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>
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</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>
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<tr>
<td>searching</td>
<td>BST, red–black BST, hash table</td>
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<tr>
<td>graphs</td>
<td>BFS, DFS, Prim, Kruskal, Dijkstra</td>
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<tr>
<td>strings</td>
<td>KMP, regular expressions, tries, data compression</td>
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<tr>
<td>advanced</td>
<td>k-d tree, suffix array, maxflow</td>
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</table>
Why study algorithms and data structures?

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

To solve problems that could not otherwise be addressed.

http://www.youtube.com/watch?v=ua7YIN4eL_w
Why study algorithms and data structures?

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

“Computer models mirroring real life have become crucial for most advances made in chemistry today.... Today the computer is just as important a tool for chemists as the test tube.”

— Royal Swedish Academy of Sciences
(Nobel Prize in Chemistry 2013)

Martin Karplus, Michael Levitt, and Arieh Warshel
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 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.
- To solve problems that could not otherwise be addressed.
- 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?
Intro to COS 226

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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>
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<tbody>
<tr>
<td>L01</td>
<td>TTh 11–12:20</td>
<td>Thomas Lab 003</td>
<td>Kevin Wayne</td>
<td>M 2–4pm</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

Andy Guna
Faculty
Lead Preceptor

Ross Teixeira
Graduate Student
Preceptor

Qasim Nadeem
Graduate Student
Preceptor
### Precepts

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

<table>
<thead>
<tr>
<th>What</th>
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<tbody>
<tr>
<td>P01</td>
<td>F 9–9:50am</td>
<td>Friend 009</td>
<td>Andy Guna</td>
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<tr>
<td>P02</td>
<td>F 10–10:50am</td>
<td>Friend 009</td>
<td>Andy Guna</td>
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<td>P03</td>
<td>F 11–11:50am</td>
<td>Friend 009</td>
<td>Maia Ginsburg</td>
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<td>P03A</td>
<td>F 11–11:50am</td>
<td>Friend 108</td>
<td>TBA</td>
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<td>P04</td>
<td>F 12:30–1:20pm</td>
<td>Friend 009</td>
<td>Ross Teixeira</td>
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<td>P05</td>
<td>F 1:30–2:20pm</td>
<td>Friend 009</td>
<td>Qasim Nadeem</td>
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<td>P06</td>
<td>Th 3:30–4:20pm</td>
<td>Friend 009</td>
<td>Maia Ginsburg</td>
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Review sessions

- Recap of material discussed during the week.
- Q&A session.
- Active learning activities.

Q. Required?
A. No. Intended for students seeking extra help to keep up with the course.

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- union–find
Programming assignments

Implement an efficient algorithm or data structure.

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

"I pledge my honor that I have not violated the Honor Code during this examination."
Grading

Programming assignments. 45%
- Due at 11pm on Mondays via Dropbox.
- 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 24).
- Final (to be scheduled by Registrar).

Participation. 5%
- Attend and participate in precept/lecture.
- Answer questions on Piazza.
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Resources (textbook)


Available in hardcover and Kindle.

- Online: Amazon ($70 hardcover, $60 Kindle, $40 rent), ...
- Brick-and-mortar: Labyrinth Books ($60 hardcover).
- On reserve: Engineering library.
Resources (videos)

Lecture videos (optional).

- Missed lecture.
- Review for exams.
Resources (videos)

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

Welcome wayne

Search Results: "percolation"

1.E Applications

http://salon.cs.princeton.edu

1:12 So, the one we’re going to talk about now is called [percolation](http://salon.cs.princeton.edu).

2:46 That’s just a few examples of the [percolation](http://salon.cs.princeton.edu) model.

5:16 So the [percolation](http://salon.cs.princeton.edu) model on the left corresponds to the, connection model on the right, according to what we’ve been doing.

7:34 And that’s where we get the result that, by running enough simulations for a big-enough n, that this, [percolation](http://salon.cs.princeton.edu) threshold is about.
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.

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

http://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.

http://piazza.com/princeton/fall2017/cos226
http://www.princeton.edu/~cos226
http://labta.cs.princeton.edu
This week

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<th>Sun</th>
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- **Assignment 1 (Percolation)**
- **Lecture 1 (Union-Find)**
- **Precept 1**
- **Quiz 0 and 1**

You are here!

Precept starts tomorrow (or today) read Assignment 1 before precept

Protip: start early

Yes, really!
A typical week

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- Lecture 2 (Analysis)
- Lecture 3 (Stacks)
- Precept 2
- Quiz 2 and 3
- Assignment 2 (Deques+RQs)

**Supportslecture material; assignment prep**

**Content based on week's material**

**Content based on corresponding lectures**
Q+A

Not registered? Go to 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.