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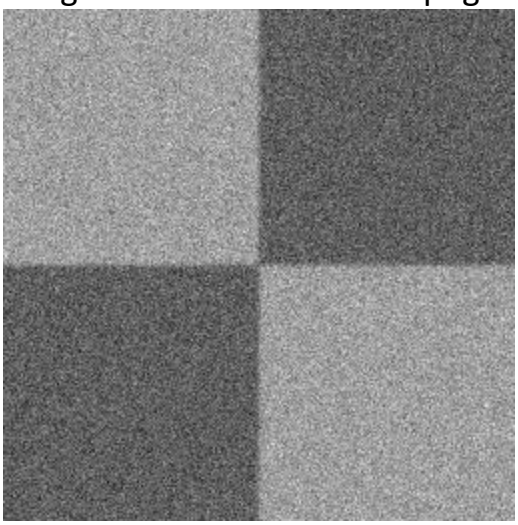
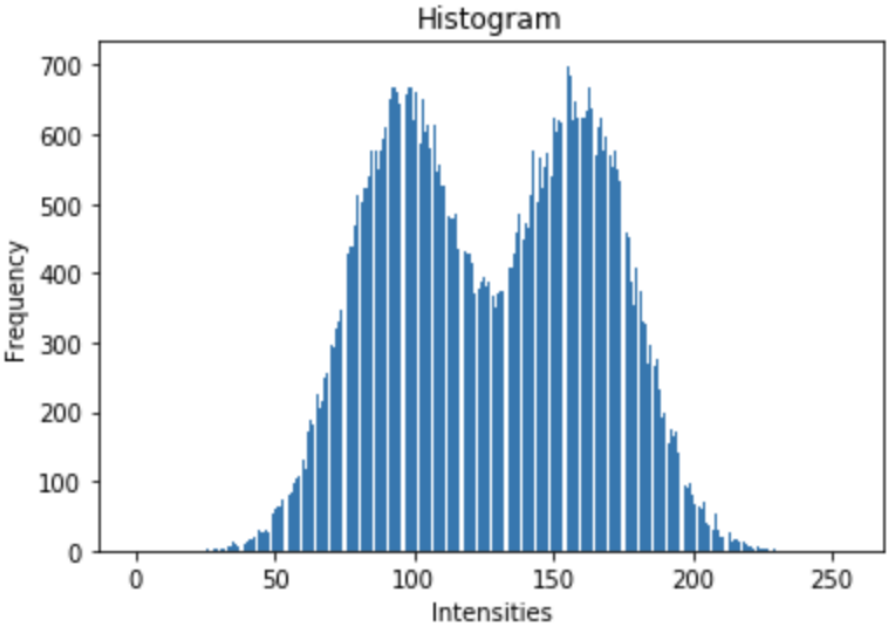
CV HW1 Practical Programming Reports:
B1) **Compute a Histogram, PDF and CDF**
Image 1: checker128-var20.png



Since our image is a balanced image with equal amounts of dark and light areas the same is depicted in our graphs.

Histogram: It's a plot of the intensity levels against the frequency. We have kept the bin size as 1. So our histogram has 256 bins.
In our case, the histogram is symmetrical and has almost equal peaks since our image has equal amounts of light and dark areas.



Name: Udita Gupta
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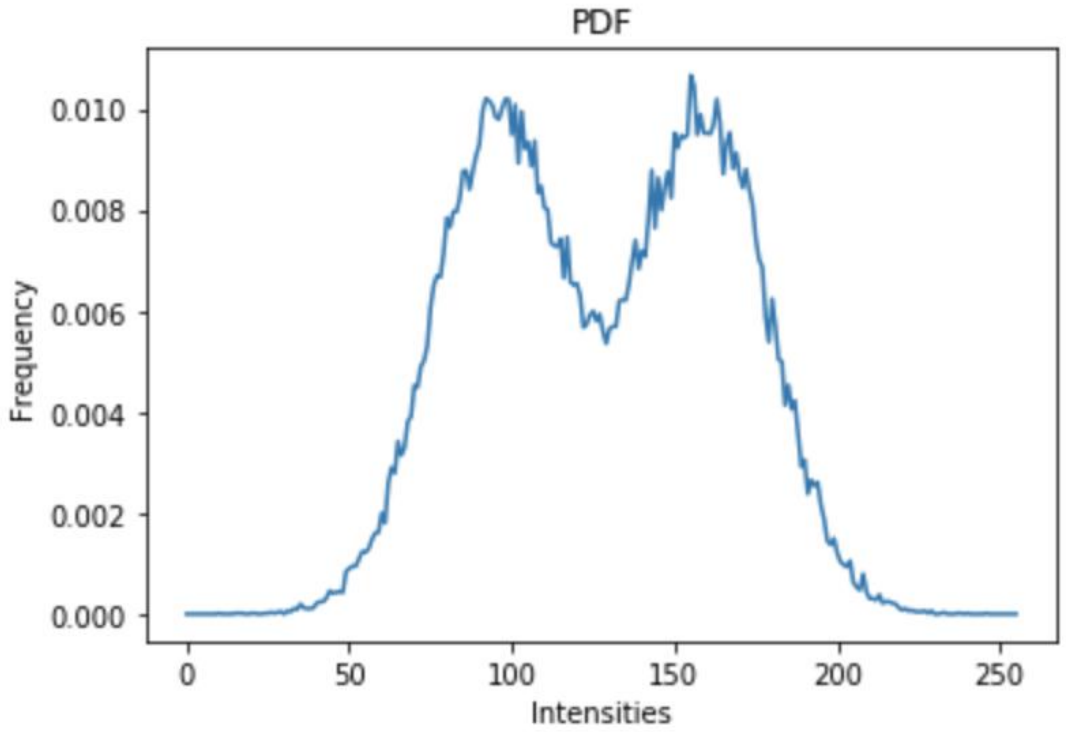
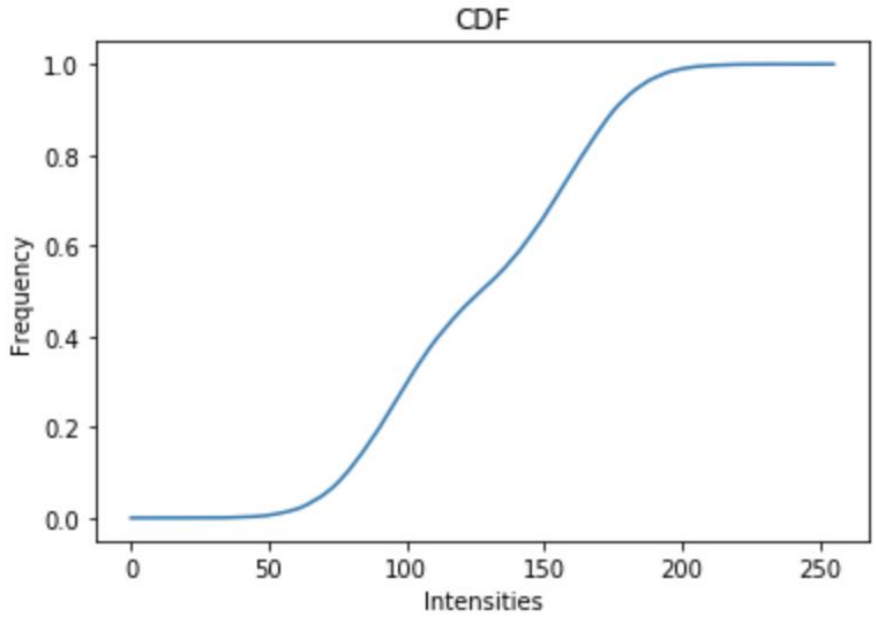
PDF (Probability Density Function): It's a plot between the intensities and their probability. The histogram was normalized by the image size to produce PDF.



CDF (Cumulative Density Function): It's calculated by doing a cumulative sum of the above probabilities.



Name: Udita Gupta
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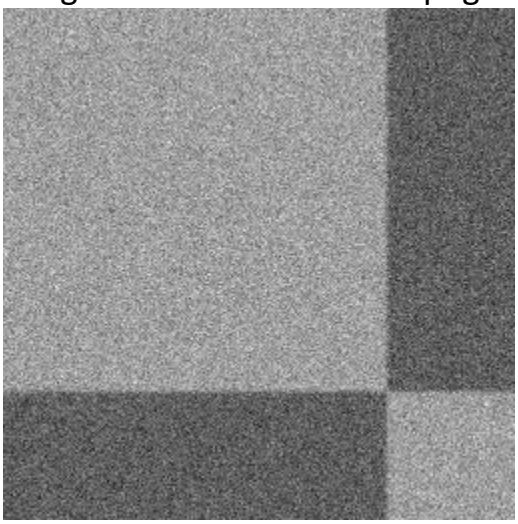
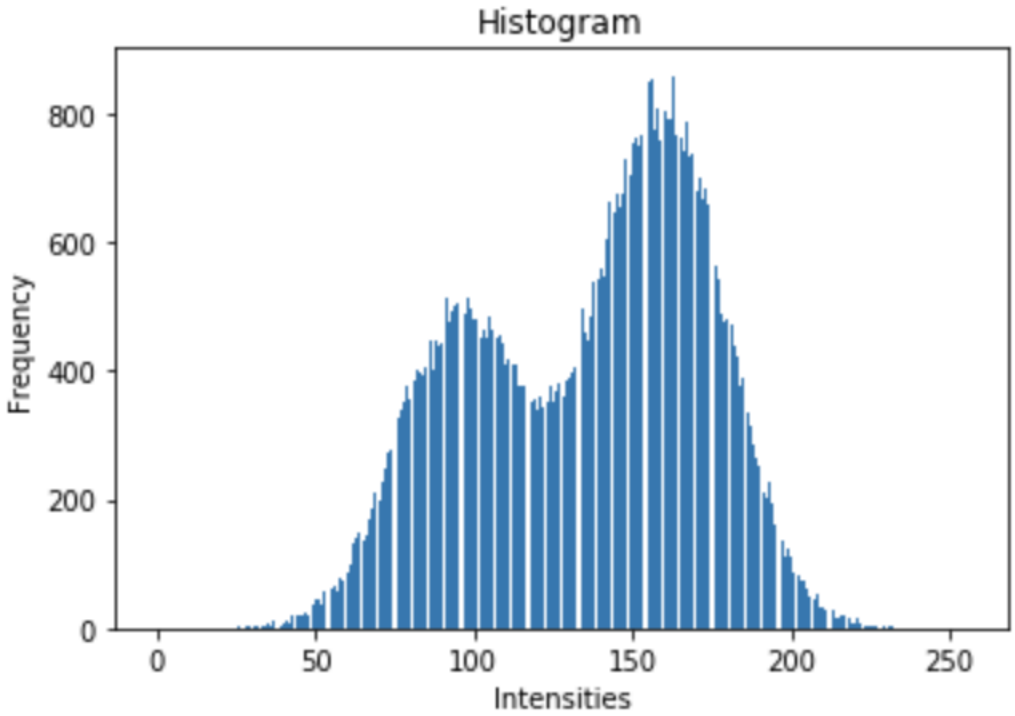
Second Image:
Image 2: checker196-var20.png



As in our second image, we do not have an equal distribution, we can see the same being depicted in our Histogram, PDF and CDF plots.



We can see that the histogram is no longer symmetrical and has two different peaks. Smaller peak denotes the darker region values.

Name: Udita Gupta
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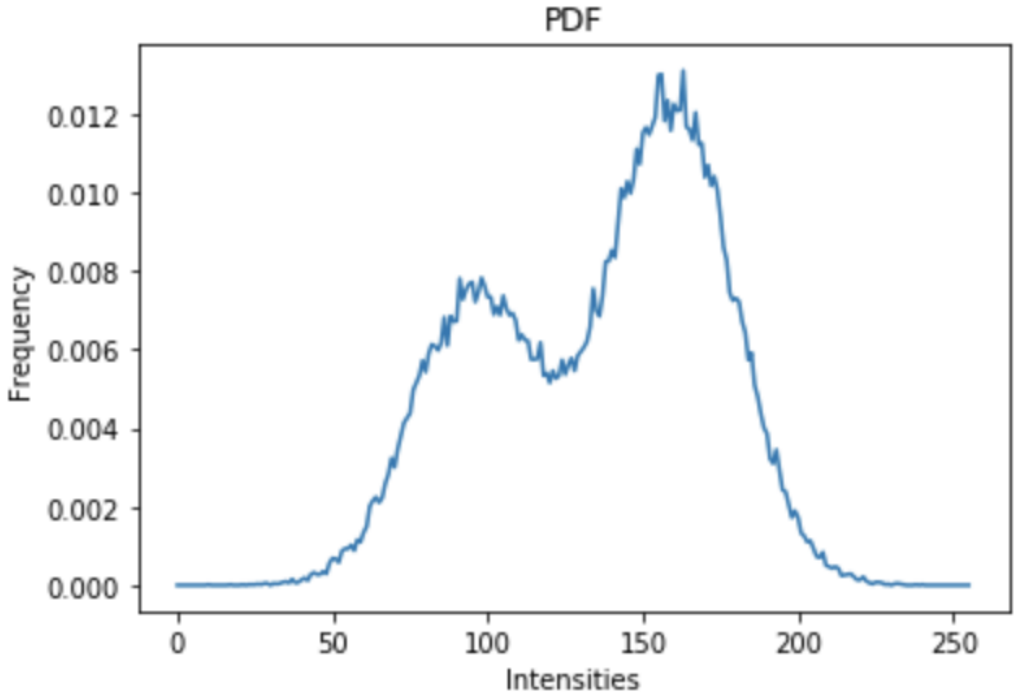
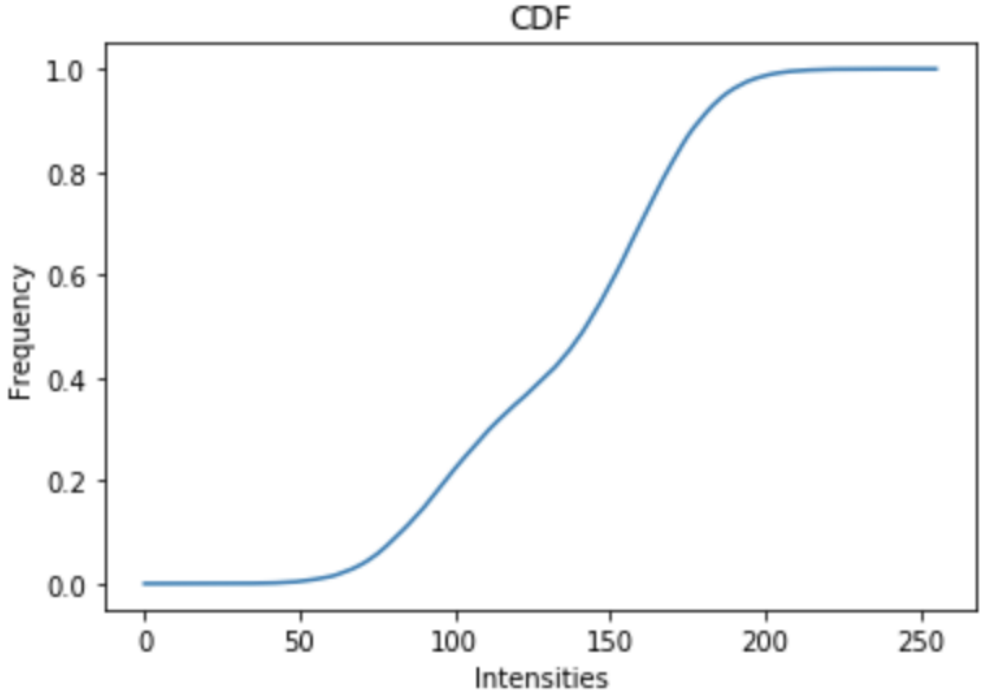
N#: N17237066

The same has been reflected in PDF and CDFs:

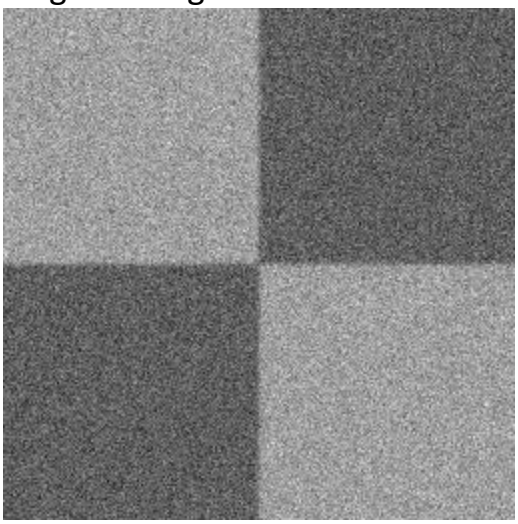




Name: Udita Gupta
Net ID: ung200
N#: N17237066

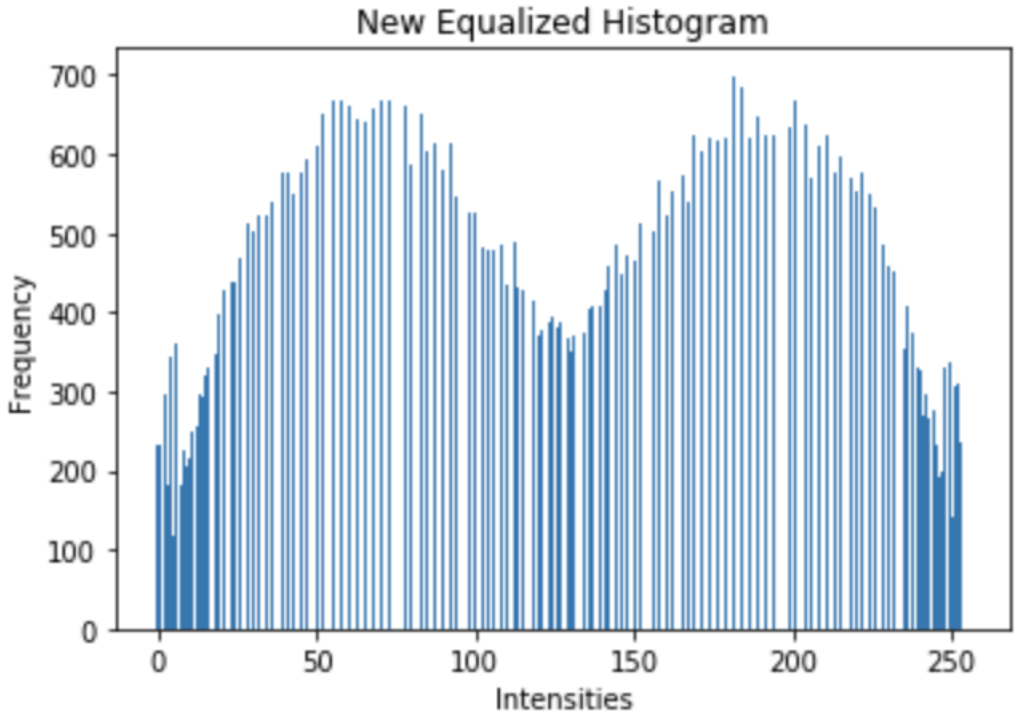
B2) Histogram Equalization

Histogram equalization is a technique for adjusting image intensities to enhance contrast.
Original Image 1: checker128-var20.png



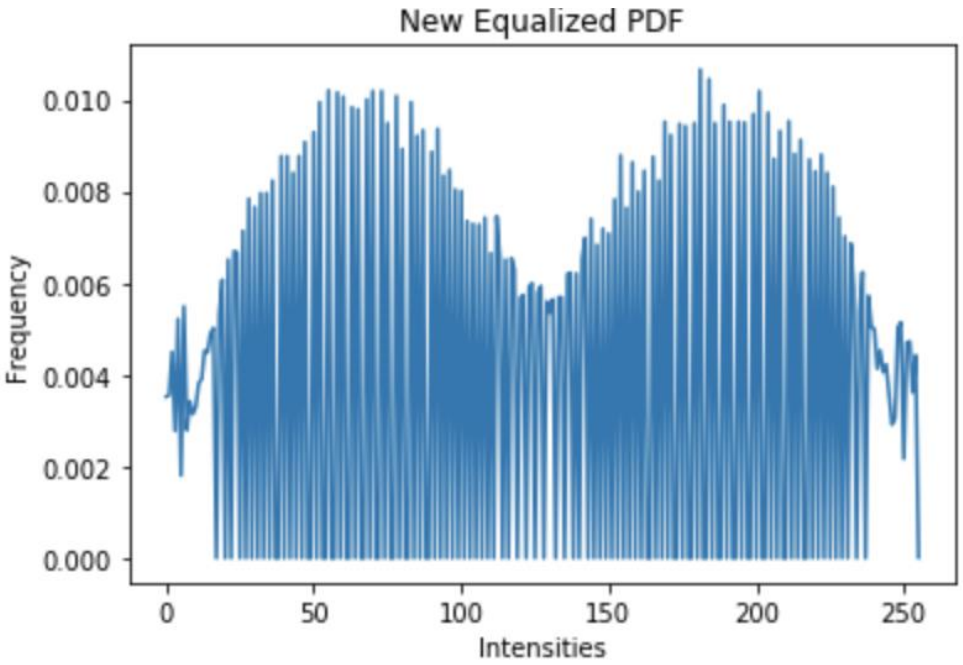
Observations after Equalization:

Histogram:
Histogram has flattened and more spread out.

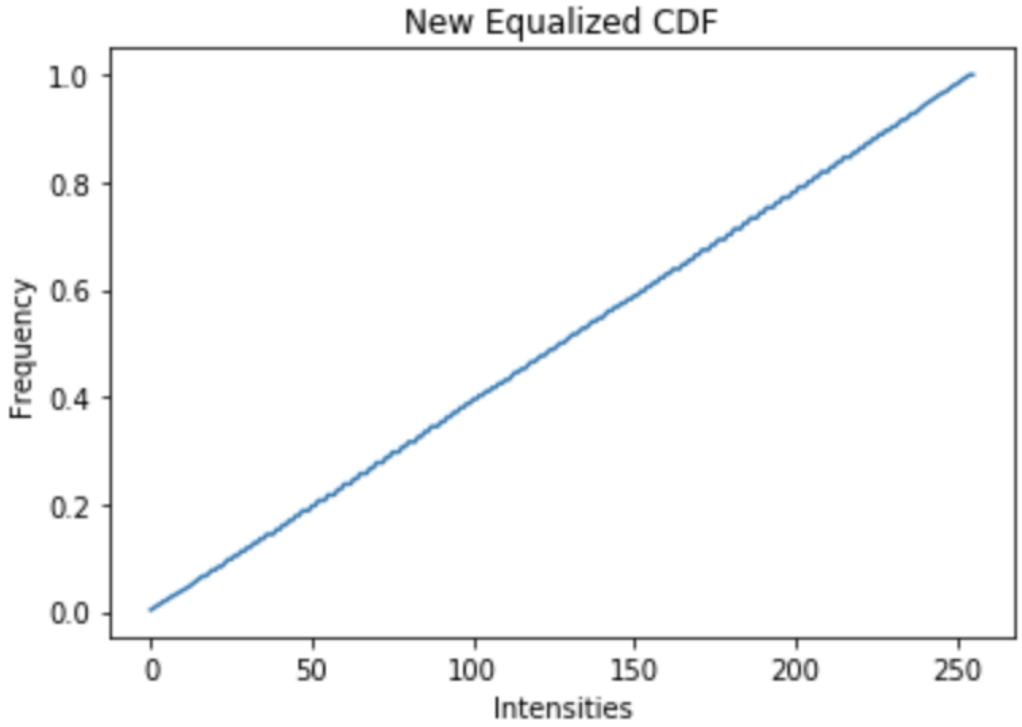


Name: Udita Gupta
Net ID: ung200
N#: N17237066

PDF: Even the PDF is similar to the Histogram.



CDF : CDF is linear for the equalized image.

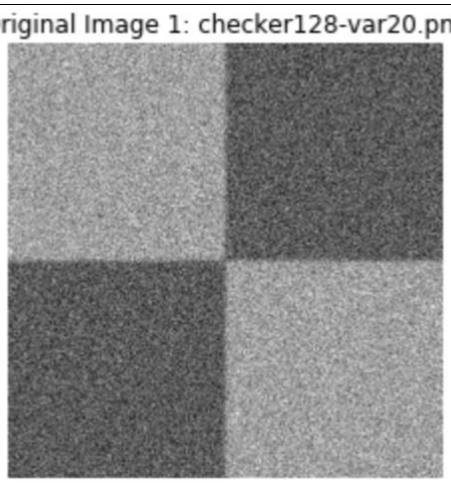
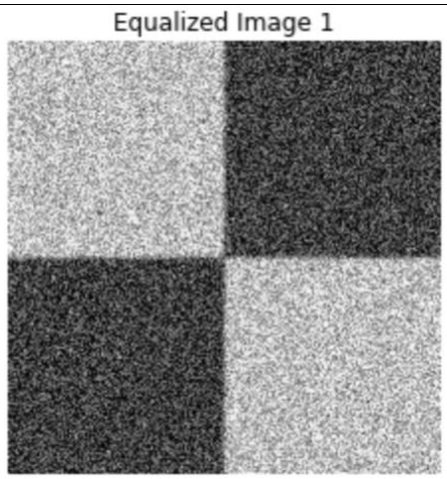
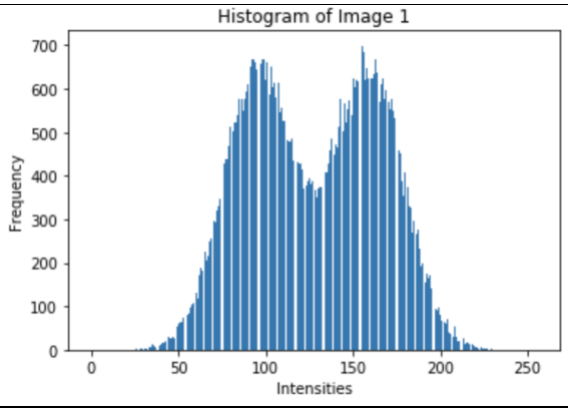
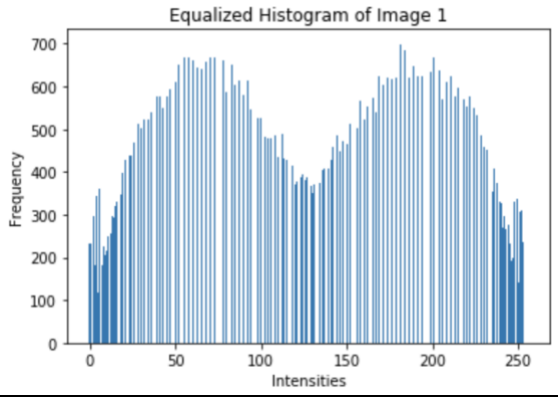


Name: Udita Gupta
Net ID: ung200
N#: N17237066

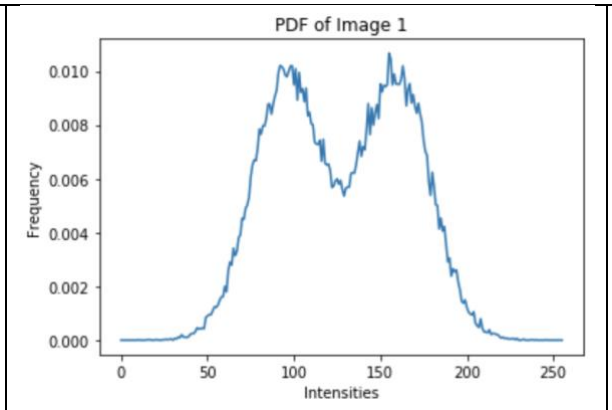
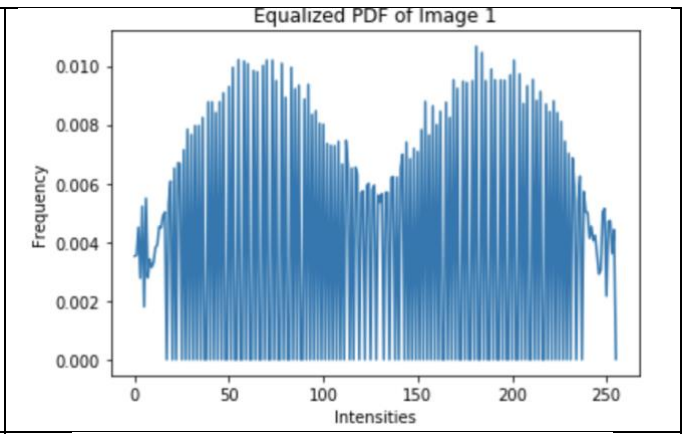
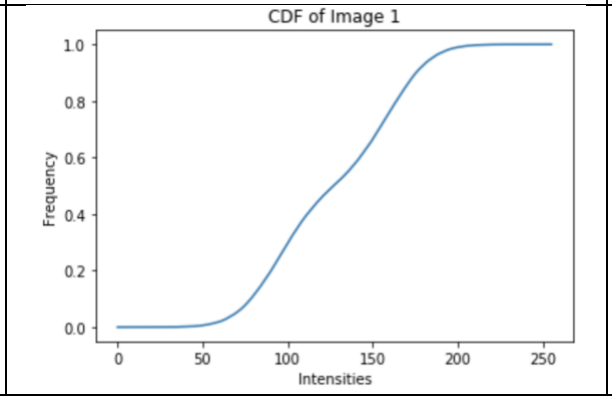
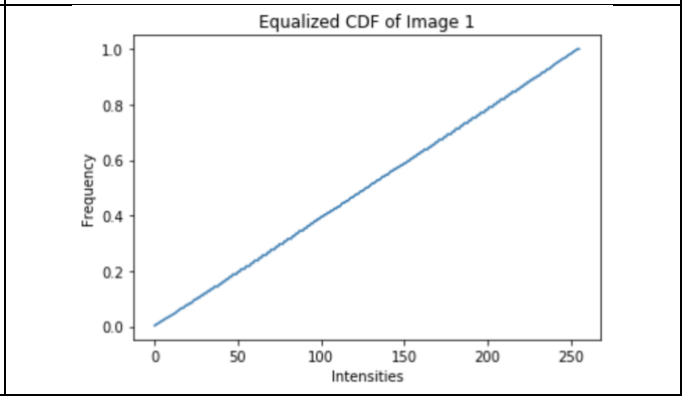
We can see that the image has a more of a spread-out intensity and even histogram has slightly flattened and is more spread out equally.
CDF is now linear for the equalized image.

Similar results were observed for Image 2 that we used in the previous question.

BEFORE and AFTER for **Image 1**:

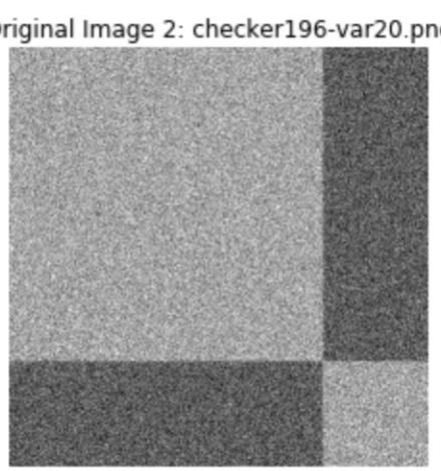
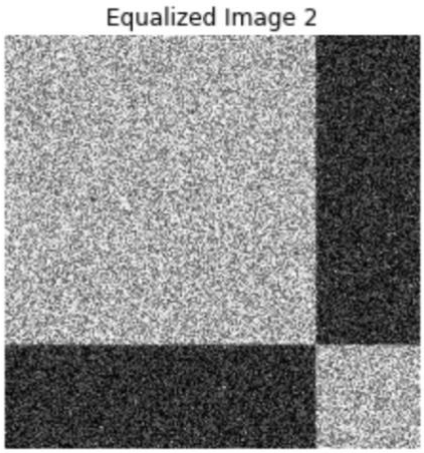
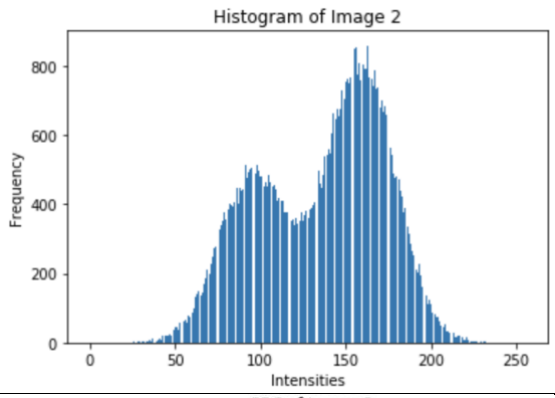
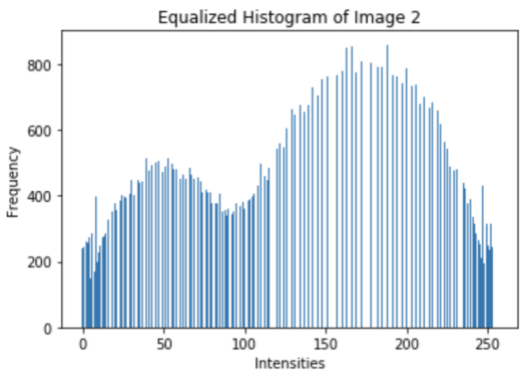
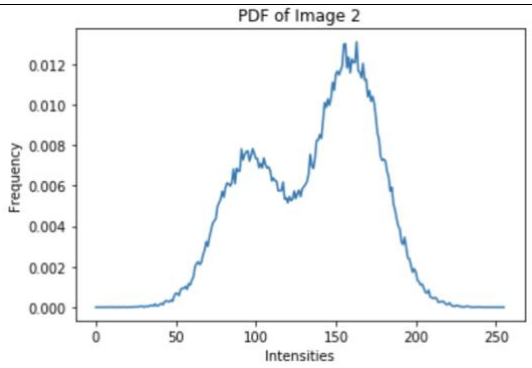
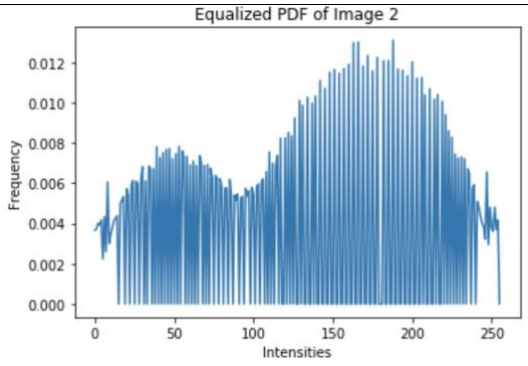
	BEFORE	AFTER
Image		
Histogram		

Name: Udita Gupta
Net ID: ung200
N#: N17237066

PDF		
CDF		

Name: Udita Gupta
Net ID: ung200
N#: N17237066

BEFORE and AFTER for **Image 2**:

	BEFORE	AFTER
Image		
Histogram		
PDF		

Name: Udita Gupta
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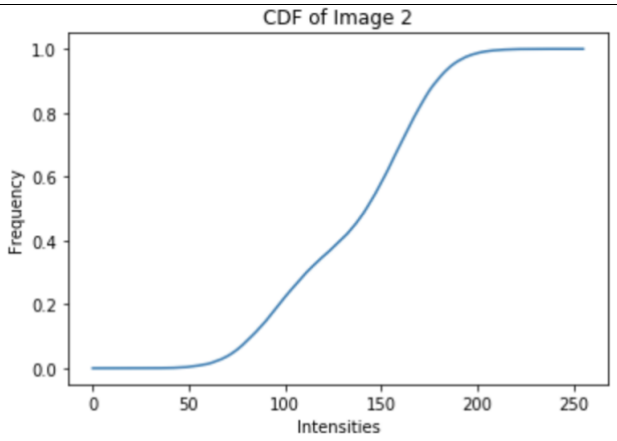
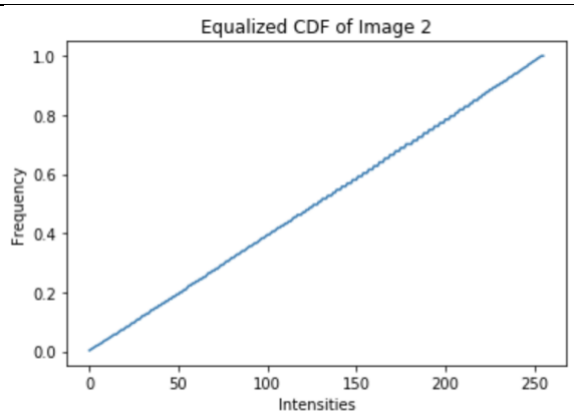
CDF		

B3) Histogram Matching

Histogram matching or histogram specification is the transformation of an image so that its histogram matches a specified histogram.

In Histogram Matching we took the following two images:
One with bad contrast and quality and the second one with good contrast quality.

chang.png

Lenna.png

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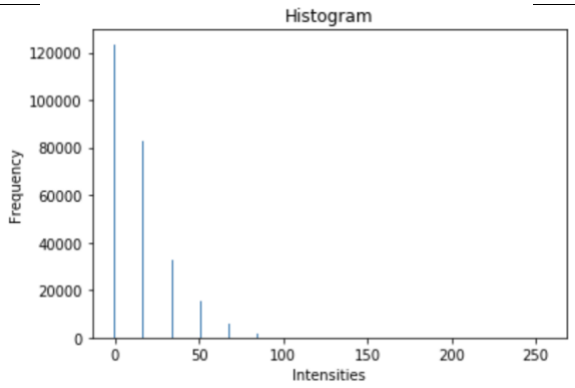
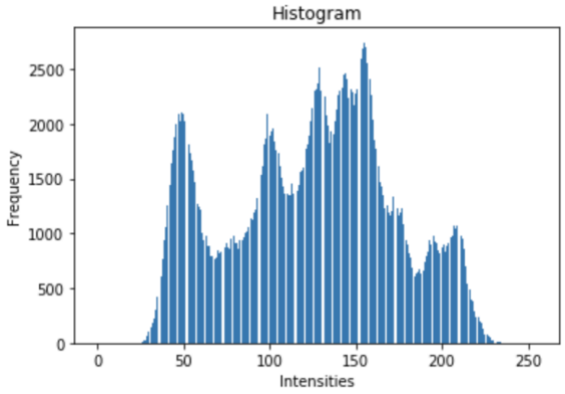
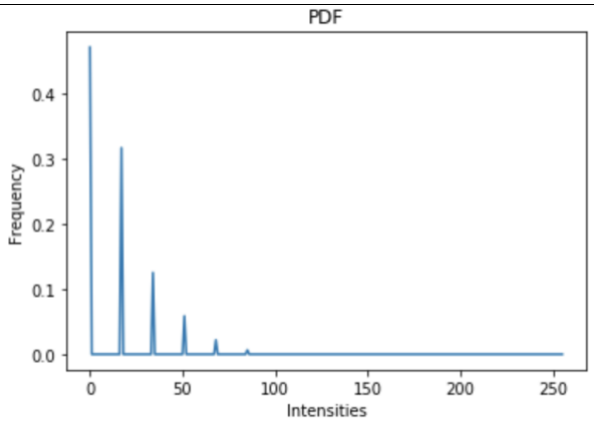
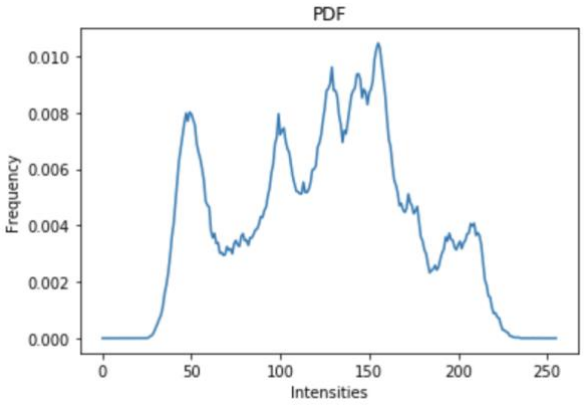
We calculated the Histogram, PDF and CDF for each of the images:

	Image 1: chang.png	Image 2: Lenna.png
Image		
Histogram		
PDF		

Name: Udita Gupta
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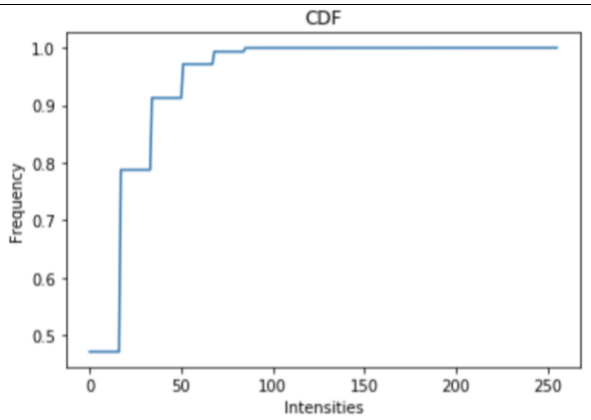
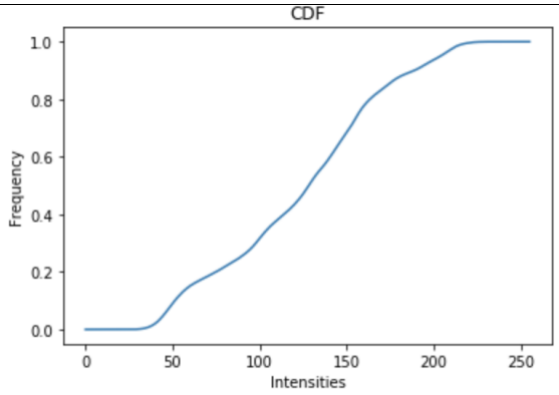
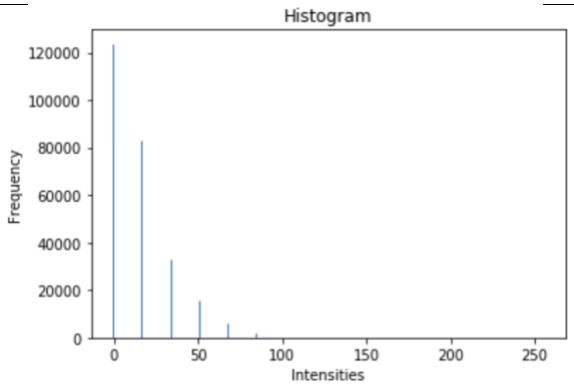
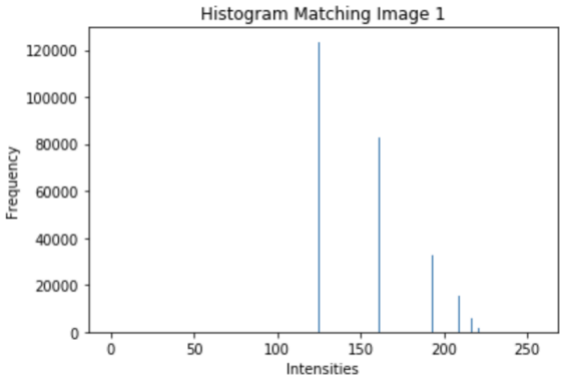
CDF		

After successful Histogram Matching:

	BEFORE	AFTER
IMAGE		
Histogram		

Name: Udita Gupta
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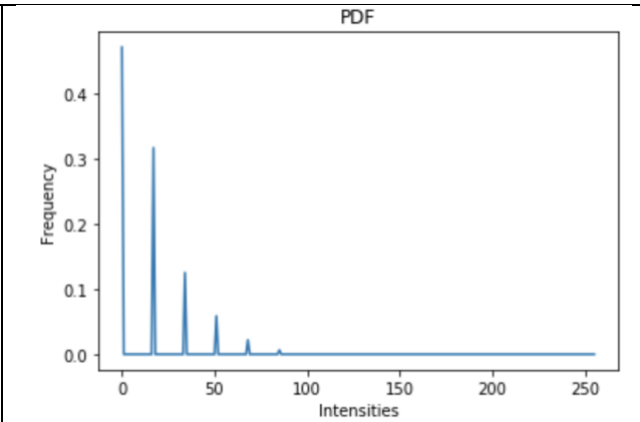
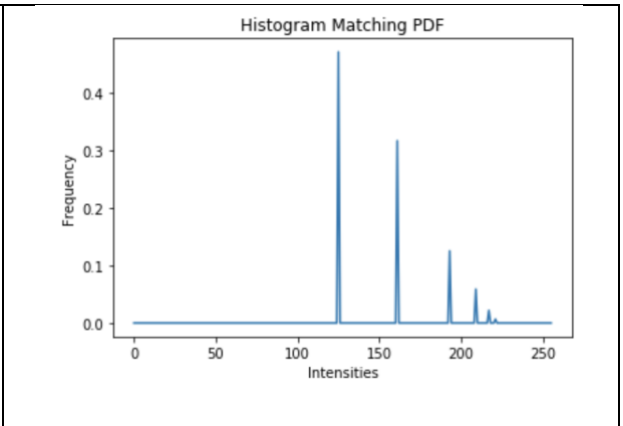
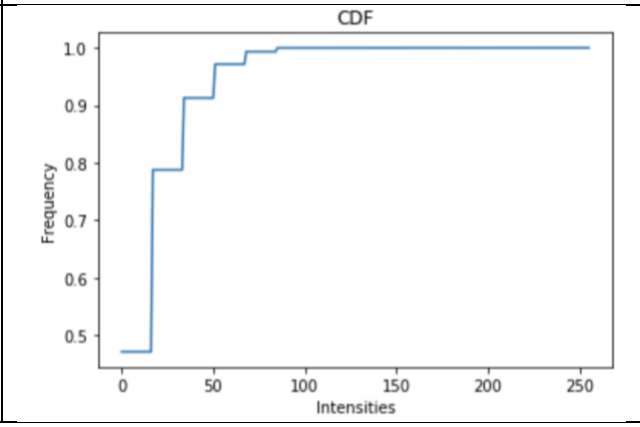
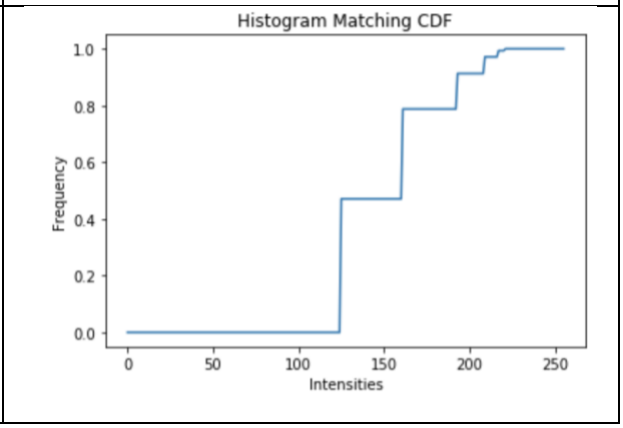
PDF		
CDF		

As we can see, the expected image was to have a better contrast and quality, which it did. Also, if we observe, the resultant histogram is similar to the second image's (Desired Image) histogram.