Homework 2

Task 1: Erosion and Dilation

- **Description**: Erode and dilate a grayscale image using different kernel sizes and iteration counts.
- **Instructions**:
    1. Read a grayscale image (`cv.IMREAD_GRAYSCALE`).
    2. Perform erosion and dilation using a 5x5 kernel, and experiment with different iteration values (e.g., 1, 5, 10).
    3. Display the original, eroded, and dilated images side by side.

Task 2: Histogram Equalization

- **Description**: Perform histogram equalization on a grayscale image to enhance contrast.
- **Instructions**:
    1. Read another grayscale image and apply `cv.equalizeHist`.
    2. Plot the original and equalized histograms.
    3. Display the original and equalized images.

Task 3: Edge Detection

- **Description**: Detect edges using Canny and Sobel edge detection methods.
- **Instructions**:
    1. Apply Canny edge detection with two sets of threshold values (e.g., (50, 150) and (100, 200)).
    2. Apply Sobel edge detection and combine the Sobel x and y results.
    3. Threshold the Sobel edge result to create a binary edge map.
    4. Display the original, Canny edges, and Sobel edges.

Task 4: Feature Extraction (HOG and SIFT)

- **Description**: Extract image features using HOG and SIFT.
- **Instructions**:
    1. Compute the Histogram of Oriented Gradients (HOG) features for the image and print the shape and a portion of the feature array.
    2. Use the SIFT algorithm to detect keypoints and descriptors. Display the image with keypoints.
    3. Compare the number of keypoints detected for two different images.