I will be recording our class sessions to ensure that they are available to students regardless of their geographic location and time zone. Please contact me if you wish to be edited out of any recording in which you appear.

Because of privacy, compliance, and legal considerations, you may not post recording of this class online or share them with anyone other than students enrolled in this course.
INTRO TO COS 226

- motivation
- course structure
- assessments
- resources

https://algs4.cs.princeton.edu
INTRO TO COS 226

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https://algs4.cs.princeton.edu
What is COS 226?

- Intermediate-level survey course.
- Programming and problem solving, with applications.
- **Data structure**: method for organizing data in a computer.

<table>
<thead>
<tr>
<th>topic</th>
<th>algorithms and data structures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>data types</strong></td>
<td>stack, queue, union–find, priority queue</td>
</tr>
<tr>
<td><strong>sorting</strong></td>
<td>quicksort, mergesort, heapsort, radix sorts</td>
</tr>
<tr>
<td><strong>searching</strong></td>
<td>BST, red–black BST, hash table, kd-tree</td>
</tr>
<tr>
<td><strong>graphs</strong></td>
<td>BFS, DFS, Prim, Kruskal, Dijkstra, Ford–Fulkerson</td>
</tr>
<tr>
<td><strong>strings</strong></td>
<td>tries, suffix arrays, data compression</td>
</tr>
</tbody>
</table>
Why study algorithms and data structures?

Their impact is broad and far-reaching.
Why study algorithms and data structures?

They may unlock the secrets of life and of the universe.

https://www.youtube.com/watch?v=ua7Y1N4eL_w
Why study algorithms and data structures?

Old roots, new opportunities.

- Study of algorithms dates at least to Euclid.
- Named after Muḥammad ibn Mūsā al-Khwārizmī.
- Formalized by Church and Turing in 1930s.
- Some important algorithms were discovered by undergrads in a course like this!
Why study algorithms and data structures?

To become a proficient programmer.

“I will, in fact, claim that the difference between a bad programmer and a good one is whether [they] considers [their] code or [their] data structures more important. Bad programmers worry about the code. Good programmers worry about data structures and their relationships.” — Linus Torvalds (architect of Linux and git)
Why study algorithms and data structures?

For intellectual stimulation.

“For me, great algorithms are the poetry of computation. Just like verse, they can be terse, allusive, dense, and even mysterious. But once unlocked, they cast a brilliant new light on some aspect of computing.” — Francis Sullivan
Why study algorithms and data structures?

For fun and profit.
Why study algorithms and data structures?

• Their impact is broad and far-reaching.
• They may unlock the secrets of life and of the universe.
• Old roots, new opportunities.
• To become a proficient programmer.
• For intellectual stimulation.
• For fun and profit.

Why study anything else?
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[link to course website]
Lectures

**Live lectures.** Introduce new material.

<table>
<thead>
<tr>
<th>What</th>
<th>When</th>
<th>Where</th>
<th>Who</th>
<th>Office Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>L01</td>
<td>TTh 11–12:20pm</td>
<td>Zoom</td>
<td>Kevin Wayne</td>
<td>see web</td>
</tr>
</tbody>
</table>

**Attendance.** Required.

**Waivers.** As verified by your residential college.

**Zoom links.** Available via Canvas.

**Zoom recordings.** Available via Canvas.

**Live questions during lecture.** Raise hand and unmute.

**Live questions after lecture.** Stay in Zoom.

**Side channel for questions during lecture.** Zoom Chat today.
Student response system (required).

- Multiple choice questions to increase engagement.
- Register iClicker Reef 📲 using your Princeton email address.

Which iClicker are you using?

A. Web app.
B. iPhone app.
C. Android app.
D. Hardware.
Precepts

Discussion, problem-solving, assignment prep, ...

Maia Ginsburg  Faculty  Lead Preceptor

Dan Leyzberg  Faculty  Lead Preceptor

Zak Kincaid  Faculty  Preceptor

Anat Kleiman  Graduate Student Preceptor

Deniz Oktay  Graduate Student Preceptor

Victor Ongkowijaya  Graduate Student Preceptor

Chris Sciavolino  Graduate Student Preceptor
<table>
<thead>
<tr>
<th>What</th>
<th>When</th>
<th>Where</th>
<th>Who</th>
<th>Office Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>P02</td>
<td>Th 3–4:20pm</td>
<td>📅</td>
<td>Dan Leyzberg</td>
<td>see web</td>
</tr>
<tr>
<td>P03</td>
<td>F 11–12:20pm</td>
<td>📅</td>
<td>Maia Ginsburg</td>
<td>see web</td>
</tr>
<tr>
<td>P04</td>
<td>F 11–12:20pm</td>
<td>📅</td>
<td>Anat Kleiman</td>
<td>see web</td>
</tr>
<tr>
<td>P05</td>
<td>F 11–12:20pm</td>
<td>📅</td>
<td>Zak Kincaid</td>
<td>see web</td>
</tr>
<tr>
<td>P06</td>
<td>F 1:30–2:50pm</td>
<td>📅</td>
<td>Deniz Oktay</td>
<td>see web</td>
</tr>
<tr>
<td>P07</td>
<td>F 1:30–2:50pm</td>
<td>📅</td>
<td>Chris Sciavolino</td>
<td>see web</td>
</tr>
<tr>
<td>P08</td>
<td>F 3–4:20pm</td>
<td>📅</td>
<td>Victor Ongkowijaya</td>
<td>see web</td>
</tr>
<tr>
<td>P09</td>
<td>F 4:30–5:50pm</td>
<td>📅</td>
<td>Maia Ginsburg</td>
<td>see web</td>
</tr>
<tr>
<td>P10</td>
<td>Th 4:30–5:50pm</td>
<td>📅</td>
<td>Dan Leyzberg</td>
<td>see web</td>
</tr>
</tbody>
</table>
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- union-find

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Programming assignments

Implement an efficient algorithm or data structure:

Solve an interesting application using a “textbook” algorithm:

Pair programming (via Zoom) encouraged on designated assignments.
Programming environment

**Recommended IDE.** Custom Intellij 2020.1 environment. 

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

- 2–3 short questions per lecture.
- Solving using pencil and paper.
- 3 attempts per question (score = max of each question).

![Quizzera platform example](image)
Midterm and final

Written exams.

- Questions drawn from lectures, precepts, and quizzes.
- Emphasizes non-programming material.

Midterm. 90-minute remote exam (24-hour window).

Final. 3-hour remote exam (24-hour window).

Final Exam

STUDENT NAME

Search students by name or email...

Q1 Initialization

3 Points

This exam has 16 questions (including this one) worth a total of 100 points. You have 180 minutes, plus a 10-minute grace period. The Gradescope timer starts at 190 minutes, which includes the 10-minute grace period.
Grading  A+

Programming assignments.  45%
- Due at 11:59pm on Mondays via TigerFile.
- Collaboration/lateness policies: see web.

Quizzes.  10%
- Due at 11:59pm on Fridays via Quizzer.
- Collaboration/lateness policies: see web.

Exams.  15% + 25%
- Midterm (Monday, October 19).
- Final (to be scheduled by Registrar).

Active participation.  5%
- Participate in precept/lecture.
  [ perfect attendance not required to earn 100% of participation points ]
- Answer questions in online discussion forum.
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Available from various vendors and formats.
- Amazon: $70 hardcover, $58 Kindle, ...
- Labyrinth: $63 hardcover, $40 rent.
- Safari Tech Books Online, $0.
Resources (studio-produced videos)

Studio-produced videos (optional).

- Different perspective.
Resources (studio-produced videos)

Studio-produced videos (optional).

- Different perspective.
- Transcript search.

https://cuvids.io
Resources (web)

Course content.
- Course info.
- Lecture slides.
- Programming assignments.
- Quizzes.
- Exam archive.

https://www.princeton.edu/~cos226

Booksites.
- Brief summary of content.
- Download code from book.
- APIs and Javadoc.

https://algs4.cs.princeton.edu
Resources (people)

Online discussion forum.
- Low latency, low bandwidth.
- See Ed Discussion for guidelines.
- Use Ed; do not email course staff.

Office hours.
- High bandwidth, high latency.
- See web for schedule.

“Computing laboratory.”
- Undergrad lab TAs.
- For help with debugging.
- See web for schedule.
# A typical week (including this one!)

<table>
<thead>
<tr>
<th>Sun</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
</tr>
</thead>
<tbody>
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<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Lecture 1 (Union–Find)</td>
<td></td>
<td></td>
<td>Lecture 2 (Analysis)</td>
<td>Precept 1</td>
<td>Quiz 0, 1, 2</td>
<td></td>
</tr>
<tr>
<td>Assignment 1 (Percolation)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
</tr>
</tbody>
</table>

- You are here! again on Thursday
- Support lecture material; assignment prep
- Content based on week’s material
- Content based on corresponding lectures

You are here again on Thursday.
Administrative Q+A

Not registered? Register ASAP; attend any precept this week (Zoom links in Canvas).
Change precept? Use TigerHub.
All non-conflicting precepts closed? Contact Colleen Kenny.

Haven’t taken COS 126? See COS placement officer.
Placed out of COS 126? Review Sections 1.1–1.2 of Algorithms 4/e.

Additional administrative questions. Ask now in Zoom; ask anytime in Ed Discussion.