Objectives

- Computer Science is Complexity Science
- BI: Facebook

1

Review

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

2

Review: What is Computer Science?

"Computer Science is no more about computers than astronomy is about telescopes."
                                                    --Edsger Dijkstra

3

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

4

Review: What This Course Is About

Problem Solving!

From
30 Rock

5

Review: Parts of an Algorithm

- Input, Output
- Primitive operations
  - What data you have, what you can do to the data
- Naming
  - Identify things we're using
- Sequence of operations
- Conditionals
  - Handle special cases
- Repetition/Loops
- Subroutines
  - Call, reuse similar techniques

An overview for the semester!

6

COMPLEXITY SCIENCE

7

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
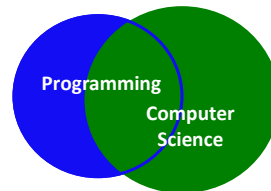
8

4

Computer Science != Programming

programming : CS ::

machining : engineering

grammar : literature

equations : mathematics

walking : W&L

a vehicle, not a destination

9

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!

10

5

Computer Science Fields

Systems
- Architecture *
- Operating systems *
- Networks *
- Distributed * and parallel systems
- Databases
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- …

Software
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- Software engineering*
- Software testing* and verification
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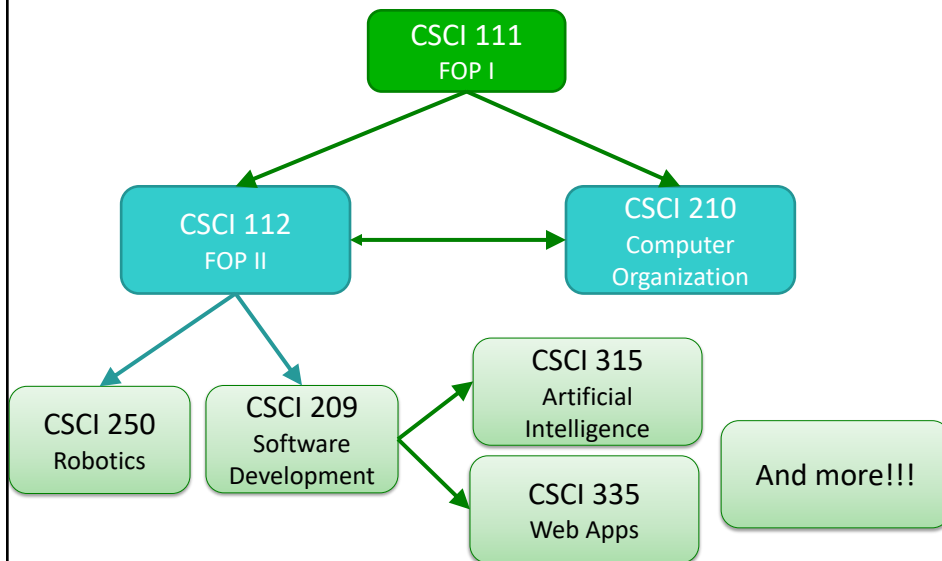***** = field we discussed or did a problem in
- Some are a stretch :)

11

Where Can You Go from Here?

CSCI 111
FOP I

CSCI 112
FOP II

CSCI 210
Computer Organization

CSCI 250
Robotics

CSCI 209
Software Development

CSCI 315
Artificial Intelligence

CSCI 335
Web Apps

And more!!!

12

Course Conclusions

- Better [computational] problem solver
- See impact of computer science on your life
  - Think differently about issues
- Understand some 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

13

Course Evaluations

- On Canvas, due Monday
- 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%

14

Final: Broader Issues

- Take-home (untimed, open articles) part on Broader Issues
  - ➤ Submit PDF on Canvas

Final: The Rest

- Timed part on Canvas
  - ➤ Only open brain, Canvas, Word
  - ➤ Closed everything else
    - Turn off notifications, hide distractions
  - ➤ Can have paper for scratchwork
  - ➤ Some questions "in" Canvas
  - ➤ Some questions in a Word document

Final: Word Part

- One question in Canvas has the Word document
- Download document, type your answers in document
  - I only left a few lines between questions
  - Write your answer below/between the questions
  - Use the point amount to help gauge how much to write
  - Be careful about autocorrect (e.g., avoid i as a variable)
- Submit Word document

17

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?

18

Final Exam Review

- What is our typical process for developing classes?
- 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, test

21

Class: Pet

- Data:
  - Species of animal (dog, cat, chinchilla)
  - Name
    - Defaults to ""
  - Status (in holding, in adoption room, adopted)
    - Defaults to "in holding"
- Functionality
  - Constructor: Pet(species)
  - String format: "species: name, status"
  - Setters for name
  - Set animal as adopted or in adoption room
  - Getters for this information

22

Counter Class Specification

- 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
    - e.g., "low: <low> high: <high> current: <current>"
  - 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

23

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
  - 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., a reverseString function

24

Broader Issue: Facebook News Feed

- How does Facebook's News Feed work?
  - How is the problem broken down?
  - Is it what you expected?

- You've seen both sides
  - You know how Facebook News Feed works (kinda)
  - You know the claims against Facebook about fueling polarization
- Who's right? What are the implications of who is right?

25

Make Good Decisions!

26