**Deep Learning Lab Assignment**

**Questions on Image Filtering**

1. Implement Gaussian Blur and Box Blur from scratch using OpenCV. Compare their effects on an image (lena.jpg) and explain when each would be preferred.
2. Apply Sobel filters in both X and Y directions. Combine them to obtain edge magnitude and direction. Compare the results with the Laplacian filter.
3. Implement Canny edge detection without using cv2.Canny(). Use a combination of Gaussian blur, gradient detection (Sobel), and thresholding.
4. Design a sharpening filter using a custom kernel and apply it to an image. Experiment with different kernel values and explain their effects.
5. Apply an emboss filter to an image and modify its kernel to enhance the effect. What changes in the kernel result in a more pronounced embossing effect?
6. Create a high-pass filter using OpenCV and compare its effect with an edge enhancement filter. Discuss their applications in feature extraction for deep learning.

**Indoor vs. Outdoor Image Classification:**

1. Find and load indoor vs. outdoor image dataset (DIML/CVL RGB-D Dataset). Perform preprocessing steps including image resizing, normalization, and data augmentation. Explain why each step is necessary for deep learning models.
2. Design and train a convolutional neural network (CNN) from scratch for indoor vs. outdoor classification. Tune hyperparameters (number of layers, kernel size, batch size, learning rate) and analyze how they affect the model’s performance.