# Métodos Numéricos Computacionais - APS-AV2 - 2022.2


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**Links**

- Notebook na íntegra
- GitHub
- Repositório da Atividade

# Atividade

## Questão

Implemente um programa em Python no Google Colab que faça:

- Carregar uma imagem e transformá-la em um matriz de valores reais.
- Aplicar a Decomposição da matriz por Valores Singulares.
- Manter apenas os valores que representam: 60%, 70% e 80% dos Valores Singulares.
- Apresentar a imagem transformada com a aplicação do item (c).

```
import numpy as np
import matplotlib.pyplot as plt
import cv2
from numpy.linalg import svd
from PIL import Image


def compress_image(img_name,img,k):
  print("processing...")

  r=img[:,:,0]
  g=img[:,:,1]
  b=img[:,:,2]

  print("compressing...")

  ur,sr,vr=svd(r,full_matrices=False)
  ug,sg,vg=svd(g,full_matrices=False)
```

```
    ub,sb,vb=svd(b,full_matrices=False)

    print('Dimensions: {}'.format(r.shape))

    rr=np.dot(ur[:,:k],np.dot(np.diag(sr[:k]),vr[:k,:]))
    rg=np.dot(ug[:,:k],np.dot(np.diag(sg[:k]),vg[:k,:]))
    rb=np.dot(ub[:,:k],np.dot(np.diag(sb[:k]),vb[:k,:]))

    print("arranging...")

    rimg=np.zeros(img.shape)

    rimg[:,:,0]=rr
    rimg[:,:,1]=rg
    rimg[:,:,2]=rb

    for ind1, row in enumerate(rimg):
      for ind2, col in enumerate(row):
        for ind3, value in enumerate(col):
          if value < 0:
            rimg[ind1, ind2, ind3] = abs(value)
          if value > 255:
            rimg[ind1, ind2, ind3] = 255

    compressed_image=rimg.astype(np.uint8)

    plt.title("Figura Compactada: "+img_name+"\n")
    plt.imshow(compressed_image)
    plt.axis("off")
    plt.show()
    cv2.imwrite("Imagem/comp-"+str(img_name)+".jpg",compressed_image)

import numpy as np
import cv2
from matplotlib import pyplot as plt
import os
from skimage import io
from google.colab.patches import cv2_imshow


#imgLink="https://upload.wikimedia.org/wikipedia/en/7/7d/Lenna_%28test_image%29.png"
#imgLink="https://external-preview.redd.it/zODRwouzI5Li-mL_Mf6dhMQfL7hKWEi0-lFEZO8CRjc.jpg?au
imgLink="https://precious-palmier-3c3ac0.netlify.app/E-Hero-Sunrise-512x512.png"
image=io.imread(imgLink)
RGB_img = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
img=cv2.cvtColor(image, cv2.COLOR_RGB2GRAY)
alt_img=cv2.cvtColor(image,cv2.COLOR_BGRA2BGR )


print("Original")
cv2_imshow(RGB_img)
```

```
Original
```

```
print("Inverted")
cv2_imshow(image)
```

Inverted

```
print("Grayscale")
cv2_imshow(img)
```

Grayscale

```
alt_img.shape
```

```
(512, 512, 3)
```

```
k=512
compress_image("Elemental HERO Sunrise - 100%",alt_img,k)
```

```
processing...
compressing...
Dimensions: (512, 512)
arranging...
```

Figura Compactada: Elemental HERO Sunrise - 100%

```
k=int(np.ceil(0.8*512)) #k=410
compress_image("Elemental HERO Sunrise - 80%",alt_img,k)
```

```
processing...
compressing...
Dimensions: (512, 512)
arranging...
```

Figura Compactada: Elemental HERO Sunrise - 80%

```
k=int(np.ceil(0.7*512)) #k=359
compress_image("Elemental HERO Sunrise - 70%",alt_img,k)
```

```
processing...
compressing...
Dimensions: (512, 512)
arranging...
```

Figura Compactada: Elemental HERO Sunrise - 70%

```
k=int(np.ceil(0.6*512)) #k=308
compress_image("Elemental HERO Sunrise - 60%",alt_img,k)
```

```
processing...
compressing...
Dimensions: (512, 512)
arranging...
```

Figura Compactada: Elemental HERO Sunrise - 60%

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