

Write a Matlab function to compute image histogram of a graylevel image. Do not use built in Matlab functions `imhist()` or `hist()`. You can use loops but try not to use too many.

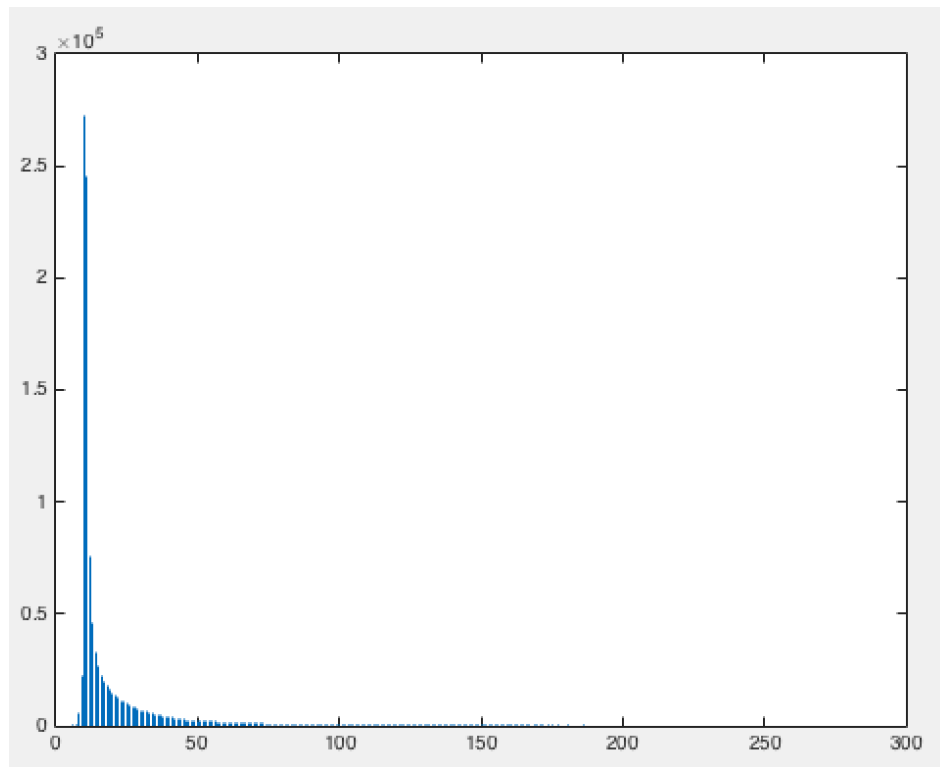


Figure 1 Histogram of the original Image

Modify the function above so that it computes histogram of a region specified using a binary mask (compute histogram of the image pixels where mask is equal to 1).

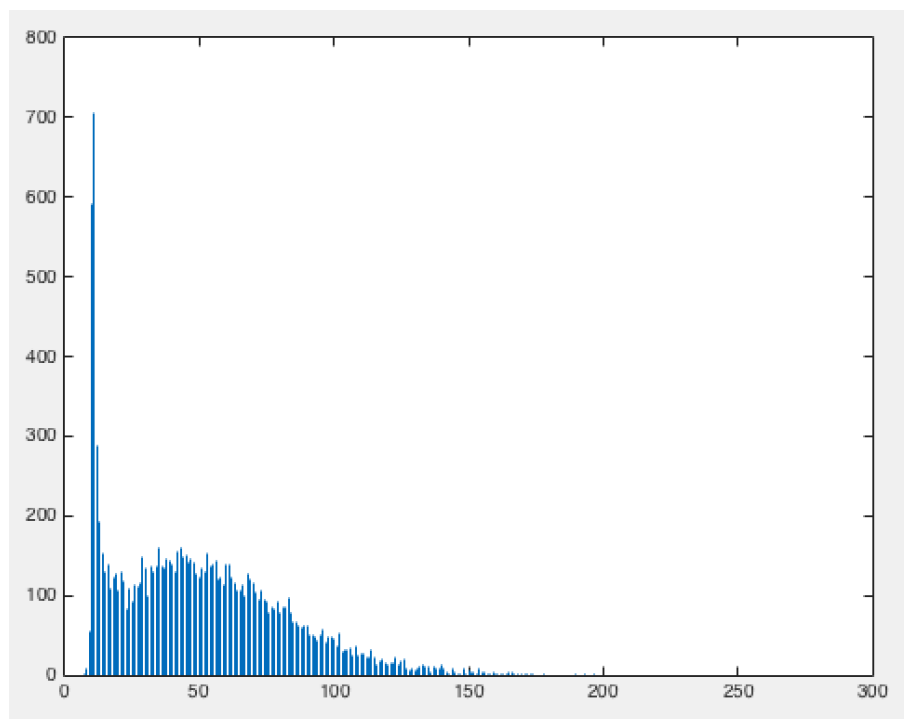


Figure 2 Histogram of the masked region

Minimum-Maximum Linear Contrast Stretch: Read a grayscale image. Determine the intensity limits of the image. Apply linear stretch to the image. Show original and enhanced images and plot corresponding histograms.

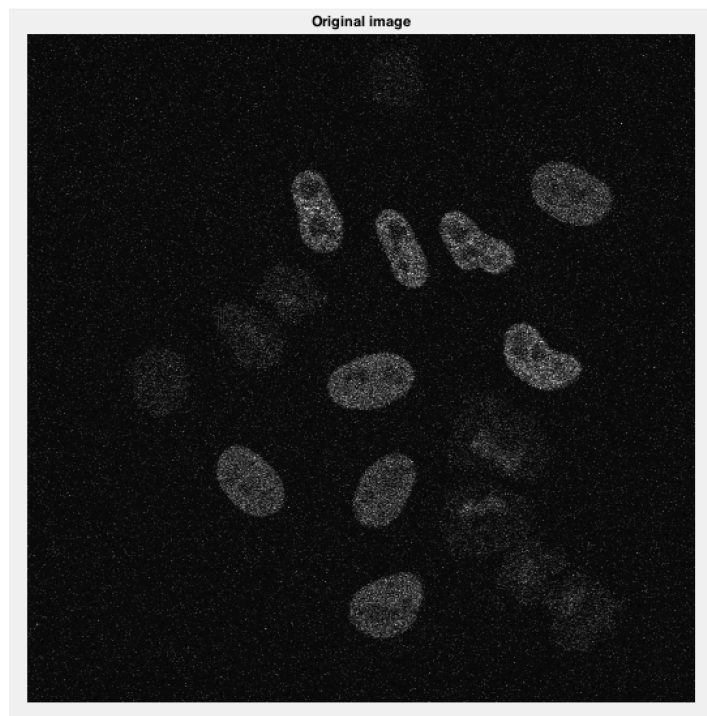


Figure 3 Original Image

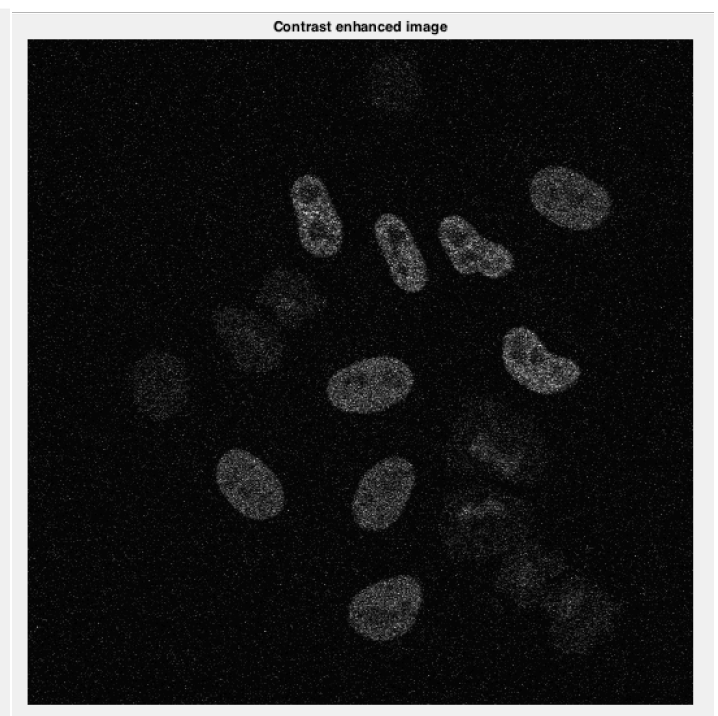


Figure 4 Contrast Enhanced Image

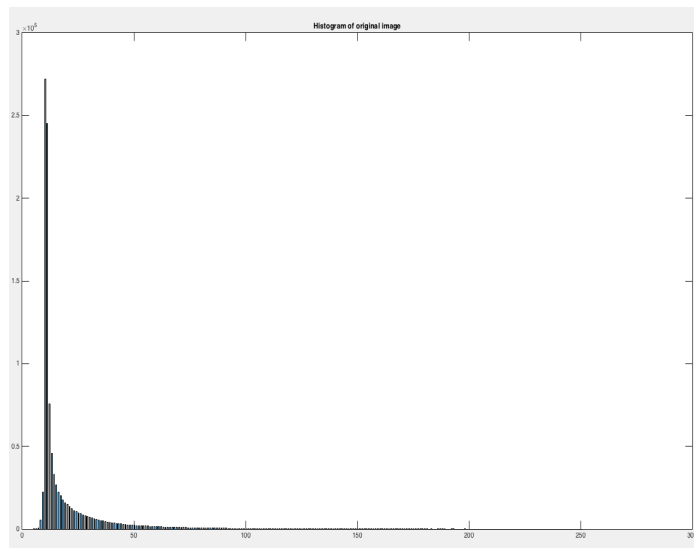


Figure 5 Histogram - original image

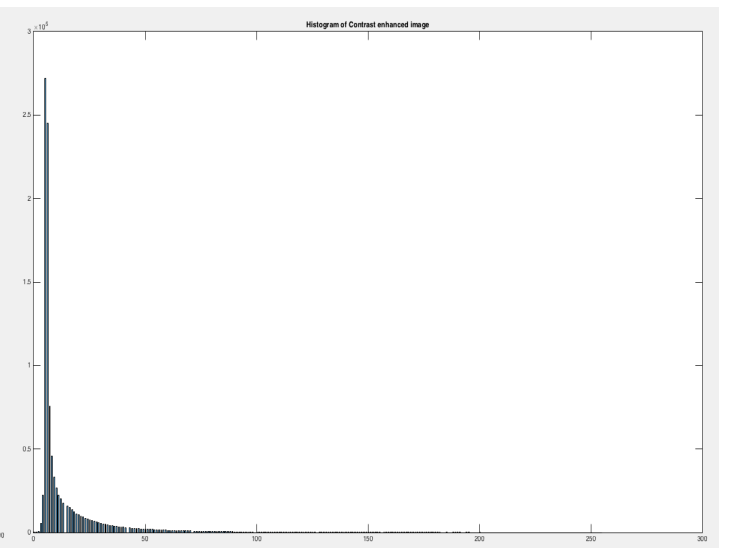


Figure 6 Histogram - Enhanced Image

Now re-compute the upper and lower intensity limits of the image but this time discard some percent of the highest and lowest valued pixels. Re-apply linear contrast stretch. First discard 1% then 5% of the image pixels from both ends of intensity spectrum and apply linear contrast stretch. Show input/output images and plot input/output histograms. Comment on the results. Hint: Use histogram or cumulative histogram to determine the new limits.

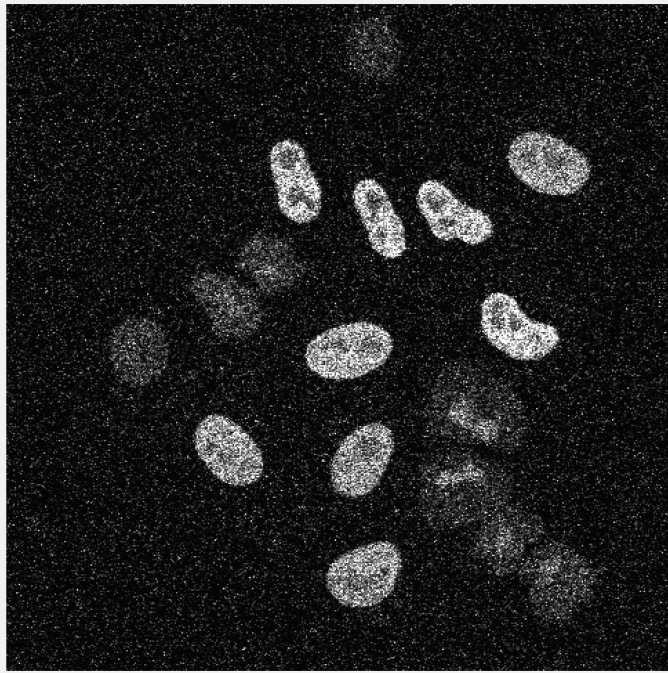


Figure 7 Enhanced Image - 1% discard

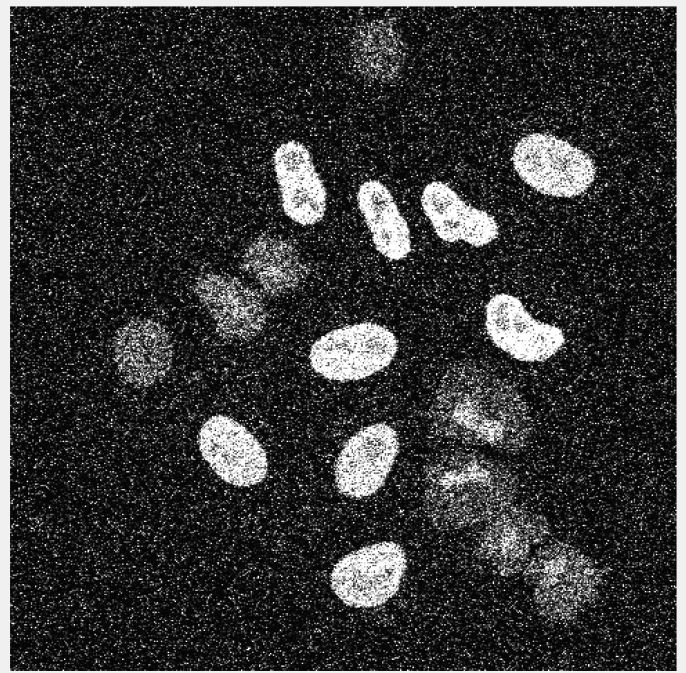


Figure 8 Enhanced Image - 5% discard

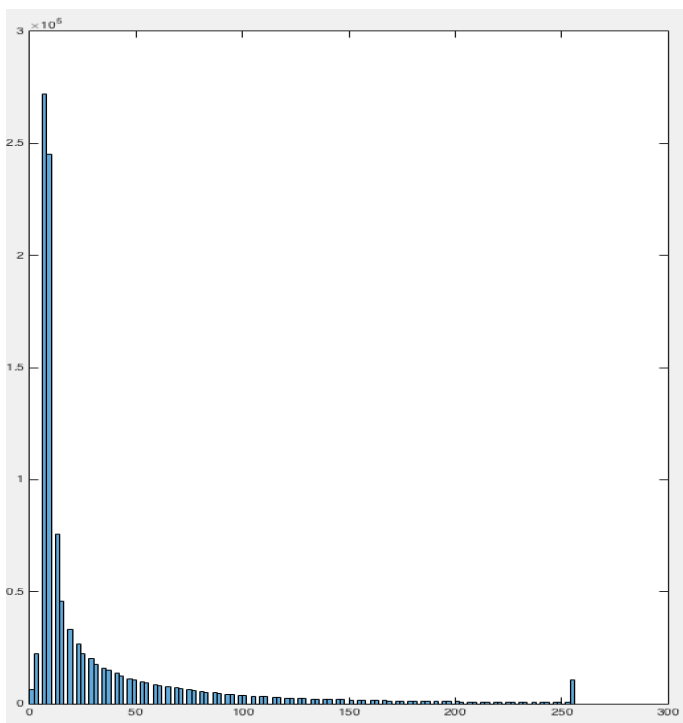


Figure 9 Histogram - Enhanced Image (1% discard)

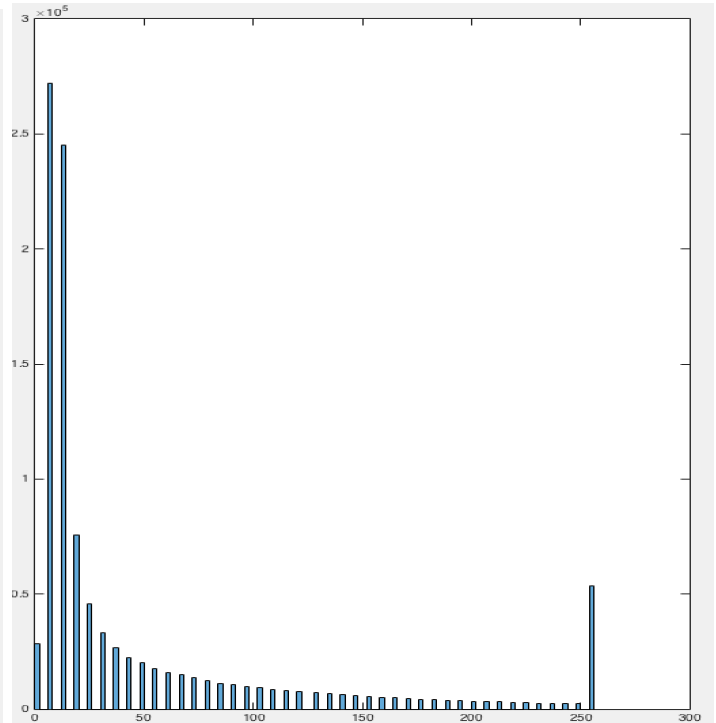


Figure 10 Histogram - Enhanced Image (5% discard)

Observations:

With the linear contrast stretch the enhanced image looks more like the original image, with no to little improvement in the contrast. This is very evident from the histograms of the original image and the contrast enhanced image. Their histograms look similar, dense at low intensities and sparse at higher intensity levels. The min and max intensities of the original image were 5 and 251 respectively. The intensity range of original image is 246, If we perform contrast stretch the improvement in contrast would be little as the possible gain is 10 intensity levels.

As the linear contrast stretch did not yield a better result, I discarded 1% of lower and higher intensity pixels while performing the contrast stretch. After doing that the min and max intensities of the original image were 8 and 91 respectively. Thus the range of intensity range of original image is 83 which is very small. There is a gain of 173 intensity levels on performing linear contrast stretching. The resultant image has a very good contrast compared to the original image. This can be deduced from the histogram of the resultant image. The intensity levels are a bit spread out. Apart from contrast, the noise in the resultant image is very clearly visible.

I discarded 5% of lower and higher intensity pixels while performing the contrast stretch. After doing that the min and max intensities of the original image were 9 and 51 respectively. Thus the range of intensity range of original image is 42 which is very small. There is a gain of 214 intensity levels on performing linear contrast stretching. The resultant image has a very good contrast compared to the original image and the image obtained by discarding 1% of pixels. The intensity levels in the resultant image are very well spread out, it can be observed in the histogram. Apart from contrast, the noise in the resultant image seems to be amplified.