Objectives

- Computer Science is Complexity Science
- BI: Facebook

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

Computer Science != Programming

programming : CS ::

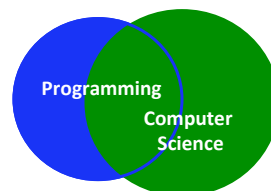machining : engineering

grammar : literature

equations : mathematics

walking : W&L

Programming

Computer Science

a vehicle, not a destination

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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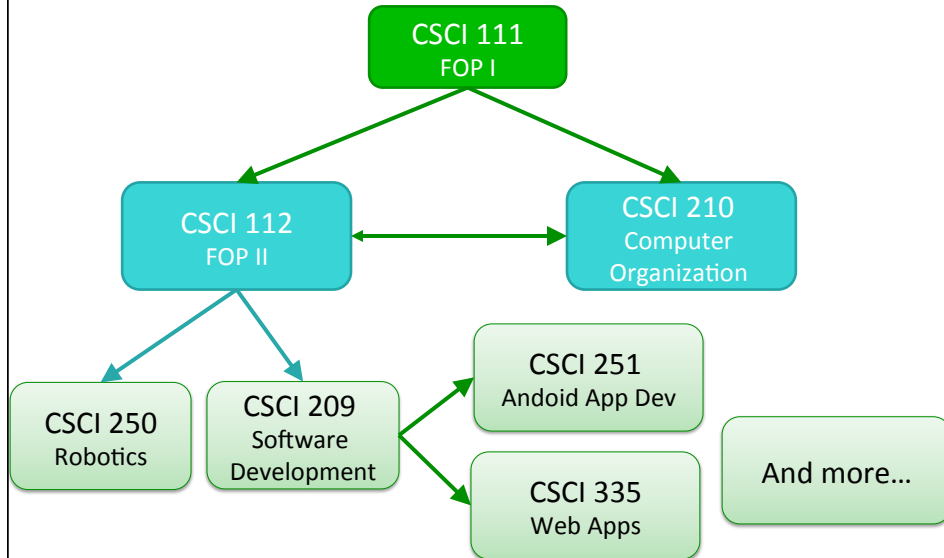***** = field we discussed or did a problem in
  - Some are a stretch :)

Where Can You Go from Here?

```
                    ┌─────────────┐
                    │  CSCI 111   │
                    │   FOP I     │
                    └─────────────┘
                      ╱         ╲
          ┌─────────────┐    ┌─────────────┐
          │  CSCI 112   │◄──►│  CSCI 210   │
          │   FOP II    │    │  Computer   │
          └─────────────┘    │Organization │
            ╱       ╲        └─────────────┘
                              ┌─────────────┐
┌──────────┐ ┌──────────┐    │  CSCI 251   │
│ CSCI 250 │ │ CSCI 209 │──► │Andoid App Dev│
│ Robotics │ │ Software │    └─────────────┘
└──────────┘ │Development│   ┌─────────────┐  ┌──────────┐
             └──────────┘──► │  CSCI 335   │  │And more… │
                             │  Web Apps   │  └──────────┘
                             └─────────────┘
```

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

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%

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

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: by appointment
  - Email me

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?

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

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!

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 <= value <= high. Otherwise, prints an error message.
  - Getters: low, high, current value

Palindrome

- Write a program that determines if a string (input by a user) is a palindrome. A *palindrome* is a word that is the same forwards and backwards. Some example palindromes: "kayak", "A man A plan A canal Panama".
- http://www.fun-with-words.com/palin_example.html
- Break the problem into at least two functions: main and isPalindrome, which returns True iff the parameter string passed into the function is a palindrome.
- Depending on how you think about the problem, you may want to break the solution into more functions, e.g., using the reverseString function you wrote in a previous lab.

Broader Issue Groups

Ben Chase Olivia Parker Ryan	Alison Andrew Harris Jordan	Findley Joseph Kalady Mary-Frances	Anna Ian Rachel Robert	Chas Lindsey Lizzie Margaret

Our Data

- How much privacy are you willing to give up for free, personalized experiences?
  - ➤ Does the domain matter?
  - ➤ Tangent: "personalized experiences" or "echo chambers"?
- Is Facebook (or other company) more likely to leak our data or are people more likely to leak their own data?
  - ➤ Consider recent spear phishing attack with email from President Dudley
- "Somewhat pointlessly, they also store all the stickers you've ever sent on Facebook (I have no idea why they do this. It's just a joke at this stage)."
  - ➤ What could the point be?
- When you put a file on Google drive, who owns it?
- What changes, if any, will you make in your online behavior?