COURSE CODE: CSE 438

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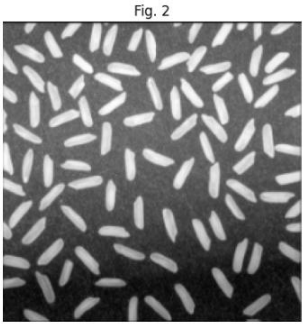
```
import cv2
import numpy as np
import matplotlib.pyplot as plt


def show_image(img, title ='',cmap ='gray'):
   plt.imshow(img, cmap=cmap)
   plt.title(title)
   plt.axis('off')
   plt.show()
fig1_path ='/kaggle/input/lab-02/lab_02_cse438/Screenshot 2025-07-07 102203.png'
fig2_path ='/kaggle/input/lab-02/lab_02_cse438/Screenshot 2025-07-07 102309.png'
fig1 = cv2.imread(fig1_path,cv2.IMREAD_GRAYSCALE)
fig2 = cv2.imread(fig2_path,cv2.IMREAD_GRAYSCALE)
show_image(fig1,"Fig. 1")
show_image(fig2,"Fig. 2")
```

Fig. 1

Fig. 2



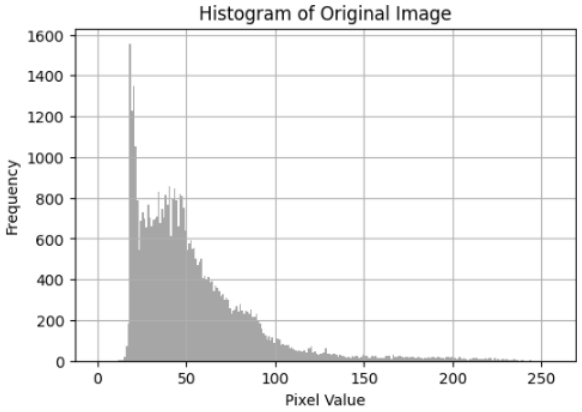
```
def show_image_and_hist(img, title='Image'):
    plt.figure(figsize=(12, 4))
    plt.subplot(1, 2, 1)
    plt.imshow(img, cmap='gray')
    plt.tilte(title)
    plt.axis('off')
    plt.sobplot(1, 2, 2)
    plt.hist(img.ravel(), 256, [0, 256], color='blue' , alpha=0.7)
    plt.tilte(f'{title} HISTOGRAM')
    plt.xlabel('Pixel Value')
    plt.Ylabel('Frequency')
    plt.tight_layout()
    plt.show()
```

1. # Show the original image only

```
plt.figure(figsize=(6, 6))
```

```
plt.imshow(fig1, cmap='gray', vmin=0, vmax=255)
plt.title("Original Image")
plt.axis('off')
plt.show()

# Show the histogram of the original image
plt.figure(figsize=(6, 4))
plt.hist(fig1.ravel(), 256, [0, 256], color='gray', alpha=0.7)
plt.title("Histogram of Original Image")
plt.xlabel("Pixel Value")
plt.ylabel("Frequency")
plt.grid(True)
plt.show()
```

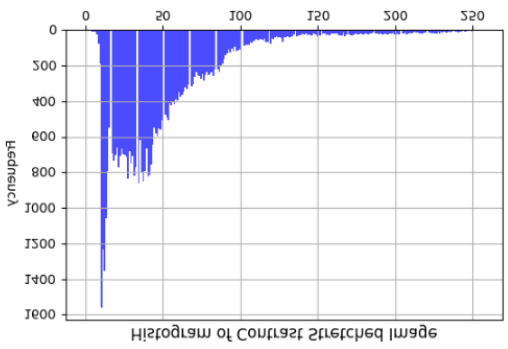



```
# Contrast stretching
min_val = np.min(fig1)
max_val = np.max(fig1)
contrast_stretched = ((fig1 - min_val) / (max_val - min_val) * 255).astype(np.uint8)

# Show the image only
```

```
plt.figure(figsize=(6, 6))
plt.imshow(contrast_stretched, cmap='gray', vmin=0, vmax=255)
plt.title("Contrast Stretched Image")
plt.axis('off')
plt.show()

# Show the histogram only
plt.figure(figsize=(6, 4))
plt.hist(contrast_stretched.ravel(), 256, [0, 256], color='blue', alpha=0.7)
plt.title("Histogram of Contrast Stretched Image")
plt.xlabel("Pixel Value")
plt.ylabel("Frequency")
plt.grid(True)
plt.show()
```

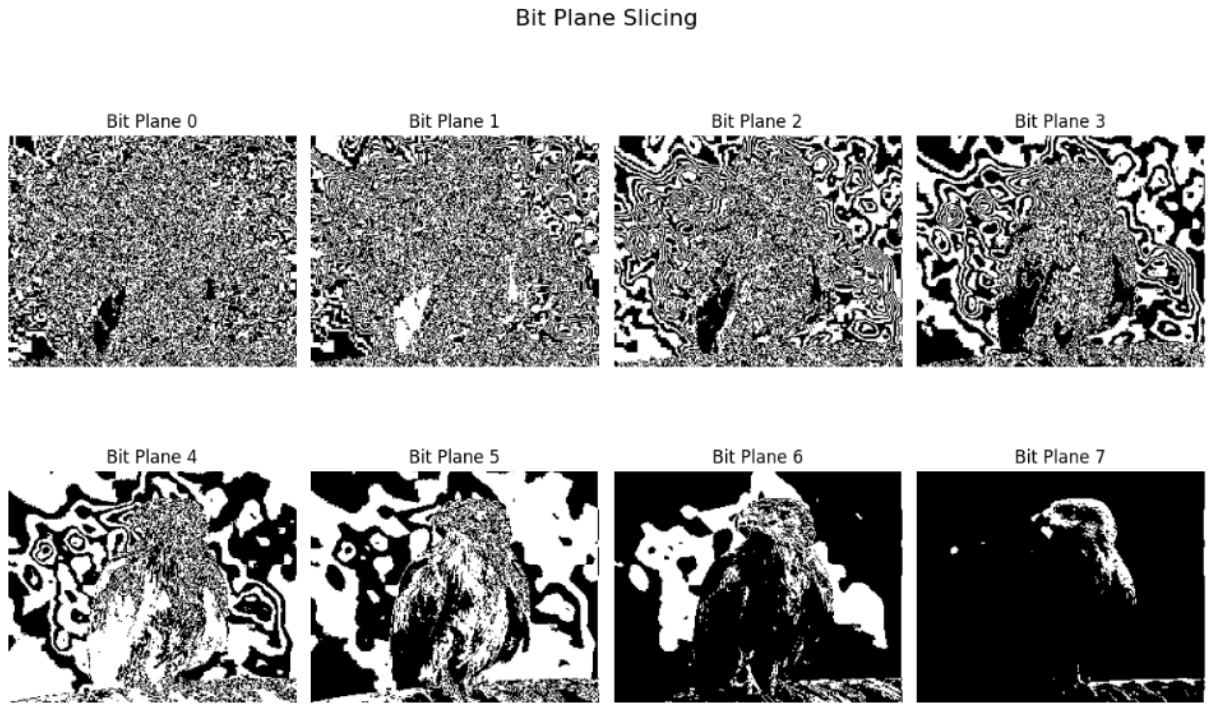
```
2. # Ensure image is 8-bit grayscale
image = fig1.astype(np.uint8)

# Plot all 8 bit planes
plt.figure(figsize=(12, 8))
for i in range(8):
```

```
    # Create bitmask for the i-th bit
    bit_plane = (image >> i) & 1
    bit_plane_img = (bit_plane * 255).astype(np.uint8)

    # Show bit plane
    plt.subplot(2, 4, i + 1)
    plt.imshow(bit_plane_img, cmap='gray')
    plt.title(f'Bit Plane {i}')
    plt.axis('off')

plt.suptitle('Bit Plane Slicing', fontsize=16)
plt.tight_layout()
plt.show()
```




3.image = fig2.astype(np.float32)

```
# Logarithmic Transformation
c_log = 255 / np.log(1 + np.max(image))
log_transformed = c_log * np.log(1 + image)
log_transformed = np.array(log_transformed, dtype=np.uint8)

# Power-law (Gamma) Transformation
gamma = 1.5  # you can adjust this value
normalized_img = image / 255.0
power_law_transformed = 255 * (normalized_img ** gamma)
power_law_transformed = np.array(power_law_transformed, dtype=np.uint8)

def show_image_and_hist_separate(img, title):
    plt.figure(figsize=(6,6))
    plt.imshow(img, cmap='gray', vmin=0, vmax=255)
    plt.title(title)
    plt.axis('off')
    plt.show()

    plt.figure(figsize=(6,4))
    plt.hist(img.ravel(), bins=256, range=[0,255], color='blue', alpha=0.7)
    plt.title(f"Histogram of {title}")
    plt.xlabel("Pixel Value")
    plt.ylabel("Frequency")
    plt.grid(True)
    plt.show()
```

show_image_and_hist_separate(log_transformed, "Logarithmic Transformation")

show_image_and_hist_separate(power_law_transformed, "Power-law (Gamma) Transformation")