

Transformação de Intensidade e Filtragem Espacial

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Programa de Pós-Graduação em Engenharia Elétrica - PPGEE

Disciplina: Processamento Digital de Imagens

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1 Introdução

2 Fundamentação Teórica

- Correção *Gamma*
- Binarização
- *bits* menos significativos (LSB) e *bits* mais significativos (MSB)
- Histograma
- Métricas

3 Metodologia

4 Resultados

5 Conclusão



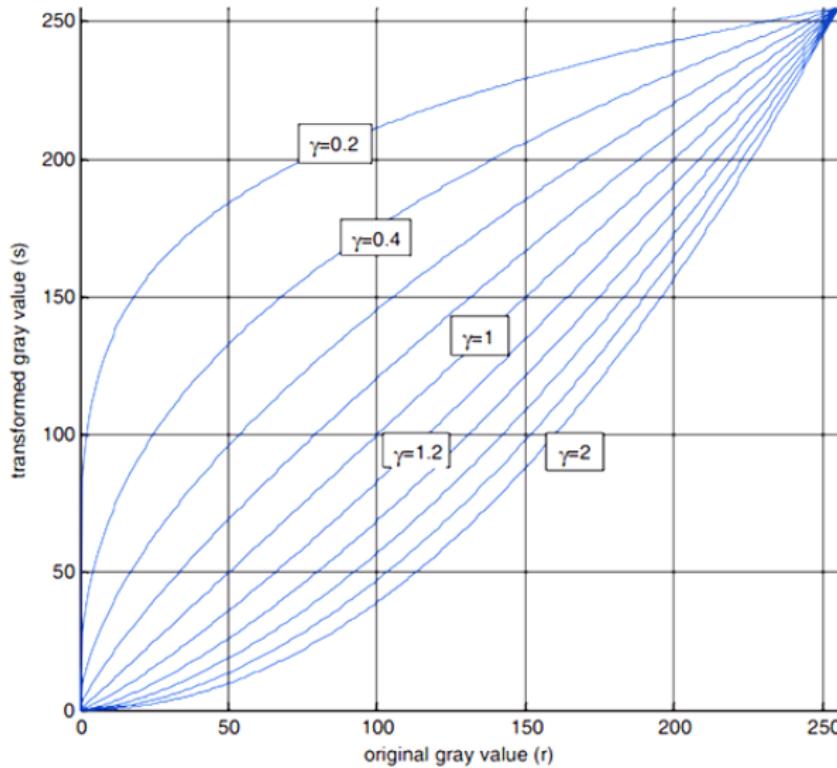
Introdução

- Informações ocultas;
- Segmentação;
- Não proposital: Correção *Gamma* e binarização;
- Proposital: LSB e MSB.



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Fundamentação Teórica - Correção Gamma

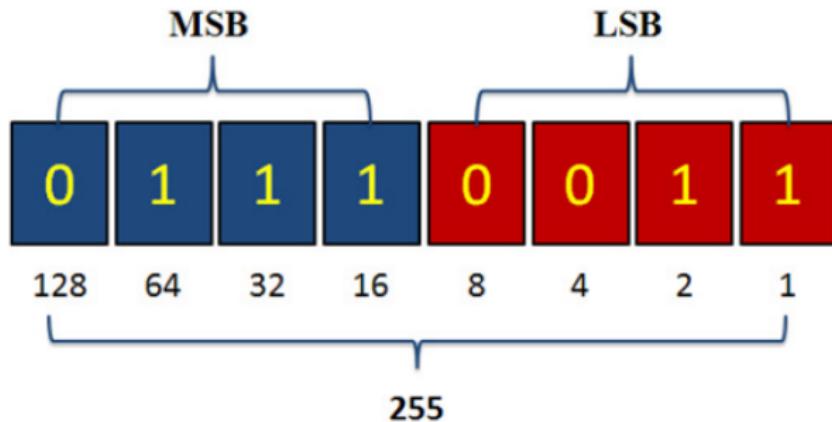


Fundamentação Teórica - Binarização

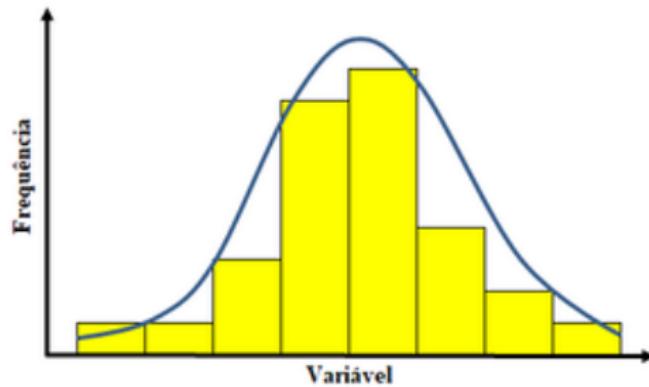
- Por Limiar;
- Por Otsu.



Fundamentação Teórica - LSB e MSB



Fundamentação Teórica - Histograma



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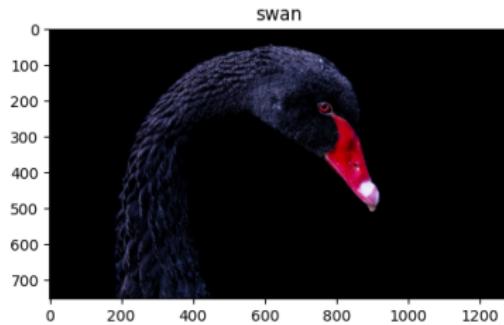
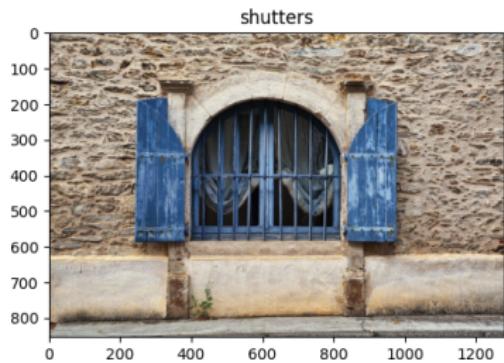
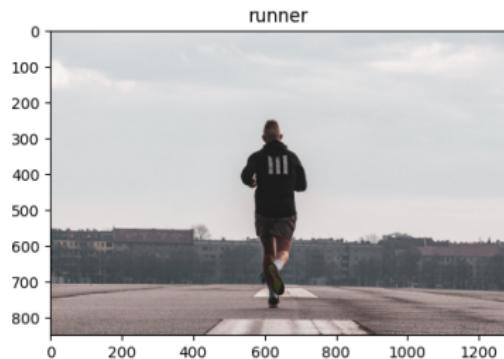
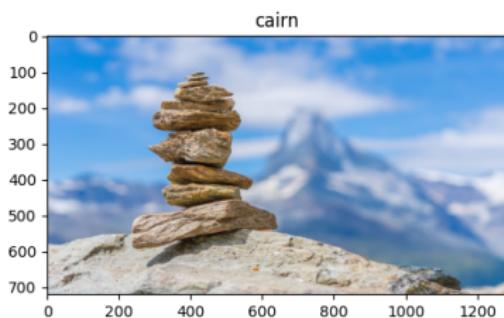
Fundamentação Teórica - Métricas

- PSNR;
- SSIM.

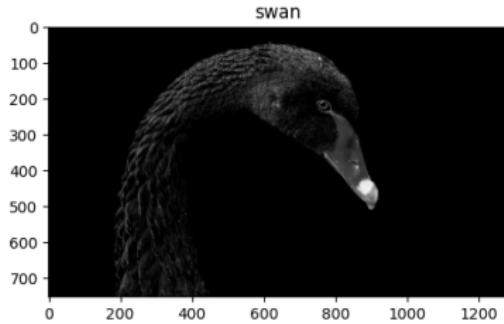
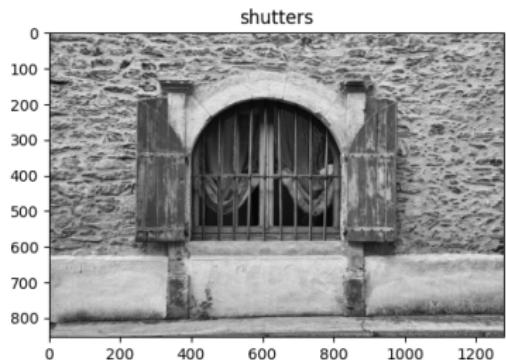
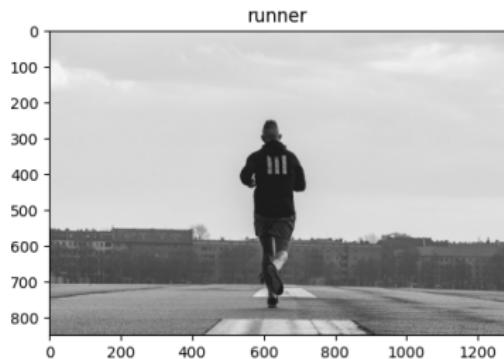
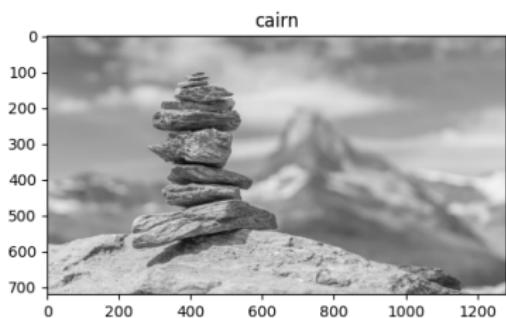


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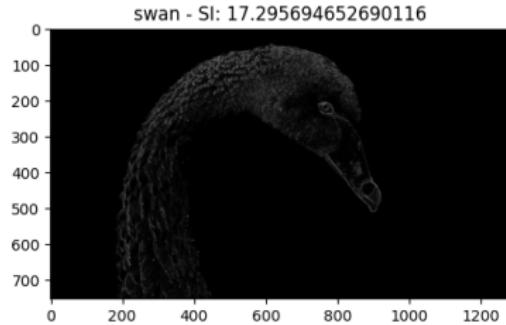
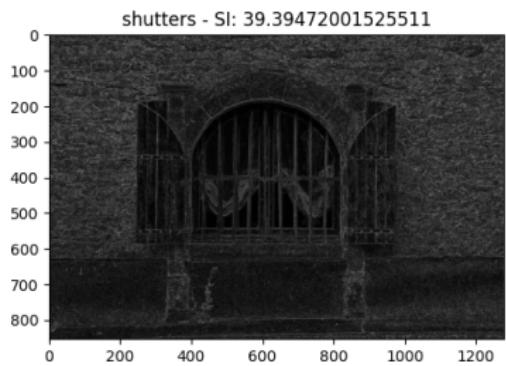
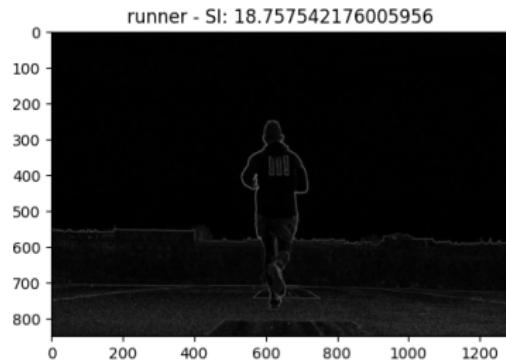
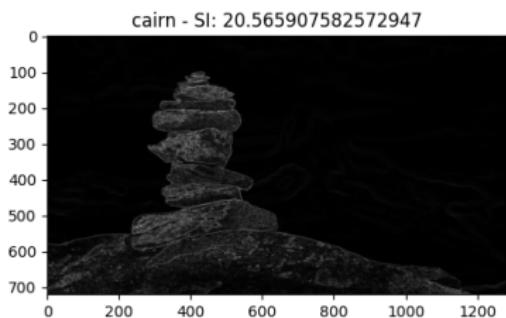
Metodologia - Imagens Originais em RGB



Metodologia - Imagens Originais em Tons de Cinza



Metodologia - Informação Espacial



Metodologia - Ambiente Google Colab/Python

The screenshot shows a Google Colab notebook interface. The title bar says 'pdi_projeto02.ipynb - Colab'. The toolbar includes standard browser controls like back, forward, search, and a refresh button. Below the toolbar is a navigation bar with icons for file operations, sharing, and settings. The main workspace contains the following code:

```
import cv2 # OpenCV
import numpy as np
from skimage.metrics import structural_similarity as ssim
from skimage.metrics import peak_signal_noise_ratio as psnr
import os
from matplotlib import pyplot as plt
from google.colab.patches import cv2_imshow

[1] from google.colab import drive
drive.mount('/content/drive')

Mounted at /content/drive

[2] imgs_dir = '/content/drive/MyDrive/PDI/projeto01/imagens/originais/'

[3] #função de Informação Espacial

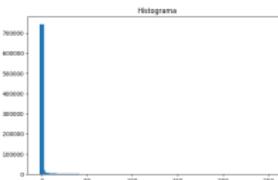
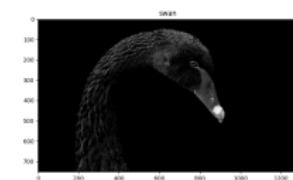
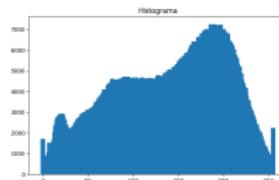
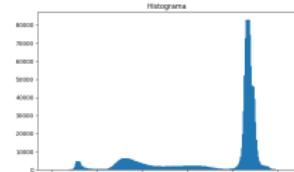
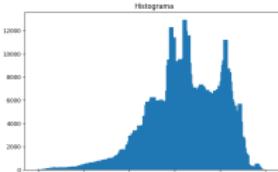
def Inf_spatial(img_grayscale):
    sh = cv2.Sobel(img_grayscale, cv2.CV_64F, 1, 0, ksize = 1)
    sv = cv2.Sobel(img_grayscale, cv2.CV_64F, 0, 1, ksize = 1)
```

The code cell [1] outputs the message 'Mounted at /content/drive'. The code cell [2] defines the directory 'imgs_dir' as '/content/drive/MyDrive/PDI/projeto01/imagens/originais/'. The code cell [3] defines a function 'Inf_spatial' that takes an image in grayscale and applies two Sobel filters to it.

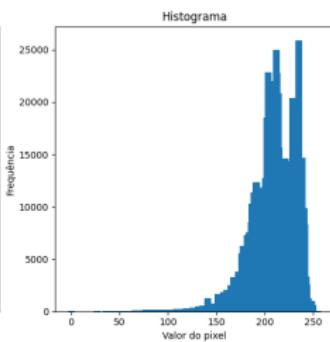
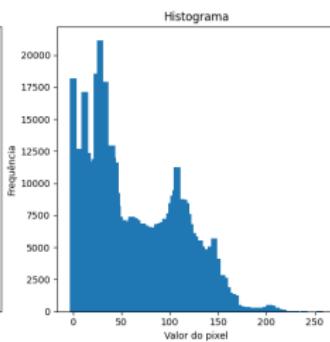
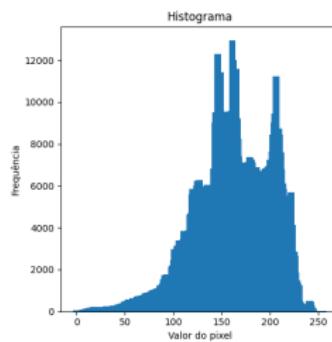


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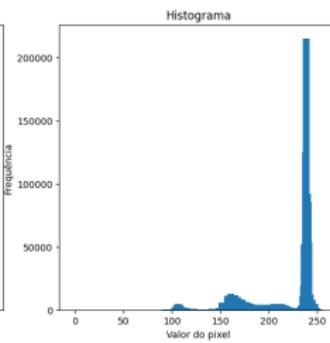
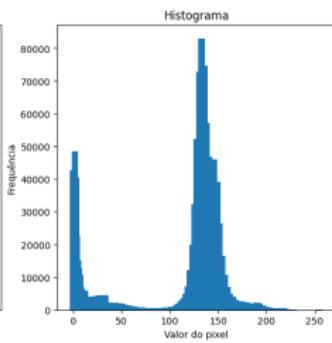
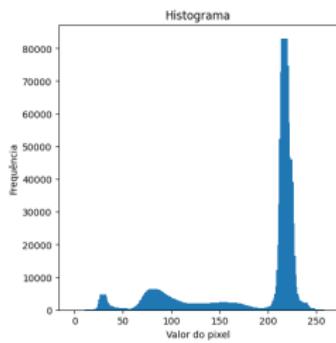
Resultados - Histograma das Imagens Originais



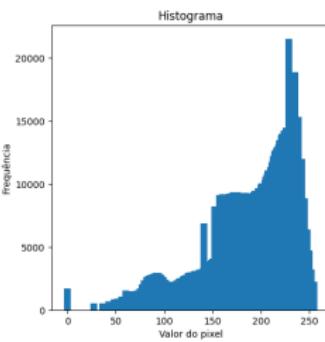
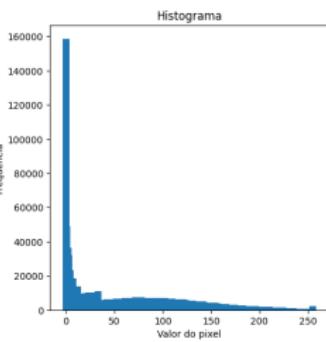
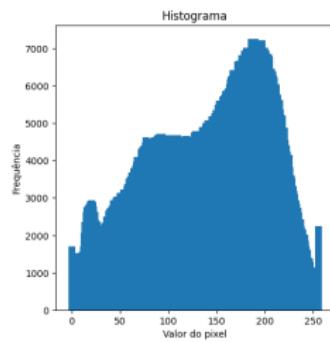
Resultados - Transformação de Intensidade



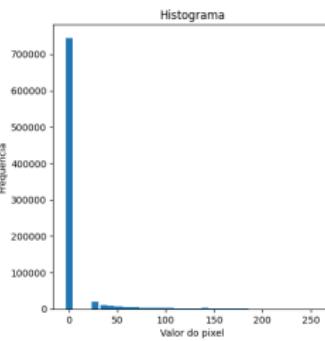
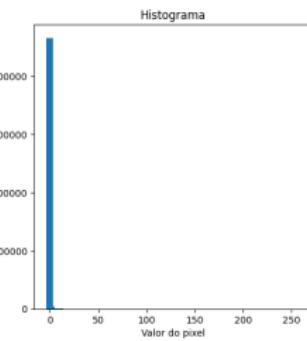
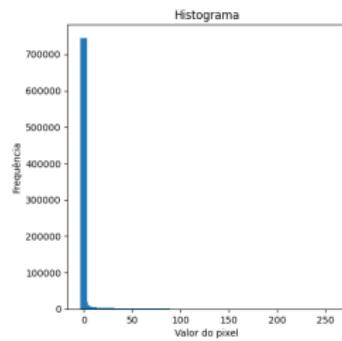
Resultados - Transformação de Intensidade



Resultados - Transformação de Intensidade



Resultados - Transformação de Intensidade



Resultados - Binarização



Resultados - Binarização

Imagen original



Binarização por limiar = 127

Imagem com valor de Gamma: 0.25



Binarização por limiar = 127

Imagen com valor de Gamma: 2.5



Binarização por limiar = 127

Binarização por otsu = 154.0



Binarização por otsu = 75,0



Binarização por otsu = 199.0

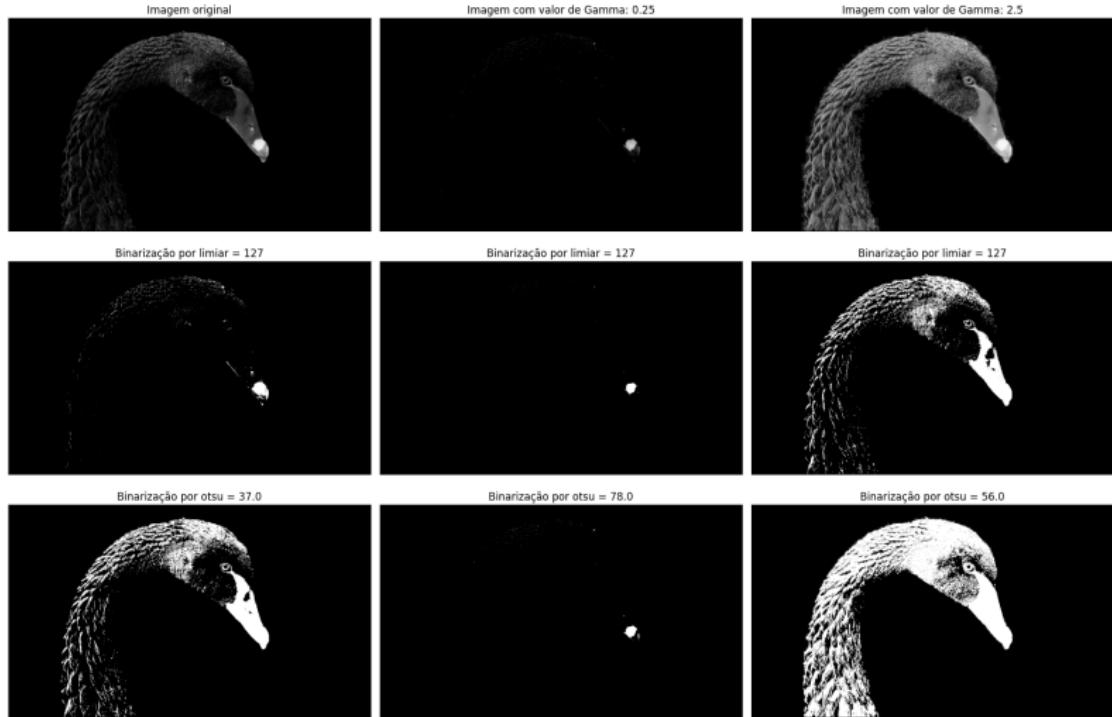


Resultados - Binarização

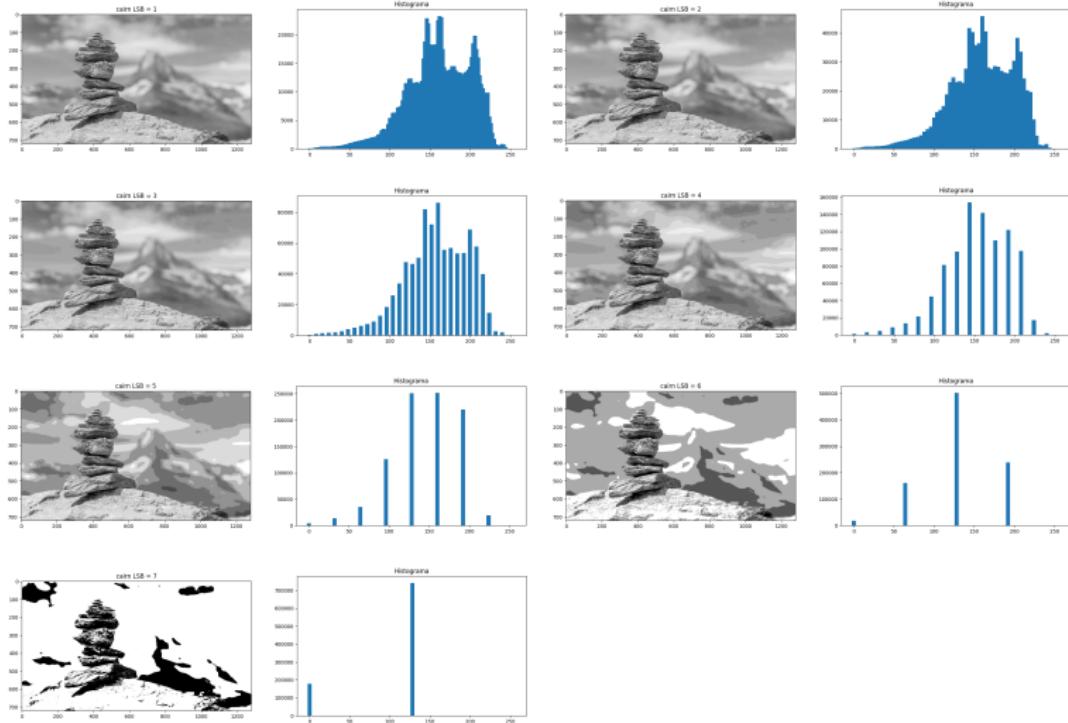


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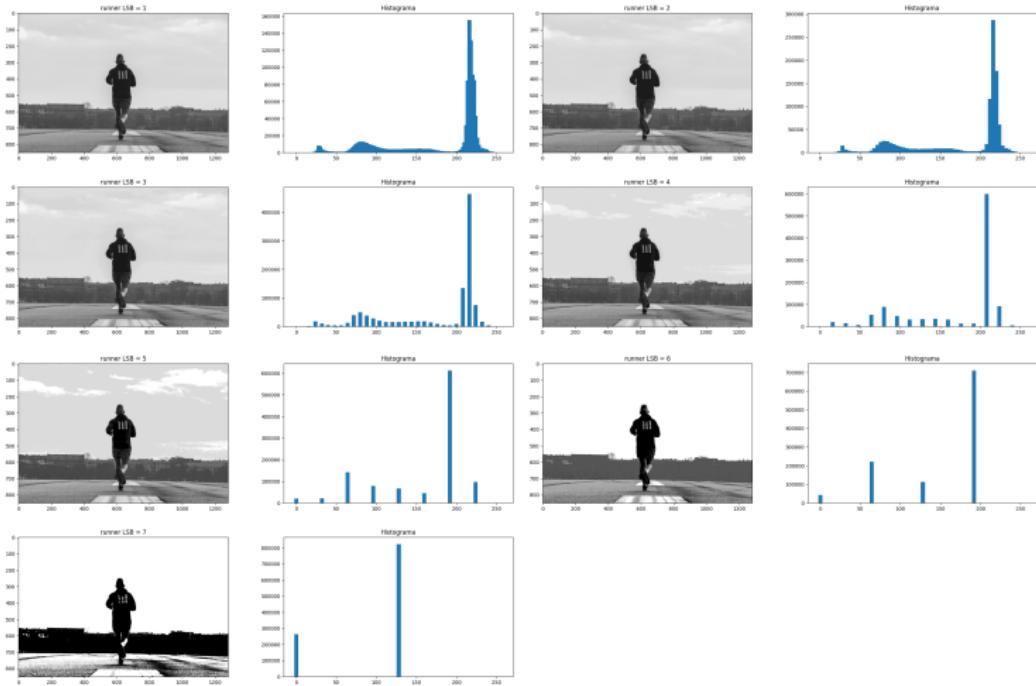
Resultados - Binarização



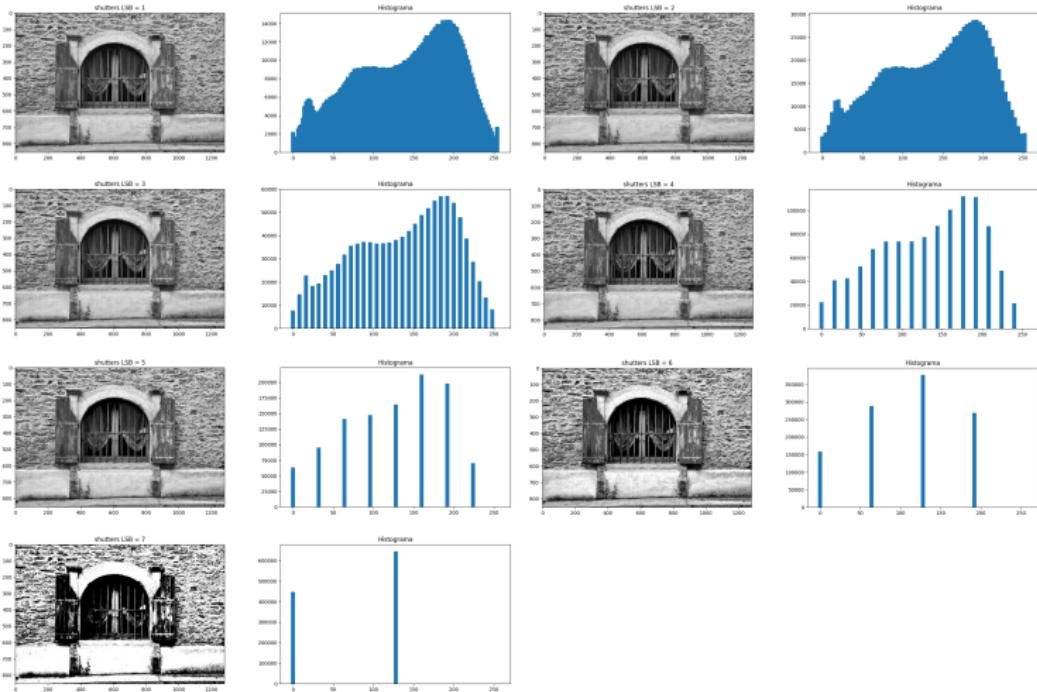
Resultados - LSB



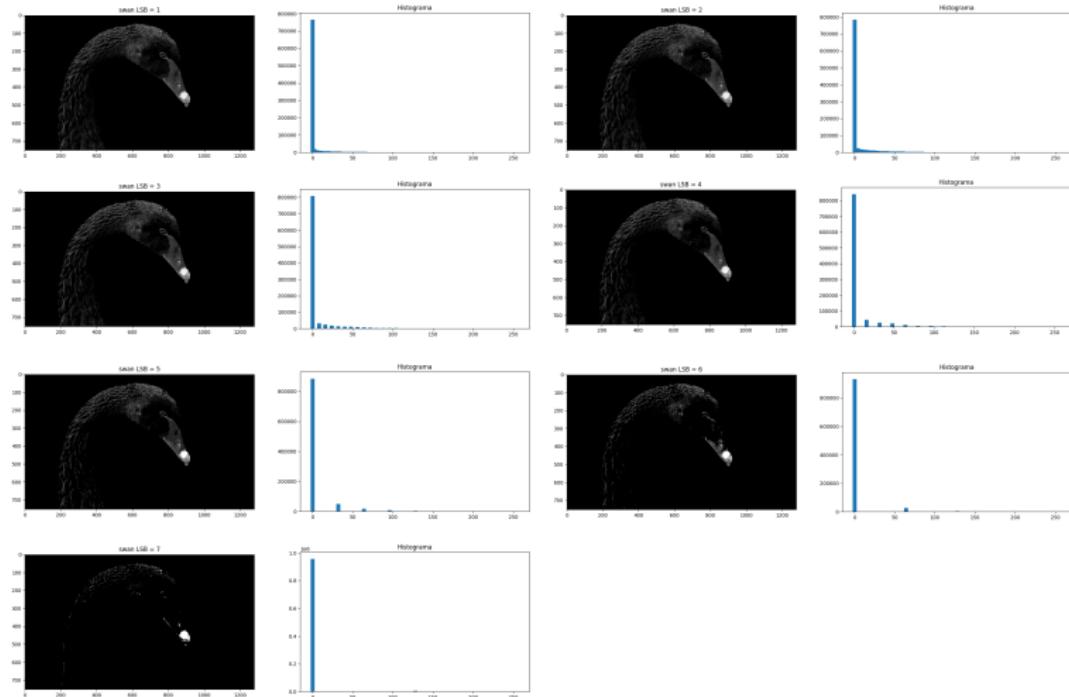
Resultados - LSB



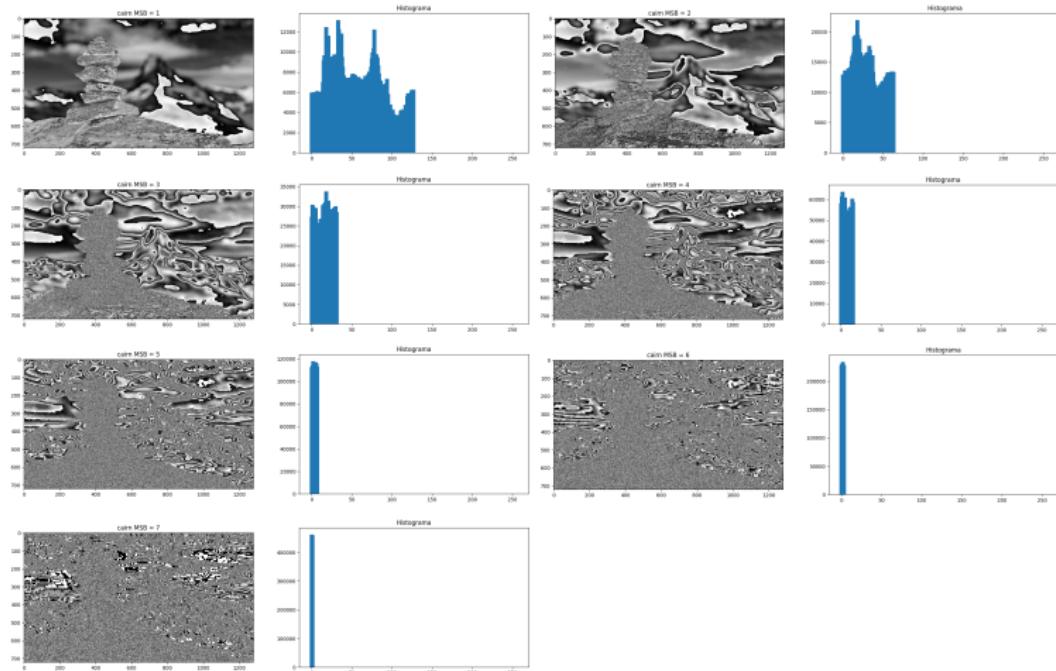
Resultados - LSB



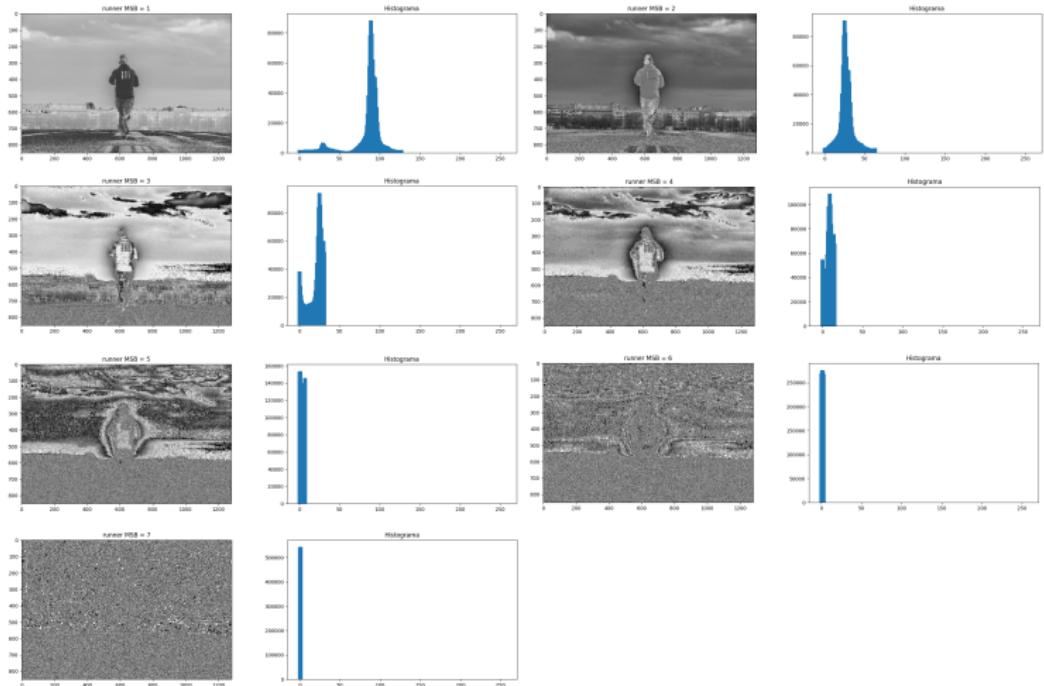
Resultados - LSB



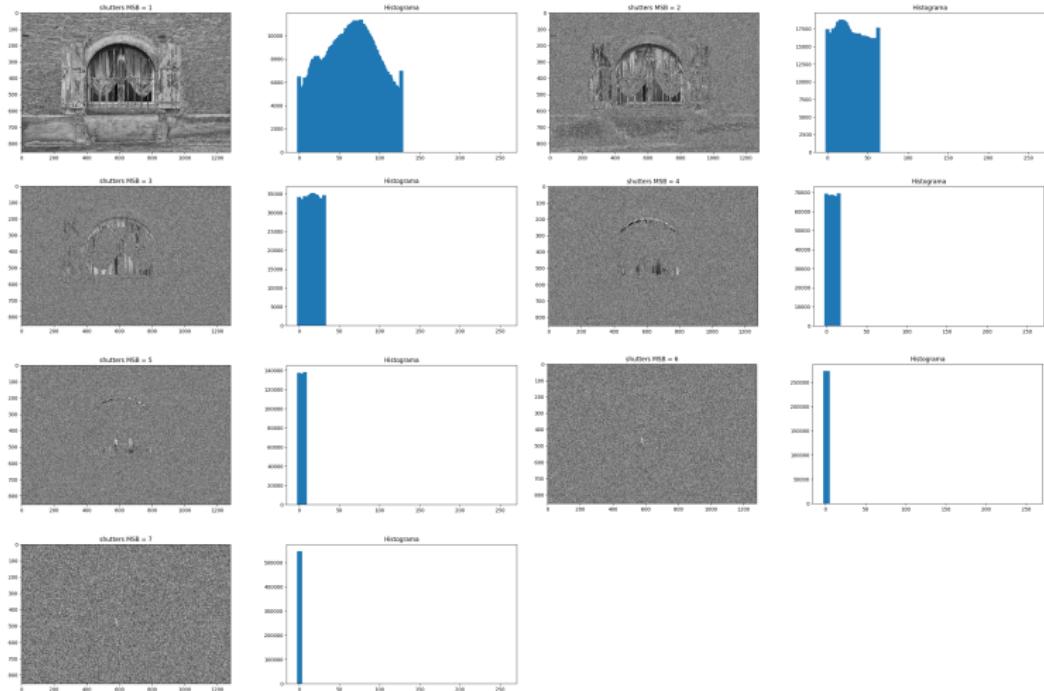
Resultados - MSB



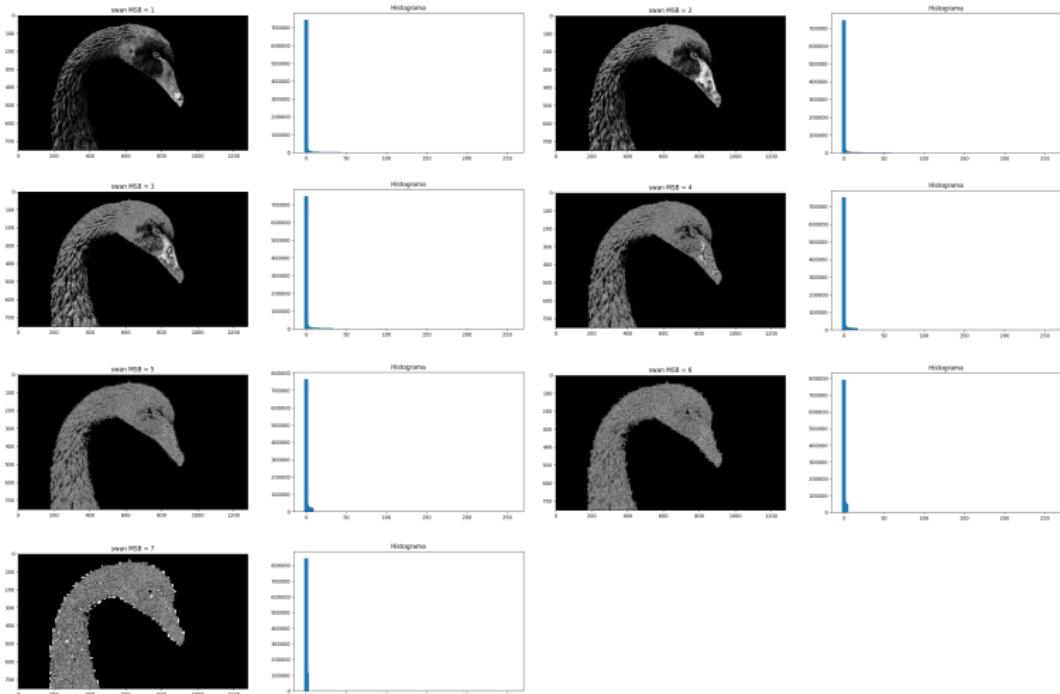
Resultados - MSB



Resultados - MSB



Resultados - MSB

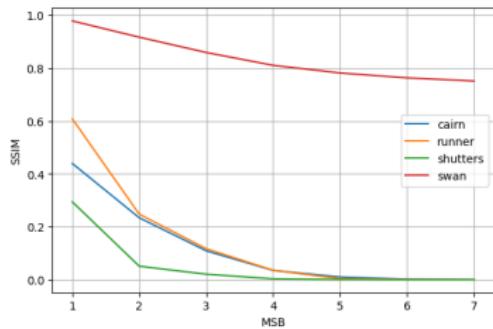
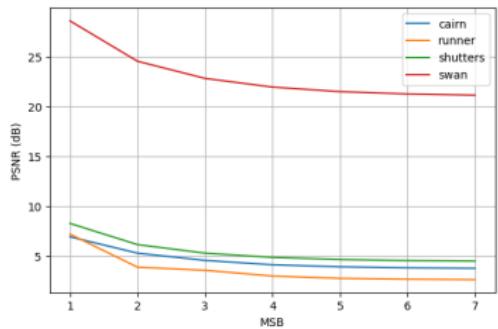
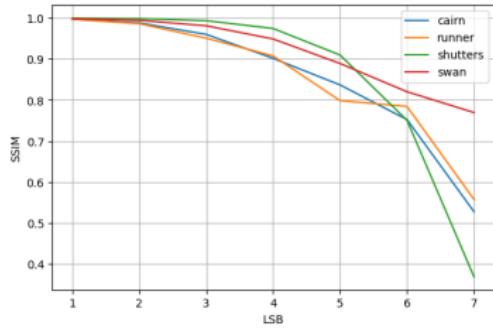
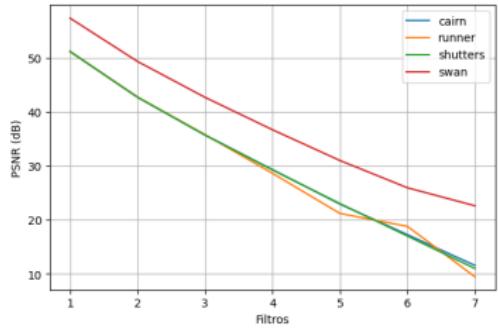


Resultados - LSB/MSB

	cairn		runner		shutters		swan	
	PSNR	SSIM	PSNR	SSIM	PSNR	SSIM	PSNR	SSIM
LSB 1	51.1575	0.9974	51.1388	0.9971	51.1370	0.9997	57.3143	0.9985
LSB 2	42.6962	0.9881	42.7157	0.9862	42.6864	0.9985	49.3048	0.9943
LSB 3	35.6999	0.9601	35.7731	0.9508	35.6897	0.9935	42.6692	0.9811
LSB 4	29.3002	0.9016	28.6152	0.9076	29.2425	0.9745	36.6770	0.9489
LSB 5	22.9212	0.8368	21.1971	0.7985	23.0121	0.9097	30.9843	0.8891
LSB 6	17.2683	0.7523	18.8059	0.7843	17.0194	0.7504	25.9452	0.8202
LSB 7	11.5796	0.5277	9.4766	0.5577	11.0111	0.3688	22.6162	0.7695
MSB 1	6.9259	0.4390	7.1952	0.6076	8.2724	0.2938	28.5954	0.9780
MSB 2	5.2902	0.2337	3.8795	0.2474	6.1461	0.0507	24.5492	0.9166
MSB 3	4.5613	0.1089	3.5696	0.1169	5.2922	0.0205	22.8298	0.8587
MSB 4	4.1211	0.0347	2.9918	0.0351	4.8618	0.0030	21.9574	0.8102
MSB 5	3.9201	0.0099	2.7581	0.0037	4.6506	0.0003	21.5006	0.7812
MSB 6	3.8171	0.0018	2.6761	0.0007	4.5456	0.0000	21.2674	0.7628
MSB 7	3.7659	0.0001	2.6324	0.0000	4.4935	0.0000	21.1479	0.7510



Resultados - LSB/MSB



Conclusão

- Importância do Histograma;
- Imagens com maior contraste -> Dificuldade de correção/binarização;
- Zerar MSBs em Regiões escuras -> Poucos ruídos;
- Mais informação espacial -> Mais LSBs.



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