

## Processamento Digital de Imagens(PDI)

## Relatório Transformações de Intensidade

```
import matplotlib.pyplot as plt
import numpy as np
from PIL import Image, ImageFilter

enhance_me = Image.open("enhance_me.gif")
enhance_me = enhance_me.convert("L")

enhance_me= enhance_me.filter(ImageFilter.MedianFilter(5))

fig_3_8 = Image.open("Fig0308.tif")
fig_3_8 = fig_3_8.convert("L")

def plot_result(original, transformed, *args):
    fig, ax = plt.subplots(1, len(args) + 1)
    ax[0].imshow(original, cmap="gray")
    ax[0].set_title("Original")
    for i, img in enumerate(args):
        ax[i + 1].imshow(img, cmap="gray")
        ax[i + 1].set_title(transformed[i])
    plt.show()

def process(img,transformation, *args):
    transformed = transformation(img, *args)
    plot_result(img, transformed, *args)
```

1. Aplicar a transformação logarítmica, testar vários valores para o parâmetro c”  
 $s=c \log(1+r)$ ”

A transformação logarítmica é dada da seguinte forma para cada pixel da imagem:

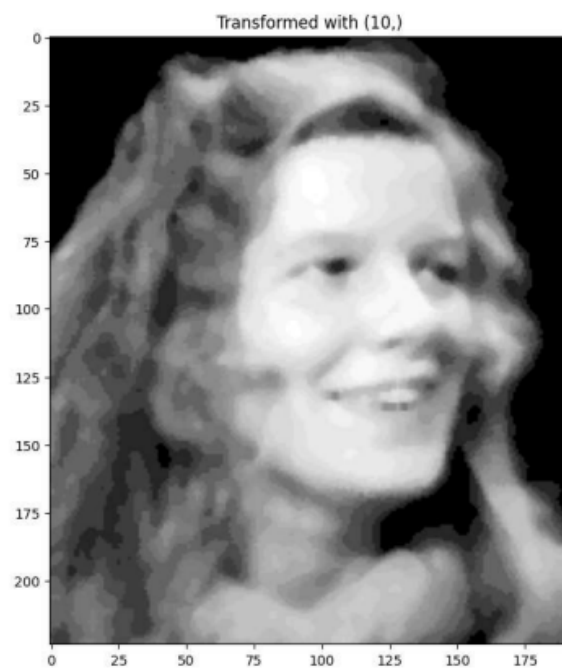
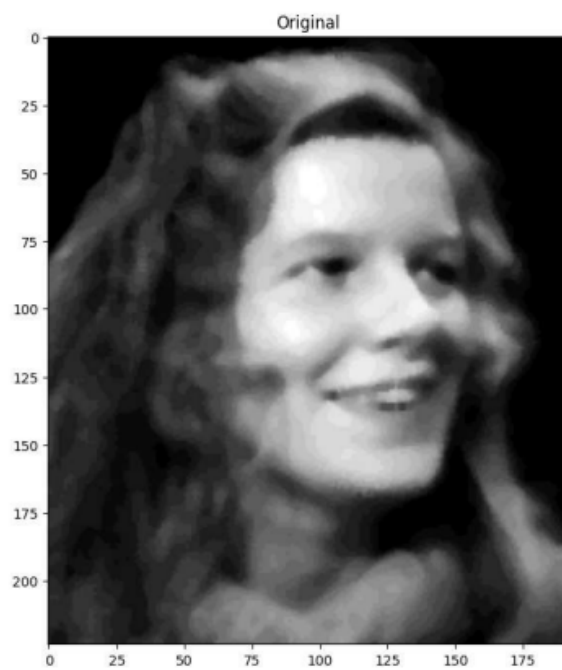
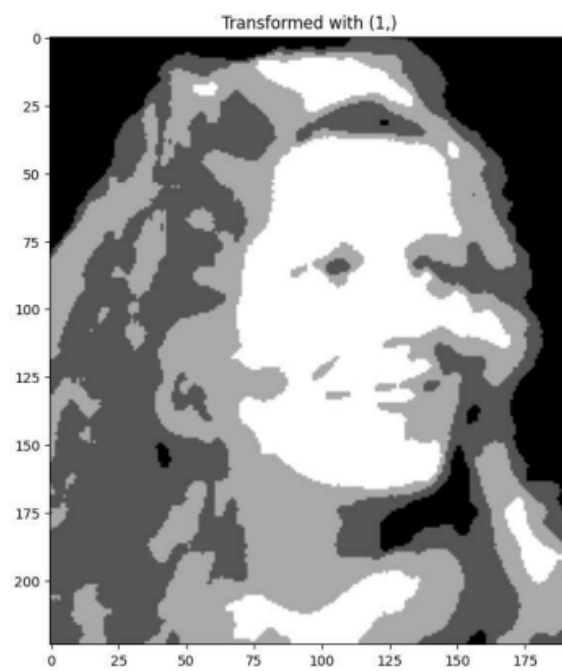
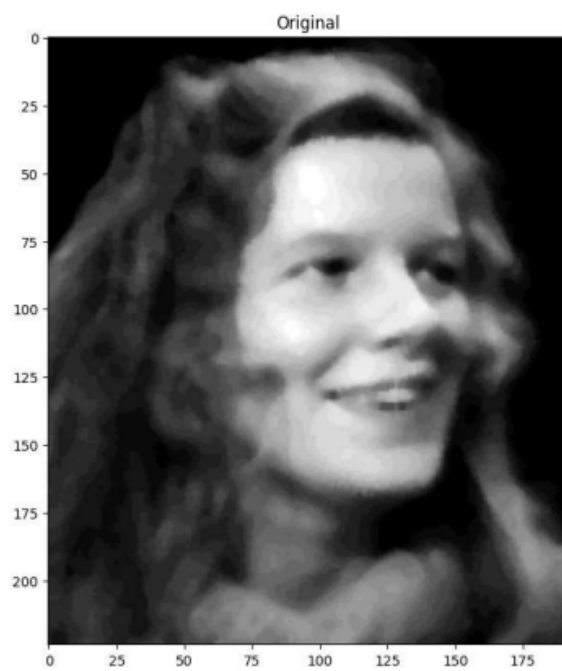
$$g(x,y) = c * \log(1 + f(x,y))$$

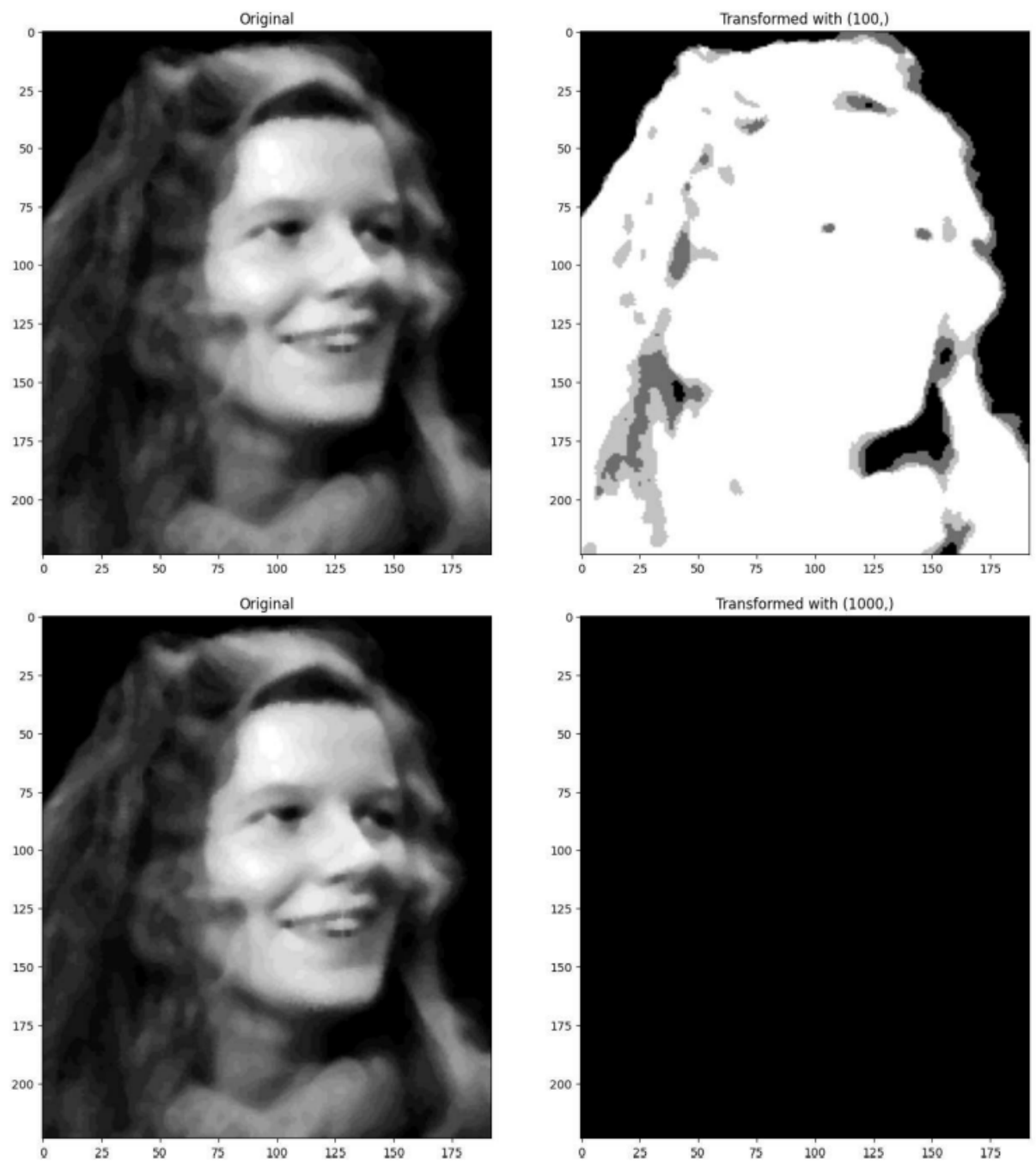
- Onde. c é um parâmetro que pode ser ajustado para melhorar o contraste da imagem.
- $f(x,y)$  é o valor do pixel na posição (x,y) da imagem original.
- $g(x,y)$  é o valor do pixel na posição (x,y) da imagem transformada.

```
def process(img,transformation, *args):
    transformed = transformation(img, *args)
    plot_result(img, transformed, *args)

def apply_log_transform(img, c):
    img = np.array(img)
    img = c * np.log2(1 + img)
    img = Image.fromarray(img.astype(np.uint8))
    return img

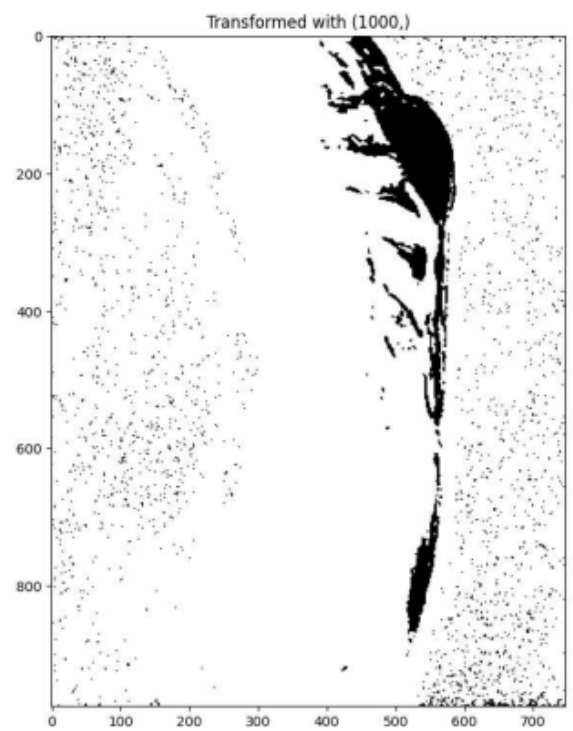
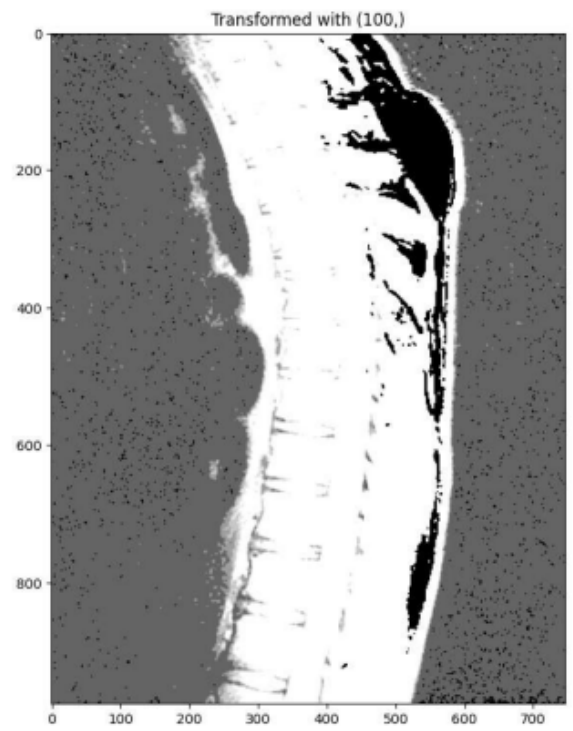
for value in [1, 10, 100, 1000]:
    process(enhance_me, apply_log_transform, value)
```





```
for value in [1, 10, 100, 1000]:  
    process(fig_3_8, apply_log_transform, value)
```





2. Aplicar a transformação de potência (gama), testar vários valores para o parâmetro  $\gamma$  e  $c=1$  "s = cry"

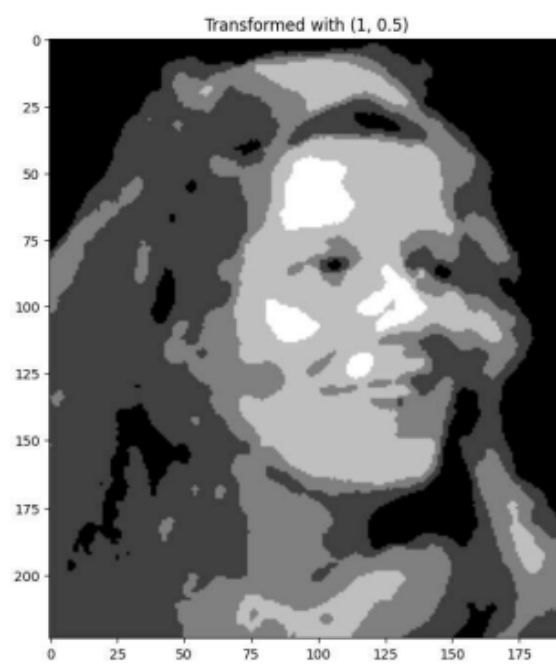
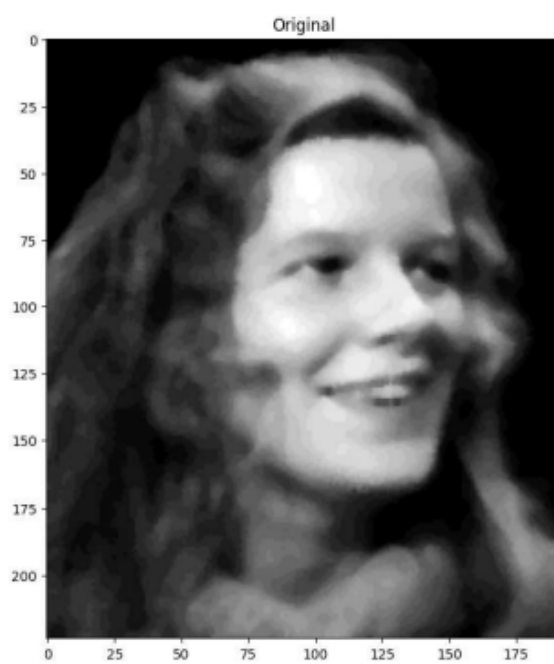
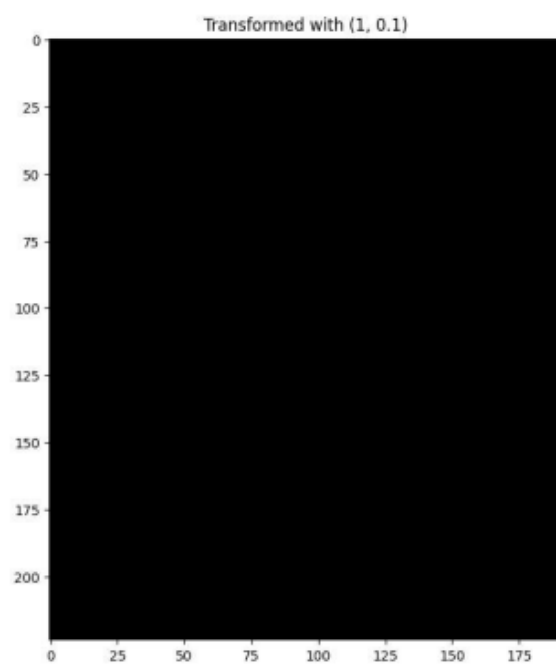
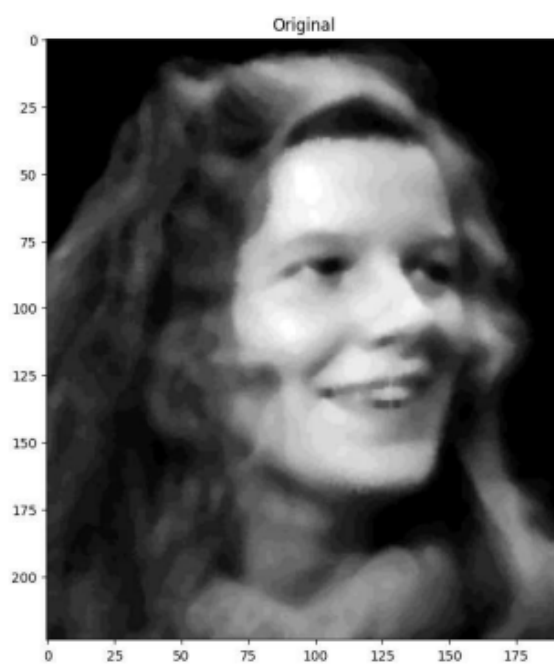
A transformação de potência é dada da seguinte forma para cada pixel da imagem:

$$g(x,y) = c * f(x,y)^\gamma$$

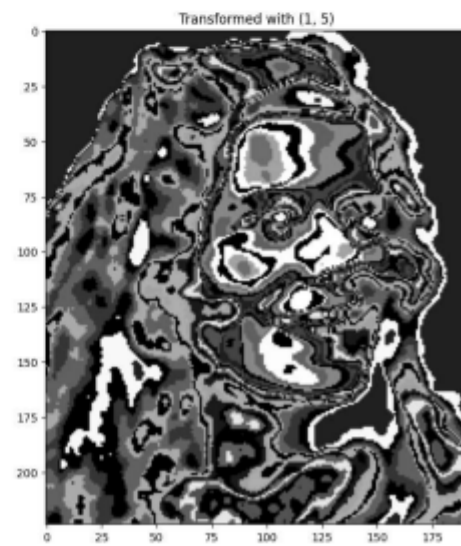
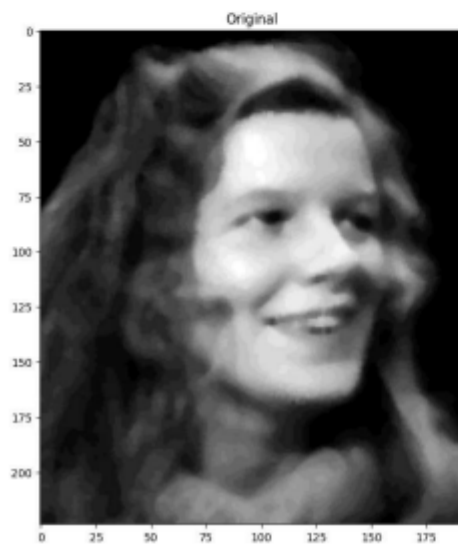
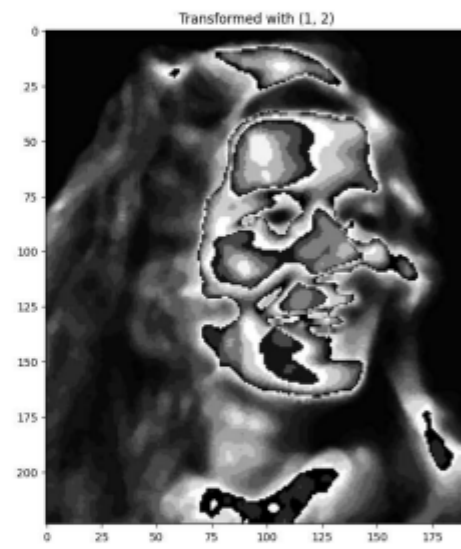
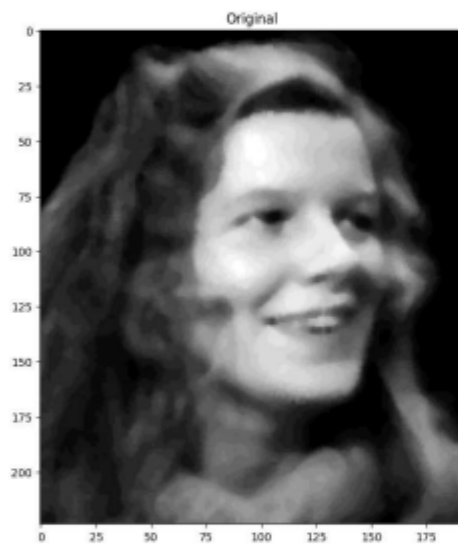
Onde.

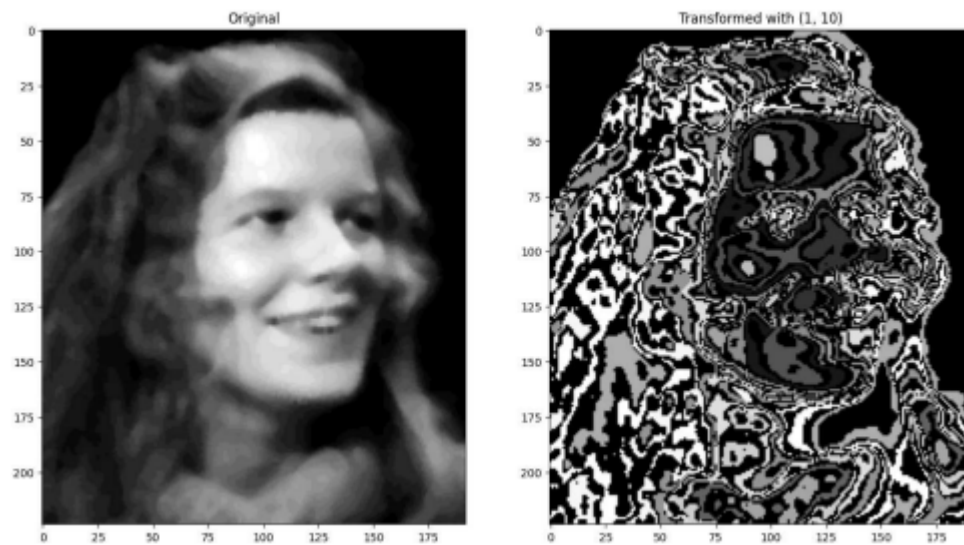
- $c$  é um parâmetro que pode ser ajustado para melhorar o contraste da imagem.
- $\gamma$  é um parâmetro que pode ser ajustado para melhorar o contraste da imagem.
- $f(x,y)$  é o valor do pixel na posição  $(x,y)$  da imagem original.
- $g(x,y)$  é o valor do pixel na posição  $(x,y)$  da imagem transformada.

```
def apply_gamma_transform(img, c, gamma):  
    img = np.array(img)  
    img = c * np.power(img, gamma)  
    img = np.clip(img, 0, 255)  
    img = Image.fromarray(img.astype(np.uint8))  
    return img  
  
for value in [0.1, 0.5, 1, 2, 5, 10]:  
    process(enhance_me, apply_gamma_transform, value, 0.4)
```









```
for value in [0.1, 0.5, 1, 2, 5, 10]:  
    process(fig_3_8, apply_gamma_transform, value, 0.4)
```

