# Step 1: Install OpenCV

!pip install opencv-python-headless

# Step 2: Import necessary libraries

import cv2

import numpy as np

from matplotlib import pyplot as plt

from google.colab import files

# Step 3: Upload an image

print("Upload a grayscale image:")

uploaded = files.upload()

image\_path = next(iter(uploaded))

# Step 4: Read image in grayscale

img = cv2.imread(image\_path, cv2.IMREAD\_GRAYSCALE)

# Step 5: Define kernel (structuring element)

kernel = np.ones((15, 15), np.uint8) # Larger kernel enhances effect

# Step 6: Apply Top-Hat transformation

tophat = cv2.morphologyEx(img, cv2.MORPH\_TOPHAT, kernel)

# Step 7: Display results

plt.figure(figsize=(10, 5))

plt.subplot(1, 2, 1)

plt.imshow(img, cmap='gray')

plt.title('Original Image')

plt.axis('off')

plt.subplot(1, 2, 2)

plt.imshow(tophat, cmap='gray')

plt.title('Top-Hat Result')

plt.axis('off')

plt.show()

# Step 8: Save the result

cv2.imwrite("tophat\_output.jpg", tophat)

print("Saved as tophat\_output.jpg")

