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 ::

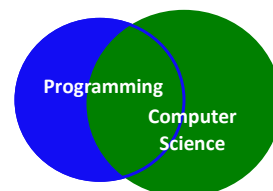machining : engineering

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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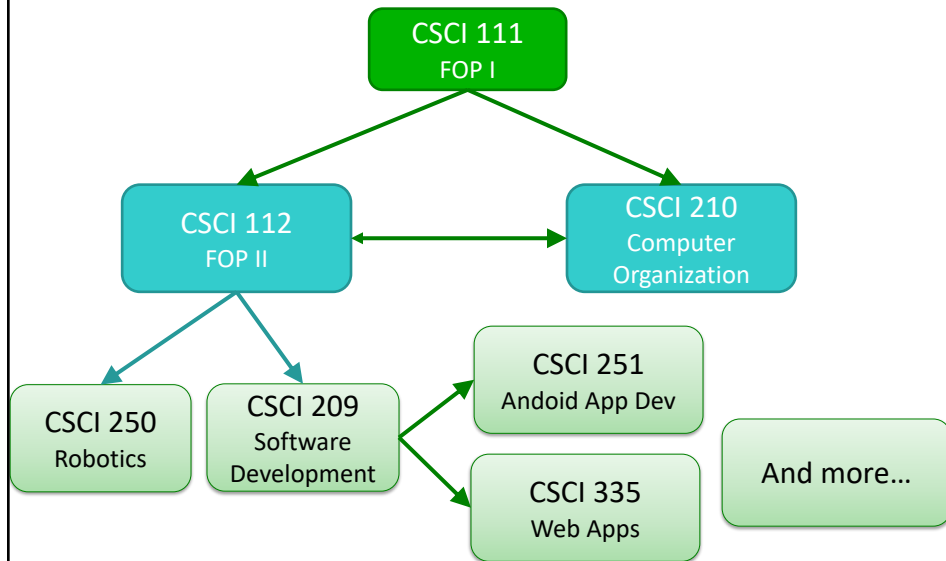- …

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

Where Can You Go from Here?

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                    ┌─────────────┐
                    │  CSCI 111   │
                    │   FOP I     │
                    └─────────────┘
                      ╱         ╲
          ┌─────────────┐    ┌─────────────────┐
          │  CSCI 112   │◄──►│   CSCI 210      │
          │   FOP II    │    │   Computer      │
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            ╱        ╲        └─────────────────┘
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                                  │  Andoid App Dev  │
  ┌────────────┐  ┌──────────────┐└──────────────────┘
  │  CSCI 250  │  │  CSCI 209    │                   ┌──────────────┐
  │  Robotics  │  │  Software    │   ┌─────────────┐ │  And more…   │
  └────────────┘  │ Development  │   │  CSCI 335   │ └──────────────┘
                  └──────────────┘   │  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% additional EC on lab grades
  - Total possible EC: 5%

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
  - Monday, Tuesday, Wednesday afternoons

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 is our typical process for testing classes we have defined?
- 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 a reverseString function

Broader Issue Groups

| Danielle Ellis Jake James Karel	Alice Charlotte Danny Matt Nate	Callie Dan Giovanni Hayden Melissa	August Jenna Laurie Mike Natalie	Andrew Bobby Cat Kassi

My Facebook Ad Interests

Choose an interest to preview examples of ads you might see on Facebook or remove it from your ad preferences.

Charity and causes • Dogs • Nature • Cats • German Shorthaired Pointer

Animal rights • Televisions • Pet adoption • Dog breed • Natural environment

My Facebook Ad Interests

Choose an interest to preview examples of ads you might see on Facebook or remove it from your ad preferences.

Feminism • Girls Who Code • Brain • Knowledge • record players • Mormonism
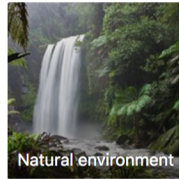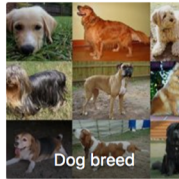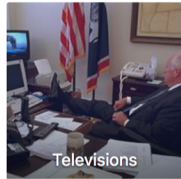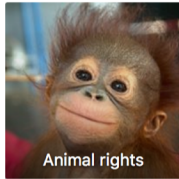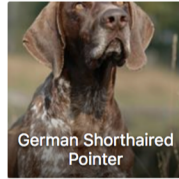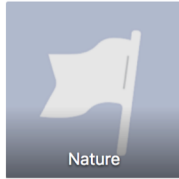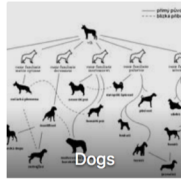
Facebook News Feed: Then and Now

- Then
  - How could you implement Facebook's news feed?
    - What information do you need?
    - What weights would you apply?
  - What did you like/not like about the work environment?
    - What is your ideal work environment?
- Now
  - Did you check out "Why am I seeing this?"
    - What did it reveal?
  - Do you see a lot of surprising posts?
  - What impact does Facebook's news feed have on us? Businesses? Other stakeholders?
  - What does Facebook need to work on next?

Facebook News Feed: Then and Now

- Recognize the iterative process
  - Facebook took a long time to make
- People don't like change
  - But they can get used to it

Make Good Decisions!