Tutorial 0: Environment Setup & Python Basics

What will be covered:

1. Environment Setup Instructions
2. IPython Tutorial
3. Python Basics

Preparation:

- Download & unzip *Tutorial0_python*

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1. Environment Setup (Local Machine)

Python: Install python3 version, specifically Python 3.5 / 3.7. Python 2 will no longer be supported at the end of 2019.

Installing Anaconda: If you decide to work locally, we recommend using the free Anaconda Python distribution, which provides an easy way for you to handle package dependencies. Please be sure to download the Python 3 version, which currently installs Python 3.7.

Anaconda Virtual environment: Once you have Anaconda installed, it makes sense to create a virtual environment for the course. If you choose not to use a virtual environment, it is up to you to make sure that all dependencies for the code are installed globally on your machine. To set up a virtual environment, run (in a terminal)

```
conda create -n py-env python=3.7 anaconda
```

to create an environment called `py-env`.

Then, to activate and enter the environment, run

```
source activate py-env
```

To exit, you can simply close the window, or run

```
source deactivate py-env
```

Note that every time you want to work on the assignment, you should run `source activate py-env` (change to the name of your virtual env).

You may refer to this page for more detailed instructions on managing virtual environments with Anaconda.

To install basic python dependencies,

```
conda install --yes --file requirements.txt
```

Python virtualenv: (Ignore this if you have installed with anaconda) Alternatively, you may use python virtualenv for the project. To set up a virtual environment, run the following:

```
cd pythonTutorial

sudo pip install virtualenv      # This may already be installed

virtualenv -p python3 .env       # Create a virtual environment (python3)

# Note: you can also use "virtualenv py-env" to use your default python (please note we support 3.6)

source py-env/bin/activate       # Activate the virtual environment

pip install -r requirements.txt  # Install dependencies

# Work on the assignment for a while …

deactivate                       # Exit the virtual environment
```

2. IPython Tutorial

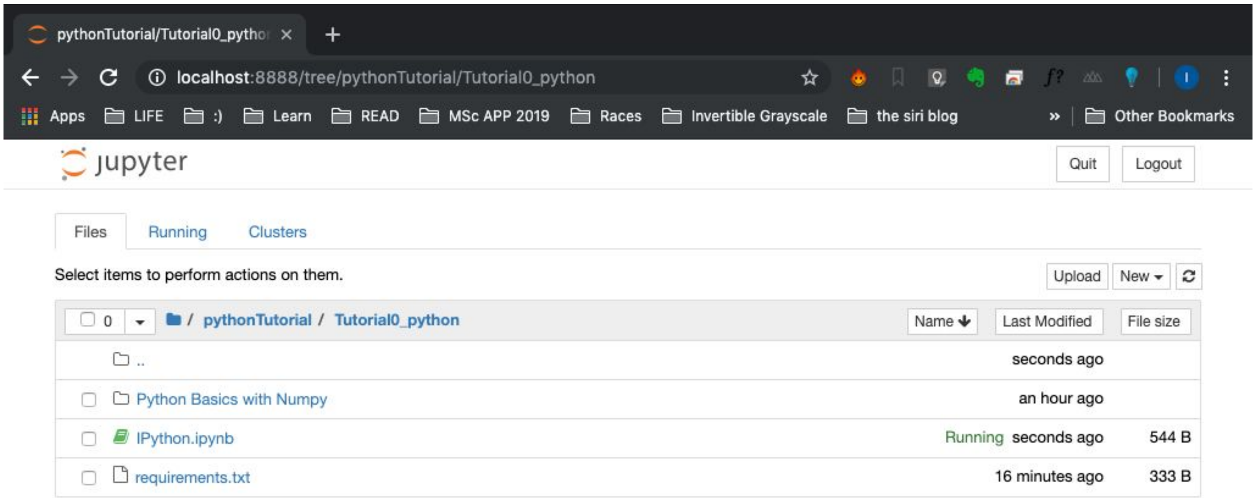
In this class, we will use IPython notebooks (more recently known as Jupyter notebooks) for the programming assignments. An IPython notebook lets you write and execute Python code in your web browser. IPython notebooks make it very easy to tinker with code and execute it in bits and pieces; for this reason IPython notebooks are widely used in scientific computing.

(Note: if your virtual environment installed correctly (as per the assignment handouts), then you shouldn't have to install from the install instructions on the website. Just remember to run source py-env/bin/activate in your assignment folder.)

Once you have it installed, start it with this command:

```
jupyter notebook
```

Once your notebook server is running, point your web browser at http://localhost:8888 to start using your notebooks. If everything worked correctly, you should see a screen like this, showing all available IPython notebooks in the current directory:

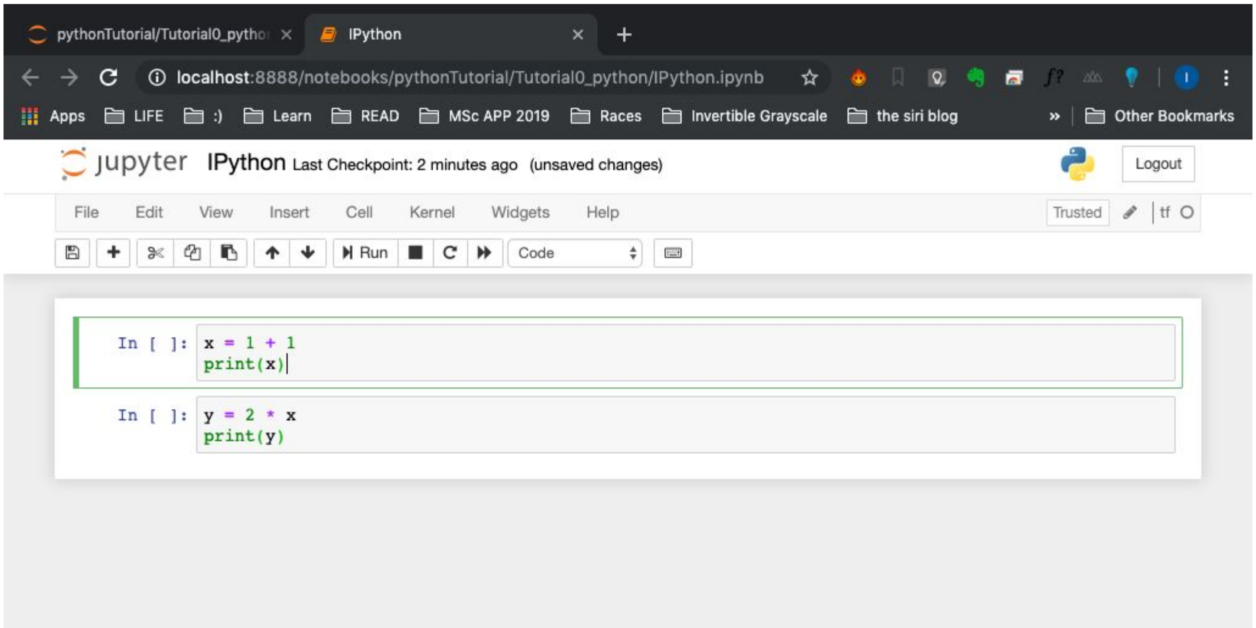


Select items to perform actions on them.

/ pythonTutorial / Tutorial0_python

	Name		Last Modified	File size
	..		seconds ago	
□	Python Basics with Numpy		an hour ago	
□	IPython.ipynb	Running	seconds ago	544 B
□	requirements.txt		16 minutes ago	333 B

If you click through to a notebook file, you will see a screen like this:

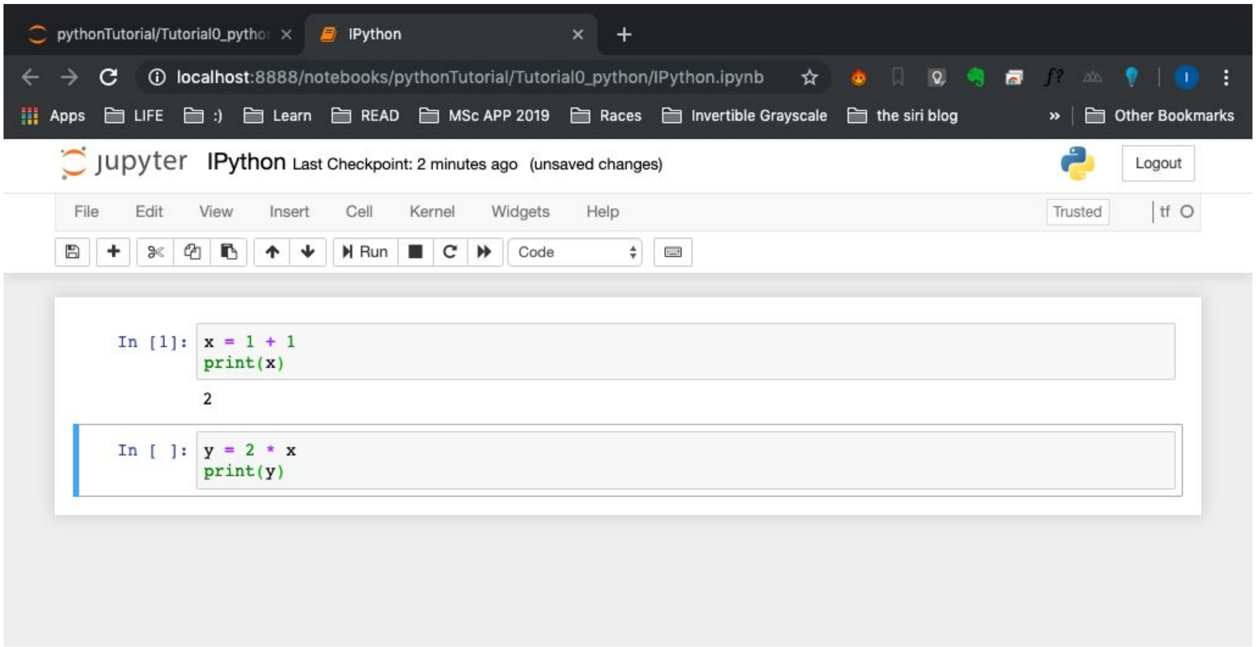


IPython Last Checkpoint: 2 minutes ago (unsaved changes)

```
In [ ]: x = 1 + 1
        print(x)

In [ ]: y = 2 * x
        print(y)
```

An IPython notebook is made up of a number of **cells**. Each cell can contain Python code. You can execute a cell by clicking on it and pressing Shift-Enter. When you do so, the code in the cell will run, and the output of the cell will be displayed beneath the cell. For example, after running the first cell the notebook looks like this: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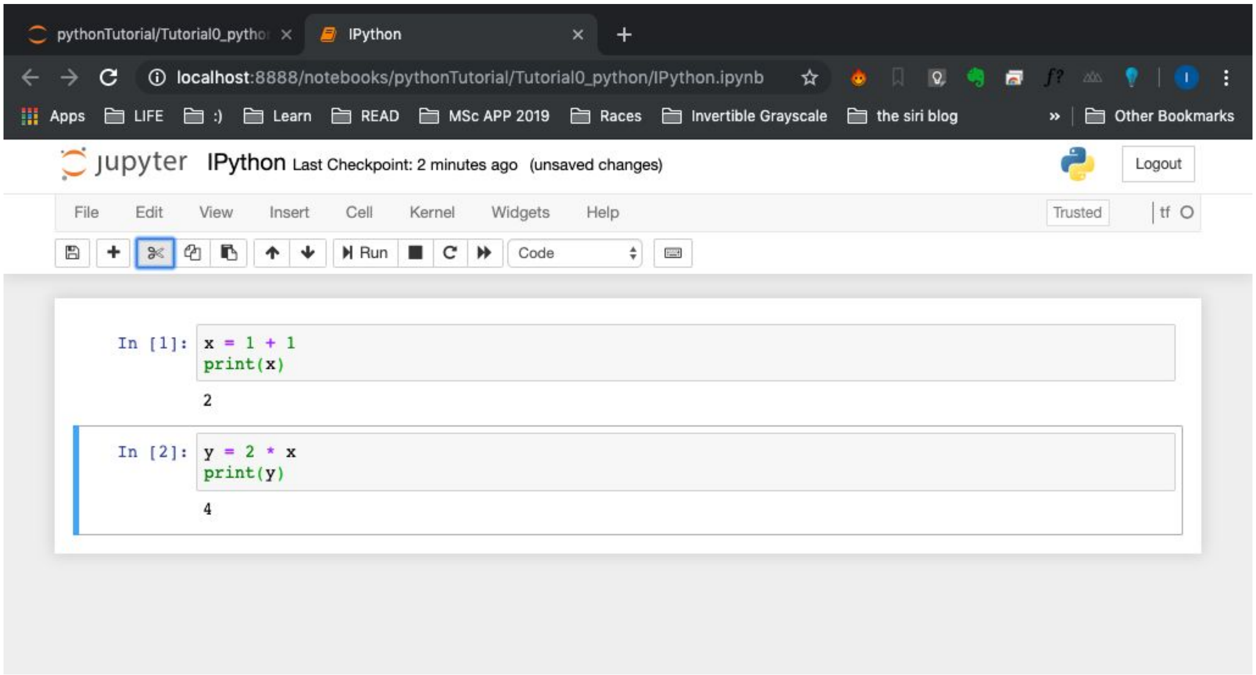
Logout
File Edit View Insert Cell Kernel Widgets Help
Trusted
tf
Run
Code

```
In [1]: x = 1 + 1
        print(x)

        2

In [ ]: y = 2 * x
        print(y)
```

Global variables are shared between cells. Executing the second cell thus gives the following result: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Logout
File Edit View Insert Cell Kernel Widgets Help
Trusted
tf
Run
Code

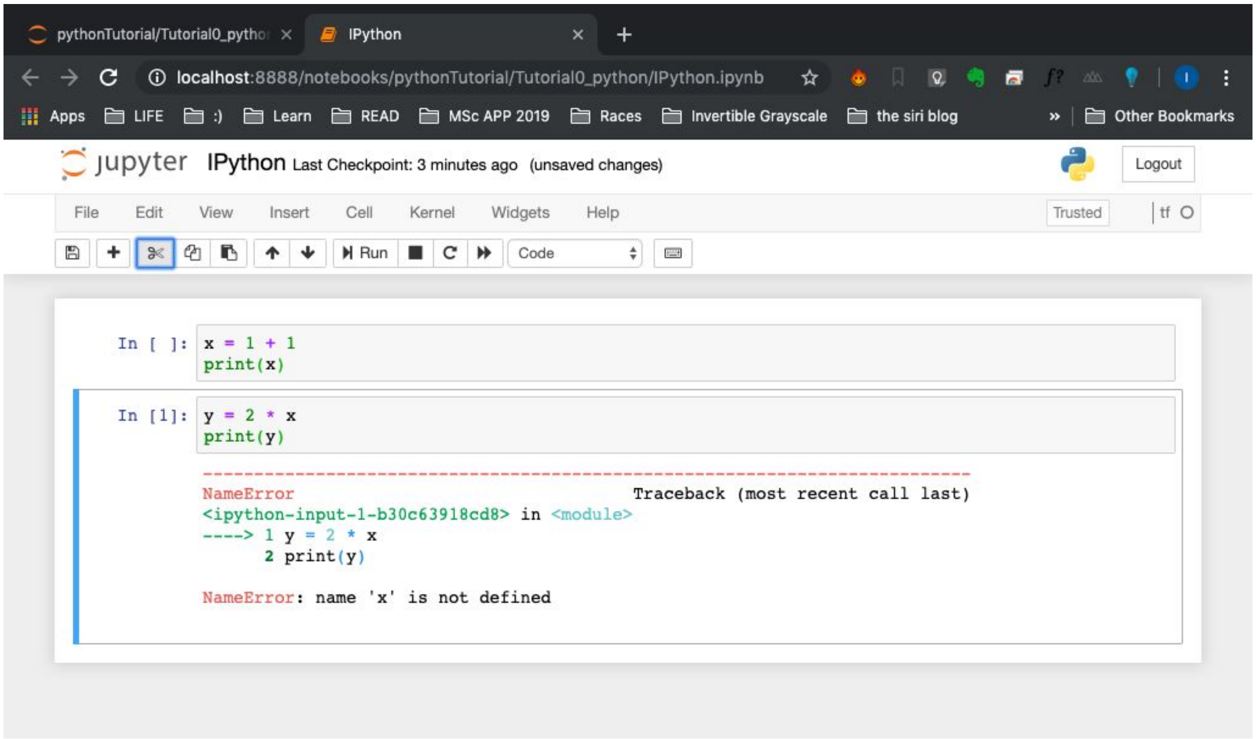
```
In [1]: x = 1 + 1
        print(x)

        2

In [2]: y = 2 * x
        print(y)

        4
```

By convention, IPython notebooks are expected to be run from top to bottom. Failing to execute some cells or executing cells out of order can result in errors: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Logout
File Edit View Insert Cell Kernel Widgets Help
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tf
Run
Code

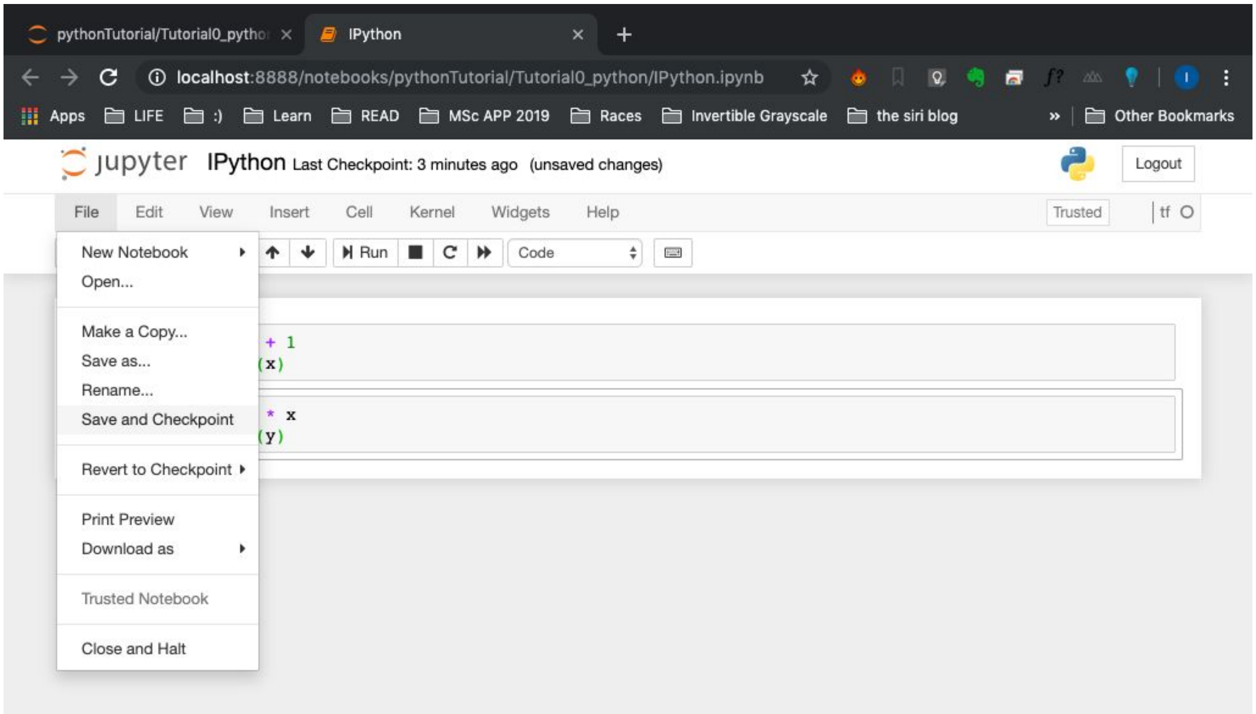
```
In [ ]: x = 1 + 1
        print(x)

In [1]: y = 2 * x
        print(y)

        ---------------------------------------------------------------------------
        NameError                                 Traceback (most recent call last)
        <ipython-input-1-b30c63918cd8> in <module>
        ----> 1 y = 2 * x
              2 print(y)

        NameError: name 'x' is not defined
```

After you have modified an IPython notebook for one of the assignments by modifying or executing some of its cells, remember to **save your changes!**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Run
Code
New Notebook
Open...
Make a Copy...
Save as...
Rename...
Save and Checkpoint
Revert to Checkpoint
Print Preview
Download as
Trusted Notebook
Close and Halt
+ 1
(x)
* x
(y)

This has only been a brief introduction to IPython notebooks, but it should be enough to get you up and running on the assignments for this course.

3. **Python Basics**

Open the notebook *Python Basics With Numpy.ipynb*