DSE312-Computer Vision Practice session3: 3rd September 2022

1. i) Plot *w* using a surface plot (use interpolation to get a smooth surface).
   ii) Create your own implementation of a function imgconv (f,w) for applying the convolution on the following:

$$w = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 4 & 2 \\ 1 & 2 & 1 \end{bmatrix} \qquad f = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

2. Import the following (python students) or (Matlab students: use image processing toolbox):

```
# import all required modules
import skimage.io
import numpy as np
import matplotlib.pyplot as plt
from scipy import ndimage
```

Load the image images/house-downsampled.png as a grayscale image and visualize it. Compute the convolution of the image with the following **3x3**, **5x5** and **11x11** kernels and visualize the results.

i. Averaging filter
ii. Gaussian filter (apply atleast 3 different sigma values)
iii. Plot Gaussian filters using a surface plot
iv. Sobel Operator. Compute the absolute gradient and orientation of the image
v. Check for Robert's cross and Prewitt operator (explore)
vi. Image Laplacian can be computed using kernels (including diagonal elements). Compute ∇^2 f(x, y) by using an appropriate kernel on the image (using image convolution). Add this result (with c=+1,-1, from our lecture) to the de-noised image and show the result.

3. Identify the type of noise in the tiger image and apply appropriate filter to denoise the image. To the de-noised image, apply gradient operators in x direction, y direction separately, compute the magnitude and orientation of the image. Then for the de-noised image, compute the image Laplacian.