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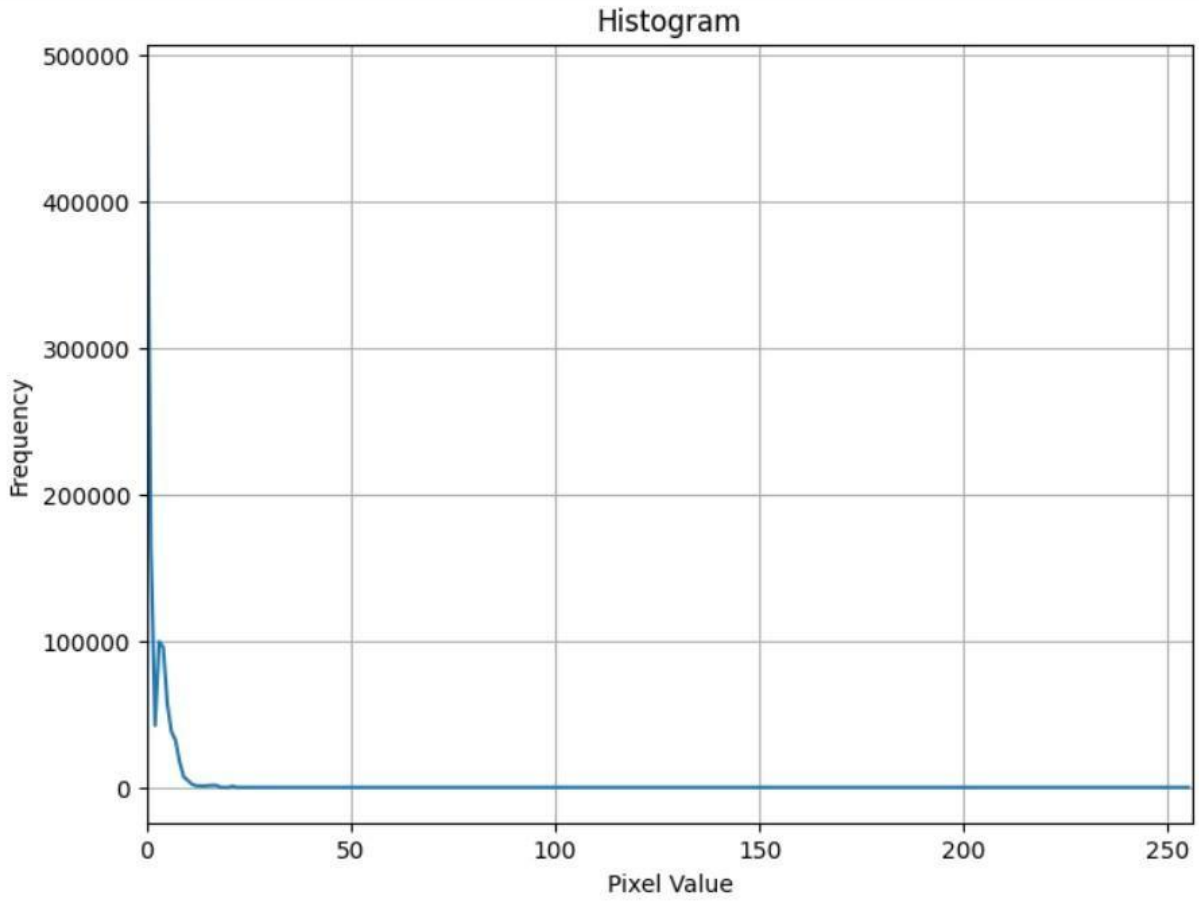
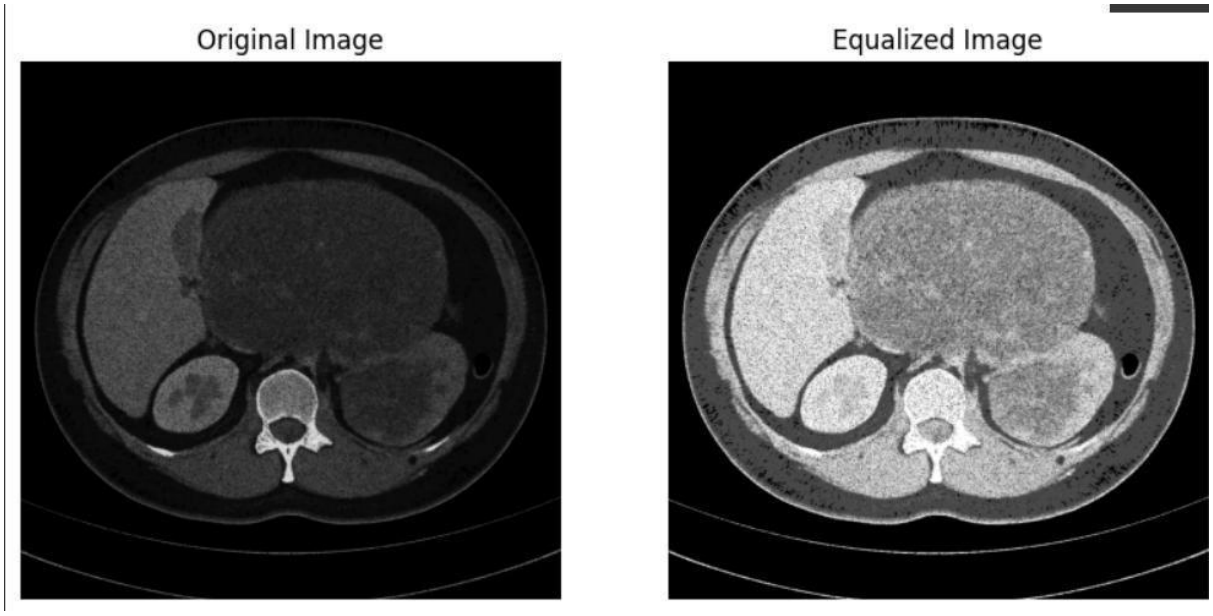
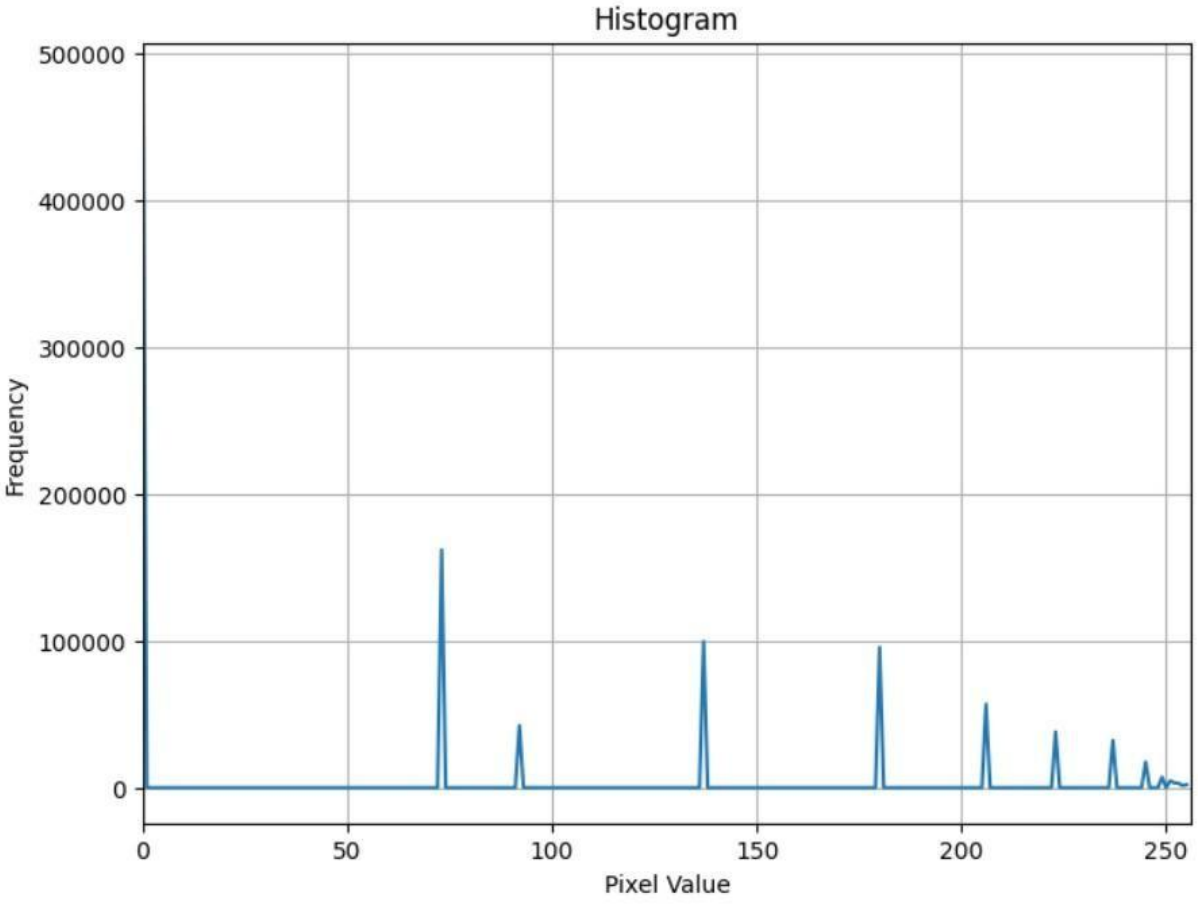
```
import cv2 import numpy as np from
matplotlib import pyplot as plt

# Load the image image_path = '/content/ex1_5.png'  # Replace with the
path to your image image = cv2.imread(image_path,
cv2.IMREAD_GRAYSCALE)

# Calculate the histogram histogram = cv2.calcHist([image],
[0], None, [256], [0, 256])

# Plot the histogram  plt.figure(figsize=(8,
6)) plt.title('Histogram') plt.xlabel('Pixel
Value') plt.ylabel('Frequency')
plt.plot(histogram) plt.xlim([0, 256])
plt.grid(True) plt.show()  # Perform
histogram equalization equalized_image =
cv2.equalizeHist(image)

# Display the original and equalized images
plt.figure(figsize=(10, 5)) plt.subplot(1, 2,
1) plt.title('Original Image') plt.imshow(image,
cmap='gray')
plt.axis('off')

plt.subplot(1,    2,          2)
            plt.title('Equalized Image')
            plt.imshow(equalized_image,
```

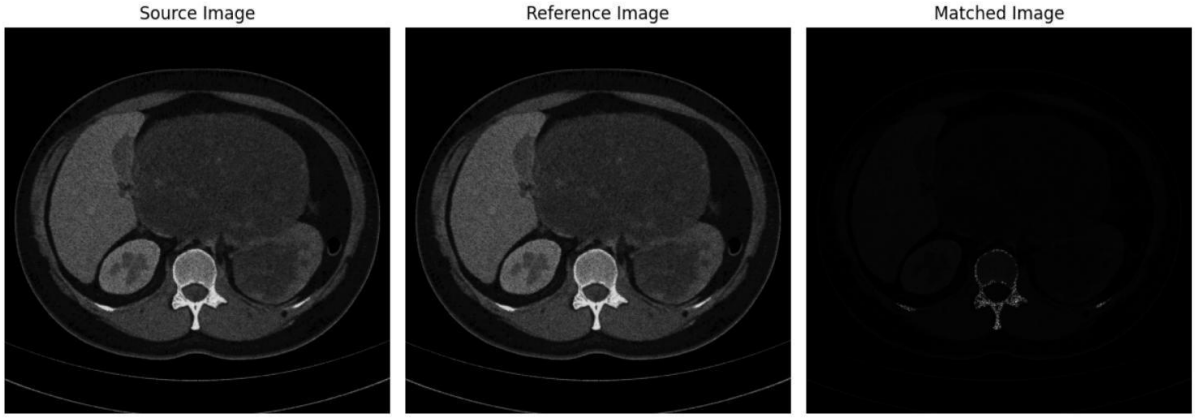
```
cmap='gray')
plt.axis('off')
# Calculate the histogram histogram = cv2.calcHist([equalized_image],
[0], None, [256], [0, 256])

# Plot the histogram
plt.figure(figsize=(8, 6))
plt.title('Histogram')
plt.xlabel('Pixel Value')
plt.ylabel('Frequency')
plt.plot(histogram)
plt.xlim([0, 256])
plt.grid(True) plt.show()
plt.tight_layout() plt.show()

# Load the source and reference images source_path =
'/content/ex1_5.png' reference_path = '/content/ex1_5.png' source_image
= cv2.imread(source_path, cv2.IMREAD_GRAYSCALE) reference_image =
cv2.imread(reference_path, cv2.IMREAD_GRAYSCALE)

# Calculate histograms for the source and reference images source_hist =
cv2.calcHist([source_image], [0], None, [256], [0, 256]) reference_hist =
cv2.calcHist([reference_image], [0], None, [256], [0, 256]) # Normalize
histograms to have sum equal to 1 source_hist /= source_hist.sum()
reference_hist /= reference_hist.sum()

# Calculate cumulative distribution functions (CDF) for histograms source_cdf
= source_hist.cumsum() reference_cdf = reference_hist.cumsum()
```

```
# Perform histogram matching by mapping source CDF to reference CDF mapping
= np.interp(source_cdf, reference_cdf, range(256)) matched_image
= mapping[source_image]

# Convert to uint8 data type matched_image =
matched_image.astype(np.uint8)

# Display the images using Matplotlib
plt.figure(figsize=(12, 6))

plt.subplot(131) plt.title('Source Image')
plt.imshow(source_image, cmap='gray')
plt.axis('off')

plt.subplot(132) plt.title('Reference Image')
plt.imshow(reference_image, cmap='gray')
plt.axis('off')

plt.subplot(133) plt.title('Matched Image')
plt.imshow(matched_image, cmap='gray')
plt.axis('off')

plt.tight_layout() plt.show()
```


Histogram
500000
400000
300000
200000
100000
0
Frequency
0
50
100
150
200
250
Pixel Value


Original Image
Equalized Image


Histogram
Frequency
500000
400000
300000
200000
100000
0
0
50
100
150
200
250
Pixel Value


Source Image
Reference Image
Matched Image