

COMPSCI 101, Fall 2014
Introduction to Computer Science

Prof. Susan Rodger

<http://www.cs.duke.edu/courses/fall14/compsci101>

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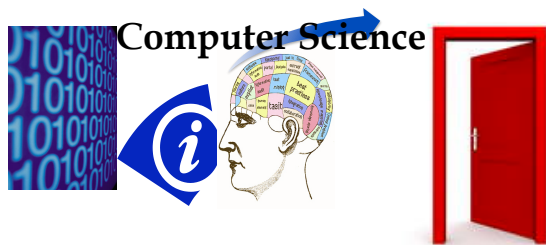
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Data into Information and Knowledge



men and women: this is compsci 101

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Today this requires computer science

“Our species needs, and deserves, a citizenry with minds wide awake and a basic understanding of how the world works.



-Carl Sagan

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Prerequisites for Compsci 101



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Who's taken Compsci 101?



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Interactive, group questions on 8/26

- What is computer science?
➤ <http://bit.ly/101fall14-826-1>
- What do these logos represent?
➤ <http://bit.ly/101fall14-826-2>
- Understanding a first, Scratch program
➤ <http://bit.ly/101fall14-826-3>

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What is Computer Science?

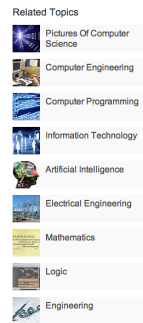
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Just ask Siri (or Bing?)

<http://www.bing.com/images/search?q=computer+science&go=Submit&q=n&form=QBIR&pq=computer+science&sc=8-16&sp=-1&sk=>



Anatomy of a search query

https://www.google.com/search?q=what+is+computer+science&espv=2&source=lnms&tbm=isch&sa=X&ei=Ib77U_O9CtDhsAT07YDABA&sqi=2&ved=0CAcQ_AUoAq&biw=1293&bih=861

- What are the parameters to the query?
 - What changes, what stays the same?

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

Daphne Koller

Computers learn to diagnose breast cancer? And more? *The Data Scientist on a Quest to turn Computers into Doctors*

- <http://bit.ly/koller-cancer>
- http://www.wired.com/2014/08/enlitic/?mbid=social_fb

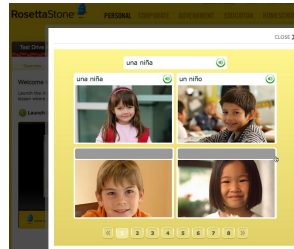


On Coursera: "But to practice problem-solving, a student must first master certain concepts. By providing a cost-effective solution for this first step, we can focus precious classroom time on more interactive problem-solving activities that achieve deeper understanding – and foster creativity."

Coursera Founder, NY Times, December 5, 2011

How will you learn to 'speak'?

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



How will you learn to program?

- You learn more than programming in Compsci 101
 - Coding
 - Algorithms
 - UX/UI: User Experience, User Interface
 - Data Analytics
 - Software Engineering
- A course, a way of thinking, a set of skills and practice that can lead to more or ...
 - Provide enough to solve problems now

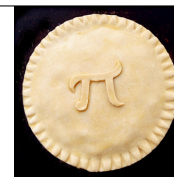
What language will we learn?

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



Why is it called Python?

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



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— 9.8 m/sec²

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What are these logos?

bit.ly/101fall14-826-2

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Course overview, logistics

- For complete details:
<http://www.cs.duke.edu/courses/fall14/compsci101/info.php>
- Programming assignments: APTs and Assignments
 - Complete on your own, acknowledge "help"
 - Be aware of late policy
- Exams: midterms and final: paper-based, different
 - All old midterms available
- Class work/attendance
 - Examples today, benefits hopefully clear

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Course Overview: Is this the right one?

- Work by yourself and collaboratively on solving problems that require writing programs
 - Analyze the problems, think about solving them
 - Create, Collaborate, Persist, Problem-Solve
- Why should you come to class?
 - 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
 - *Power of automation, repetition, scale*
 - Understanding and changing the world
- Programming using Python
 - Tools: Eclipse, EPD, Libraries, ...
 - Using mathematical and scientific techniques
 - Art *and* science of programming

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?"



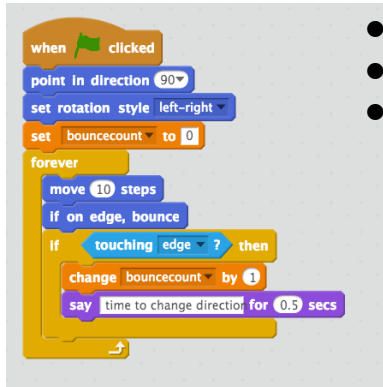
What questions did you ask today?
Arno Penzias

Research Questionnaire Interlude

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?

<http://scratch.mit.edu/projects/25866811/>



- "Hello World"
- Scratch Program
- Colors
 - Duke blue: motion
 - Mustard: control
 - Light blue: sensing
 - Orange: data
 - Purple: looks

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What is this program?

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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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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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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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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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