

```
In [ ]: import numpy as np
import cv2
import matplotlib.pyplot as plt

def compare_imgs(img1, img2, title1, title2, figsize=(15, 15)):
    plt.figure(figsize=figsize)
    plt.subplot(121)
    plt.imshow(img1, cmap='gray')
    plt.title(title1)
    plt.axis('off')
    plt.subplot(122)
    plt.imshow(img2, cmap='gray')
    plt.title(title2)
    plt.axis('off')
```

Contrast Enhancement

```
In [ ]: low_contrast_img = cv2.imread('assets/low_contrast.jpg')  
low_contrast_img = cv2.cvtColor(low_contrast_img, cv2.COLOR_BGR2GRAY)
```

```
In [ ]: equalised_img = cv2.equalizeHist(low_contrast_img)
```

```
In [ ]: compare_imgs(low_contrast_img, equalised_img, 'Low Contrast Image', 'Equalised Image')
```

Low Contrast Image



Equalised Image



Alter HSV

```
In [ ]: leaves_img = cv2.imread('assets/leaves.jpg')  
leaves_img = cv2.cvtColor(leaves_img, cv2.COLOR_BGR2RGB)
```

```
In [ ]: leaves_hsv = cv2.cvtColor(leaves_img, cv2.COLOR_RGB2HSV)  
leaves_hsv[..., 0] = (leaves_hsv[..., 0] + 50) % 180  
leaves_hue_adjusted = cv2.cvtColor(leaves_hsv, cv2.COLOR_HSV2RGB)  
compare_imgs(leaves_img, leaves_hue_adjusted, 'Original Image', 'Hue Adjusted Image')
```

Original Image



Hue Adjusted Image



Image smoothing

```
In [ ]: noisy_img = cv2.imread('assets/noisy.jpg')  
noisy_img = cv2.cvtColor(noisy_img, cv2.COLOR_BGR2RGB)
```

```
In [ ]: # Gaussian Blur  
gaussian_blur = cv2.GaussianBlur(noisy_img, (15, 15), 0)  
compare_imgs(noisy_img, gaussian_blur, 'Original Image', 'Gaussian Blur')
```

Original Image



Gaussian Blur



Image Sharpening

```
In [ ]: smooth_img = cv2.imread('assets/smooth.jpg')  
smooth_img = cv2.cvtColor(smooth_img, cv2.COLOR_BGR2RGB)
```

```
In [ ]: kernel = np.array([  
    [-1, -1, -1],  
    [-1,  9, -1],  
    [-1, -1, -1]  
)  
sharpened_img = cv2.filter2D(smooth_img, -1, kernel)  
compare_imgs(smooth_img, sharpened_img, 'Original Image', 'Sharpened Image')
```

Original Image



Sharpened Image



```
In [ ]:
```