```
# -*- coding: utf-8 -*-
"""EjercicioConvoluciones.ipynb

Automatically generated by Colaboratory.

Original file is located at
    https://colab.research.google.com/drive/1_Av2MDwdfz22BLfOp8HX9gQD8e5-24EW

## **Ejercicio convoluciones**

Funciones
"""

def print_matrix(mat, name=None, val_len=3):
    out_str = ""

    if name is not None:
        out_str += ("--" + "-" * val_len + "-") * len(mat[0]) + "-\n"
        out_str += str(name) + ":\n"

    # Draw a starting line
    out_str += ("--" + "-" * val_len + "-")  * len(mat[0]) + "-\n"

    # Add all the values
    for row in mat:
        for val in row:
            val = str(val)
            out_str += "| " + " " * (val_len - len(val)) + val + " "
        out_str += "|\n"
```

```
        if row is not mat[-1]:
            # Draw the lines between rows
            out_str += ("|-" + "-" * val_len + "-") * len(mat[0]) + "|\n"

    # Draw the last line
    out_str += ("--" + "-" * val_len + "-") * len(mat[0]) + "-\n"

    print(out_str)

def mult_matrix(matrix,kernel):
    res = 0
    for i in range(3):
        for j in range(3):
            res = res + ( matrix[i][j] * kernel[i][j])
    if res > 255 :
        res = 255
    if res < -256:
        res = -255
    return res

def llenado_mat(img_In,kernel_In):
    matriz1 = []
    matriz2 = []
    matriz3 = []
    matriz4 = []
    matriz5 = []
    matriz6 = []
    matriz7 = []
```

```
matriz8 = []
matriz9 = []
for i in range(0,3):
    matriz1.append([])
    for j in range(0,3):
        n = img_In[i][j]
        matriz1[i].append(n)

for i in range(0,3):
    matriz2.append([])
    for j in range(1,4):
        n = img_In[i][j]
        matriz2[i].append(n)

for i in range(0,3):
    matriz3.append([])
    for j in range(2,5):
        n = img_In[i][j]
        matriz3[i].append(n)

for i in range(1,4):
    matriz4.append([])
    for j in range(0,3):
        n = img_In[i][j]
        matriz4[i-1].append(n)

for i in range(1,4):
    matriz5.append([])
    for j in range(1,4):
```

```
        n = img_In[i][j]
        matriz5[i-1].append(n)

for i in range(1,4):
    matriz6.append([])
    for j in range(2,5):
        n = img_In[i][j]
        matriz6[i-1].append(n)

for i in range(2,5):
    matriz7.append([])
    for j in range(0,3):
        n = img_In[i][j]
        matriz7[i-2].append(n)

for i in range(2,5):
    matriz8.append([])
    for j in range(1,4):
        n = img_In[i][j]
        matriz8[i-2].append(n)

for i in range(2,5):
    matriz9.append([])
    for j in range(2,5):
        n = img_In[i][j]
        matriz9[i-2].append(n)

mat_res = []
mat_res.append(mult_matrix(matriz1,kernel_In))
```

```
    mat_res.append(mult_matrix(matriz2,kernel_In))
    mat_res.append(mult_matrix(matriz3,kernel_In))
    mat_res.append(mult_matrix(matriz4,kernel_In))
    mat_res.append(mult_matrix(matriz5,kernel_In))
    mat_res.append(mult_matrix(matriz6,kernel_In))
    mat_res.append(mult_matrix(matriz7,kernel_In))
    mat_res.append(mult_matrix(matriz8,kernel_In))
    mat_res.append(mult_matrix(matriz9,kernel_In))

    mat_res2 = []
    i1 = 0
    for i in range(3):
        mat_res2.append([])
        for j in range(3):
            mat_res2[i].append(mat_res[i1])
            i1 = i1 + 1
    print_matrix(img_In, name='Imagen', val_len=3)
    print_matrix(kernel_In, name='Kernel', val_len=3)
    print_matrix(mat_res2, name='Matriz Convolusional', val_len=4)

"""# ***IMAGEN 1***"""

kernel1 = [[0, -1, 0],
           [-1, 5, -1],
           [0, -1, 0]]

img1 = [
    [ 178, 88, 28, 186, 164],
    [ 4, 226, 204, 71, 194],
```

```
   [ 200, 175, 156, 53, 0],
   [ 3, 127, 217, 208, 187],
   [ 200, 173, 134, 209, 213]
]

llenado_mat(img1,kernel1)

"""# ***IMAGEN 2***"""

kernel2 = [[1, 2, 1],
        [0, 0, 0],
        [-1, -2, -1]]

img2 = [
   [ 55, 179, 171, 205, 124],
   [ 72, 83, 163, 66, 132],
   [ 99, 39, 192, 135, 23],
   [ 46, 101, 162, 152, 156],
   [ 165, 7, 118, 243, 9]
]

llenado_mat(img2,kernel2)

"""# ***}***"""

kernel3 = [[-2, -1, 0],
        [-1, 1, 1],
        [0, 1, 2]]
```

```
img3 = [
   [ 155,125,228,101,147],
   [ 133,19,95,109,249],
   [ 133,120,174,94,190],
   [ 178,251,69,159,39],
   [ 47,111,26,171,156]
]

llenado_mat(img3,kernel3)

"""# ***IMAGEN 4***"""

kernel4 = [[-1,-1,-1],
        [-1,8,-1],
        [-1,-1,-1]]

img4 = [
   [ 237,90,40,207,112 ],
   [ 191,123,158,55,128 ],
   [ 36,168,149,225,176 ],
   [ 10,113,128,244,58 ],
   [ 66,87,255,59,236 ]
]

llenado_mat(img4,kernel4)
```