

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?

Who took Compsci 101?



Compsci 101, Fall 2014

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.



Algorithm

- **Recipe**
- **Sequence of steps that constitute instructions**
- **Step-by-step procedure for calculations**

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>

Skills and Practice for Game Playing

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



Skills and Practice for Game Playing

- <http://www.youtube.com/watch?v=AEBbsZK39es>



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

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

<http://bit.ly/101fall14-828-1>

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?

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

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!

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++

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.



Compsci 101, Fall 2014



<http://latanyasweeney.org/>

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

(RE)-INTRODUCTION TO PYTHON

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)
```


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"
 - Assign a value: `x = 5`
 - Print value of variable: `print x`
 - 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"`



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"`?

ALGORITHMIC INTERLUDE

Whole Genome Shotgun with words

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compsci101 we get t
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- **Creation algorithm**

- Take a phrase
- Replicate it four times
- Chop into "chunks"
 - 15-22 characters

- **How to recreate original phrase?**

<http://bit.ly/101fall14-828-2>

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 ☹
- **Getting used to the environment can take time**
 - Once you've got it, second nature!
 - Easy to reuse with a new language

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

