CompSci 101
Introduction to Computer Science

Aug 31, 2017

Prof. Rodger
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
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
Software Failure
Software Failure

Duke UNIVERSITY | VM Manage

Docker Containers

Welcome back Susan Rodger, Ph.D.!

**Eclipse - IDE with Java and Python**

*Click here to log in* to your Eclipse environment

**RStudio - statistics application with Rmarkdown and knitr support**

*Click here* to create your personal RStudio environment

**Jupyter - interactive data science and scientific computing notebooks**

*Click here* to create your personal Jupyter environment

**MATLAB - mathematics and matrix manipulations**

*Click here* to create your personal MATLAB environment

**KLAMPT - modeling, simulating, planning, and optimization for complex robots**

*Click here* to create your personal KLAMPT environment
Software Failure

Server disconnected (code: 1005, reason: Target closed)

no VNC
Lab 1 This Week Done!

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

- "Hello World"
- Scratch Program
- Colors
  - Duke blue: motion
  - Mustard: control
  - Light blue: sensing
  - Orange: data
  - Purple: looks
Python code
hello.py

```python
print "hello CompSci 101 students!"
```

<terminated> hello.py [C:\Users\Susan\AppData\Local\Enthought]

hello CompSci 101 students!
Python data reading code

```python
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)
```

Woa!!!
Am I suppose to understand all that code right now!!!!
No!!!
We will learn all that over The next month!
Explain Python data reading code
bit.ly/101f17-0831-1

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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://wrd.cm/1E9zFqy](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
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
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
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
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

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

How to Tell Someone’s Age When All You Know Is Her Name

By Nate Silver and Allison McCann

RECOMMENDED

Voters Really Did Switch To Trump At The Last Minute

How The Golden Globes Changed The Oscars Race

How Much More Money Could ‘Rogue One’ Make?
Who will win the presidency?

Chance of winning

Hillary Clinton 73.8%
Donald Trump 26.1%
Google Algorithm – with News

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 Clari, 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 ...
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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

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

- How to recreate original phrase?

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