**Lab List Image Processing:**

**1. Image Filtering and Noise Removal**

**Question:** Apply different noise types (Gaussian, Salt & Pepper) to an image and use the following filters to remove noise:

* Mean Filter
* Median Filter
* Gaussian Filter  
  Compare the effectiveness of each method. Which filter works best for which type of noise?

**2. Histogram Equalization for Image Enhancement**

**Question:** Perform histogram equalization on a low-contrast image.

* Compare the histogram before and after equalization.
* How does histogram equalization affect image brightness and contrast?
* Try **adaptive histogram equalization (CLAHE)**. How does it differ from global equalization?

**3. Image Morphology (Erosion & Dilation)**

**Question:** Use morphological operations on a binary image to enhance or remove certain structures.

* Apply **erosion** and **dilation** to a noisy binary image.
* How does the structuring element size impact the results?
* Combine **opening** and **closing** operations to refine object boundaries.

**4. Image Segmentation using Thresholding**

**Question:** Segment an object from an image using different thresholding techniques:

* Global Thresholding (Otsu’s method)
* Adaptive Thresholding
* Compare results and discuss when adaptive thresholding is preferable over global thresholding.

**5. Image Transformation using Fourier Transform**

**Question:** Apply **Fast Fourier Transform (FFT)** to an image and analyze its frequency components.

* Remove high-frequency noise using a low-pass filter.
* Apply a high-pass filter to enhance edges.
* How does modifying frequency components affect the spatial domain image?

 Load a grayscale image and apply the following edge detection techniques:

* Sobel Operator
* Prewitt Operator
* Canny Edge Detector

 Compare the results by analyzing the sharpness and completeness of detected edges.

 How do different filter sizes affect the results in Sobel and Prewitt operators?

 Why does the Canny edge detector perform better in detecting fine edges compared to gradient-based methods?

**6. Threshold-Based Segmentation**

**Question:** Perform image segmentation using different thresholding techniques:

* Apply **global thresholding (Otsu's method)** to segment objects in an image.
* Use **adaptive thresholding** for images with uneven lighting.
* Compare results and explain when adaptive thresholding performs better than global thresholding.

**7. Region-Based Segmentation (Watershed Algorithm)**

**Question:** Use the **Watershed algorithm** for segmenting overlapping objects in an image.

* Convert the image to grayscale and apply a threshold.
* Compute the **distance transform** and identify foreground and background markers.
* Apply the **Watershed transform** and analyze the segmented regions.
* Why is preprocessing (e.g., noise removal) necessary before applying the Watershed algorithm?

**8. Write a MATLAB/Python program to Character Segment of an image.**

**9.** Write a MATLAB/Python program to read ‘rice.tif’ image, count number of rice and display area (also specific range), major axis length, and perimeter.

10. Write a MATLAB/Python program to read an image and perform convolution with 3X3 mask.