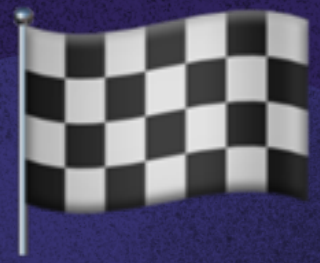
LEC 27

CSE 373

Course Wrap-Up



BEFORE WE START

Use the Zoom chat:

What are you looking forward to for the rest of your winter break?

and, more importantly:

Now that we're done with the quarter, what's your favorite data structure?

Instructor Hunter Schafer

TAs
Ken Aragon
Khushi Chaudhari
Joyce Elauria
Santino Iannone
Leona Kazi
Nathan Lipiarski
Sam Long
Amanda Park
Paul Pham
Mitchell Szeto
Batina Shikhalieva
Ryan Siu
Elena Spasova
Alex Teng
Blarry Wang
Aileen Zeng

Course Evaluations

- ***Please*** fill these out! They have an *enormous* impact on the course, and a 90% response rate makes them far more useful than 60%.
  - Have to guess what sampling bias is for "missing 40%"
- As a student, you underestimate how much instructors take evals into account – trust me, I've been a student here too ☺
  - Every 20su/20au course logistics decision was the result of weeks spent looking at previous quarter's evals
- Looks like we'll be doing this remote thing for a little longer, and your insight is the most valuable part of this experiment

Course Evaluations

- Evals for lecture and section are open until **Sunday night**
- Lecture: https://uw.iasystem.org/survey/232774
  - Have a challenge goal of 80% response rate!
    - Will do *something* if we hit the challenge goal (TBD)
- Sections:
  - Check your inbox ☺

The Stars of the Show

- Let's get a huge round of zoom applause for your TAs!
  - They do so much behind the scenes to keep 373 running smoothly… and that's on top of office hours, section, Ed, etc.
  - None of this would be possible without them!

- UW CSE has an award for excellent TAs! Please consider nominating here: https://www.cs.washington.edu/students/ta/bandes


Aileen Zeng


Alex Teng


Amanda Park


Batina Shikhalieava


Blarry Wang


Elena Spasova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Mitchell Szeto


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Paul Pham

Time For a Victory Lap

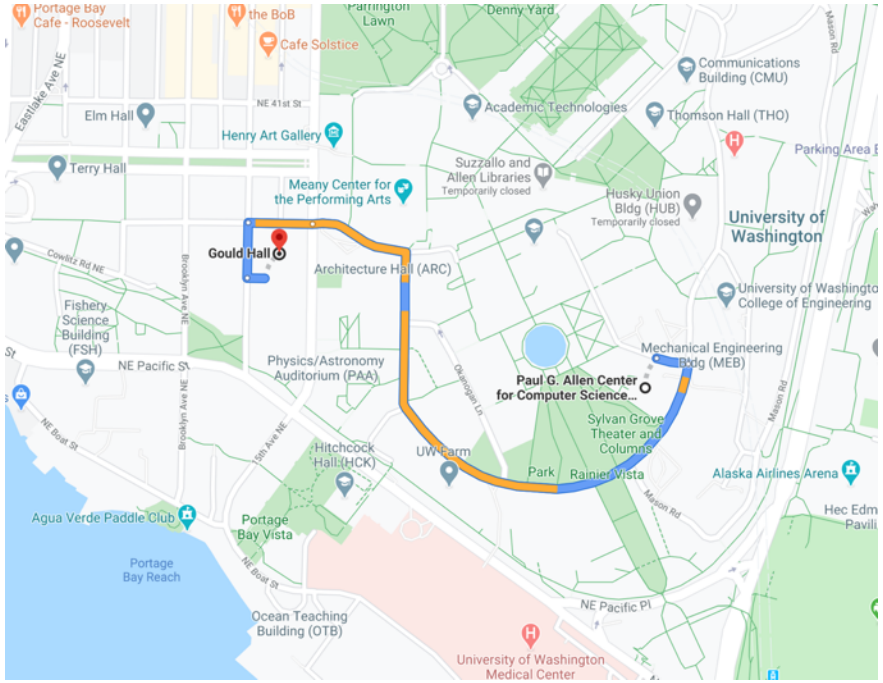
- We made it to the finish line!
- One more lap around the track by the exhausted victors (that's us ☺)

- Why?
  - It's easy to lose sight of just how much you've accomplished in a quarter!
  - Review the themes of the course that you can carry forward

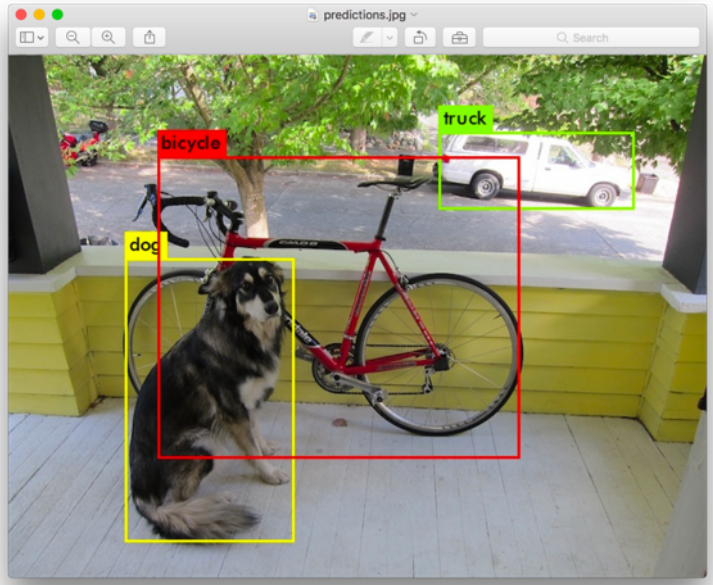
LEC 01

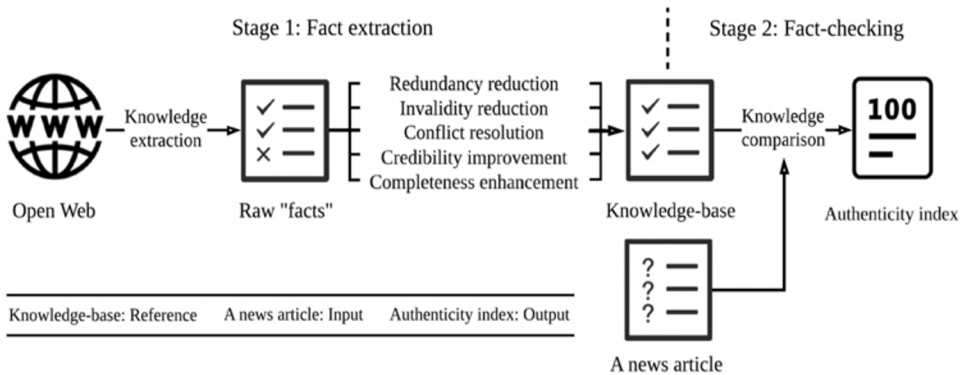
Why 373?

1. Build a **strong foundation** of data structures and algorithms that will let you tackle the biggest problems in computing



373 Data Structures & Algorithms





Fake News: A Survey of Research, Detection Methods, and Opportunities (Xinyi Zhou, Reza Zafarani/arXiv:1812.00315)

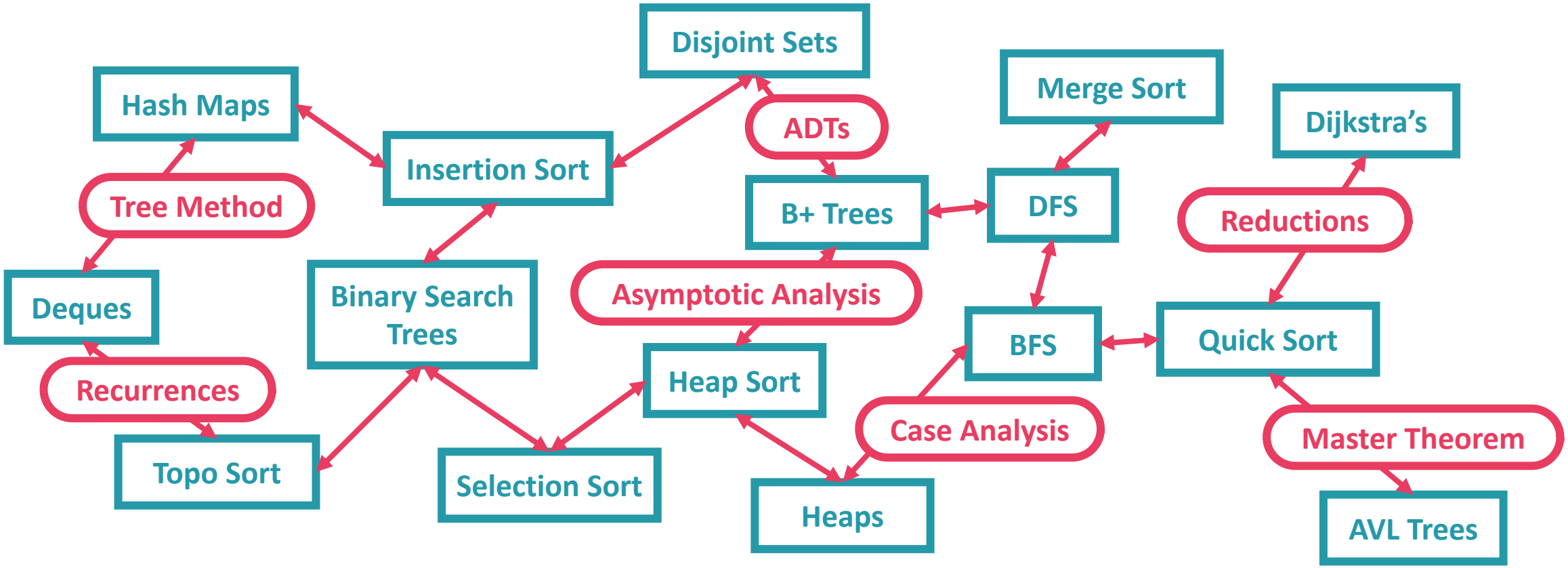
LEC 01

Why 373?

2. Pick up the vocabulary, skills, and practice needed to make **design decisions**. Learn to **evaluate** the tools in your CS toolbox

- Differences between technical implementations
- Evaluation can mean many different things!

Data Structures & Algorithms



1. Build a **strong foundation** of data structures & algorithms
2. Learn to make **design decisions** and **evaluate** your tools

Put Another Way…

1. Build a **strong foundation** of data structures & algorithms

=

Give you a cooler full of "tried-and-true" fish (that have been around for a while)

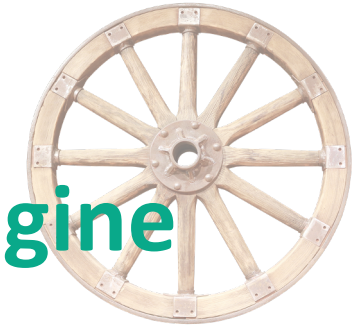
2. Learn to make **design decisions** and **evaluate** your tools

=

Teach you to fish… for your own ideas, data structures, and algorithms going forward

~~Reinventing the Wheel?~~

Studying the Wheel, So We Can Invent the Jet Engine



P0	**CSE 143 Review**
P1	**Deques**
P2	**Maps**
P3	**Heap**
P4	**Mazes**

- We spent a lot of time this quarter implementing our own data structures
  - But Java has a lot of these built-in. Why?

1. Software engineering skills can't just be taught, they need to be **practiced**
2. Not just writing code, but **analyzing** & **experimenting** with it
3. Set you up to **invent** new, more complex data structures when the need arises
4. Understanding the **implementation** (the layer below) makes you more effective as the **client** (the layer above)!

LEC 01

Metacognition

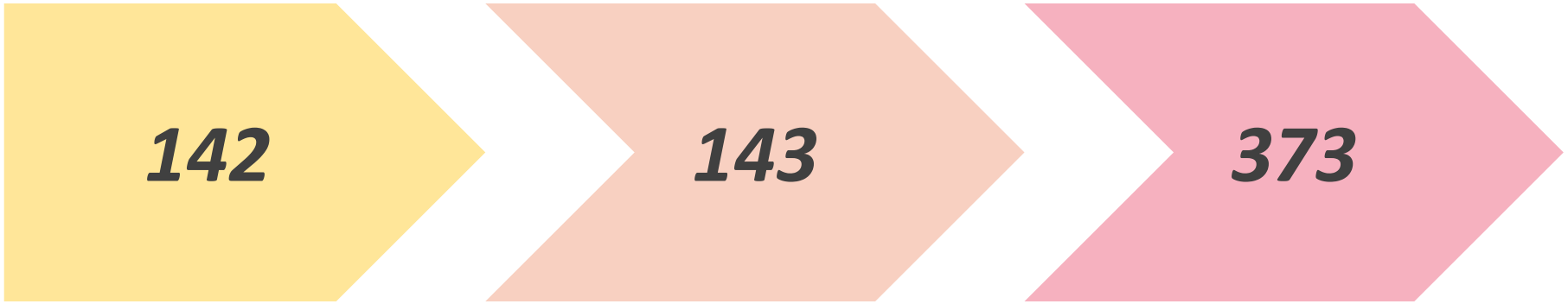
- **Metacognition**: asking questions about your solution process.

- Examples:
  - **While debugging**: explain to yourself why you're making this change to your program.
  - **Before running your program**: make an explicit prediction of what you expect to see.
  - **When coding**: be aware when you're not making progress, so you can take a break or try a different strategy.
  - **When designing**:
    - Explain the tradeoffs with using a different data structure or algorithm.
    - If one or more requirements change, how would the solution change as a result?
    - Reflect on how you ruled out alternative ideas along the way to a solution.
  - **When studying**: what is the relationship of this topic to other ideas in the course?

Learning to Bake in a CSE Class

- Think of what you've learned this quarter as a cookbook
  - ADTs are the chapters/category: Soups, Salads, Cookies, Cakes, etc
    - High-level descriptions of a category of functionality
    - You don't serve a soup when guests expect a cookie!
  - Data structures are the recipes: chocolate chip cookies, snickerdoodles, etc
    - Step-by-step, concrete descriptions of an item with specific characteristics
    - Understand your tradeoffs before replacing carrot cake with a wedding cake
- When you go out into the world …
  - Figure out which category is required
  - Choose the specific recipe that best fits the situation
  - **Adapt or invent your own recipe when you need to!**

What's Next?



Introduction to Programming

- Methods
- Parameters, returns, values
- Conditionals
- Loops
- File Processing
- Arrays

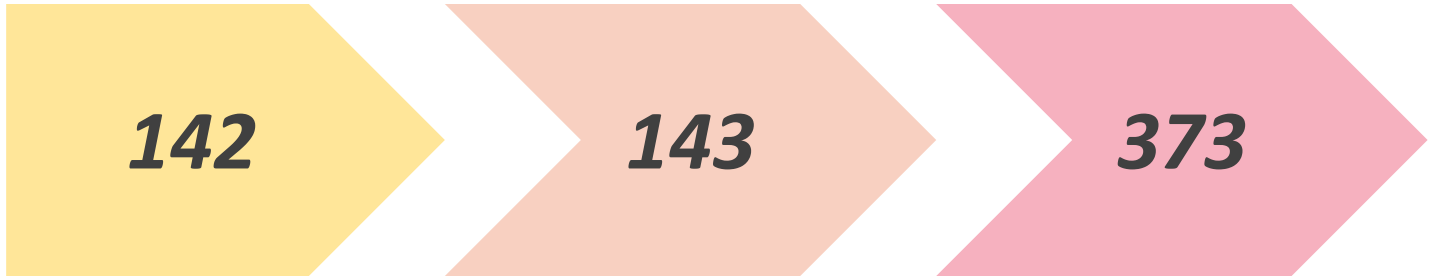
Object Oriented Programming

- Classes and Interfaces
- Recursion
- Linked lists and binary trees
- Sorting and Searching
- O(n) analysis
- Generics

Data Structures & Algorithms

- Design Decisions
- Data Structure Implementation
- Debugging & Testing
- Abstract Data Types
- Algorithmic Analysis
- Software Engineering

What's Next?



In CSE 142 and 143, you learn **programming**. In 373, you open up the world of **computer science**.

And there's no shortage of places you can take the concepts from this class ☺

If you want to…

- Learn about popular tools used in industry
  - e.g. Writing shell scripts in Linux, Using version control and git in more depth
- Understand exactly how your hardware and code interact at a very low level inside a physical computer
  - Want to go more than one lecture deep to learn how memory actually works?

Consider taking…

CSE 374 Intermediate Programming Concepts and Tools

- Offered 21wi (Wilcox), 21sp (Hazen)

If you want to…

- Learn new strategies for problem-solving through programming languages that look completely different from Java
- Learn how programming languages actually work
  - What happens starting the moment you click "run" in IntelliJ?
  - What does the Java compiler even do?

Consider taking…

CSE 413 Programming Languages

- Offered 21sp (Perkins)

If you want to…

- Level up the scope of the applications you can work on by learning how to store, access, and query huge amounts of data
  - *So many* projects in industry incorporate a database
  - Heard of big data™? You'll want a bit more than an in-memory hash map
- Learn about parallelism and concurrency

Consider taking…

CSE 414 Database Systems

- Offered 21wi (Maas), 21sp (Thompson)

If you want to…

- Use those databases full to the brim with big data™ to do machine learning on new and interesting problems
- Understand *why* machine learning has so much potential to overturn entire industries
  - And in the process, get practical experience working on ML projects with real datasets

Consider taking…

CSE 416 Machine Learning

- Offered 21sp (Schafer)

If you want to…

- Learn more about the underlying theory behind data structures and algorithms covered in this class
- Learn about designing complex algorithms
- Understand the *limits* of computation and the fundamental problems that remain unsolved in computer science (P vs. NP, anyone?)

Consider taking…

CSE 417 Algorithms and Computational Complexity

- Offered 21wi (Weber)

If you want to…

- Do something with data science
  - The world is run on decisions made from data. Data science requires processing large amounts of data collected to help people make decisions.
- Learn the programming concepts, libraries, and tools that make up the modern data science ecosystem.
  - Data programming = The programming that supports data science

Consider taking…

CSE 163 and other courses in the Data Science Minor & Option

- CSE 163 offered 21wi (Schafer), 21sp (Lin), 21su (TBD)

If you want to…

- Build a website or web app
  - Either the frontend (what visitors see in their browser) or the backend (what runs on the server to compute data)
- Learn the fundamentals of a number of web technologies that make it easier for you to learn more on your own

Consider taking…

CSE 154, INFO 343, or INFO 344

- CSE 154 offered 21sp (Gibbon)

Your Next Language

- Java is our lens, but these concepts generalize to any language!
  - Learning your second language is *much* easier than learning your first ☺

- Mainstream languages you might be interested in:
  - Python ("pseudocode that runs")
  - C# ("Java done right")
  - HTML/CSS/JavaScript ("building blocks of the web")
  - C/C++ ("if you want full control")

- Or, consider an unconventional/up-and-coming one:
  - Haskell
  - Racket
  - Rust
  - Prolog

Learning New Things

- Nothing in Computer Science is out of your grasp!
  - This class is designed to give you the foundation to go out and
- Where to next?
  - You can find tutorials on almost any topic via google
  - Coursera: lots of good online courses
  - Google “open source CS curriculum” or “what every CS major should know” if you want a more curated list
  - Try contributing to open source
  - Try attending hackathons!
  - StackOverflow: pick interesting tags, sort by top, and read
- Advice: Take charge of your own education, prioritize practice over passive learning, be persistent, and always let your curiosity lead

These Unprecedented Times

- As much as we want to focus on making 373 an excellent experience, we can't forget what's going on in the world around us

- I know online learning hasn't been easy for anyone
  - Thank you for letting us know your experiences and feedback
  - Thank you for reaching out to ask for help when you needed it
  - Thank you for being so understanding with recording difficulties

- As a course staff, we are blown away by how much you've engaged with the course despite the fact that it all happens in a rectangle on your computer screen. **Thank you.**

AMA

ASK ME ANYTHING!

Thanks for a great quarter!

– The CSE 373 20AU Staff ☺