# ta1

April 21, 2023

### 0.0.1 Setup

Instalação das libs necessárias e importação e configuração das mesmas.

```
[ ]: %pip install opencv-python
     %pip install matplotlib
     %pip install ipywidgets
```

```
Requirement already satisfied: opencv-python in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (4.7.0.72)
Requirement already satisfied: numpy>=1.21.2 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from opencv-
python) (1.24.2)

[notice] A new release of pip
available: 22.3.1 -> 23.1
[notice] To update, run:
pip install --upgrade pip
Note: you may need to restart the kernel to use updated packages.
Requirement already satisfied: matplotlib in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (3.7.1)
Requirement already satisfied: contourpy>=1.0.1 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
matplotlib) (1.0.7)
Requirement already satisfied: cycler>=0.10 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
matplotlib) (0.11.0)
Requirement already satisfied: fonttools>=4.22.0 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
matplotlib) (4.39.3)
Requirement already satisfied: kiwisolver>=1.0.1 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
matplotlib) (1.4.4)
Requirement already satisfied: numpy>=1.20 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
matplotlib) (1.24.2)
Requirement already satisfied: packaging>=20.0 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
matplotlib) (23.1)
```

```
Requirement already satisfied: pillow>=6.2.0 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
matplotlib) (9.5.0)
Requirement already satisfied: pyparsing>=2.3.1 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
matplotlib) (3.0.9)
Requirement already satisfied: python-dateutil>=2.7 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
matplotlib) (2.8.2)
Requirement already satisfied: six>=1.5 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from python-
dateutil>=2.7->matplotlib) (1.16.0)

[notice] A new release of pip
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Note: you may need to restart the kernel to use updated packages.
Requirement already satisfied: ipywidgets in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (8.0.6)
Requirement already satisfied: ipykernel>=4.5.1 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipywidgets) (6.22.0)
Requirement already satisfied: ipython>=6.1.0 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipywidgets) (8.12.0)
Requirement already satisfied: traitlets>=4.3.1 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipywidgets) (5.9.0)
Requirement already satisfied: widgetsnbextension~=4.0.7 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipywidgets) (4.0.7)
Requirement already satisfied: jupyterlab-widgets~=3.0.7 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipywidgets) (3.0.7)
Requirement already satisfied: comm>=0.1.1 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipykernel>=4.5.1->ipywidgets) (0.1.3)
Requirement already satisfied: debugpy>=1.6.5 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipykernel>=4.5.1->ipywidgets) (1.6.7)
Requirement already satisfied: jupyter-client>=6.1.12 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipykernel>=4.5.1->ipywidgets) (7.4.9)
Requirement already satisfied: jupyter-core!=5.0.*,>=4.12 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipykernel>=4.5.1->ipywidgets) (5.3.0)
Requirement already satisfied: matplotlib-inline>=0.1 in
```

```
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipykernel>=4.5.1->ipywidgets) (0.1.6)
Requirement already satisfied: nest-asyncio in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipykernel>=4.5.1->ipywidgets) (1.5.6)
Requirement already satisfied: packaging in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipykernel>=4.5.1->ipywidgets) (23.1)
Requirement already satisfied: psutil in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipykernel>=4.5.1->ipywidgets) (5.9.5)
Requirement already satisfied: pyzmq>=20 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipykernel>=4.5.1->ipywidgets) (24.0.1)
Requirement already satisfied: tornado>=6.1 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipykernel>=4.5.1->ipywidgets) (6.3)
Requirement already satisfied: backcall in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipython>=6.1.0->ipywidgets) (0.2.0)
Requirement already satisfied: decorator in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipython>=6.1.0->ipywidgets) (5.1.1)
Requirement already satisfied: jedi>=0.16 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipython>=6.1.0->ipywidgets) (0.18.2)
Requirement already satisfied: pickleshare in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipython>=6.1.0->ipywidgets) (0.7.5)
Requirement already satisfied: prompt-toolkit!=3.0.37,<3.1.0,>=3.0.30 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipython>=6.1.0->ipywidgets) (3.0.38)
Requirement already satisfied: pygments>=2.4.0 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipython>=6.1.0->ipywidgets) (2.15.1)
Requirement already satisfied: stack-data in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipython>=6.1.0->ipywidgets) (0.6.2)
Requirement already satisfied: pexpect>4.3 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
ipython>=6.1.0->ipywidgets) (4.8.0)
Requirement already satisfied: parso<0.9.0,>=0.8.0 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
jedi>=0.16->ipython>=6.1.0->ipywidgets) (0.8.3)
Requirement already satisfied: entrypoints in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from jupyter-
client>=6.1.12->ipykernel>=4.5.1->ipywidgets) (0.4)
Requirement already satisfied: python-dateutil>=2.8.2 in
```

```
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from jupyter-
client>=6.1.12->ipykernel>=4.5.1->ipywidgets) (2.8.2)
Requirement already satisfied: platformdirs>=2.5 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from jupyter-
core!=5.0.*,>=4.12->ipykernel>=4.5.1->ipywidgets) (3.2.0)
Requirement already satisfied: ptyprocess>=0.5 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
pexpect>4.3->ipython>=6.1.0->ipywidgets) (0.7.0)
Requirement already satisfied: wcwidth in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from prompt-
toolkit!=3.0.37,<3.1.0,>=3.0.30->ipython>=6.1.0->ipywidgets) (0.2.6)
Requirement already satisfied: executing>=1.2.0 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from stack-
data->ipython>=6.1.0->ipywidgets) (1.2.0)
Requirement already satisfied: asttokens>=2.1.0 in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from stack-
data->ipython>=6.1.0->ipywidgets) (2.2.1)
Requirement already satisfied: pure-eval in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from stack-
data->ipython>=6.1.0->ipywidgets) (0.2.2)
Requirement already satisfied: six in
/home/gabriel/.pyenv/versions/3.11.3/lib/python3.11/site-packages (from
asttokens>=2.1.0->stack-data->ipython>=6.1.0->ipywidgets) (1.16.0)

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```

```python
from matplotlib import pyplot as plt
import cv2
from ipywidgets import interactive, interact_manual

plt.rcParams['figure.dpi'] = 200
```

### 0.0.2 Thresholding

Thresholding binário para segmentação de imagem.

```python
def binary_threshold(threshold):
    image = cv2.imread("images/woman_with_umbrella.jpg")
    ret, thresh = cv2.threshold(image, threshold, 255, cv2.THRESH_BINARY)
    plt.subplot(121), plt.imshow(image, 'gray')
    plt.title("Original image"), plt.xticks([]), plt.yticks([])
    plt.subplot(122), plt.imshow(thresh, 'gray')
    plt.title("Threshold image"), plt.xticks([]), plt.yticks([])
```

```
        plt.show()

    interactive(binary_threshold, threshold=(0, 255, 1))
```

```
[ ]: interactive(children=(IntSlider(value=127, description='threshold', max=255),
     Output()), _dom_classes=('widget…
```

### 0.0.3 Filtros de desfoque

Diferentes filtros de desfoque com sliders para alterar o tamanho de seus kernels ou o sigma do desfoque gaussiano.

```
[ ]: def filters(average_kernel_size, gaussian_sigma, median_kernel_size):
         image = cv2.imread("images/woman_with_umbrella.jpg", cv2.IMREAD_GRAYSCALE)
         average_blur = cv2.blur(image, (average_kernel_size, average_kernel_size))
         gaussian_blur = cv2.GaussianBlur(image, (127, 127), sigmaX=gaussian_sigma)
         median_blur = cv2.medianBlur(image, median_kernel_size)
         plt.subplot(221), plt.imshow(image, 'gray')
         plt.title("Original image"), plt.xticks([]), plt.yticks([])
         plt.subplot(222), plt.imshow(average_blur, 'gray')
         plt.title("Average blur"), plt.xticks([]), plt.yticks([])
         plt.subplot(223), plt.imshow(gaussian_blur, 'gray')
         plt.title("Gaussian blur"), plt.xticks([]), plt.yticks([])
         plt.subplot(224), plt.imshow(median_blur, 'gray')
         plt.title("Median blur"), plt.xticks([]), plt.yticks([])

         plt.show()

     interact_manual(filters, average_kernel_size=(0,127, 1), gaussian_sigma=(0,␣
      ↪127, 1), median_kernel_size=(1, 255, 2))
```

```
    interactive(children=(IntSlider(value=63, description='average_kernel_size',␣
     ↪max=127), IntSlider(value=63, des…
```

```
[ ]: <function __main__.filters(average_kernel_size, gaussian_sigma,
     median_kernel_size)>
```

### 0.0.4 Detecção de bordas

Detecção de bordas utilizando a técnica de Canny com 2 thresholds.

```
[ ]: def edges(th1, th2):
         img = cv2.imread('images/woman_with_umbrella.jpg', cv2.IMREAD_GRAYSCALE)
         edges = cv2.Canny(img, th1, th2, L2gradient=True)
         plt.subplot(121),plt.imshow(img,cmap = 'gray')
         plt.title('Original Image'), plt.xticks([]), plt.yticks([])
         plt.subplot(122),plt.imshow(edges,cmap = 'gray')
         plt.title('Edge Image'), plt.xticks([]), plt.yticks([])
```

```
    plt.show()

interactive(edges, th1=(0, 255, 1), th2=(0, 255, 1))
```

[ ]: interactive(children=(IntSlider(value=127, description='th1', max=255),
     IntSlider(value=127, description='th2'…