Where to Go From Here

Taking Stock: Where Are We?

Goals for this Course

- ***Learn how to model and solve complex problems with computers.***
- To that end:
  - Explore common abstractions for representing problems.
  - Harness recursion and understand how to think about problems recursively.
  - Quantitatively analyze different approaches for solving problems.

What We've Covered

Strings

Recursion

Stacks

Queues

Vectors

Maps

Sets

Lexicons

What We've Covered

Recursive Graphics

Recursive Enumeration

Recursive Backtracking

Big-O Notation

Sorting Algorithms

Class Design

Pointers and Memory

Constructors and Destructors

What We've Covered

Dynamic Arrays

Chained Hashing

Linear Probing

Robin Hood Hashing

Linked Lists

Binary Search Trees

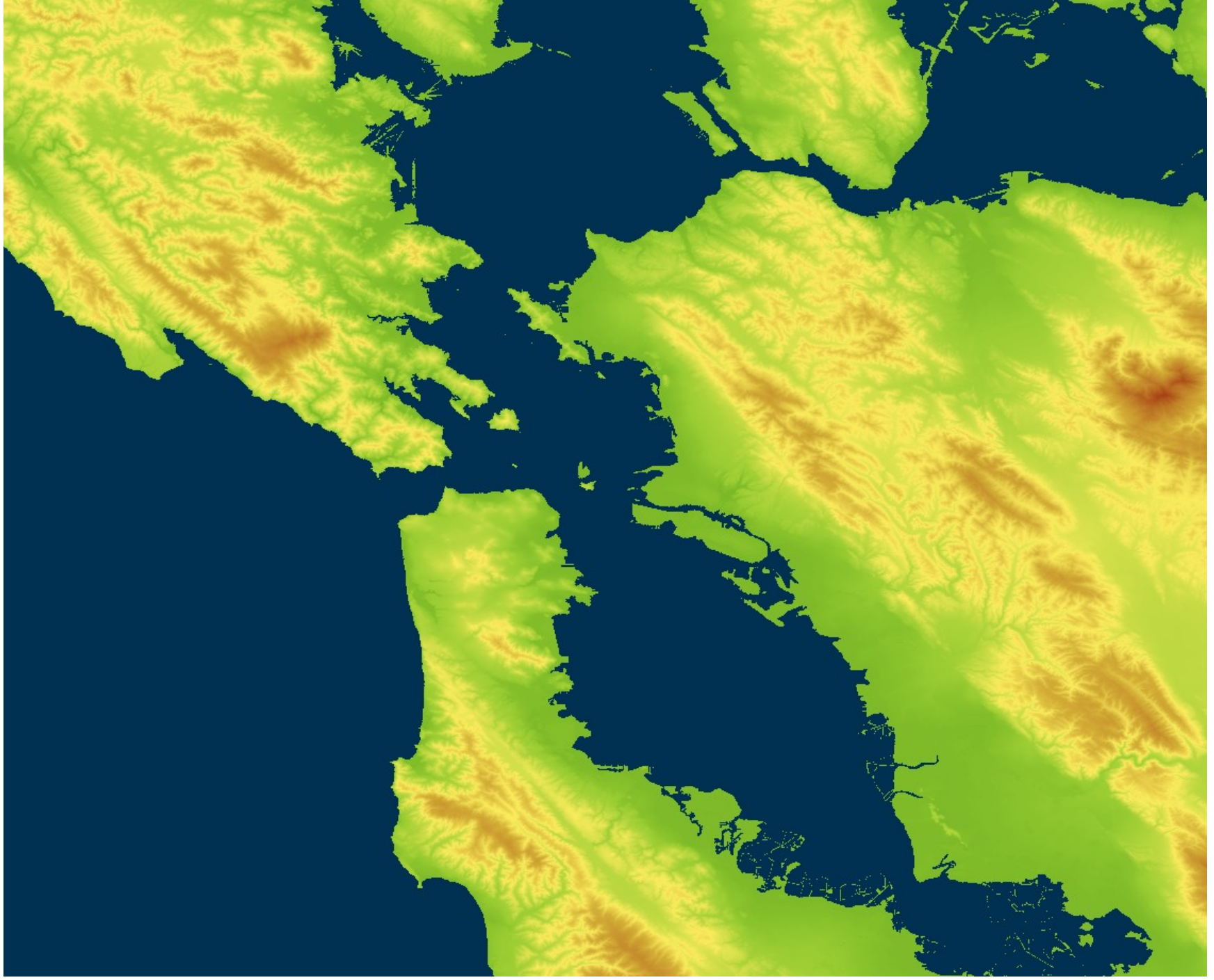
Huffman Coding

Graphs

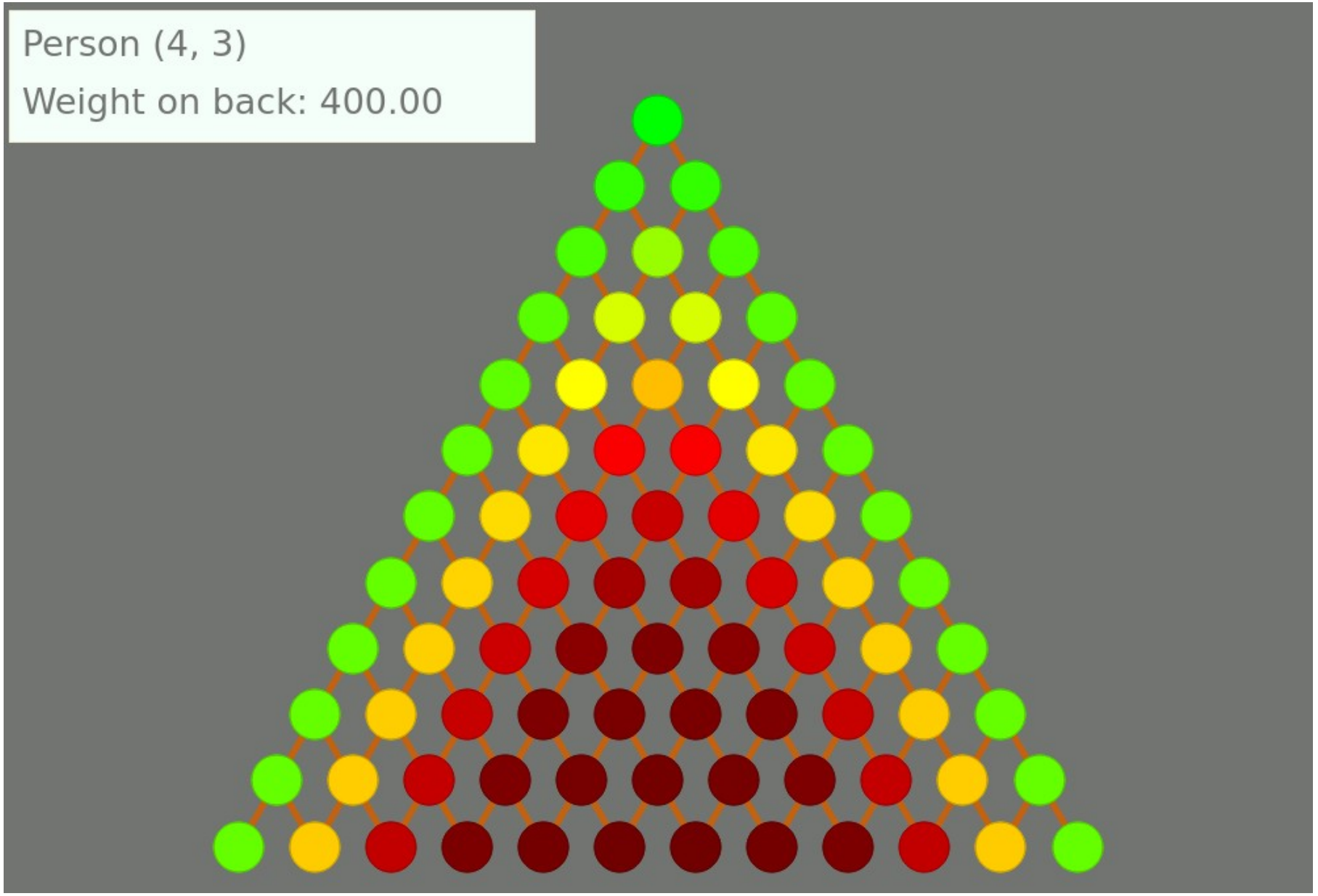
You didn’t just learn a list of concepts.

You learned to make those concepts ***shine***.

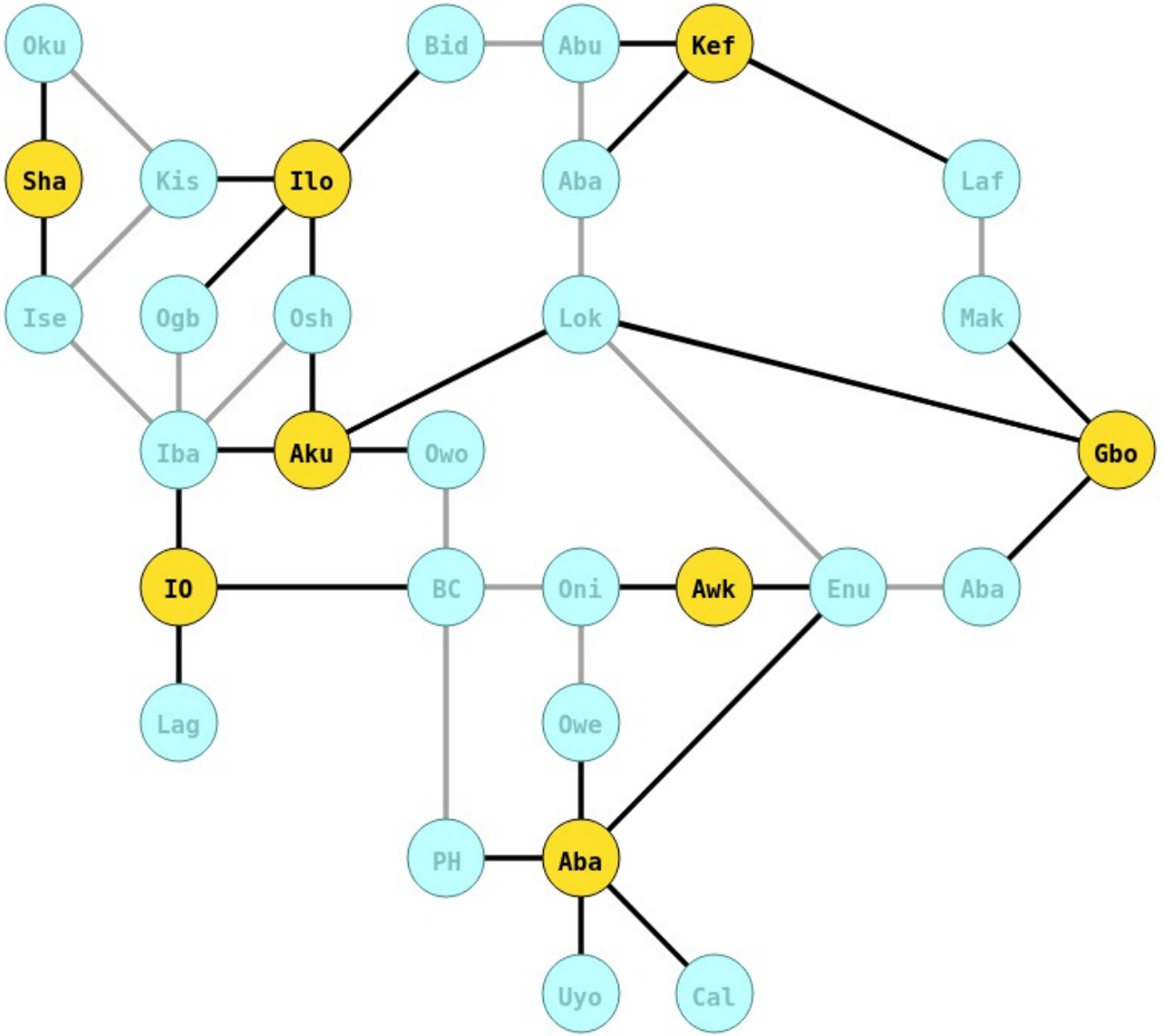
Assignment 1: Grids, Strings, and Recursion



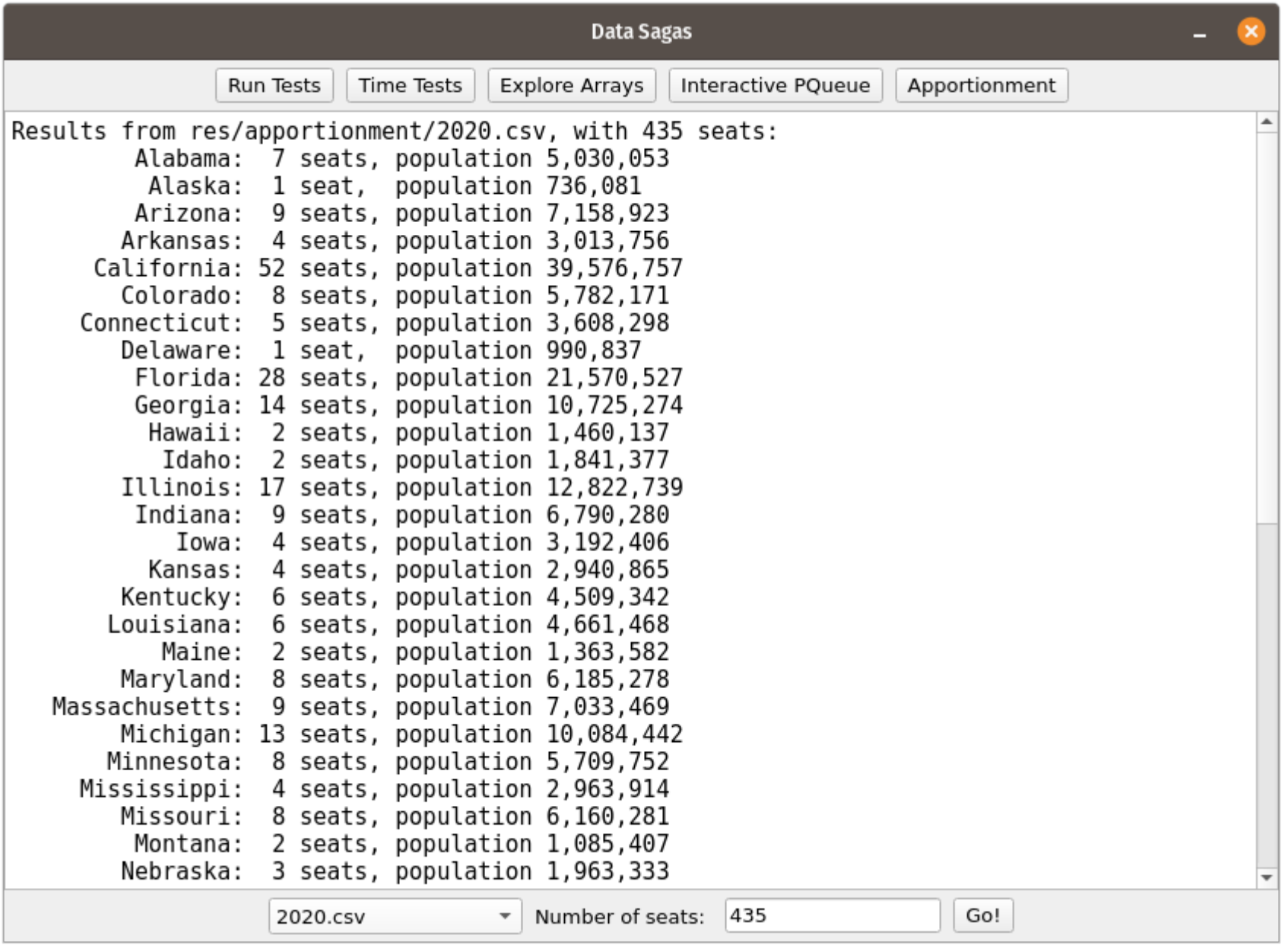
Assignment 2: Container Types



Assignment 3: Recursive Problem-Solving



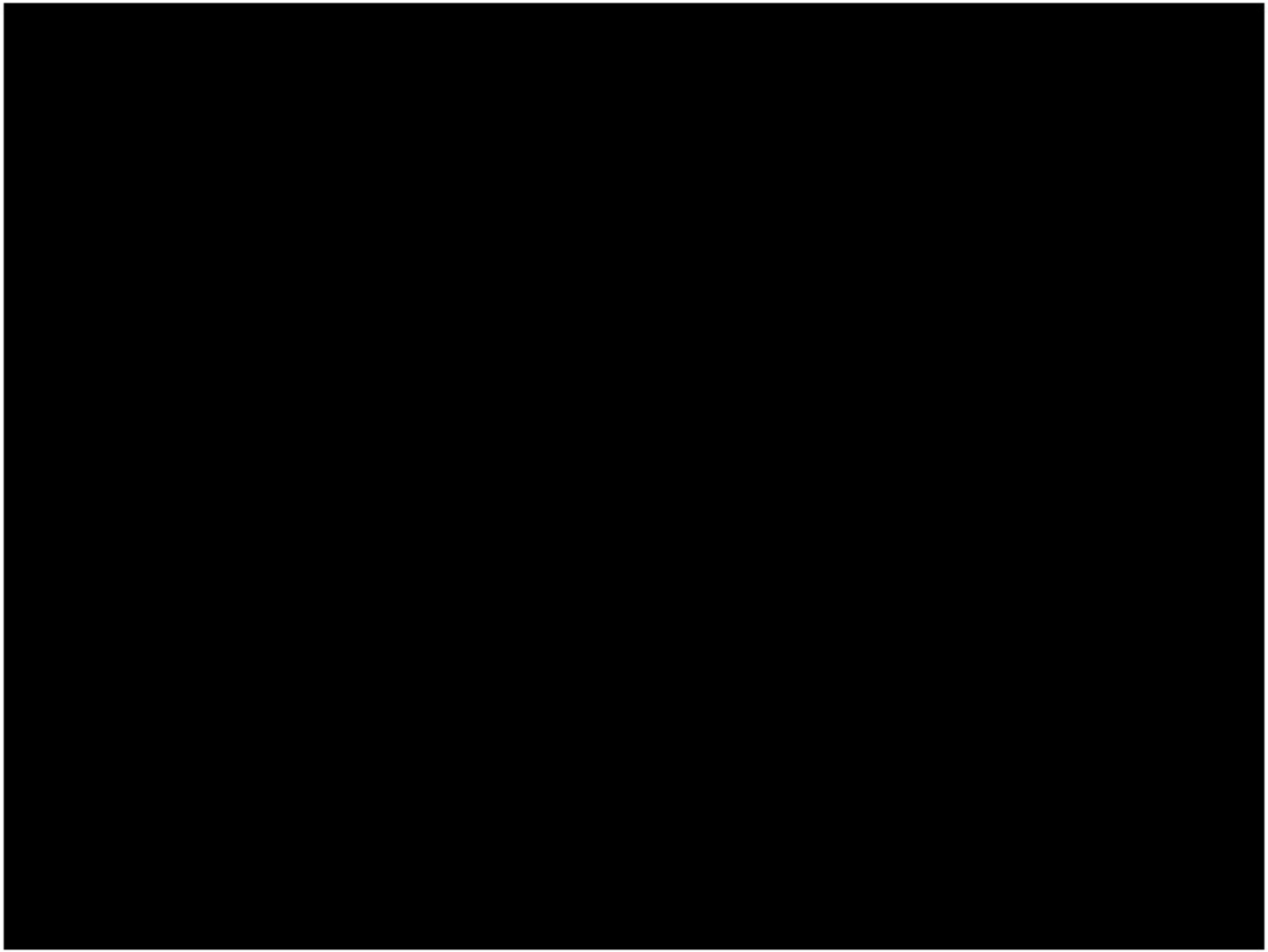
Assignment 4: Recursive Backtracking



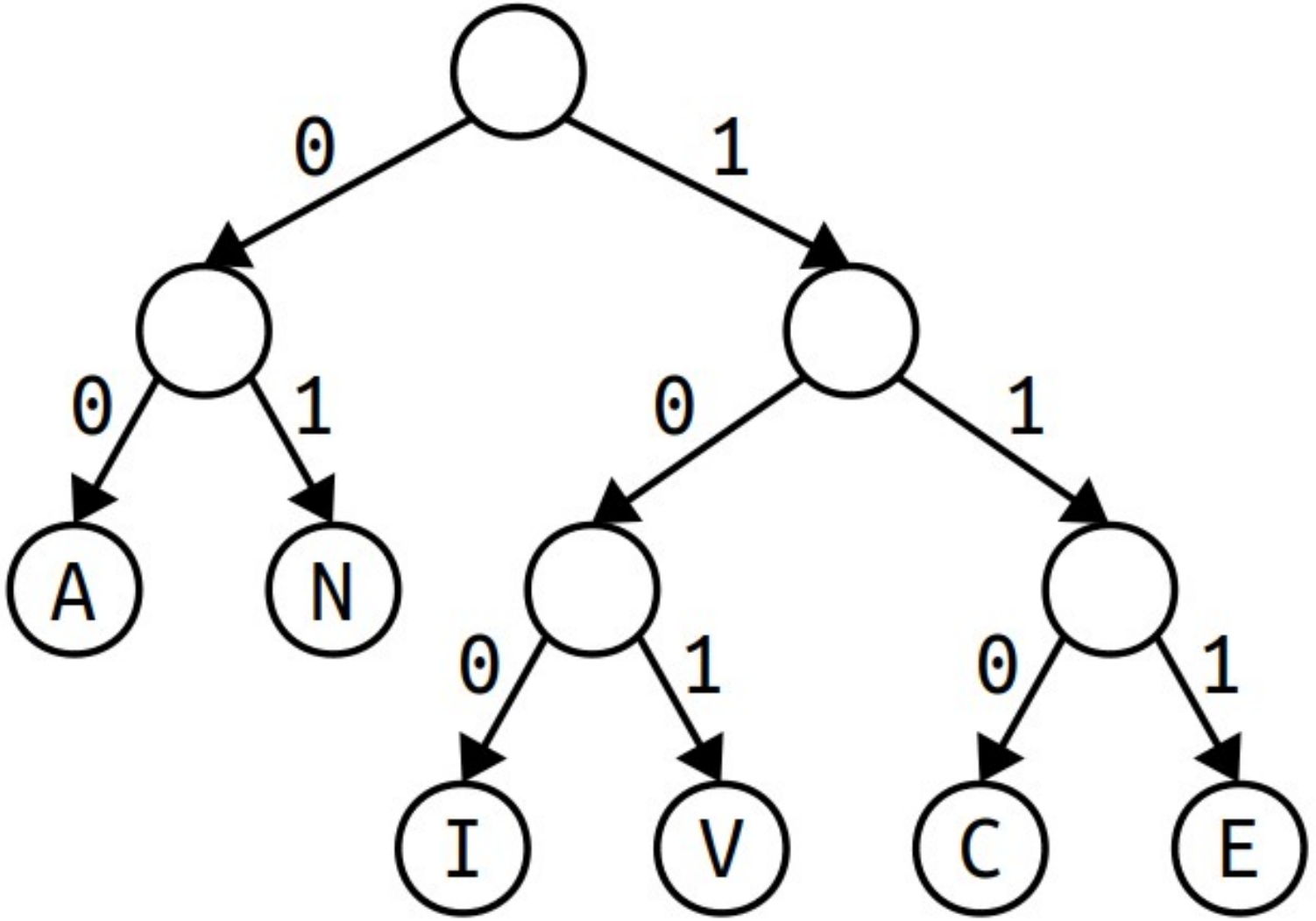
Assignment 5: Classes, Dynamic Arrays

		Chained Hashing	Linear Probing
α = 0.5	Insert (success)	758.11ns	388.44ns
	Insert (failure)	424.51ns	247.08ns
	Lookup (success)	411.30ns	244.01ns
	Lookup (failure)	346.17ns	250.69ns
	Remove (success)	451.11ns	242.85ns
	Remove (failure)	285.53ns	251.65ns
α = 0.6	Insert (success)	745.39ns	390.01ns
	Insert (failure)	413.00ns	249.98ns
	Lookup (success)	412.50ns	245.00ns
	Lookup (failure)	349.92ns	255.58ns
	Remove (success)	448.89ns	243.58ns
	Remove (failure)	291.13ns	257.51ns
α = 0.7	Insert (success)	750.09ns	393.45ns
	Insert (failure)	415.35ns	251.90ns
	Lookup (success)	413.80ns	249.08ns
	Lookup (failure)	359.01ns	279.67ns
	Remove (success)	447.78ns	247.36ns
	Remove (failure)	296.00ns	280.64ns

Assignment 6: Hash Functions, Class Design



Assignment 7: Linked Structures



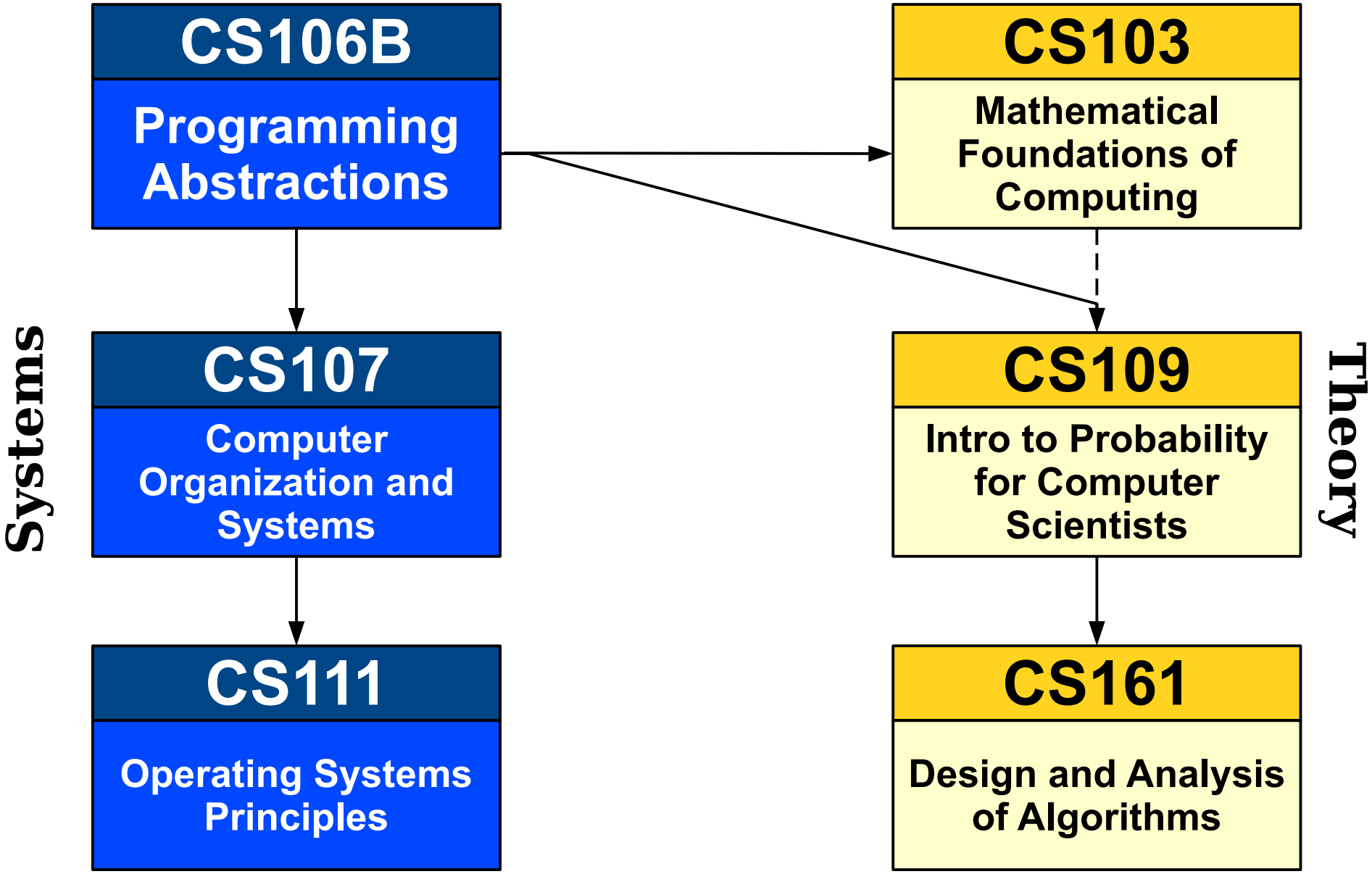
Assignment 8: Trees and Tree Searches

Computer science is more than just programming.

These skills will make you better at whatever you choose to do.

So what comes next?

The CS Core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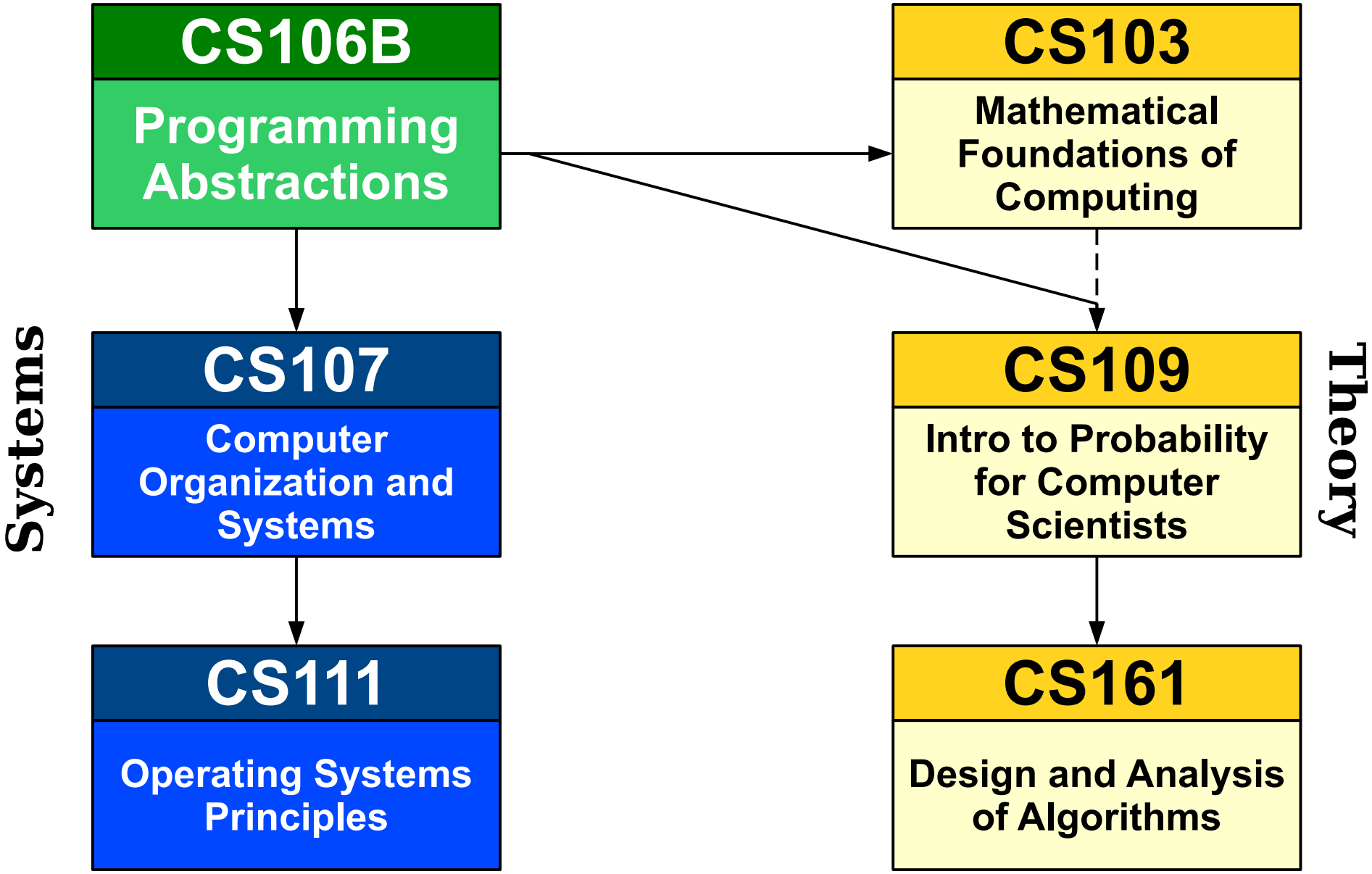
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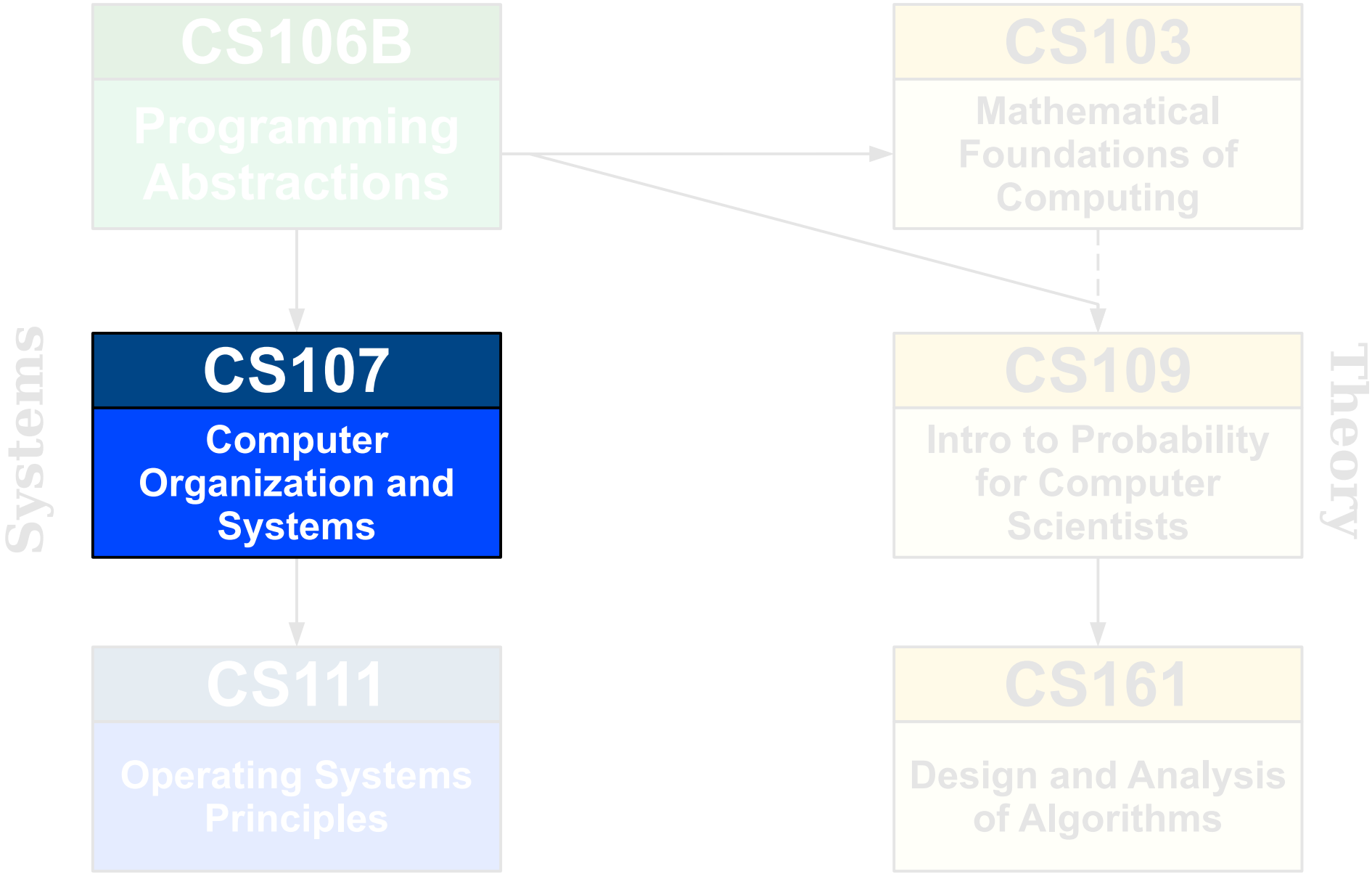
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CS107

Computer Organization and Systems

Prerequisite: CS106B

How does the computer work, at its most basic levels?

How do those low-level details lead to larger-scale phenomena?

What levels of abstraction lie beneath basic C++ concepts?

CS107E

Computer Systems from the Ground Up

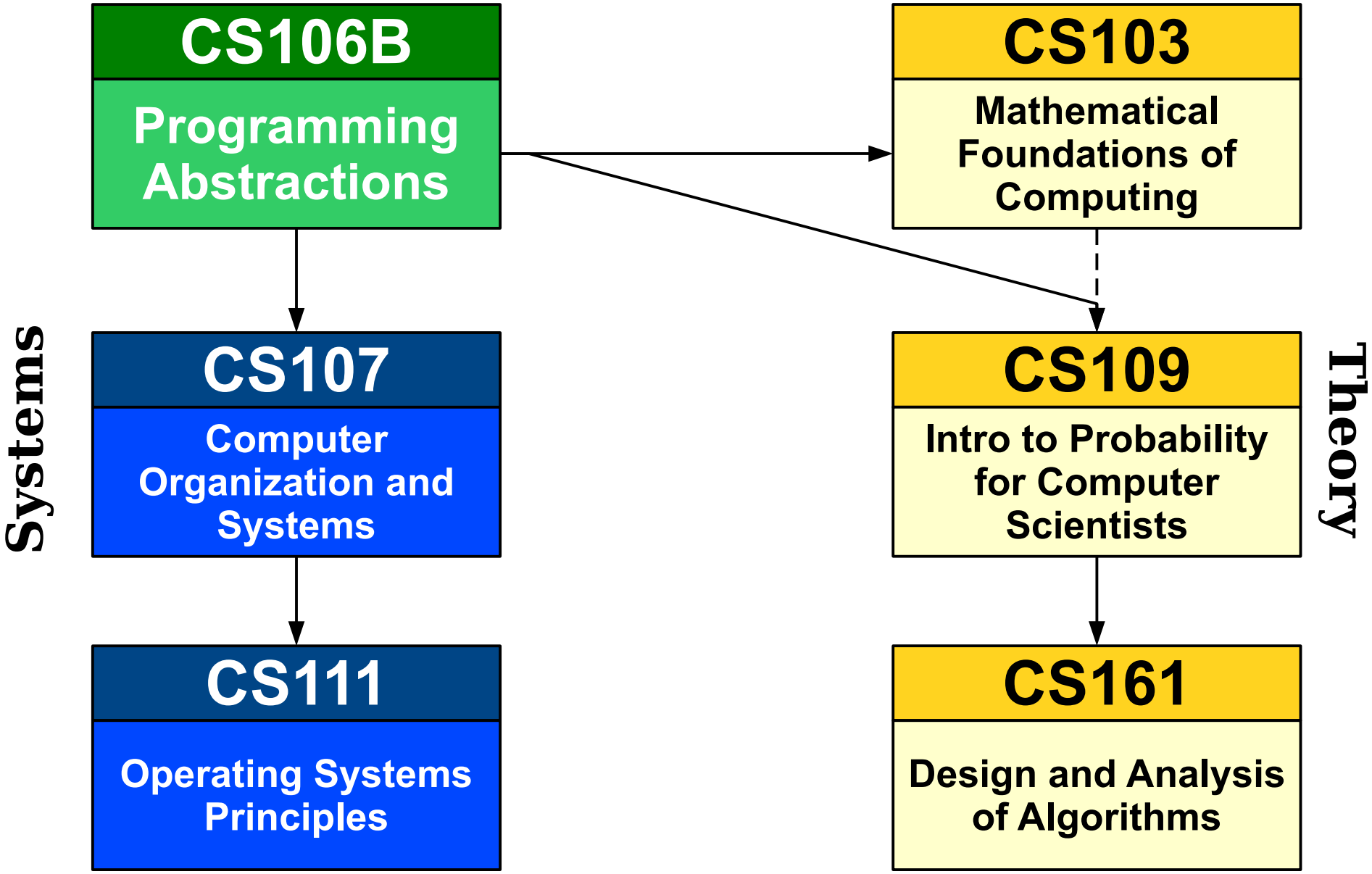
Prerequisite: CS106B

How can we use software to control hardware devices?

How do displays, keyboards, etc. get data into or out of the computer?

What's it like to build a computer system from scratch?

The CS Core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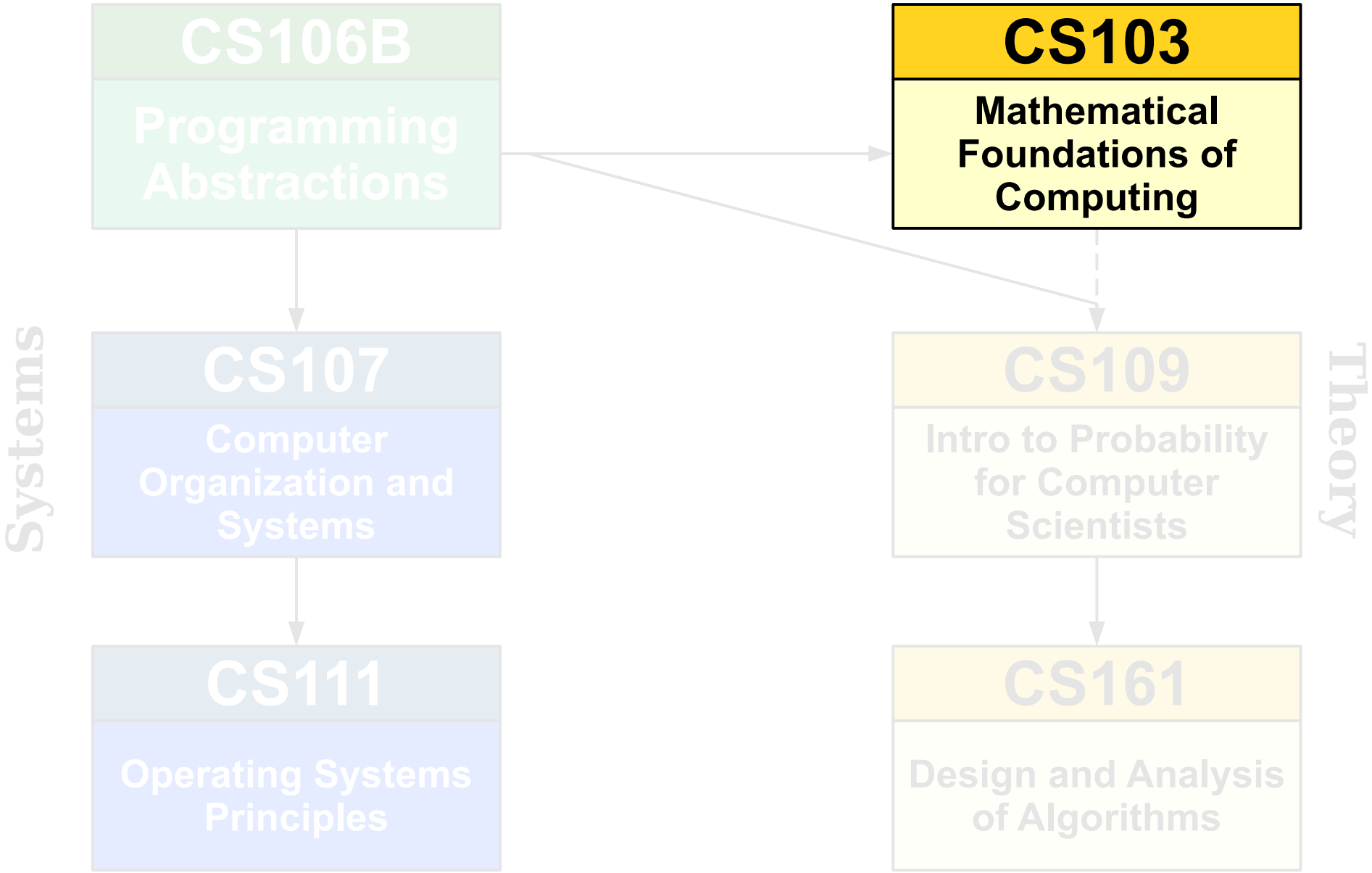
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CS103

Mathematical Foundations of Computing

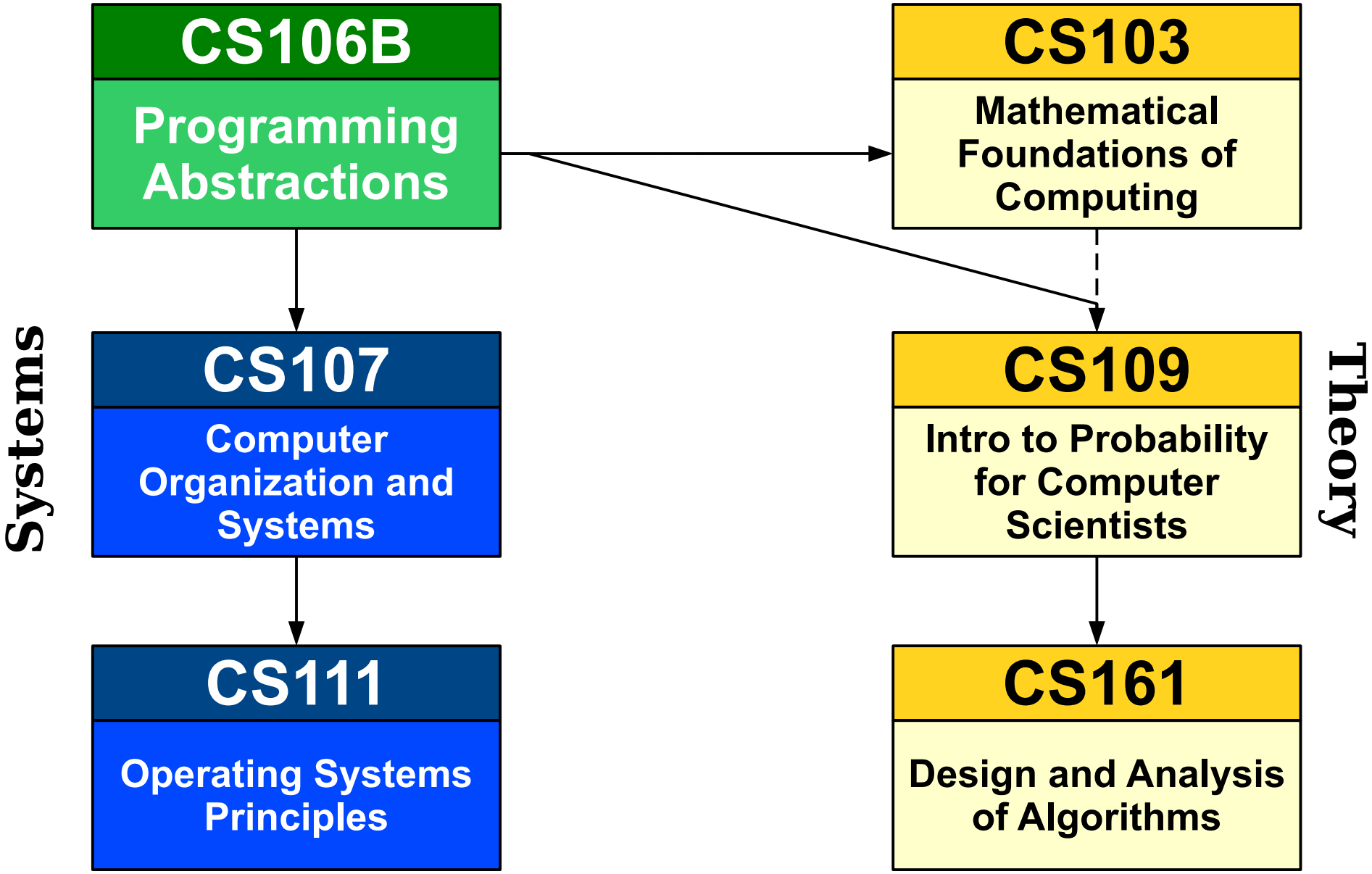
Corequisite: CS106B

What mathematical tools can we use to analyze programs, processes, and graphs?

Why are some problems harder to solve than others?

Are there problems that cannot be solved by computers, and how would we know?

The CS Core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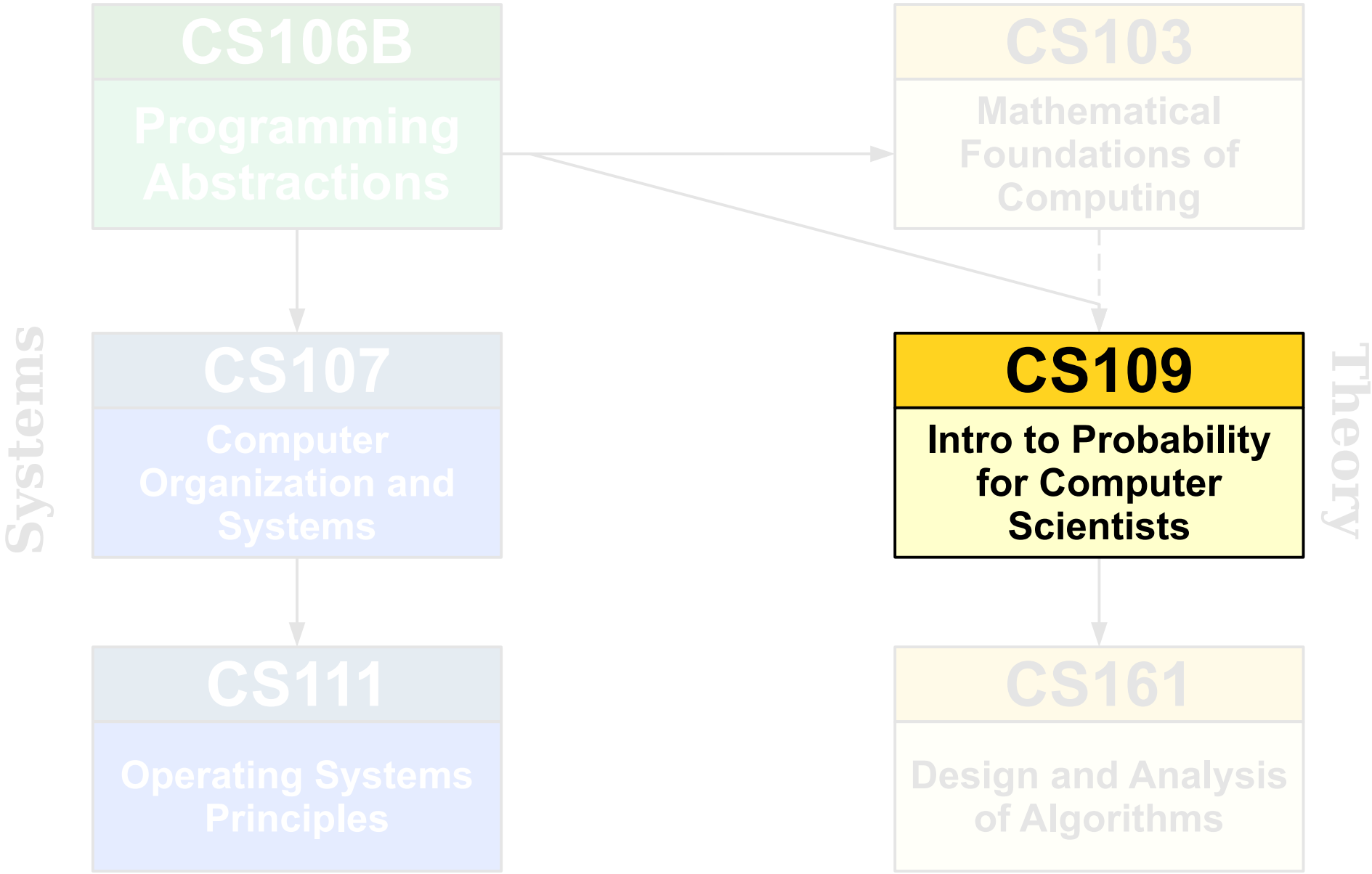
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CS109

Probability for Computer Scientists

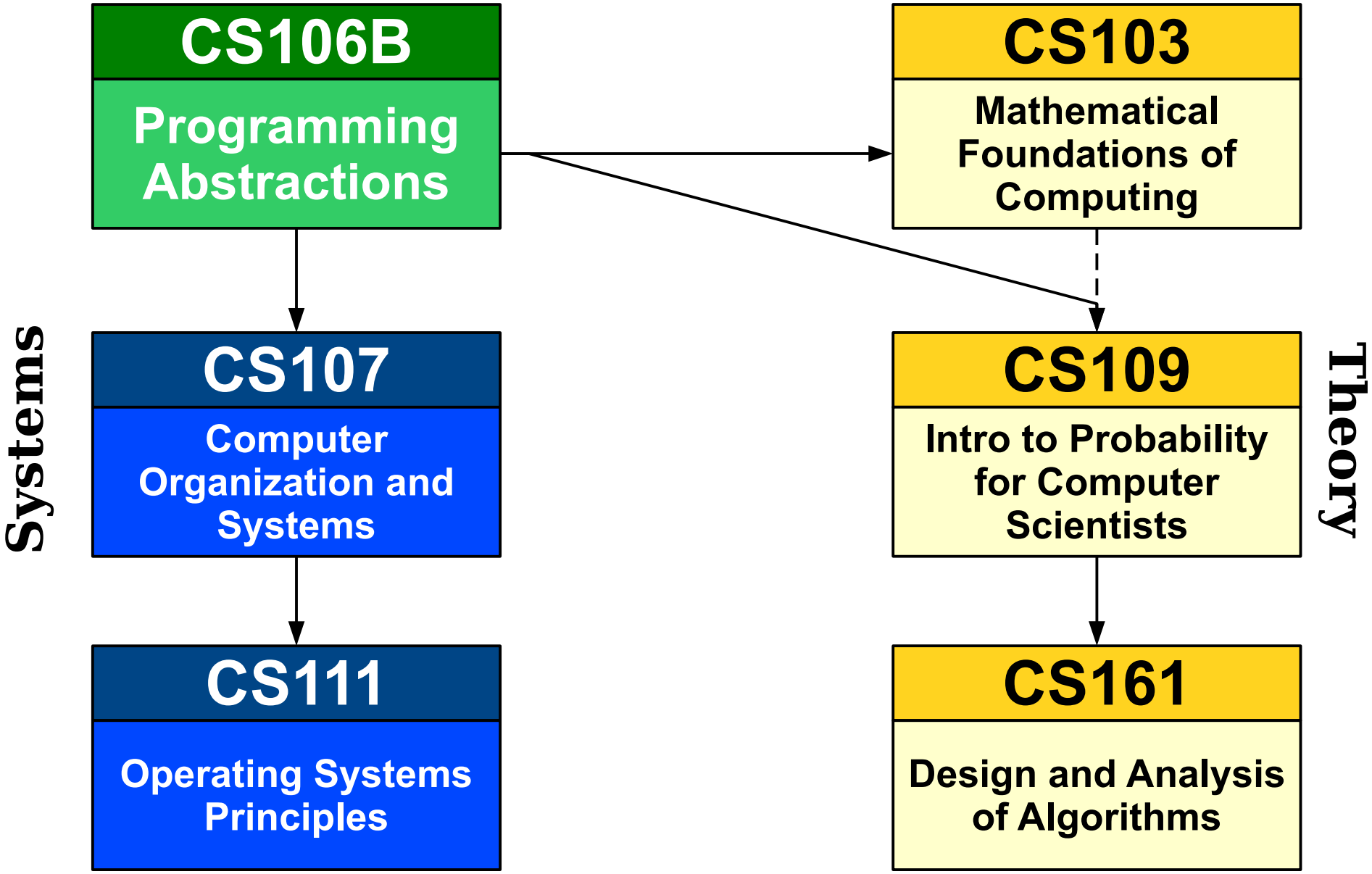
Prerequisites: CS106B, Math 51, "CS103"

Why is a randomly-built binary search tree probably balanced?

How do we use computers to make sense of large data sets?

What is machine learning, and how do machines learn?

The CS Core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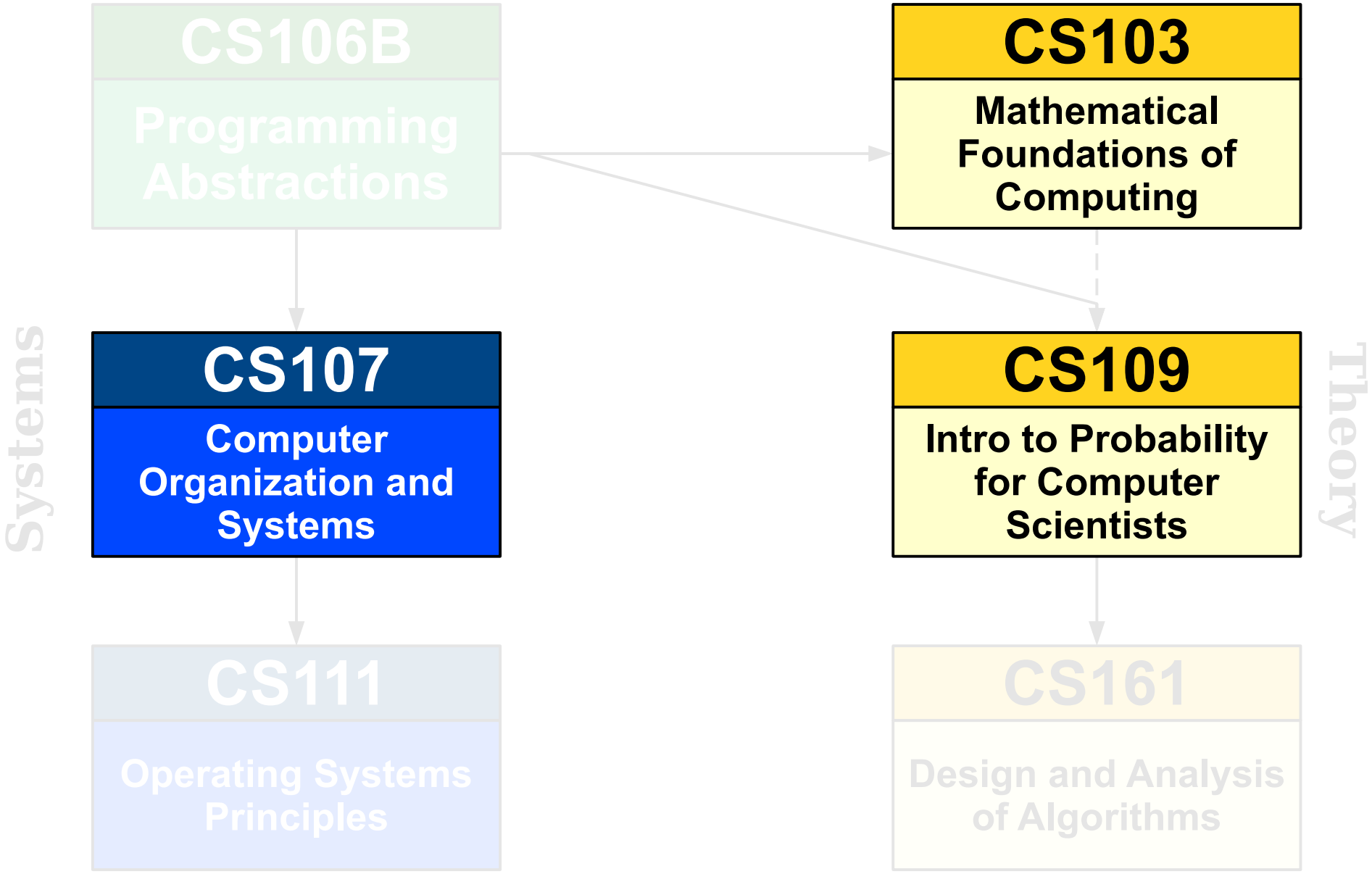
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Next Steps in CS

- It’s reasonable to take one of CS107, CS103, or CS109 as a next CS class. You’ll put in a good amount of work and learn a ton in the process.
- ***Do not feel pressured to do everything at once***. Taking two of these classes concurrently is a significant amount of work, and it isn’t expected of you.
- Want some more guidance? Come talk to me after class!

Other CS Classes to Consider

- You also have the prereqs for all of these courses. Come talk to me after class to learn more!

CS41: Python Programming
CS45: Software Tools
CS106L: C++ Programming
CS139: Human-Centered AI
CS147: Human-Computer Interaction
CS151: Logic Programming
CS153: Trust and Safety Engineering
CS157: Computational Logic
CS177: Human-Centered Prod. Mgmt
CS182: Ethics, Pub Pol, and Tech Change
CS193X: Web Programming

CS198: Section Leading!
CS202: Law for Computer Scientists
CS206: Computational Journalism
CS274: Computational Biology
CS278: Social Computing
CS300: Survey of CS Research
CS309: Cloud Computing Seminar
CS521: AI Safety Seminar
CS522: AI in Healthcare Seminar
CS529: Robot / Autonomy Seminar
CS547: Human-Comp. Interaction Sem

Reflecting on Learning

Three Questions

- What’s something you know now that, at the start of the quarter, you knew you didn’t know?
- What’s something you know now that, at the start of the quarter, you *didn’t* know you didn’t know?
- What’s something you *don’t* know now that, at the start of the quarter, you *didn’t* know you didn’t know?

What's something you're glad you learned this quarter in CS106B?

Answer at

https://pollev.com/cs106bwin23

Your Questions

Some Words of Thanks

Thank you, section leaders, for all your hard work!

Thank you, Neel, for four years of working together!

And thanks to all of you for such a wonderful quarter!

Who's Here Today?

- Aero/Astro
- African/Afro-American Studies
- Anthropology
- Applied Physics
- Bioengineering
- Biology
- Business
- CME
- Cancer Biology
- Chemistry
- Chinese
- CEE
- Computer Science
- Economics
- EE
- Energy Resources Engineering
- Engineering
- Environmental Systems Engineering
- Film and Media Studies
- Geophysics
- Human Biology
- International Policy
- IR
- Law
- MCS
- MS&E
- Materials Science and Engineering
- Mathematics
- MechE
- Medicine
- Music
- Philosophy
- Public Policy
- STS
- Sociology
- Statistics
- Structural Biology
- Symbolic Systems
- ***Undeclared!***
- Urban Studies

You've learned skills that will empower you for a lifetime.

Use them in ways that are meaningful to you and make a difference.

Best of luck going forward – and I hope to see you around!