
Welcome to Python Camp
Sign in on the clipboard by the door.
Photo credit: @hannahredner https://www.instagram.com/p/BsoSLf4nblN/

Introductions

Instructors:

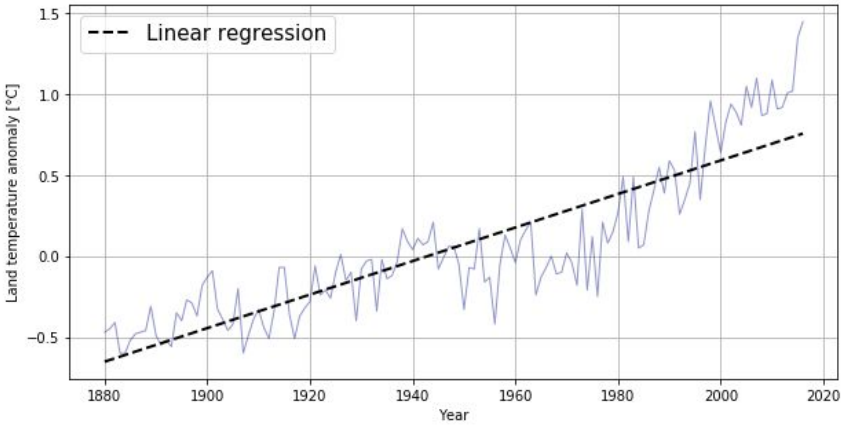
Megan Potterbusch and Laura Wrubel

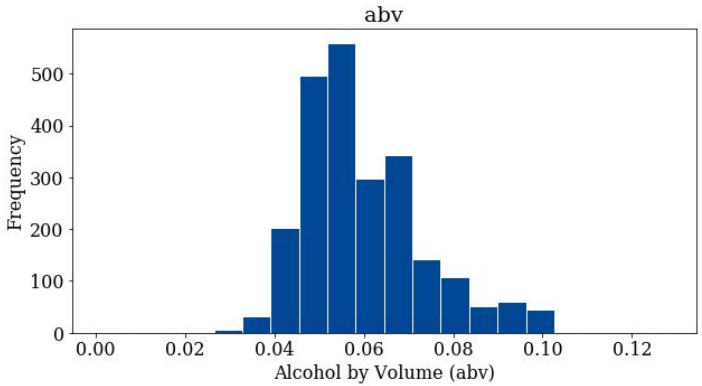
Helpers:

Leah Richardson, Dominique Pierce, Dolsy Smith, Nopi Suraminitkul

What will be learning?

- Fundamental data types (strings, integers, lists, tuples, dictionaries)
- Fundamental structures
  - loops
  - conditionals
  - functions
- NumPy library:
  - arrays for numeric scientific data
  - multidimensional arrays
  - linear regression
- Querying an API for data
- Basic wrangling of data and writing to a CSV
- Visualizing data using matplotlib





Python Camp Schedule

January 10

10:00-12 noon:

- Introductions
- Setting up
- Data types
- Working with strings

12:00-12:45: Lunch

1:00-4:00:

- String methods
- Lists

4:00-4:30 Study Hall

January 17

10:00-12 noon:

- Iterations with for loops
- Conditionals

12:00-12:45: Lunch

1:00-4:00:

- Strings and lists in action with text from a web page
- Dictionaries
- JSON format and APIs

4:00-4:30: Study Hall

January 24

10:00-12 noon:

- Functions
- NumPy arrays
- Multidimensional arrays

12:00-12:45: Lunch

1:00-4:00:

- Matplotlib
- Linear regression
- Pandas, histograms, bar charts

4:00-4:30: Wrap-up and Study Hall

Inclement Weather Plan

If campus has a delayed opening: we will still have Python Camp.

Camp will start at 10:00 AM or when campus opens, whichever is later.

If classes are cancelled: make-up day on Friday, January 31.

Code of Conduct

This course by design reflects the ethics of open-source software communities. This means that we value everyone's participation, we strive for transparency and inclusion, and we promote collaboration. We want every student to have a rewarding, fruitful learning experience. To achieve this, everyone is expected to show courtesy and respect towards each other. The following Code of Conduct (CoC) is agreed upon by those taking this course:

- All communication should be appropriate for a professional audience including people of many different backgrounds.
- We will not tolerate harassment in the course, in person or online. Harassment refers to offensive verbal or written comments in reference to gender, sexual orientation, age, disability, physical appearance, body size, race, or religion; sexual images in public spaces; deliberate intimidation, stalking, following, harassing photography or recording, sustained disruption of class meetings, inappropriate physical contact, and unwelcome sexual attention.
- Be kind to others. Do not insult or put down other participants.
- Behave professionally. Avoid jokes that could be interpreted as sexist, racist, or exclusionary. Remember that humor is a social act.

Requirements for Certificate of Completion

- Attend every day of the mini-course, 10AM-4:30PM. Be sure to sign in both in the morning **and** afternoon!
- Complete the required course homework exercises by **February 7,** getting at least 80% correct for each.
- Contribute to a positive learning environment through respectful and constructive behavior and language.

Required Homeworks:

- Homework #1 (Strings)
- Homework #2 (String methods)
- Homework #3 (Lists)
- Homework #4 (Iterations & conditionals)
- Homework #5 (Creating arrays, array operations)
- Homework #8 (Function concepts. Not a notebook--do in course site)
- Homework #9 (Good plots. Not a notebook--do in course site)

Must get at least 80% correct

Introductions

Pair up with another person you don’t already know. Introduce yourself and discuss:

- What would you like to get out of Python Camp?
- What is one thing you’d like to learn in this workshop? Write that thing down on a blue sticky note.

Lesson 1: Why Python?

python™

Python Camp Etherpad

https://go.gwu.edu/pythonpad

Setting up your course account

1. Go to: openedx.seas.gwu.edu
2. Click on Courses.
3. Click on “Get Data Off the Ground with Python”
4. Click the green Enroll Now button.
5. Use the same email address you used to register.

Let’s go!

Go to Jupyter Hub:

go.gwu.edu/jupyter

“Start My Server”

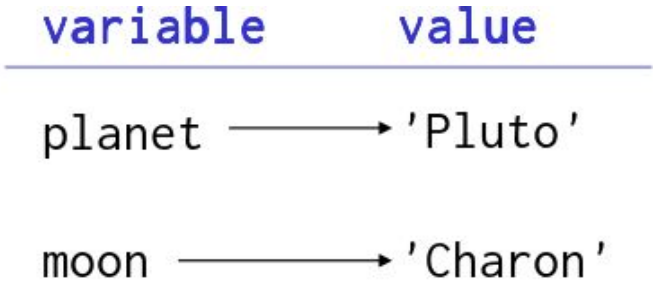
Lesson 1: Python Data Types

Lesson 1 exercise: Python as a calculator

1. The volume of a sphere with radius **r** is: $V = \frac{4}{3}\pi r^3$
   a. What is the volume of a sphere with **diameter** 6.65 cm?
   b. Use 3.14159 for pi
   c. Hint: 523.5983 is wrong and 615.9184 is also wrong

Lesson 1: Variables and Values

```
In[1]: planet = 'Pluto'
In[2]: print(planet)
Pluto
In[3]: moon = 'Charon'
In[4]: print(moon)
Charon
```



Nbviewer

Website for viewing human readable Jupyter Notebooks.

Lesson 1 example:
https://github.com/engineersCode/EngComp1_offtheground/blob/master/notebooks_en/1_Interacting_with_Python.ipynb

Lesson 2: Python strings and string methods

Lesson 2 exercises: slicing

1. Define a string with the value 'banana' and print out the first and last 'a'.

2. Using the same string, grab the 2 possible slices that correspond to the word 'ana' and print them out.

Homework submission process

1. Go to the course site and within the lessons on the left bar, find the link to the Homework Page, for example, “Graded HW 1”.
2. Download the notebook to your computer. Remember where that is, so you can find it again!
3. Go to Jupyter Hub and upload the notebook.
4. Work on the exercises, deleting the "your code here" lines and the raiseError line. Once done, save and restart the kernel as described in the notebook.
5. Download the notebook from Jupyter Hub using File > Download as > Notebook.
6. Go back to the homework page in the course site and upload the revised notebook. Make sure you're not uploading the blank one that you previously downloaded. You may have to delete the blank one you got originally.

Lesson 2 exercises: count() and index()

1. Use the count() method to count how many letters 'a' are in AE_quote.

2. Using the same method, how often does the word 'a' appear in `AE_quote`?

3. Use the index() method to find the position of the words 'genius', 'judge' and 'tree' in AE_quote.

4. Using slice syntax, extract the words in exercise 3 from AE_quote.

Lesson 2 exercises: List Slices

1. From the `integers` list, grab the slice [2, 3, 4] and then [4, 5].
2. Create your own list and design an exercise for grabbing slices. Work with a partner to solve each other's exercises.

Lesson 2 exercises: Modifying Lists

1. Add two different fruits to the `fruits`.
   a. Use `append()` method
2. Check if ‘mango’ is in your new `fruits` list.
3. Given the list below, try the following in new cells; discuss.

```
items = [1, 2, 3, '4', [5, 'six'], [7]]
   4 in items
   5 in items
   7 in items
   [7] in items
```

Lesson 2 exercises: Modifying Lists (cont.)

1. Replace the last element of `items` with something different

```
items = [1, 2, 3, '4', [5, 'six'], [7]]
```

Feedback on Day 1

Green sticky: What is something that is working well today?

Pink sticky: What is something we could improve for next Friday?

Study Hall options for Day 1

1. Watch the videos about strings in the course site.
2. Finish Homeworks #1 & #2: String methods
3. Finish Homework #3: Lists
4. Start on Homework #4: Iterations and conditionals (we cover conditionals later)
5. Complete interactive exercises in Lesson 2.
6. Get help on any concepts so far.
7. Do optional course readings listed in the course site.

Today's schedule

Did you sign in this morning?

10:00-12 noon:

- Refresher on string methods
- Iteration with "for" loops
- Conditionals
- Strings and lists in action with text from a web page

12:00-12:45: Lunch

1:00-4:00:

- Dictionaries
- JSON format and APIs
- Writing to a csv file

4:00-4:30: Study Hall

Lesson 2 refresher: string methods

Create a string variable called gdp, with the value “GDP:13.9trillion”

How could you slice this string to get just the 13.9 part?

Once you have that, turn it into a float.

Refresher on Day 1: strings, string methods, lists

1. Go to the notepad (https://go.gwu.edu/pythonpad) and scroll to the section for today, where you'll find text from a list of grant awards in the National Science Foundation BIGDATA program: https://go.gwu.edu/nsfdata. Assign it as a string to a variable called grant.

```
grant = "BIGDATA: Collaborative Research: F: Nomadic Algorithms for Machine Learning in the Cloud; Award Number:1546459; Principal Investigator:Manfred Warmuth; Co-Principal Investigator:; Organization:University of California-Santa Cruz;NSF Organization:IIS Start Date:01/01/2016; Award Amount:$596,326.00; Relevance:48.0;"
```

2. Split the string on the semicolon character, so you have a list. Assign that result to a new variable called grant_info. How many items are in the list `grant_info`?

3. Access the element in the list which holds the award amount and assign that to a new variable called amount. Remove the extra spaces from the front of the element. Create a variable called dollars and assign just the dollar amount to it (not the label "Award amount")

Lesson 2 exercises: For Loops 1

Say we have the following list:

```
all_sizes = ['xs', 's', 'm', 'l', 'xl']
```

Use the string method **.upper()**

Write a for statement to:

- Print sizes in uppercase.
- Bonus: Test to see if the size starts with an “x” and print the True or False result.

Remember! You can’t append to a list that doesn’t exist.

Lesson 2 exercises: For Loops 2

Say we have a list of lists (a.k.a., a nested list), as follows:

```
fullnames =
[['sam','jones'],['zoe','smith'],['joe','cheek'],['tom','perez']]
firstnames = [ ]
lastnames = [ ]
```

Write some code that creates two simple lists:

- One with the first names from the list,
- Another with the last names from the list, but capitalized.

Remember! You can’t append to a list that doesn’t exist.

Lesson 2 exercises: if, elif, else

1. Using `if, elif` and `else` statements write some code that does the following based on a 4-digit number you pick.
   a. If it is divisible by 2 and 3 you print: 'Your number is not only divisible by 2 and 3 but also by 6'.
   b. If it is divisible by 2 you print: 'Your number is divisible by 2'.
   c. If it is divisible by 3 you print: 'Your number is divisible by 3'.
   d. Any other option, you print: 'Your number is not divisible by 2, 3 or 6'
2. **Challenge:**
   a. Create a `for` statement containing the conditions above.
   b. Test your `for` statement on a **list** of several 4-digit numbers.

Lesson 3: Strings and Lists in Action

Lesson 3 exercises: Turning Text into Lists

1. Create a list named `course_with_cor` that contains all the courses with a corequisite, and print out the list.
2. Using a `for` statement and `if elif else` statements:
    a. Separate the courses that are offered in the *Fall semester*, those offered in the *Spring semester*, those offered in *both semesters*, and those that *don't specify a semester*.
    b. Create 4 lists: fall_and_spring, fall, spring and not_spec.

Tip: When looking for the courses that are taught both semesters, check on the original file to look for the correct syntax.

Exercise on World Cup API:

Which team was the winner of each match? *Hint:*

- Create an empty list named winners.
- Access the “winners” element in each match
- Add it to the winners list.

Bonus: How many games are high-scoring games (greater than 5 goals scored total)? What were the teams in that game? The result will be a list, where each item is a list containing the names of the two teams.

Writing to CSV

```
with open("attendance_counts.csv", "w", newline='') as csvfile:
    writer = csv.writer(csvfile)
    # each row should be list
    writer.writerow(["Date", "Venue", "Attendance"])
    for match in matches:
        row = [match["datetime"],
               match["venue"],
               match["attendance"]]
        writer.writerow(row)
```

Feedback on Day 2

Green sticky: What is something you learned today?

Pink sticky: What is something that still confuses you?

Other feedback also welcome!

Schedule for Friday

10:00-12 noon:

- Functions
- NumPy arrays
- Multidimensional arrays

12:00-12:45: Lunch

1:00-4:00:

- Matplotlib
- Linear regression
- Intro to pandas

4:00-4:30: Wrap-up and Study Hall

Did you sign in this morning and get sticky notes?

Exercises for Functions

1. Write a function called: **greeting**
    a. Takes 1 argument: **name**
    b. Returns a string with a personalized greeting
2. Write a function called: **rectangle_area**
    a. Takes 2 arguments: **height** and **width**
    b. Returns the area based on the height and width
    c. **Advanced:** Write another function that accepts a nested list of height and width pairs and returns the areas of these pairs in the form of a list.

Lesson 4: Play with NumPy Arrays

Lesson 4 exercises: creating arrays, operations

1. Create an array that starts with the element 4, ends in 80, and steps by 2 (i.e., 4 6 8 ...80). Assign the array to a variable named my_array, and print it.

2. You have the following arrays:

```
a = np.array([14, 20, 75, 90])
b = np.array([10, 32, 18, 120])
```

Create an array called total_array that is the result of adding together the two arrays.

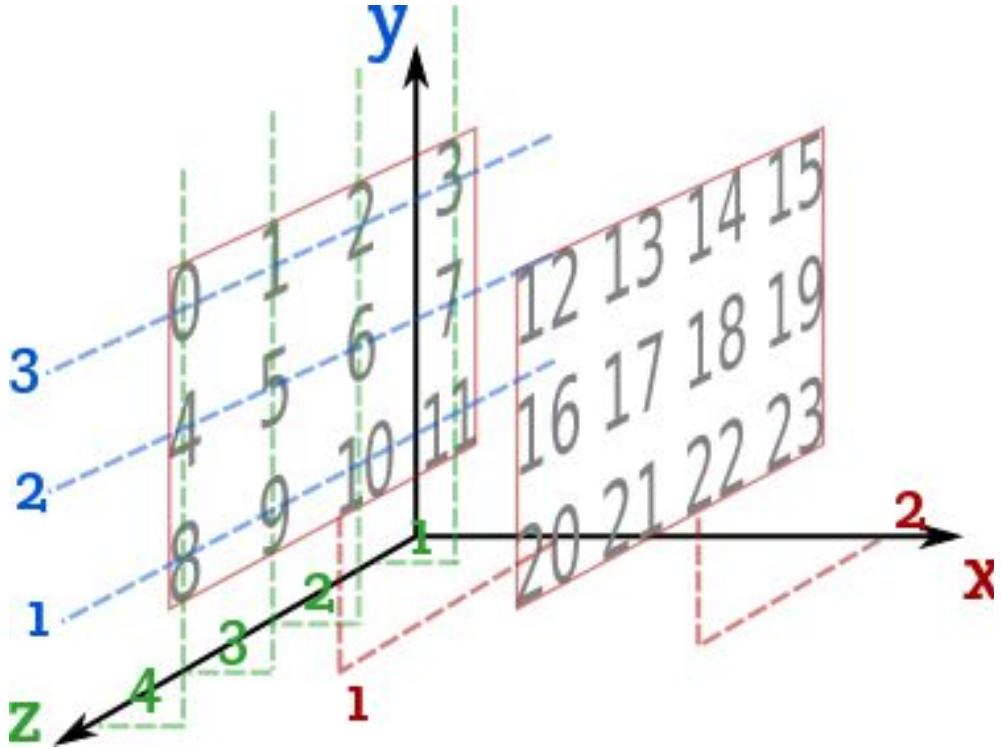
Lesson 4 exercises: array operations

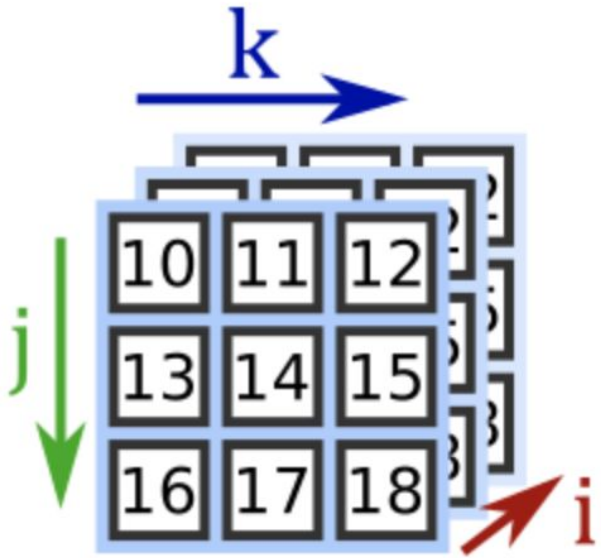
You have the following array named scores:

```
scores = np.array([99, 85, 90, 75, 88])
```

Come up with **two ways** to create a new array called new_scores that has all of the scores with 1 added to them. Print the result.

Lesson 4: multidimensional arrays





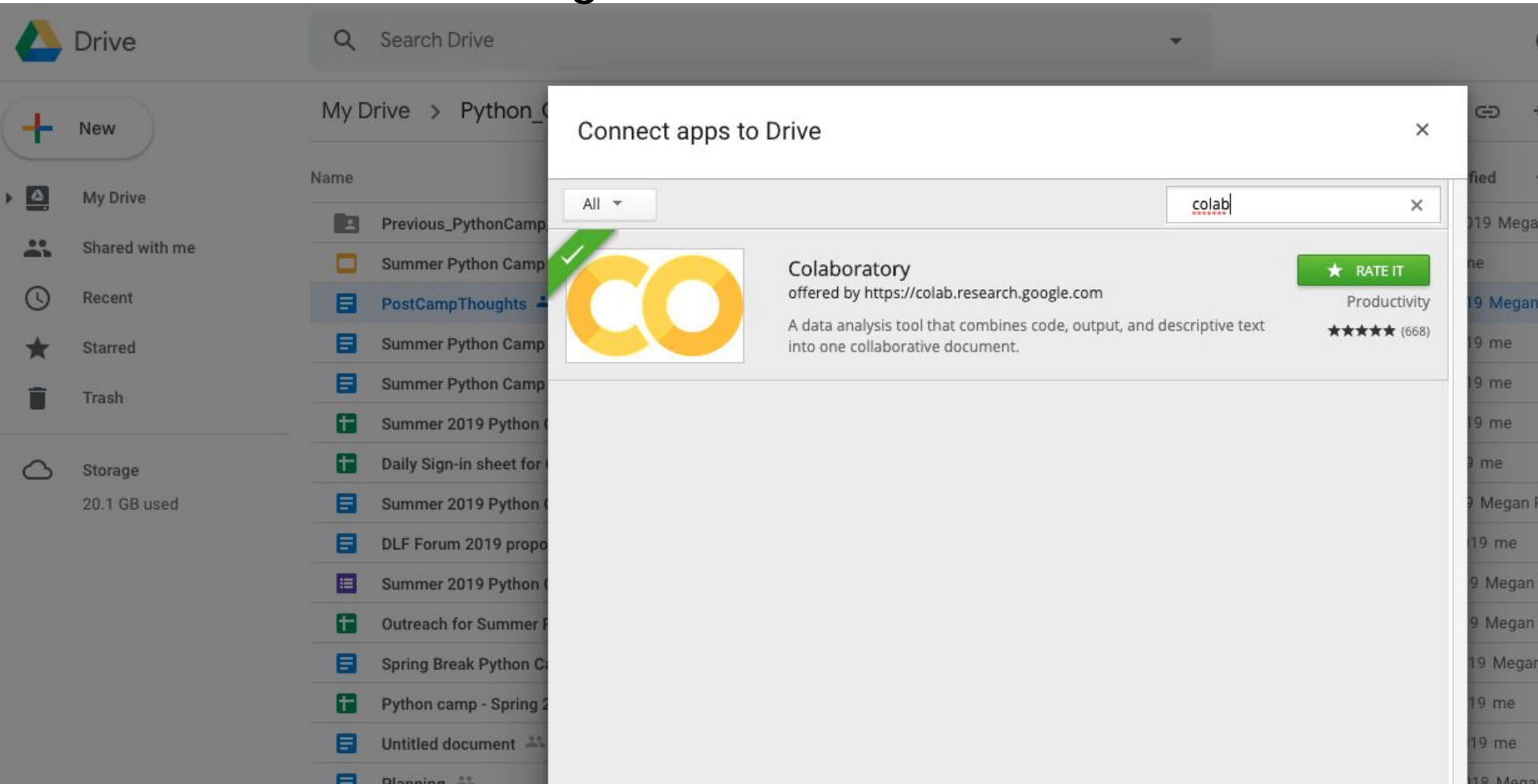
https://www.pythoninformer.com/python-libraries/numpy/index-and-slice/

What Next?

Download Anaconda with Python and Jupyter

https://www.anaconda.com/distribution/#download-section

Online notebooks: Google Colab



What Next?

- Training Videos: LinkedIn Learning (go.gwu.edu/linkedinlearning)
- Tutorials: Software Carpentry
  - Learn about version control, collaboration, automation
- Library Workshops

Bonus Study Hall:
Tuesdays and Thursdays at 6pm
in STEMworks (Gelman 201) on entrance floor

Coding Consultations:
https://academiccommons.gwu.edu/writing-research-help

Watch for post-camp Qualtrics survey from Ryan Watkins

Required Homeworks:

#1 Strings

#2 String methods

#3 Lists

#4 Iterations & conditionals

#5 Creating arrays, array operations

Note: use `import numpy` and `numpy.arange()`

Will be graded incorrect if you use `import numpy as np` and `np.arange()`

#8 Function concepts. (Not a notebook: do quiz in course site)

#9 Good plots. (Not a notebook: do quiz in course site)

Requirements for Certificate of Completion

- Attend each day of the mini-course, 10AM-4PM. Be sure to sign in both in the morning and afternoon!
- Complete the required course homework exercises by **February 7,** getting at least 80% correct for each.
- Contribute to a positive learning environment through respectful and constructive behavior and language.

Should receive certificate via email by February 28.

Feedback on Python Camp

Green sticky: What is something that worked well in Python Camp?

Pink sticky: What is something we could improve for next time?

Thank you,
Python_Camp_Cohort[3]!