Assignment 2

- For this exercise, you will need to download the CIFAR-10 Dataset from pytorch.
  You can download it from here:
  https://pytorch.org/vision/stable/generated/torchvision.datasets.CIFAR10.html
- Using this dataset, choose any 1 image from each of the classes for the questions in this assignment

Q1) Write a python function which can rotate an input image at any user specified angle about the center of the image. Verify whether rotating an image n times, by an angle $\theta = 2\pi/n$, for some fixed n, yields the original image or not.

(Reference: https://youtu.be/tc8UhVhdq50?feature=shared)

Q2) a) Write a function to generate a histogram for a grayscale image and plot the original image alongside its histogram. Do it for all of the 10 chosen images.

b) Write a function to implement histogram equalization in Python. Display both the original and equalized images, and compare their histograms. Do it for all of the 10 chosen images.

(You can refer to chapter 3 of the given book)

Q3) Create a binary image based on a threshold, and display the original image, the thresholded binary image, and the result of blending the binary map with the original image. Do it for all of the 10 chosen images.

(https://youtu.be/CdltAssTMs8?feature=shared , https://youtu.be/COxRYLrsscc?feature=shared)

Q4) Implement the following image filters in python:

a) Convolution (Avg pool)
b) Lowpass_Filter
c) Highpass_Filter
d) Sharpening_Filter
e) Wiener_Filter

Apply each of them to each of the 10 chosen images and write your observations in a new ipynb cell. Also pass the image through a lowpass filter followed by a high pass filter and observe the difference between the original and the obtained image

(Chapter 3,5 from book)

Q5) Calculate the 2D Discrete Fourier Transform (DFT) for each of the 10 images. Now on these images , use the inverse DFT and observe how the reconstructed images look. Also calculate the error between the reconstructed and the original images.

(Resources : https://youtu.be/tEzgtbnbXgQ?feature=shared , https://youtu.be/OOu5KP3Gvx0?feature=shared