

Objectives

- Computer Science is Complexity Science

Review

- What are common constructs in programming languages?
- What are some differences between programming languages?

A human must turn information into intelligence or knowledge.
We've tended to forget that
no computer will ever ask a new question.
-- Grace Hopper

Computers are incredibly fast, accurate, and stupid.
Human beings are incredibly slow, inaccurate, and brilliant.
Together they are powerful beyond imagination.
-- Albert Einstein

COMPLEXITY SCIENCE

CS == Complexity Science

- How can it be done?
 - Based on **information**
 - Managing, manipulating data
 - Possible algorithms
- How well can it be done?
 - Most **efficient** algorithm in terms of time and/or space
- Can it be done at all?
 - Often, proof is a program--an implementation of the above

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Computer Science != Programming

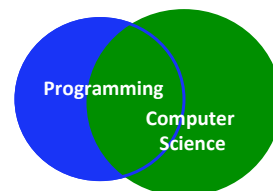
programming : CS ::

machining : engineering

grammar : literature

equations : mathematics

walking : W&L



a vehicle, not a destination

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Computer Science Fields

Systems

- Architecture
- Operating systems
- Networks
- Distributed and parallel systems
- Databases
- Security
- ...

Software

- Compilers
- Graphics
- Software engineering
- Software testing and verification
- ...

Theory

- Algorithms
- Theory of computation
- ...

Other

- Artificial intelligence
- Robotics
- Natural language processing
- Bioinformatics
- Visualization
- Numerical analysis
- ...

- Often research involves combinations of these fields
- Not just programming!
 - But programming is a tool to do much, much more!

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Computer Science Fields

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- Architecture *
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- Databases
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Software

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- Algorithms *
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* = field we discussed or did a problem in

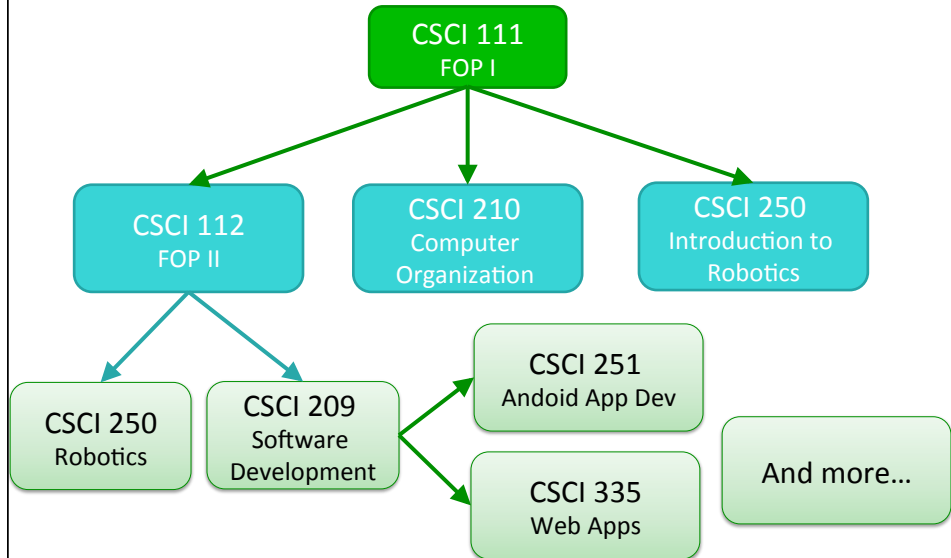
➤ Some are a stretch :)

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Where Can You Go from Here?



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Conclusions

- See impact of computer science on your life
 - Think differently about issues
- Understand some of the computing issues better
 - Taking out some of the mystery
 - Testing, debugging, efficiency
- Algorithms are everywhere
 - Process for solving problems, **efficiently**
 - Mapping human intuition to systematic/automatic process

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Final Exam Take Home Questions

- 2 essay questions about the Broader Issues
- **Due before end of exam period**
 - Noon Friday
- Each essay should be about 1/2 a page, single-spaced
- Goal: answer the question clearly, precisely, and convincingly
 - Not too wordy
 - Evidence/examples to support your argument
 - Correct spelling, grammar, punctuation

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Final Exam

- Finals are taken in the lab classroom (Parmly 405)
 - No computers
 - If need to change your time, sheet outside the CS department office
- Evaluations due Sunday at midnight on Sakai
- Take-home essay due Friday at noon.
 - End of exam period
- All lab work and extra credit articles must be submitted by **MONDAY midnight**
- Office hours:
 - Monday: noon – 5 p.m.
 - Appointments preferable during that time
 - Other times by appointment

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Final Exam Review

- Focus on object-oriented programming
- New content: search techniques, lists (1D and 2D), complexity science
- Cumulative:
 - Functions, data types, common methods & operations
 - How to model data

Your questions?

Final Exam Review

- What do you need to do to be able to use methods from a class?
- What are the different ways to iterate through a list?
- How can you iterate through a dictionary?

Course Evaluations

- On Sakai, due Sunday
- Incentive
 - If 60% of students complete evaluation, 1% Extra Credit on lab grades
 - For each additional 10% of students who complete evaluation, 1% EC on lab grades
 - Total possible EC: 5%

Animal Shelter Software

- We want to keep track of animals at an animal shelter

What is our process for developing a class?

Process

- Determine data, functionality
- Create class
 - Create `__init__`, `__str__` methods
- Test
- Create additional methods, testing

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Class: Pet

- Data:
 - Name
 - Species of animal (dog, cat, chinchilla)
 - Status (in holding, in adoption room, adopted)
- Functionality
 - Getters for this information
 - Mark animal as adopted or in holding!

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Counter Class Specification

- Implement, Test
- Example use: Caesar cipher

- A class that represents a counter that wraps around from a high value back to its low value
- Functionality:
 - Constructor – takes as parameters the low value and the high value; default – counter starts at low value
 - A string representation of the Counter
 - Increment the counter by a given amount (a positive amount), wrapping around to low again, if necessary. Returns number of times had to wrap around.
 - Decrement the counter by a given amount (a positive number), wrapping around to high again, if necessary. Returns number of times had to wrap around.
 - Sets the counter's value, only if $low \leq value \leq high$. Otherwise, prints an error message.
 - Getters: low, high, current value

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Broader Issue Groups

Annie B.
JD
Katlin
Pranam
Utkrist

Aimee
Angel
Daniel
Sam
Turner

Amalia
Isaac
Landon
Prakriti
Tristan

Abhi
Gabe
Max
Pengrui
Rinn

Alex
Chris
Drew
Liam

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Net Neutrality

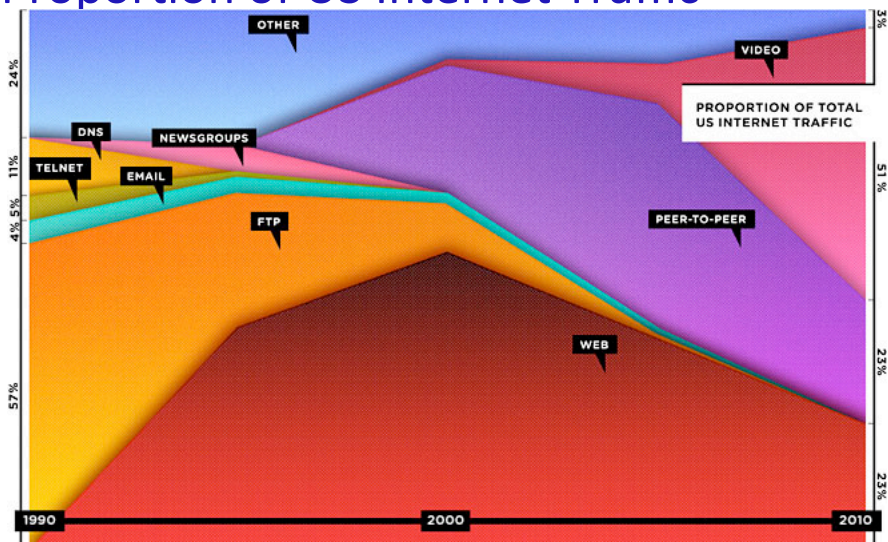
- What is net neutrality?
- Is this an issue?
 - Argument: hasn't been an issue up until now
- What are the arguments for/against net neutrality?
 - Who are the stakeholders in net neutrality?
 - What are their takes?
 - "My view is that the Internet should be run by engineers and entrepreneurs, not lawyers and bureaucrats." – Ajit Pai, FCC head
- How is this similar/different to phone calls or TV?

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Proportion of US Internet Traffic



Sources: Cisco estimates based on CAIDA publications
Andrew Odlyzko https://www.wired.com/2010/08/ff_webrip/

Make Good Decisions!

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