Coursework 1:
Convolution & Kernels

Compute the effect of convolving an image with the average and the weighted average smoothing kernels. For your experiments, please use kitty.bmp that can be found on BB.

1. Write a short function that performs the convolution between an image, and a 3 × 3 structuring element, by performing an explicit looping over the image pixels. You should pad the edges of the input image with zeros to deal with the edges and corners of the original image.

   Load the image kitty.bmp, and compute the effect for this convolution.

2. By convolving the original image (kitty.bmp) with the appropriate kernels, compute the horizontal and vertical gradient images, and then find the edge strength image given by the gradient magnitude (combined image).

3. Perform thresholding of the edge strength image, and hence display the major edges of the image. You may find it useful to plot the image histogram for the edge-strength image. Can you find a threshold value that gives the edges of the cat, but not the patterns in the fur, or the wood-grain?

4. Repeat the above steps, but now starting from the weighted mean of the original image. Compare the edge-strength images. What difference has the weighted-mean smoothing made to the edges detected?

5. Write a report that describes your results and conclusions. Remember to include some of the images of your results and also a listing of your code for your own implemented functions.

Please note:
- **You are expected to write your _own code_ for the convolution and thresholding functions.**
- **Python/OpenCV code snippets are provided on Blackboard, however, use them as a _reference_ to help/guide you with your own implementation.**
- **Use Python3/OpenCV 4.2.0 for your implementation**