CS663, Assignment 2 **Yash Sanghvi, Pradyot Prakash**
Instructor: Prof. Suyash Awate 13D070042, 130050008
Question 1: Image Sharpening

Problem Statement

(15 points) Image Sharpening.
Input images: (1) 1/data/superMoonCrop.mat, and (2) 1/data/lionCrop.mat. Assume the pixel dimensions to be equal along both axes, i.e., assume an aspect ratio of 1:1 for the axes.
Write code for image sharpening using unsharp masking and apply it to both the input images.
To compare the original and filtered images, linearly contrast-stretch them to the same intensity range, say, [0, 1].
Tune the parameters (Gaussian standard-deviation parameter and the scaling parameter) to your best judgment, but such that the sharpening in the image is clearly visible. You may use the following Matlab functions: fspecial() and imfilter().

1. Write a function myUnsharpMasking.m to implement this.
2. For each image, show the original and sharpened versions side by side, using the same (gray) colormap.
3. Report the tuned parameter values for each image.

Code

(i) Code for Unsharp Masking

```
function [outputImage] = myUnsharpMasking(inputImage, W, sig,
    lap_scale)
        inputImage = double(inputImage);

        h = fspecial('log', [W W], sig);
        LoG = imfilter(inputImage, h);
        outputImage = inputImage + lap_scale .* (inputImage - LoG);
end
```

(ii) Main Script

```
%% MyMainScript

tic;
%% Your code here
lion_struct = load('../data/lionCrop');
lion = lion_struct.imageOrig;
enhanced_lion = myUnsharpMasking(lion, 9, 0.6, 3.1);
plotAndSave(lion, enhanced_lion, 'lion_enhanced', 1);

moon_struct = load('../data/superMoonCrop');
moon = moon_struct.imageOrig;
enhanced_moon = myUnsharpMasking(moon, 9, 0.5, 8);
```

```
13 plotAndSave(moon, enhanced_moon, 'moon_enhanced', 2);
14 toc;
```

Optimal Parameters

We worked with a **window size of 9 X 9** for both the images.

1. **Tuned parameters for the 'croppedLion' image:**
   Gaussian standard deviation parameter, σ = **0.6**
   Weighting factor of the enhancement = **3.1**
2. **Tuned parameters for the 'superMoonCrop' image:**
   Gaussian standard deviation parameter, σ = **0.5**
   Weighting factor of the enhancement = **8**

Result Images