Procesare imagini Python

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Catalin Stoean
catalin.stoean@inf.ucv.ro
http://inf.ucv.ro/~cstoean

1 OpenCV in Python

1.1 Citim o imagine si o afisam intr-o fereastra

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 fereastra separata.
Fereastra se inchide dupa 5 secunde.
Celula curenta nu isi va incheia executia pana nu se inchide fereastra cu imaginea
'''

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

```
---------------------------------------------------------------------------

AttributeError                            Traceback (most recent call last)

<ipython-input-1-ea34590df1d9> in <module>()
  3 #citim o imagine si aflam de la aceasta lungimea x inaltimea x numarul de canale
  4 im = cv2.imread('D:/pic.jpg')
----> 5 h, w, c = im.shape #intai inaltimea
```

```
6
7 #afisam in doua moduri valorile obtinute mai sus


AttributeError: 'NoneType' object has no attribute 'shape'
```

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 fereastra 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()
```

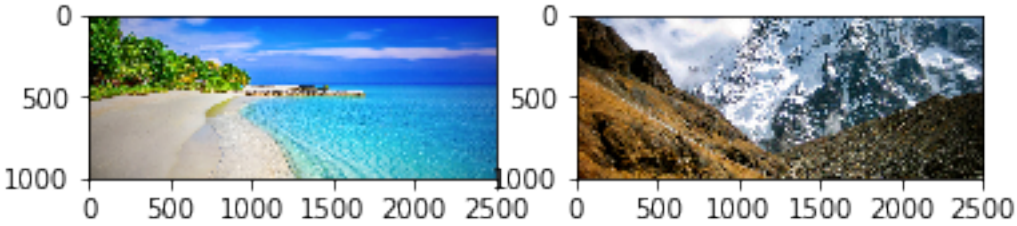
2.3 Salvarea unei imagini

```
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 imagini

```
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(122)
        ax2.imshow(img2)
```

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



2.5 Matplotlib este un pachet folosit indeosebi pentru a realiza grafice. Pentru numeroase exemple, vizitati pagina: 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 fereastra noua
         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>
```

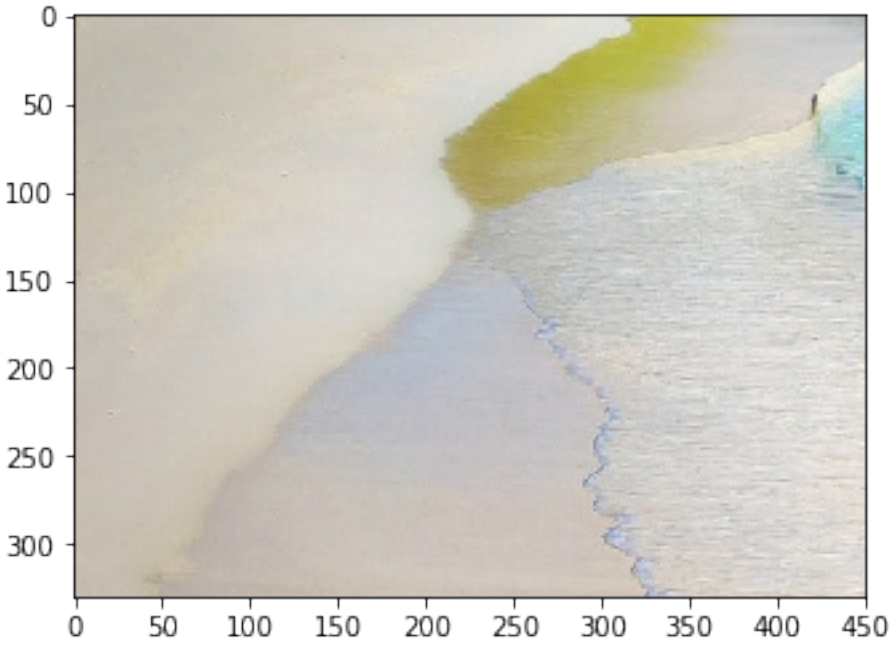
3.3 Salvarea unei imagini

```
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

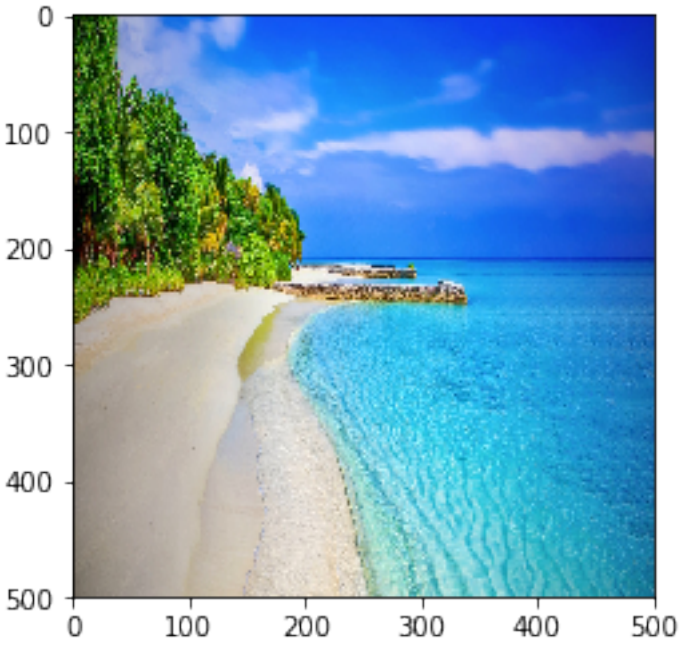
```
In [50]: #in cazul in care nu este RGB, este nevoie sa facem
         #o convertire catre RGB imPIL = imPIL.convert('RGB')
         r, g, b = imPIL.getpixel((300, 300))

         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)
```

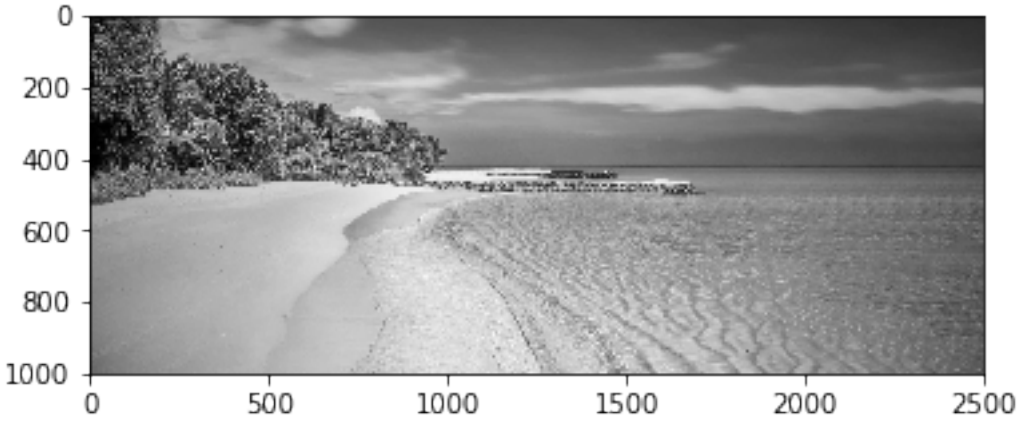
```
Out[29]: <matplotlib.image.AxesImage at 0x1d141a2a7f0>
```



3.7 Convertirea la nuante de gri

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

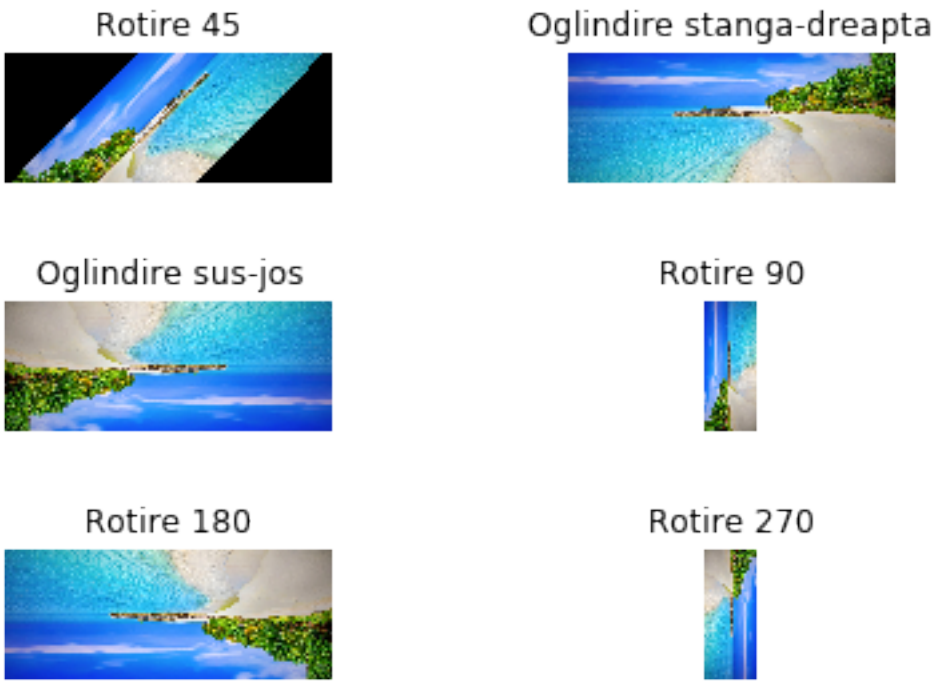
```
Out[30]: <matplotlib.image.AxesImage at 0x1d13de7da90>
```



3.8 Transformari asupra imaginilor

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

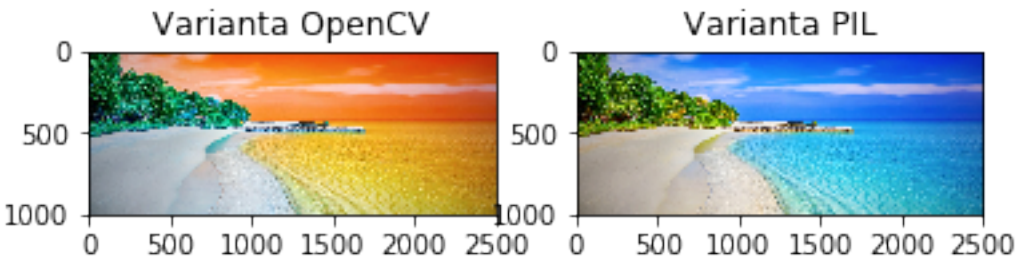
```
flip2 = imPIL.transpose(Image.FLIP_TOP_BOTTOM)
rot90 = im.transpose(Image.ROTATE_90)
rot180 = im.transpose(Image.ROTATE_180)
rot270 = im.transpose(Image.ROTATE_270)

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()
```



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(122)
ax2.imshow(imPIL)
ax2.set_title('Varianta PIL')
```

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


Varianta OpenCV
0
500
1000
0
500
1000
1500
2000
2500
Varianta PIL
0
500
1000
0
500
1000
1500
2000
2500