Assignment 2
Deadline: 13th Sept, Monday, Midnight

Q1. Find the histogram matching for the following – [2]

Input image

3	3	0	1
3	2	1	2
2	0	0	0
3	1	1	2

Target image

0	0	0	1
0	3	3	2
3	0	0	0
3	1	1	2

Show how the input pixels are mapped to the output pixels.

Q2. Find the convolution for (**bold** indicates origin) [2]

Image

-1	2	-1
3	0	1
-2	1	2

And filter

-1
0
1

Note the output is of size 5x3.

Q3. Write a code for histogram equalization. You code should [2]

- Read an input image I
- Compute the normalized histogram h. You may use 'find' in Matlab or numpy.where in Python or equivalent that can directly give you indices. This will avoid looping over all the pixels of the image.
- Compute the CDF using histogram h. Let it be H.
- For a pixel value r in [0, 255], map it to s = 255*H(r)
- For a pixel value r in [0, 255], find the indices for a given r in I.
- At those indices, replace r with s.

Show the input image, its normalized histogram, equalized image and its normalized histogram. Use the full cameraman image given in previous assignment.

Q4. Write a code for histogram matching [2]

- Read an input image I and a target image T
- Obtain the target image using gamma transformation of input image. Take gamma = 0.5.
- Compute the normalized histogram h of I and g of T.
- Compute the CDF using histogram h and g. Let it be H and G.
- For a pixel value r in [0, 255], find argmin |H(r) - G|. That is, map r to the value of s for which H(r) is closest to G.
- Find indices where r occurs in I and at those indices, replace r with s.

Show the input image, its normalized histogram, target image, its normalized histogram, matched image and its normalized histogram. Use the full cameraman image given in previous assignment.

Q5. Write a code for convolution of two matrices of 3x3 each. Generate two random matrices. Note the elements should be integers. Your code should [2]

- show the original filter and rotation of the filter.
- compute the response at every coordinate. Note the dimension of output would be 5x5
- display the input matrices and the output
- verify the output by giving the following

image

0	0	0
0	1	0
0	0	0

filter

1	2	3
4	5	6
7	8	9

Output

9	8	7
6	**5**	4
3	2	1