–2:40pm] 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



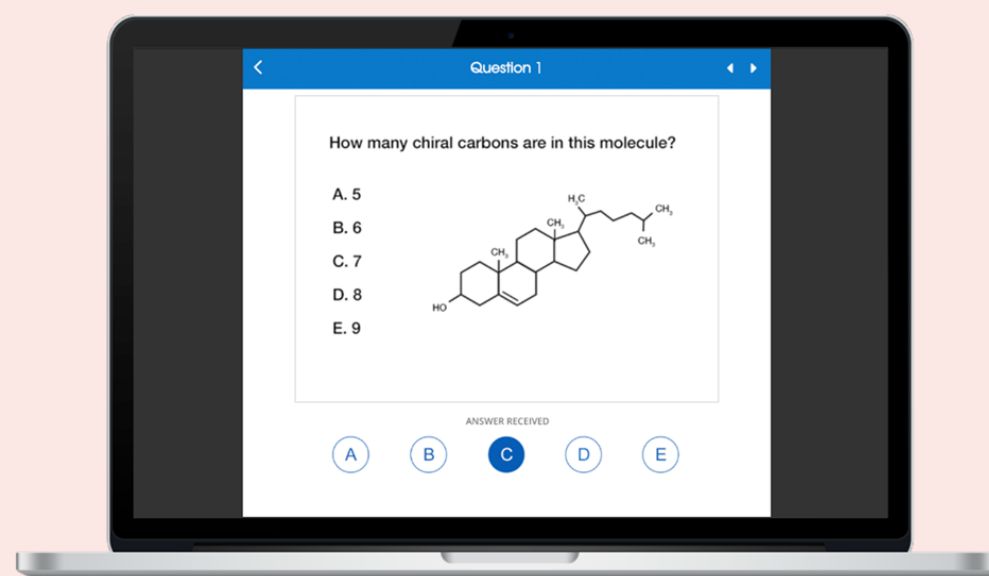
iClicker. To earn participation credit:

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

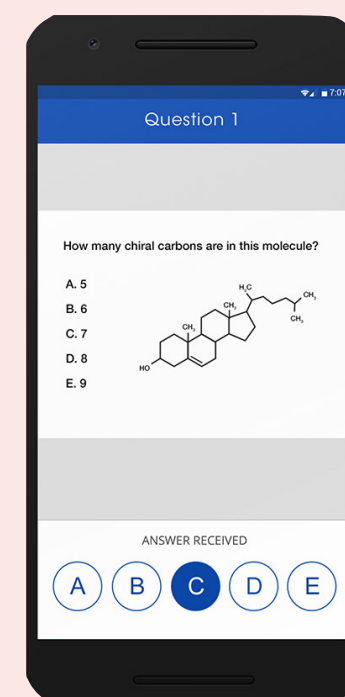


<https://www.iclicker.com>

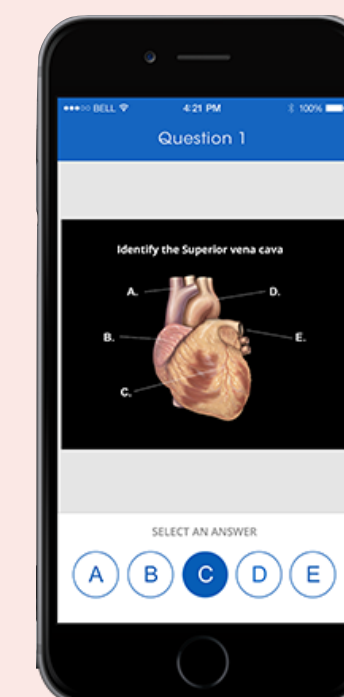
Which iClicker device are you using?



A. Web



B. iPhone



C. Android

Precepts

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

- 50-minute precepts.
- 80-minute precepts.
- Raspberry Pi 🍷 precept (P11).

← *same content; different pace*

↑
*if interested, see
Prof. Alan Kaplan after class*

Assistant Instructors



Sowmya Thanvantri



Ryan Oet



Reva Hirave



Nobline Yoo



Max Gonzalez Saez-Diez



Matthew Munoz



Kylie Zhang



Kara Schechtman



David Shustin



Daniel Williams



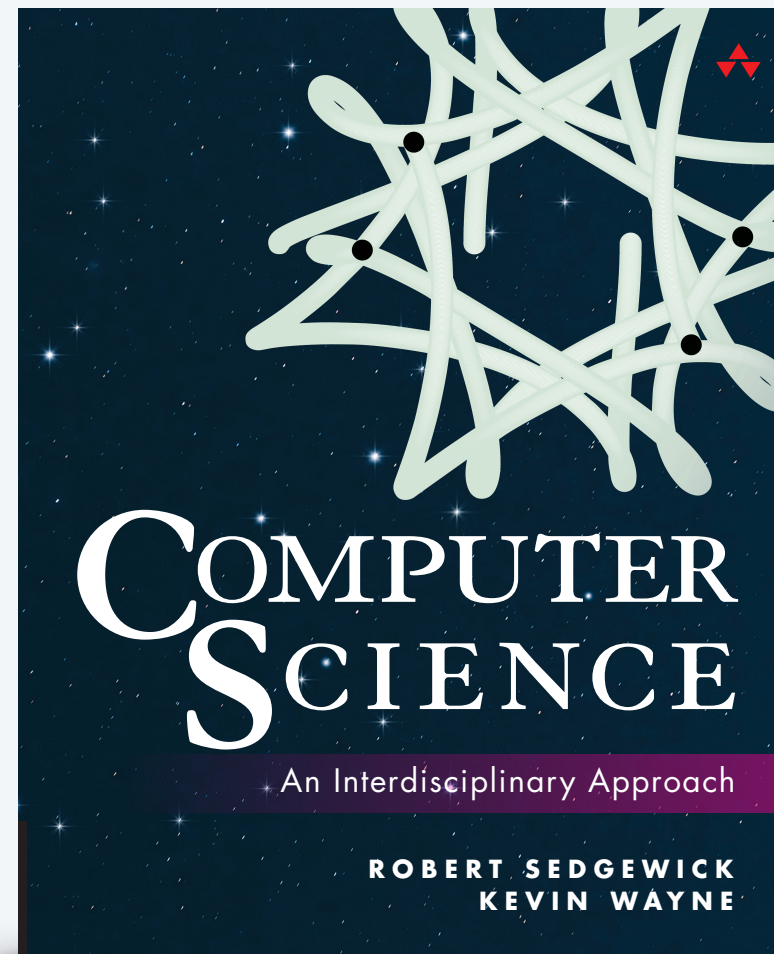
Alan Zhang



Abhishek Joshi

Course textbook

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



Grading

Programming assignments (30%). Assigned weekly.

Final project (5%). Capstone programming assignment.

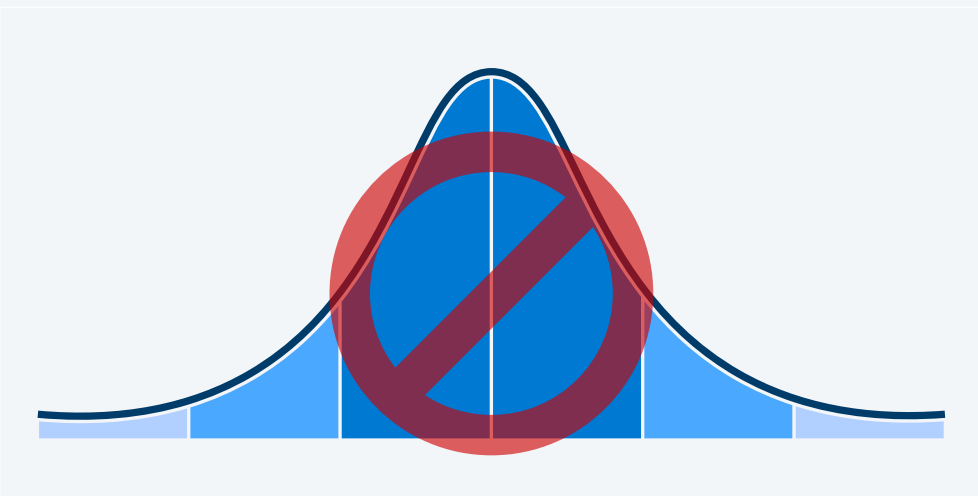
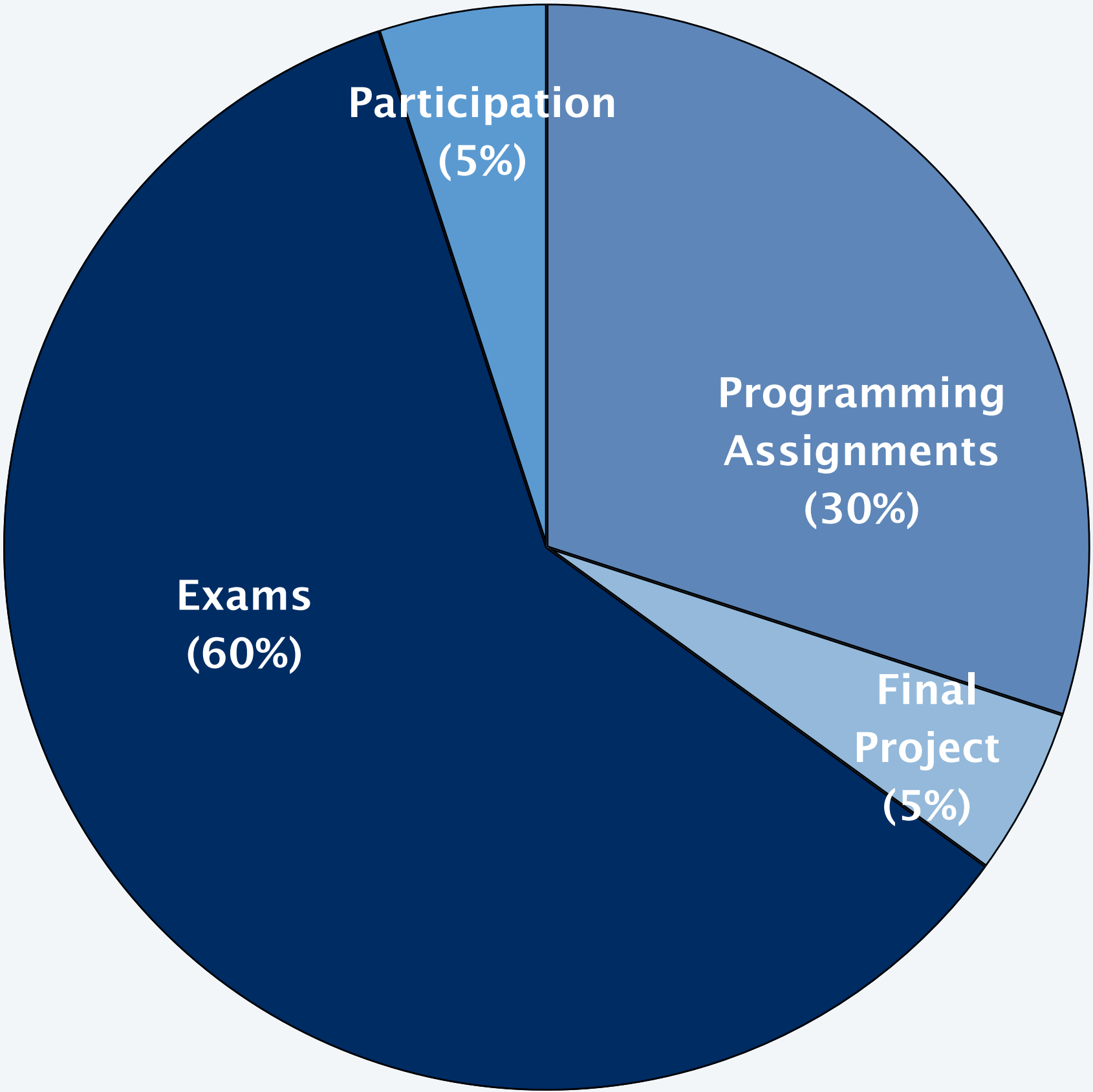
Exams (60%).

- 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. 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!

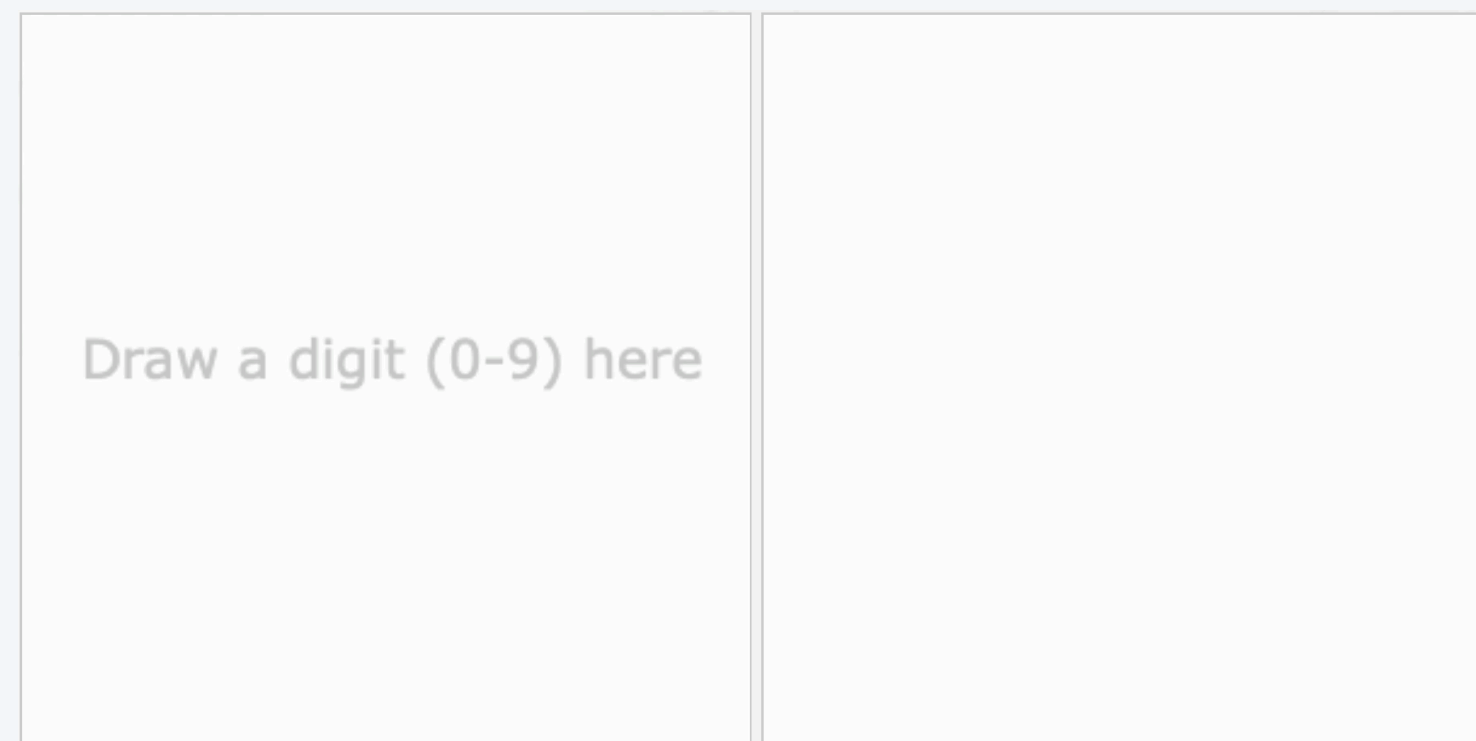


Image Classifier
(assignment 6)



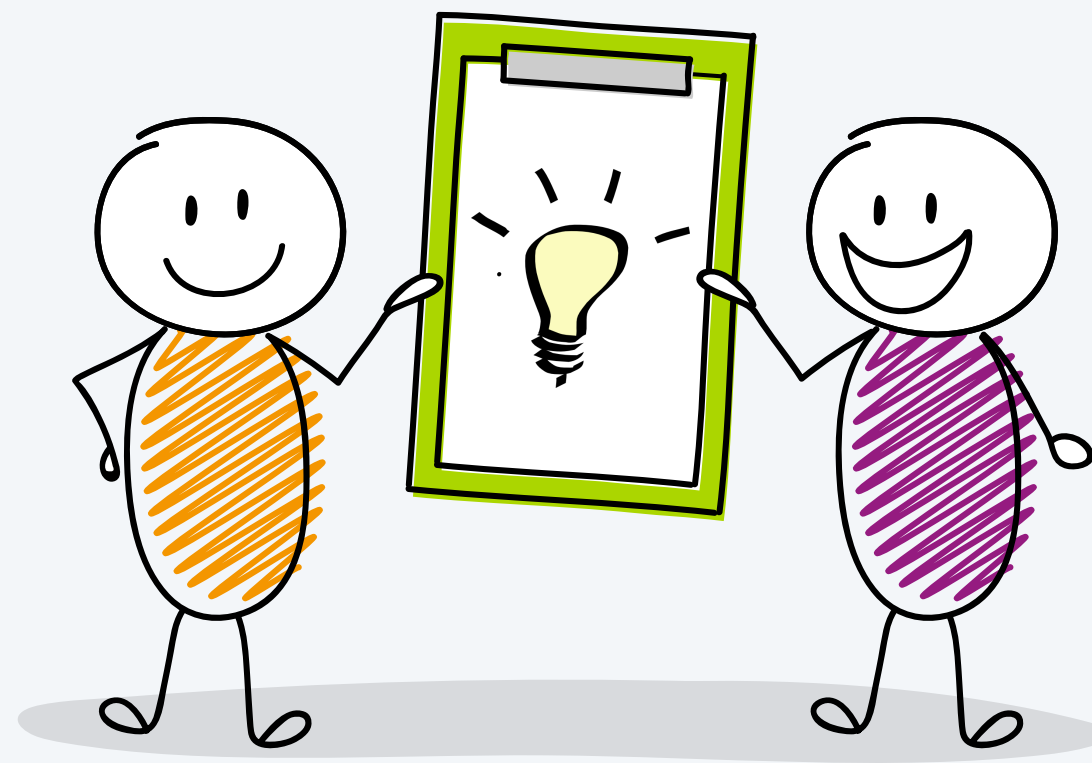
Guitar Hero
(assignment 7)



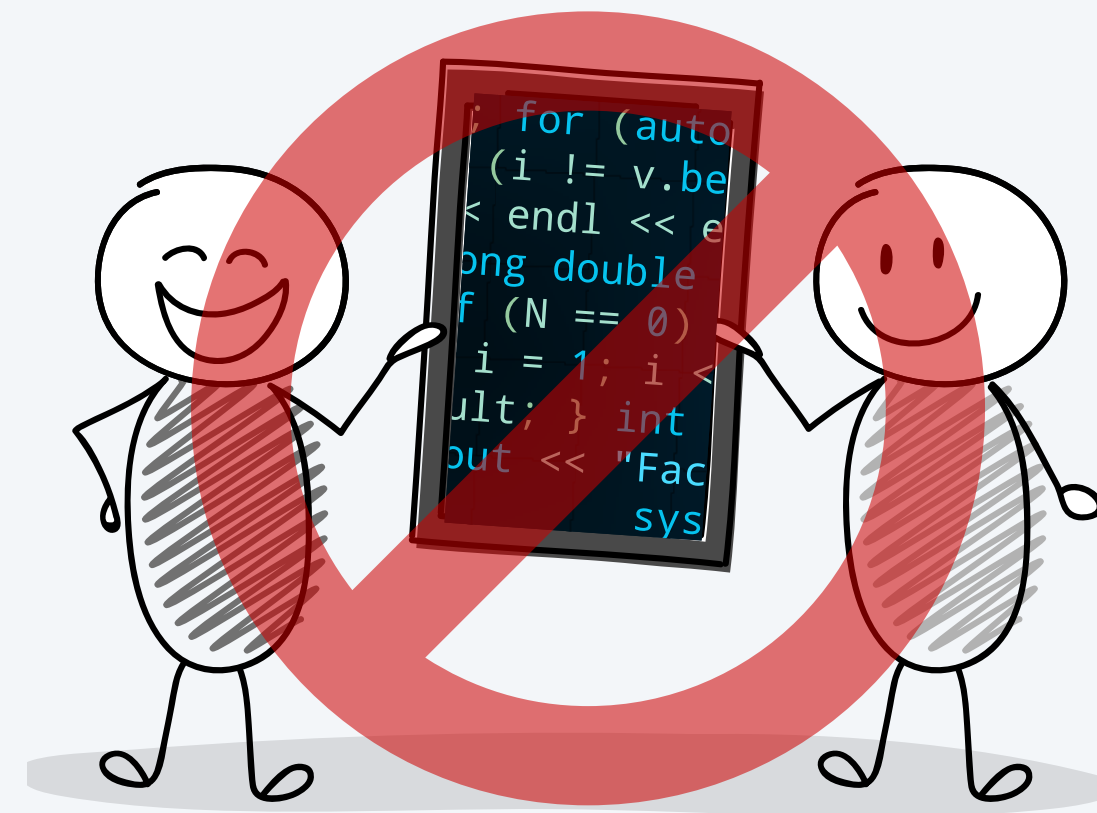
Executive summary.

- **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

Policy on generative AI tools

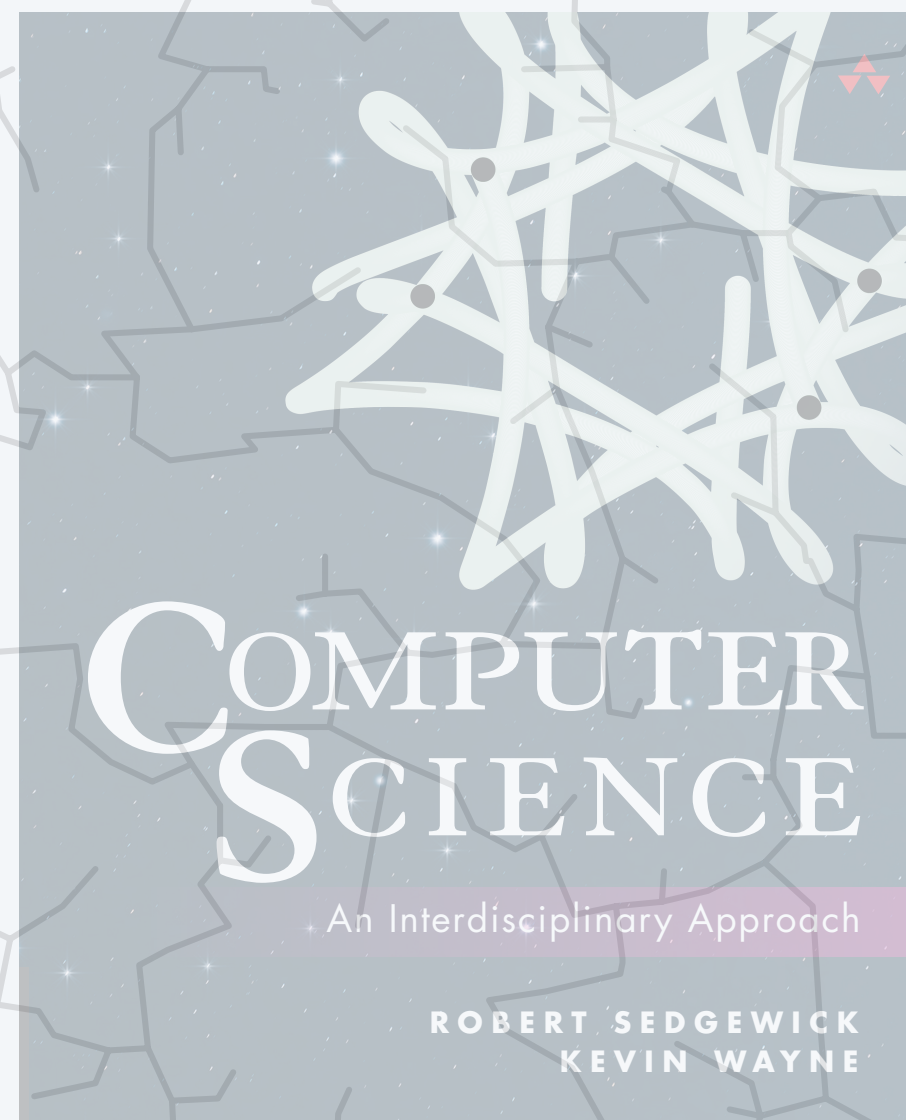
Executive summary.

- **Do not** use generative AI tools **for any purpose** for graded assessments (unless explicitly allowed).

Reasons not to use generative AI (unless permitted):

- Enhance your critical thinking and problem-solving skills.
- Establish a strong foundation in programming (syntax, semantics, design, debugging, data structures, algorithms, performance, and theoretical principles).
- Will use generative AI more effectively in the future by learning to critically evaluate its output.
- Relying on AI-generated code without understanding how it works can lead to significant technical and ethical issues.
- We routinely detect the use of generative AI on assignments and refer these cases to the CoD.

Full details. See course syllabus.



<https://introcs.cs.princeton.edu>

COS 126, FALL 2025

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

Course website.

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

Booksite.

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

COS 126 Fall 2025

SyllabusScheduleAssignmentsProjectHelpResourcesExams

Syllabus

Course Description

This course is an introduction to computer science in the context of scientific, engineering, and commercial applications. The goal of the course is to teach basic principles and practical issues, while at the same time preparing students to use computers effectively for applications in computer science, physics, biology, chemistry, engineering, and other disciplines. Topics include: programming in Java; hardware and software systems; algorithms and data structures; fundamental principles of computation; and scientific computing, including simulation, optimization, and data analysis.

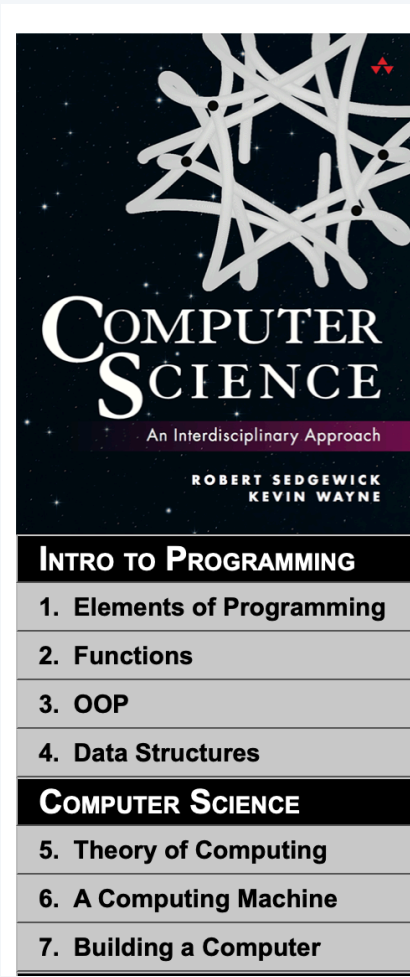
<https://www.princeton.edu/~cos126>

PROGRAMMING IN JAVA · COMPUTER SCIENCE · AN INTERDISCIPLINARY APPROACH

*textbooks for a first course in computer science
for the next generation
of scientists and engineers*

Online content. This booksite contains tens of thousands of files, fully coordinated with our textbook and also useful as a standalone resource. It consists of the following elements:

- *Excerpts.* A condensed version of the text narrative, for reference while online.
- *Lectures.* Curated studio-produced online videos, suitable for remote instruction.
- *Java code.* Hundreds of easily downloadable Java programs and our I/O libraries for processing text, graphics, and sound.
- *Data.* Real-world data sets for testing code (ours and yours).
- *Exercises.* Selected exercises from the book and “web exercises” developed since its publication, along with solutions to selected exercises



INTRO TO PROGRAMMING
1. Elements of Programming
2. Functions
3. OOP
4. Data Structures
COMPUTER SCIENCE
5. Theory of Computing
6. A Computing Machine
7. Building a Computer

<https://introcs.cs.princeton.edu>

Resources (people)

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

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



<https://edstem.org/us/courses/78087>

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.

McGraw group drop-in study halls.

- Led by undergrads.
- For help with concepts.




<https://introlab.cs.princeton.edu>


The McGraw Center
for Teaching & Learning

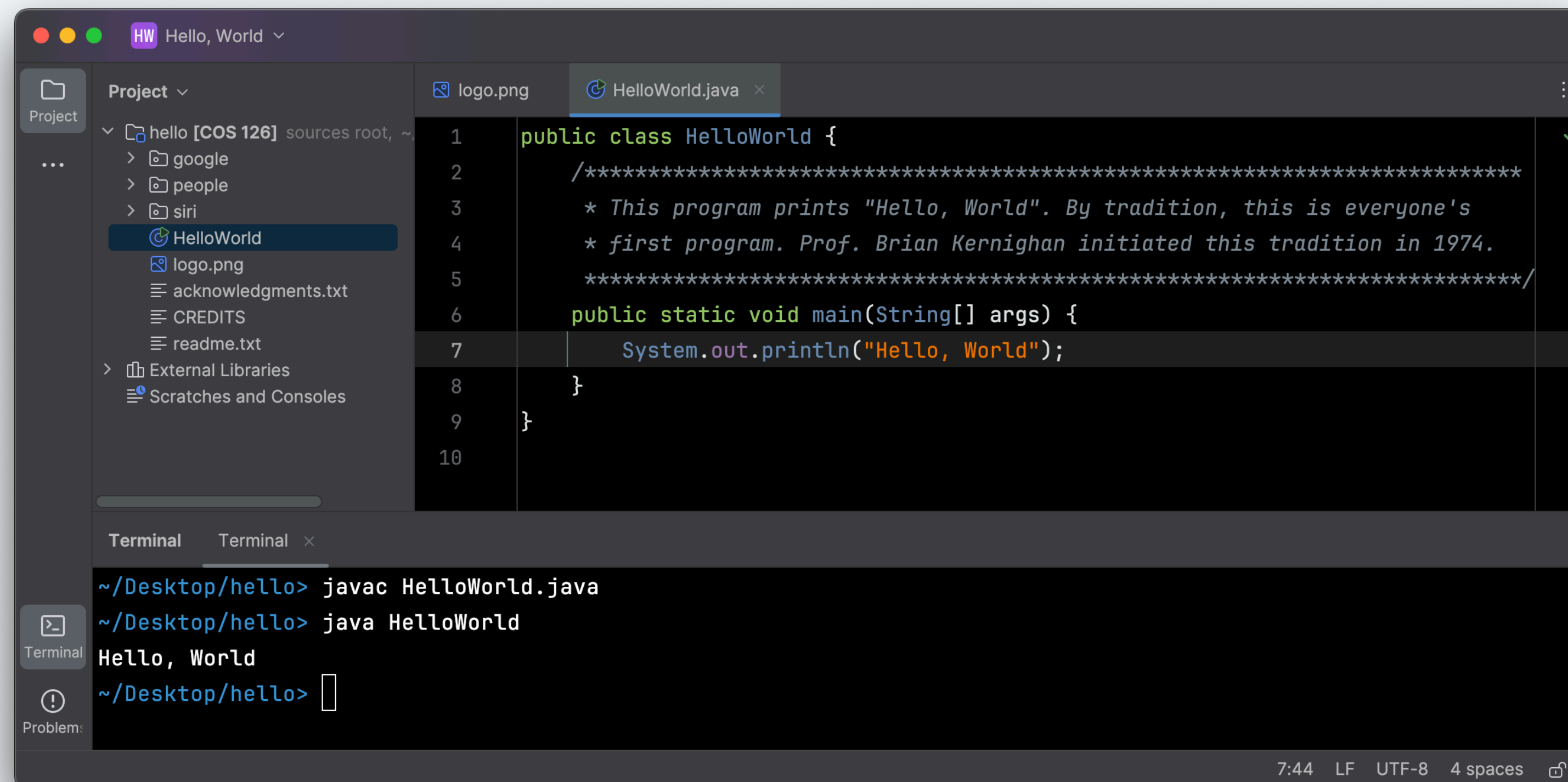









<https://mcgraw.princeton.edu/undergraduates>

Resources (programming environment)

Recommended IDE. Custom IntelliJ 2025.2 environment.  *use our Fall 2025 version
(see lab TAs for troubleshooting)*

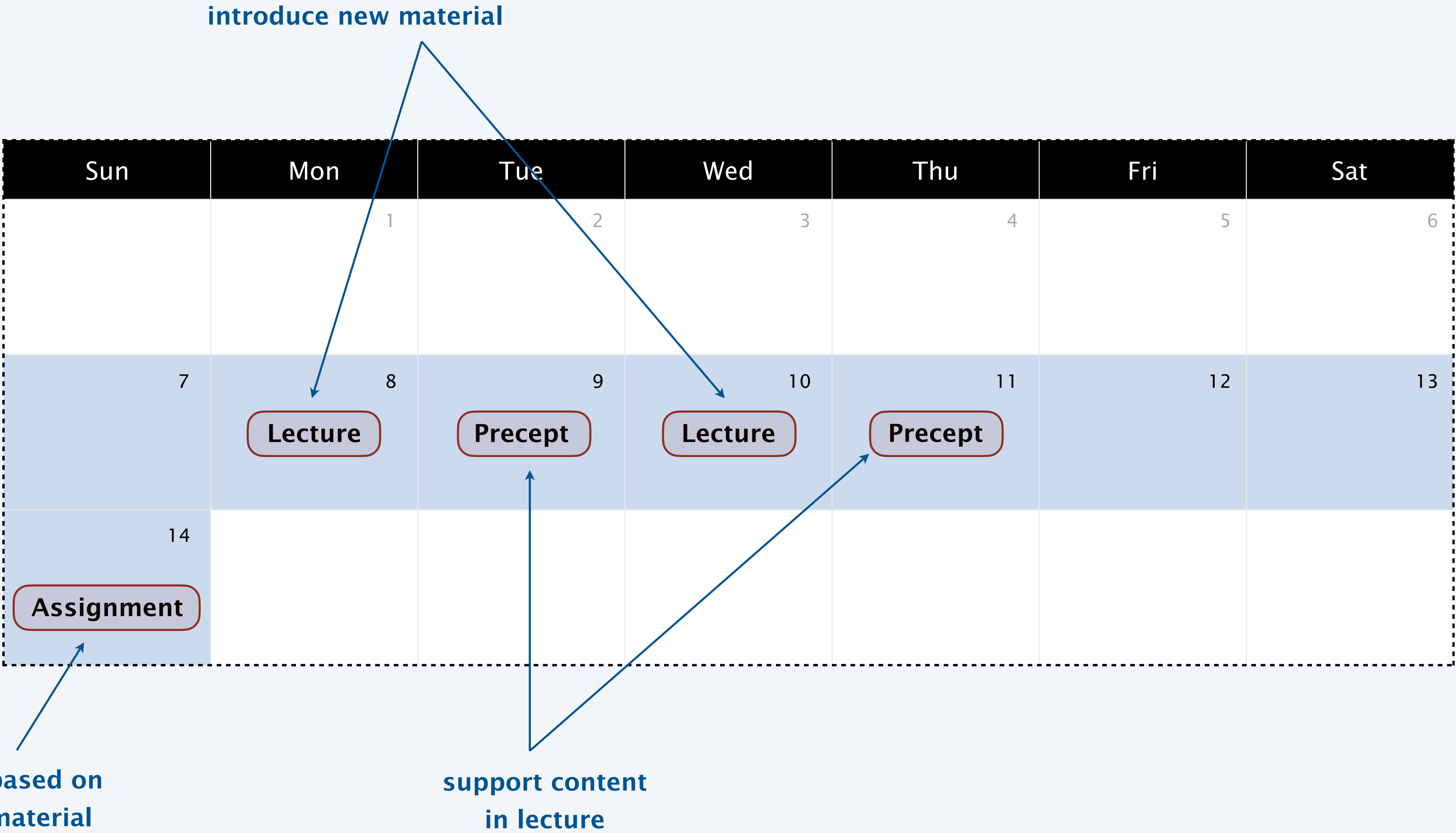
- Embedded Bash terminal.
- Autoformat, autoimport, autocomplete, ...
- Continuous code inspection.
- ~~AI assistant.~~  *not in this course*
- ...



Platform	What
 Ed	<i>discussion forum, precept exercises</i>
 IntelliJ	<i>Java IDE</i>
 TigerFile	<i>programming assignment submissions</i>
 codePost	<i>programming assignment feedback</i>
 Gradescope	<i>written exam feedback</i>
 Canvas	<i>grades, lecture recordings</i>
 iClicker	<i>in-class polls</i>

also use for communication with course staff

A typical week



Announcement: Tech Ethics Action (TEA) seminar starting Wed Sep 10



CENTER FOR
INFORMATION
TECHNOLOGY
POLICY
CITP.PRINCETON.EDU

TECH ETHICS ACTION

PRINCETON STUDENTS ARE LEADERS IN RESPONSIBLE TECHNOLOGY DEVELOPMENT.

Your tech skills can help address bias, privacy loss, tech addiction, and so much more. Join us for a weekly discussion to get the tea, present our own projects, and join forces for good. Bring your ideas and your favorite mug.

WEDNESDAYS
SHERRERD HALL
ROOM 306
SEPT - DEC '25
4:30PM ☕

JOIN THE LIST
TO GET THE TEA





raise your hand and ask



or ask anonymously on Ed
(use ❤️ to upvote)



Credits

media	source	license
<i>Crowd Cheering</i>	<u>YouTube</u>	
<i>Wireframe Tiger</i>	Audrey Cheng '20	by author
<i>Programmer</i>	<u>Wall Street Journal</u>	
<i>Albert Einstein</i>	<u>Wikimedia</u>	<u>public domain</u>
<i>Binary Tunnel</i>	<u>Adobe Stock</u>	<u>education license</u>
<i>Open Book with Letters</i>	<u>Adobe Stock</u>	<u>education license</u>
<i>Panda in Snow</i>	<u>Smithsonian National Zoo</u>	<u>public domain</u>
<i>DNA Sequencing</i>	<u>Adobe Stock</u>	<u>education license</u>
<i>3D Printer</i>	<u>Adobe Stock</u>	<u>education license</u>
<i>Fortran Punch Card</i>	<u>Wikimedia</u>	<u>CC BY-SA 2.5</u>

Credits

media	source	license
<i>Ocean Modeling</i>	<u>JPL / NASA</u>	<u>public domain</u>
<i>Fruit Fly Brain</i>	<u>FlyWire Brain</u>	<u>CC BY-NC 4.0</u>
<i>Pueblo Food Web</i>	<u>Stefani Crabtree</u>	
<i>Nuclear Physics</i>	<u>FLASH Center</u>	
<i>Colliding Galaxies</i>	<u>YouTube</u>	
<i>Airflow Over Landing Gear</i>	<u>NASA Ames Research Center</u>	<u>public domain</u>
<i>Coronavirus Simulation</i>	<u>New York Times</u>	
<i>McCosh 50</i>	<u>Figueras Seating</u>	
<i>Normal Distribution</i>	<u>Adobe Stock</u>	<u>education license</u>
<i>Handwritten Digit Demo</i>	<u>Adam Smith</u>	
<i>Stairway to Heaven</i>	Led Zeppelin	

Credits

media	source	license
<i>Collaborating Hands</i>	<u>Flaticon</u>	<u>Flaticon license</u>
<i>Cartoon People Sharing</i>	<u>Adobe Stock</u>	<u>education license</u>
<i>Light Bulb Idea</i>	<u>Clker-Free-Vector-Images</u>	<u>Pixabay</u>
<i>Ice Breaker</i>	<u>Adobe Stock</u>	<u>education license</u>
<i>Countdown Timer</i>	<u>YouTube</u>	
<i>Office Hours</i>	<u>clipground.com</u>	<u>CC BY 4.0</u>
<i>COS Lab TAs</i>	<u>Pulkit Singh '20</u>	by author
<i>McGraw Center</i>	<u>McGraw Center</u>	
<i>Student Raising Hand</i>	<u>classroomclipart.com</u>	<u>educational use</u>
<i>Question Marks</i>	<u>pikpng.com</u>	<u>non-commercial use</u>