Math 156

TA: Bumsu Kim

UCLA

Today…

- Installing Python and Jupyter Notebook

- Jupyter Notebook Tutorial

UCLA

Introduction

- TA: Bumsu Kim (grad student in applied math)
- email: bumsu@ucla.edu

- Slides(if any) and supplementary materials will be uploaded on Canvas

- Office Hours – please complete the survey in the email sent yesterday

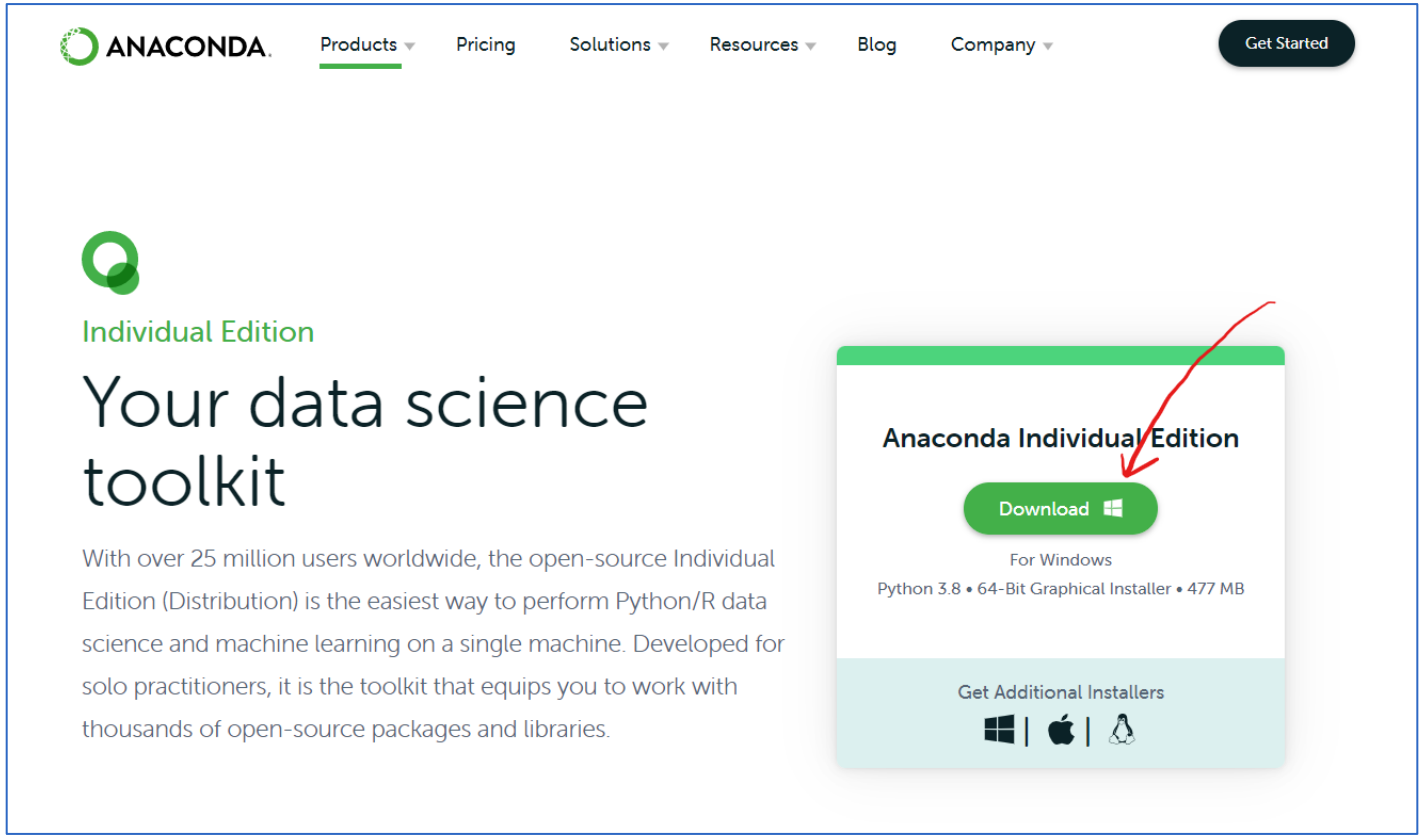
- OH Location: Virtually on ZOOM meeting room
  - link will be shared on Canvas when the time is set

UCLA

Anaconda Installation

- We will use Anaconda for installing Python and Jupyter Notebook

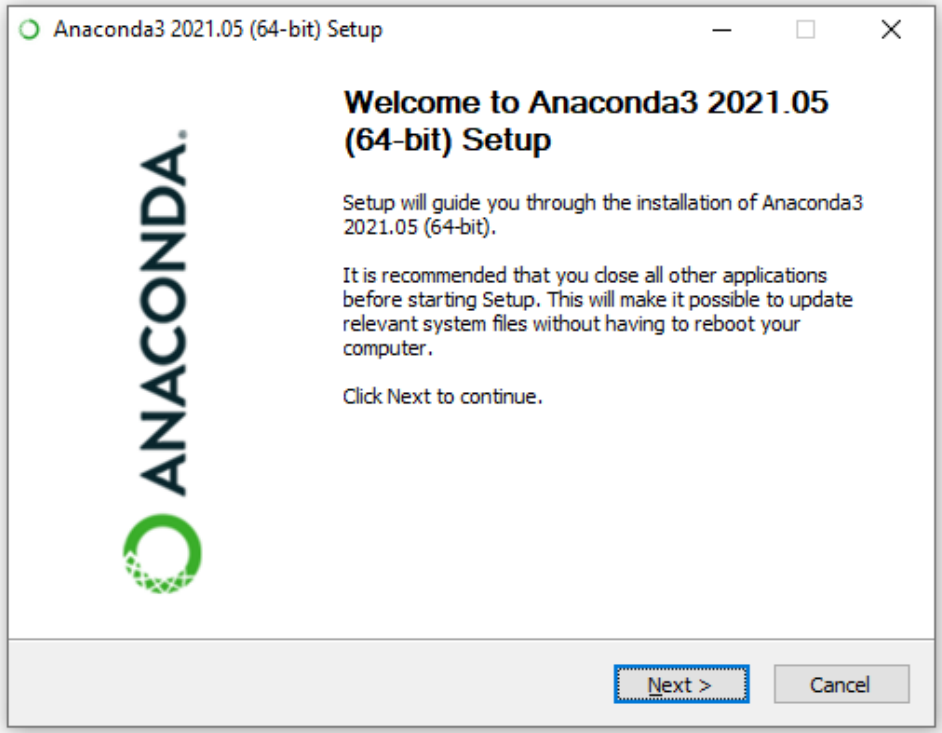
- Google “Anaconda” or go to: https://www.anaconda.com/products/individual



UCLA

Anaconda Installation

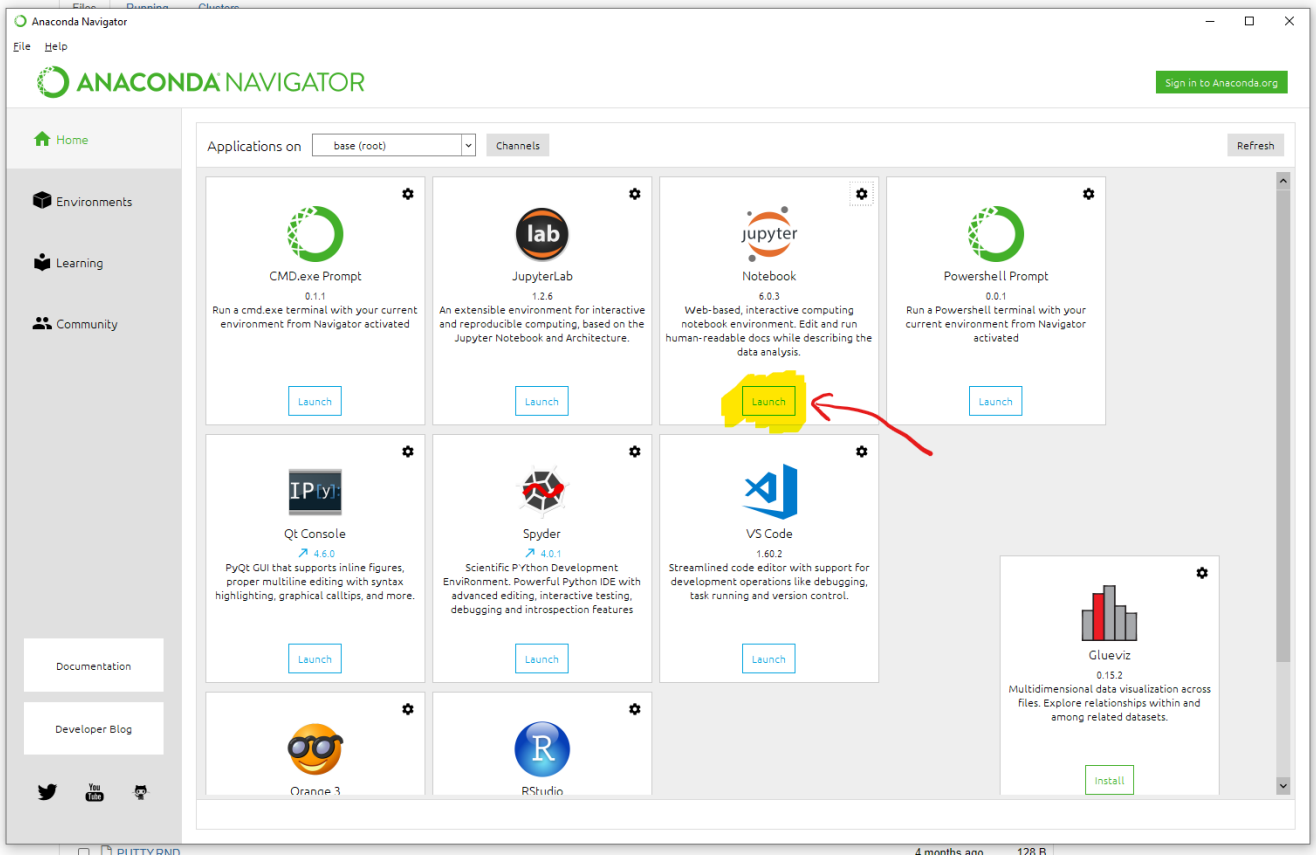
- And run the Setup file, click Next, Next, Next, …
- Don’t include a white space (‘ ’) in the installation path



UCLA

Anaconda Installation

- You’re done!
- Anaconda installs Python and Jupyter Notebook at once



UCLA

Jupyter Notebook Tutorial

- Simplest Program

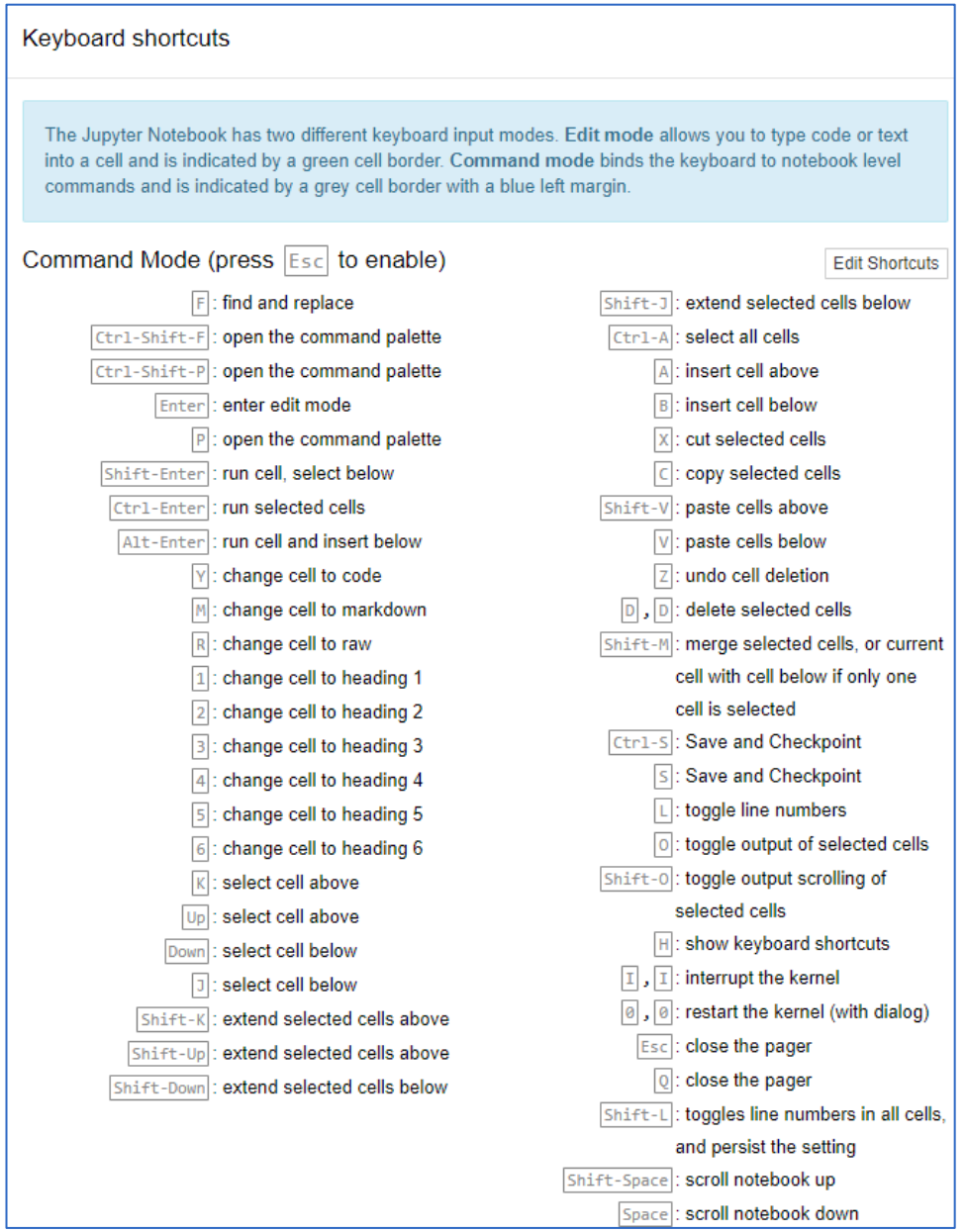
```
In [1]: print("Hello, World!")
        Hello, World!
```

  - Type Python commands and [Run this cell]
  - Shortcut: [Ctrl]+[Enter], different for Mac computers
  - See [Help]-[Keyboard Shortcuts]

- Simple Program

```
In [2]: x = 1
        y = 2
        z = 3

In [3]: print(f"x = {x}, y = {y}, z = {z}")
        x = 1, y = 2, z = 3
```



UCLA

Jupyter Notebook Tutorial

- NumPy is a super useful library adding support for arrays, matrices, and mathematical functions

In [10]:

```
import numpy as np

x = [1, 2, 3, 4]
print(f"x = {x}\n Data type of x = {type(x)}\n")
y = np.array(x)
print(f"y = {y}\n Data type of y = {type(y)}\n")

print(f"Sum of the elements in y = {np.sum(y)}")
print(f"Product of the elements in y = {np.prod(y)}")
print(f"Mean of the elements in y = {np.mean(y)}")
```

```
x = [1, 2, 3, 4]
 Data type of x = <class 'list'>

y = [1 2 3 4]
 Data type of y = <class 'numpy.ndarray'>

Sum of the elements in y = 10
Product of the elements in y = 24
Mean of the elements in y = 2.5
```

UCLA

Jupyter Notebook Tutorial

- NumPy is a super useful library adding support for arrays, matrices, and mathematical functions

- You will later use other cool libraries too!
  - PyTorch, TensorFlow, etc.

In [10]:
```
import numpy as np

x = [1, 2, 3, 4]
print(f"x = {x}\n Data type of x = {type(x)}\n")
y = np.array(x)
print(f"y = {y}\n Data type of y = {type(y)}\n")

print(f"Sum of the elements in y = {np.sum(y)}")
print(f"Product of the elements in y = {np.prod(y)}")
print(f"Mean of the elements in y = {np.mean(y)}")
```

```
x = [1, 2, 3, 4]
 Data type of x = <class 'list'>

y = [1 2 3 4]
 Data type of y = <class 'numpy.ndarray'>

Sum of the elements in y = 10
Product of the elements in y = 24
Mean of the elements in y = 2.5
```

UCLA

More Advanced Example

- A simple Convolutional Neural Network for training MNIST dataset →

- Accuracy is usually >99% on images like

```
class Net(nn.Module):
    def __init__(self):
        super(Net,self).__init__()
        self.conv1 = nn.Conv2d(in_channels=1, out_channels=6,
                               kernel_size=5 , stride=1)
        self.relu = nn.ReLU()
        self.pool = nn.MaxPool2d(kernel_size=2)
        self.conv2 = nn.Conv2d(in_channels=6, out_channels=16,
                               kernel_size=5, stride=1)
        self.conv3 = nn.Conv2d(in_channels=16, out_channels=120,
                               kernel_size=4, stride=1)
        self.fc_1 = nn.Linear(in_features=120,out_features=84)
        self.fc_2 = nn.Linear(in_features=84, out_features=10)

    def forward(self,u):
        u = self.conv1(u)  # apply first convolutional layer
        u = self.relu(u)   # apply ReLU activation
        u = self.pool(u)   # apply max-pooling
        u = self.conv2(u)  # apply second convolutional layer
        u = self.relu(u)   # Apply ReLU activation
        u = self.pool(u)
        u = self.conv3(u)  # Apply third and final convolutional layer
        u = torch.flatten(u, 1)
        u = self.fc_1(u)
        u = self.relu(u)
        u = self.fc_2(u)
        u = self.relu(u)
        y = F.log_softmax(u, dim=1)
        return y
```

UCLA