Introducao: Numpy

In [1]:
```
import numpy as np
```

Criando uma matriz (array)

In [2]:
```
lista = [0,1,2,3,4]
```

In [3]:
```
array = np.array(lista)
```

In [4]:
```
array
```

Out[4]:
```
array([0, 1, 2, 3, 4])
```

Criando uma matriz com 10 elementos sequenciais

In [5]:
```
np.arange(0,10)
```

Out[5]:
```
array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
```

Criando uma matriz com intervalo fixo entre os valores

In [7]:
```
np.arange(0,10,2)
```

Out[7]:
```
array([0, 2, 4, 6, 8])
```

Criando uma matriz de zeros

In [8]:
```
np.zeros((5,5))
```

Out[8]:
```
array([[0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0.]])
```

Matriz com uns

In [6]:
```
np.ones((2,4))
```

Out[6]:
```
array([[1., 1., 1., 1.],
       [1., 1., 1., 1.]])
```

Operacoes básicas: Numpy

Números aleatórios

In [7]:
```
np.random.seed(128)
arr = np.random.randint(0,100,10)
```

In [8]:
```
arr
```

Out[8]:
```
array([82, 83, 82, 10, 34, 84, 57, 21, 75, 16])
```

In [9]:
```
arr2 = np.random.randint(0,100,10)
```

In [10]:
```
arr2
```

Out[10]:
```
array([48, 55, 47, 69, 42,  9,  0, 44, 27, 22])
```

Obter o maior e menor valor de uma matriz

In [11]:
```
arr.max()
```

Out[11]:
```
84
```

In [12]:
```
arr.min()
```

Out[12]:
```
10
```

Obter o índice do maior e menor valor da matriz

In [13]:
```
arr.argmax()
```

Out[13]:
```
5
```

In [14]:
```
arr.argmin()
```

Out[14]:
```
3
```

Média, desvio padrão e soma da matriz

In [15]:
```
arr.mean()
```

Out[15]:
```
54.4
```

In [16]:
```
arr.std()
```

Out[16]:
```
29.37073373274832
```

In [17]:
```
arr.sum()
```

Out[17]:
```
544
```

Redimensionamento da matriz

In [18]:
```
arr.reshape(2,5)
```

Out[18]:
```
array([[82, 83, 82, 10, 34],
       [84, 57, 21, 75, 16]])
```

In [19]:
```
arr_extend = np.append(arr, arr2)
arr_extend
```

Out[19]:
```
array([82, 83, 82, 10, 34, 84, 57, 21, 75, 16, 48, 55, 47, 69, 42,  9,  0,
       44, 27, 22])
```

In [20]:
```
len(arr_extend)
```

Out[20]:
```
20
```

In [21]:
```
arr_extend = arr_extend.reshape(4,5)
arr_extend
```

Out[21]:
```
array([[82, 83, 82, 10, 34],
       [84, 57, 21, 75, 16],
       [48, 55, 47, 69, 42],
       [ 9,  0, 44, 27, 22]])
```

In [22]:
```
len(arr_extend)
```

Out[22]:
```
4
```

In [23]:
```
arr_extend.shape, arr_extend.ndim
```

Out[23]:
```
((4, 5), 2)
```

In [24]:
```
arr_3d = arr_extend.reshape(4,5,1)
arr_3d
```

Out[24]:
```
array([[[82],
        [83],
        [82],
        [10],
        [34]],

       [[84],
        [57],
        [21],
        [75],
        [16]],

       [[48],
        [55],
        [47],
        [69],
        [42]],

       [[ 9],
        [ 0],
        [44],
        [27],
        [22]]])
```

In [25]:
```
arr_3d.shape, arr_3d.ndim
```

Out[25]:
```
((4, 5, 1), 3)
```

In [26]:
```
arr_3d = arr_extend.reshape(2,5,2)
arr_3d
```

Out[26]:
```
array([[[82, 83],
        [82, 10],
        [34, 84],
        [57, 21],
        [75, 16]],

       [[48, 55],
        [47, 69],
        [42,  9],
        [ 0, 44],
        [27, 22]]])
```

Indexação de uma matriz

In [27]:
```
matriz = np.arange(0,100).reshape(10,10)
```

In [28]:
```
matriz
```

Out[28]:
```
array([[ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9],
       [10, 11, 12, 13, 14, 15, 16, 17, 18, 19],
       [20, 21, 22, 23, 24, 25, 26, 27, 28, 29],
       [30, 31, 32, 33, 34, 35, 36, 37, 38, 39],
       [40, 41, 42, 43, 44, 45, 46, 47, 48, 49],
       [50, 51, 52, 53, 54, 55, 56, 57, 58, 59],
       [60, 61, 62, 63, 64, 65, 66, 67, 68, 69],
       [70, 71, 72, 73, 74, 75, 76, 77, 78, 79],
       [80, 81, 82, 83, 84, 85, 86, 87, 88, 89],
       [90, 91, 92, 93, 94, 95, 96, 97, 98, 99]])
```

In [29]:
```
linha = 3
coluna = 5
```

In [30]:
```
matriz[linha, coluna]
```

Out[30]:
```
35
```

In [31]:
```
matriz[:,coluna]
```

Out[31]:
```
array([ 5, 15, 25, 35, 45, 55, 65, 75, 85, 95])
```

In [32]:
```
matriz[linha,:]
```

Out[32]:
```
array([30, 31, 32, 33, 34, 35, 36, 37, 38, 39])
```

In [33]:
```
matriz[0:3,0:3]
```

Out[33]:
```
array([[ 0,  1,  2],
       [10, 11, 12],
       [20, 21, 22]])
```

Carregando uma imagem como matriz

In [34]:
```
import matplotlib.pyplot as plt
%matplotlib inline
from PIL import Image
```

In [35]:
```
exemplo = Image.open('static/exemplo1.jpg') #carregando a imagem
exemplo
```

Out[35]:

In [36]:
```
type(exemplo)
```

Out[36]:
```
PIL.JpegImagePlugin.JpegImageFile
```

In [37]:
```
exemplo_arr = np.asarray(exemplo) # converter em matriz
exemplo_arr.shape # verificar as dimensoes das matrizes
```

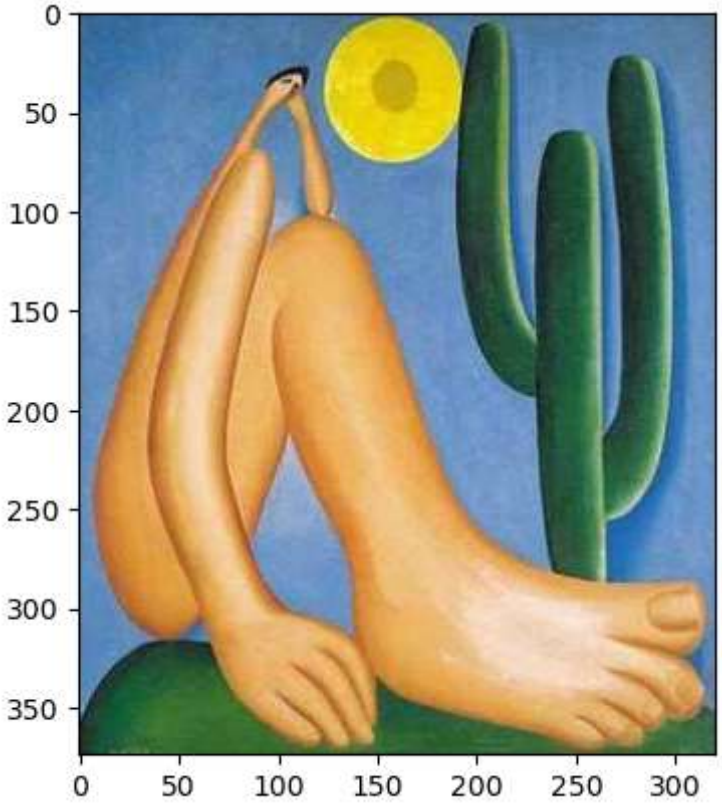
Out[37]:
```
(374, 320, 3)
```

In [38]:
```
exemplo_arr #verificar a matriz
```

Out[38]:
```
array([[[ 67, 105, 142],
        [ 68, 106, 143],
        [ 68, 106, 143],
        ...,
        [ 85, 121, 145],
        [ 85, 121, 145],
        [ 85, 121, 145]],

       [[ 65, 103, 140],
        [ 67, 105, 142],
        [ 67, 105, 142],
        ...,
        [ 90, 126, 150],
        [ 90, 126, 150],
        [ 90, 126, 150]],

       [[ 64, 102, 139],
        [ 66, 104, 141],
        [ 65, 105, 141],
        ...,
        [ 91, 127, 151],
        [ 91, 127, 151],
        [ 91, 127, 151]],

       ...,

       [[ 24,  52,  40],
        [ 29,  55,  44],
        [ 32,  58,  47],
        ...,
        [ 64, 111,  77],
        [ 63, 110,  76],
        [ 60, 107,  73]],

       [[ 22,  50,  38],
        [ 26,  52,  41],
        [ 30,  56,  45],
        ...,
        [ 64, 111,  77],
        [ 62, 109,  75],
        [ 59, 106,  72]],

       [[ 19,  47,  35],
        [ 24,  50,  39],
        [ 27,  53,  42],
        ...,
        [ 67, 114,  80],
        [ 64, 111,  77],
        [ 60, 107,  73]]], dtype=uint8)
```

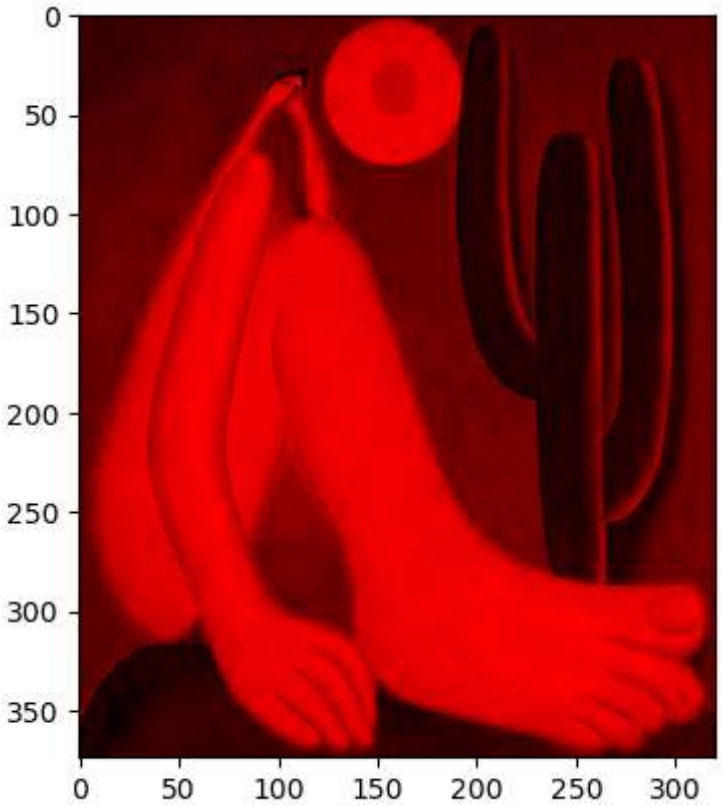
In [39]:
```
plt.imshow(exemplo_arr)
```

Out[39]:
```
<matplotlib.image.AxesImage at 0x242b9cb8350>
```



In [40]:
```
exemplo_vermelho = exemplo_arr.copy()
exemplo_vermelho[:, :, 1] = 0    # todos os valores da dimensao 1 = 0 (verde)
exemplo_vermelho[:, :, 2] = 0    # todos os valores da dimensao 2 = 0 (azul)
plt.imshow(exemplo_vermelho)
```

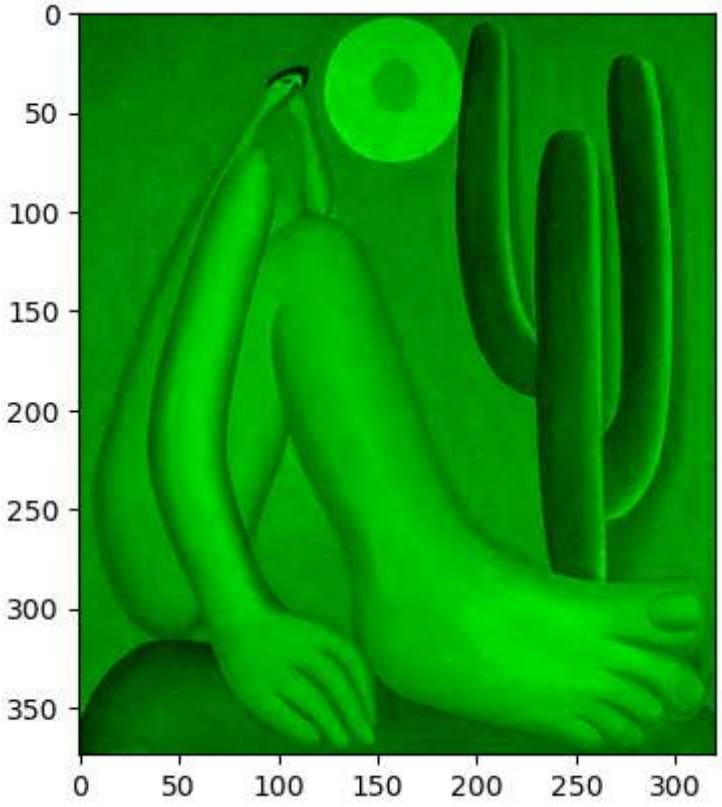
Out[40]:
```
<matplotlib.image.AxesImage at 0x242b9d1b710>
```



In [41]:
```
exemplo_verde = exemplo_arr.copy()
exemplo_verde[:, :, 0] = 0    # todos os valores da dimensao 0 = 0 (vermelho)
```

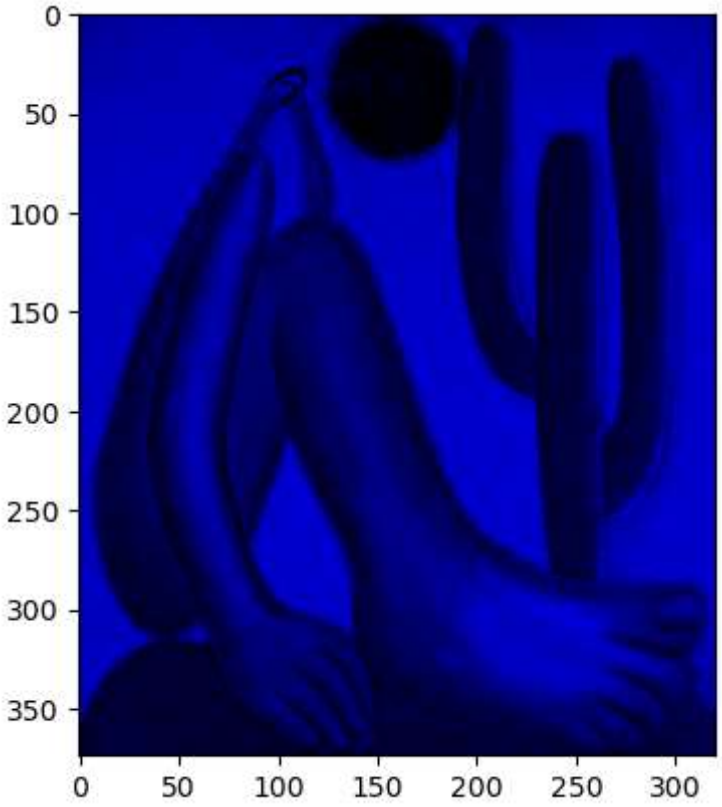
```
exemplo_verde[:, :, 2] = 0    # todos os valores da dimensao 2 = 0 (azul)
plt.imshow(exemplo_verde)
```

Out[41]: <matplotlib.image.AxesImage at 0x242bb523f10>



In [42]:
```
exemplo_azul = exemplo_arr.copy()
exemplo_azul[:, :, 0] = 0    # todos os valores da dimensao 0 = 0 (vermelho)
exemplo_azul[:, :, 1] = 0    # todos os valores da dimensao 1 = 0 (verde)
plt.imshow(exemplo_azul)
```

Out[42]: <matplotlib.image.AxesImage at 0x242bb600390>

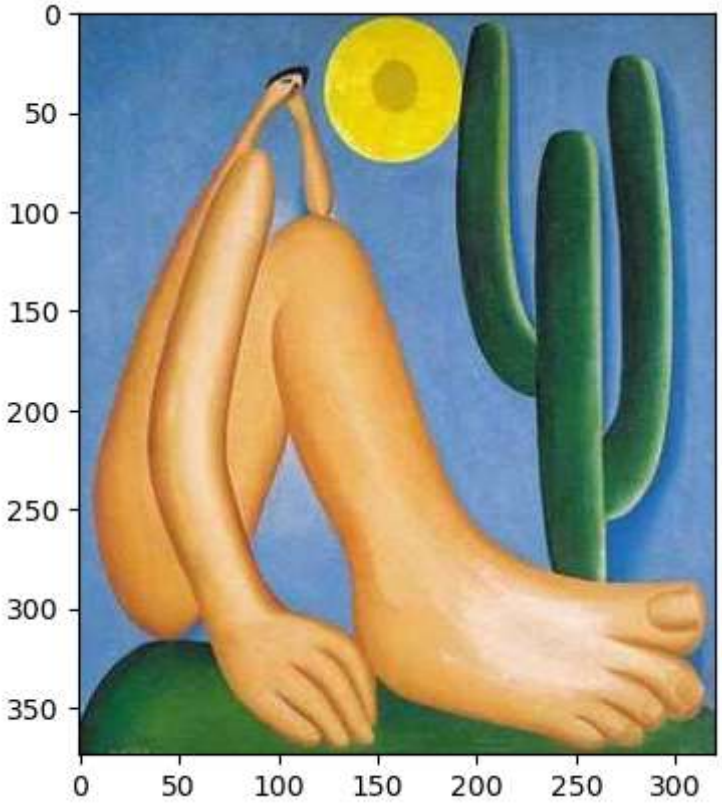


In [43]:
```
arr_normal = exemplo_arr/255 #normalizar a matriz
arr_normal
```

Out[43]:
```
array([[[0.2627451 , 0.41176471, 0.55686275],
        [0.26666667, 0.41568627, 0.56078431],
        [0.26666667, 0.41568627, 0.56078431],
        ...,
        [0.33333333, 0.4745098 , 0.56862745],
        [0.33333333, 0.4745098 , 0.56862745],
        [0.33333333, 0.4745098 , 0.56862745]],

       [[0.25490196, 0.40392157, 0.54901961],
        [0.2627451 , 0.41176471, 0.55686275],
        [0.2627451 , 0.41176471, 0.55686275],
        ...,
        [0.35294118, 0.49411765, 0.58823529],
        [0.35294118, 0.49411765, 0.58823529],
        [0.35294118, 0.49411765, 0.58823529]],

       [[0.25098039, 0.4       , 0.54509804],
        [0.25882353, 0.40784314, 0.55294118],
        [0.25490196, 0.41176471, 0.55294118],
        ...,
        [0.35686275, 0.49803922, 0.59215686],
        [0.35686275, 0.49803922, 0.59215686],
        [0.35686275, 0.49803922, 0.59215686]],

       ...,

       [[0.09411765, 0.20392157, 0.15686275],
        [0.11372549, 0.21568627, 0.17254902],
        [0.1254902 , 0.22745098, 0.18431373],
        ...,
        [0.25098039, 0.43529412, 0.30196078],
        [0.24705882, 0.43137255, 0.29803922],
        [0.23529412, 0.41960784, 0.28627451]],

       [[0.08627451, 0.19607843, 0.14901961],
        [0.10196078, 0.20392157, 0.16078431],
        [0.11764706, 0.21960784, 0.17647059],
        ...,
        [0.25098039, 0.43529412, 0.30196078],
        [0.24313725, 0.42745098, 0.29411765],
        [0.23137255, 0.41568627, 0.28235294]],

       [[0.0745098 , 0.18431373, 0.1372549 ],
        [0.09411765, 0.19607843, 0.15294118],
        [0.10588235, 0.20784314, 0.16470588],
        ...,
        [0.2627451 , 0.44705882, 0.31372549],
        [0.25098039, 0.43529412, 0.30196078],
        [0.23529412, 0.41960784, 0.28627451]]])
```

In [44]:
```
plt.imshow(arr_normal)
```

Out[44]:
```
<matplotlib.image.AxesImage at 0x242bb670390>
```


0
50
100
150
200
250
300
350
0
50
100
150
200
250
300