

# Procesare imagini Python

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## 1 OpenCV in Python

### 1.1 Citim o imagine si o afisam intr-o fereastră

```
In [1]: import cv2
```

```
#citim o imagine si aflam de la aceasta lungimea x inaltimea x numarul de canale
im = cv2.imread('D:/pic.jpg')
h, w, c = im.shape #intai inaltimea

#afisam in doua moduri valorile obtinute mai sus
print('w = {}, h = {}, c = {}'.format(w, h, c))
print('w =', w, 'h =', h, 'c =', c)

'''
Afisam imaginea intr-o fereastră separata.
Fereastră se inchide dupa 5 secunde.
Celula curenta nu isi va incheia executia pana nu se inchide fereastră cu imaginea
'''

cv2.imshow('Poza noastra', im)
cv2.waitKey(5000)
cv2.destroyAllWindows() #ne asiguram ca se inchide fereastră
```

```
w = 2500, h = 1000, c = 3
w = 2500 h = 1000 c = 3
```

### 1.2 Salvarea unei imagini cu extensia dorita

```
In [13]: cv2.imwrite('D:/im.tif', im)
```

```
Out[13]: True
```

### 1.3 Accesam valorile unor pixeli din imagine

In [6]: #In OpenCV avem canalele in ordinea Blue, Ggreen, Red

```
b, g, r = im[10, 20]
print('b = {}, g = {}, r = {}'.format(b, g, r))

#Afisam valorile pentru ultimii 16 pixeli din imagine
for i in range(h):
    for j in range(w):
        b, g, r = im[i, j]
        if i > h - 5 and j > w - 5:
            print('i = {}, j = {}, b = {}, g = {}, r = {}'.format(i, j, b, g, r))
```

```
b = 20, g = 71, r = 34
i = 996, j = 2496, b = 140, g = 105, r = 19
i = 996, j = 2497, b = 141, g = 106, r = 20
i = 996, j = 2498, b = 141, g = 106, r = 20
i = 996, j = 2499, b = 142, g = 107, r = 21
i = 997, j = 2496, b = 140, g = 105, r = 19
i = 997, j = 2497, b = 141, g = 106, r = 20
i = 997, j = 2498, b = 141, g = 106, r = 20
i = 997, j = 2499, b = 142, g = 107, r = 21
i = 998, j = 2496, b = 142, g = 110, r = 21
i = 998, j = 2497, b = 142, g = 110, r = 21
i = 998, j = 2498, b = 142, g = 110, r = 21
i = 998, j = 2499, b = 143, g = 111, r = 22
i = 999, j = 2496, b = 145, g = 113, r = 24
i = 999, j = 2497, b = 144, g = 112, r = 23
i = 999, j = 2498, b = 144, g = 112, r = 23
i = 999, j = 2499, b = 143, g = 111, r = 22
```

### 1.4 Extragem o regiune de interes din imagine

In [9]: # extragem o sectiune de 100x100 pixelide la x = 200, y = 100 pana la x = 300, y = 200

```
roi = im[100:200, 200:300]
cv2.imshow("ROI", roi)
cv2.waitKey(5000)
cv2.destroyAllWindows()
```

### 1.5 Redimensionarea unei imagini

In [14]: imMica = cv2.resize(im, (300, 200)) #primul este w, apoi h  
cv2.imshow("Imaginea redimensionata", imMica)  
cv2.waitKey(5000)  
cv2.destroyAllWindows()

## 1.6 Desenarea unui patrat pe o imagine

```
In [17]: # desenam un patrat rosu cu grosimea liniei de 3 pixeli
imCopie = im.copy()
#daca vrem ca patratul sa fie plin, in loc de 3 vom pune un numar negativ, precum -1
#imagine, colt stanga-sus, colt dreapta-jos, culoare, grosime
cv2.rectangle(imCopie, (200, 100), (300, 200), (0, 0, 255), 3)
cv2.imshow("Patrat", imCopie)
cv2.waitKey(5000)
cv2.destroyAllWindows()
```

## 1.7 Desenarea unui cerc pe o imagine

```
In [21]: imCopie = im.copy()
#imagine, centru, raza, culoare, grosime
cv2.circle(imCopie, (500, 250), 50, (0, 255, 0), 5)
cv2.imshow("Cerc", imCopie)
cv2.waitKey(5000)
cv2.destroyAllWindows()
```

## 1.8 Desenarea unui linii pe o imagine

```
In [27]: imCopie = im.copy()
#imagine, (x1, y1), (x2, y2), culoare, grosime
cv2.line(imCopie, (100, 500), (500, 200), (0, 0, 255), 5)
cv2.imshow("Linie", imCopie)
cv2.waitKey(5000)
cv2.destroyAllWindows()
```

## 1.9 Scriere de text pe o imagine

```
In [36]: imCopie = im.copy()
#imagine, text, (x, y), font, marime font, culoare, grosime
cv2.putText(imCopie, "Functioneaza!", (200, 100),
            cv2.FONT_HERSHEY_SIMPLEX, 1.5, (0, 0, 255), 3)
cv2.imshow("Text", imCopie)
cv2.waitKey(5000)
cv2.destroyAllWindows()
```

# 2 Matplotlib pentru imagini

## 2.1 Citirea unei imagini

```
In [1]: %matplotlib inline
#pentru a putea afisa imaginile in interiorul acestui notebook
#(nu intr-o fereastră separata, ca la OpenCV)
import matplotlib.pyplot as plt #interfata pentru afisare de imagini
import matplotlib.image as mpimg #incarcare de imagini
```

```

import numpy as np # pentru lucrul cu arrays

img = mpimg.imread('D:/pic.jpg')
#afisam valorile pixelilor
print(img)

[[[ 41 105  19]
  [ 24  82   5]
  [ 13  65   1]
  ...
  [ 12  34 179]
  [ 12  34 179]
  [ 12  34 179]]

[[[ 33  96  15]
  [ 21  82   5]
  [ 19  75   4]
  ...
  [ 12  34 179]
  [ 12  34 179]
  [ 12  34 179]]

[[[ 11  73   0]
  [ 24  86   9]
  [ 57 118  38]
  ...
  [ 10  35 179]
  [ 10  35 179]
  [ 10  35 179]]

...

[[[107 101  89]
  [107 101  89]
  [110 104  92]
  ...
  [ 20 106 141]
  [ 20 106 141]
  [ 21 107 142]]

[[[110 104  92]
  [110 104  92]
  [110 104  92]
  ...
  [ 21 110 142]
  [ 21 110 142]
  [ 22 111 143]]

```

```
[[107 101 89]
 [107 101 89]
 [108 102 90]
 ...
 [ 23 112 144]
 [ 23 112 144]
 [ 22 111 143]]]
```

## 2.2 Afisam imaginea ca poza

```
In [2]: imgplot = plt.imshow(img)
        #plt.axis('off')
        #plt.colorbar()
```



## 2.3 Salvarea unei imagini

```
In [62]: fig = plt.figure()
         imgplot = plt.imshow(img)
         plt.axis('off')
         fig.savefig('D:/im.png', bbox_inches='tight')
```

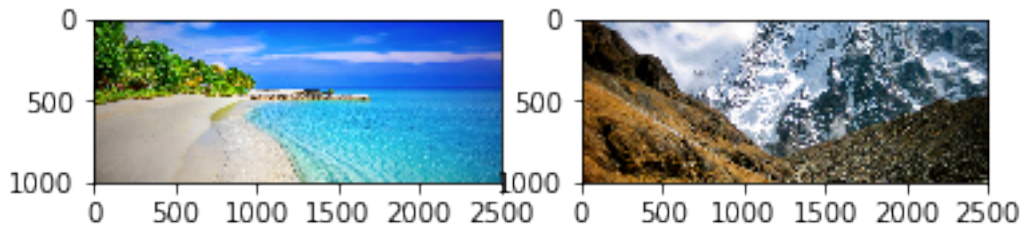


## 2.4 Afisarea a doua imaginii

```
In [7]: img2 = mpimg.imread('D:/pic2.jpg')
```

```
fig = plt.figure()
ax1 = fig.add_subplot(1,2,1) #numarul de linii, de coloane, index.
#Se putea scrie si 121 in loc de 1, 2, 1
ax1.imshow(img)
ax2 = fig.add_subplot(1,2,2)
ax2.imshow(img2)
```

```
Out [7]: <matplotlib.image.AxesImage at 0x1d13ca676a0>
```



2.5 Matplotlib este un pachet folosit indeosebi pentru a re-aliza grafice. Pentru numeroase exemple, vizitati pagina: [https://matplotlib.org/tutorials/introductory/sample\\_plots.html](https://matplotlib.org/tutorials/introductory/sample_plots.html)

### 3 PIL

#### 3.1 Citirea unei imagini folosind PIL

```
In [45]: from PIL import Image
```

```
imPIL = Image.open('D:/pic.jpg')

w, h = imPIL.size #aici este intai w, apoi h, spre deosebire de "shape" din OpenCV
print(imPIL.format)
print('w = {}, h = {}, mod = {}'.format(w, h, imPIL.mode))

#linia de mai jos deschide o fereastră nouă
imPIL.show()
```

JPEG

w = 2500, h = 1000, mod = RGB

#### 3.2 Pentru afisarea unei imagini citite cu PIL putem utiliza matplotlib ca mai sus

```
In [18]: plt.imshow(imPIL)
```

```
Out[18]: <matplotlib.image.AxesImage at 0x1d13cb7ada0>
```



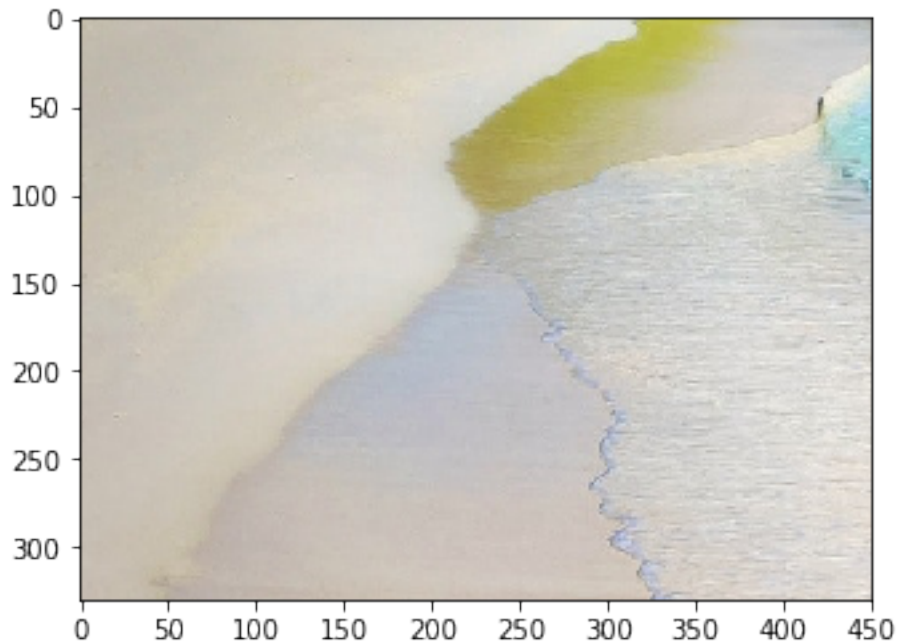
#### 3.3 Salvarea unei imagini

```
In [19]: imPIL.save('D:/imPIL.png') #putem pune diverse extensii de imagini
```

### 3.4 Regiune de interes

```
In [27]: roiPIL = imPIL.crop((500, 520, 950, 850)) #(x1, y1, x2, y2)
plt.imshow(roiPIL)
```

```
Out[27]: <matplotlib.image.AxesImage at 0x1d13dfe2048>
```



### 3.5 Accesarea pixelilor cu PIL

```
In [50]: #in cazul in care nu este RGB, este nevoie sa facem
#o conversie catre RGB imPIL = imPIL.convert('RGB')
r, g, b = imPIL.getpixel((300, 300))
```

```
print('r = {}, g = {}, b = {}'.format(r, g, b))
```

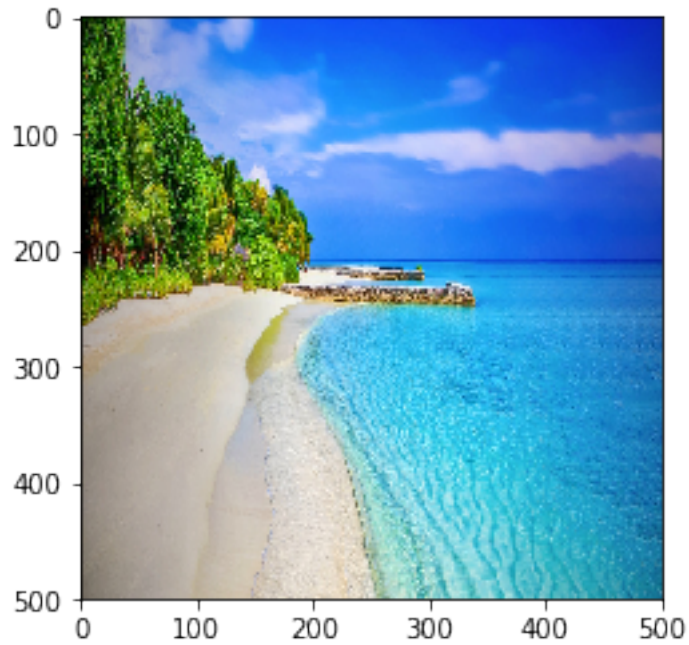
```
r = 169, g = 164, b = 44
```

### 3.6 Redimensionare

```
In [29]: micaPIL = imPIL.resize((500, 500))
plt.imshow(micaPIL)
```

```
Out[29]: <matplotlib.image.AxesImage at 0x1d141a2a7f0>
```

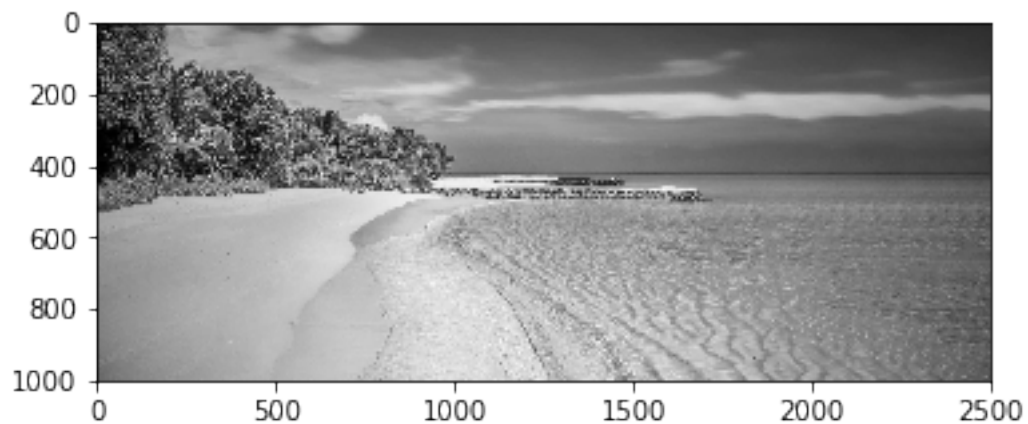




### 3.7 Convertirea la nuante de gri

```
In [30]: grayPIL = imPIL.convert('L')
plt.imshow(grayPIL)
```

Out [30]: <matplotlib.image.AxesImage at 0x1d13de7da90>



### 3.8 Transformari asupra imaginilor

```
In [41]: imRot = imPIL.rotate(45)
flip1 = imPIL.transpose(Image.FLIP_LEFT_RIGHT)
```

```

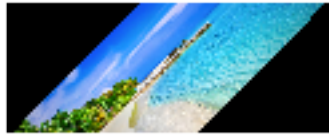
flip2 = imPIL.transpose(Image.FLIP_TOP_BOTTOM)
rot90 = im.transpose(Image.ROTATE_90)
rot180 = im.transpose(Image.ROTATE_180)
rot270 = im.transpose(Image.ROTATE_270)

fig = plt.figure()
ax1 = fig.add_subplot(3,2,1) #numarul de linii, de coloane, index.
ax1.imshow(imRot)
ax1.axis('off')
ax1.set_title('Rotire 45')
ax2 = fig.add_subplot(3, 2, 2)
ax2.imshow(flip1)
ax2.set_title('Oglindire stanga-dreapta')
ax2.axis('off')
ax3 = fig.add_subplot(3, 2, 3)
ax3.set_title('Oglindire sus-jos')
ax3.imshow(flip2)
ax3.axis('off')
ax4 = fig.add_subplot(3, 2, 4)
ax4.set_title('Rotire 90')
ax4.imshow(rot90)
ax4.axis('off')
ax5 = fig.add_subplot(3, 2, 5)
ax5.set_title('Rotire 180')
ax5.imshow(rot180)
ax5.axis('off')
ax6 = fig.add_subplot(3, 2, 6)
ax6.set_title('Rotire 270')
ax6.imshow(rot270)
ax6.axis('off')

fig.tight_layout()

```

Rotire 45



Oglindire stanga-dreapta



Oglindire sus-jos



Rotire 90



Rotire 180



Rotire 270



## 4 Transformari de la OpenCV la Matplotlib & PIL

```
In [44]: import cv2
```

```
im = cv2.imread('D:/pic.jpg')  
#trebuie sa facem trecerea de la BGR la RGB  
imPIL = cv2.cvtColor(im, cv2.COLOR_BGR2RGB)
```

```
fig = plt.figure()  
ax1 = fig.add_subplot(1,2,1)  
ax1.imshow(im)  
ax1.set_title('Varianta OpenCV')  
ax2 = fig.add_subplot(1,2,2)  
ax2.imshow(imPIL)  
ax2.set_title('Varianta PIL')
```

```
Out[44]: Text(0.5, 1.0, 'Varianta PIL')
```

