

STSCI 4060

Lecture File 7

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Introduction to Anaconda, Spyder, Ipython Notebook (Jupyter Notebook), numpy, scipy, matplotlib, etc.

--Something more complicated

Python IDEs

There are at least dozens of Python IDEs. IDLE (for 100% pure Python) is the one we have used in the class for a while.

- IDLE
- [Spyder \(from Anaconda\)](#)
- [Canopy \(from Enthought\)](#)
- Eclips (PyDev)
- Komodo
- ...

Download and Install Anaconda



Windows



macOS



Linux

Anaconda 2018.12 for Windows Installer

Python 3.7 version

[Download](#)

64-Bit Graphical Installer (614.3 MB)

32-Bit Graphical Installer (509.7 MB)

Python 2.7 version

[Download](#)

64-Bit Graphical Installer (560.6 MB)

32-Bit Graphical Installer (458.6 MB)

Download and Install Anaconda



Windows



macOS



Linux

Anaconda 2018.12 for macOS Installer

Python 3.7 version

[Download](#)

64-Bit Graphical Installer (652.7 MB)

64-Bit Command Line Installer (557 MB)

Python 2.7 version

[Download](#)

64-Bit Graphical Installer (640.7 MB)

64-Bit Command Line Installer (547 MB)

Anaconda Navigator

Anaconda Navigator interface showing applications on the orange3 channel.

Applications on: orange3 | **Channels:**

- orange3** 3.11.0
Component based data mining framework. Data visualization and data analysis for novice and expert. Interactive workflows with a large toolbox.
[Launch](#)
- glueviz** 0.12.4
Multidimensional data visualization across files. Explore relationships within and among related datasets.
[Install](#)
- jupyterlab** 0.31.12
[Install](#)
- jupyter notebook** 5.4.1
Web-based, interactive computing notebook environment. Edit and run human-readable docs while describing the data analysis.
[Install](#)
- qtconsole** 4.3.1
PyQt GUI that supports inline figures, proper multiline editing with syntax highlighting, graphical calltips, and more.
[Install](#)
- rstudio** 1.1.423
A set of integrated tools designed to help you be more productive with R. Includes R essentials and notebooks.
[Install](#)
- spyder** 3.2.8
Scientific PYthon Development EnviRonment. Powerful Python IDE with advanced editing, interactive testing, debugging and introspection features
[Install](#)

Spyder (Scientific PYthon Development EnviRonment)

The screenshot shows the Spyder IDE interface. The main window is the Editor, displaying a Python script named 'Scatter-3D-1.py'. The code creates a 3D scatter plot using numpy and matplotlib. The IPython console below shows the Python environment and help documentation.

```
1 """
2 This program create a 3D scatter plot. We will utilize
3 numpy and matplotlib in this program.
4 """
5
6 import numpy as np
7 from mpl_toolkits.mplot3d import Axes3D
8 import matplotlib.pyplot as plt
9
10 def randrange(n, vmin, vmax):
11     return (vmax-vmin)*np.random.rand(n) + vmin
12
13 fig = plt.figure()
14 ax = fig.add_subplot(111, projection='3d') #1X1 grid, first subplot
15 n = 100
16 for c, m, zl, zh in [('r', 'o', -50, -25), ('b', '^', -30, -5)]:
17     xs = randrange(n, 23, 32)
18     ys = randrange(n, 0, 100)
19     zs = randrange(n, zl, zh)
20     ax.scatter(xs, ys, zs, c=c, marker=m)
21
22 ax.set_xlabel('X Direction')
23 ax.set_ylabel('Y Direction')
```

IPython console

```
In [1]:
```

Python 2.7.12 |Anaconda 4.2.0 (64-bit)| (default, Jun 29 2016, 11:07:13) [MSC v.1500 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.

IPython 5.1.0 -- An enhanced Interactive Python.
? -> Introduction and overview of IPython's features.
%quickref -> Quick reference.
help -> Python's own help system.
object? -> Details about 'object', use 'object??' for extra details.

Permissions: RW End-of-lines: CRLF Encoding: ASCII Line: 2 Column: 55 Memory: 57 %

IⁿPython (Jupyter) Notebook

IⁿPython is an enhanced, powerful interactive Python shell.
The **IⁿPython Notebook** is an interactive computational environment, in which you can combine coding, code execution, rich text, mathematics, plots and rich media, etc.

Notebook documents (or notebooks) are files which record all computations carried out and the results obtained in a literate way, including inputs, outputs, together with descriptive text and mathematics.

They are plain text files, which are thus easy to share with colleagues and place under version control.

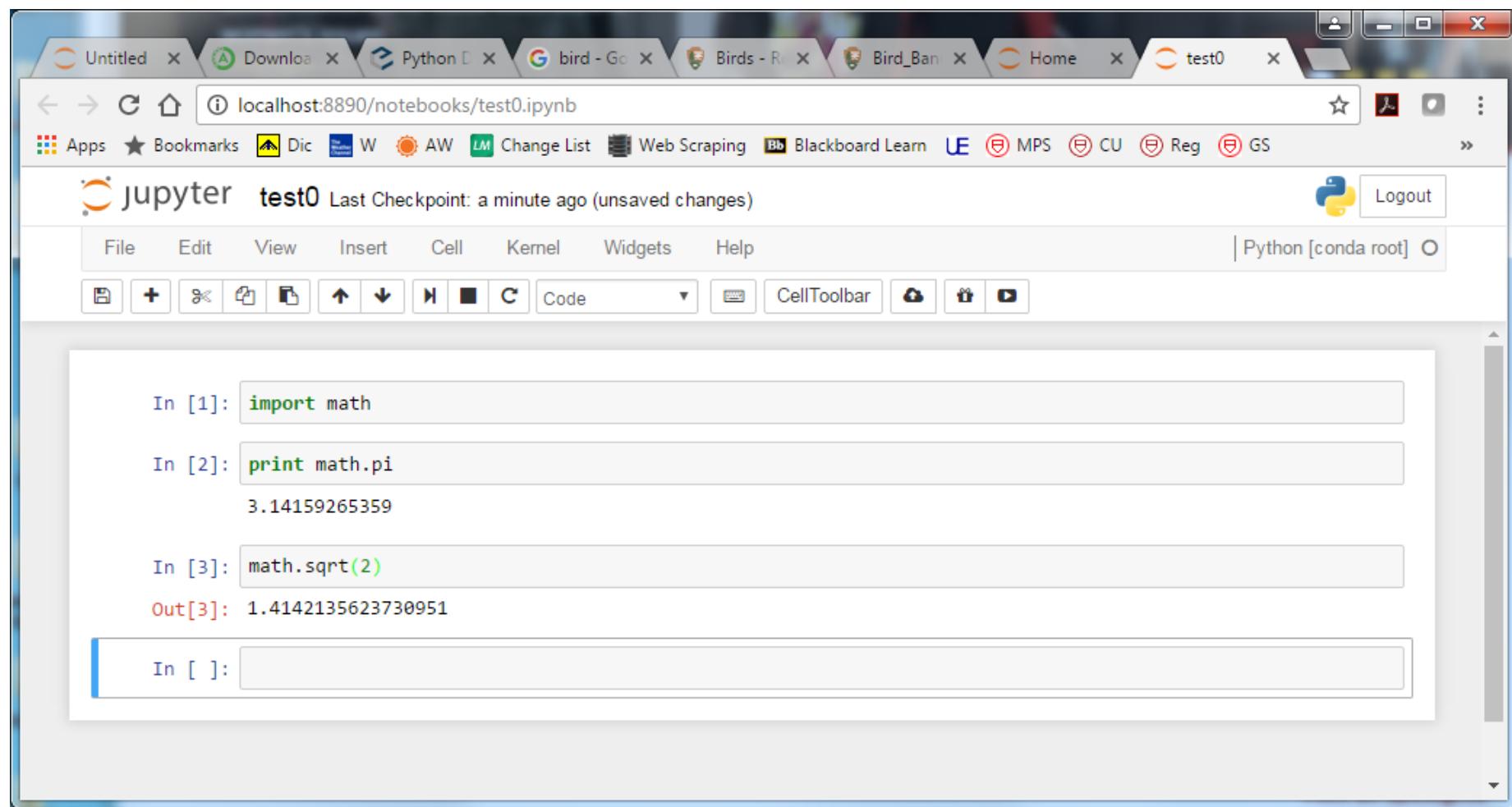
We will use the **Jupyter Notebook** (which comes with Anaconda), a web application.

Jupyter Notebook

The Jupyter Notebook App is a server-client application that allows editing and running notebook documents via a web browser. The Jupyter Notebook App can be executed on a local desktop requiring no internet access (e.g., through 127.0.0.1:8888 or 8890).

For Python, it uses the IPython kernel (a "computational engine") that executes the code contained in a Notebook document. When a Notebook document is opened, the associated kernel is automatically launched. When the notebook is executed (either cell-by-cell or with menu Cell -> Run All), the IPython kernel performs the computation and outputs the results.

Jupyter Notebook Web Interface



Two Modes of the Jupyter Notebook

The notebook has two modes of operation:

- **Edit Mode:** In this mode, a single cell comes into focus and we can enter text, execute code, and perform tasks related to that single cell. The Edit mode is activated by clicking on a cell or pressing the **Enter** key.
- **Command Mode:** In this mode, we perform tasks related to the whole notebook structure, such as moving, copying, cutting, and pasting cells. The Command mode is activated by clicking anywhere on the notebook outside any cell, or by pressing the **Esc** key.

Useful Shortcuts for Editing Cells

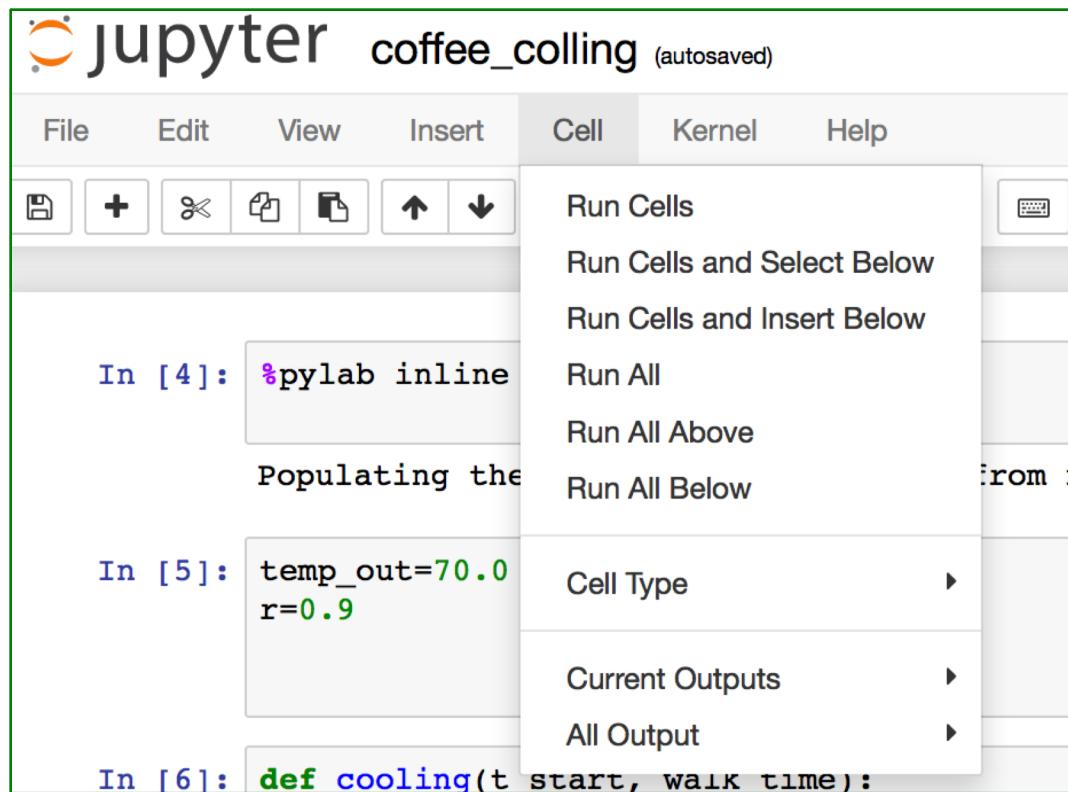
Shortcut	Action
<i>Enter</i>	Activates the Edit mode
<i>Esc</i>	Activates the Command mode
<i>H</i>	Displays the list of keyboard shortcuts
<i>S</i> or <i>Ctrl + S</i>	Saves the notebook
<i>A</i>	Inserts a cell above
<i>B</i>	Inserts a cell below
<i>D</i> (press twice)	Deletes the cell
<i>Z</i>	Undoes the last delete
<i>Ctrl + K</i>	Moves the cell up
<i>Ctrl + J</i>	Moves the cell down
<i>X</i>	Cuts the content of the cell
<i>C</i>	Copies the content of the cell
<i>V</i>	Pastes the content of the cell below the current cell
<i>Shift + V</i>	Pastes the content of the cell above the current cell

Cell Types

Cell type	Command mode shortcuts	Use
Code	Y	To edit and write new Python code to the IPython interpreter.
Markdown	M	To write an explanatory text.
Heading 1 to 6	Keys 1 to 6	To structure the document (Headings).
Raw NBConvert	R	The content of this cell remains unmodified when the notebook is converted to a different format.

Three Ways to Run a Cell

- Press **shift + enter** (In Windows OS)
- Click the **Play (or Run)** button
- Use the **Cell** dropdown menu



IPython Magic Commands

Commands that start with % and %% are called magic commands and are used to set up configuration options and special features. There are two types of magics:

- **Line-oriented:** This type of magics start with a single percent (%) sign
- **Cell-oriented:** This type of magics start with double percent (%%) signs

To list all magics that are available, run the following command in a cell: **%lsmagic**

Most Commonly Used Magics

Magic	Function
%cd	Changes the directory
%pwd	Prints the current directory
%ls	Lists the current directory contents
%mkdir	Creates a new directory
%rmdir	Removes a directory
%echo	Prints/displays a string
%alias	Creates an alias
%run	Runs a Python file

Display Images

Images can be loaded either from the local filesystem, the Internet, or a graph you create. To display the image called `circle_rainbow.jpg` in local filesystem, run the following command in a cell:

```
from IPython.display import Image  
Image("C:/Users/xy44/bor55.png")
```

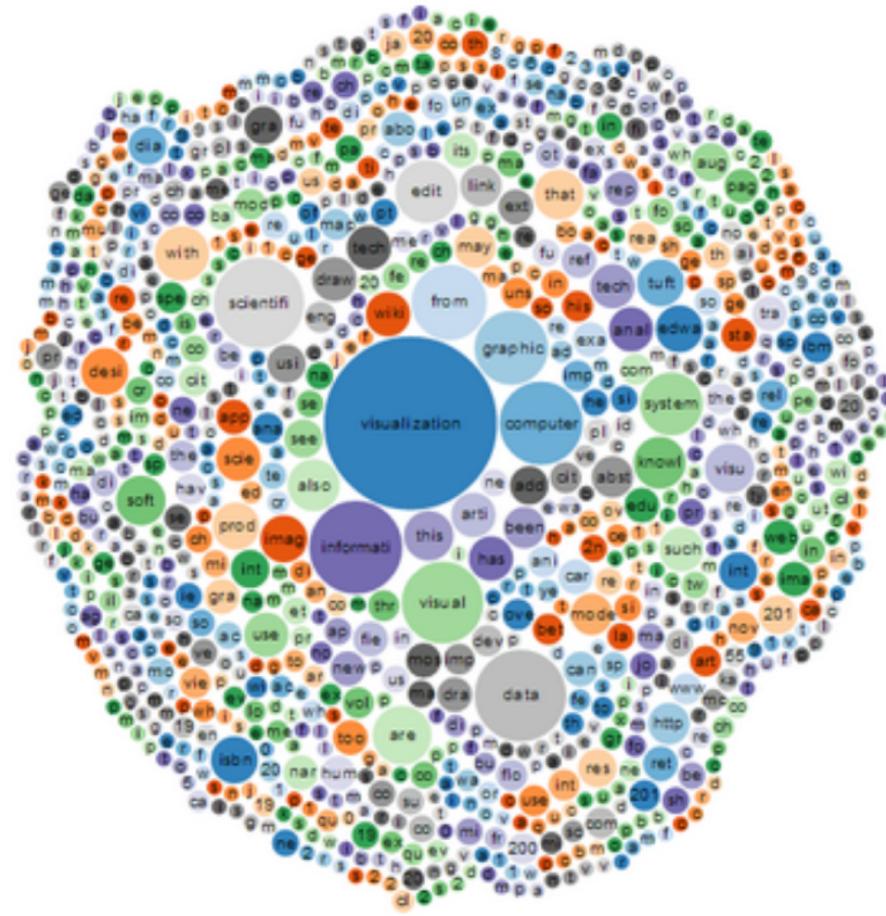
To load an image from the Web, simply give its URL as an argument:

```
from IPython.display import Image  
Image('https://www.nps.gov/romo/learn/nature/images/Bir  
d_Banner_MountainBluebird_688x340.jpg')
```

Display an Image From Local Filesystem

```
In [2]: 1 from IPython.display import Image  
2 Image("/Users/xy44/bor55.png")
```

Out[2]:



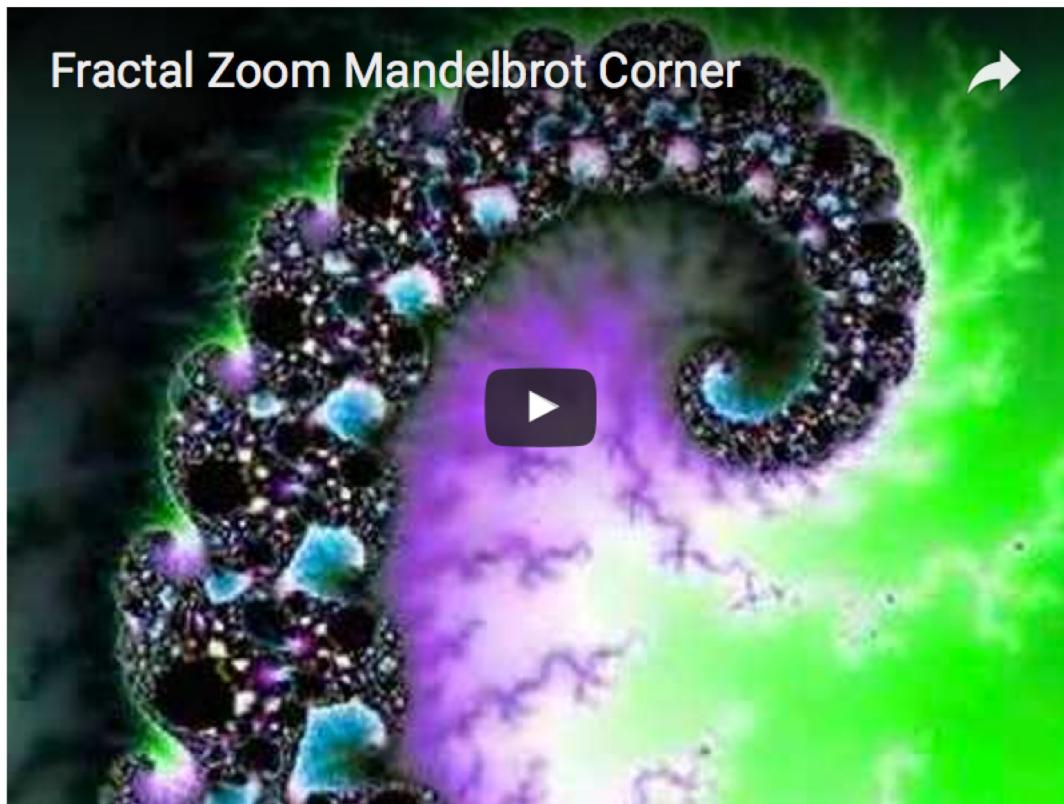
Display an Image From a Website

```
from IPython.display import Image  
Image('https://www.nps.gov/romo/learn/nature/images/Bird_Banner_MountainBluebird_688x340.jpg')
```



Display YouTube Videos

```
from IPython.display import YouTubeVideo  
YouTubeVideo("G_GBwuYuOOs")
```



Display YouTube Videos

```
In [1]: from IPython.display import YouTubeVideo  
YouTubeVideo("HW29067qVwk")
```

Out[1]:

