

COMP - 285  
Advanced Analysis of Algorithms

# Welcome to COMP 285

## Lecture 0: Welcome + Course Logistics

Chris Lucas (cflucas@ncat.edu)

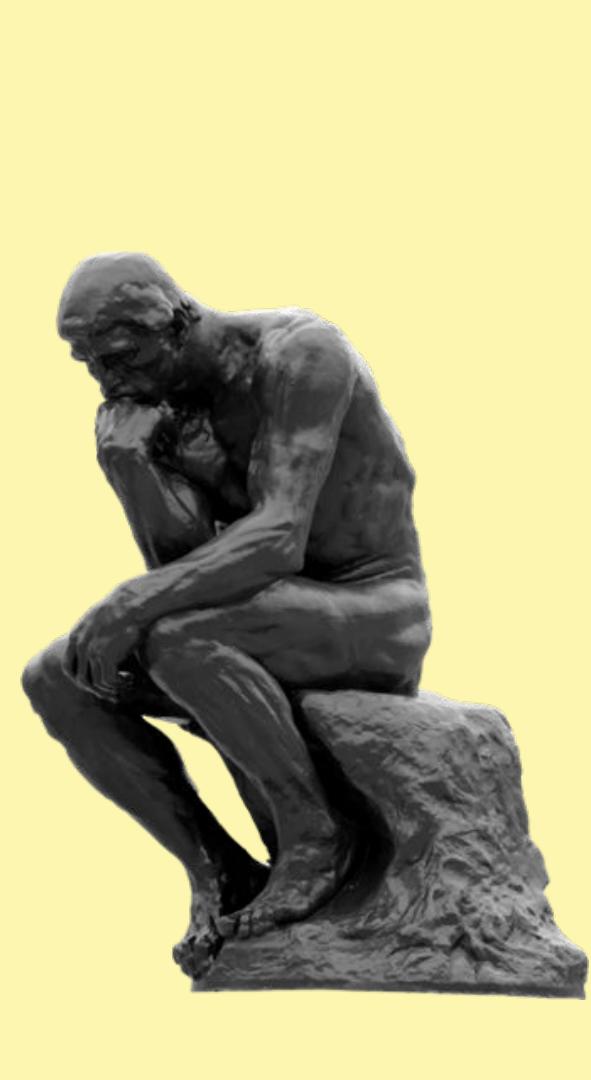


A black and white photograph of Auguste Rodin's bronze sculpture "The Thinker". The figure is a man with a beard, sitting on a large, irregular rock. He is in a contemplative pose, with his right arm resting on his chin and his head tilted down. The background is a plain, light-colored wall.

# Big Questions!

## 08/18/22 - Session

- Who are we?
- Why are we here?
- Where do we want to go?
- What's going on?

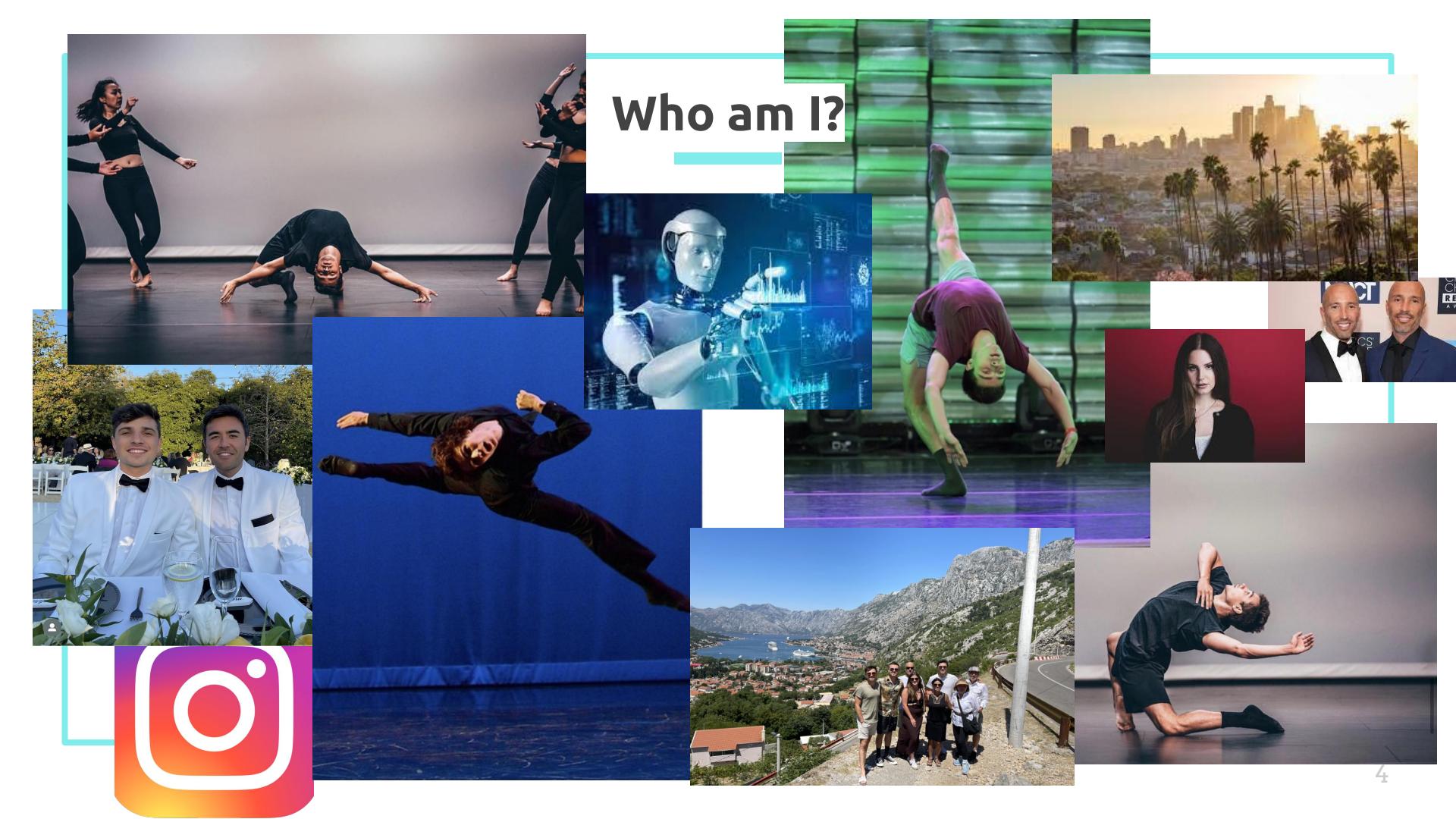
A black and white photograph of Auguste Rodin's bronze sculpture "The Thinker". The figure is a man with a beard, sitting on a large, irregular rock. He is in a contemplative pose, with his right hand resting on his chin and his left hand supporting his right elbow. His legs are bent and drawn up. The background is a plain, light-colored wall.

# Big Questions!

**08/18/22 - Session**

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- What's going on?





# Who am I?



# Who are you?

# Who are you?

Preview for HW 0!  
(Released by end of day)

A black and white photograph of Auguste Rodin's bronze sculpture "The Thinker". The figure is a man with a beard, sitting on a large, irregular rock. He is in a contemplative pose, with his right hand resting on his chin and his left hand supporting his right elbow. His gaze is directed downwards and to the side, suggesting deep thought. The background is a plain, light-colored wall.

# Big Questions!

**08/18/22 - Session**

- Who are we?
- Why are we here?
- What's going on?
- Where do we want to go?



# Motivations for this Course!

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## Why are you here?

- Algorithms are **fundamental**
- Algorithms are **fun**
- Algorithms are **useful**

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## Why am I here?

- I **love** algorithms and computer science!
- I **love** teaching!
- I want to help you **succeed**

# Motivations for this Course!

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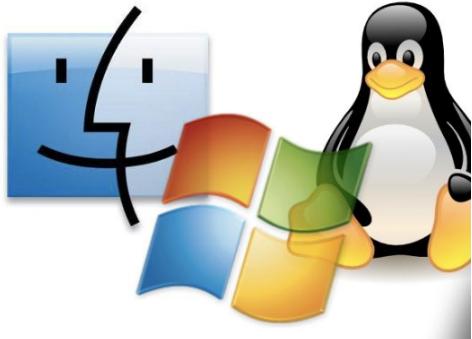
## Why am I here?

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- I want to help you **succeed**

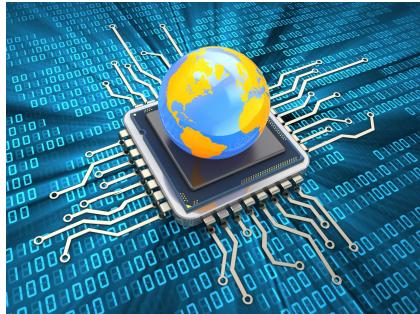
## Why is this course required?

- Algorithms are **fundamental**
- Algorithms are **fun**
- Algorithms are **useful**
- Algorithms are **core** to interview process

# Algorithms are Fundamental



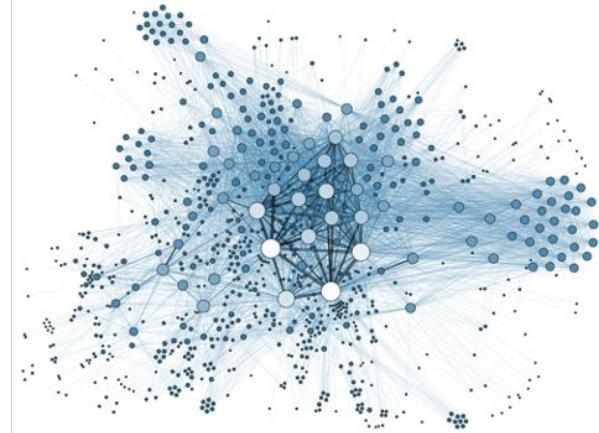
Operating Systems (COMP 350)



Computer Architecture (COMP 375)



AI & Machine Learning (COMP 365)



Internet Systems (COMP 322)



Applied Network  
Security (COMP 420)

# Algorithms are Useful



Social Media

	27,000	2,180	2,21			
50	1,225	5,350	5,690	4,500	5,420	0,000
40	0	0,000	0,410	564,494	0,450	0,000
450	30,393	2,440	2,750	32,464	2,600	0,000
600	5,000	1,600	1,830	56,512	1,800	0,000
650	73,778	2,300	2,210	128,544	2,280	0,000
700	0	0,000	3,100	874,820	3,090	0,000
750	0	0,000	0	2,950	0,000	0,000

Finance/equity trade



e-Commerce



Autonomous Driving



Google search,  
internet browsing,  
*Know the algo behind page  
indexing?*

# Algorithms are fun!

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- More an **art** than **science**
- Requires a lot of **creativity**
- Many **surprises!**
- Still a **new** field!
- Many exciting and new **research** and **applications!**

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# Big Questions!

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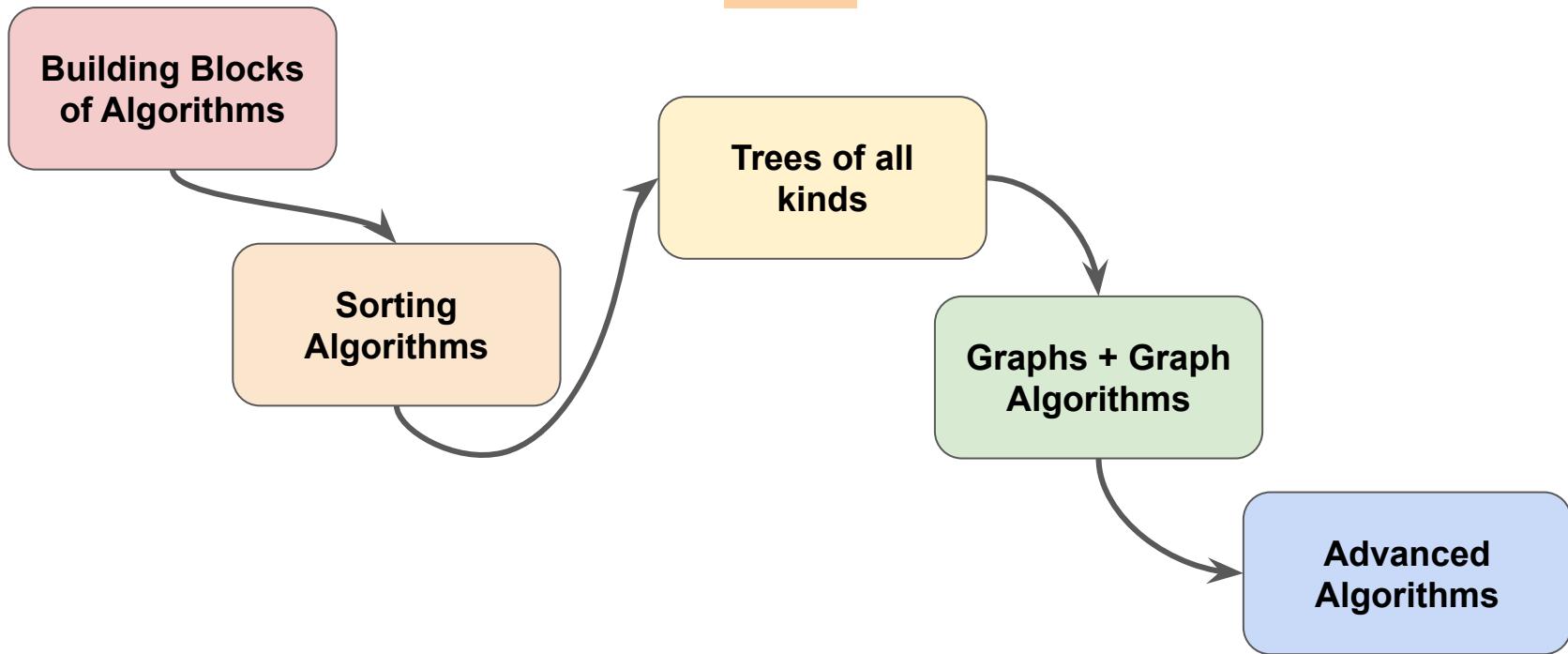
# The Purposes of this Course



- This course is meant to meet you where you are, challenge you, and uplevel your engineering skills.
- This course is meant to teach you **teach you how to reason about algorithms, how much time and space they consume, how to solve problems with algorithms.**
- This course is meant to prepare you to navigate applying to internships/jobs and what ensues thereafter.

# Our Course Map!

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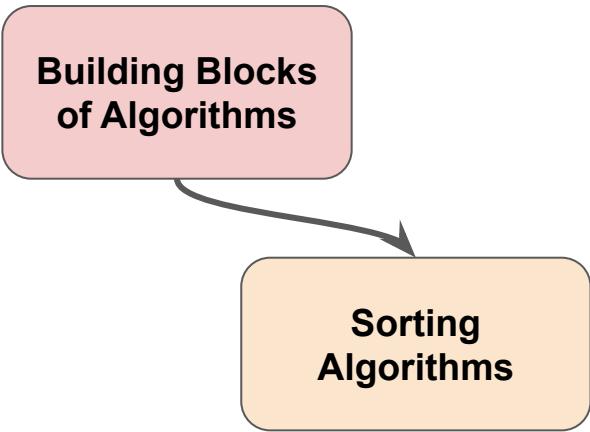
# Our Course Map!



## Building Blocks of Algorithms

- Recursion
- Big-O (time/space complexity)
- Data structures (stacks, queues, maps, sets, etc.)
- General problem solving methodology

# Our Course Map!



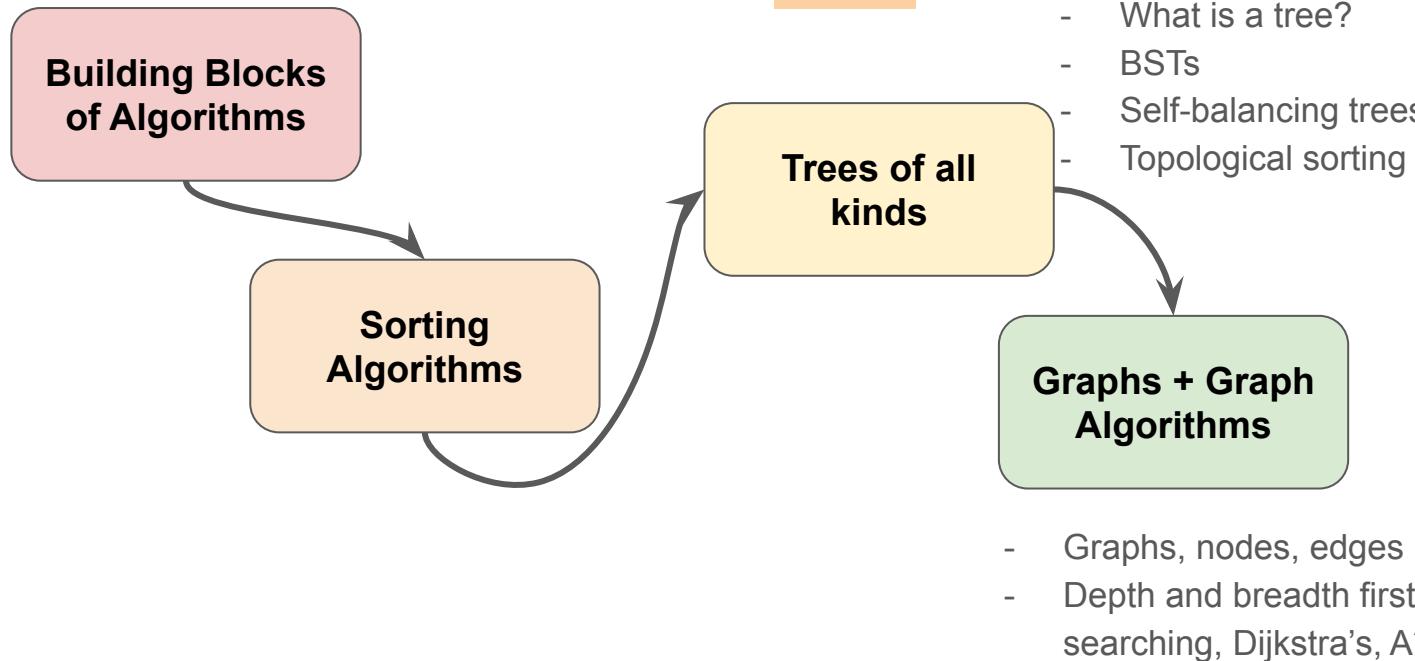
```
graph TD; A[Building Blocks of Algorithms] --> B[Sorting Algorithms]
```

**Building Blocks  
of Algorithms**

**Sorting  
Algorithms**

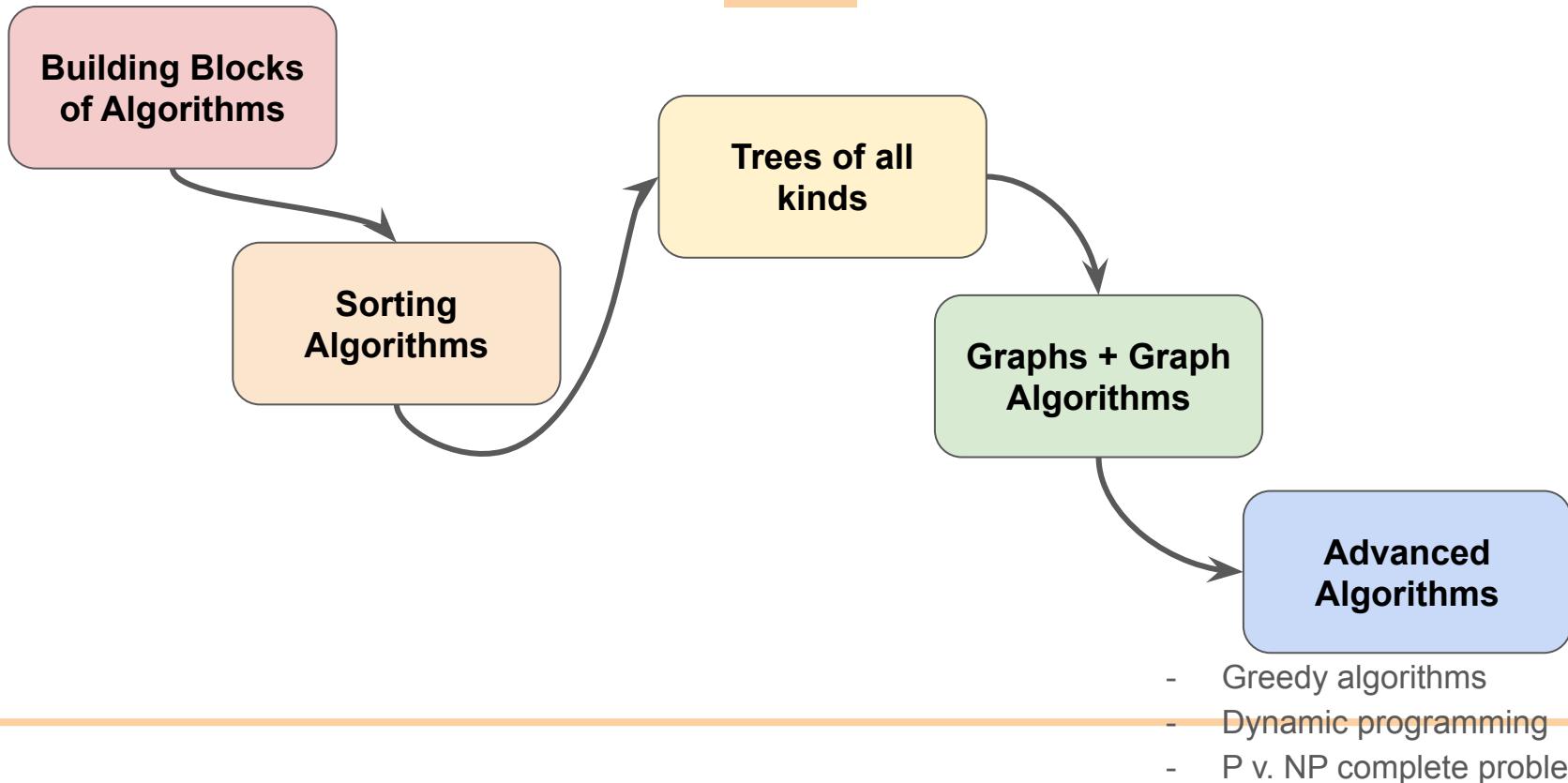
- How to arrange and “sort” data in data structures
- Mergesort, InsertionSort, QuickSort
- Master Theorem, linear sorting approaches

# Our Course Map!



# Our Course Map!

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# Our Course Map!

Building Blocks  
of Algorithms

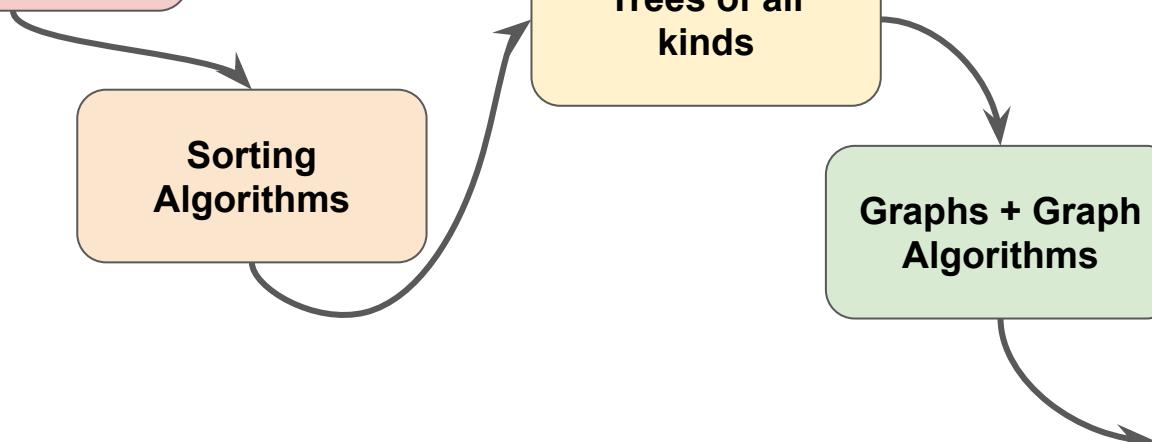
Sorting  
Algorithms

Trees of all  
kinds

Graphs + Graph  
Algorithms

Advanced  
Algorithms

Career Preparation



# Our Course Map!

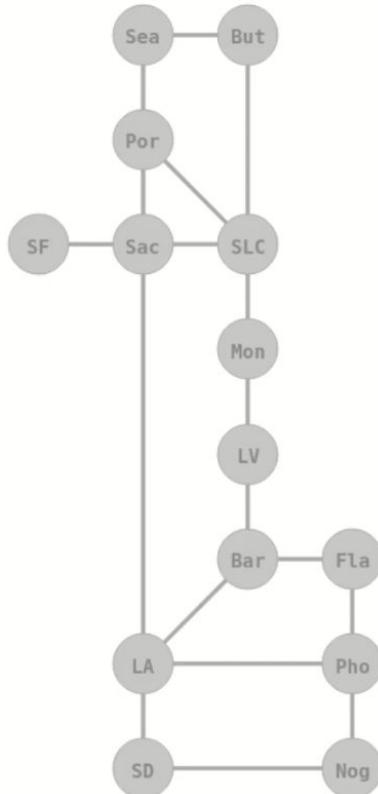
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- **Building Blocks of Algorithms:** problem-solving skills, time and space complexity analysis, recursion, using basic data structures
- **Sorting algorithm:** Merge-, Insertion-, Quick-sort, Master Theorem,  $O(n)$  sorting
- **Trees & Graphs:** tree and graph traversals, self-balancing binary search trees, topological sorts, weighted graphs, Dijkstra's, minimum spanning trees
- **Advanced Topics:** greedy algorithms, dynamic programming, P vs NP, approximation algorithms.
- **Career Prep:** resume building, preparing for technical interviews, how to apply to internships/jobs

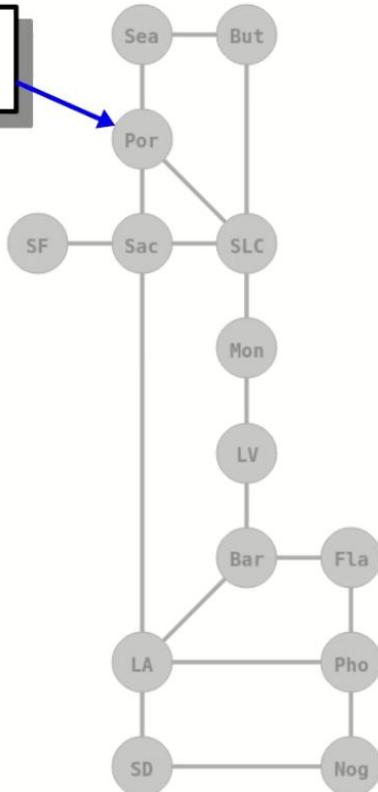
# Concrete Examples

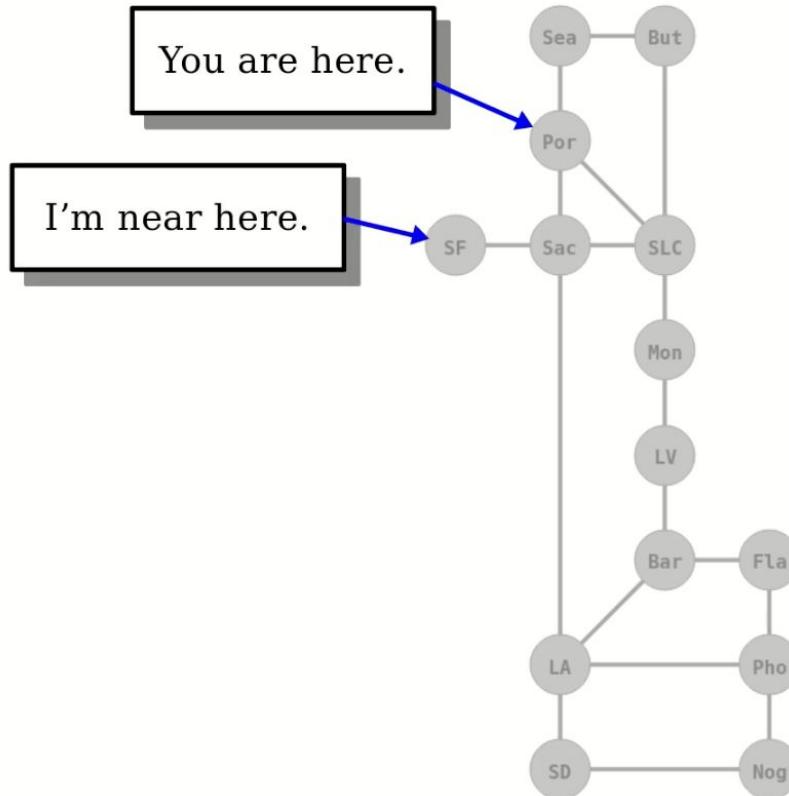


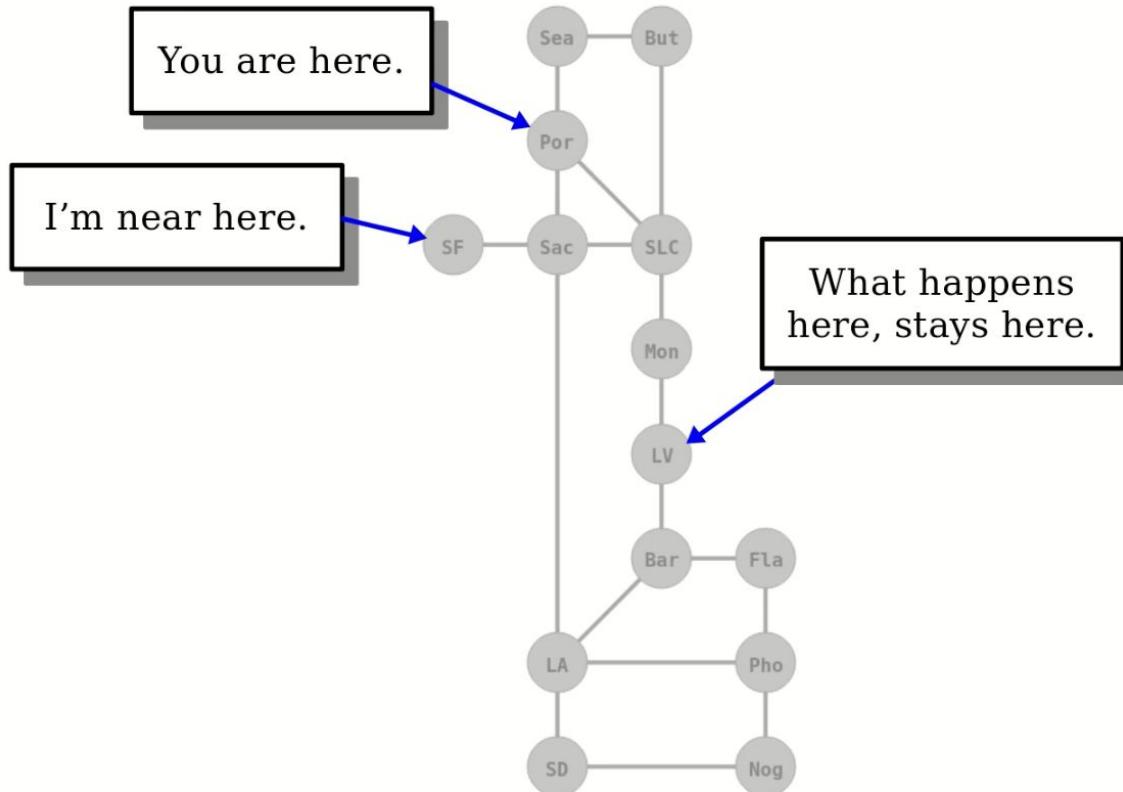
# Disaster Planning



You are here.







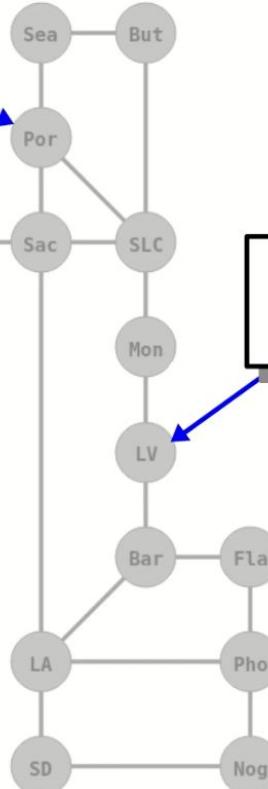
You are here.

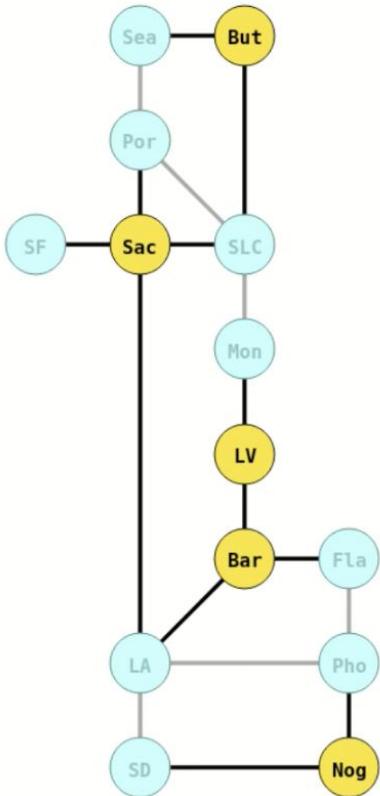
I'm near here.

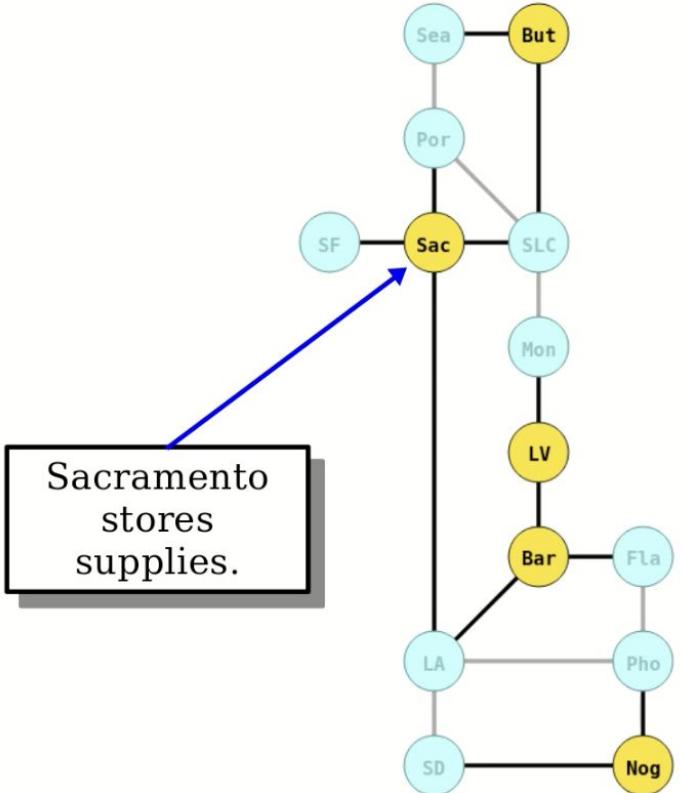
Each city either needs supplies or must be adjacent to one with supplies.

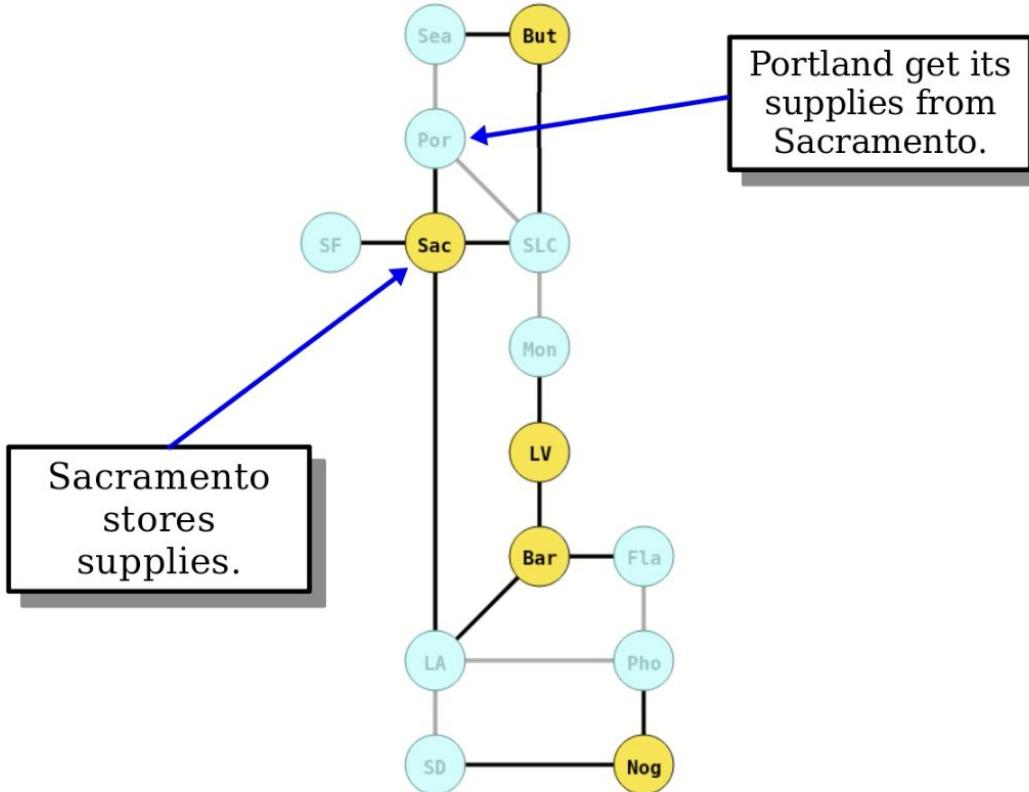
**Question:** How few cities can you stockpile supplies in?

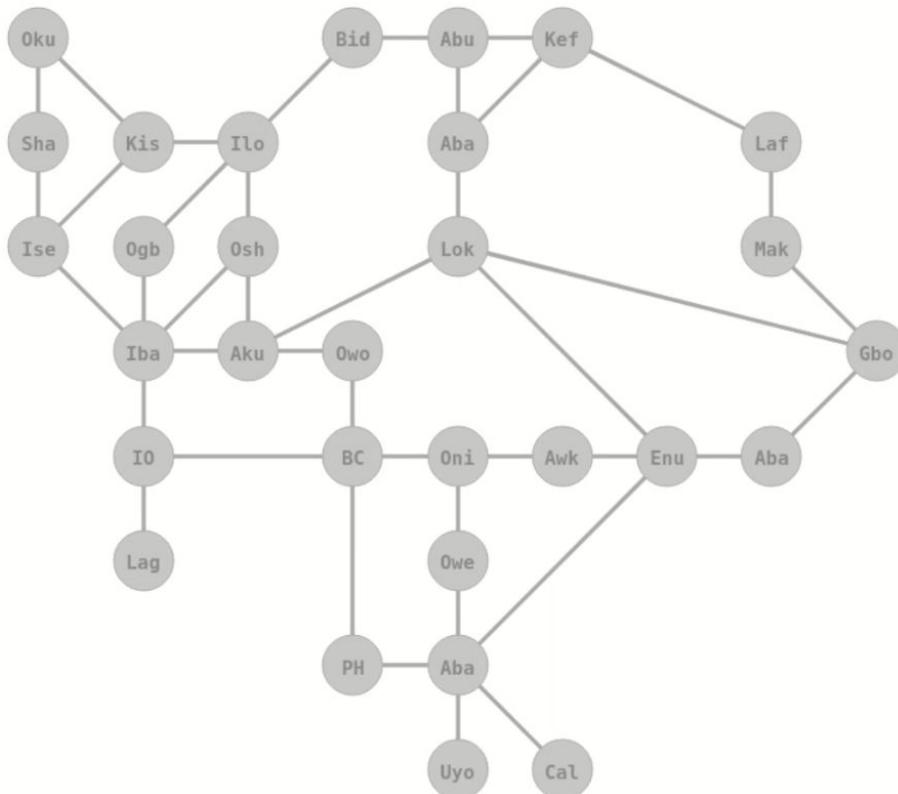
What happens here, stays here.

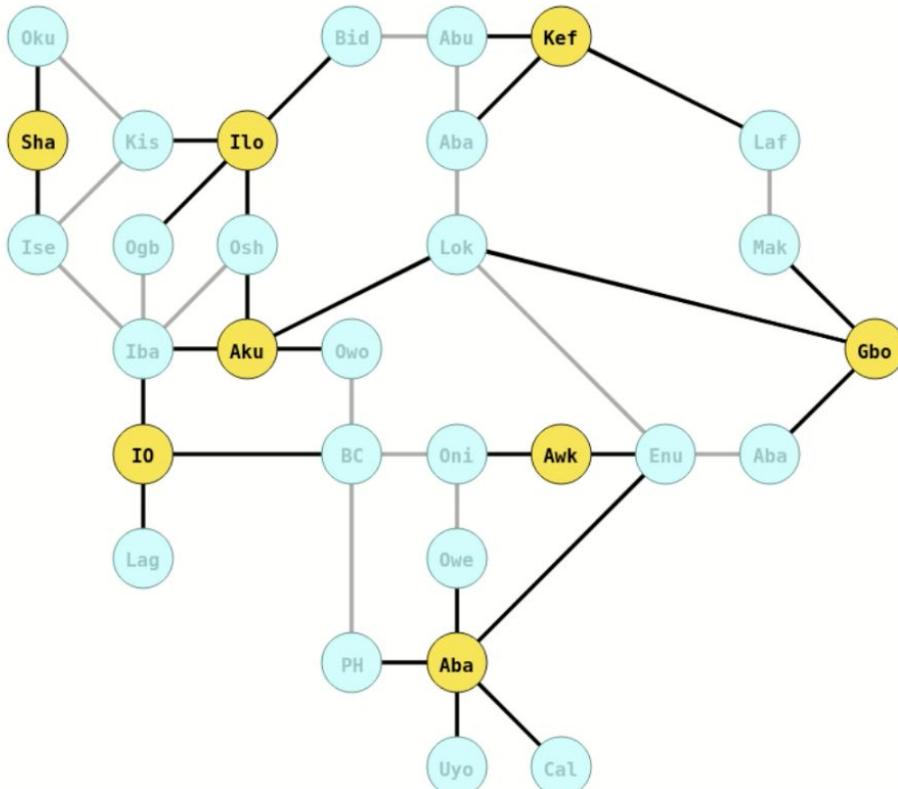


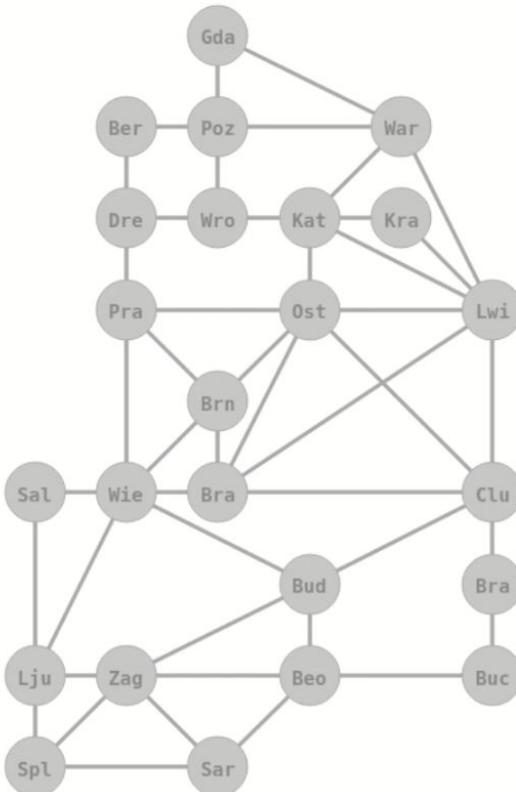


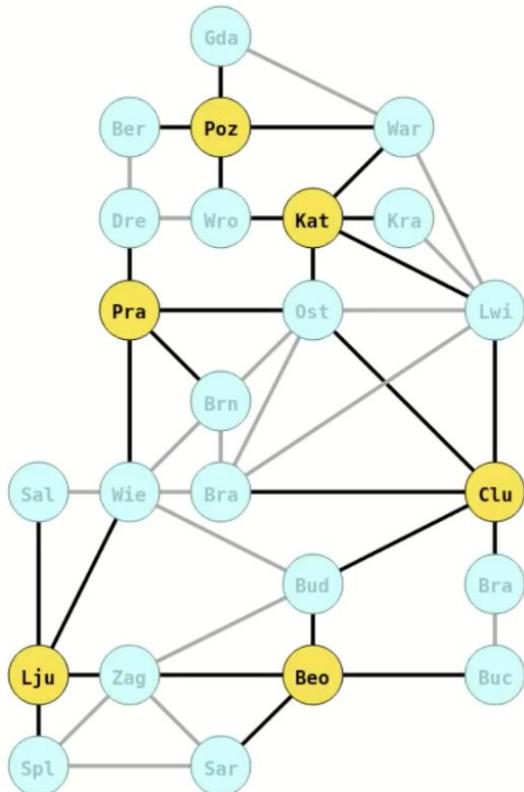












# Doctors Without Orders

**Doctor Thomas**

**(10 hours free)**

**Doctor Taussig**

**(8 hours free)**

**Doctor Sacks**

**(8 hours free)**

**Doctor Ofri**

**(8 hours free)**

**Doctor Thomas**

**(10 hours free)**

**Doctor Taussig**

**(8 hours free)**

**Doctor Sacks**

**(8 hours free)**

**Doctor Ofri**

**(8 hours free)**

**Patient Lacks**

**(2 hours needed)**

**Patient Gage**

**(3 hours needed)**

**Patient Molaison**

**(4 hours needed)**

**Patient Writebol**

**(3 hours needed)**

**Patient St. Martin**

**(1 hour needed)**

**Patient Washkansky**

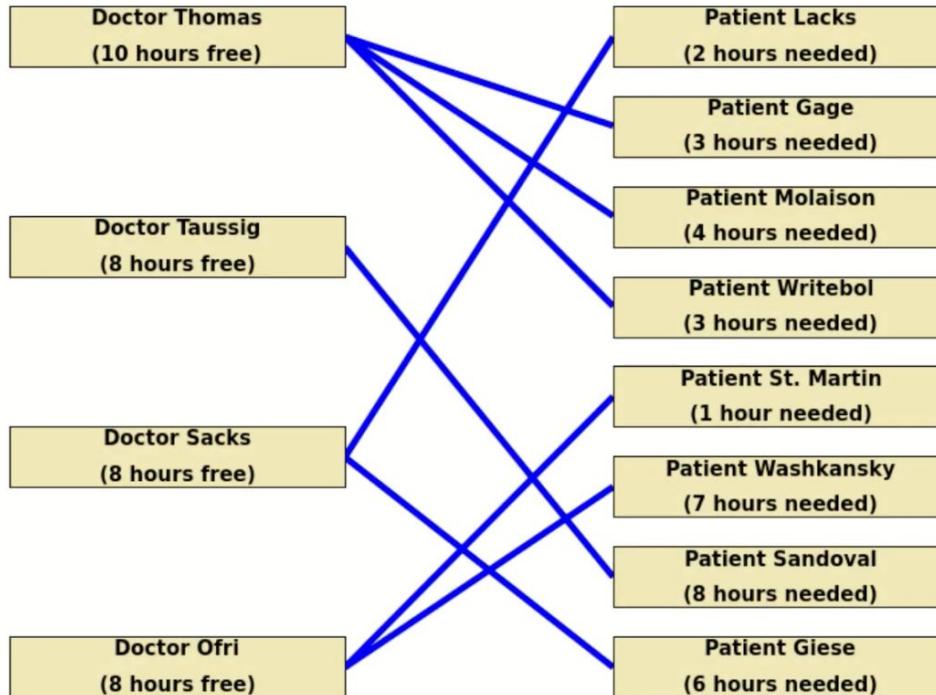
**(7 hours needed)**

**Patient Sandoval**

**(8 hours needed)**

**Patient Giese**

**(6 hours needed)**



# Winning the Presidency



KQED PUBLIC MEDIA

news

arts & life

music

programs

shop



POLITICS



## How To Win The Presidency With 23 Percent Of The Popular Vote

November 2, 2016 · 6:00 AM ET



DANIELLE KURTZLEBEN



## POLITICS

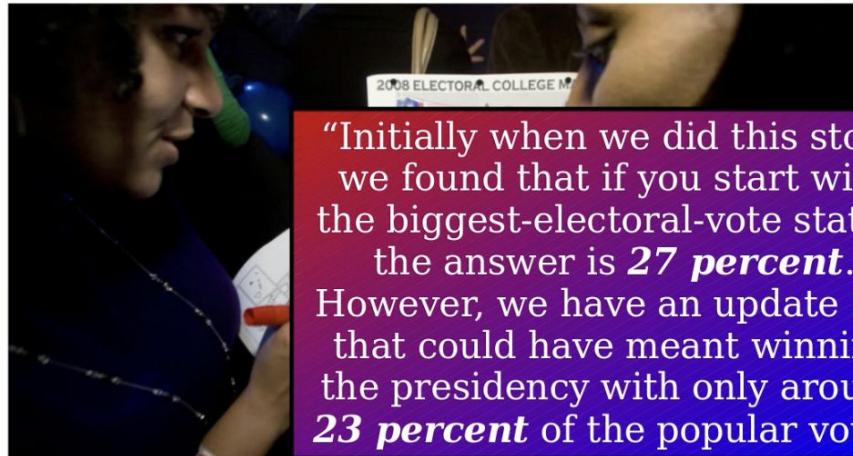


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November 2, 2016 · 6:00 AM ET



DANIELLE KURTZLEBEN



## POLITICS

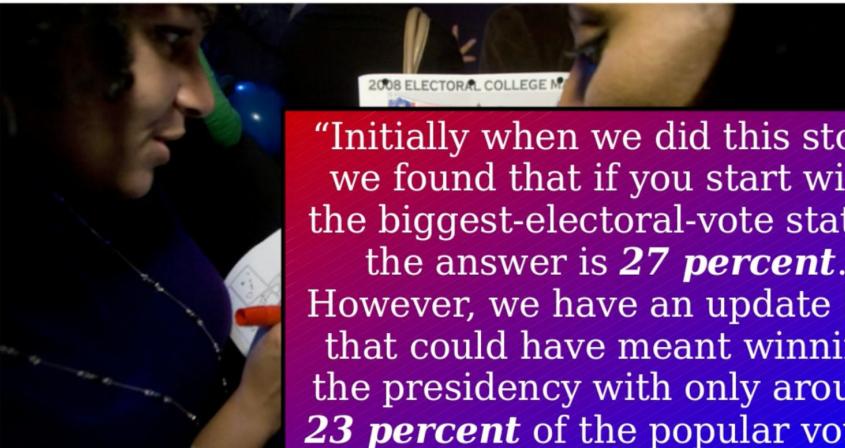


# How To Win The Presidency With ~~25~~ Percent Of The Popular Vote

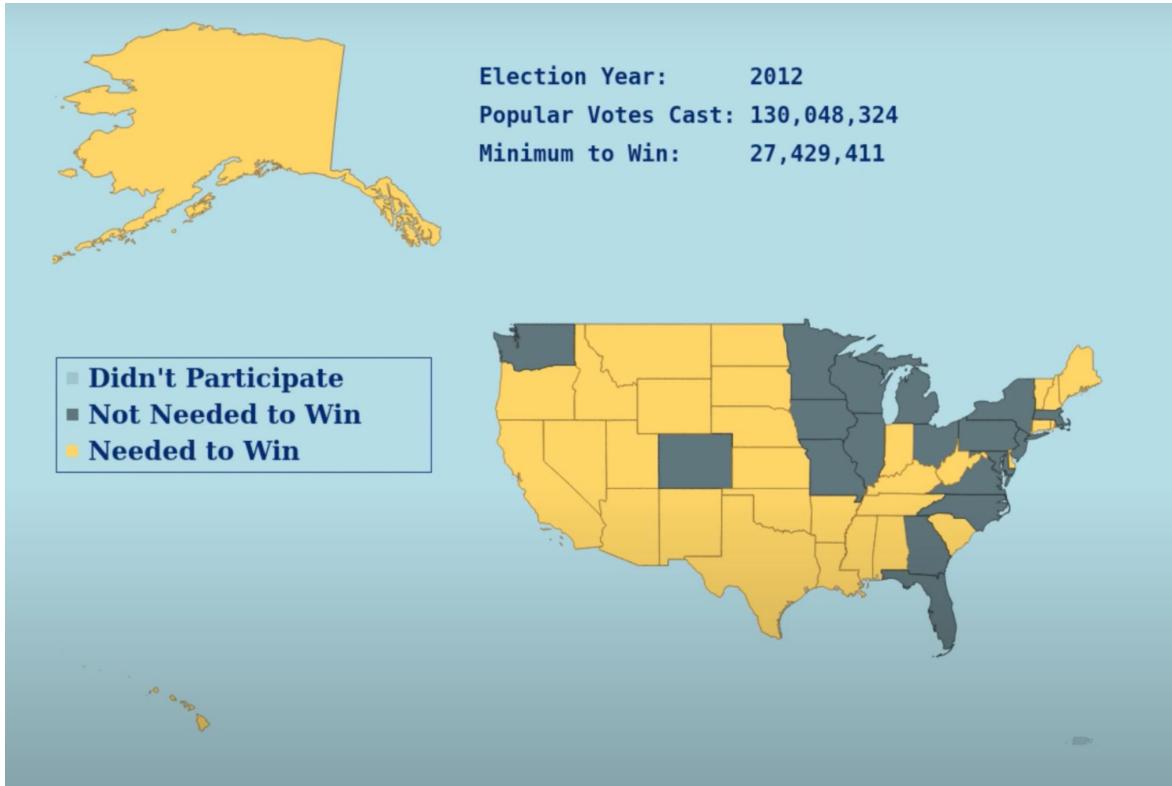
November 2, 2016 · 6:00 AM ET

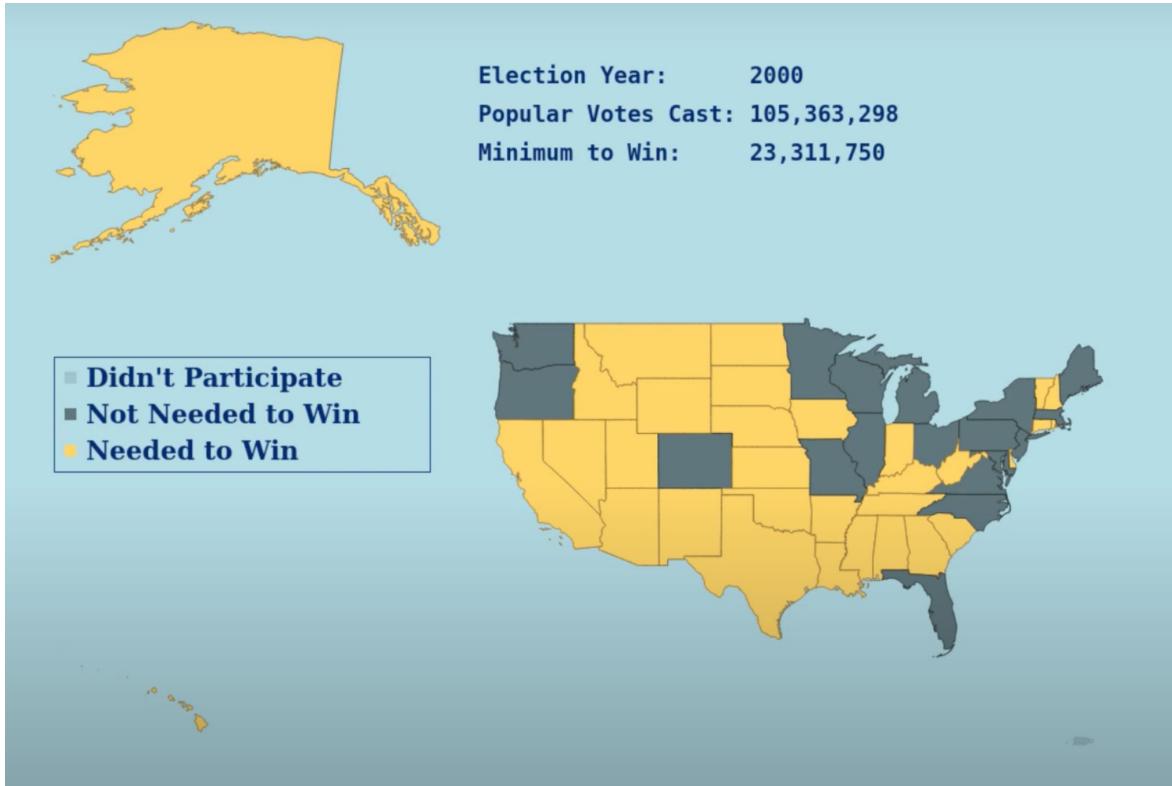


DANIELLE KURTZLEBEN

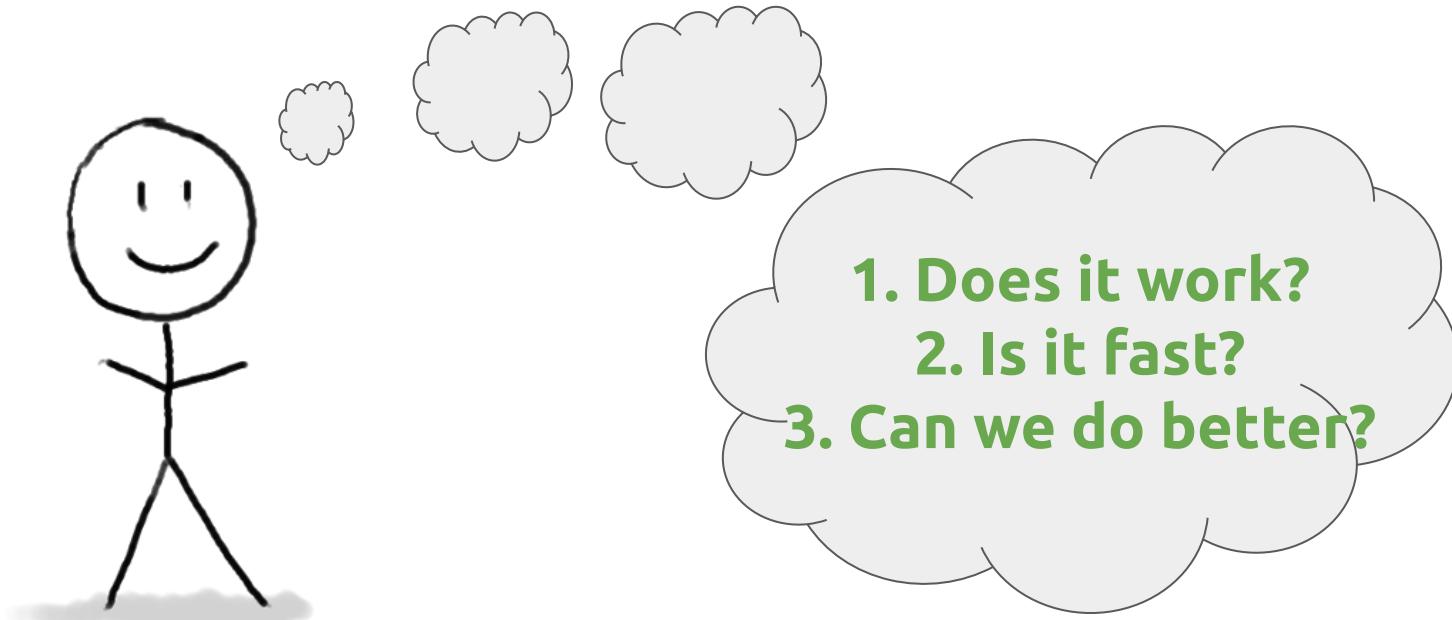


“Initially when we did this story, we found that if you start with the biggest-electoral-vote states, the answer is **27 percent**. However, we have an update [...] that could have meant winning the presidency with only around **23 percent** of the popular vote.”





# Our Guiding Questions...



A black and white photograph of Auguste Rodin's bronze sculpture "The Thinker". The figure is a man with a beard, sitting on a large, irregular rock. He is in a contemplative pose, with his right arm resting on his chin and his head tilted down. The background is a plain, light-colored wall.

# Big Questions!

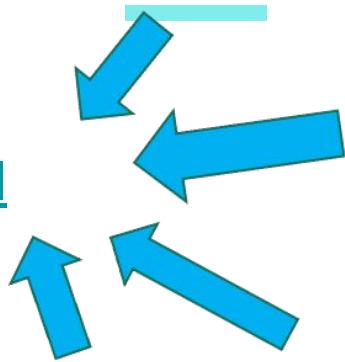
## 08/18/22 - Session

- Who are we?
- Why are we here?
- Where do we want to go?
- What's going on?



# Course Logistics!

- Course Website
  - o [comp285-fall22.ml](http://comp285-fall22.ml)
- Lectures
- Optional References
- Homework
- Exams
- Piazza
- Office Hours

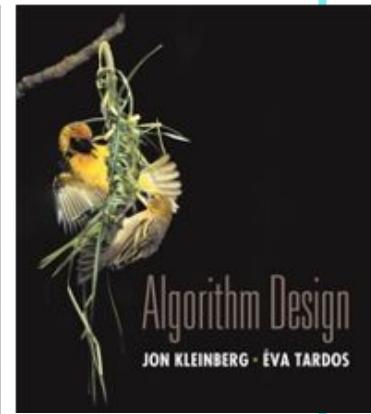
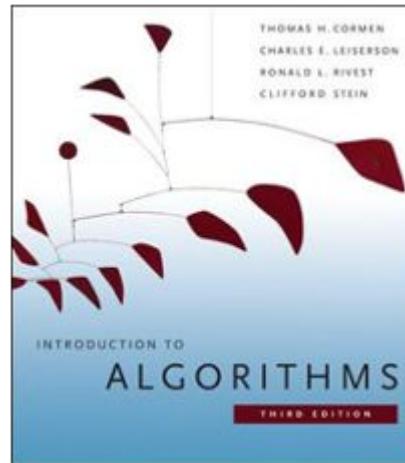
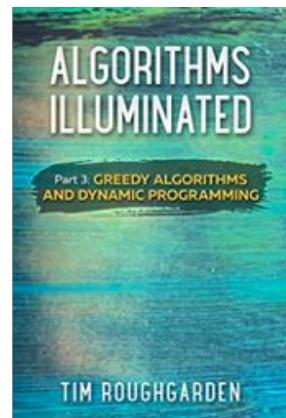
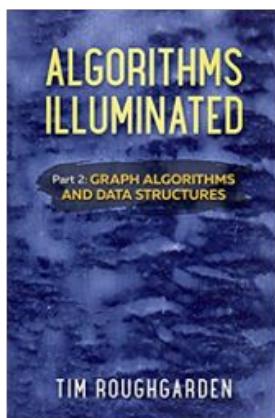
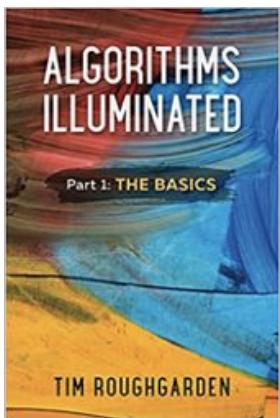


# Lectures

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	Monday	Tuesday	Wednesday	Thursday	Friday
12pm					
12:30pm					
1:00pm					
1:30pm					
2:00pm					
2:30pm		Lecture 2:00pm-3:15pm Graham Hall 208		Lecture 2:00pm-3:15pm Graham Hall 208	
3:00pm					
3:30pm					
4:00pm					
4:30pm					

# Optional References

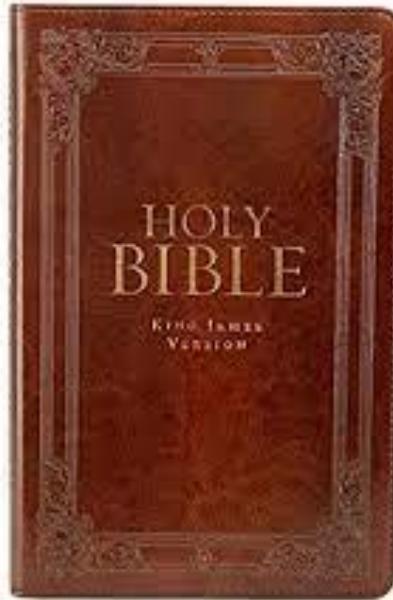
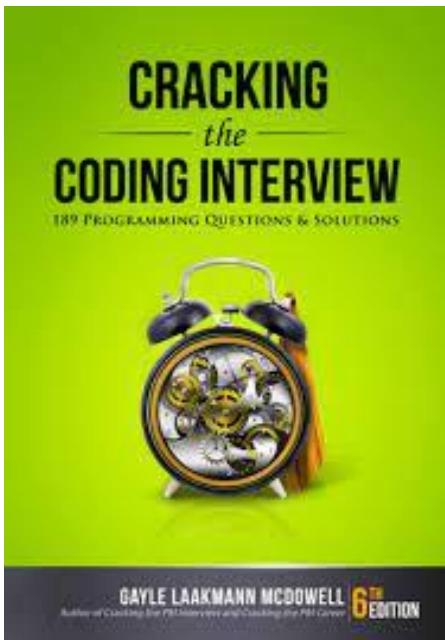


**Algorithms Illuminated, Vols 1,2 and 3**  
by Tim Roughgarden

Additional resources at  
[algorithmsilluminated.org](http://algorithmsilluminated.org)

# Required(-ish) References

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## Homework (40%)

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- HW0 will be out today, due in 1 week @ 11:59pm ET
- HW1 through HW9 have >7 day turnaround time
  - o If released on Tuesday, due Thursday after next @ 1:59pm ET
  - o If released on Thursday, due Tuesday after next @ 1:59pm ET
- 5-late day policy per assignment
- Lowest HW score dropped w/ caveat

### Homework Assignments

#### Homework 0: Logistics + Getting to Know You

Release: [Aug 18, 3:30 PM](#) - Due: [Aug 25, 11:59 PM](#)

- PDF Version: [\[Link\]](#)
- Repl.it: [\[Starter code\]](#)

# Homework (40%)

## COMP 285

- Schedule
- Lectures
- Homework**
- C++ Resources
- Exams
- Meeting Times
- Policies
- Quizzes
- Resources
- Staff - Student Hours

### Repl.it Homework Starter Code Setup

Repl.it is an IDE that we will use to complete the coding portions of the assignments. Even if you do not plan to use repl.it for writing/developing your solutions, you will need to access the starter code here.

First, let's start by getting you an account and joining the right project:

- 1 If you don't already have a repl.it account with your "aggies.ncat.edu" email, head over to the repl.it [homepage](#). On the top-right, click the 'Sign Up' and use your NCAT email address to sign-up.
- 2 Complete the registration process (eg, there's a verification email you should get)
- 3 Join the COMP 285 Team by following this [link](#).

Next, let's get your starter code.

- From your repl.it homepage, you should have a menu down the left-hand side of the page (if not, maybe click the hamburger menu to open it?).
- Click on "Teams" on the lefthand side. You should see 'COMP 285: Analysis of Algorithms' under 'Education', as well as the 'comp285-fall22' Team Project. See the figure for more information.
- Click on 'comp285-fall22', which will take you to the Team Homepage. From there, under 'Projects', you should see a link to get started on the homework.
- Clicking it will give you the starter code, as well as set you up with an online. If the above does not work, you can also try going directly to the [project link](#).

 gradescope ≡

### Your Courses

Welcome to Gradescope! Click on one of your courses to the right, or on the Account menu below.

### Your Courses

#### Fall 2022

##### COMP 285

Analysis of Algorithms

0 assignments

# Quizzes (10%)

- ~Weekly quizzes starting 08/29
- Quiz drop lowest 2 scores w/ homework caveat applied

The screenshot shows a course website for COMP 285. The top navigation bar includes a search bar, links to Blackboard, Piazza, and Gradescope, and the course title 'COMP 285'. The main content area features a heading 'Quizzes' with a subtext: 'Check back starting 08/29 for ~weekly quizzes (with solutions)!'. Below this, a 'Back to top' link is visible. On the left, a sidebar lists course links: Schedule, Lectures, Homework, C++ Resources, Course Philosophy, Exams, Meeting Times, Policies, Quizzes (which is highlighted with a grey background), Resources, and Staff - Student Hours.

COMP 285

Search COMP 285

Blackboard Piazza Gradescope

Quizzes

Check back starting 08/29 for ~weekly quizzes (with solutions)!

Back to top

Schedule  
Lectures  
Homework  
C++ Resources  
Course Philosophy  
Exams  
Meeting Times  
Policies  
**Quizzes**  
Resources  
Staff - Student Hours

# Exams (45%)

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## Midterm

2:00pm – 3:15pm on Thursday, October 6th, 2022.

## Final Exam

Date and time TBD

## **In-class Participation (5%) /Extra Credit (~5%)**

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- In-class participation:
  - Socratic method
  - Short exercises to be submitted
- Extra credit opportunities:
  - Solving leetcode problems
  - Mock interview practice with teaching staff
  - Attending CS department events
  - Answering students' questions on Piazza
  - Finding bugs in HW, quizzes, etc.

## Piazza

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**Talk to us! Talk to each other!**  
**Use Piazza!**  
**(setup instructions in HW0)**

- <https://piazza.com/class/l6fee1cmjpp5az>
  - Link to [enroll](#)

# Office Hours

	Monday	Tuesday	Wednesday	Thursday	
12pm					
12:30pm					
1:00pm		<b>Office Hours</b> 1:00pm-2:00pm Zoom		<b>Office Hours</b> 1:00pm-2:00pm MARTIN 331/Zoom	
1:30pm					
2:00pm					
2:30pm					
3:00pm					
3:30pm		<b>Office Hours</b> 3:30pm-4:30pm MARTIN 331		<b>Office Hours</b> 3:30pm-4:30pm MARTIN 331	
4:00pm					
4:30pm					

**Everyone can succeed!**

- Work **hard!**
- Work **smart!**
- Ask for **help!**



## Poll

---

Where can you find the most up-to-date info everything related to the course (logistics, announcements, resources, office hour schedules, etc.)?

1. Blackboard
2. Piazza
3. Gradescope
4. Course Website

## Poll

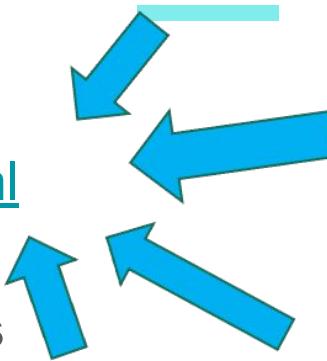
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# A few words on academic integrity

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- What are reasons that people cheat?
  - If you feel trapped or encouraged to cheat, please email instead to ask for help.
- What counts as cheating?
  - Copying from another student or online sources (Stack Overflow, Quora, Chegg, etc.)
  - Providing written solutions to other students
  - Posting on Chegg or uploading material + solutions to CourseHero, Github, public Repl.it, etc.
- **You should never have someone else's solution in your possession**
- It's not in your best interest to cheat.

# Feedback?

COMP 285

 Search COMP 285

Blackboard

Piazza

Gradescope

Zoom

Feedback

Schedule 1:1

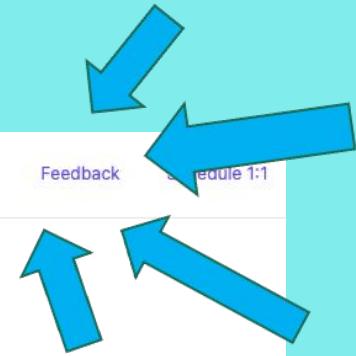
Schedule

Lectures

Homework

Analysis of Algorithms

North Carolina A&T University, Fall 2022



# Anything else?

COMP 285

 Search COMP 285

Blackboard

Piazza

Gradescope

Zoom

Feedback

Schedule 1:1

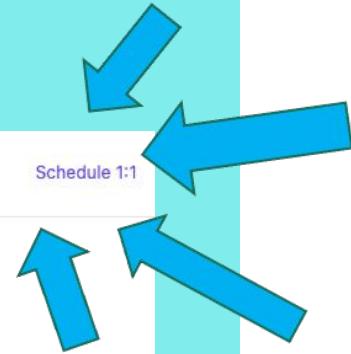
Schedule

Lectures

Homework

Analysis of Algorithms

North Carolina A&T University, Fall 2022



# **Tools for Success + Core Values**

# Welcome Feedback

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## **What this means for me:**

- Will ask for feedback consistently over the semester
- Will incorporate feedback into the classroom as it is given
- Will give feedback to each student

## **What this means for you:**

- Will receive feedback positively and seek to improve
- Will constructively provide feedback on how we can all achieve our shared goals
- Will share feedback with other students so we all may improve

# Grit is essential

## What this means for me:

- Will come to class prepared to deliver content in a meaningful, impressionable way
- Will scale to meet students where they are and work to uplevel/challenge from there

## What this means for you:

- Will show up class prepared to learn new material
- Will show up to class with willingness to participate and maximize learning
- Will see challenge as opportunity, understanding that optimal growth as engineers/computer scientists occurs in these instances

# Comparison is the thief of joy

## What this means for me:

- Will ensure career coaching, 1:1 office hour conversations, etc. are tailored to the individual student
- Offer my individual perspective, realizing it is only one perspective, while accommodating other perspectives

## What this means for you:

- Will remain focused on oneself, what one as an individual needs to do next in order to succeed (in their own terms)
- Will abstain from comparing progression/trajectories among peers
- Remain able to seek inspiration from those around you

# Goals are Golden

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## What this means for me:

- Will incorporate applications of course content to answer “why are we learning this”, “why is this important”
- Will prioritize orienting content in a way that facilitates students achieving their short- and long-term goals.

## What this means for you:

- Will create time and space for honest reflection of short- and long-term goals and why COMP 285 fits into that picture
- Will use these goals as motivation/fuel to propel through the course



## Big Questions!

08/18/22 - Session

- Who are we?
- Why are we here?
- What's going on?
- Where do we want to go?
- Remember how to multiply?





## Big Questions!

### 08/18/22 - Session

- Who are we?
- Why are we here?
- What's going on?
- Where do we want to go?
- Remember ~~how to multiply?~~





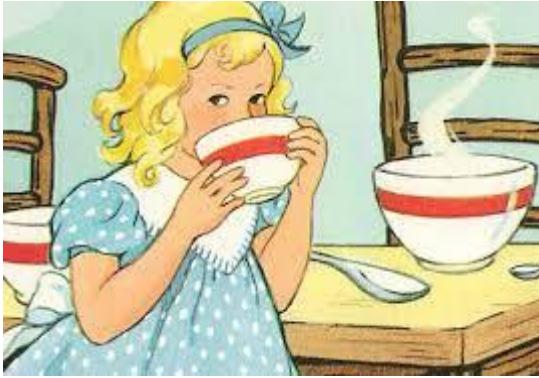
## Big Questions!

08/18/22 - Session

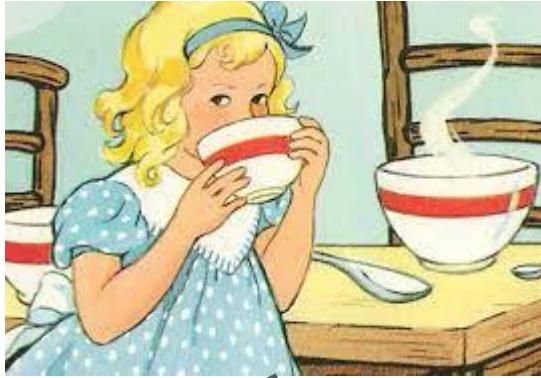
- Who are we?
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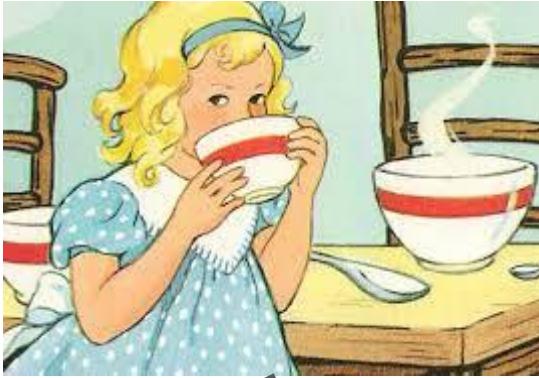
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5s



X



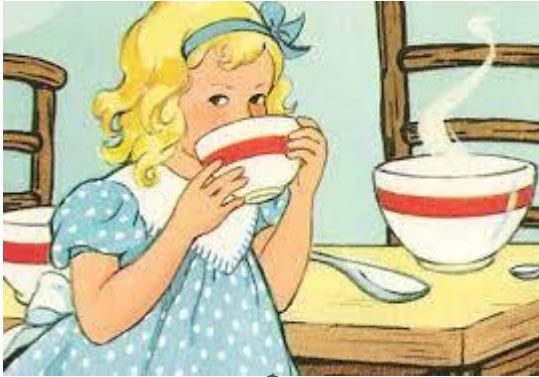
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**5s**



**x**

**5s**



**2x**



**5s**

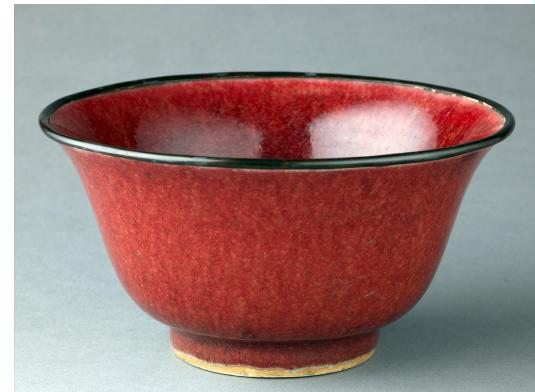


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**3x**



**5s**



**x**

**5s**



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**3x**



**5s**



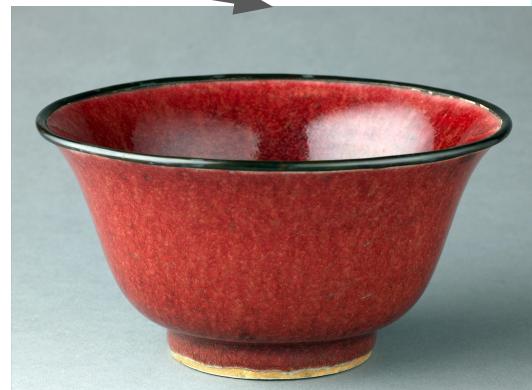
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**15s**



**3x**



**5s**



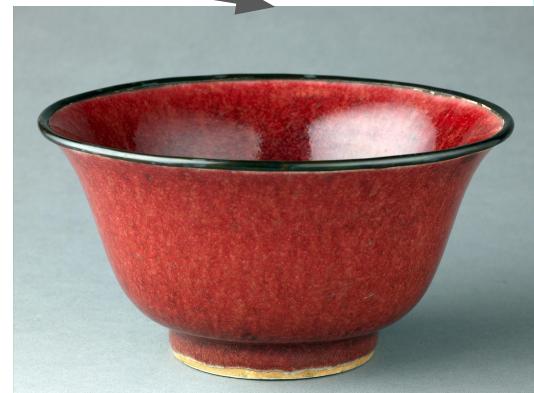
**x**

**20s**



**2x**

**?s**



**3x**



**5s**



**x**

**20s**



**2x**

**45s**



**3x**

# Announcements

- **Sign up for CodePath! application due Sunday, August 21st, 2022**
  - *Great preparation for technical interviews and recruiting!*
- **Mock interviews w/ Meta Oct 10th-13th**
  - *For practice and feedback only; performance is not documented anywhere!*
  - *Sign ups will go live mid-Sept.*
- **HW0 is OUT!**

## Wrap-Up

- [comp285-fall22.ml](#)
- Algorithms are **fundamental, useful** and **fun!**
- Does it work? Is it fast? Can we do better?
- We'll develop algorithm intuition and tech chops (helps with interviews!). As such, We're continuing to invest in career prep

## Next time!

- Career prep step #1 - **Resumes!**
- Karatsuba multiplication
- Recursion, recursion, recursion

COMP - 285  
Advanced Analysis of Algorithms

# Welcome to COMP 285

## Lecture 0: Welcome + Course Logistics

Chris Lucas (cflucas@ncat.edu)

