

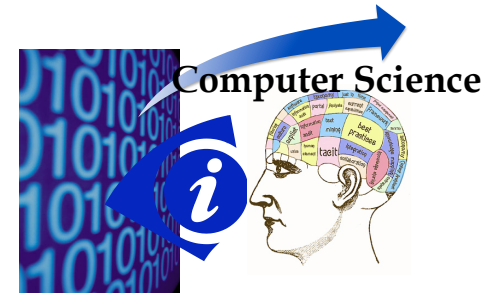
COMPSCI 101, Fall 2012
Introduction to Computer Science
Owen Astrachan

<http://www.cs.duke.edu/courses/fall12/compsci101>
<http://www.cs.duke.edu/~ola>

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1.1

Data into Information and Knowledge



men and women: this is compsci 101

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Prerequisites for Compsci 101



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Who's taken Compsci 101?



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Is a picture worth a thousand words?

- <http://www.google.com/images?q=world%20wide%20web&biw=1238&bih=969>
- <http://www.google.com/images?q=computer%20science&biw=1370&bih=1081>
- <http://www.google.com/images?q=internet&biw=1370&bih=1081>
- <http://www.google.com/images?q=programming&biw=1370&bih=1081>



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Anatomy of a search [query]

- <http://www.google.com/images?q=programming&biw=1370&bih=1081>
- What comes after the question-mark in the URL?
 - What is the query string?
 - What are the browser dimensions?
 - What is constant in the search query, what changes?
 - How is the query *parameterized*?
 - How are multiple-word queries handled?
- What does this have to do with Computer Science and programming?

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Questions about Computer Science

What is it that distinguishes it from the separate subjects with which it is related? What is *the linking thread* which gathers these disparate branches into a single discipline? My answer to these questions is simple --- it *is the art of programming a computer*. It is the art of designing efficient and elegant methods of getting a computer to solve problems, theoretical or practical, small or large, simple or complex.

C.A.R. (Tony)Hoare

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Milking Stool v Neural Queue

- Engineering, Mathematics, Science
 - Pillars of computer science?
 - Braid of computer science?
- Other aspects of CS?
 - Technology and policy
 - Art and visualization
 - Collaborative Filtering



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Sebastian Thrun

Udacity, Stanford, Google, driverless cars, ...

"What's unique about Sebastian, and all innovators, perhaps, is that they don't start with the current situation and try to make incrementally better based on what's been done in the past. They look out and say



'Given the current state of technology, what can I do radically differently to make a discontinuity — not an incremental change, but put us in a different place?'" says Dean Kamen, the inventor of the Segway. "He is a true innovator...And he has a fantastic vision."

http://www.huffingtonpost.com/2012/08/19/a-beautiful-mind_n_1773468.html

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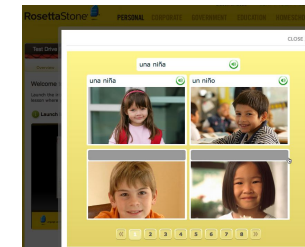
Understanding Information/Data

- Does understanding computer science help you when you want a new smart phone?
- Does knowledge of programming help you get your laptop connected to a wireless access point?
- Does experience with algorithms and algorithmic approaches help physicians and attorneys?
- Are these important to society, to you?

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How will you learn to 'speak'?

- <http://www.rosettastone.com/personal/demo>
- <http://duolingo.com>



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What language will we learn?

- <http://www.python.org/>
- Python is a *multi-paradigm* language
 - Procedural
 - Functional
 - Object-Oriented
- Simple, huge libraries, widely used
- Guido is BDFL

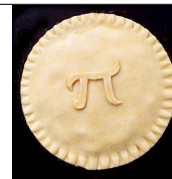


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Why is it called Python?

- <http://www.youtube.com/watch?v=anwy2MPT5RE>



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— 9.8 m/sec²

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Course Overview: Is this the right one?

- There are details, see the [course web page](#)
 - Midterms and final are open book, what does that mean?
 - APTs: Algorithmic Problem-solving and Testing
 - Weekly small programming assignments, tested online
 - Programming assignments: solo, group, ...
 - Lab/recitation: group and individual work
- Why should you come to class?
 - Meet people, learn things, participate in a community
 - Provide help, get help, wonder, dance, think
- Why is this course so great?
 - Because you're in it

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What's in Compsci 101?

- Learning about computing, computer science, and programming
 - Vocabulary of Python and programming languages
 - Crafting programs from the vocabulary
 - Power of automation, repetition, scale
 - Understanding and changing the world
- Programming using Python
 - Tools: Eclipse, EPD, Libraries, ...
 - Engineering and analyzing designs and programs
 - Using mathematical and scientific techniques
 - Appreciating and learning art and science of programming
 - Moving toward scaling solutions (continued later courses)

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Questions

If you gotta ask, you'll never know

Louis Armstrong: "What's Jazz?"



If you gotta ask, you ain't got it

Fats Waller: "What's rhythm?"



What questions did you ask today?

Arno Penzias

From Blog to Scientific Visualization

- Text Cloud aka Tag Cloud?

- Number of occurrences/emphasis indicated by size of word
- Great visual/statistic: <http://chr.ag/phernalia/preztags/>
- <http://www.nytimes.com/gst/mostsearched.html?period=30&format=tagcloud>
 - What information is stored in the URL of the NYTimes site above?



Problem Solving and Programming

- **How many words are in a file? A webpage?**
 - What's a word?
 - What's a file?
 - How do we solve this: simply, quickly, ...?
 - What's the best we can do? Constraints?
- **How many different/unique words are in a file?**
 - How is this related to previous task?
- **How many words do two files have in common?**
 - Spell-checking, Google did you mean ..?
- **How many codons common to DNA strands?**

Toward a Pythonic Tagcloud generator

- This is valid and correct Python code, questions?

```
def countWords(filename):
    file = open(filename)
    str = file.read()
    words = str.split()
    unique = set(words)
    print "filename: ", filename
    print "total # words = ",len(words)
    print "unique # words = ",len(unique)

if __name__ == "__main__":
    countWords('/data/kjv10.txt')
```

```
filename: /data/kjv10.txt
total # words = 823135
unique # words = 34027
```

Python vocabulary

- **Python has a large standard library**
 - Organized in *modules*: sys, io, math, os, ...
 - <http://docs.python.org/library/index.html>
 - API browseable online, but Eclipse IDE helps a lot
- **Python users often use third-party libraries too**
 - Scientific, visual, plotting, ...
 - We will use EPD: Enthought Python Distribution
- **Python is a multi-paradigm language, though this won't matter so much in the beginning**
 - Very useful later!

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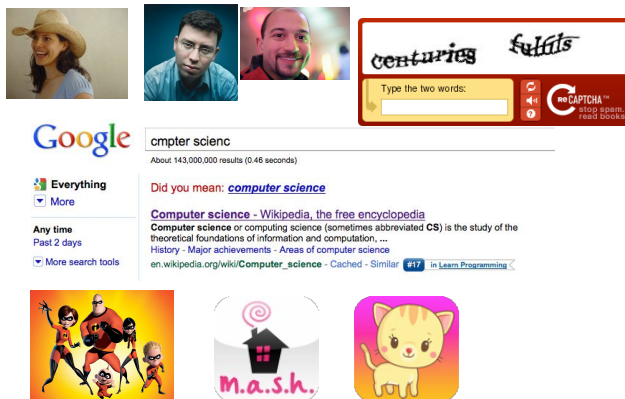
Python and Programming Concepts

- **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++
 - Static v Dynamic

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Duke Contributions



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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.**



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