

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

COS 126, SPRING 2024

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

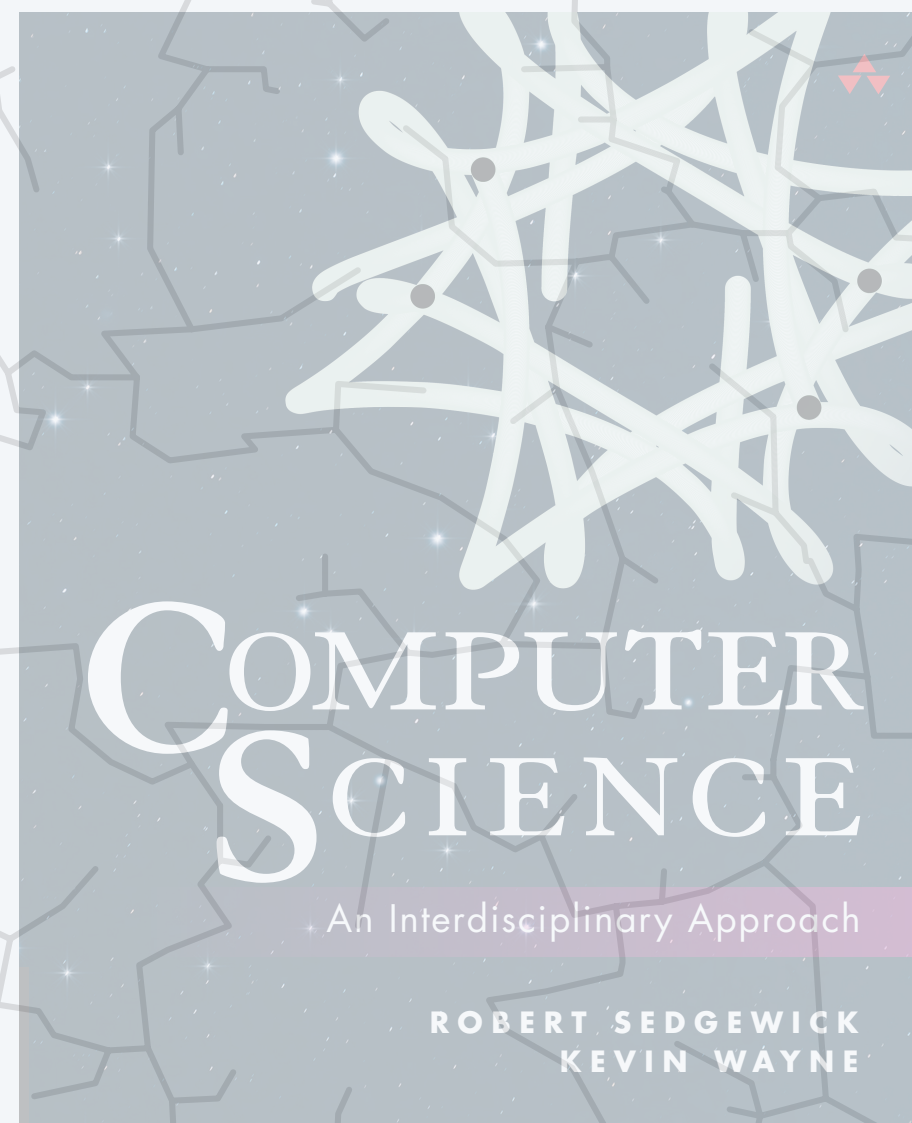
- Goal 1. Read, write, and reason about computer programs.
- Goal 2. Apply concepts to science, engineering, and beyond.
- Goal 3. Understand key ideas underlying computation and computer systems.

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>

```

:n==t?this.pause().cycle():this.slide
ent.find(".next, .prev").length&&e.su
clearInterval(this.interval),this.int
nction(){if(this.sliding)return;return
|r[t]() ,s=this.interval,o=t=="next"?
h?i:this.$element.find(".item")[u](),
cators.length&&(this.$indicators.find
children()[a.getActiveIndex()]);t&&t.
t.trigger(f);if(/defaultPrevented(
t.transition()&&t.$element.hasClass("
iding=!1,se
on(){a.$ele
moveClass("
ass("activ
.carousel
ction(n){r
defaults
n),o=typ
lo():s.in
.cycle()})
t,e.fn.carousel
t=function()
slide-to]",fu
var n=e(this),
({},i.data
carousel(s
)})(wind
e){"use
ts.n)
is.$par

```

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

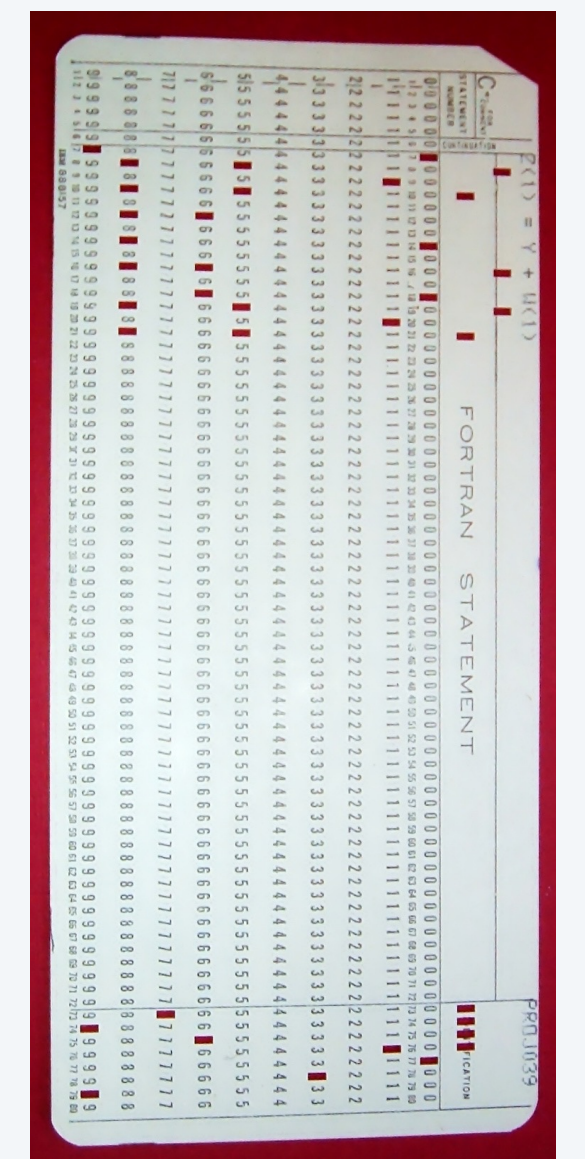
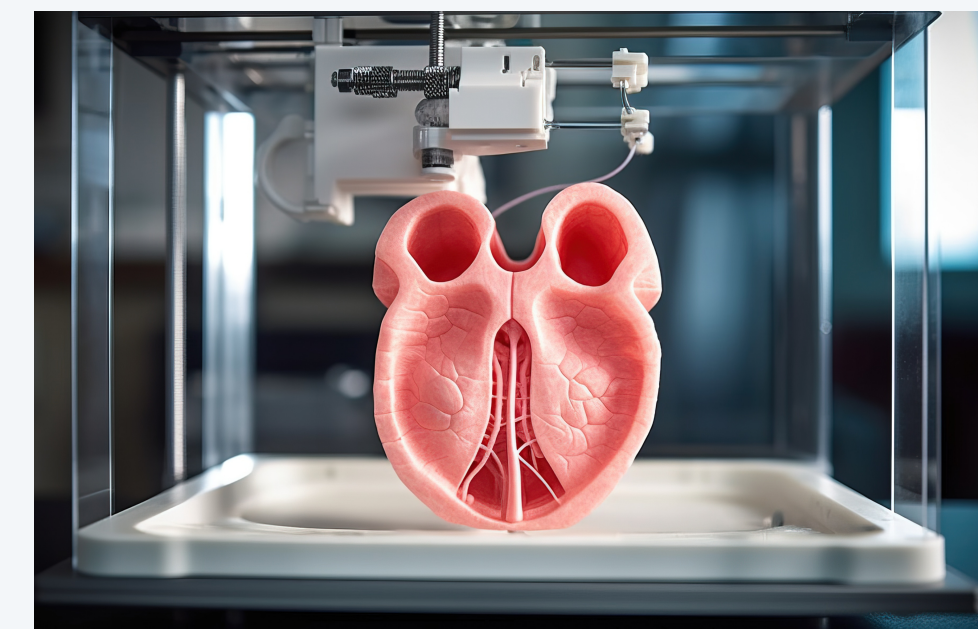
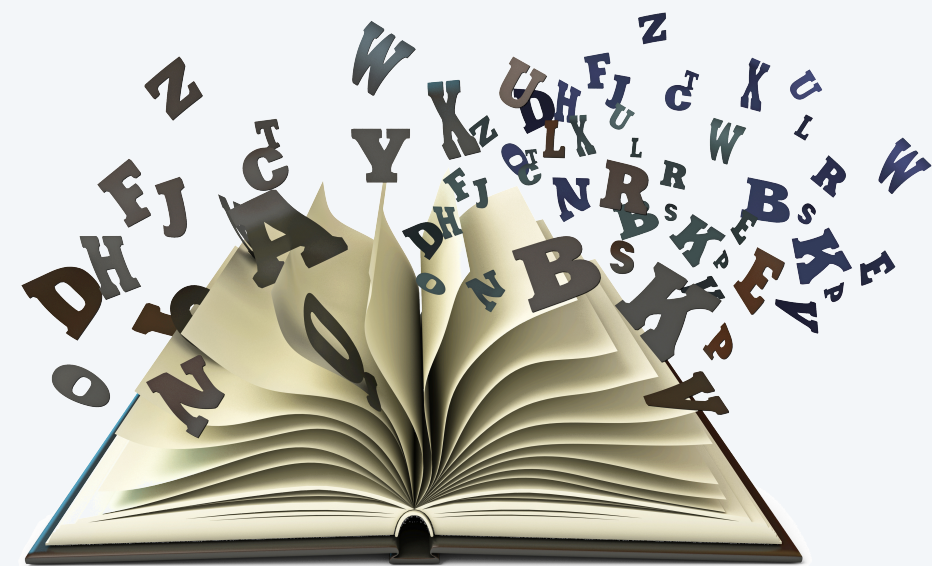
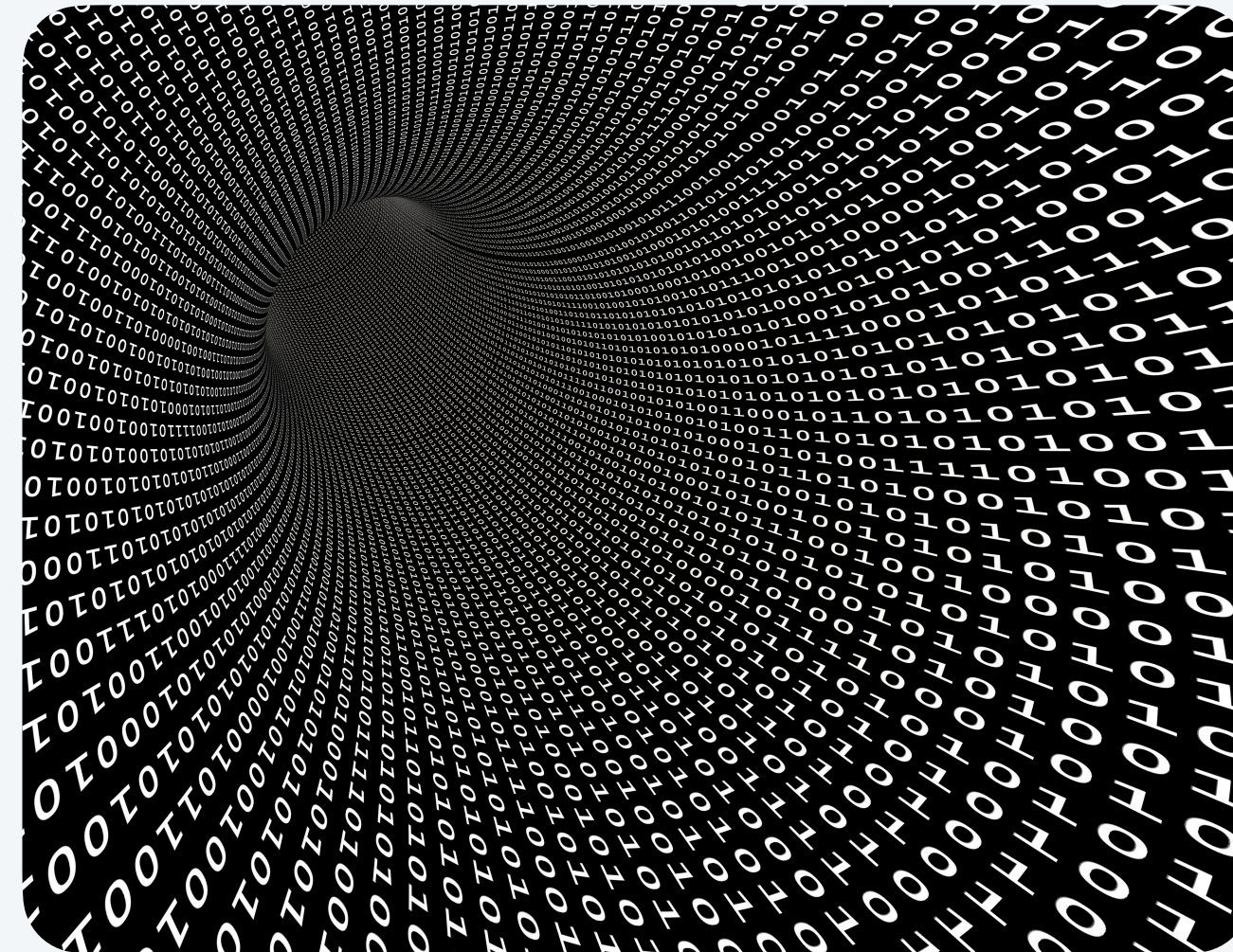
COS 126, SPRING 2024

- ▶ *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

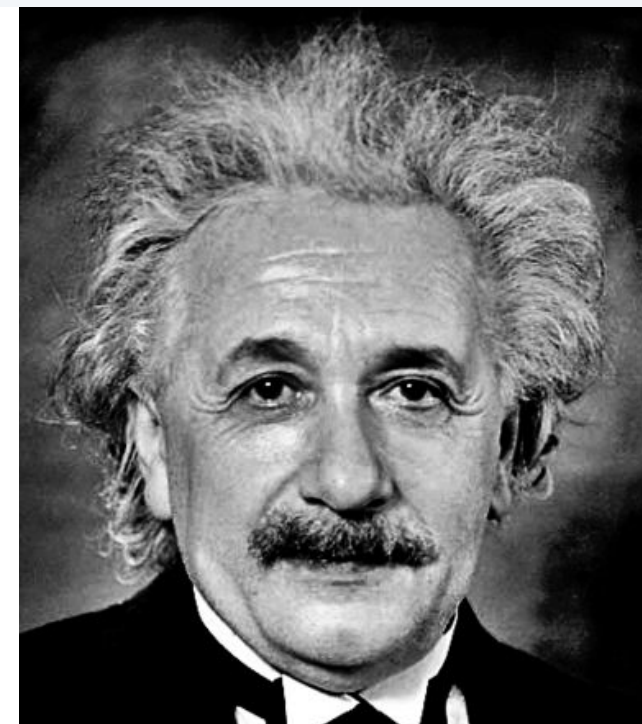
Key idea. “Everything” can be encoded as a sequence of **bits** (0s and 1s).

Innovation 1. You can **program computers** to process bits.

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

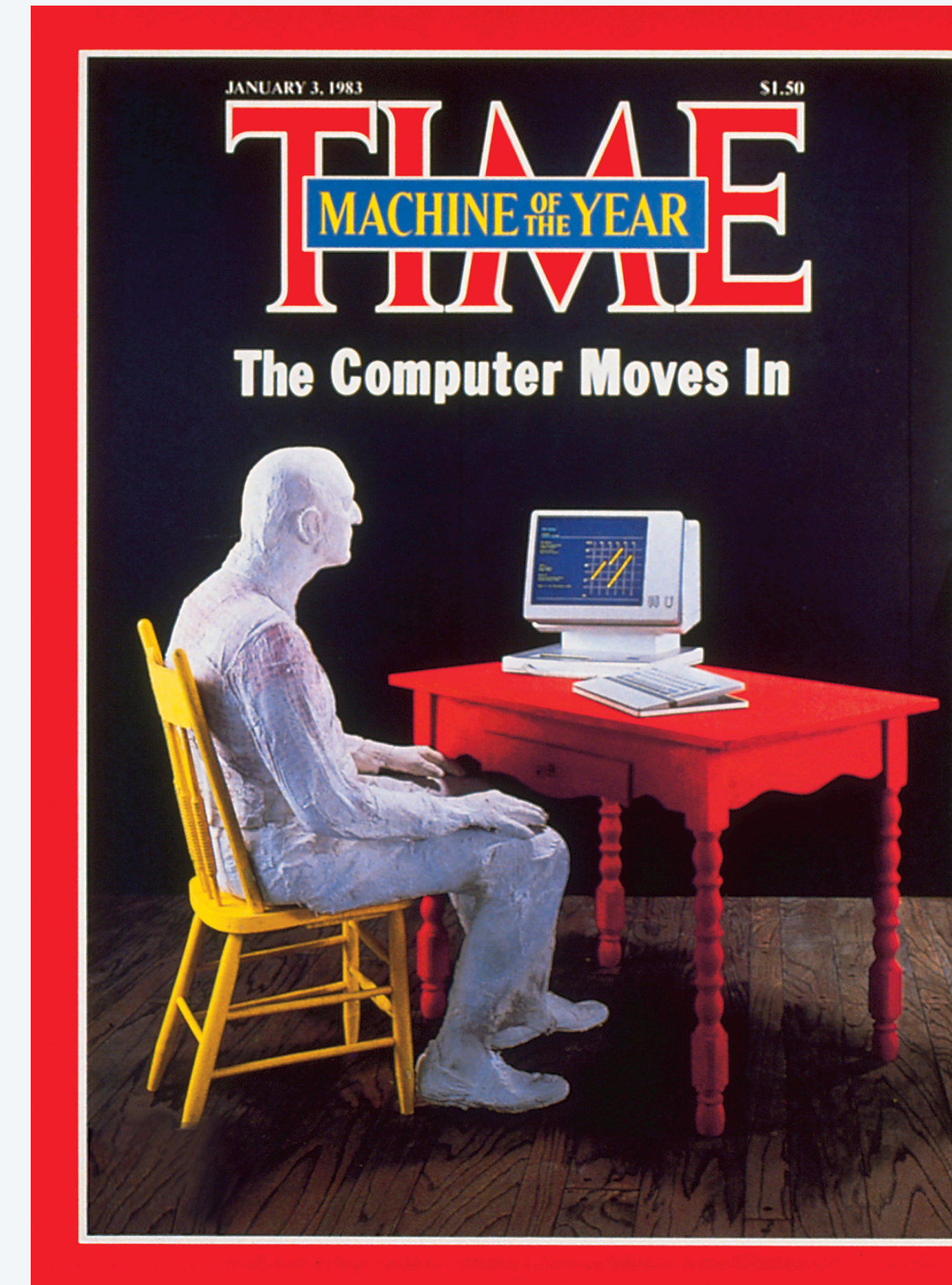
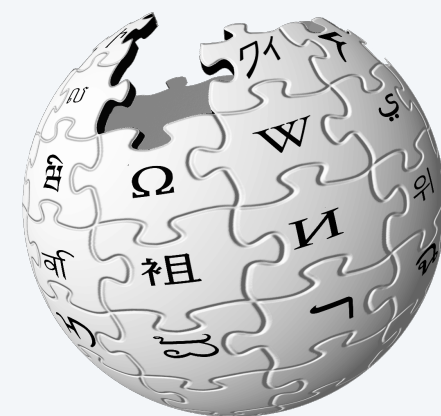
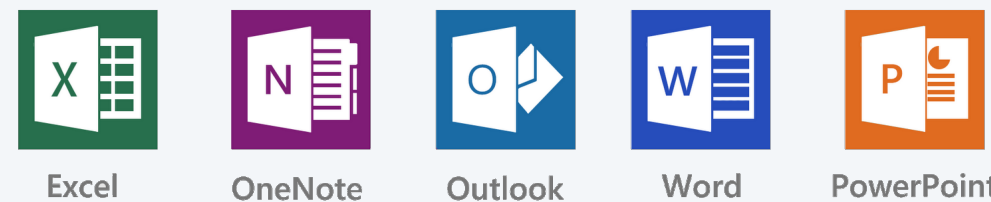
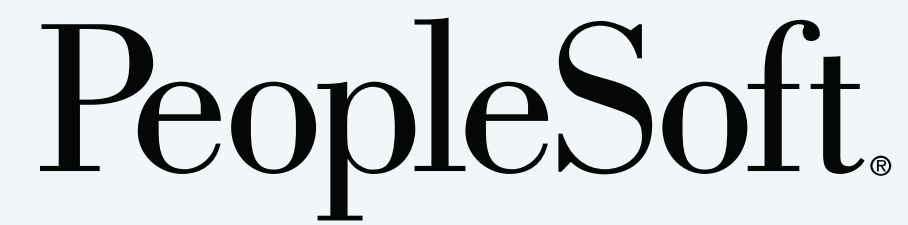
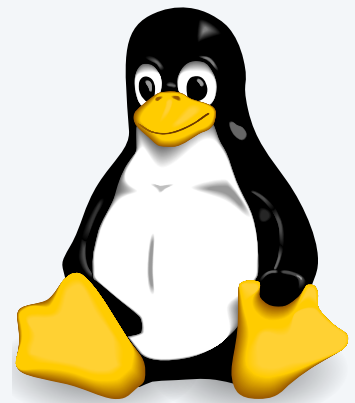
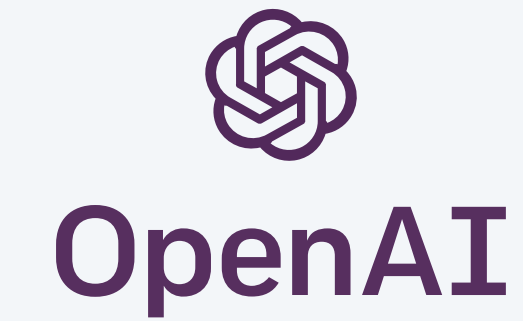
*“Computers are incredibly fast, accurate, and stupid;
humans are incredibly slow, inaccurate, and brilliant;
together they are powerful beyond imagination.”*

— widely misattributed to Albert Einstein



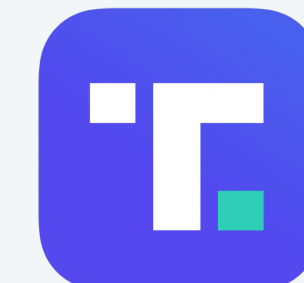
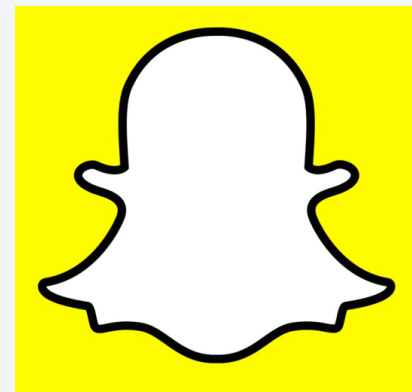
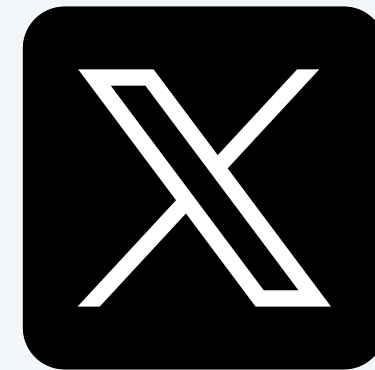
Computers are transforming society

From the way we work ...



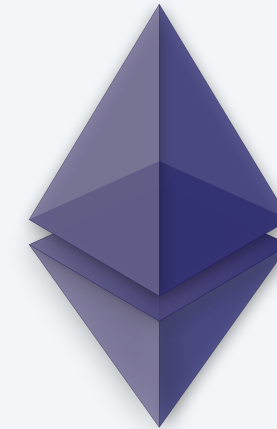
Computers are transforming society

... to the way we live.



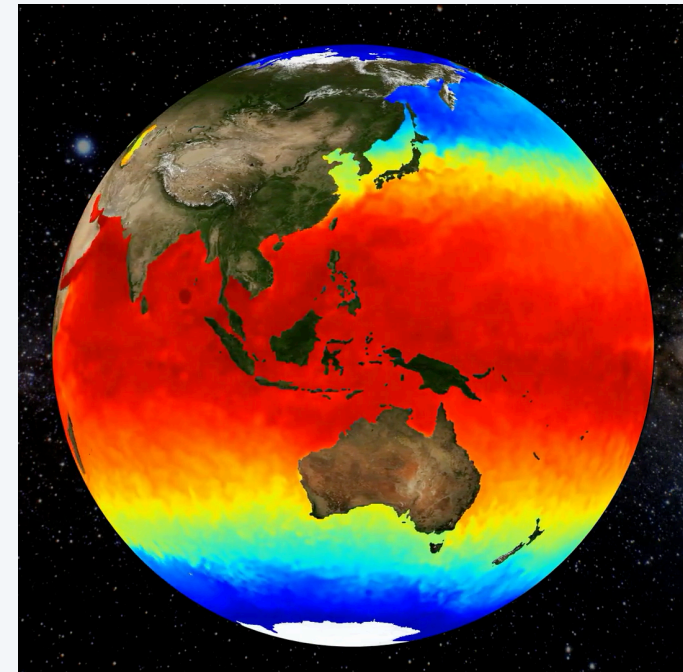
Computers are transforming society

From the “new” economy ...

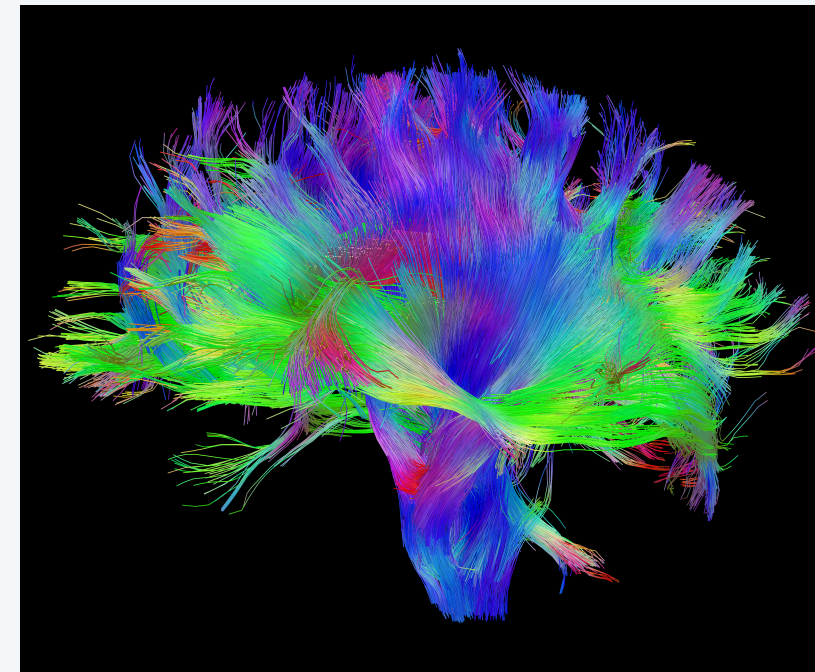


Computers are transforming society

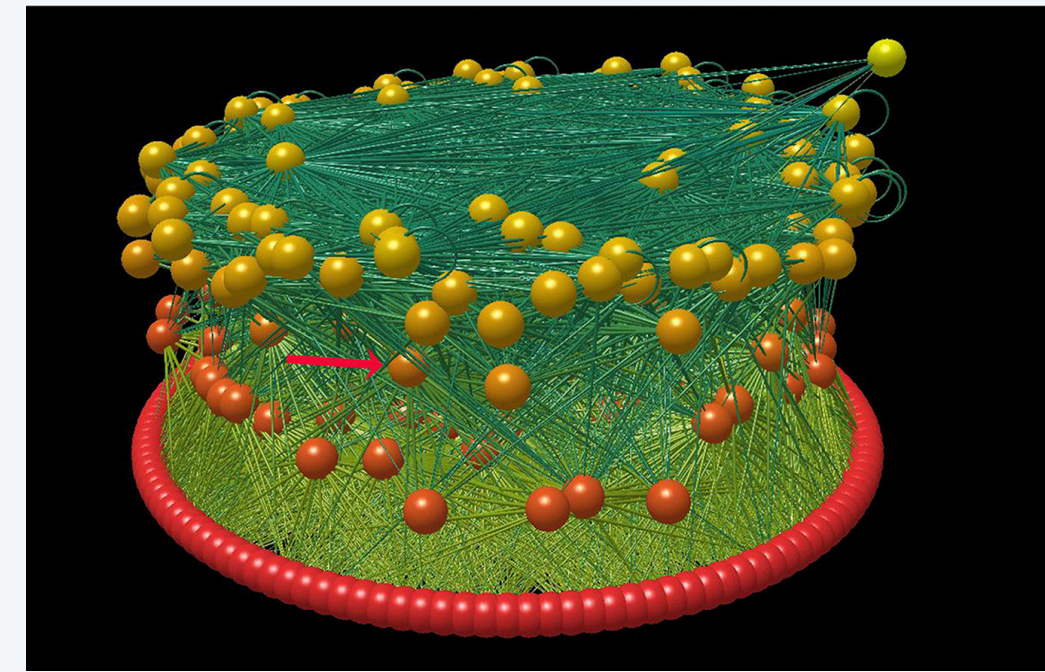
... to the way we do science and engineering.



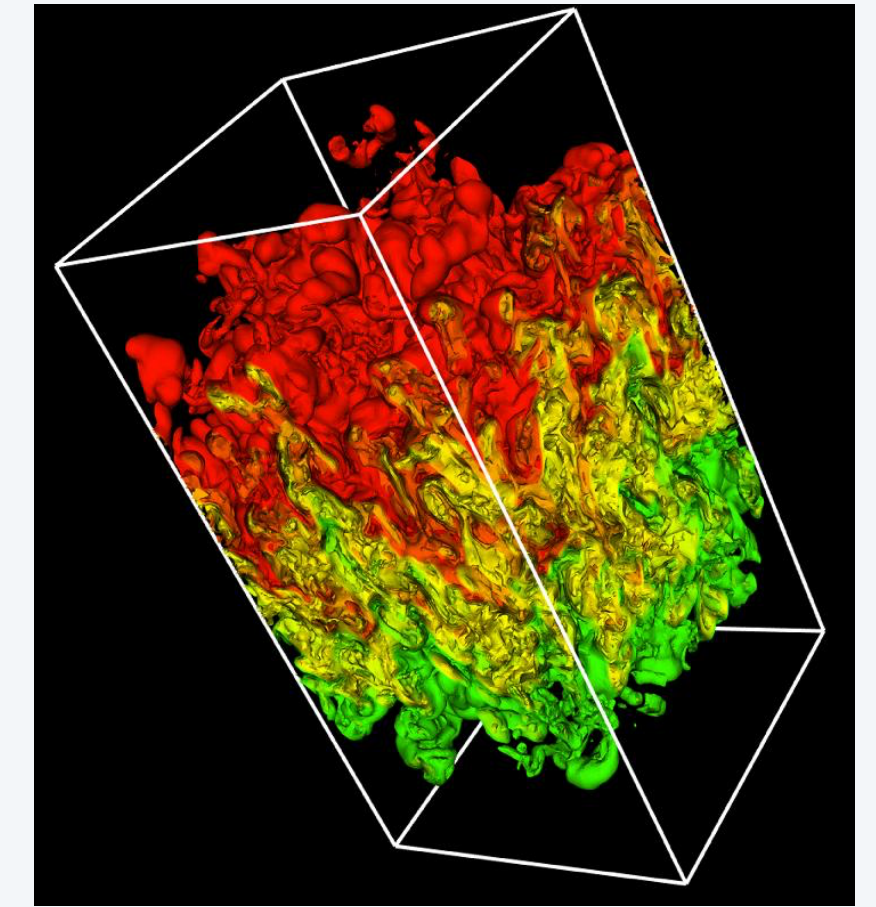
ocean modeling



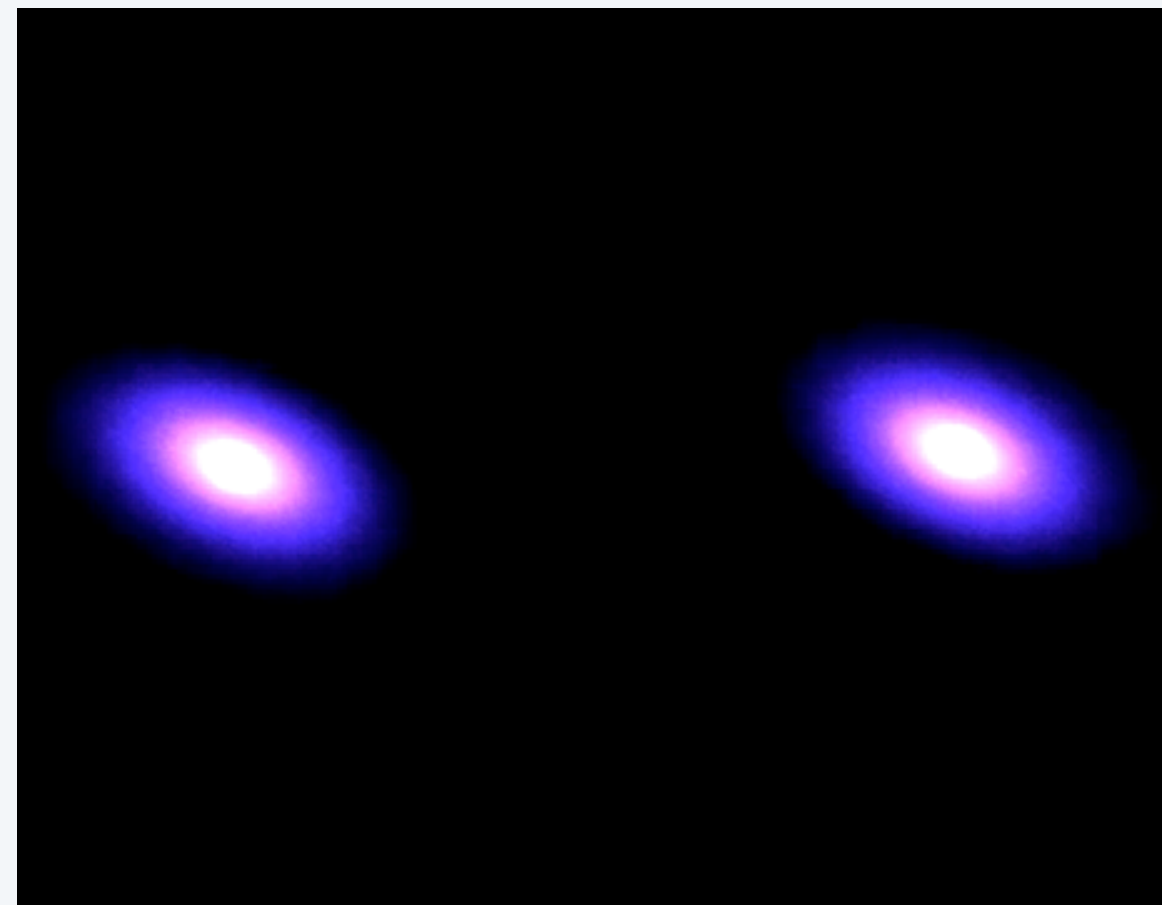
diffusion MRI of brain



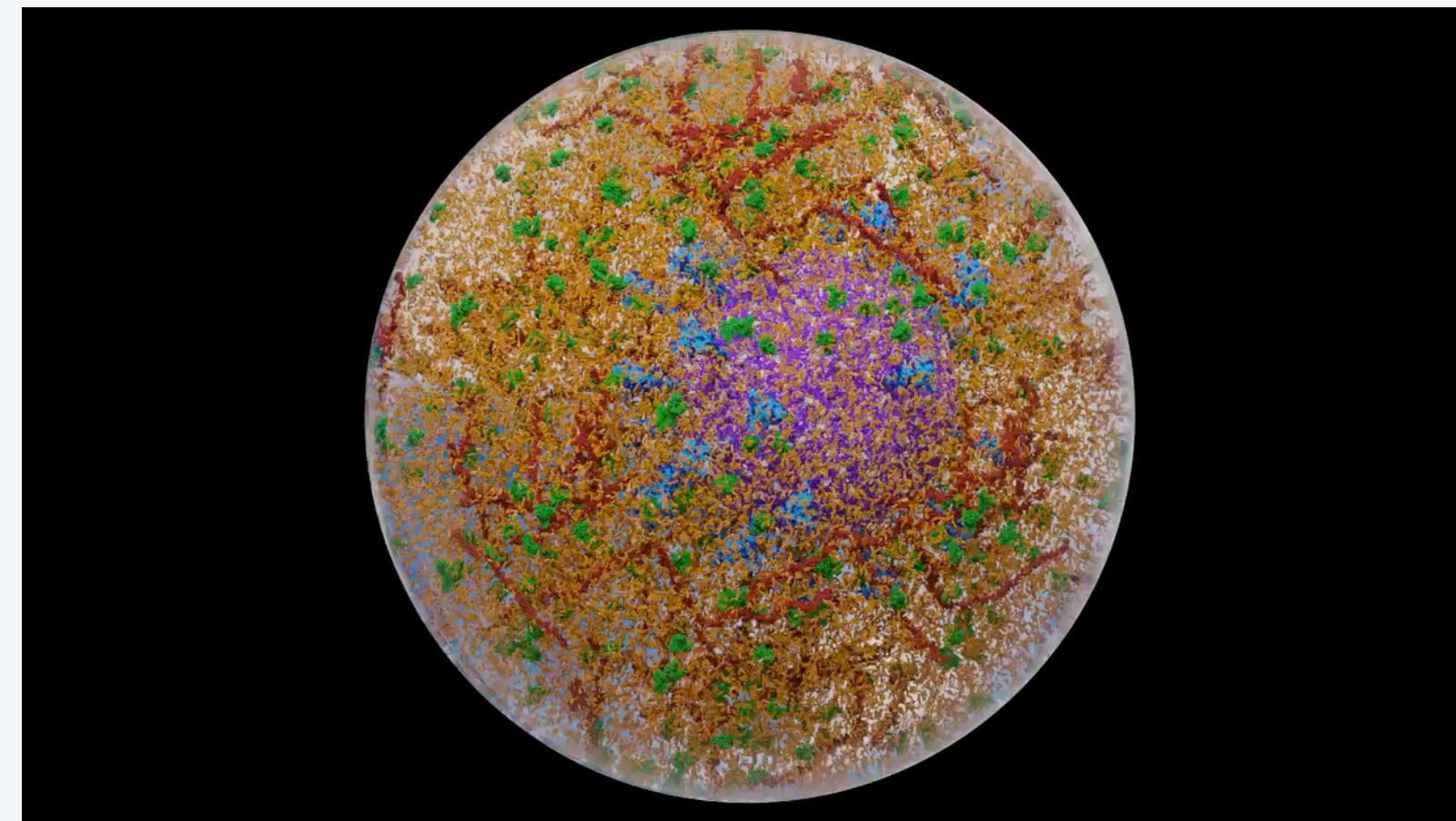
ancestral Pueblo food web



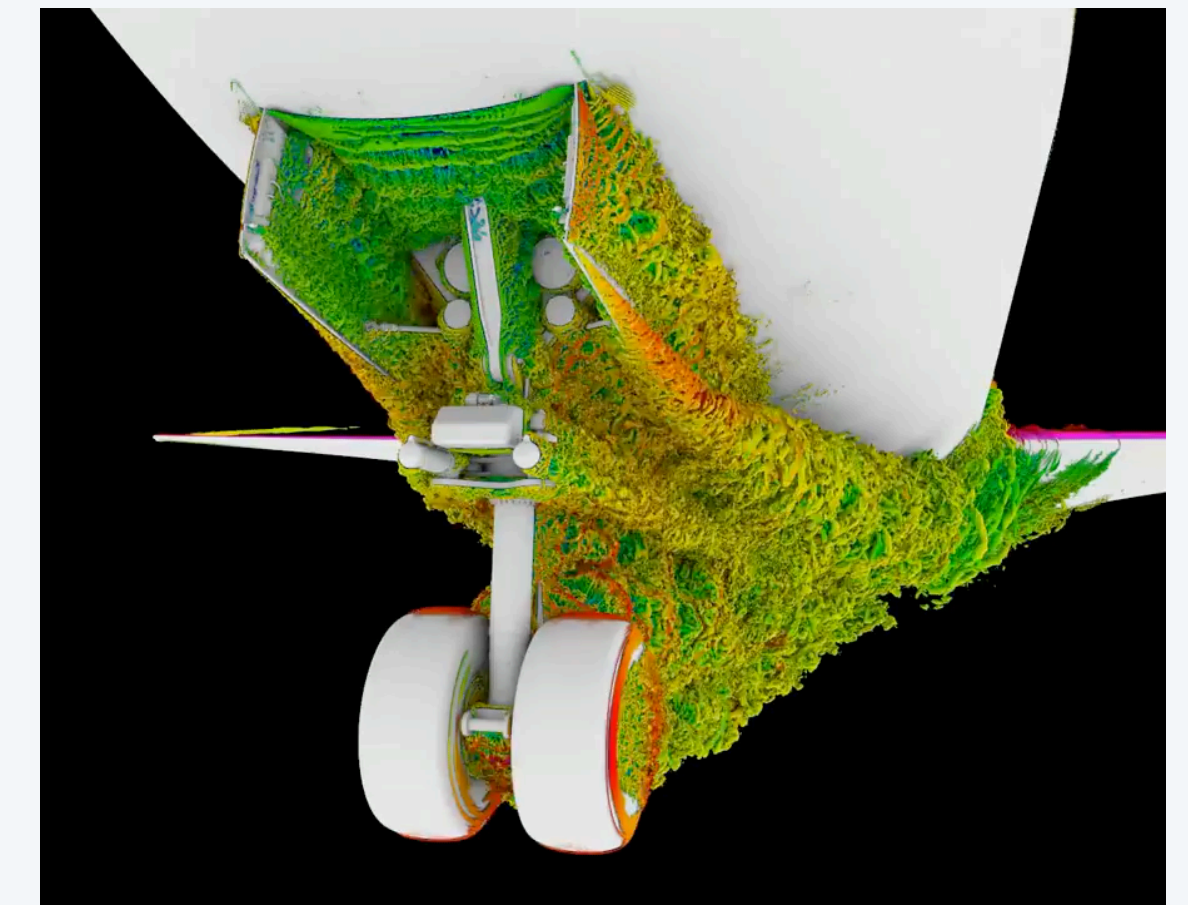
nuclear physics



colliding galaxies



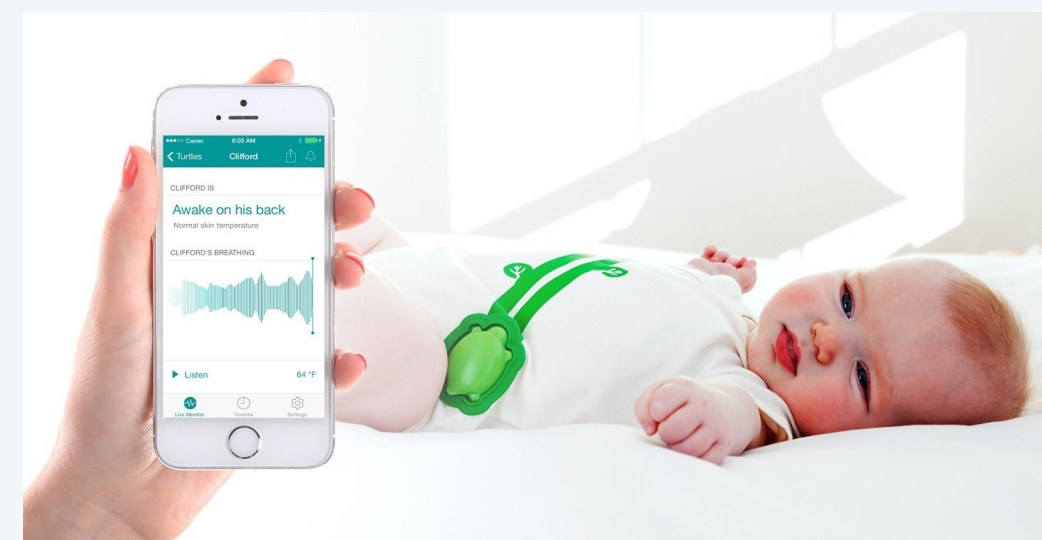
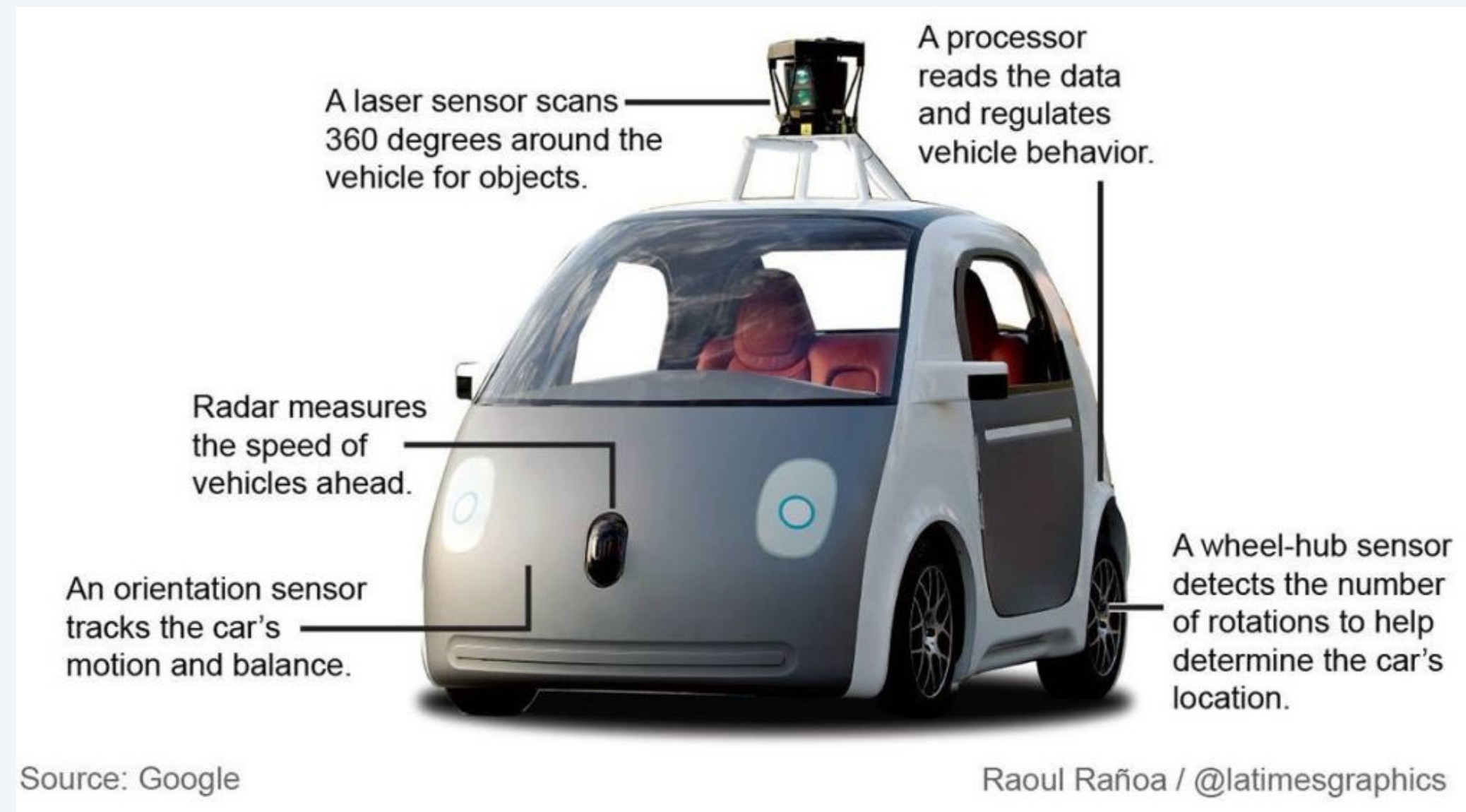
an aerosol droplet containing coronavirus



airflow over landing gear

The digital revolution has only just begun

In 2020. 50 billion+ smart connected devices, all developed to collect, analyze, and share data.

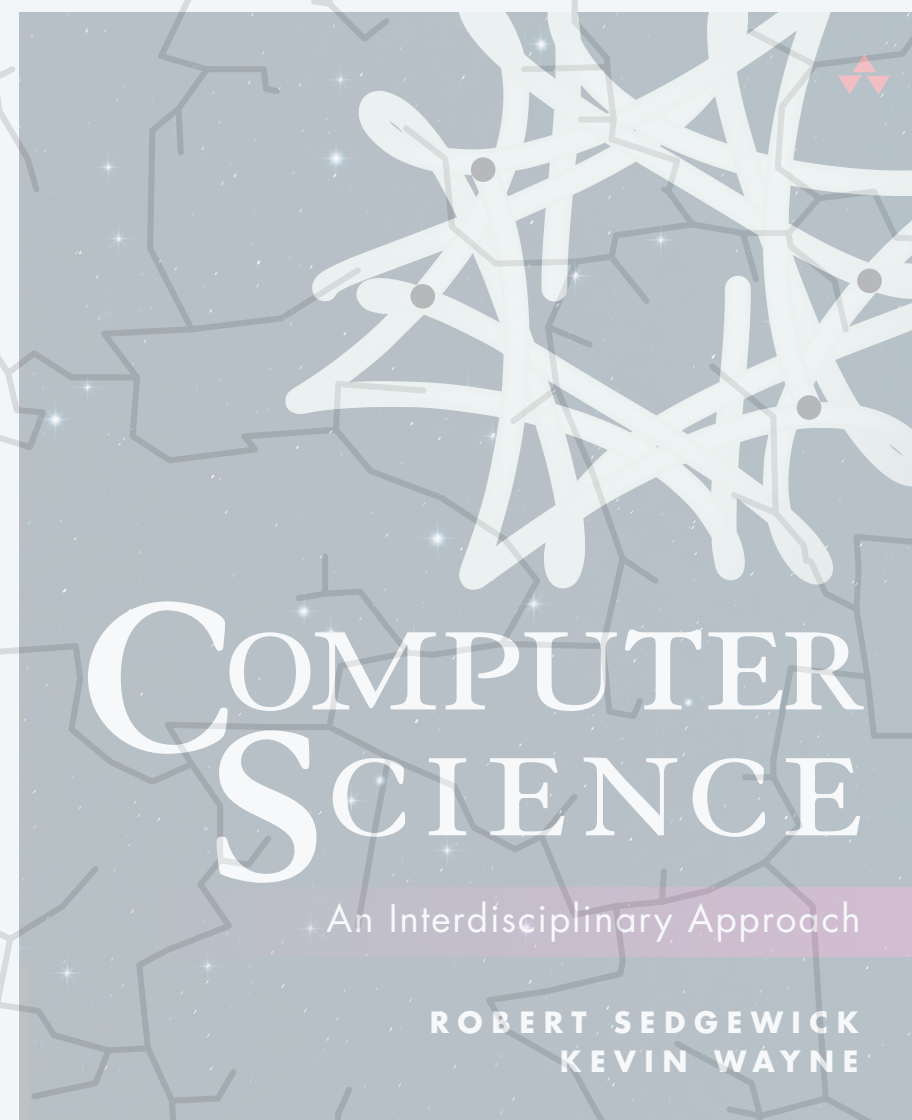


The digital revolution has only just begun

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

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





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

COS 126, SPRING 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, ...*





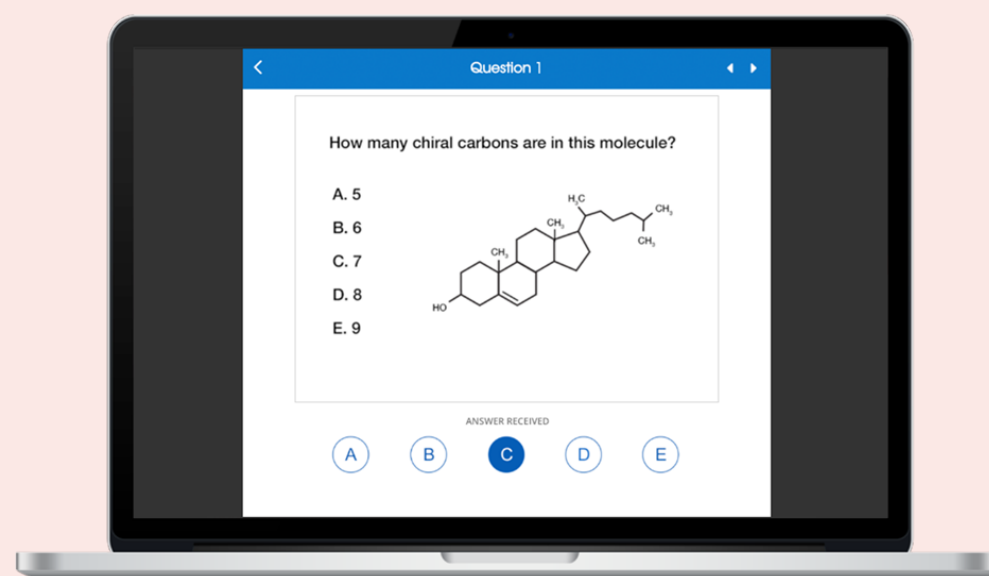
iClicker. To earn participation credit:

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

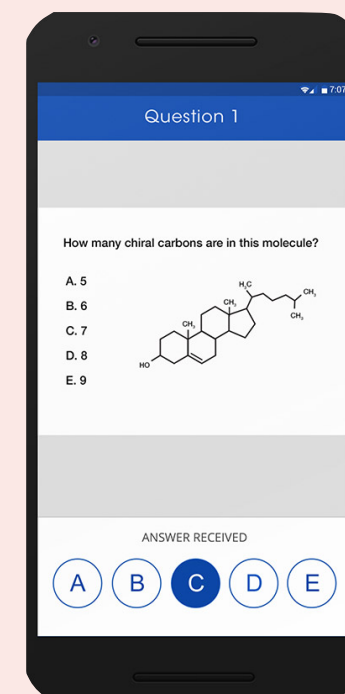


<https://www.iclicker.com>

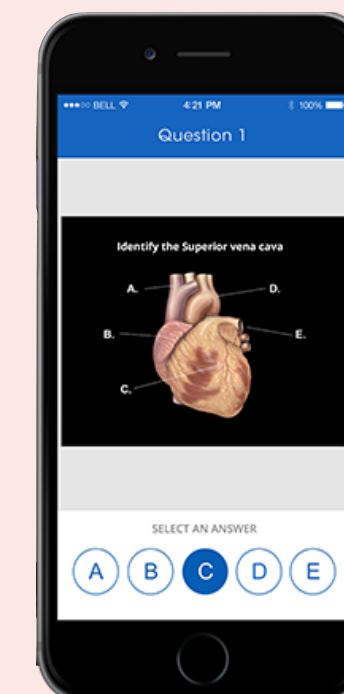
Which iClicker device are you using?



A. Web



B. iPhone



C. Android

Precepts

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

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

← *same content; different pace*

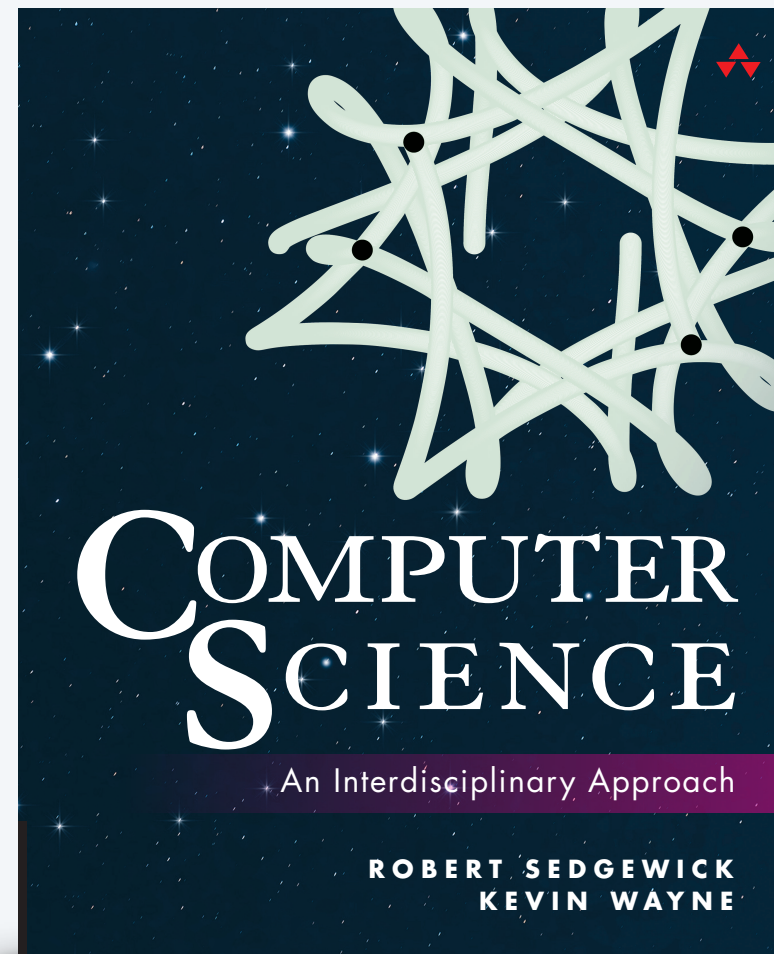
- Makeup precept TTh 7:30–8:20pm (Zoom).
- Raspberry Pi precept (P14A).



↑
*if interested,
see Prof. 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 (40%). Assigned weekly.

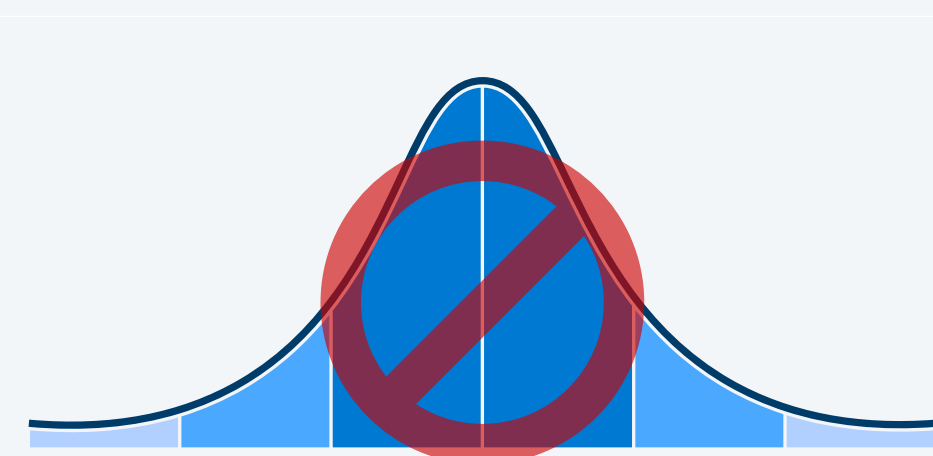
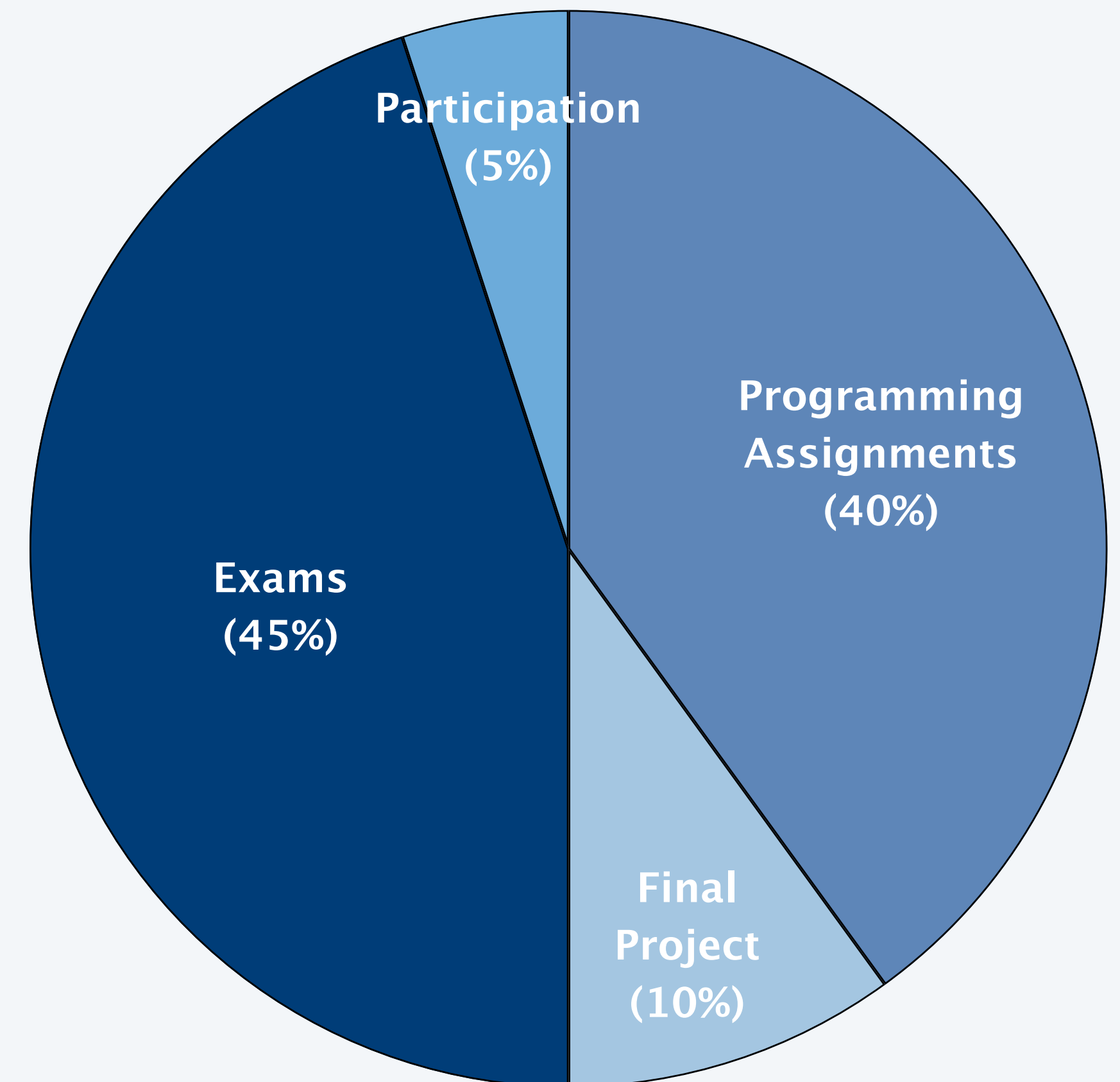
Final project (10%). Capstone programming assignment.

Exams (45%).

- Two written exams (15% each).
 - One programming exam (15%).
- ← *during lecture time slot
(mark your calendars)*

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

Course grades. Uncurved.



grade	percentage
A	93.0
A-	90.0
B+	87.0
⋮	⋮

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!

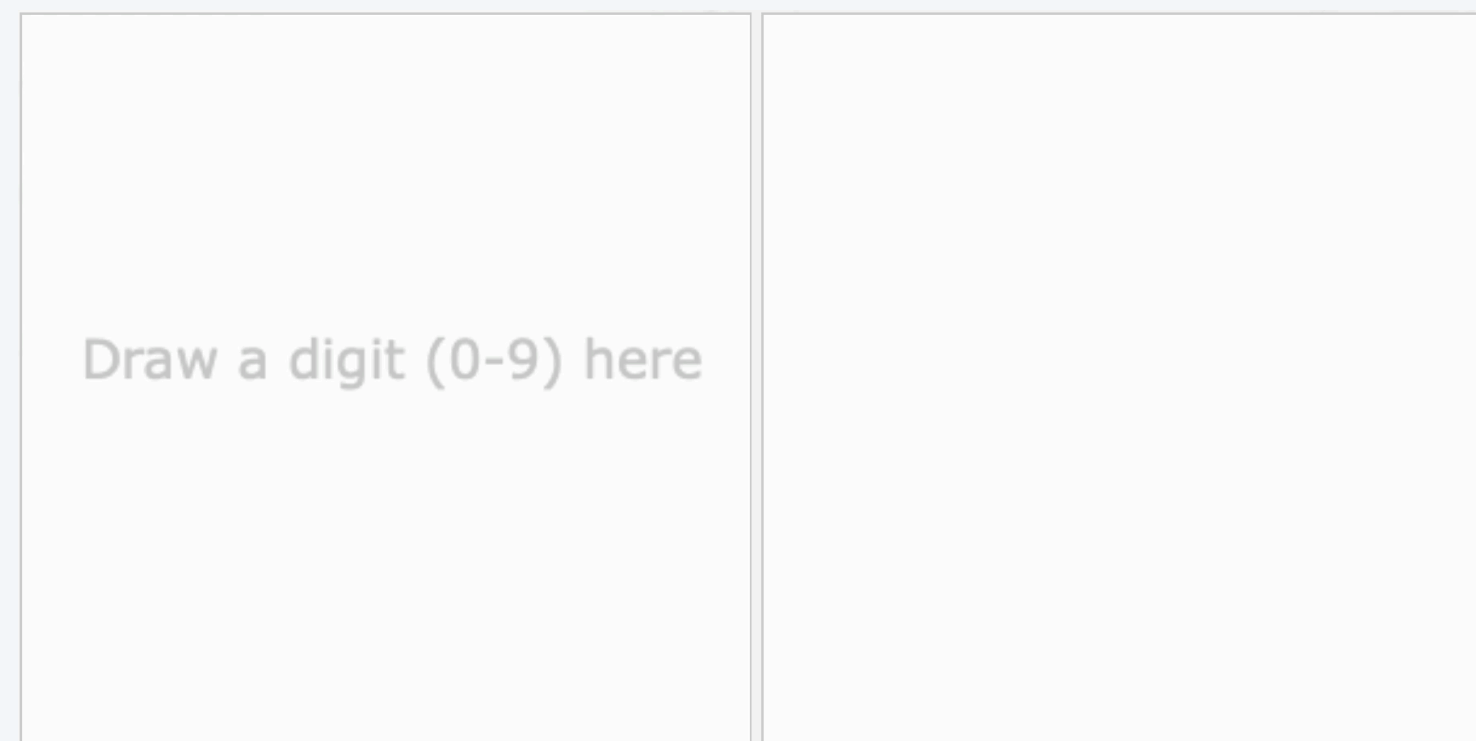


Image Classifier
(assignment 6)

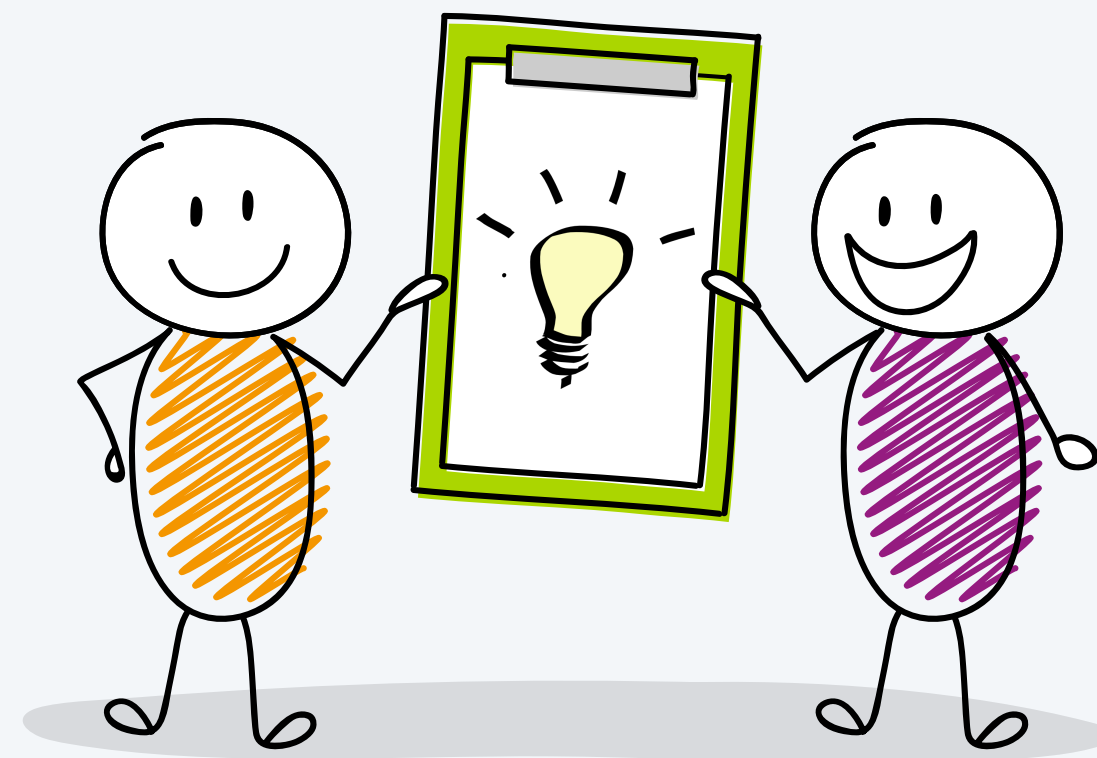




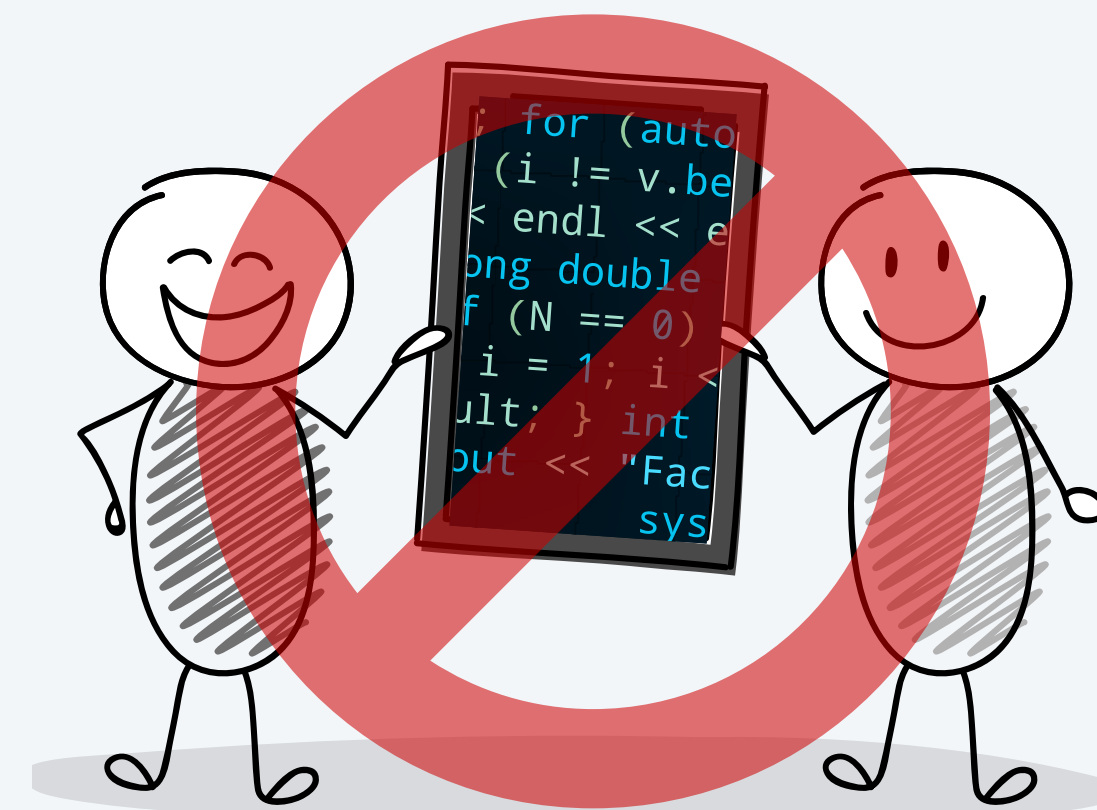
Executive summary.

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

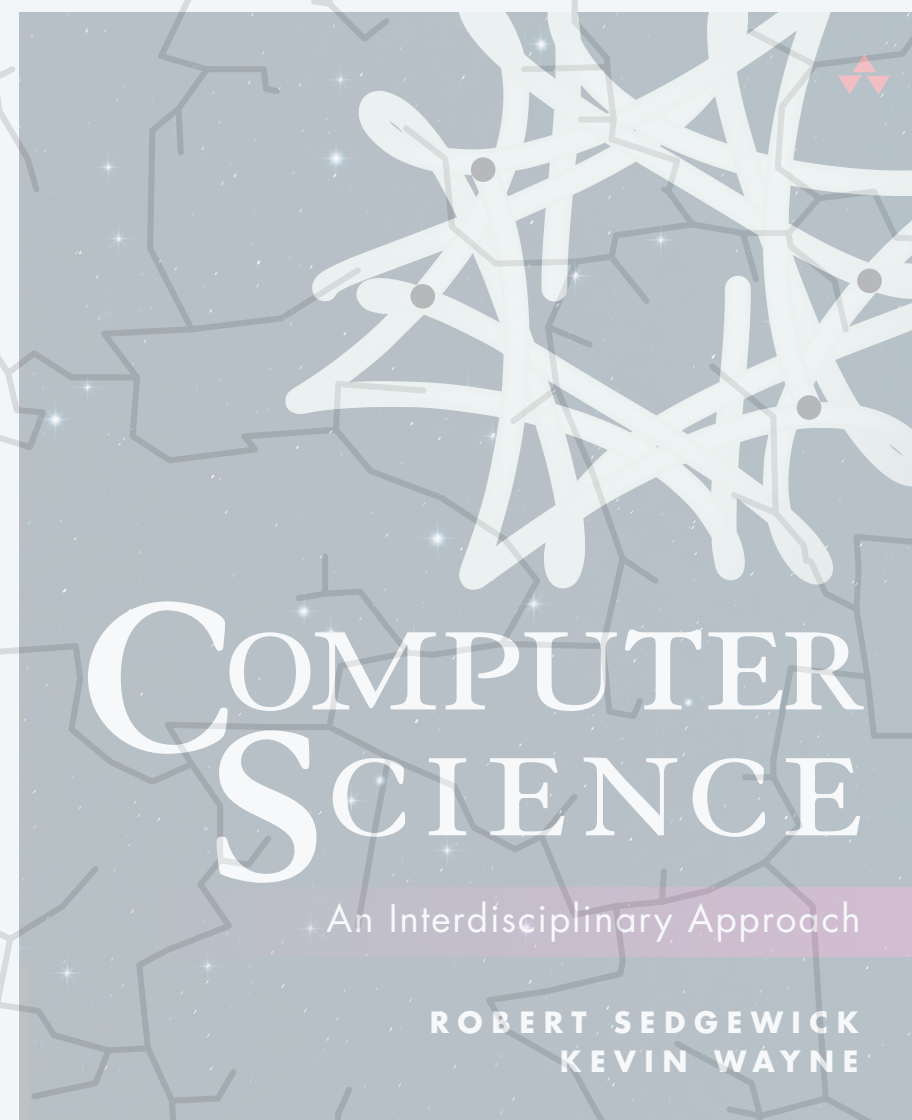
[Full details.](#) See course syllabus.



share ideas



not code



<https://introcscs.princeton.edu>

COS 126, SPRING 2024

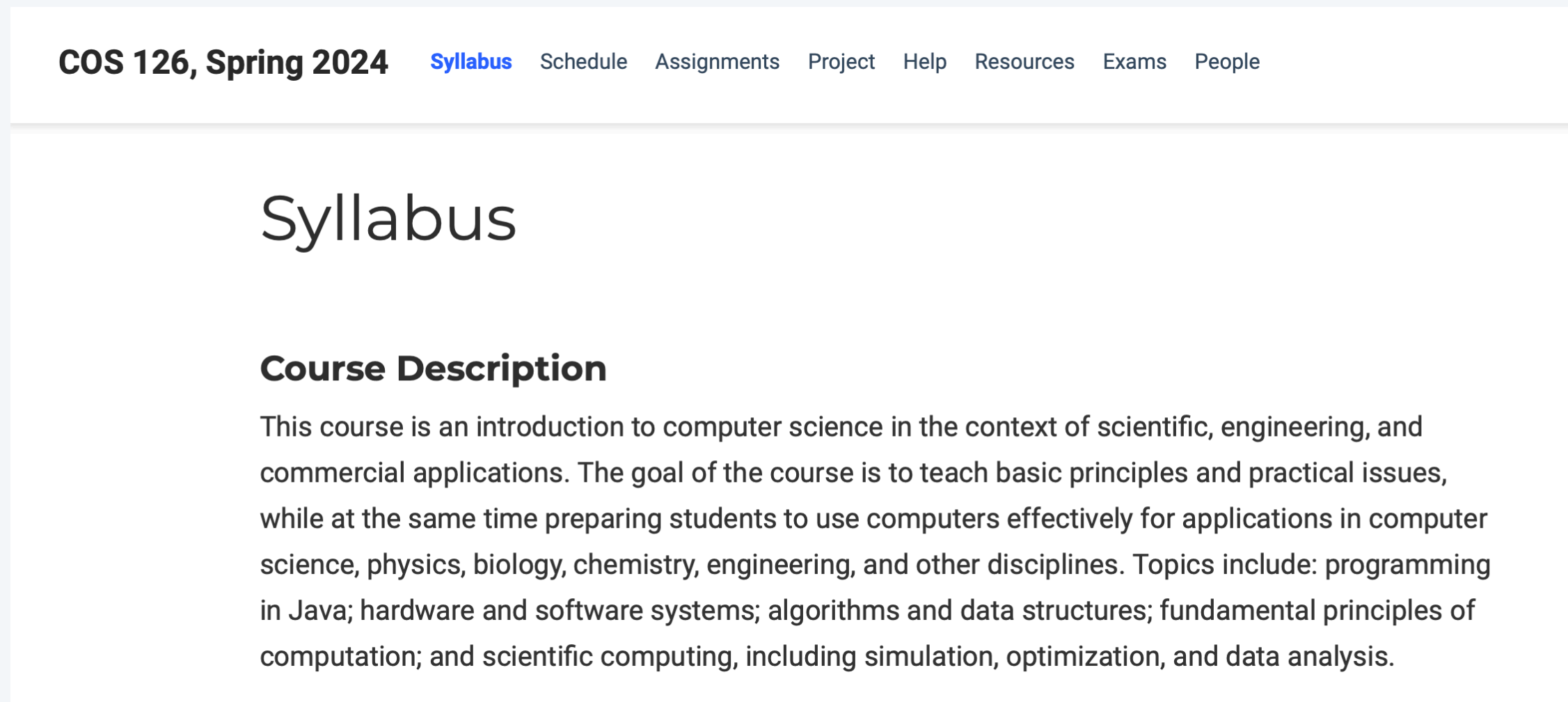
- ▶ *digital revolution*
- ▶ *course mechanics*
- ▶ ***course resources***

Course website.

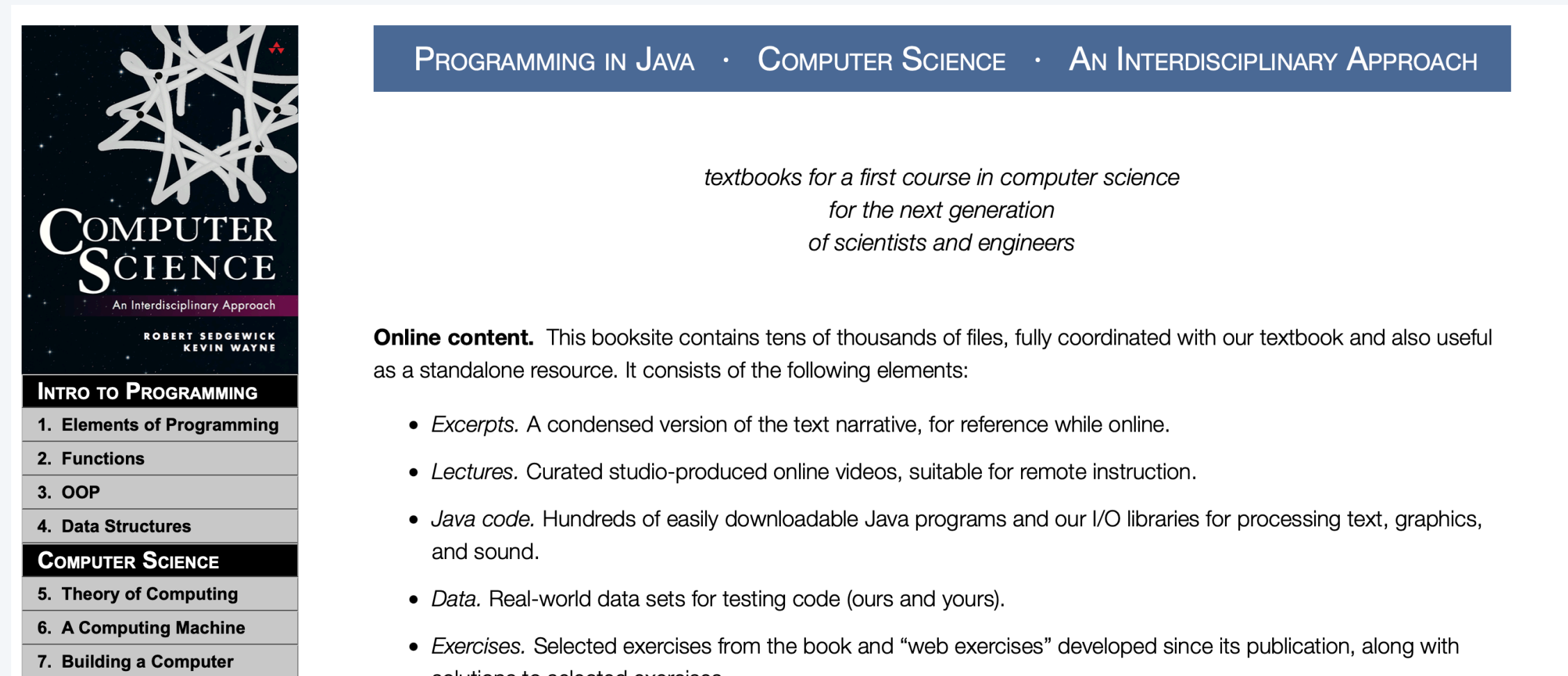
- Syllabus and course policies.
- Lecture slides.
- Programming assignments.
- Exam archive.
- Getting help.
- ...

Booksite.

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



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



<https://introc.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/53171>

Office hours.  *protip: attend*

- Longer discussions.
- See course website for schedule.



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

Intro COS Lab.  *opens later this week*

- 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 2023.2 environment.  *use our fall 2023 version
(see lab TAs for troubleshooting)*

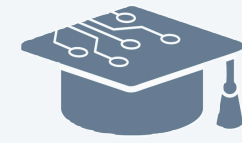
- Embedded Bash terminal.
- Autoformat, autoimport, autocomplete, ...
- Continuous code inspection; integrated Checkstyle and SpotBugs.
- ...











The screenshot shows the IntelliJ IDE interface. The title bar reads "Hello, World - HelloWorld.java". The left sidebar shows a project structure with a folder named "hello [COS 126] sources root, ~/Desktop/hello" containing a "HelloWorld" folder, "logo.png", "acknowledgments.txt", and "readme.txt". The main editor window displays the following Java code:

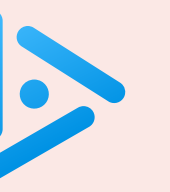
```
1  /*****
2  * This program prints "Hello, World". By tradition, this is
3  * everyone's first program. Prof. Brian Kernighan initiated
4  * this tradition in 1974.
5  *****/
6  public class HelloWorld {
7      public static void main(String[] args) {
8          System.out.println("Hello, World");
9      }
10 }
```

The status bar at the bottom indicates "8:44 LF UTF-8 4 spaces".



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>
 Zoom	<i>makeup precept</i>

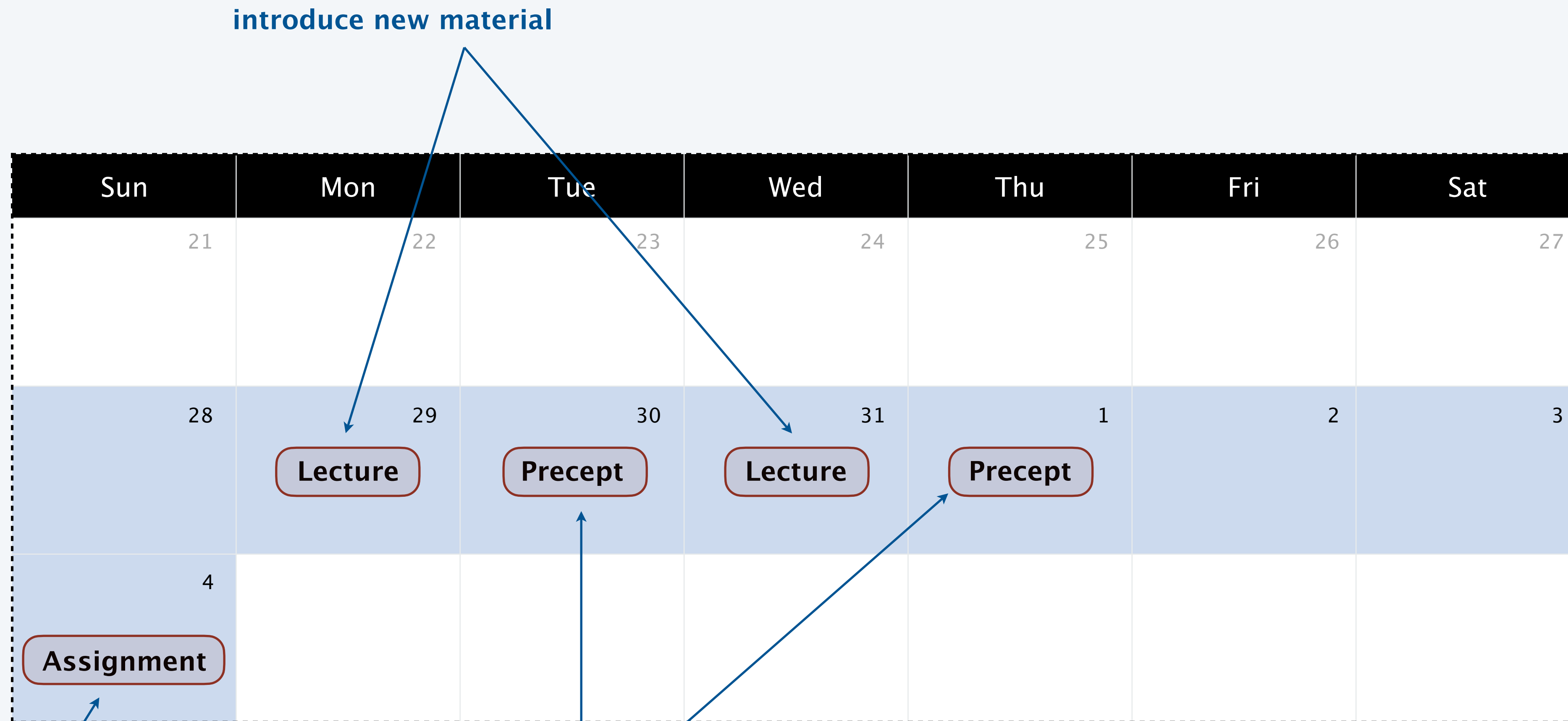
also use for communication with course staff ←



If I don't understand a fundamental programming concept, what should I do?

- A.** Attend office hours.
- B.** Get help from a lab TA.
- C.** Post a question on Ed Discussion.
- D.** Email/text my preceptor.
- E.** Copy a classmate's solution.

A typical week



content based on week's material

support content in lecture



raise your hand and ask



or ask anonymously on Ed
(use ❤️ to upvote)



Credits

image	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

image	source	license
<i>Ocean Modeling</i>	<u>JPL / NASA</u>	<u>public domain</u>
<i>Diffusion MRI Scan</i>	<u>Human Connectome Project</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>Race After Technology</i>	<u>Ruha Benjamin</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

image	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>