#### Plan For The Day (PFTD)

- Practice solving problems (algorithms, programs)
  - > Some solved with a computer, some with Python
- Learning about vocabulary
  - > We'll work with English and Python
- Practice using tools for Duke Compsci courses
  - > Eclipse, APT, ambient, ... Python-tutor
  - > Sakai, Piazza, Feedback
- Reveling in the wonder of thinking and working
  - ▶ How do we know when something works?

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#### Who took Compsci 101?



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**Algorithm** 

2.2

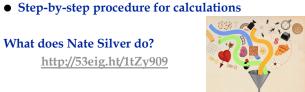
#### Why is programming fun? **Fred Brooks**

- First is the sheer joy of making things
- Second is the pleasure of making things that are useful
- Third is the fascination of fashioning complex puzzle-like objects of interlocking moving parts
- Fourth is the joy of always learning
- Finally, there is the delight of working in such a tractable medium. The programmer, like the poet, works only slightly removed from pure thought-stuff.

Recipe • Sequence of steps that constitute instructions

What does Nate Silver do?

http://53eig.ht/1tZy909



How do Netflix and Amazon know me?

• Compsci101: capable of implementation as a program, but tread gently here

http://moreintelligentlife.com/content/features/anonymous/slaves-algorithm

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#### **Skills and Practice for Game Playing**

• I have 7 and 5, dealer showing 5, I should ...



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2.5

#### **Skills and Practice for Game Playing**

• http://www.youtube.com/watch?v=AEBbsZK39es



\$193, \$540, \$820, \$700, \$749. Are these reasonable? Why?

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2.6

#### I'm thinking of a number ...

- You guess. I'll tell you high, low, or correct
  - > Goal: guess quickly, minimal number of guesses
  - > Number between 1 and 100...
  - > Number between 1 and 1000...
- Can you describe an algorithm, instructions, that would allow someone to use your instructions to play this game correctly. Start with 1 and 100, but ideally your instructions work with 1 and X

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2.7

#### Analyzing the binary search algorithm

- Is the algorithm correct?
  - > Try it, again, and again and ...
  - > Reason about it: logically, informally, ...
- How efficient is the algorithm?
  - ➤ How many guesses will it take (roughly, exactly)
  - > Should we care about efficiency?
- When do we really care about efficiency?
  - > Examples?

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#### Concepts you'll learn in Compsci 101

- Programming
  - > Practice, skill, art, science, engineering, creativity
- Problem-solving
  - How to solve problems using programming and a computer
- Impact of computer science
  - > Scale and automation: powerful forces
- Foundation for future work
  - > In many areas, not limited to compsci@duke

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2.9

#### **Python and Programming Concepts**

- Names are important, abstractions
  - ➤ What is http://152.3.140.1
  - ▶ What is http://www.amazon.com
- Types are important, facilitate operations
  - > What is foo.pdf, foo.mp4, foo.jpg, foo.wav
  - > Do the file extensions guarantee file type?
- Thinking in terms of names and types can help
  - > Python has types, inferred dynamically
  - > Python uses types differently from Java and C++

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2.11

#### **Programming Examples**

- Scratch example from class, elaborate in lab
  - http://scratch.mit.edu/projects/25866811/
- Hour of code: http://learn.code.org/hoc/1
  - Designed for kids, useful to millions
- Light-bot (many versions, first assignment)
  - http://armorgames.com/play/6061/light-bot-20
- Python!

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2.10

#### **Latanya Sweeney**

I am a computer scientist with a long history of weaving technology and policy together to remove stakeholder barriers to technology adoption. My focus is on "computational policy" and I term myself a "computer (cross) policy" scientist. I have enjoyed success at creating technology that weaves with policy to resolve real-world technology-privacy clashes.



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http://latanyasweenev.org/

Identify 87% of US population using (dob,zip,gender). Director of Harvard Data Privacy Lab, instrumental in HIPAA because if *de-identification* work, currently Chief Technologist FTC

# (RE)-INTRODUCTION TO PYTHON

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## Python data reading code

```
f = open("/data/kjv10.txt")
st = f.read()
len(st)
ac = st.count('a')
zc = st.count('z')
for ch in 'aeiou':
    print ch, st.count(ch)
```

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2.14

#### Vocabulary, grammar, rules: Python

- Naming
  - > The power of abstraction and parameterization
  - > What is abstraction?
  - > What are parameters? What has them?
- Types
  - > What's used in Python? Use console
  - > Determine names of types in Python
  - > int, float, bool, string, list, ...
  - > Operators and expressions: (see web pages)

#### Variables, Types, Values

- Variable is a name associated with "container/stuff"
  - $\triangleright$  Assign a value: x = 5
  - > Print value of variable: print x
  - $\triangleright$  Use variable in expression: y = x \* 55
- String is a type and has a value
  - > Assign: x = "hello"
  - Print value of variable: print x
  - ➤ Use in expression: x + " world"



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2.15

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#### **Expressions, Operators, Types**

- Why is 3+5\*4 different than (3+5) \*4?
  - > Operator precedence: () ((( are your friends
- Why is 5/3 different than 5.0/3?
  - > We use Python 2.7, different in Python 3.0
- What happens when operators go bad?
  - > What is "apple" + 3? What is "apple" + "pi"?
  - > What is "apple" \* 3? What is "apple" \* "pi"?

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2.17

#### **ALGORITHMIC INTERLUDE**

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2.18

#### Whole Genome Shotgun with words

olve problems.
ratively, create,
compsci101 we get t
01 we get to work colla
vely, create, and
s. In compsci1
y, create, and s
e get to work collabo

- Creation algorithm
  - > Take a phrase
  - > Replicate it four times
  - Chop into "chunks"
    - 15-22 characters
- How to recreate original phrase?

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2.19

#### **Getting ready to code in Python**

- We need a programming environment
  - Eclipse, PyDev, Python, Ambient
    - Open source or free for academics
- We need a computer with an operating system
  - > Installing the suite of tools can be cumbersome
    - Persist, Perserve, Get Help, start over 8
- Getting used to the environment can take time
  - Once you've got it, second nature!
    - Easy to reuse with a new language

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### What is an APT? BMI APT

- Automated/Algorithmic Problem Testing
  - > Write one function, 2-30 lines, solve a problem
  - > Tested automagically in Eclipse or the browser
  - > Test test test ... Quality of code not an issue
- Start simple, build toward more complex
  - > What is a function? A function call?
  - > What is a parameter? Argument?
  - > How do you run/execute a program

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