Intro to COS 226

- motivation
- course structure
- assessments
- resources
COS 226 course overview

What is COS 226?

- Intermediate-level survey course.
- Programming and problem solving, with applications.
- **Algorithm:** sequence of instructions for solving a problem.
- **Data structure:** method to organize data in a computer.

<table>
<thead>
<tr>
<th>topic</th>
<th>data structures and algorithms</th>
</tr>
</thead>
<tbody>
<tr>
<td>data types</td>
<td>stack, queue, union–find, priority queue</td>
</tr>
<tr>
<td>sorting</td>
<td>quicksort, mergesort, heapsort, radix sorts</td>
</tr>
<tr>
<td>searching</td>
<td>BST, red–black BST, hash table</td>
</tr>
<tr>
<td>graphs</td>
<td>BFS, DFS, Prim, Kruskal, Dijkstra</td>
</tr>
<tr>
<td>strings</td>
<td>KMP, regular expressions, tries, data compression</td>
</tr>
<tr>
<td>advanced</td>
<td>k-d tree, suffix array, maxflow</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.

http://www.youtube.com/watch?v=ua7YIN4eL_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.

“\textit{I will, in fact, claim that the difference between a bad programmer and a good one is whether he considers his code or his 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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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 11–12:20</td>
<td>Friend 101</td>
<td>Kevin Wayne</td>
<td>M 1:30–3:30pm</td>
</tr>
</tbody>
</table>

Electronic devices. Permitted only to support lecture (e.g., viewing slides and taking notes).
Student response system (required).

- Any hardware version of iClicker. (use iClicker Reef at your own risk, WiFi issues?)
- Register your iClicker in Blackboard.  
- Available at Labyrinth Books ($30).

Which model of iClicker are you using?

A. iClicker.
B. iClicker+.
C. iClicker 2.
D. iClicker Reef.
Precepts

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

Maia Ginsburg  
Faculty  
Lead Preceptor

Ibrahim Albluwi  
Faculty  
Lead Preceptor

Bob Tarjan  
Faculty  
Preceptor

Lisa Jian  
Graduate Student  
Preceptor

Chris Sciavolino  
Graduate Student  
Preceptor

Devon Loehr  
Graduate Student  
Preceptor
Precepts

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

<table>
<thead>
<tr>
<th>What</th>
<th>When</th>
<th>Where</th>
<th>Who</th>
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</thead>
<tbody>
<tr>
<td>P01</td>
<td>Th 1:30–2:50pm</td>
<td>Friend 016</td>
<td>Maia Ginsburg</td>
</tr>
<tr>
<td>P02</td>
<td>Th 3–4:20pm</td>
<td>Friend 016</td>
<td>Chris Sciavolino</td>
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<tr>
<td>P04</td>
<td>F 11–12:20pm</td>
<td>Friend 009</td>
<td>Ibrahim Albluwi</td>
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<tr>
<td>P05</td>
<td>F 11–12:20pm</td>
<td>Friend 111</td>
<td>Lisa Jian</td>
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<tr>
<td>P07</td>
<td>F 1:30–2:50pm</td>
<td>Friend 009</td>
<td>Devon Loehr</td>
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<tr>
<td>P08</td>
<td>F 3–4:20pm</td>
<td>Friend 009</td>
<td>Ibrahim Albluwi</td>
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<tr>
<td>P09</td>
<td>Th 3–4:20pm</td>
<td>Sherrerd 001</td>
<td>Bob Tarjan</td>
</tr>
<tr>
<td>P10</td>
<td>Th 3–4:20pm</td>
<td>TBA</td>
<td>Maia Ginsburg</td>
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- union–find

https://algs4.cs.princeton.edu
Programming assignments

Implement an efficient algorithm or data structure.

Solve an interesting application using a “textbook” algorithm.
Programming assignments

**Recommended IDE.** Custom Intellij environment (used in COS 126).
- Continuous code inspection; integrated Checkstyle and Spotbugs.
- Autoformat, autoimport, and autocomplete.
- Embedded bash terminal.
- ...

![Image of IntelliJ IDEA with a Java file open showing a Hello World program](image-url)
Quizzes

- 2–3 short questions per lecture.
- 3 attempts per question.
- Use pencil and paper.
Written exams.

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

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

Quizzes. 10%
• Due at 11pm on Fridays via Quizzera.
• Collaboration/lateness policies: see web.

Exams. 15% + 25%
• Midterm (in class on Tuesday, October 22).
• 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 on Piazza.
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Available from various vendors in hardcover and ebook formats.  
- Amazon: $75 hardcover, $58 Kindle, ...
- Labyrinth: $63 hardcover, $40 rent.
- Engineering library: on reserve.
- Safari Tech Books Online.
Resources (videos)

Lecture videos (optional).

- Missed lecture.
- Review for exams.
Lecture videos (optional).

- Missed lecture.
- Review for exams.

**Acurate**

**View your progress**

**Search Results: "percolation"**

1. **E Applications**

0:56 So, the one we're going to talk about now is called **percolation**.

2:49 That's just a few examples of the **percolation** model.

6:17 So the **percolation** model on the left corresponds to the, connection model on the right, according to what we've been doing.

7:41 And that's where we get the result that, by running enough simulations for a big-enough n, that this, **percolation** threshold is about.

**http://cuvids.io**
Resources (web)

Course content.

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

Booksite.

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

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

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

Piazza discussion forum.
- Low latency, low bandwidth.
- See Piazza for guidelines.

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

Computing laboratory.
- Undergrad lab TAs.
- For help with debugging.
- See web for schedule.
This week

- **Assignment 1 (Percolation)**: Start early
- **Lecture 1 (Union-Find)**
- **Precept 1**: Starts tomorrow (or today)
- **Quiz 0 and 1**: Yes, really!

You are here! Read Assignment 1 before precept.
A typical week

<table>
<thead>
<tr>
<th>Sun</th>
<th>Mon</th>
<th>Tue</th>
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<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
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<td>28</td>
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</tbody>
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- **Lecture 2** (Analysis)
- **Lecture 3** (Stacks)
- **Precept 2**
- **Quiz 2 and 3**
- **Assignment 2** (Deques+RQs)

- Content based on week’s material
- Content based on corresponding lectures
- Support: lecture material; assignment prep
Q&A

Not registered? Register ASAP; attend any precept this week.
Change precept? Use TigerHub.

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