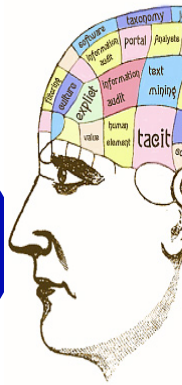


**COMPSCI 101, Fall 2015**  
***Introduction to Computer  
Science***  
**Susan Rodger**  
**Owen Astrachan**

<http://www.cs.duke.edu/courses/fall15/compsci101>

# Data into Information and Knowledge

## Computer Science



women and men: this is compsci 101

**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**



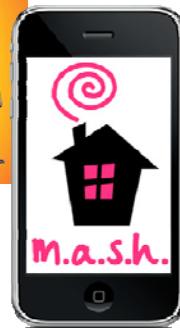
# Prerequisites for Compsci 101



# Who's taken Compsci 101? (astrachan)



# Who has taken CompSci 101? (rodger)



# What is Computer Science?

<http://bit.ly/101fall15-825-1>

# Just ask Siri (or Bing?)

<http://www.bing.com/images/search?q=computer+science&go=Submit&qs=n&form=QBI R&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\\_09CtDhsAT07YDABA&sqi=2&ved=0CAcQ\\_AUoAg&biw=1293&bih=861](https://www.google.com/search?q=what+is+computer+science&espv=2&source=lnms&tbm=isch&sa=X&ei=Ib77U_09CtDhsAT07YDABA&sqi=2&ved=0CAcQ_AUoAg&biw=1293&bih=861)

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

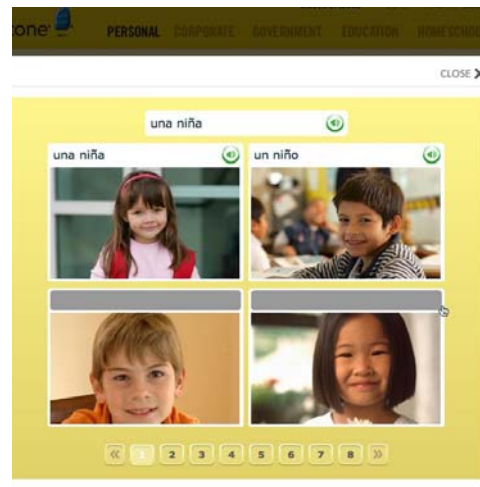
# Questions about Computer Science

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

# 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
- 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 ...

# What language will we learn?

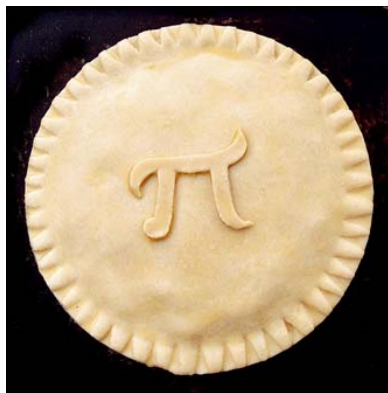
- <http://www.python.org/>
- Python is a *multi-paradigm* language
  - Procedural
  - Functional
  - Object-Oriented
- Simple, libraries, widely used
- Guido is BDFL



# Why is it called Python?

- <http://www.youtube.com/watch?v=anwy2MP>

TEDE

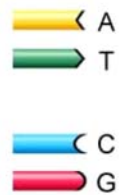


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**C**  
9.8 m/sec<sup>2</sup>



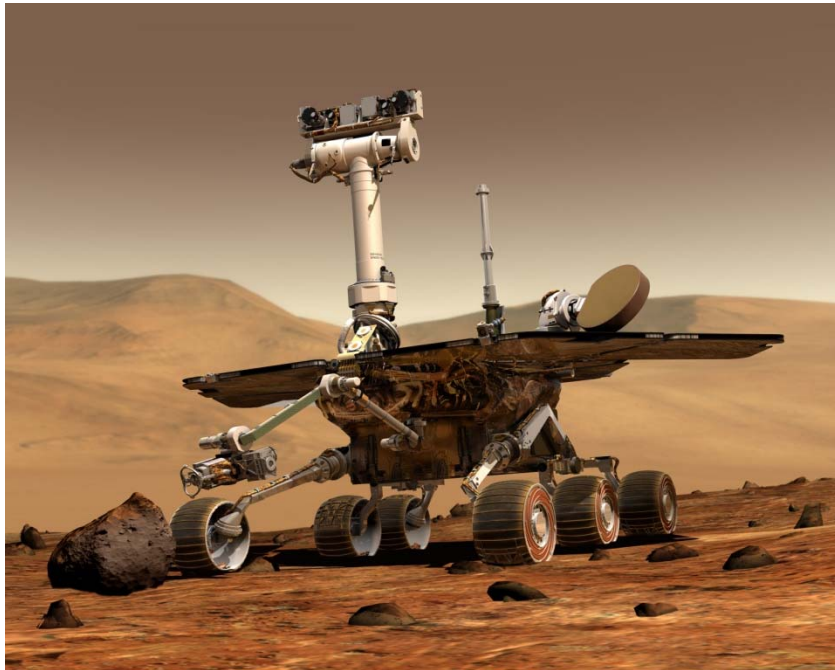
# Who are you?

- **Let's look at survey to see who is taking Compsci 101 in Fall 2015**
  - **Do you recognize yourself?**
  - **Is there a stereotypical Compsci 101 student?**
  - **Is there a stereotypical computer scientist?**
  
- **Everyone can succeed! Ideally you won't have lots of experience programming**



# What is Computer Science?

- Artificial Intelligence



Spirit, Mars Rover

Computer 101.2, Fall 2013



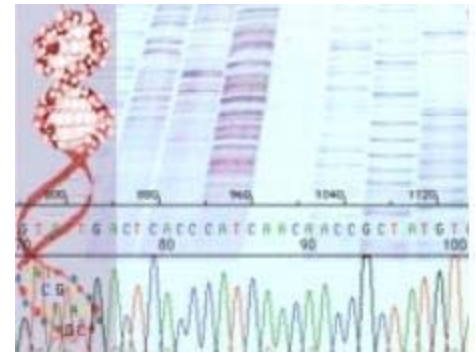
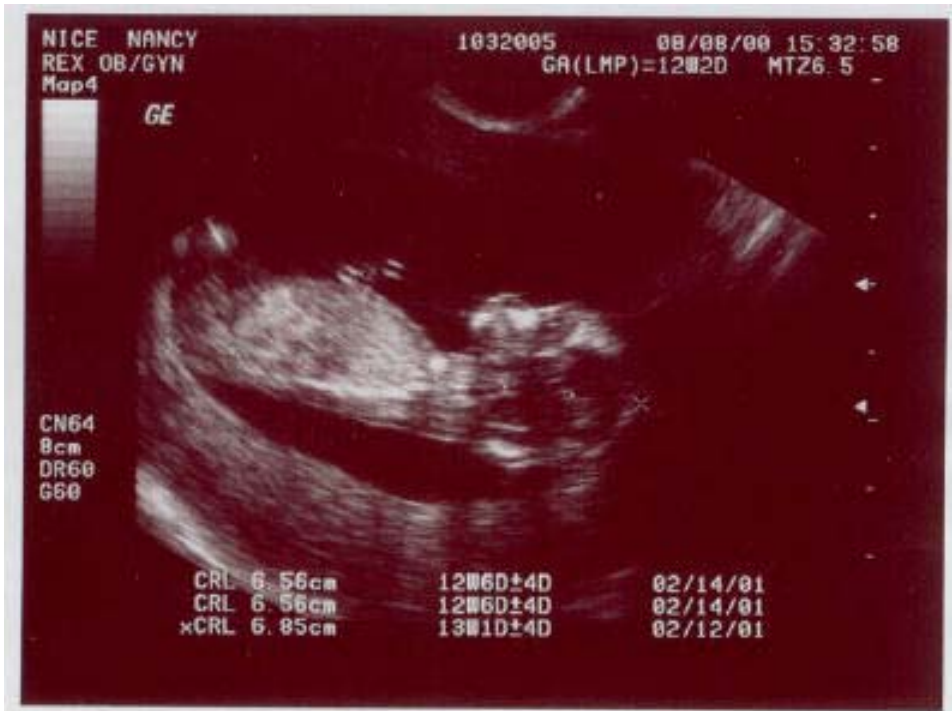
Roomba



CMU's Sandstorm

# What is Computer Science?

- **Medicine, Genomics**



# What is Computer Science?

## □ Devices



# What is Computer Science?

- Animation



# Daphne Koller, AI Pioneer, Educator

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://wrd.cm/1E9zFqy>



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

# Course overview, logistics

- **For complete details:** <http://bit.ly/101fall15>
- **Programming assignments: APTs and Assignments**
  - Acknowledge assistance, to learn to program ...
  - Be aware of late policy
- **Exams: midterms and final: paper-based, different**
  - All old midterms available
- **Class work/attendance**
  - Examples today, benefits hopefully clear

# Course Overview: Is this the right one?

- **Work by yourself and collaboratively on solving problems that programming**
  - 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

# 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

# Latanya Sweeney

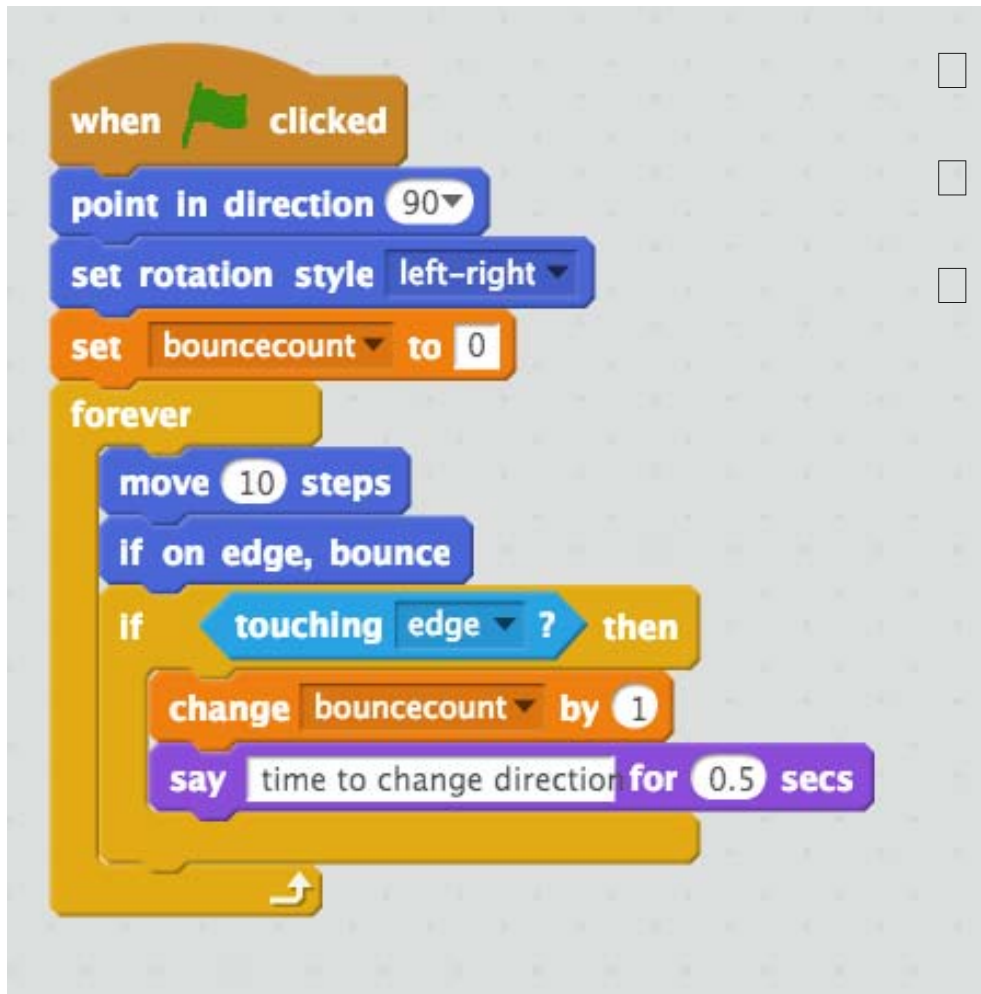
Chief Technologist at FTC. I am a computer scientist with a long history of weaving technology and policy together to remove stakeholder barriers to technology adoption. My focus is on "computational policy" and I term myself a "computer (cross) policy" scientist. I have enjoyed success at creating technology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



<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

<https://scratch.mit.edu/projects/73232552/>



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

# What is a Scratch Program?

<http://bit.ly/101fall15-825-2>

## Python data reading code

```
f = open("/data/kjv10.txt")
st = f.read()
total = len(st)
zc = st.count('z')
print "total # chars = ",total
print "number of z's",zc
for ch in 'aeiou':
    print ch, st.count(ch)
```

# Explaining Python code?

<http://bit.ly/101fall15-825-3>

# Duke Connection: Fred Brooks '53

## □ What Would FB Say?

"The most important single decision I ever made was to change the IBM 360 series from a 6-bit byte to an 8-bit byte, thereby enabling the use of lowercase letters. That change propagated everywhere."

- "Fred Brooks" by Copyright owned by SD&M (www.sdm.de) - Request for picture sent by email to Fred Brooks by uploader (Mark Pellegrini; user:Raul654) Fred sent this photo back, along with contact information for Carola Lauber at SD&M, who gave copyright permission.. Licensed under CC BY-SA 3.0 via Wikimedia Commons - [https://commons.wikimedia.org/wiki/File:Fred\\_Brooks.jpg#/media/File:Fred\\_Brooks.jpg](https://commons.wikimedia.org/wiki/File:Fred_Brooks.jpg#/media/File:Fred_Brooks.jpg)



# 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.

