Introduction to Jupyter Notebook and Python 3.x

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Introduction

The aim of this lab is to become more familiar with Jupyter Notebook and to use programming tools of Python with variables, arrays, complex numbers and plots.

Procedure

The goal of the first part of the lab is to become familiar with the features of Jupyter Notebook, by reading through an introductory tutorial on Dataquest. The first thing I learned from that tutorial is the difference between a cell and a markdown cell, as a code cell contains code to be executed in the kernel and displays its output below, while a markdown cell contains text formatted using Markdown and displays its output in-place when it is run. Secondly, I learned a lot of keyboard shortcuts as they save much time when coding. In addition, I learned how to rename a file, by shutting down the notebook first. Moreover, I learned that it is very important to save and checkpoint the notebook. The checkpoint is used recover the unsaved work in the event of an unexpected issue. Lastly, I learned that it is important to clear all output and restart the kernel before sharing my notebook.

After going through the tutorial, the next step for me was to practice some useful operations using Python. Firstly, I learned how to define a variable as shown below:

```
In [1]: t = 1
        print(t)
        print("t =",t)
        print('t =',t,"seconds")
        print('t is now =',t/3,'\n...and can be rounded using `round()`',round(t/3,4))
```

So, I also learned 4 ways to use print() statements and the round() statement to round a number to the desired significant figure.

Moreover, I learned that (**) is used to square numbers as shown below:

```
In [2]: print(3**2)

9
```

After that I learned that I need to use the sign in order to write a comment when using Python as shown below:

```
In [3]: # This is a comment, and the following statement is not executed:
        # print(t+5)
```

Also, I learned that it is important to import the numpy package as it is used for most of the labs as shown below:

```
In [4]: import numpy
```

In addition, I learned 3 different ways to define a list of numbers, and 3 different ways to use the numpy.array() statement. These different ways are very important to define matrices as shown below:

```
In [5]: list1 = [0,1,2,3]
        print('list1:',list1)
        list2 = [[0],[1],[2],[3]]
        print('list2:',list2)
        list3 = [[0,1],[2,3]]
        print('list3:',list3)
        array1 = numpy.array([0,1,2,3])
        print('array1:',array1)
        array2 = numpy.array([[0],[1],[2],[3]])
        print('array2:',array2)
        array3 = numpy.array([[0,1],[2,3]])
        print('array3:',array3)
list1: [0, 1, 2, 3]
list2: [[0], [1], [2], [3]]
list3: [[0, 1], [2, 3]]
array1: [0 1 2 3]
array2: [[0]
 [1]
 [2]
 [3]]
array3: [[0 1]
 [2 3]]
```

Also, I learned that I can use statements like np.arange() and np.linspace() to create larger arrays as shown below:

```
In [1]: import numpy as np

        print(np.arange(4),'\n',
              np.arange(0,2,0.5),'\n',
              np.linspace(0,1.5,4))

[0 1 2 3]
 [0.  0.5 1.  1.5]
 [0.  0.5 1.  1.5]
```

Another important thing that I learned this lab is that indexes start at 0 in Python so list1[0] indicates the first number in list1. Also : is used to access an entire row as shown below:

```
In [10]: print(array2[:,2],
               array2[0,:])

[3 8] [1 2 3 4 5]
```

After that, I learned how to express a matrix as an array of 1's and 0's using the numpy.zeros() and numpy.ones() functions as shown below:

```
In [2]: print('1x3:',np.zeros(3))
        print('2x2:',np.zeros((2,2)))
        print('2x3:',np.ones((2,3)))

1x3: [0. 0. 0.]
2x2: [[0. 0.]
 [0. 0.]]
2x3: [[1. 1. 1.]
 [1. 1. 1.]]
```

Lastly, I learned how to plot 3 graphs using Python. The main goal of this is to learn how to define variables, adjust step sizes using np.arange() function, adjust the figure size using figsize() function, plotting subplots using plt.subplot()

function, write a title for the plot using plt.title() function, label the axes using the plt.xlabel() and plt.ylabel() functions, show grid using plt.grid() function and showing the graph using plt.show(). The resulting figures I got from the functions I learned during this lab is shown below:
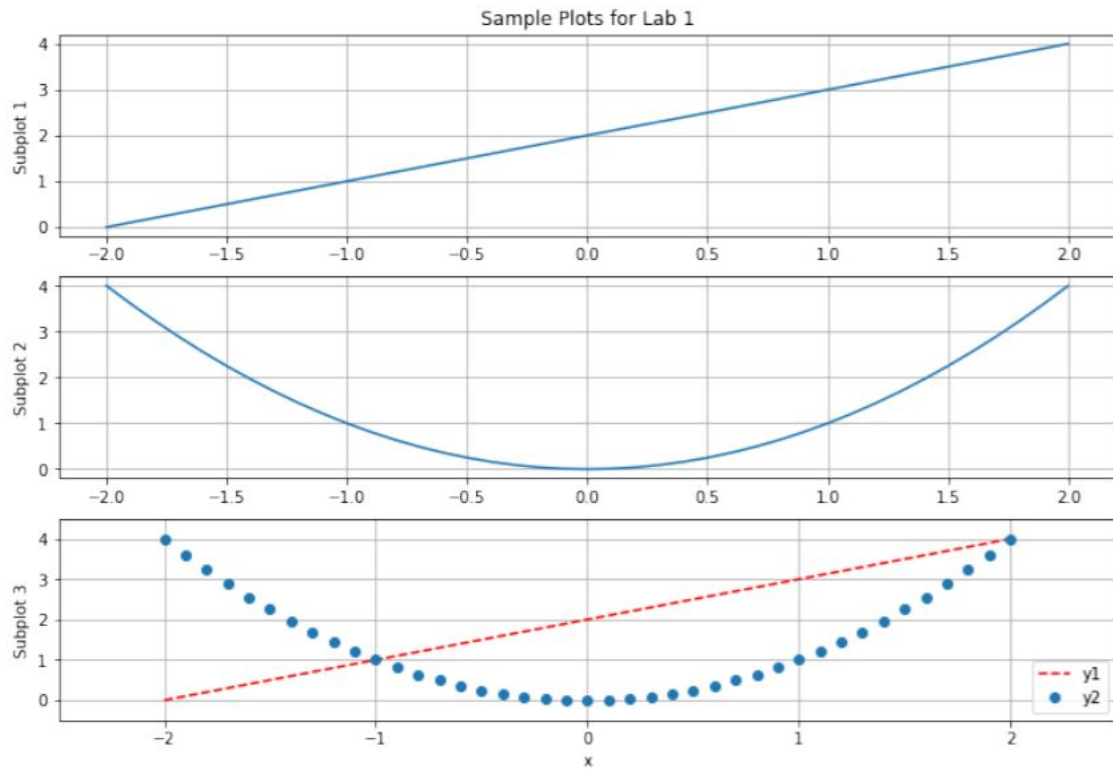
Questions

1. For which course are you most excited in your degree? Which course have you enjoyed the most so far?

I am really excited for taking the microelectronics class because it's the closest course to what I want to be doing after I graduate. However, I've been enjoying the energy and systems class so far the most because my professor makes the class exciting and energetic.

2. Leave any feedback on the clarity of the purpose, deliverables, and tasks for this lab.

I think that this lab is clear and that it doesn't need any adjustments.

Conclusion

All in all, I found this lab really helpful because it made me more familiar with using Jupyter, and it helped me learn and practice a lot of functions and commands in Python that I'll be using throughout the semester.