Lecture 9 - Basic Programming with R and Python

DSE 511

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Announcements

- Nothing unresolved from last time
- Homework is almost live!
- Questions?

Content

- The Course So Far
- History of R and Python
- Programming and Data Science

The Course So Far

Where We've Been

Module 1: Introduction

- Lecture 1 - Course Introduction
- Lecture 2 - Introduction to VMs
- Lecture 3 - CANCELED 🏈

Where We've Been

Module 2: Version Control

- Lecture 4 - Introduction to Version Control
- Lecture 5 - Basic git
- Lecture 6 - Working with Remotes
- Lecture 7 - Collaborating on GitHub
- Lecture 8 - When Things Go Wrong

Where We're Headed

Module 3: Basic Programming with R and Python

- Lecture 9 - Introduction to R and Python
- Lecture 10 - Basic Programming
- Lecture 11 - Data Structures (Part 1)
- Lecture 12 - Data Structures (Part 2)
- Lecture 13 - Application? (or possibly Data Structures Part 3)

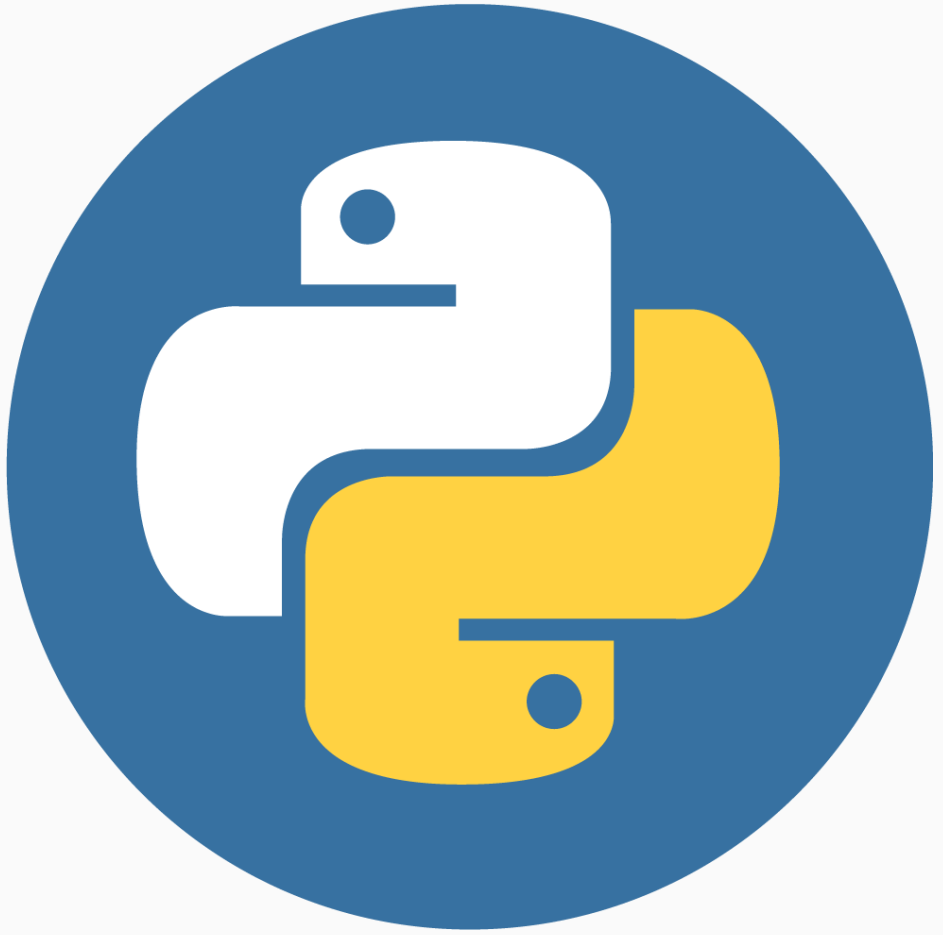
History of R and Python

What is R?

- *Lingua franca* for statistical computing
  - Good for data/stats
  - Can do general programming tasks (poorly)
- Part programming language, part data analysis package
- Dialect of S (May 5, 1976, Bell Labs)
- Notable names: Ross Ihaka, Robert Gentleman, **John Chambers**
- Free software (GPL >= 2)

Python

- General purpose programming language
  - Good for general purpose tasks
  - Can do data/stats tasks (poorly)
- Created late 80's / early 90's
- Notable names: Guido Van Rossum
- Reference to Monty Python's Flying Circus
- Python Software Foundation License



R vs Python

- Both are important to data science
  - Python: ML, *especially* neural networks
  - R: everything else
- Both have lots of career paths
- Learn **at least one of the two** a a high level

Calling Python from R

```
library(reticulate)
np = import('numpy')
np$random$seed(1234L)
np$random$rand()
```

```
[1] 0.1915195
```

```
np$zeros(c(3L, 2L))
```

```
     [,1] [,2]
[1,]    0    0
[2,]    0    0
[3,]    0    0
```

Calling R from Python

```
import rpy2.robjects as robjects
r = robjects.r

set_seed = r('set.seed')
set_seed(1234)
rnorm = r('rnorm')
rnorm(3)
```

```
[-1.207066, 0.277429, 1.084441]
```

```
from rpy2.robjects import pandas2ri
iris = pandas2ri.rpy2py(r('iris')
iris.head()
```

```
    Sepal.Length  Sepal.Width  Petal.Length  Petal.Width  Species
1            5.1          3.5           1.4          0.2        1
2            4.9          3.0           1.4          0.2        1
3            4.7          3.2           1.3          0.2        1
4            4.6          3.1           1.5          0.2        1
```

Programming and Data Science

Programming and Data Science

- We'll quickly lay out some basics
  - for loop
  - branching
  - etc
- We quickly want to get to "algorithms and data structures"

Why Do We Need This?

- Most of your problems *are not new problems*
- There are often **known** good and bad solutions
- You will ***never*** be in a weaker position for knowing these things

My Request to You

Ask yourself: how does this work?

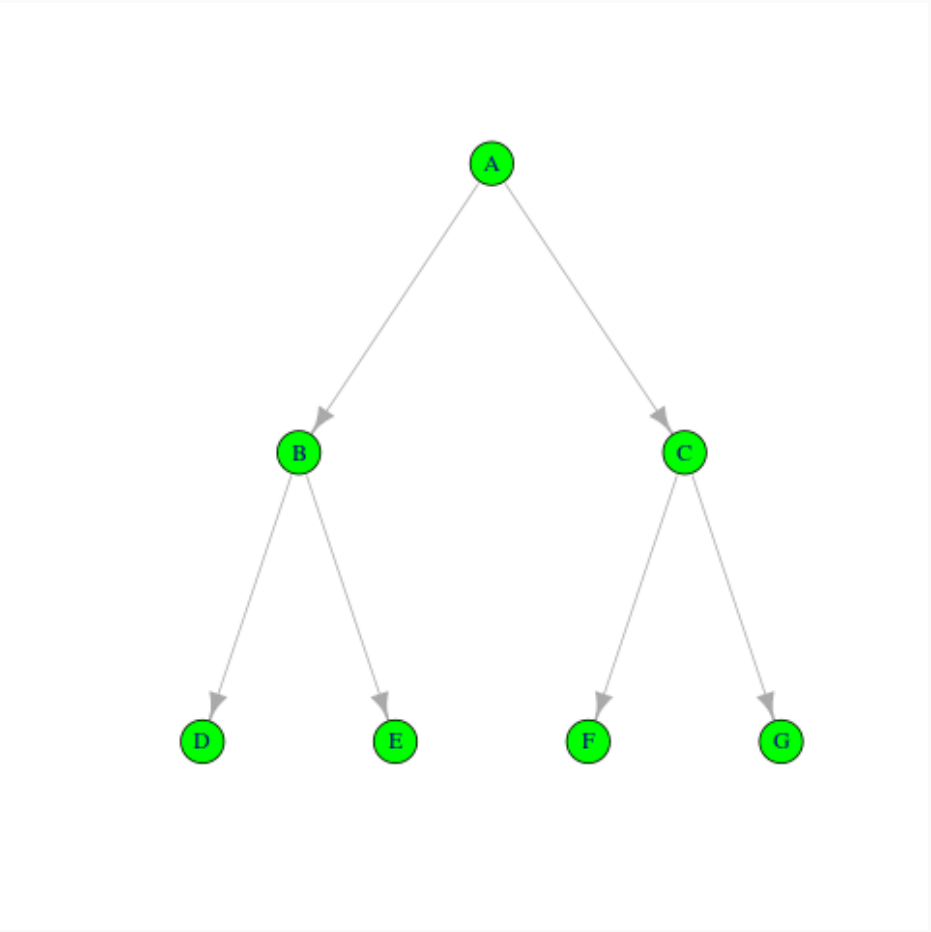
How would I implement it?

Thought Experiment

- I have two files
- How do I tell if they're "the same"?

Important Data Structures

- Arrays
- Lists
- Stacks and Queues
- Hash Tables
- Graphs and Trees



What We Will and Won't Do

What's the goal?

- Understand tradeoffs of solutions
- Learn "just enough" about how computers really work
- Learn some basic complexity ("Big O")

What's not the goal?

- Turn you into a computer scientist
- Make you into hardware experts
- Spend all day thinking about sorting algorithms
- Give you tons of algorithm puzzles

Questions?