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## Travaux pratiques

### *Module: Deep Learning pour la vision par ordinateur* **TP 3**

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Analysez les lignes de codes et donnez vos constats et interprétations.

Utilisez le lien suivant dans le code :

url="https://upload.wikimedia.org/wikipedia/commons/8/88/Commander\_Eileen\_Collins\_-\_GPN-2000-001177.jpg"

### A coding example of convolution operation

```
import numpy as np
def conv(image, im_filter):
    """
    :param image: grayscale image as a 2-dimensional numpy array
    :param im_filter: 2-dimensional numpy array
    """
    # input dimensions
    height = image.shape[0]
    width = image.shape[1]
    # output image with reduced dimensions
    im_c = np.zeros((height - len(im_filter) + 1, width - len(im_filter) + 1))
    # iterate over all rows and columns
    for row in range(len(im_c)):
        for col in range(len(im_c[0])):
            # apply the filter
            for i in range(len(im_filter)):
                for j in range(len(im_filter[0])):
                    im_c[row, col] += image[row + i, col + j] * im_filter[i][j]
    # fix out-of-bounds values
    im_c[im_c > 255] = 255
    im_c[im_c < 0] = 0
    # plot images for comparison
    import matplotlib.pyplot as plt
    import matplotlib.cm as cm
    plt.figure()
    plt.imshow(image, cmap=cm.Greys_r)
    plt.show()
    plt.imshow(im_c, cmap=cm.Greys_r)
    plt.show()

import requests
from PIL import Image
from io import BytesIO
# load the image
url = "https://upload.wikimedia.org/wikipedia/commons/thumb/8/88/Commander_Eileen_Collins_-_GPN-2000-001177.jpg/382px-Commander_Eileen_Collins_-_GPN-2000-001177.jpg?download"
resp = requests.get(url)
image_rgb = np.asarray(Image.open(BytesIO(resp.content)).convert("RGB"))
# convert to grayscale
image_grayscale = np.mean(image_rgb, axis=2, dtype=np.uint)
# blur filter
blur = np.full([10, 10], 1. / 100)
conv(image_grayscale, blur)
# Sobel edge detectors
sobel_x = [[-1, -2, -1], [0, 0, 0], [1, 2, 1]]
conv(image_grayscale, sobel_x)
sobel_y = [[-1, 0, 1], [-2, 0, 2], [-1, 0, 1]]
```