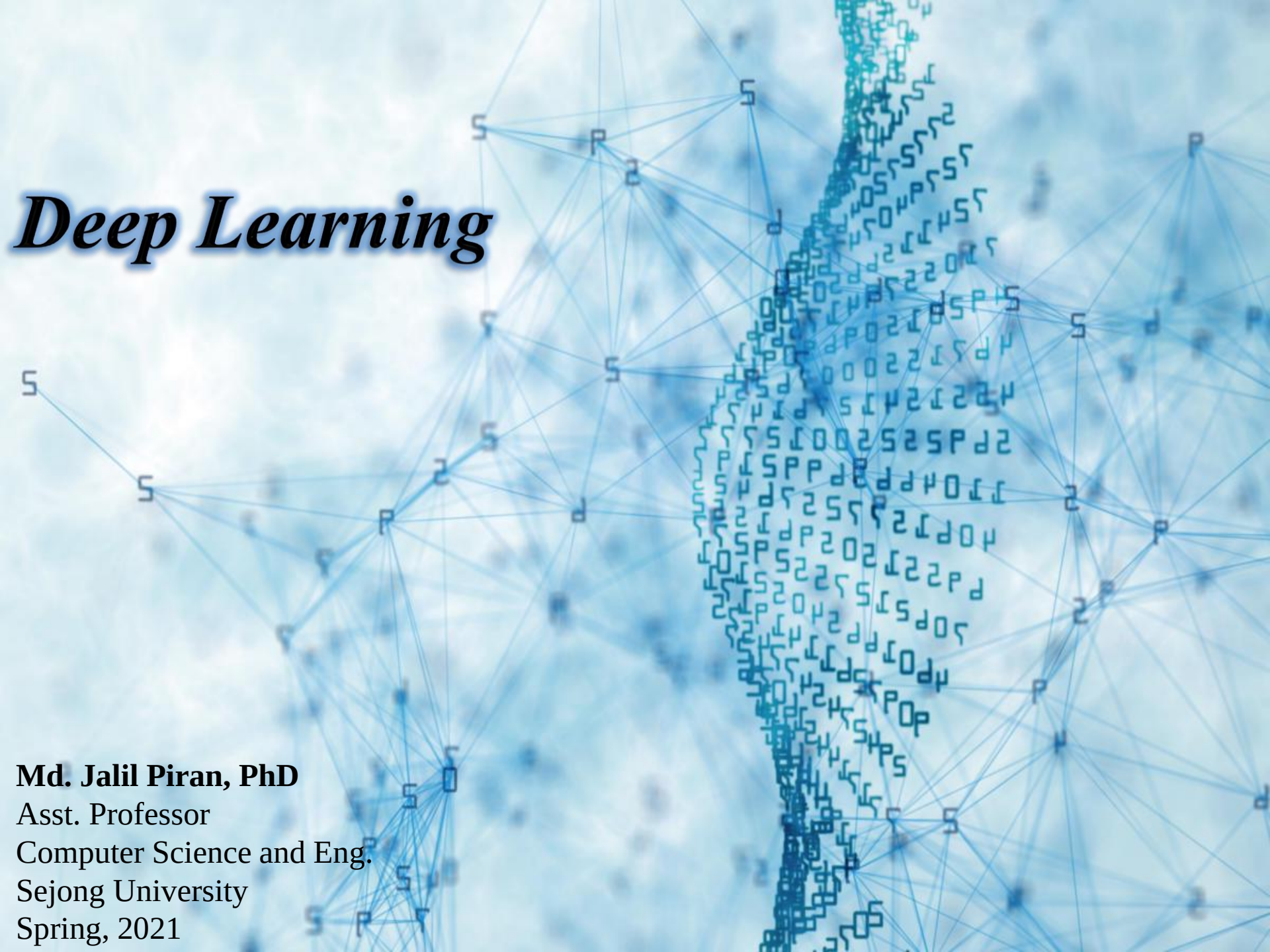


Deep Learning

Md. Jalil Piran, PhD
Asst. Professor
Computer Science and Eng.
Sejong University
Spring, 2021

Outline

- **Introduction to Deep Learning (DL)**
- **The History of DL**
- **Programming Tools**

PROGRAMMING TOOLS

DL Programming Languages

Python

R Programming

Java

C++

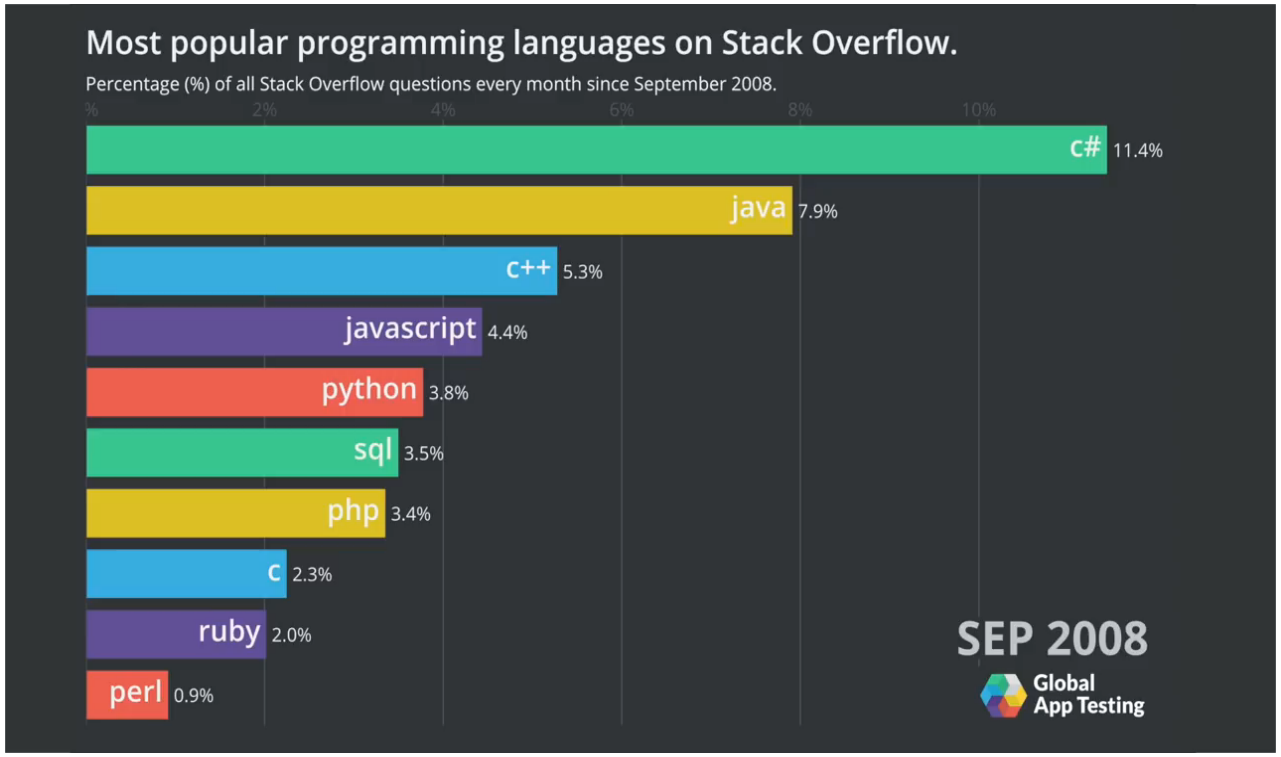
Julia

LISP

Python

- An **interpreted**, **high-level**, **general-purpose** programming language.
- Released in **1991**.

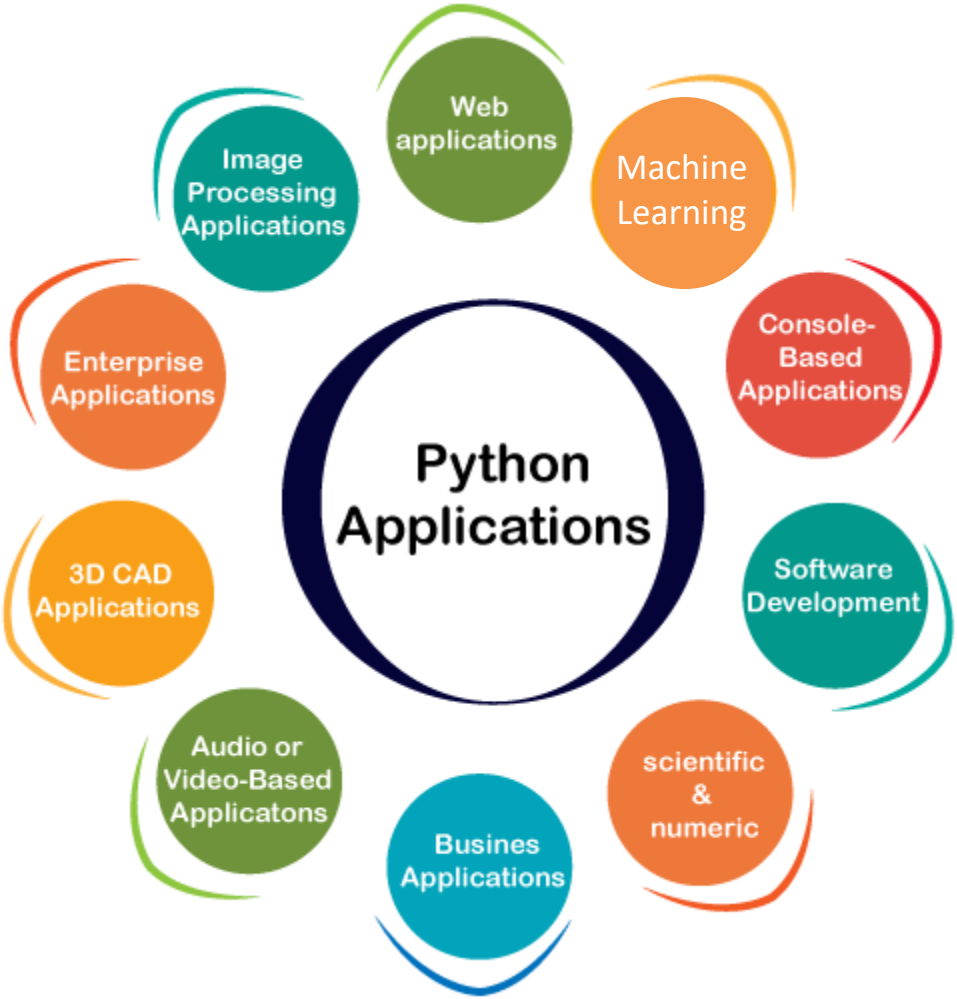
https://www.python.org/



Guido van Rossum

https://www.youtube.com/watch?v=cKzP61Gjf00

Python Applications



Advantages

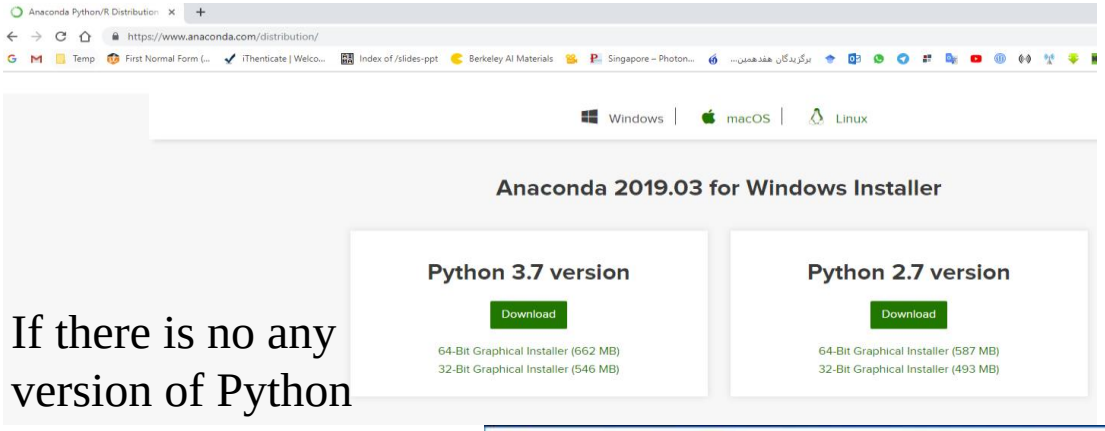
- Simple **syntax**; similar to the English language.
- Runs on an **interpreter** system
- In-built **libraries**
- Moderate **learning curve**
- Easy to **integrate**
- Easy to create **prototypes**
- Free and **open source**
- **Object-oriented** paradigm
- **Portability**
- High **productivity**
- **Platform agnostic** (Windows, Mac, Linux, Respberry Pi, etc.)

Anaconda Navigator

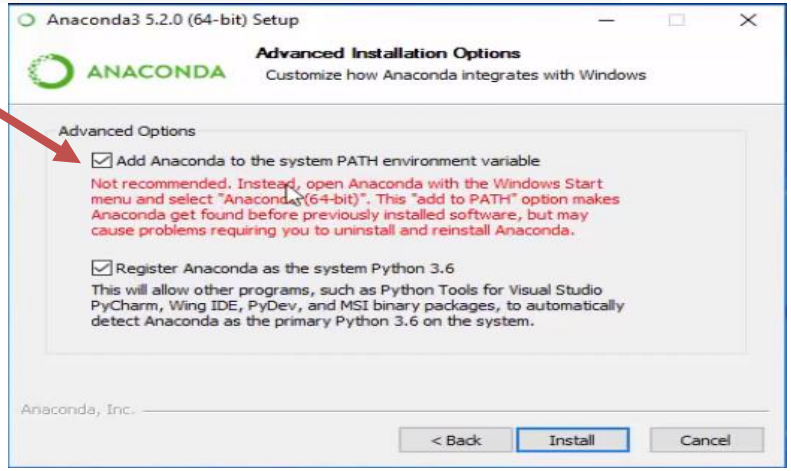
- **Conda:** an open cross-platform language agnostic package management system
  - Used to install Python packages.
- **Anaconda Navigator:** a free and open source Environment of Python and R programming language .
  - Mostly used for data science and ML applications.
  - Includes Jupyter and Spyder notebook for Python Coding.

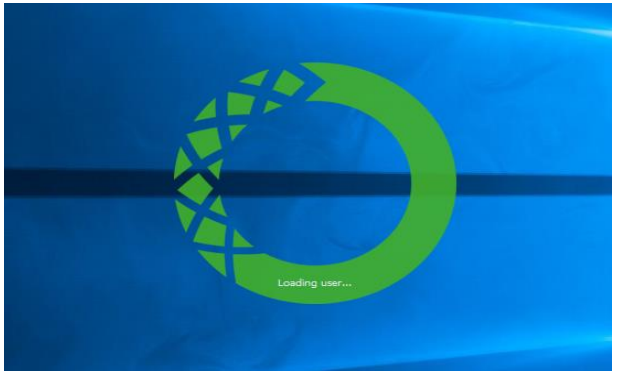
Anaconda Navigator Installation

https://www.anaconda.com/distribution/

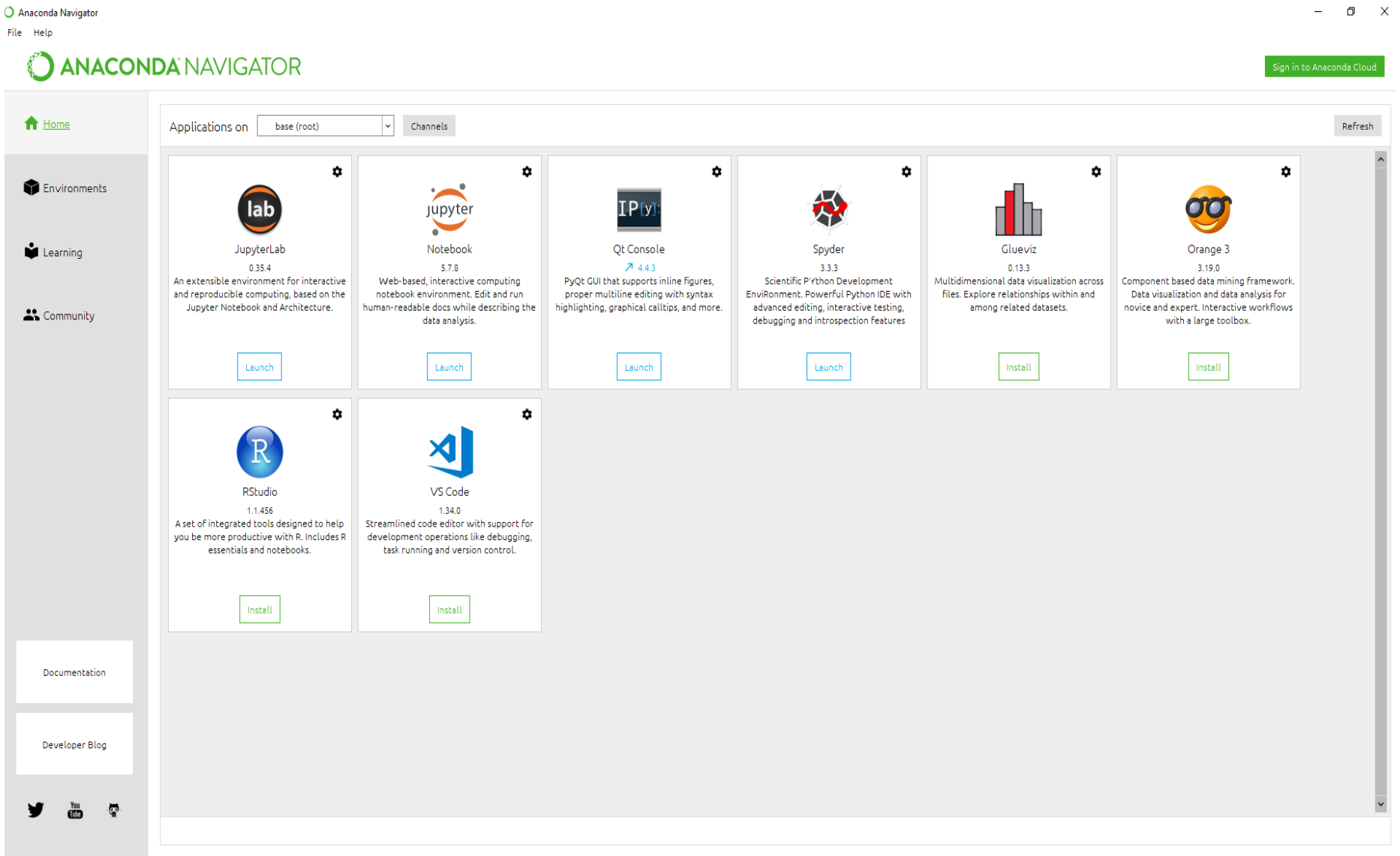


If there is no any version of Python on your computer check the first option, otherwise uncheck it.





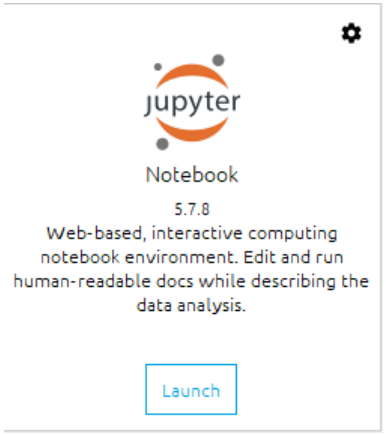
Anaconda Navigator Installation

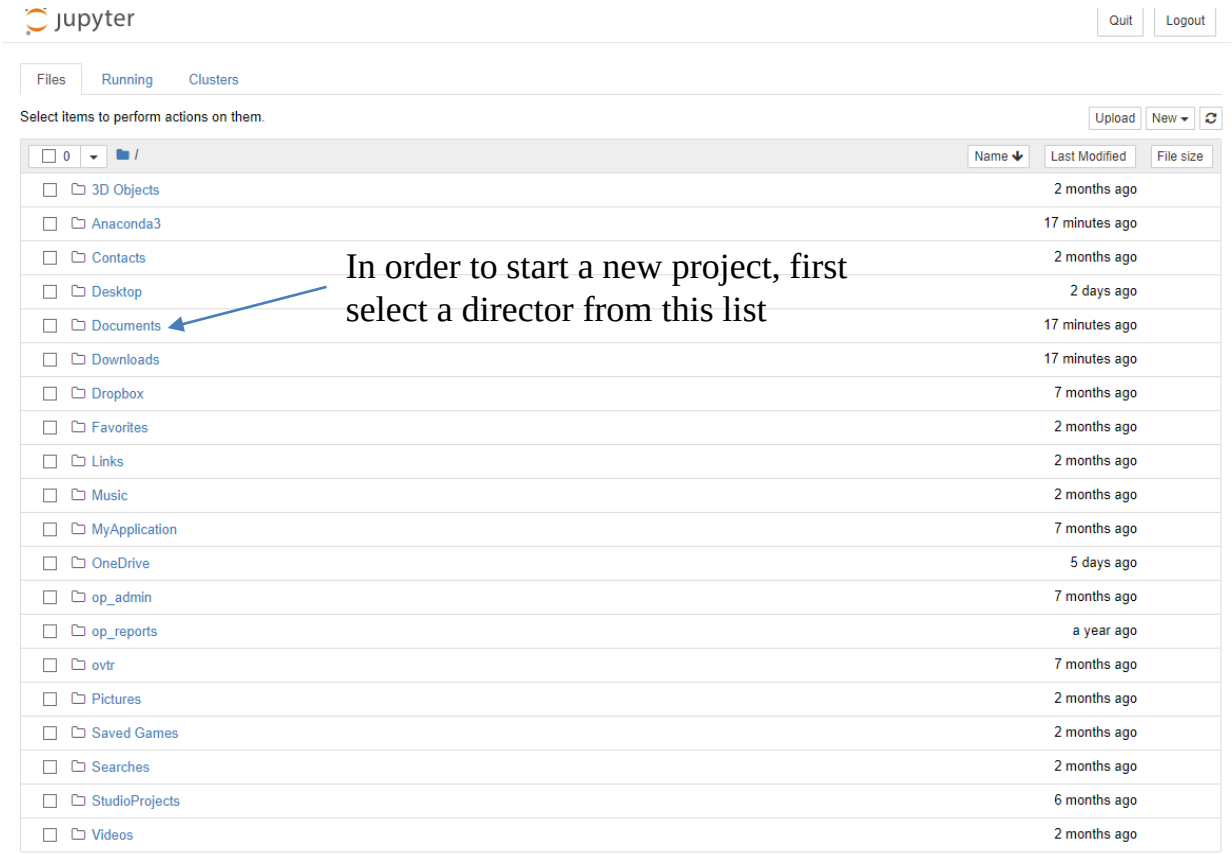


IDEs

- Jupyter
- Colab Notebooks
- Spyder
- VSCode
- Rstudio
- PyCharm
- Notepad
- Sublime Text
- Vim / Emacs
- …

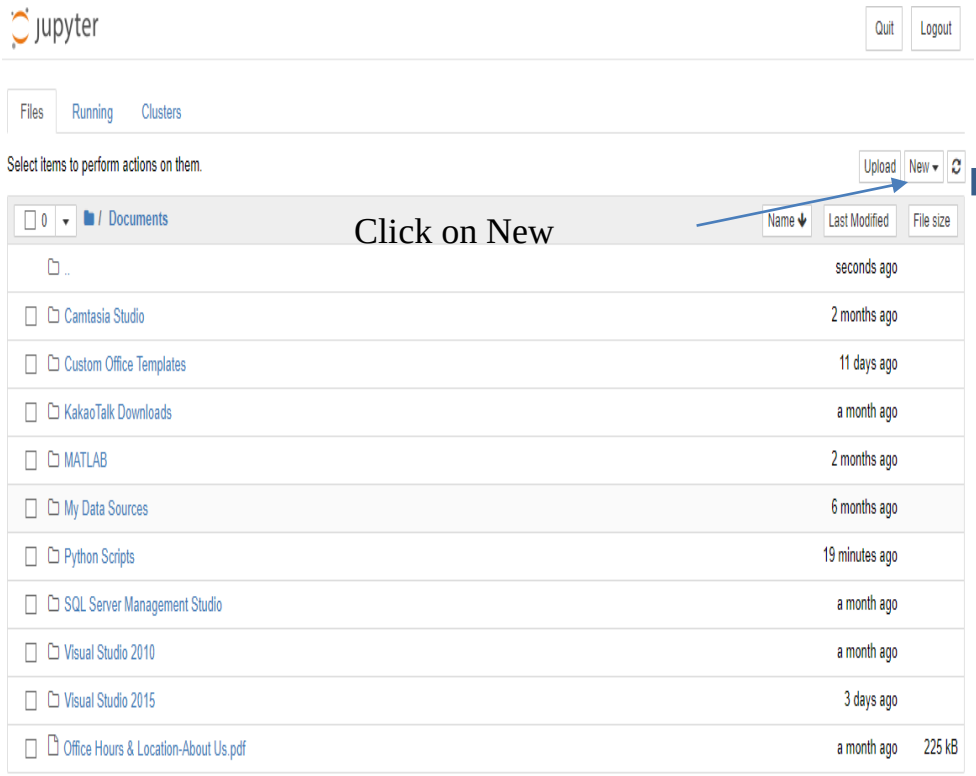
Jupyter Notebook

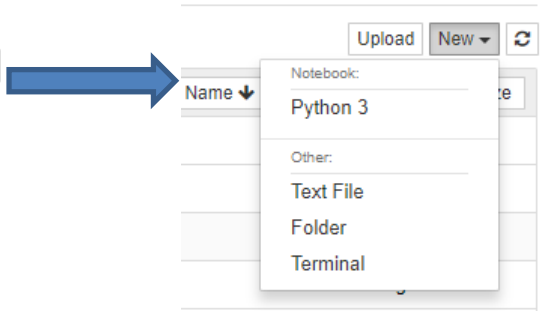


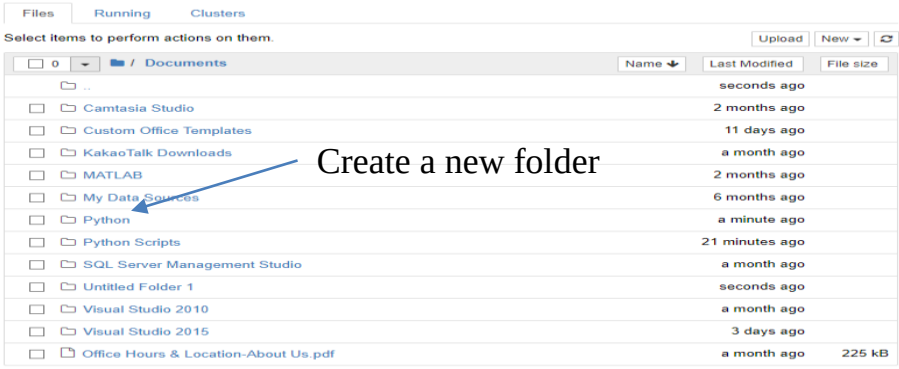


In order to start a new project, first select a director from this list

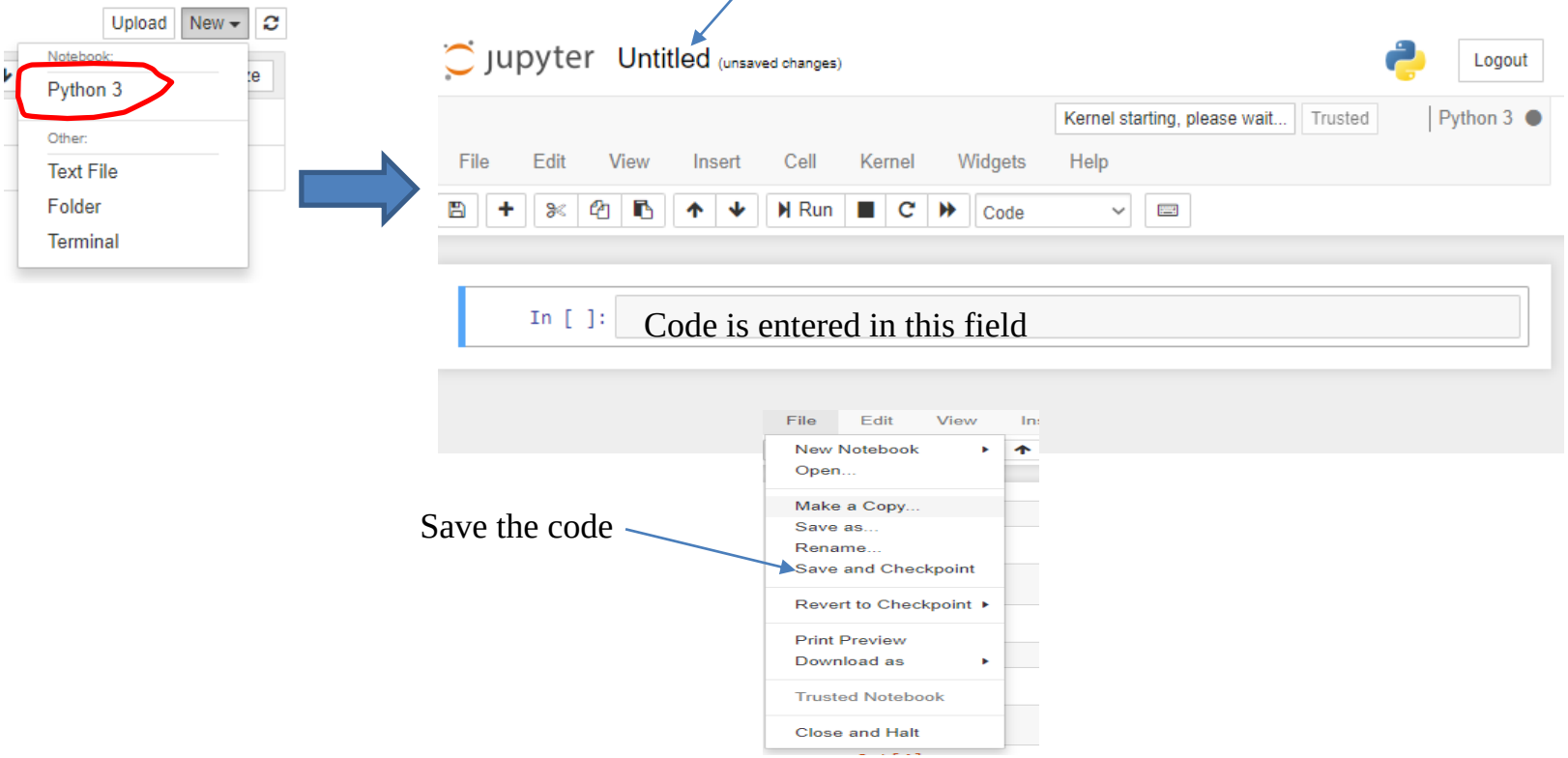
Jupyter Notebook







Jupyter Notebook



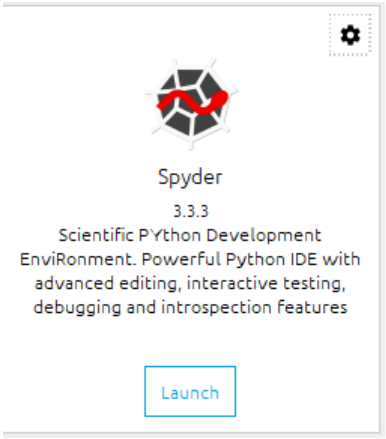
Colab Notebooks

- **Colaboratory,** “Colab”,
- A Google research project
- Created to help disseminate ML education and research.
- It's a Jupyter notebook environment
- Requires no setup to use and runs entirely in the cloud, while providing free access to computing resources including GPUs.
- Free to use.

https://colab.research.google.com/

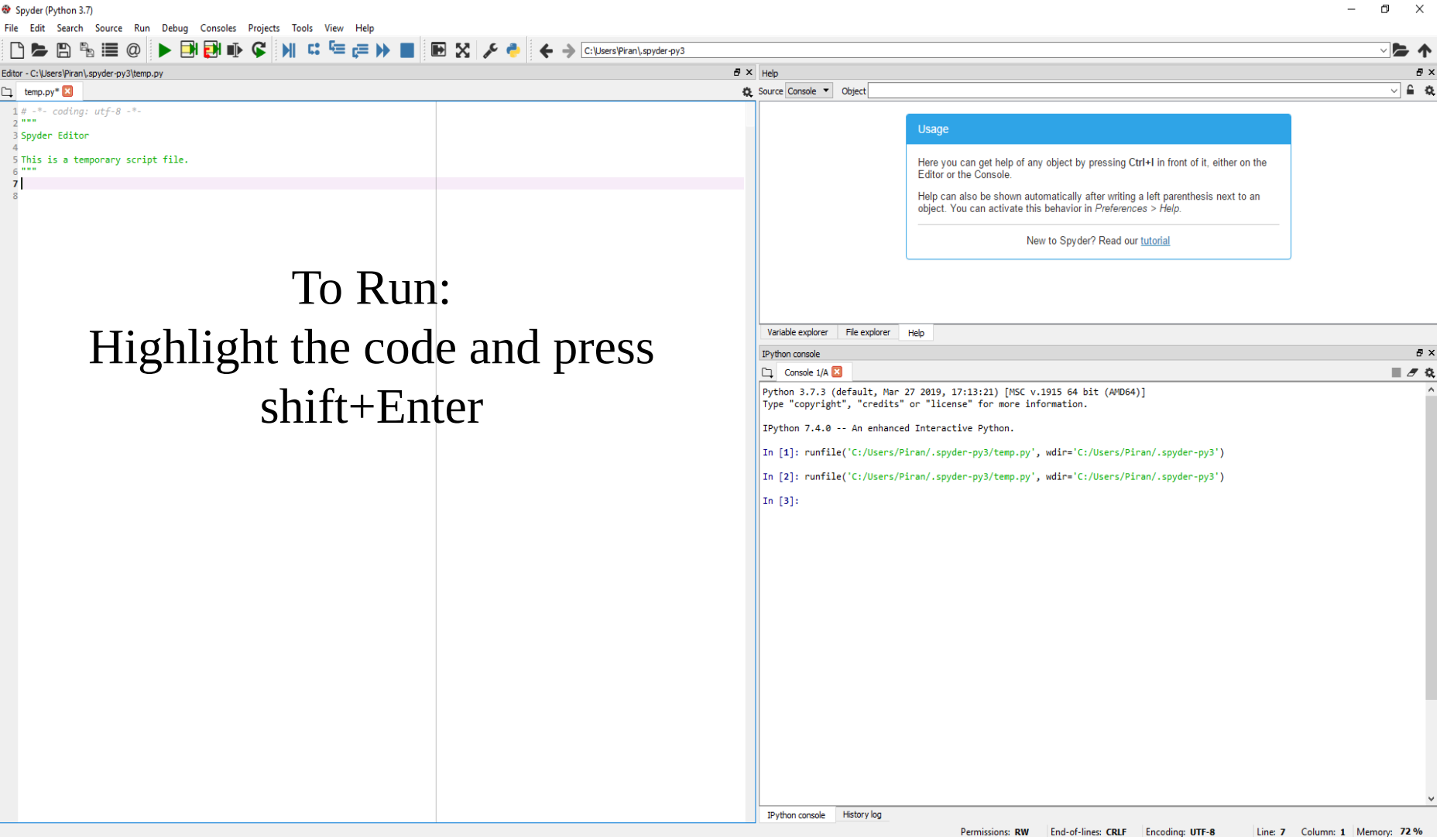
Spyder IDE

- **Spyder:** an open source cross-platform IDE for scientific programming in Python language.



- Spyder integrates with a number of prominent packages in the scientific Python stack, including:
  - **NumPy**,
  - **SciPy**,
  - **Matplotlib**,
  - **Pandas**,
  - **IPython**,
  - **SymPy**

Spyder IDE



To Run:
Highlight the code and press shift+Enter

The Libraries

- **Pandas**: used for data analysis
- **Numpy**: multidimensional arrays
- **TensorFlow**: ML approaches
- **Matplotlib**, **seaborn**, **Bokeh**: data visualization
- **Keras**: high-level neural network API
- **scikit-learn**: ML algorithms
- **SciPy**: algorithms to use with Numpy
- **SQLAlchemy**: Python SQL Toolkit
- **Theano**: Deep Neural Networks
- **SymPy**: Symbolic math
- **AirFlow**, **Dask**, **Luigi**: data engineering tool
- **PyBrain**: ML algorithms
- **Pattern**: natural language processing

Google TensorFlow

- **Tensor:** a container for data in N-dimensions.
- **TensorFlow:** an end-to-end open-source platform for ML.
- Use TF to describe computations as a **graph**
- TF **schedules** computations on devices - CPU, GPU...
- Performs **automatic differentiation** (like JuMP!)
- Main focus on training and inference for DL
- Free.

https://www.tensorflow.org/

Keras

- **Keras:** a model-level library,
- Provids high-level building blocks for developing DL models.
- An open-source neural-network library.
- acts as an interface for the TensorFlow library.
- It is capable of running on top of:
  - TensorFlow,
  - Microsoft Cognitive Toolkit,
  - Theano,
  - PlaidML.

install Keras

```
conda install -c anaconda keras
```

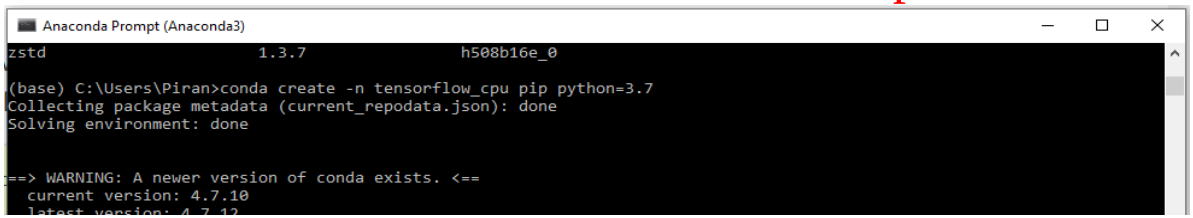
TensorFlow

- Types:
  - **TensorFlow CPU**; simple to install, slow performance.
  - **TensorFlow GPU**; recommended if a Nvidia graphic card is installed.

- Installation if TensorFlow CPU
  - Open a new *Anaconda/Command Prompt* window
  - Create a new virtual environment with name ‘tensorflow_cpu’

    conda create -n tensorflow_cpu pip python=3.6
  - Activate the newly created virtual environment:

    activate tensorflow_cpu



conda install pip

- Once you have activated your virtual environment, the name of the environment should be displayed within brackets at the beginning of your cmd path specifier, e.g.:

- Then

pip install --ignore-installed --upgrade tensorflow==1.9

- **Note**) the Python version must be 3.6.x! You can see your python version using "conda list" command.

- Test your installation by running

```
python
>>> import tensorflow as tf
>>> hello = tf.constant('Hello, TensorFlow!')
>>> sess = tf.Session()
```

If you see the following, it means successfully done!

```
2019-02-28 11:59:25.810663: I T:\src\github\tensorflow\tensorflow\core\p
```

- Test it:

```
>>> print(sess.run(hello))
b'Hello, TensorFlow!‘
```

- Install Keras

```
pip install Keras
```

Note you no longer need to import Keras, use ‘tf.keras’ instead

Kaggle

- A subsidiary of **Google LLC**
- An **online community** of data scientists and ML practitioners.
- To find and publish data sets,
- Explore and build models in a web-based data-science environment,
- Work with other data scientists and ML engineers,
- Enter competitions to solve data science challenges.

https://www.kaggle.com/

Office: #432, Dayang AI Center, **Phone**: 010-8999-8586, **email**: *piran@sejong.ac.kr*