

## Objectives

- Final Exam Questions?
- Concluding CS111
  - Other programming languages
  - What is computer science?

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## Applying What You Know To Other Languages

- At the beginning of the semester, some of you asked
  - "Why Python?"
  - "Will I be able to read/write programs in other programming languages?"
- We'll answer the first by showing that you can do the second

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## Applying What You Know To Other Languages

- **Syntax:** symbols used
- **Semantics:** what the symbols *mean*

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## What is the Python Program Doing?

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## What is the Python Program Doing?

- Getting a line of input from "standard in" (from the user)
- Splitting the input into integers
- Calculating the result to a formula
- Deciding if a student is admitted, based on the result of the formula

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## Admissions Problem

- Binary University decides to admit students based on a formula that weighs various factors
  - Scores of 70 or better are admitted
- Input: single line, 4 integers, in order below

Category	Range	Weight Factor (Multiplier)
High School GPA	0 - 10	0.25
SAT score	600-2400	.01
AP Courses	0-10	10
Intangibles	1-10	8

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## Example Input/Expected Output

Input	Expected Output
0 1 0 300	DENY
6 10 99 2390	ADMIT
0 7 82 1500	ADMIT
2 5 0 990	DENY
2 5 0 1000	ADMIT
2 5 0 1010	ADMIT

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## What is the Python Program Doing?

- Getting a line of input from “standard in” (from the user)
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Identify these pieces in the other programs

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## Example Programs

- printLab.sh
  - Bash script
- Java, C++, C
  - Programming content problem: determining if someone should be admitted to college

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## Comparing Programming Languages

- How is the syntax/semantics of these languages different from Python?
- What is easier or harder to do in these other programming languages than in Python?

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## Comparing Programming Languages

- Benefits of Python:
  - Simpler syntax (e.g., fewer {} and ())
  - Can cover some content with less overhead
- Drawbacks
  - Data types aren't explicit (static)
    - Can be harder for you to remember and keep straight
  - Not compiled explicitly beforehand
    - Keep executing to find all the syntax bugs
  - Allows you to do some crazy stuff that won't work in other programming languages

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## Who Uses Python?

- Google
  - Backends of Gmail and Google Maps and search-engine internals
- NASA
  - Collaborative engineering
- Yahoo
  - Groups: Maintain discussion groups; Maps
- RedHat Linux
  - System infrastructure
- Original BitTorrent client; Youtube; Civilization IV

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## Computer Science != Programming

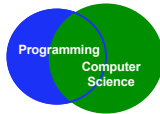
programming : CS ::

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
- ...

### 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

### Systems

- Architecture \*
- Operating systems \*
- Networks \*
- Distributed \* and parallel systems
- Databases
- ...

### 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
- ...

\* = field we discussed or did a problem in

➢ Some are a stretch :)

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## CS == Complexity Science

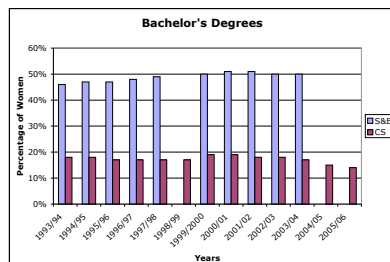
- Study of Complexity
  - How can it be done?
    - Based on **information**
    - Managing, manipulating data
    - Possible algorithms
  - How well can it be done?
    - Most **efficient** algorithm in terms of time and/or space
  - Can it be done at all?
    - Often, proof is a program--an implementation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

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## Diversity in Computer Science



- S&E around 50%, CS < 20%

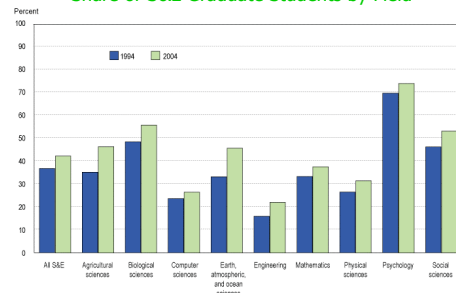
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## Graduate Enrollment

Share of S&E Graduate Students by Field



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## Attracting Computer Scientists

- Demand for software engineers is high
  - Create new software, applications --> improve productivity
  - Good starting salaries, esp. compared to other college graduates
- Computer science majors are decreasing
  - Dropped with dot-com bust
  - Losing "normal" people of all genders, ethnicities
- Need to attract and retain more majors
  - Maintain technical innovation, diversity of ideas
  - Computing's effect on other fields
- Does attracting new majors compromise/weaken the discipline?

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## Discussion

Group1: Julie, Lucy, Vasil, Colin  
 Group2: Greg, Dave, Joe, Alex, Nay  
 Group3: Ty, Clay, Arturo, Joa, Stuart

Stereotype	% Truth	Perception changed?	How to Address?

Some stereotypes  
have some truth  
to them

Since W&L  
or since  
CS111

In classroom?  
As a profession?  
Recruitment tools?

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## Discussion

- Why do we need women and minorities and others?
  - Diversity of perspective, ideas
  - iRobot: makers of Roomba
    - Male and Female co-founders
  - Games: Missing 50% of market
    - Sims - most popular game in history
- Broader: need applications for all people

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## Conclusions

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

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