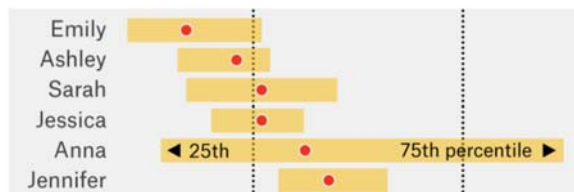


# CompSci 101

## Introduction to Computer Science



Aug 31, 2017

Prof. Rodger

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1

## Announcements

- Reading for next time on calendar page
  - RQ 2 due Tuesday
- Assignment 1 due Tuesday
  - Have fun with Blockly
- Plan for Today:
  - Algorithms, Problem Solving and Python

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2

## Tips on Using the VM

- Each netid only one VM
- Kill the tab you are in when you are done!
- On Windows 10? Try Microsoft Edge
- OIT is making available a local VM

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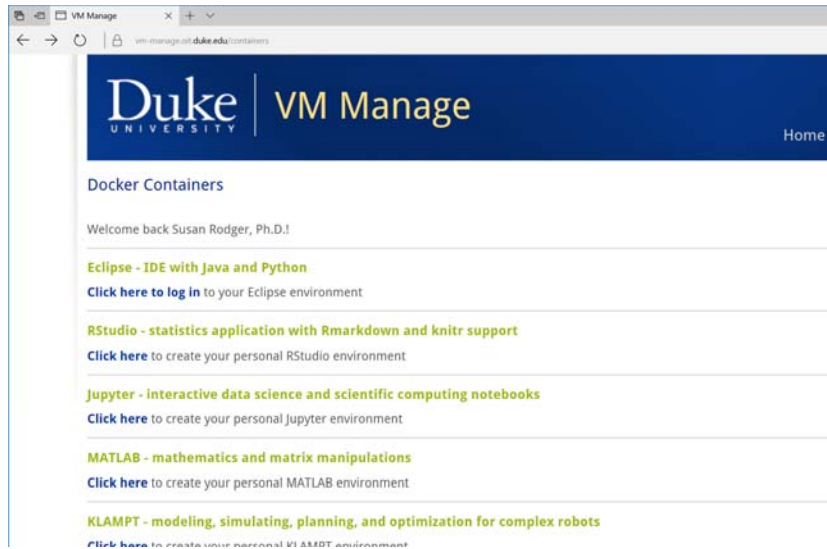
3

## Software Failure

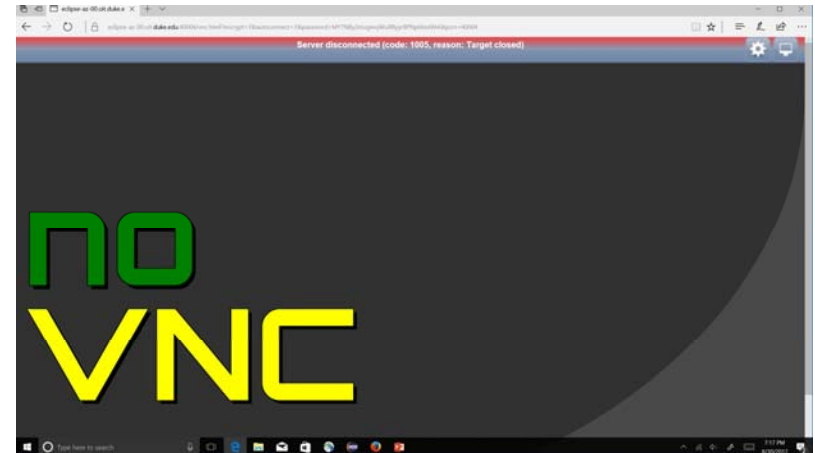
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4

## Software Failure



## Software Failure

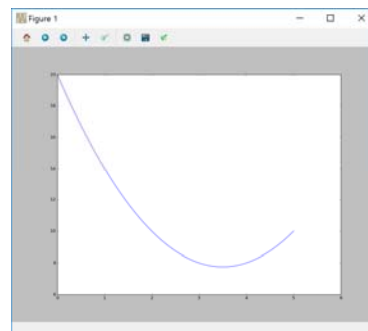


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6

## Lab 1 This Week Done!

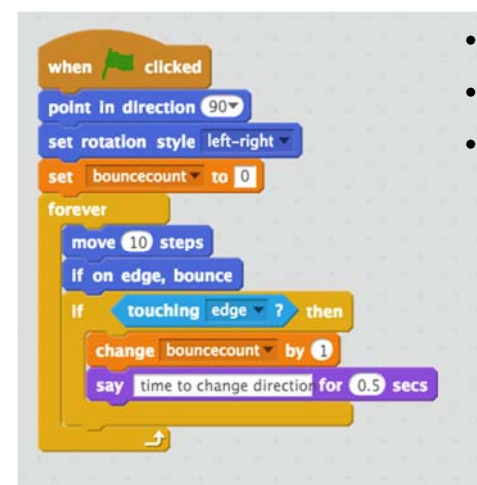
- Run the VM
- Modify Python program
- Scratch program for fun



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7

## Last Time Scratch program



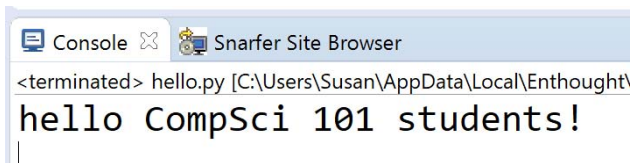
- "Hello World"
- Scratch Program
- Colors
  - Duke blue: motion
  - Mustard: control
  - Light blue: sensing
  - Orange: data
  - Purple: looks

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8

## Python code hello.py

```
1 '''
2 Created on Aug 28, 2017
3
4 @author: Susan
5 '''
6 print "hello CompSci 101 students!"
```



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9

## Python data reading code

```
f = open("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)
```

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10

Woa!!!

Am I suppose to understand  
all that code right now!!!!

No!!!

We will learn all that over  
The next month!

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11

## Explain Python data reading code [bit.ly/101f17-0831-1](http://bit.ly/101f17-0831-1)

```
f = open("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)
```

12

# 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  
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13

## Our Programming Environment

- Install 5 items or just use VM!



- Why Java? – not using

- Eclipse – platform for development



- Python – programming language



- Pydev – Python IDE for Eclipse



- Canopy – python libraries



- Ambient – turnin/snarf files to/from Duke

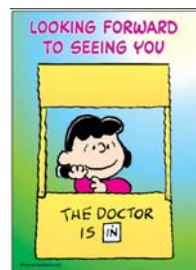
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14

## How does one get help in CompSci 101?

- Consulting hours
  - Sunday-Thursday 7:30-11:30pm
- Office hours (prof, TAs)
- Collaborate with other students
- Piazza
  - Ask questions
  - Do not post your code and ask what is wrong!
  - Post error message and line of code for error message
  - If added class late, may need to add yourself



15

## How to succeed in CompSci 101

- Start assignments early, they'll take longer than you think
- Read the book, we'll build on it in class
- Collaborate well, but be sure you can do work on your own!
- Be curious, work hard at beginning, think carefully

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16

## Your goal is to ...

- Get all assignments completed and turned in on time.

AND...

## Your goal is to ...

- Get all assignments completed and turned in on time.

AND...

- Understand the code you turn in.
- Be able to explain the code you turn in.

## Algorithm

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

Biscuits



Cookie Sandwich



## Write an algorithm for making a cookie sandwich

[bit.ly/101f17-0831-2](http://bit.ly/101f17-0831-2)

Cookie Sandwich  
should look like:



Here are your supplies:



# Algorithm

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

How do Netflix and Amazon know me?

- Compsci101 project: capable of implementation as a program, but much more basic

What does Nate Silver do?

<http://53eig.ht/1tZy909>

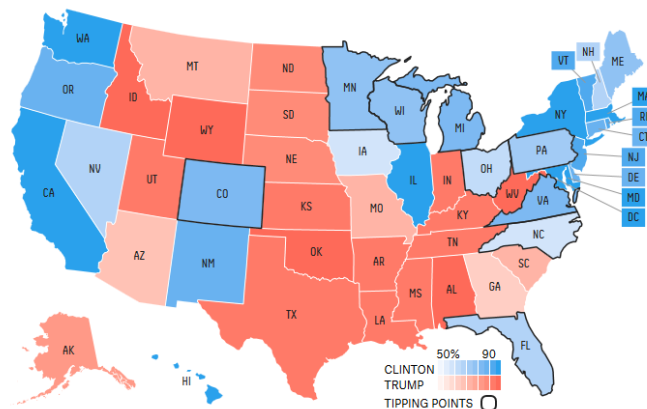
More on algorithms:

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

# Algorithm – Nate Silver and others

## Who will win the presidency?

Chance of winning



## Google Algorithm – with News

algorithm

About 558,000 results (0.40 seconds)

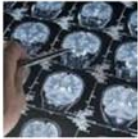
- Online dating: Can an algorithm really match you with your dream ...**  
Hindustan Times - 2 hours ago  
A new research questioned whether data and algorithm can predict attraction between two people who have never met. Here's what they found ...
- This genius algorithm turns your name into an awesome musical ...**  
Classic FM - Aug 30, 2017  
Ever wondered what your name would sound like as a musical motif? You can now find out using Claralael, an algorithm that reveals your ...
- Algorithm could predict Alzheimer's risk years before symptoms occur**  
Medical News Today - Aug 27, 2017  
In the new study, Dr. Rosa-Neto and team describe the development of an algorithm that could predict a patient's likelihood of progressing from ...
- Amazon has an algorithm that designs clothes by replicating human ...**  
Quartz - Aug 25, 2017  
At its core, Amazon's goal is to remove as much friction as possible from a customer finding what they want, ordering it, and having it land on ...



**Online dating: Can an algorithm really match you with your dream ...**  
 Hindustan Times - 2 hours ago  
 A new research questioned whether data and algorithm can predict attraction between two people who have never met. Here's what they found ...



**This genius algorithm turns your name into an awesome musical ...**  
 Classic FM - Aug 30, 2017  
 Ever wondered what your name would sound like as a musical motif? You can now find out using Clarallel, an algorithm that reveals your ...



**Algorithm could predict Alzheimer's risk years before symptoms occur**  
 Medical News Today - Aug 27, 2017  
 In the new study, Dr. Rosa-Neto and team describe the development of an algorithm that could predict a patient's likelihood of progressing from ...



**Amazon has an algorithm that designs clothes by replicating human ...**  
 Quartz - Aug 25, 2017  
 At its core, Amazon's goal is to remove as much friction as possible from a customer finding what they want, ordering it, and having it land on ...

## Algorithms that scale: An example

- Human Genome Project
  - Multiple approaches, relying heavily on computational power and algorithms
  - Combine reads of DNA sequences, we'll look at an illustrative example
- These combine bio/chemistry techniques with computational techniques to recreate the sequencing, e.g., CGATTCCG... from "live data", actual DNA.

## Eugene (Gene) Myers

- Lead computer scientist/software engineer at Celera Genomics, then at Berkeley, now at Janelia Farms Research Institute (HHMI)

*"What really astounds me is the architecture of life. The system is extremely complex. It's like it was designed." ... "There's a huge intelligence there."*

- BLAST and WG-Shotgun



## 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?

<http://bit.ly/101f17-0831-3>

## From Algorithms to Code

- An algorithm that scales needs to run on a computer --- programming to the rescue!
- Extensive libraries help with programming
  - Brain or Neuroscience
  - Engineering and Mathematics
  - Genomics
  - Graphic User Interfaces, ...
- We are using Python, extensible and simple