Solution Travaux pratiques N°1

```
import numpy as np
im_01 = np.array([[255, 255, 255, 255, 255, 255, 255, 255, 255, 255, 255, 255, 255, 255],
                  [255, 255, 255, 255,110, 110, 110, 110, 110, 110, 255, 255, 255],
                  [255, 255, 255, 255, 110, 110, 110, 110, 110, 110, 255, 255, 255],
                  [255, 255, 255, 255, 110, 110, 110, 110, 110, 110, 255, 255, 255],
                  [255, 255, 255, 255, 110, 110, 110, 110, 110, 110, 255, 255, 255],
                  [255, 255, 110, 110, 110, 110, 110, 110, 110, 110, 110, 110, 255],
                  [255, 255, 255,170,170,170,170,170,170,170,170, 255, 255],
                  [255, 255, 255, 255,170,170,170,170,170,170, 255, 255, 255],
                  [255, 255, 255, 255,170,170,170,170,170,170, 255, 255, 255],
                  [255, 255, 255, 255,170,10,170,170,10,170, 255, 255, 255],
                  [255, 255, 255, 255,170,170,170,170,170,170, 255, 255, 255],
                  [255, 255, 255, 255, 255,170, 80,80,170, 255, 255, 255, 255],
                  [255, 255, 255, 255, 255,170,170,170,170, 255, 255, 255, 255],
                  [255, 255, 255, 255, 255, 255, 255, 255, 255, 255, 255, 255, 255],
                  [255, 255, 255, 255, 255, 255, 255, 255, 255, 255, 255, 255, 255]])

print(type(im_01 ))
print(im_01.shape)
#           2.1.   Boucle "for", et opérations sur les vecteurs
#Calculer la moyenne de la matrice en utilisant deux méthodes différentes.
# Methode itérative
s = 0
for i in range(len(im_01)):
    for j in range(len(im_01[i])):
        s += im_01[i][j]

r,c = np.shape(im_01)
print('Methode Itérative .... ', s/(r*c) )
# Methode Véctorielle
print('Methode Véctorielle 1.... ', np.average(im_01) )
print('Methode Véctorielle 2.... ', np.mean(im_01) )

#  2.2. Manipulation des pixels de l'image

A = np.array((8, 8))
B = np.array((7, 11))
dist_e = np.sqrt(np.sum(np.square(A - B)))
print('Distance euclidienne entre A et B .... ',round(dist_e,2)  )
print('Distance Manathan entre A et B .... ', round(np.sum(np.abs(A - B)))  )


print('Valeur du pixel p est ', im_01[5,3])
Voisinage_p = np.array([ im_01[4,2] ,im_01[4,3] ,im_01[4,4] ,im_01[5,2] ,im_01[5,3] ,im_01[5,4] ,im_01[6,2],im_01[6,3] , im_01[6,4]])
print('les 8 Voisin de p est ', Voisinage_p)
print('la moyenne de la fenetre ', np.mean(Voisinage_p))
Voisinage_p_ord = np.sort(Voisinage_p)
print('la mediane de la fenetre est ', Voisinage_p_ord[5] , ' egale aussi avec numpy ' , np.median(Voisinage_p))

# 2.3. Manipulation des images
from PIL import Image as im
new_image = im.fromarray(im_01)

hauteur , largeur = np.shape(im_01)
newsize = (hauteur , largeur)
new_image = new_image.resize(newsize)
new_image.show()
print("hauteur , largeur = ", hauteur , "  " , largeur)
print("nbr de bits = ",  hauteur * largeur * 3)

#-------------------------------------------------------------------------------
im_02 = np.array( [[255, 255, 255, 255, 255, 255, 255, 255, 255, 255, 255, 255, 255, 255],
                   [255, 255, 255, 255, 110, 110, 110, 110, 110, 110, 255, 255, 255],
                   [255, 255, 255, 255, 110, 110, 110, 110, 110, 110, 255, 255, 255],
                   [255, 255, 255, 255, 110, 110, 110, 110, 110, 110, 255, 255, 255],
                   [255, 255, 255, 255, 110, 110, 110, 110, 110, 110, 255, 255, 255],
                   [255, 255, 110, 110, 110, 110, 110, 110, 110, 110, 110, 110, 255],
                   [255, 255, 255, 170, 170, 170, 170, 170, 170, 170, 170, 255, 255],
                   [255, 255, 255, 255, 170, 170, 170, 170, 170, 170, 255, 255, 255],
                   [255, 255, 255, 255, 170, 170, 170, 170, 170, 170, 255, 255, 255],
                   [255, 255, 255, 255, 170, 10, 170, 170, 10, 170, 255, 255, 255],
                   [255, 255, 255, 255, 170, 170, 170, 170, 170, 170, 255, 255, 255],
                   [255, 128, 128, 128, 255, 170, 80, 80, 170, 255, 255, 255, 255],
                   [255, 128, 128, 128, 255, 170, 170, 170, 170, 255, 255, 255, 255],
                   [255, 128, 128, 128, 255, 255, 255, 255, 255, 255, 255, 255, 255],
                   [255, 255, 255, 255, 255, 255, 255, 255, 255, 255, 255, 255, 255]])
```

```python
#  2.3.5. Détecter cette modification en utilisant la soustraction entre Im_01 et Im_02 et
# donner l'image résultante.

diff = im_02 * ((im_02 - im_01) != 0)
print(diff)

im_diff = im.fromarray(diff)
im_diff.show()

#-----------------------------------------------------------------
arr_s = 0 * im_01
print(arr_s)
for i in range(len(im_01)):
    for j in range(len(im_01[i])):
        s = im_01[i][j] + im_01[i][j]
        if(s > 255 ):
            s = 255
        arr_s[i][j] = s

print(arr_s)
s_image = im.fromarray(arr_s)
im._show(s_image)
#-----------------------------------------------------------------------------------------------------
```