

Upper School 2 - Coding To Graph a Calculator



Nasri Academy
Thurs. Oct. 3rd, 2019
By Julio B. Figueroa

Overview

- **Review**
- **Def my_function():**
- **File Organization**
- **Intro to Matplotlib**

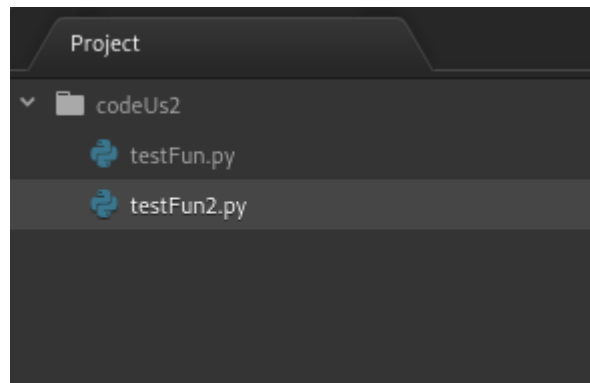
Review

```
testFun.py x testFun2.py
1  def average2(a,b):
2      average = (a + b)/2
3      return average
4
5  def average3(a, b, c):
6      average = (a + b + c)/3
7      return average
8
9  def average4(a, b, c, d):
10     average = (a + b + c + d)/4
11     return average
12
13     print(average2(10,5))
14     print(average3(15,10,5))
15     print(average4(20,15,10,5))
16
17     # now you can use functions within functions
18     # be careful with the dataTypes they accept
19     print(average2(2,average3(1,2,3)))
20
```



File Organization

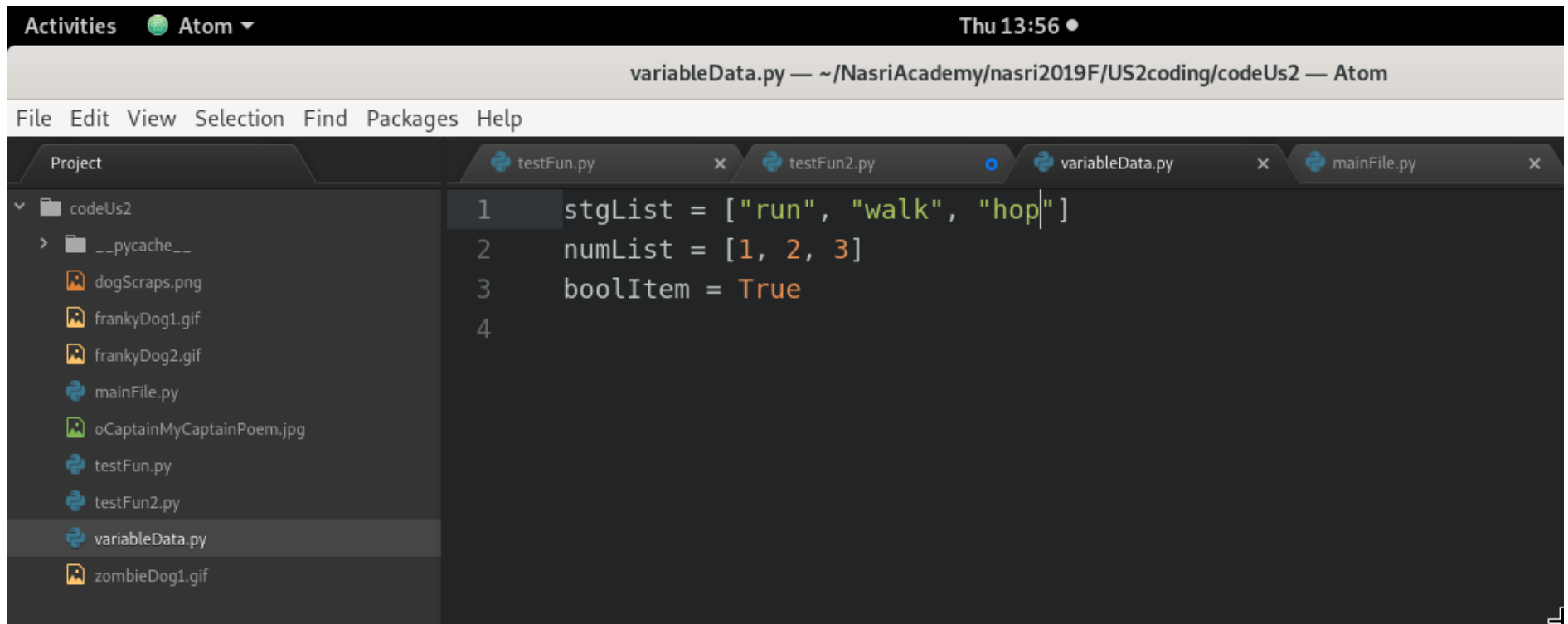
- How do you structure programs into separate files?
- How do you call a function from another file?
- For those using atom, use the browser view to drop your files into view like so.



- We're going to add a few more files to this folder

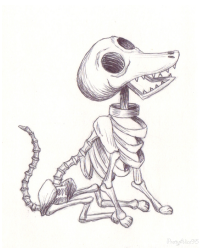


File Organization



The screenshot shows the Atom text editor interface. The top status bar indicates the current file is `variableData.py` located at `~/NasriAcademy/nasri2019F/US2coding/codeUs2`. The menu bar includes File, Edit, View, Selection, Find, Packages, and Help. The left sidebar displays the project structure for `codeUs2`, which includes a `__pycache__` directory, several image files (`dogScraps.png`, `frankyDog1.gif`, `frankyDog2.gif`, `oCaptainMyCaptainPoem.jpg`, `zombieDog1.gif`), and Python files (`mainFile.py`, `testFun.py`, `testFun2.py`, `variableData.py`). The `variableData.py` file is currently open and shows the following code:

```
1 stgList = ["run", "walk", "hop"]
2 numList = [1, 2, 3]
3 boolItem = True
4
```



File Organization

Activities Atom Thu 13:56

mainFile.py — ~/NasriAcademy/nasri2019F/US2coding/codeUs2 — Atom

File Edit View Selection Find Packages Help

Project

- codeUs2
 - __pycache__
 - dogScraps.png
 - frankyDog1.gif
 - frankyDog2.gif
 - mainFile.py
 - oCaptainMyCaptainPoem.jpg
 - testFun.py
 - testFun2.py
 - variableData.py
 - zombieDog1.gif

```
1 from variableData import stgList,numList
2 import random
3
4 print(random.choice(stgList))
5 print(random.choice(numList))
6
7 # try this
8 print(boolItem)
9 # what can you do to fix this?
10
```

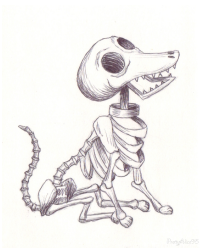


Classwork

Given the shorter 2 sides of a right triangle, create a function that gives you the length of the third side.

```
Welcome Guide x triangles02.py
1 # a solution to the right triangle problem
2 import math
3
4 def rightTriangle(a,b):
5     c = math.sqrt(a**2.0 + b**2)
6     return c
7
8 # Check it!
9 # Can solve a 3,4,5 triangle?
10 print(rightTriangle(3,4))
11
```

Can you modify your program to find the length of any triangle (not just right triangles)?



Classwork (cont.)



```
1  import math
2
3
4  # for this function, a and b should both be less than c
5  def anyTriangleHypo(a, b):
6      c = math.sqrt(a**2.0+b**2.0)
7      return c
8
9
10 # for this function, a should be less than c
11 def rightTriangleShort(a, c):
12     if a >= c:
13         return print("error 404, a is larger or equal to c")
14     else:
15         shortSide = math.sqrt(c**2.0 - a**2.0)
16         return shortSide
17
18
19 print(anyTriangleHypo(3, 4))
20 print(rightTriangleShort(6, 5))
21
22 # this function runs for a while
23 for i in range(5):
24     print(anyTriangleHypo(i, 4))
25
```


Introduction to Pip

Installing package is typically done using the pip command

It comes installed with modern python environments

To install or to check to see if it's updated

`python -m pip install -U pip`
`pip install --upgrade pip`

We will use pip to install numpy and matplotlib

```
Activities Terminator Thu 1
joule@sid: ~
joule@sid: ~ 95x45
joule@sid:~$ pip --version
pip 19.1.1 from /home/joule/anaconda3/lib/python3.7/site-packages/pip (python 3.7)
joule@sid:~$ python -m pip install
ERROR: You must give at least one requirement to install (see 'pip help install')
WARNING: You are using pip version 19.1.1, however version 19.2.3 is available.
You should consider upgrading via the 'pip install --upgrade pip' command.
joule@sid:~$ pip install --upgrade pip
Collecting pip
  Downloading https://files.pythonhosted.org/packages/30/db/9e38760b32e3e7f40cce46dd5fb107b8c73840df38f0046d8e6514e675a1/pip-19.2.3-py2.py3-none-any.whl (1.4MB)
    | 1.4MB 2.0MB/s
Installing collected packages: pip
  Found existing installation: pip 19.1.1
  Uninstalling pip-19.1.1:
    Successfully uninstalled pip-19.1.1
  Successfully installed pip-19.2.3
joule@sid:~$
```



Introduction to NumPy

```
joule@sid:~$ python -m pip install numpy  
Requirement already satisfied: numpy in ./anaconda3/lib/python3.7/site-packages (1.15.4)  
joule@sid:~$
```

Numpy is a matrix library and is often used to make linear algebra easier.

It is a powerful library with commonly used functions (along with advanced functions) that you use without having to make them from scratch.

<https://numpy.org/>

<https://numpy.org/devdocs/user/quickstart.html>

To invoke it within a program try

```
import numpy as np
```



Introduction to matplotlib

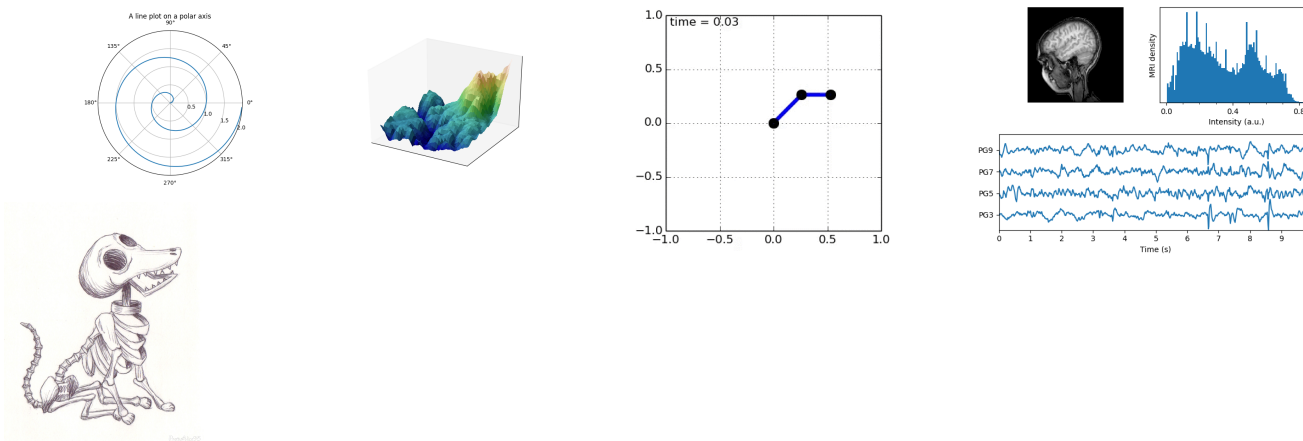
```
joule@sid:~$ python -m pip install matplotlib  
Requirement already satisfied: matplotlib in ./anaconda3/lib/python3.7/site-packages (3.0.2)
```

<https://matplotlib.org/users/installing.html>

Python -m pip install -U pip
Python -m pip install -U matplotlib



Matplotlib is a library for rendering all sorts of plots and graphs. You can use it for your science project or for when you're writing reports! You can even use it to analysis images and to analysis robotic arm trajectories.



Classroom Example

