



# OpenCV with Python

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# Required software packages

- Python 2.7 or 3.5
  - <https://www.python.org/downloads/>
  - Frequently used Libraries : Numpy, Matplotlib, Scipy
    - <http://www.scipy.org/>
- OpenCV 3.X
  - <http://opencv.org/downloads.html>
- Scikit-learn 0.20.3
  - <https://pypi.org/project/scikit-learn/>
- Anaconda (Python + popular libraries)
  - <https://www.anaconda.com/>
- In this course: Jupyter notebook that requires no setup
  - <https://colab.research.google.com/>

# History and features of Python

- founded in the year 1991 by developer Guido Van Rossum
- Python 2.0 introduced in the year 2000
- Python 3.0 introduced in the year 2008
- Features:
  - Interactive
  - Interpreter
  - Modular
  - Dynamic
  - Object-oriented
  - Portable
  - High level
  - Extensible in C++ and C

# Intro to OpenCV

- OpenCV is an image processing library created by Intel and later supported by Willow Garage and now maintained by Itseez.
- Available on Mac, Windows, Linux.
- Works in C, C++, and Python.
- Open Source and free
- Easy to use and install

# Image vs Matrix

- Digital images are typically stored in a matrix.
- There are many different file formats (IplImage & Mat in C/C++)



$j$  →

↓  $i$

62	79	23	119	120	105	4	0
10	10	9	62	12	78	34	0
10	58	197	46	46	0	0	48
176	135	5	188	191	68	0	49
2	1	1	29	26	37	0	77
0	89	144	147	187	102	62	208
255	252	0	166	123	62	0	31
166	63	127	17	1	0	99	30

# What is Numpy

- Numpy is highly optimized library for numerical operations.
- Array structure is important because digital images are 2D array of pixels
- All the OpenCV array structures are converted to-and-from Numpy arrays.
- You can use more convenient indexing system rather than using for loops

# 1<sup>st</sup> example: 🌸 Hello World

```
import cv2 as cv
from google.colab import files
from google.colab.patches import cv2_imshow

print('Hello World' )
uploaded = files.upload()

img1_rgb = cv.imread('Lenna. jpg' )

cv2_imshow(img1_rgb)
```

# Download the rest jupyter notebook files

<https://github.com/AlexofNTHU/PythonOpenCV>

The screenshot displays the GitHub interface for the repository `AlexofNTHU / PythonOpenCV`. At the top, there's a navigation bar with links to Google Sheets, Google Docs, YouTube, Facebook, Google, Yahoo, and various other services. Below this, the repository name is shown with statistics: 0 Watch, 0 Star, and 0 Fork. The main content area shows the repository has 2 commits, 1 branch, 0 releases, and 1 contributor. A table lists files under the `data_types_container` directory, each with an 'Add files via upload' button. A modal is open over the 'Clone or download' button, showing the 'Clone with HTTPS' option and the repository URL: `https://github.com/AlexofNTHU/PythonOpenCV`. The modal also includes buttons for 'Open in Desktop' and 'Download ZIP'.

File Name	Action
<code>data_types_container.ipynb</code>	Add files via upload
<code>data_types_container1.ipynb</code>	Add files via upload
<code>data_types_container2.ipynb</code>	Add files via upload
<code>data_types_container3.ipynb</code>	Add files via upload



# Resources

- Python for Everybody –  
<https://www.coursera.org/specializations/python>
- Learn Computer Vision with OpenCV Library using Python  
<https://www.udemy.com/pythoncv/>

