



COMPUTATIONAL INTELLIGENCE

DEEP LEARNING

Introduction to Jupyter Notebook, Anaconda and Phyton DL Tools



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Scope



- ✓ **Python** – a modern language often used for AI, CI, KE, and DM computing.
- ✓ **Jupyter Notebook** – a modern and intuitive programming environment with linked libraries (like Tensorflow, Keras) that allow to effectively process deep learning algorithms and present results quickly.
- ✓ **Tensorflow and Keras** libraries produced by leading IT companies, like Google, that facilitate and simplify implementation and use of deep learning algorithms and networks.



The Jupyter Notebook:

- is an open-source web application that allows you to create and share documents that contain live code, equations, visualizations, and narrative text;
- includes data cleaning and transformation, numerical simulation, statistical modeling, data visualization, machine learning, and much more.



We will use it to demonstrate various algorithms, so you are asked to install it.

Jupyter in your browser

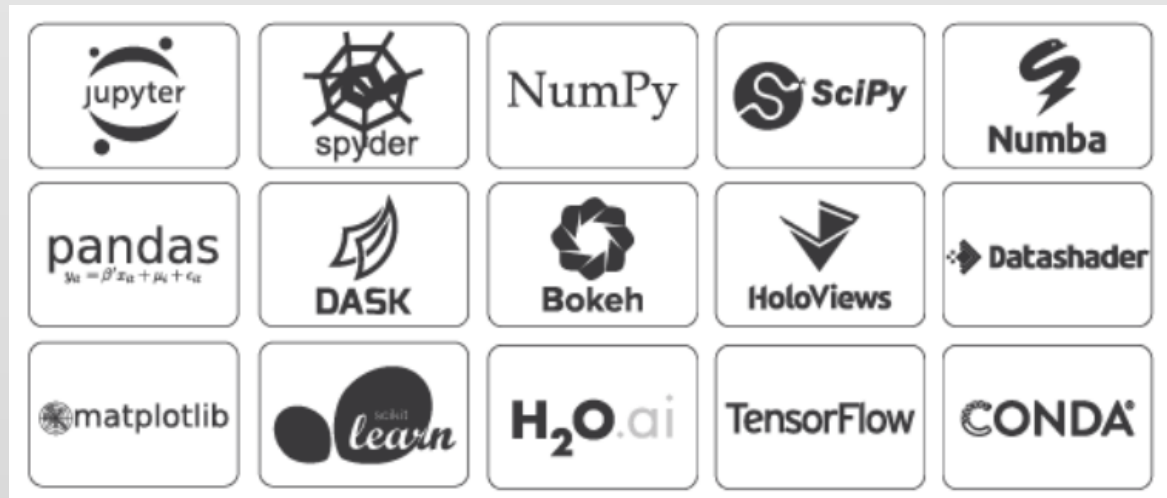
Install a Jupyter Notebook

Install Jupyter using [Anaconda](#) with built in Python 3.7+

- It includes many other commonly used packages for scientific computing, data science, machine learning, and computational intelligence libraries.
- It manages libraries, dependencies, and environments with Conda.
- It allows developing and training various machine learning and deep learning models with scikit-learn, TensorFlow, Keras, Theano etc.
- It supplies us with data analysis including scalability and performance with Dask, NumPy, pandas, and Numba.
- It quickly visualizes results with Matplotlib, Bokeh, Datashader, and Holoviews.

And [run it](#) at the Terminal (Mac/Linux) or Command Prompt (Windows):

```
jupyter notebook
```





My Anaconda Landscape

? Packages

[View all](#) (0)

Get more information on how to [upload a Package](#).

? Notebooks

[View all](#) (0)

Get more information on how to [upload a Notebook](#).

? Environments

[View all](#) (0)

Get more information on how to [upload an Environment](#).

? Projects

[View all](#) (0)

No projects yet, [upload one here](#).

★ Favorites

[View all](#) (0)

Favorite some packages, notebooks, and environments to get started!

i Activity Feed

[View more](#)

Welcome to Anaconda Cloud! 10 months and 22 hours ago

Anaconda Cloud allows you to create or distribute software packages.

Getting started: [Installing your first package](#)

Getting started: [Distributing your first package](#)

It is recommended to install [PyCharm](#) for Anaconda:



ANACONDA

Anaconda3 2019.03 (64-bit)

Anaconda + JetBrains

Anaconda and JetBrains are working together to bring you Anaconda-powered environments tightly integrated in the PyCharm IDE.

PyCharm for Anaconda is available at:

<https://www.anaconda.com/pycharm>



ANACONDA®





Jupyter Notebook



PyCharm is a python IDE for Professional Developers

- It includes scientific mode to interactively analyze your data.

The screenshot displays the PyCharm IDE interface with a Jupyter Notebook open. The notebook file is named 'sine.ipynb'. The code in the notebook is as follows:

```
#%%  
import numpy as np  
import matplotlib.pyplot as plt  
  
x = np.linspace(0, 2*np.pi)  
  
#%%  
plt.plot(x, np.sin(x))  
plt.plot(x, np.sin(x-1/4*np.pi))
```

The output of the notebook shows the execution of the code, resulting in a plot of two sine waves. The first wave is blue and the second is orange. The x-axis ranges from 0 to 6, and the y-axis ranges from -1.00 to 1.00. The plot is displayed in the 'SciView' tab, which also shows a 'Database' tab. The bottom status bar indicates the current mode is 'Run'.



Jupyter Notebook Dashboard



Running a Jupyter Notebook in your browser:

- When the Jupyter Notebook opens in your browser, you will see the Jupyter Notebook Dashboard, which will show you a list of the notebooks, files, and subdirectories in the directory where the notebook server was started by the command line „jupyter notebook”.
- Most of the time, you will wish to start a notebook server in the highest level directory containing notebooks. Often this will be your home directory.

The screenshot shows the Jupyter Notebook Dashboard interface. At the top, there's a header with the Jupyter logo and a user profile picture. Below the header, there are tabs for 'Files', 'Running', and 'Clusters'. The 'Files' tab is active, showing a list of files and directories. The interface includes a search bar, a 'Select items to perform actions on them.' prompt, and buttons for 'Upload', 'New', and 'Refresh'. The file list is organized into columns: Name, Last Modified, and File size. The files are listed in a table format.

Name	Last Modified	File size
3D Objects	5 miesięcy temu	
Apple	rok temu	
Contacts	5 miesięcy temu	
Desktop	miesiąc temu	
Documents	4 miesiące temu	
Downloads	18 godzin temu	
Dropbox	19 dni temu	
Exhibeon	3 miesiące temu	
Favorites	5 miesięcy temu	
Links	5 miesięcy temu	
miniconda3	3 dni temu	
Music	4 miesiące temu	
OneDrive	19 dni temu	
OpenVPN	2 lata temu	
Pictures	2 miesiące temu	
PycharmProjects	3 dni temu	
Saved Games	5 miesięcy temu	
Searches	5 miesięcy temu	
source	9 miesięcy temu	
Tracing	rok temu	
Videos	2 miesiące temu	
Comparison of for-looped and vectorized efficiency of computations-Copy1.ipynb	Running 2 dni temu	7.72 kB
Comparison of for-looped and vectorized efficiency of computations-Copy2.ipynb	Running 2 dni temu	7.72 kB
Comparison of for-looped and vectorized efficiency of computations.ipynb	Running 12 godzin temu	19 kB
Python+Basics+With+Numpy+v3-Copy1 modified for lectures.ipynb	Running 2 dni temu	41.9 kB
Python+Basics+With+Numpy+v3.ipynb	Running 2 dni temu	41.3 kB
Untitled.ipynb	3 dni temu	1.15 kB

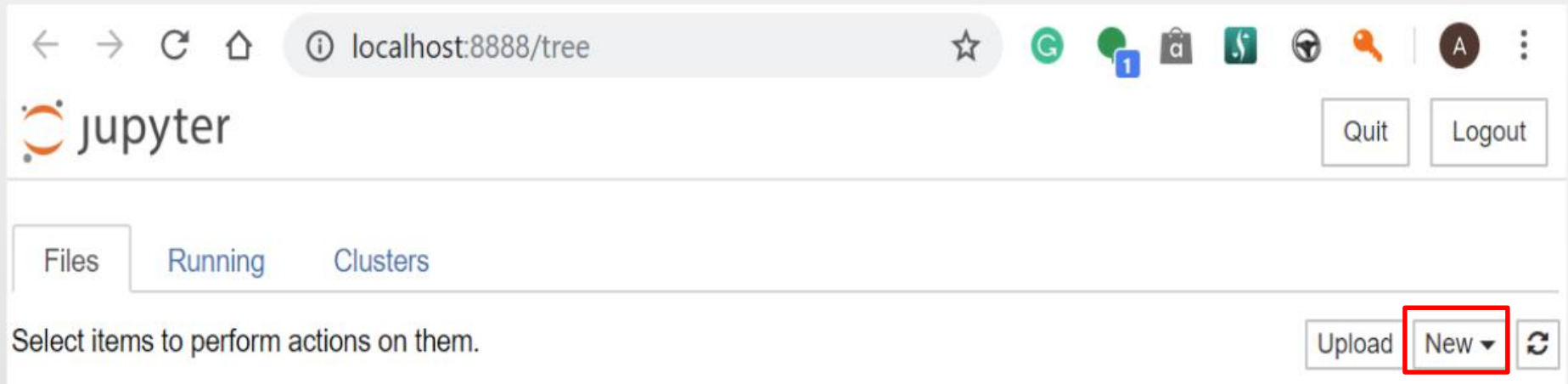


Starting a new Python notebook

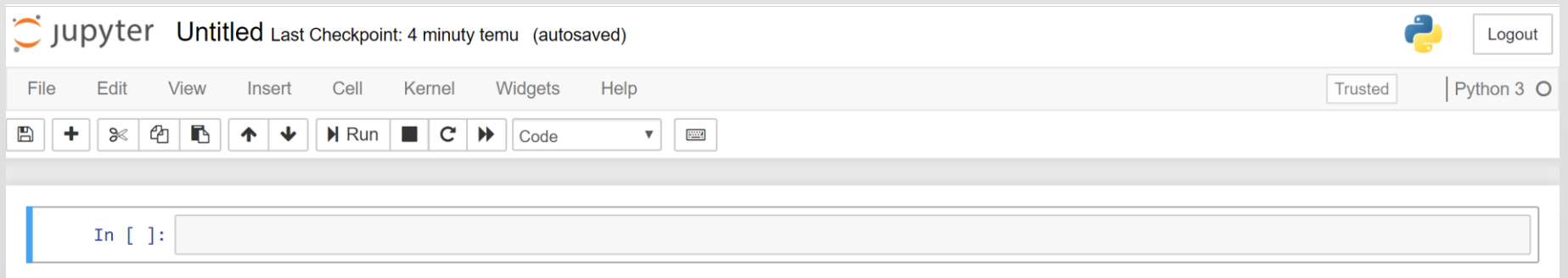


Start a new Python notebook:

- Clicking New → Python 3



- And a new Python project in the Jupyter Notebook will be started:



In the next assignments and examples, we will use the following packages:

- [numpy](#) is the fundamental package for scientific computing with Python.
- [h5py](#) is a common package to interact with a dataset that is stored on an H5 file.
- [matplotlib](#) is a famous library to plot graphs in Python.
- [PIL](#) and [scipy](#) are used here to test your model with your own picture at the end.

They must be imported:

```
In [2]: import numpy as np
import matplotlib.pyplot as plt
import h5py
import scipy
from PIL import Image
from scipy import ndimage
from lr_utils import load_dataset

%matplotlib inline
```



Let's start with powerful computations!



- ✓ Questions?
- ✓ Remarks?
- ✓ Suggestions?
- ✓ Wishes?



Bibliography and Literature

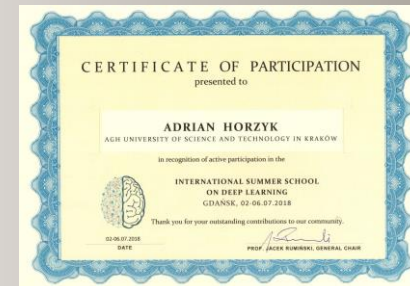
1. Nikola K. Kasabov, *Time-Space, Spiking Neural Networks and Brain-Inspired Artificial Intelligence*, In Springer Series on Bio- and Neurosystems, Vol 7., Springer, 2019.
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, *Deep Learning*, MIT Press, 2016, ISBN 978-1-59327-741-3 or PWN 2018.
3. Holk Cruse, *Neural Networks as Cybernetic Systems*, 2nd and revised edition
4. R. Rojas, *Neural Networks*, Springer-Verlag, Berlin, 1996.
5. *Convolutional Neural Network* (Stanford)
6. *Visualizing and Understanding Convolutional Networks*, Zeiler, Fergus, ECCV 2014
7. IBM: <https://www.ibm.com/developerworks/library/ba-data-becomes-knowledge-1/index.html>
8. NVIDIA: <https://developer.nvidia.com/discover/convolutional-neural-network>
9. JUPYTER: <https://jupyter.org/>



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