DIP Assignment 1

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Q1.)
Uses of this function are the following:
a.May be helpful for an artist who wants to analyse any work of art.
b.May be helpful in data cleaning while preparing a dataset.If you know to dominant color in our ideal dataset,we can filter data points out based on the fraction of dominant color in the image/data point.
c.Extracting relevant scenes from a video.
d.Tuning the display properties of a television will be effective if we know the dominant color in a video, so that we can adjust contrast ,saturation ,etc values for a better experience.

Image:

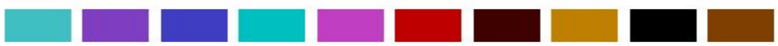
Dominant color:

Palette (not in sorted order):

Image:

Dominant color:

Palette(not in sorted order):



Q2.)

Original background:

Original foreground:

Result:

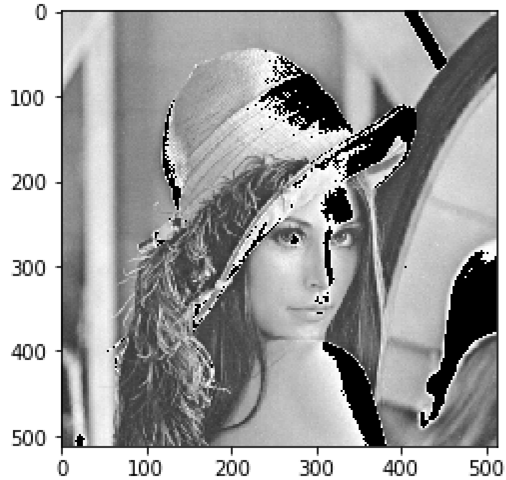
Original background:

Original foreground:

Result:

Q3.)a)
Analytical Equation:

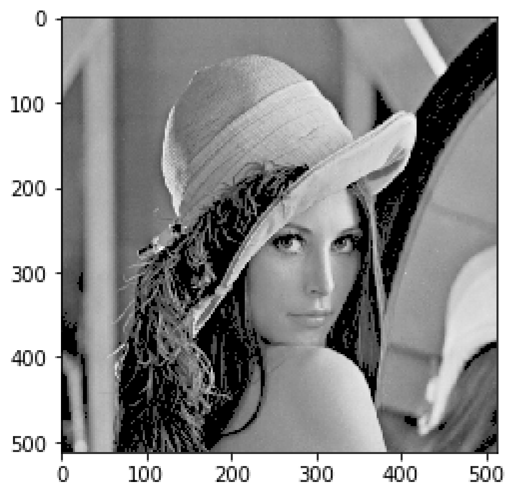
$$g(z) = \begin{cases} z + 0.25 & (0 <= z <= 0.75) \\ 1 & (0.75 < z <= 1) \end{cases}$$



b)

Analytical Equation:

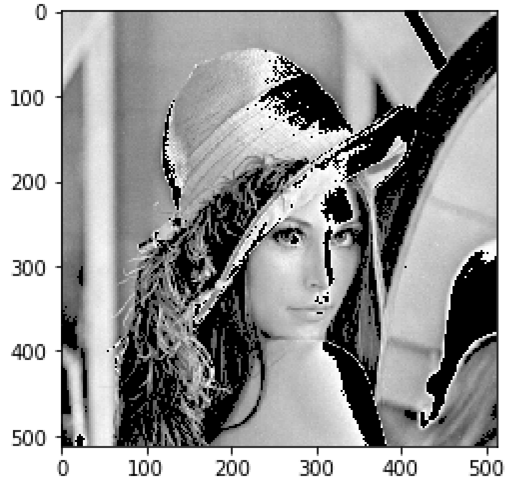
$$g(z) = 0 \qquad (0 <= z <= 0.25)$$
$$= 4z/3 - 1/3 \qquad (0.75 < z <= 1\ )$$



c)

Analytical Equation:

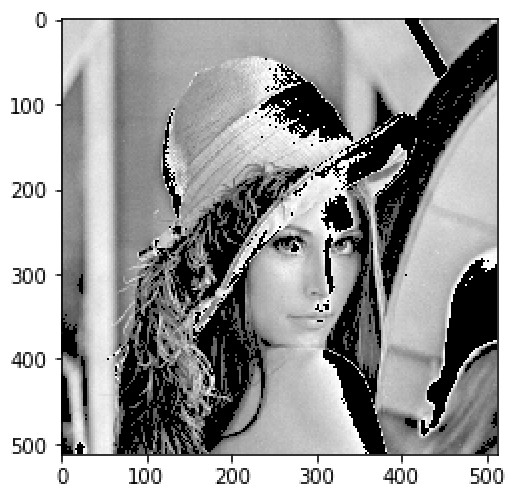
$$g(z) = 0 \qquad (0 <= z <= 0.25)$$
$$= 2z - 0.5 \qquad (0.25 < z <= 0.75\ )$$
$$= 0 \qquad (0.75<=z<=1)$$



d)

Analytical Equation:

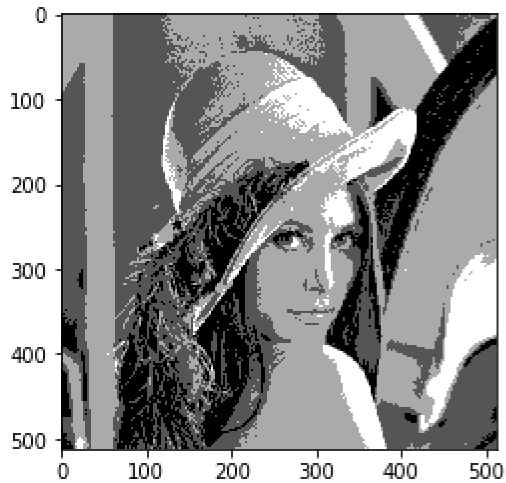
$$g(z) = \begin{cases} 0 & (0 <= z <= 0.25) \\ z & (0.25 < z <= 0.75) \\ 0 & (0.75<=z<=1) \end{cases}$$



e)

Analytical Equation:

$$g(z) = \begin{cases} 0.25 & (0 <= z <= 0.25) \\ 0.5 & (0.25 < z <= 0.5) \\ 0.75 & (0.5<=z<=0.75) \\ 1 & (0.75<=z<=1) \end{cases}$$



Q4.)Histogram of images

Image: Histogram:

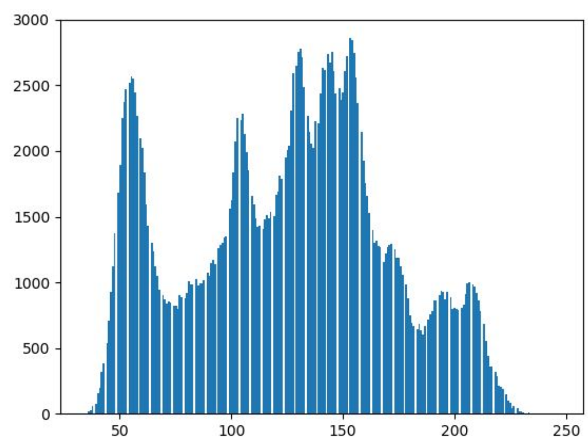


Image: Histogram:

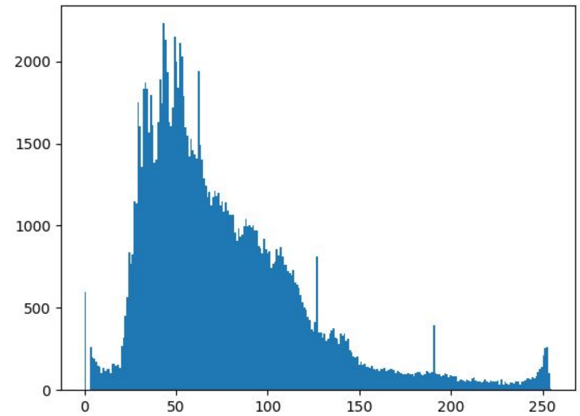
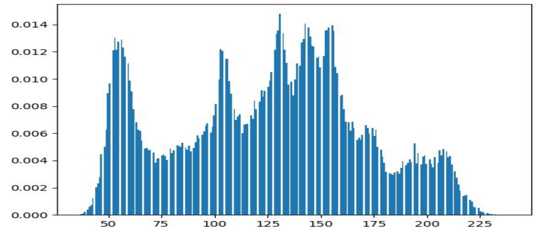
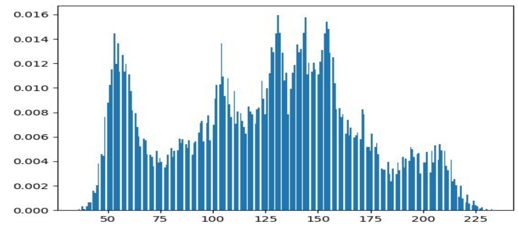
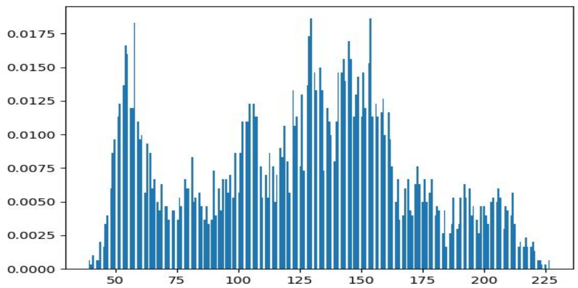
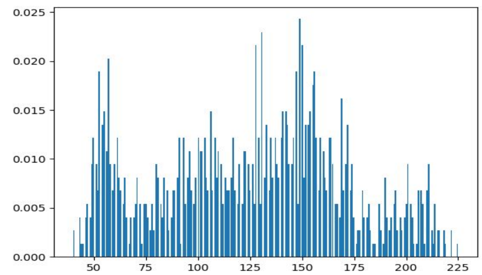


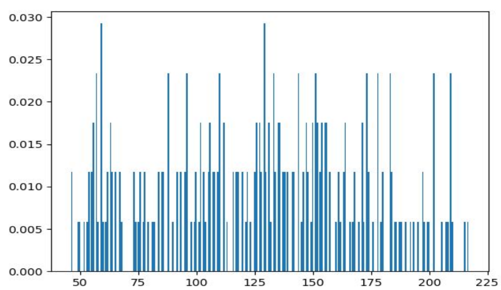
Image resolution	Histogram size	Raw Image size
16x16	2048 bytes	256 bytes
32x32	2048 bytes	1024 bytes
64x64	2048 bytes	4096 bytes
128x128	2048 bytes	16384 bytes
256x256	2048 bytes	65536 bytes









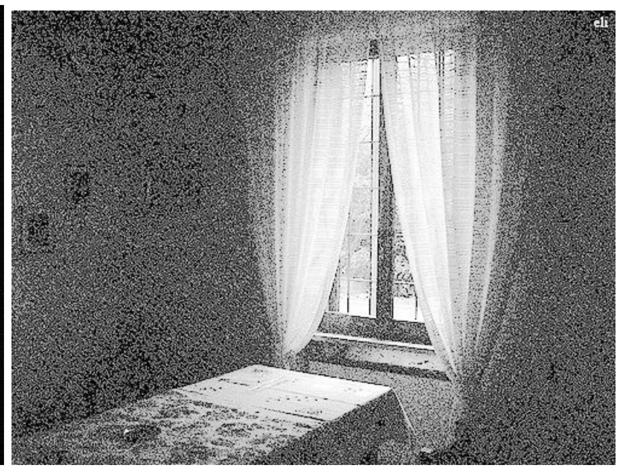


It is clear from the histograms that increasing or decreasing the resolution of the images results in similarly shaped histograms.
Very low resolution image will have slightly different shape due to scarcity of intensity values.

Q5.)Histogram equalization:

Original image: Result:

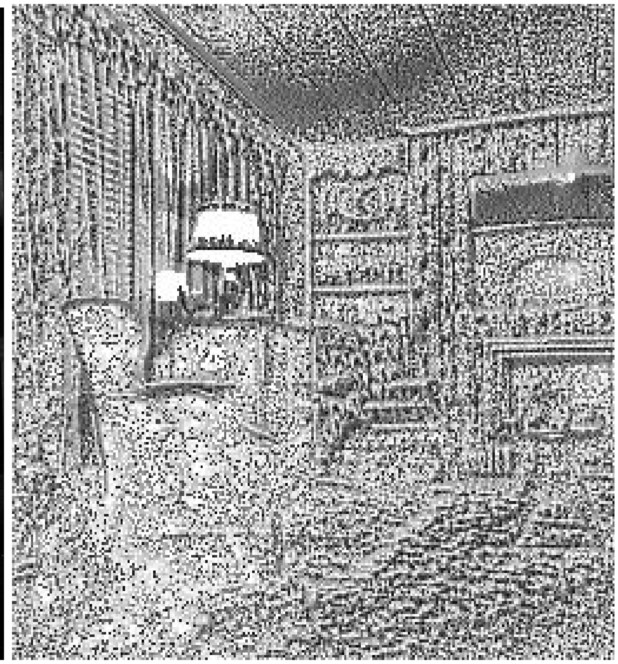
Original image: Result:



Local histogram equalization:

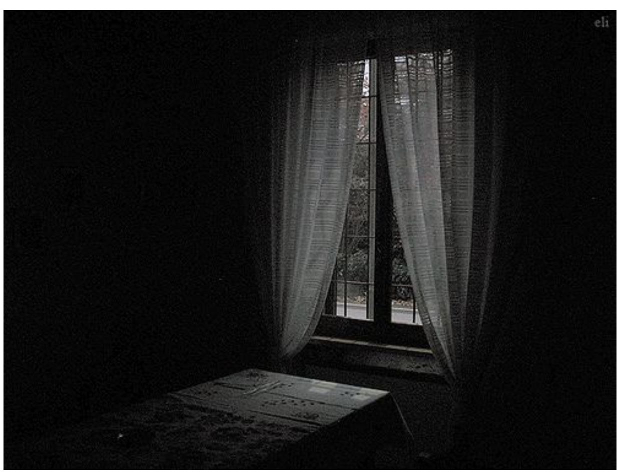
Window size:5

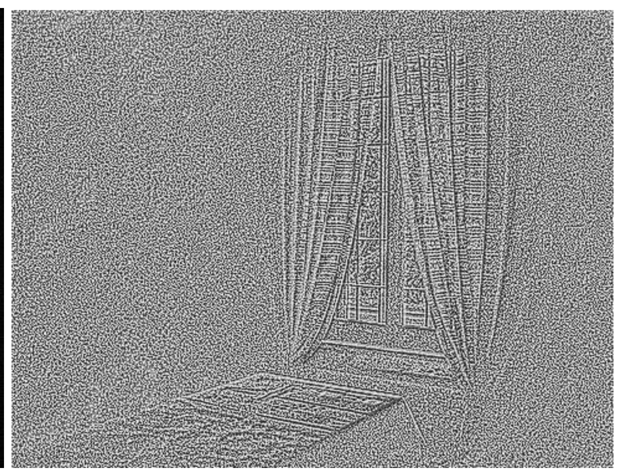
Original Image: Result:



Original Image:

Result:

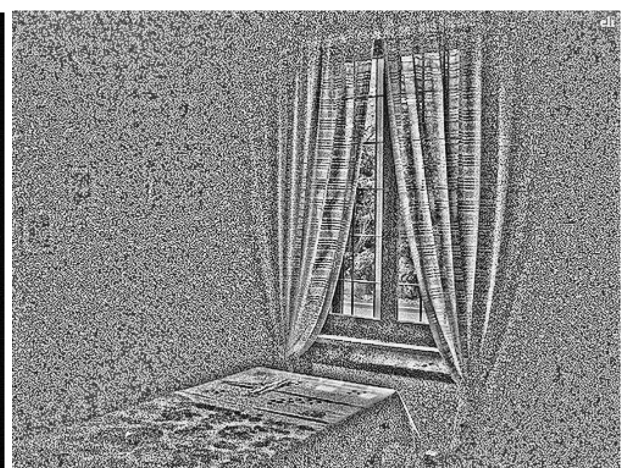




Window size:20

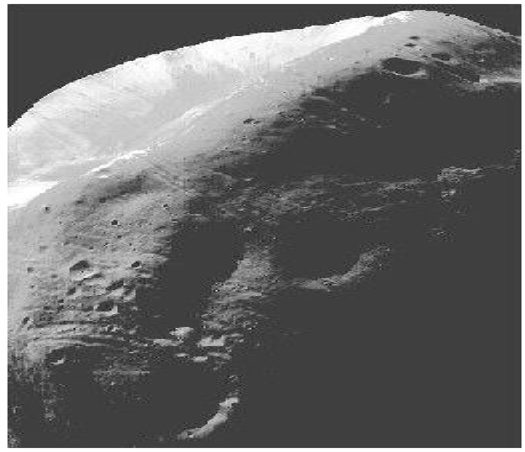
Original Image: Result:

Original Image: Result:



Histogram matching:

Original image: Second image:



Result:

Q6.)For a n bit image k can be integer between 1 and n (both inclusive).
So, for a 8-bit image like the following image, the value of k can range from 1 till 8.

Original Image:

1-bit quantized

2-bit quantized

3-bit quantized

4-bit quantized

5-bit quantized

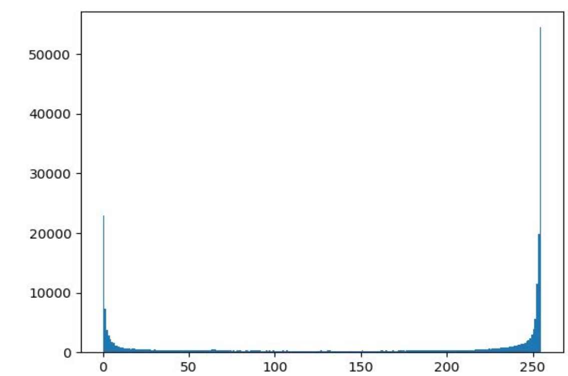
6-bit quantized

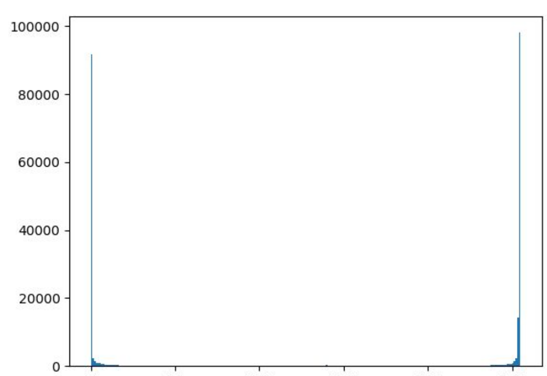
7-bit quantized

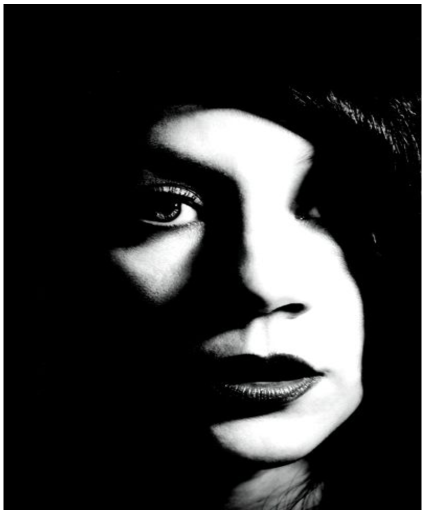
8-bit quantized

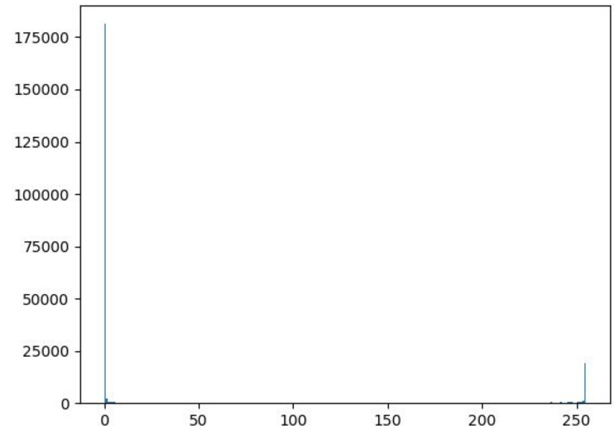
Q7.)

High contrast images and their corresponding histograms:

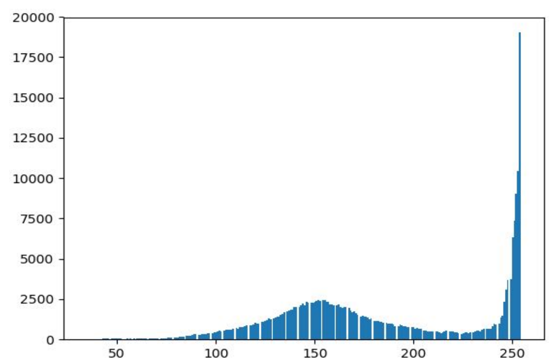


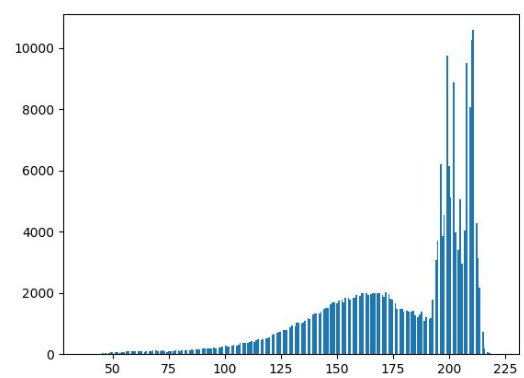


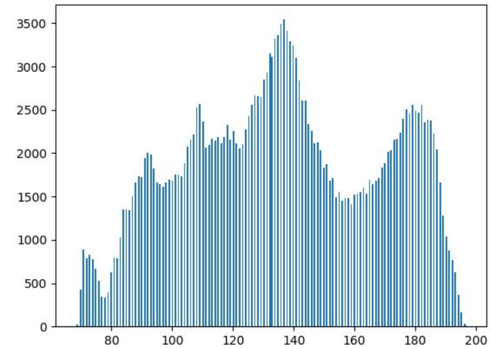




Low contrast images and their corresponding histograms:



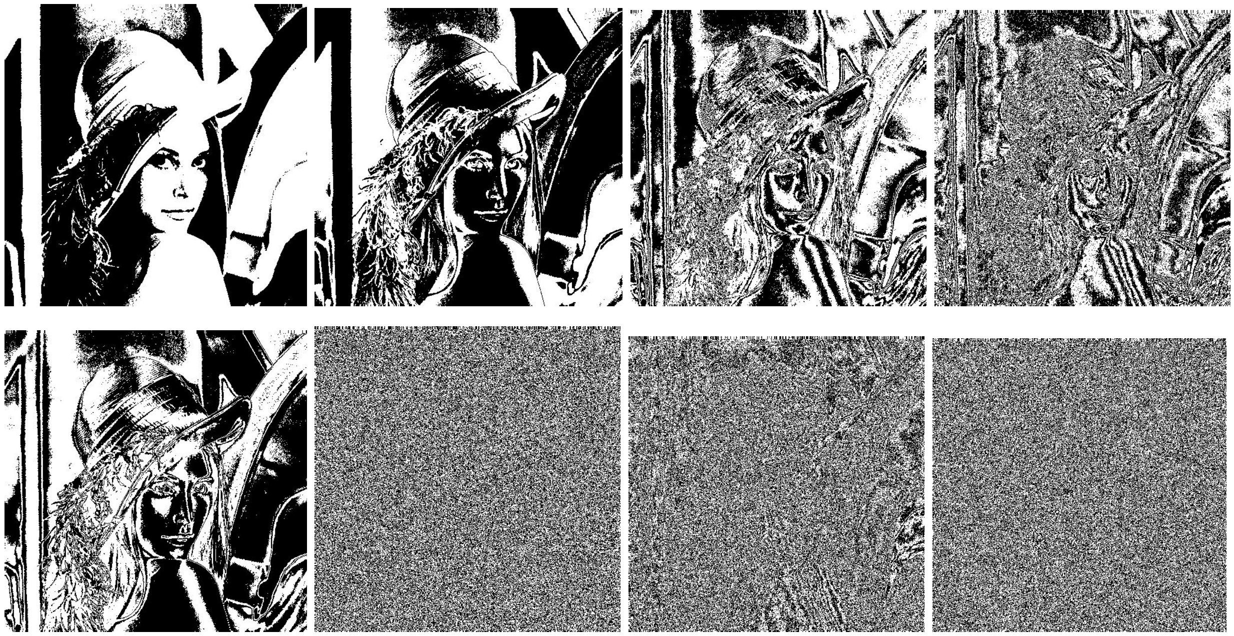




We can clearly see that the images with high contrast have histograms which have two visible peaks.This tells us that these have pixel intensities only around a certain value.
The low contrast images have a widely spread histogram because they do have every intensity value.

Q8.)
The 8th bit plane contains most of the information because it maps to values from 128 to 255, which is the larger than what the other bit planes map to.

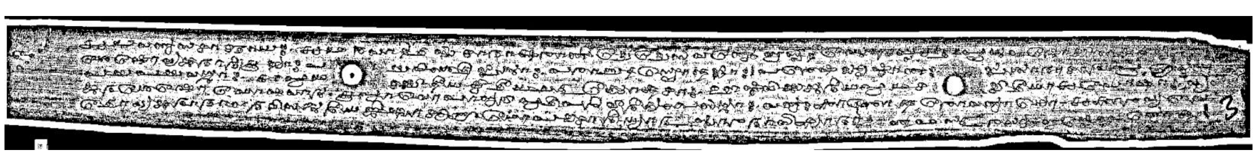
Nth-bit plane images(N ranging from 8 to 1):



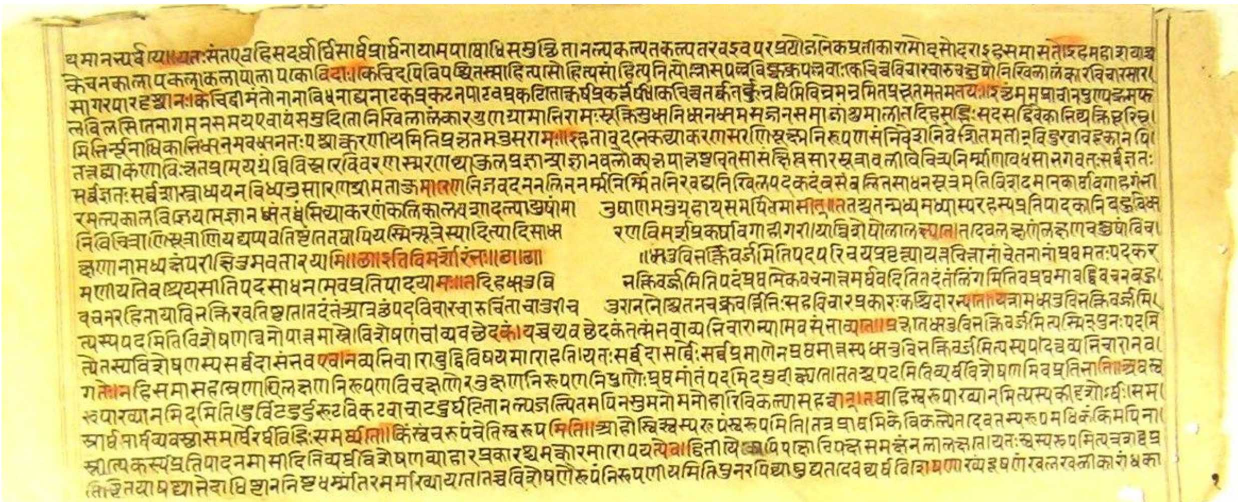
Q9.)

Original image

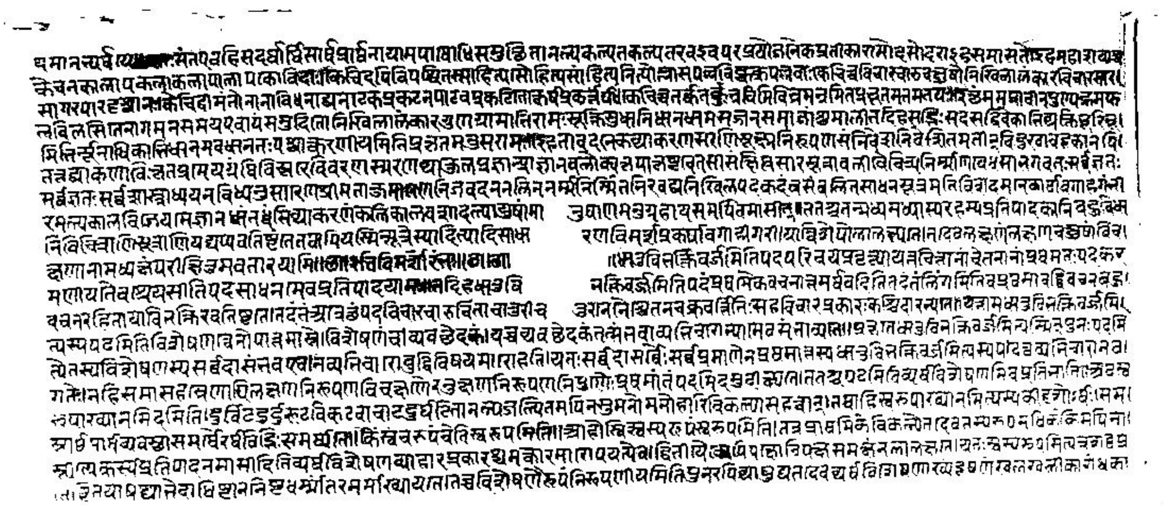
Thresholded image using otsu thresholding



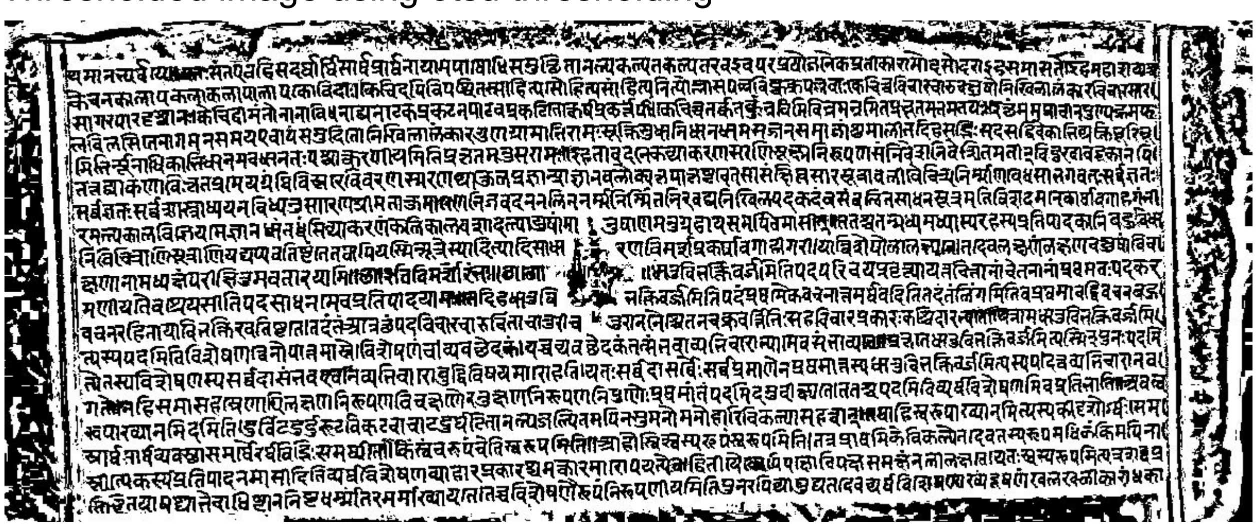
Thresholded image using adaptive thresholding



Original Image



Thresholded image using otsu thresholding



Thresholded image using adaptive thresholding

Global thresholding is acceptable only if the image has a clear distinction between foreground and background.

Adaptive thresholding divides the image into different neighbourhoods and picks a different threshold for each neighbourhood. The main choice while performing adaptive thresholding is the size of the neighbourhood/window. If it is too small, the resulting binarized image can look discontinuos. And if it is too big, it has the same issue as global thresholding.