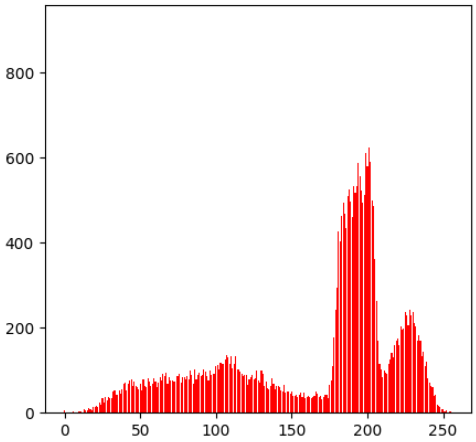
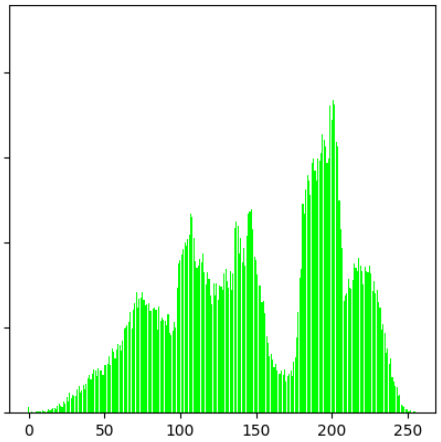
Akash Kandli Srinivasalu
Computer Vission
Assignment 1 -Practical

Question B1) Histogram and CDF

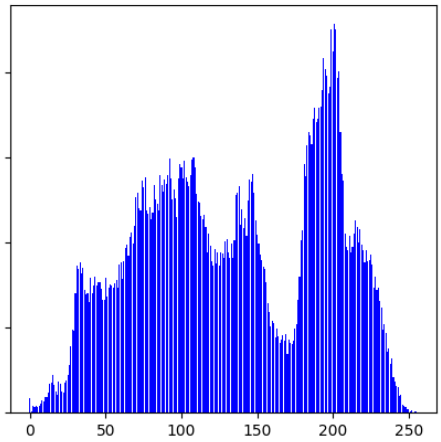
1.



red



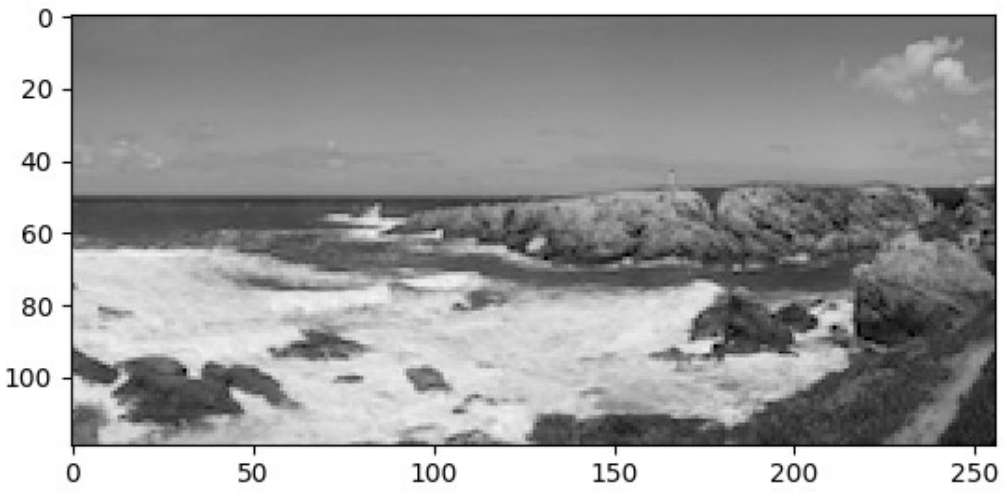
green



blue

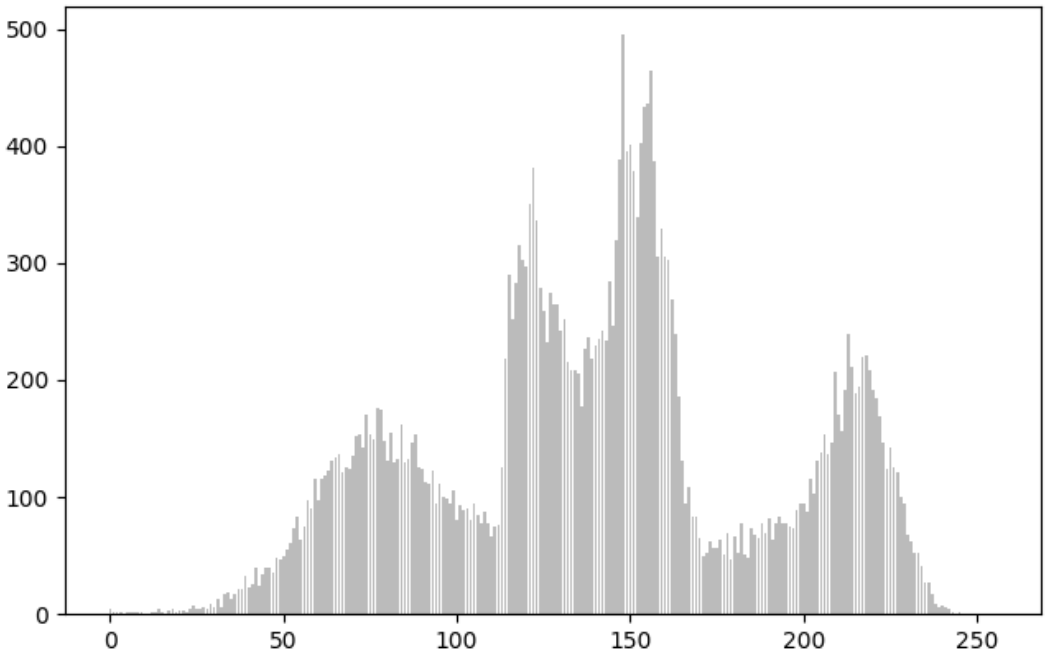
2. In the above image we can see the histograms of the different color channels and they represent the frequency of diferent pixel intensities. We can see that these graphs clearly represent the distribution of each color, for example, we can see that in the graph which represents the blue color there are higher number of pixels which have high intensities in the range of 180-220 when compared to red or green, this is because a great part of the image looks blue because of the sky and the ocean, in these pixels the intensity of blue will be much higher than the other 2 colors. The areas which are brown are areas where the intensity of red and green is more and there is very little intensity of blue.

3.



Greyscale image

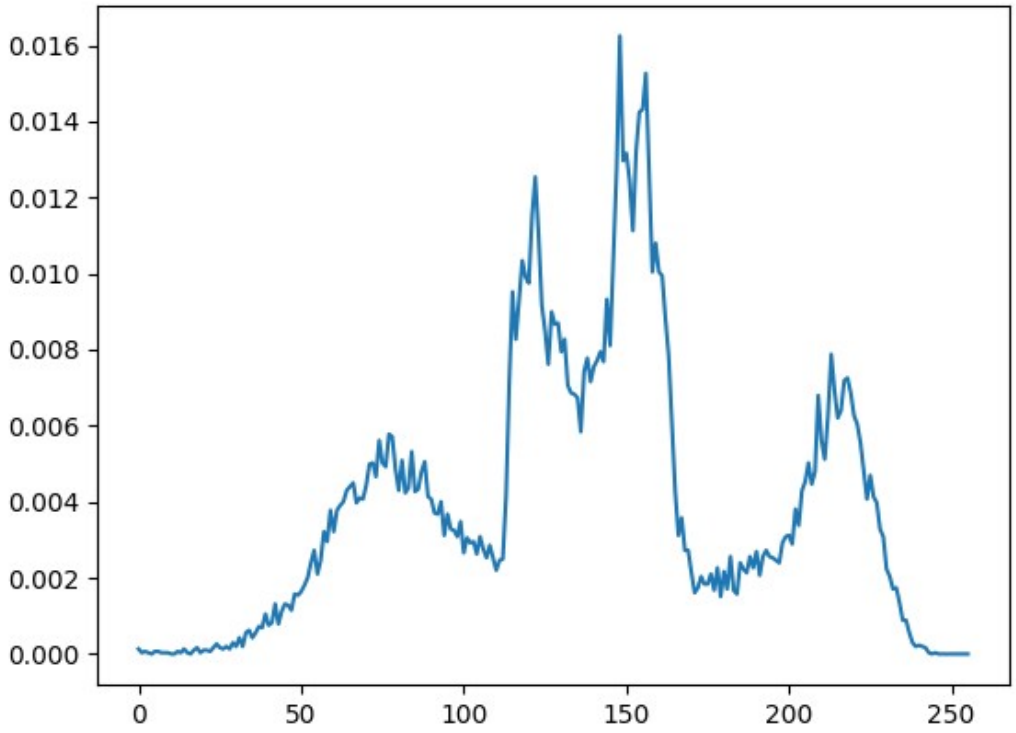
4.



Luminosity Graph

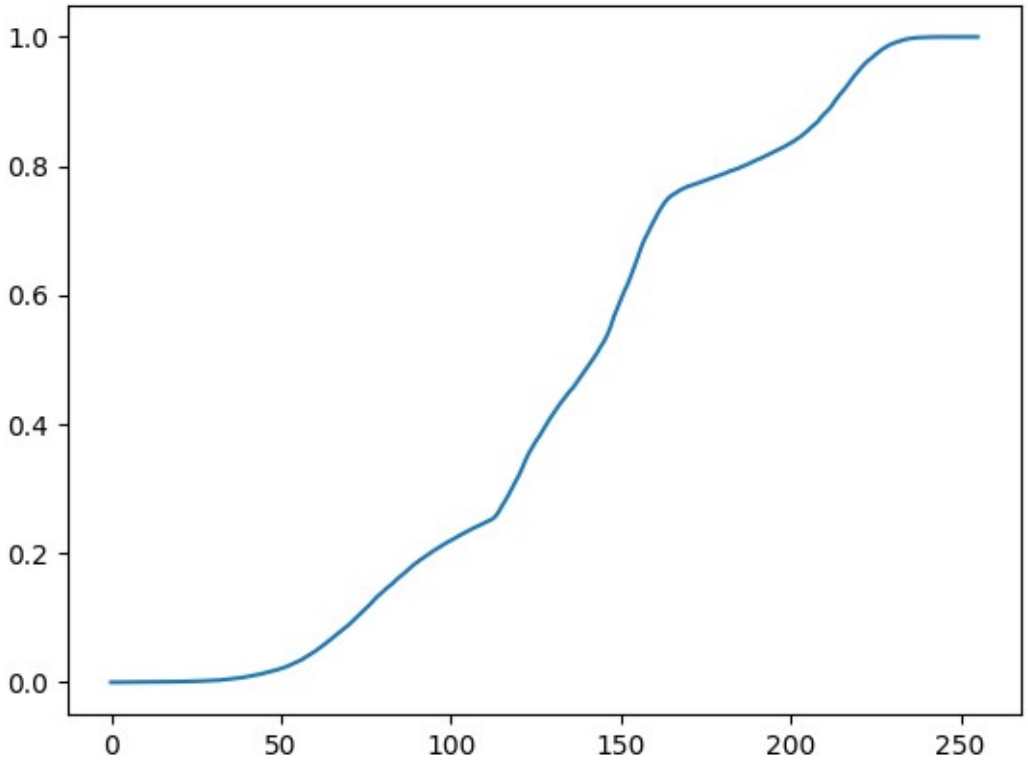
5. From the above Luminosity graph we see that there is hardly any pixels with intensity close to 0 which tells that there are not many dark areas in the image, we have a good density of pixels in the range of 200-240 which tells us there are bright areas in the image which are the waves but again they are not completely white. We have different high intensities which each represent the sky, the ocean and the rocks.

6.



Probability density graph

7.



Cumulative Distribution Function

8.

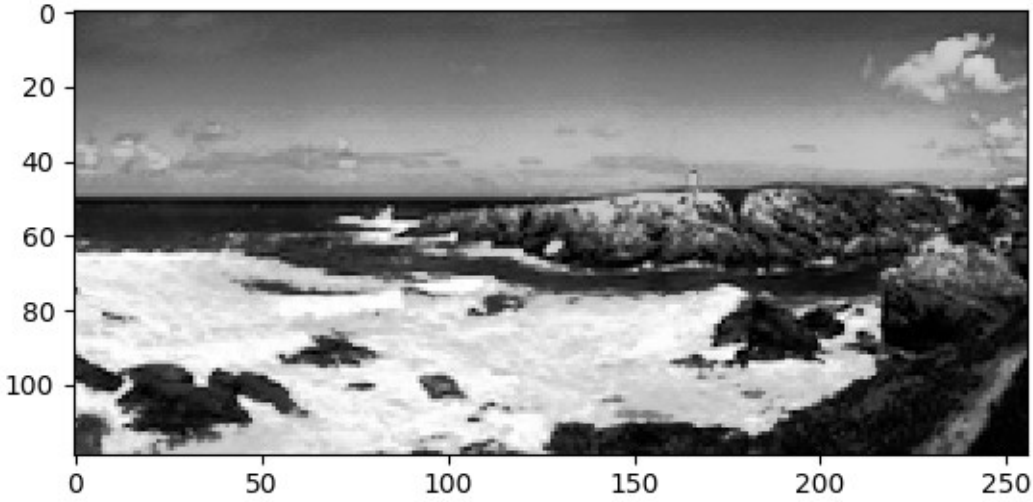
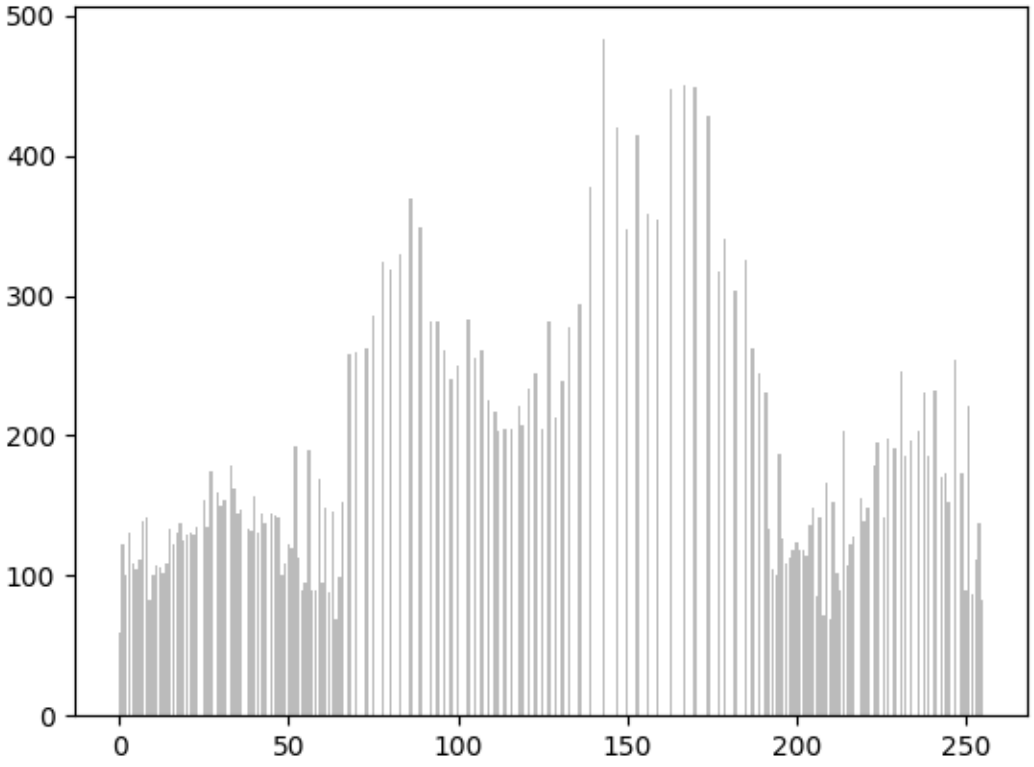


Image after Equalization

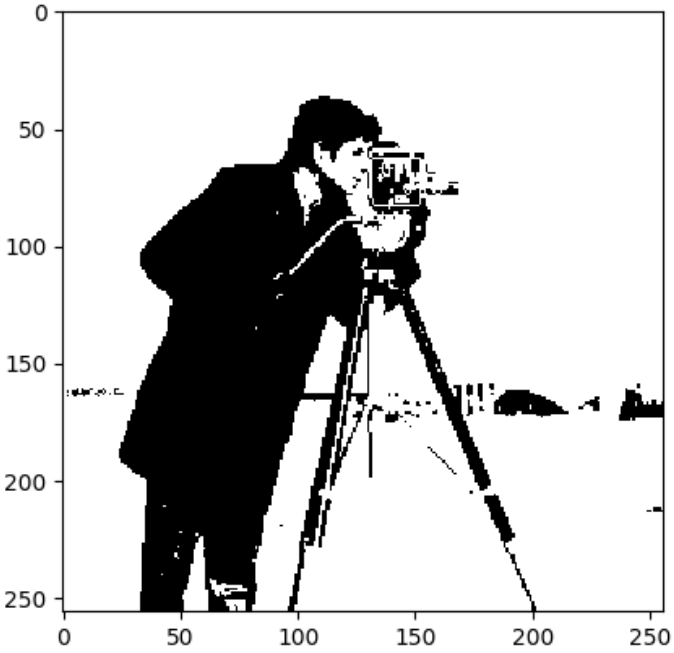


Equalized Histogram

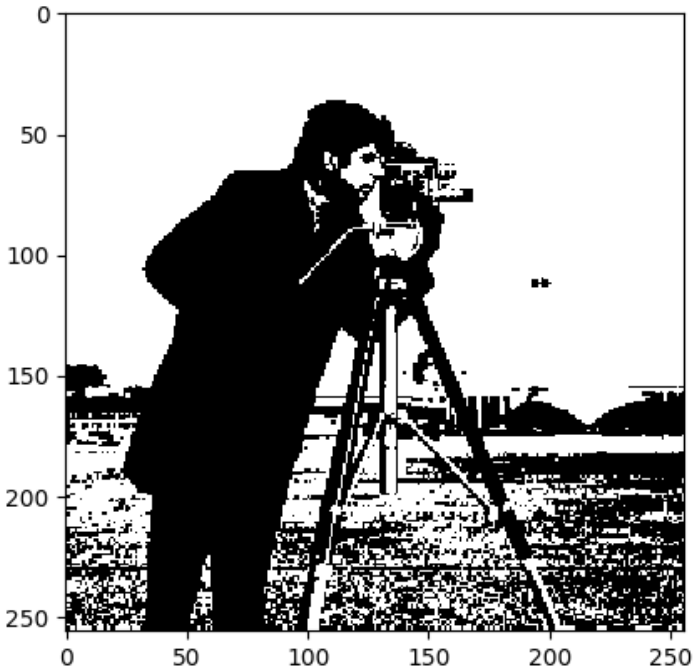
9. Histogram equalization helps us increase the contrast of the image and from the graph we see that it is more discrete and spaced out because intensities of values which are close to each other are converted to a single intensity value.

Question B2) Image Thresholding

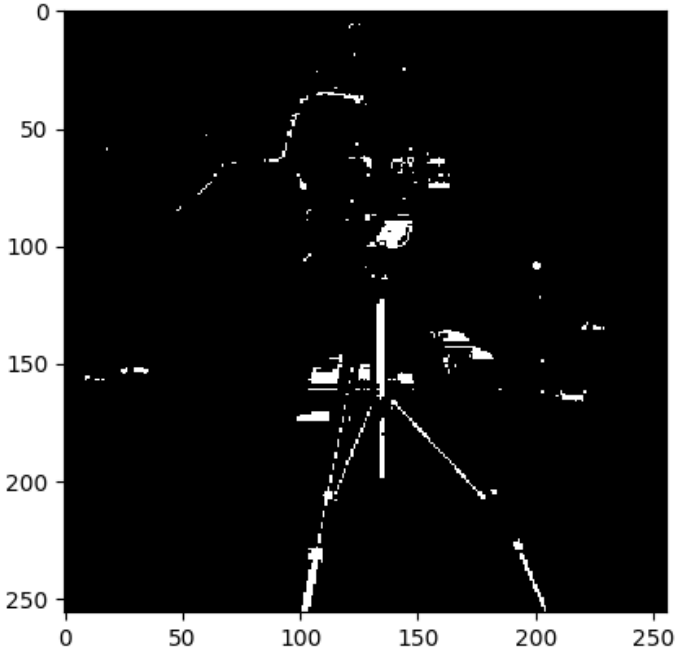
1. **Image A**



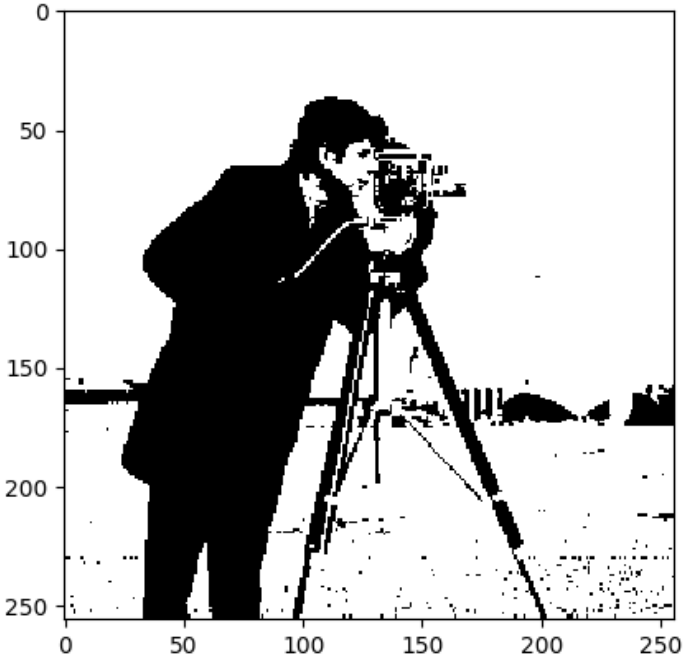
25% (Threshold = 63)



50% ((Threshold = 127)

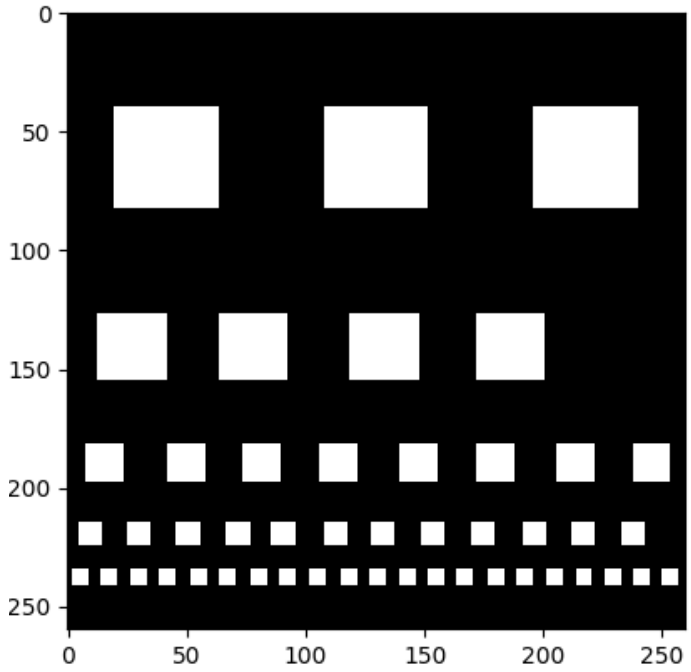


75% (Threshold = 191)

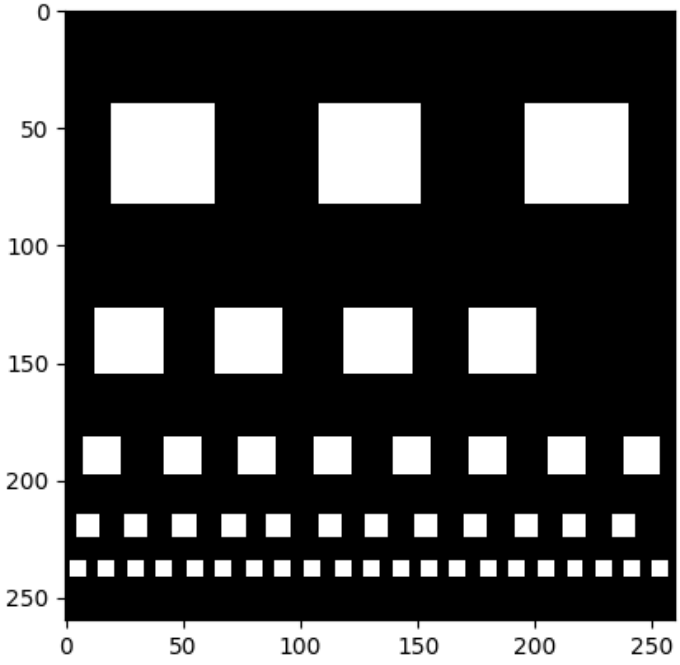


Otsu (Threshold = 88 pixels)

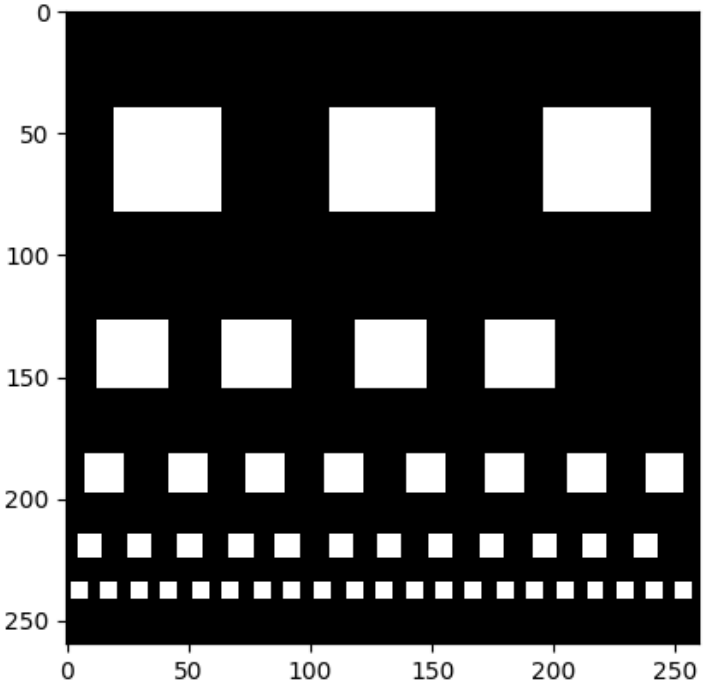
Image B



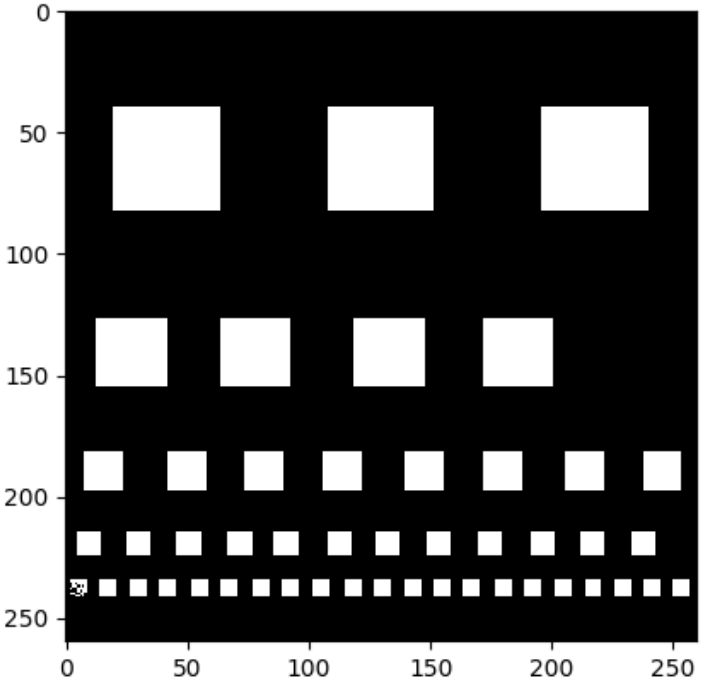
25% (Threshold = 63)



50%(Threshold = 127)

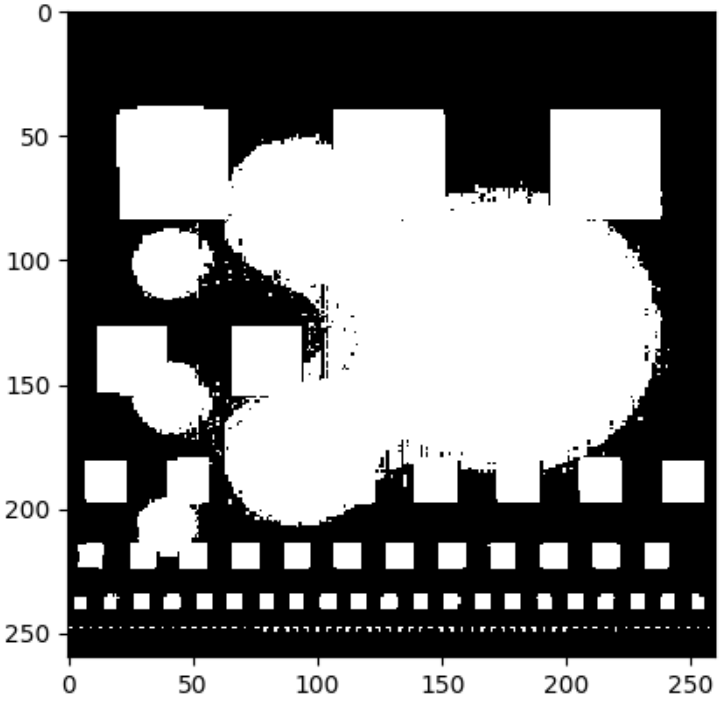


75% (Threshold = 191)

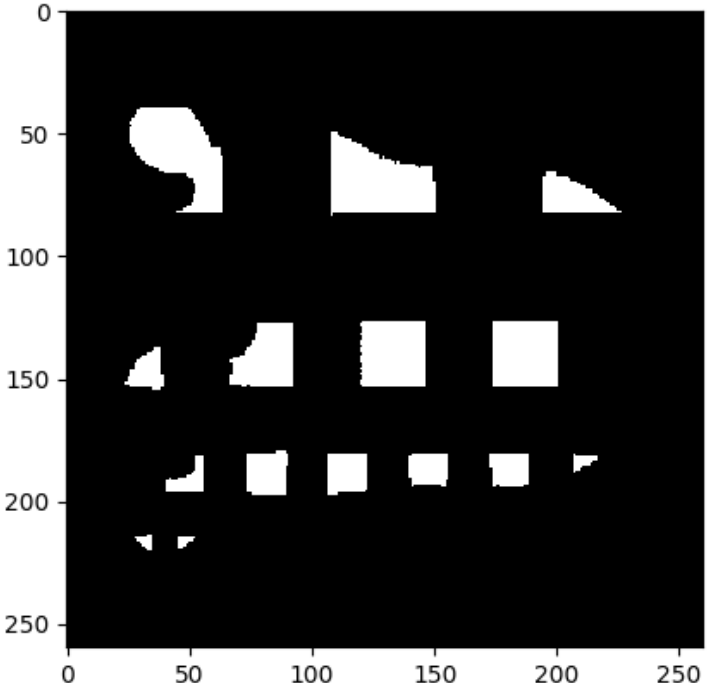


Otsu (Threshold = 212 pixels)

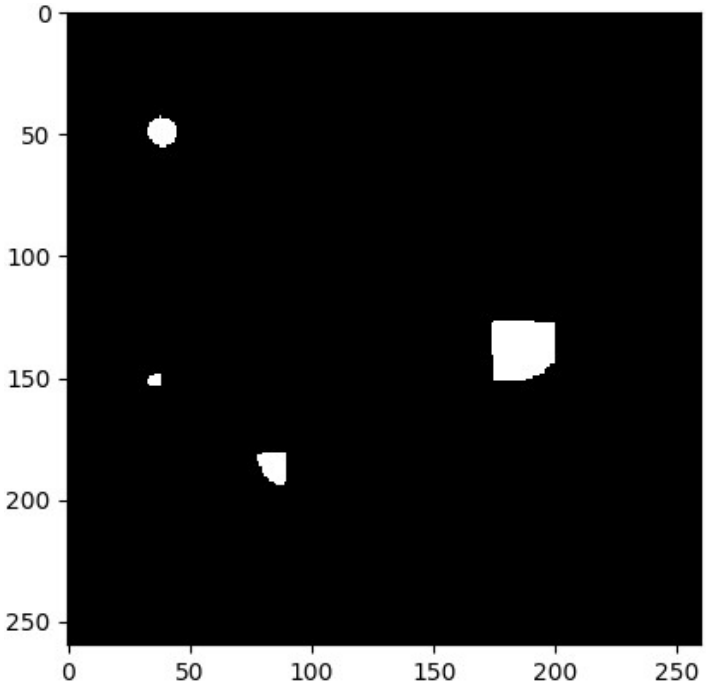
Image C



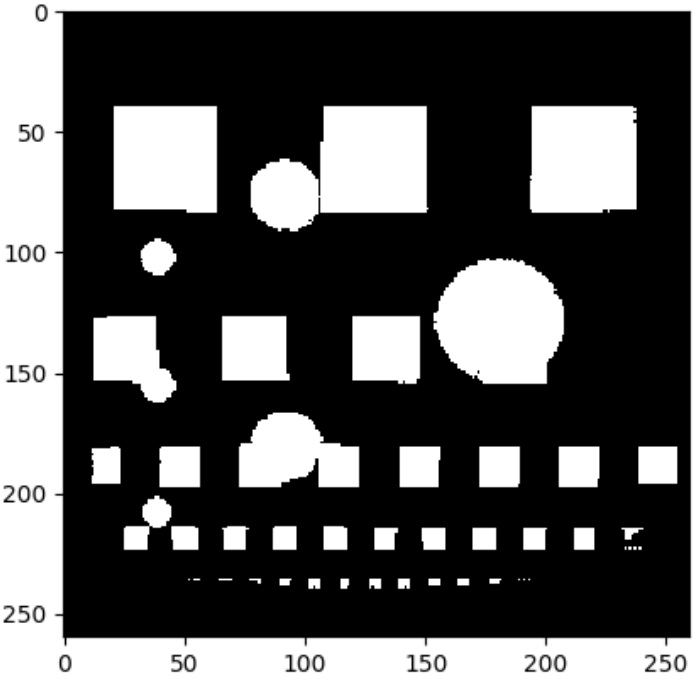
25% (Threshold = 63)



50% (Threshold = 127)



75% (Threshold = 191)



Otsu (Threshold = 88 pixels)

The above figures show the effect of binarization of the given images and we can also see how different threshold values affect the images.

In **image A** when we use a threshold of 25% or 50% we can clearly see the image pixelated at the edges, in the image with 50% threshold we can see the shapes quite clearly and also the waves in the water. In the image with 75% threshold we see that most of the image appears to be black and we can barely figure out the edges.

In **image B** we see that there is no difference in all the 3 images because there is clear difference in the white and black regions and there are no pixels with intensities other than 0 or 255.

In **image C** we can see that the area of the white circle becomes more clear when the threshold value is less, this is because as we lower the threshold more grey pixels are converted to white.

We can see that the Otsu method which generated the threshold values generated decent images.

2a) Histograms

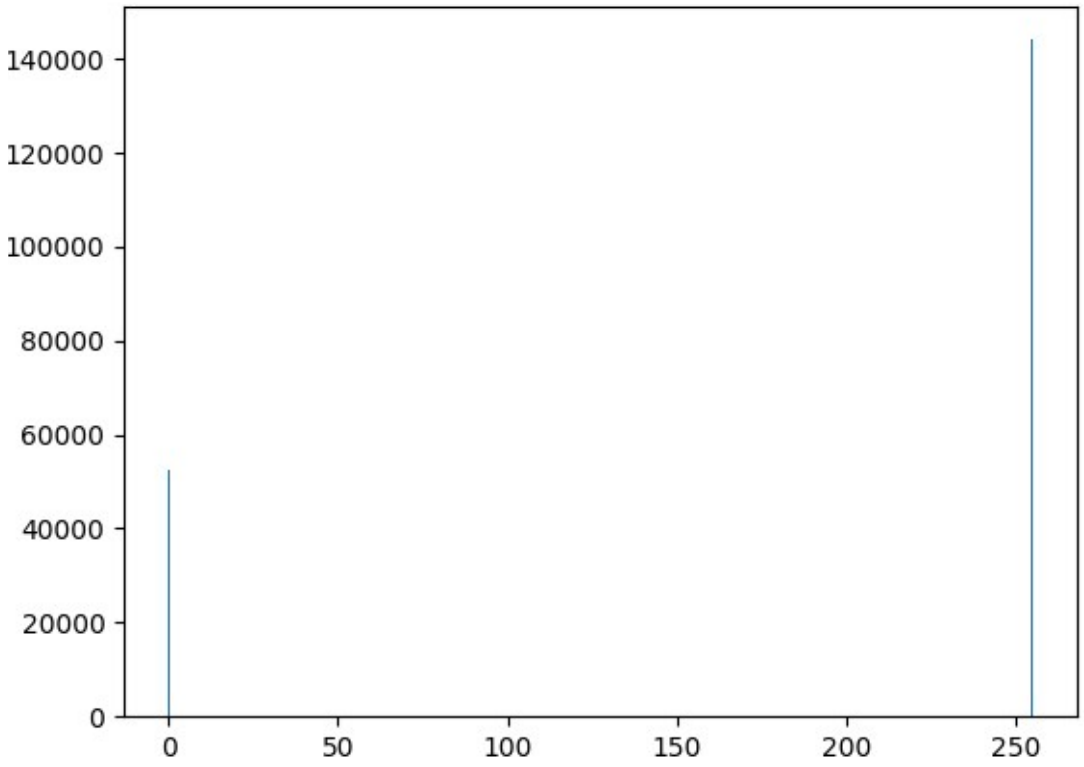


Image A

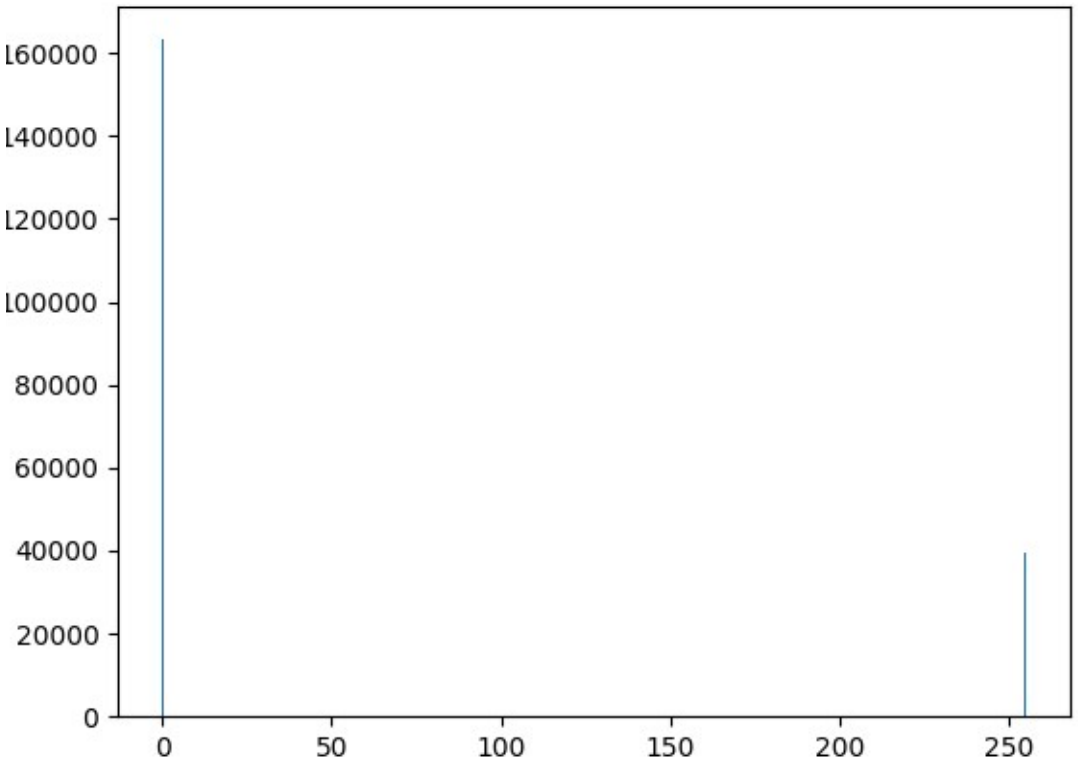


Image B

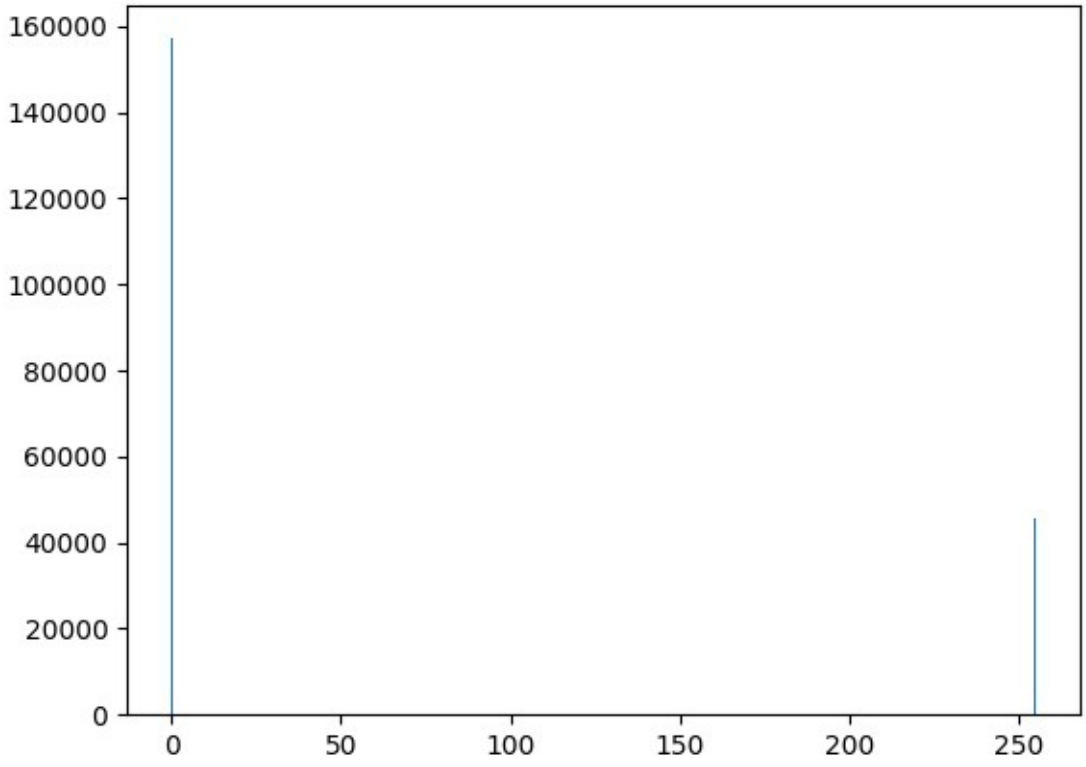
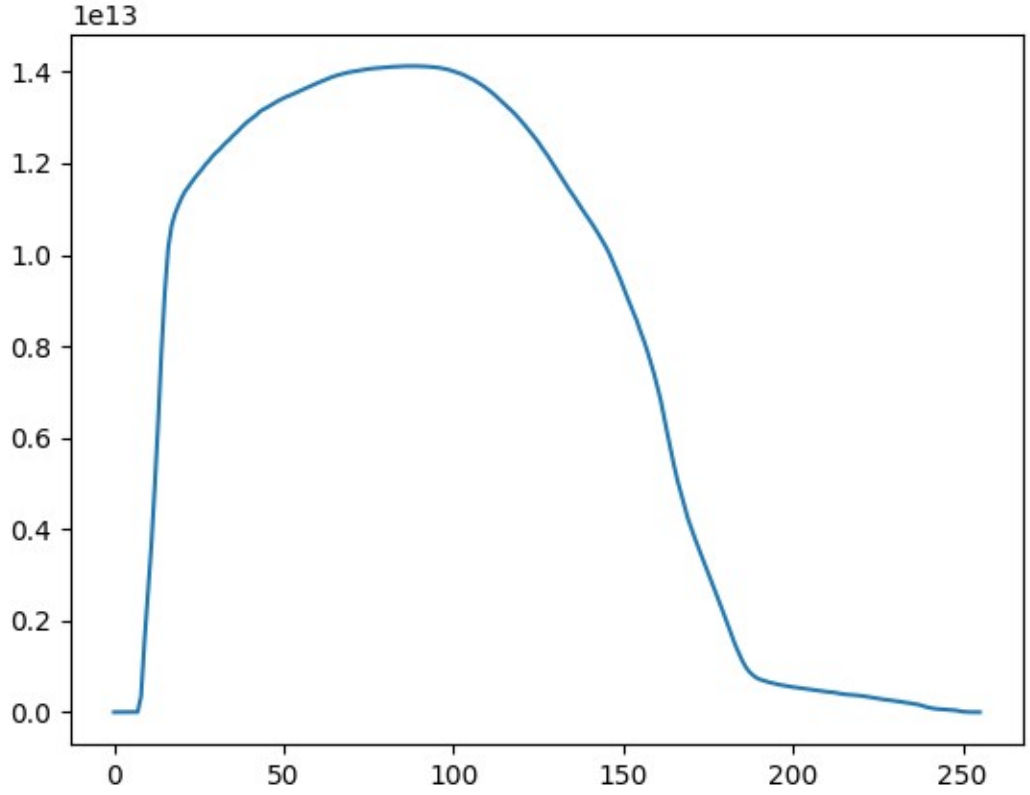
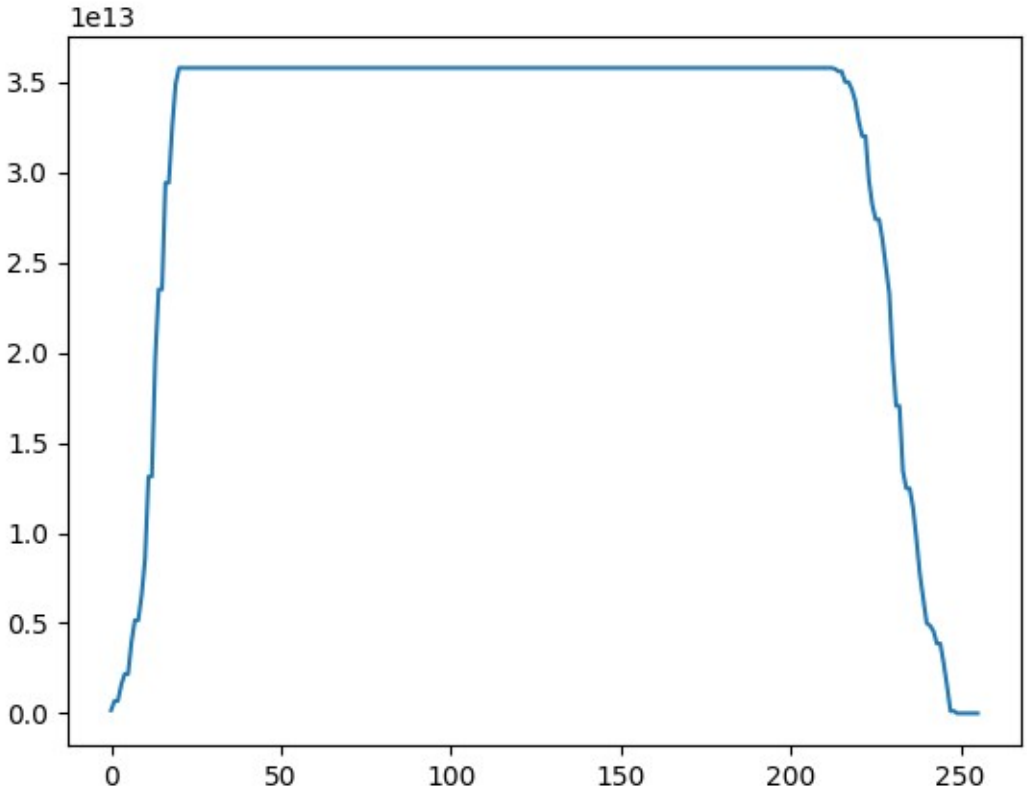


Image C

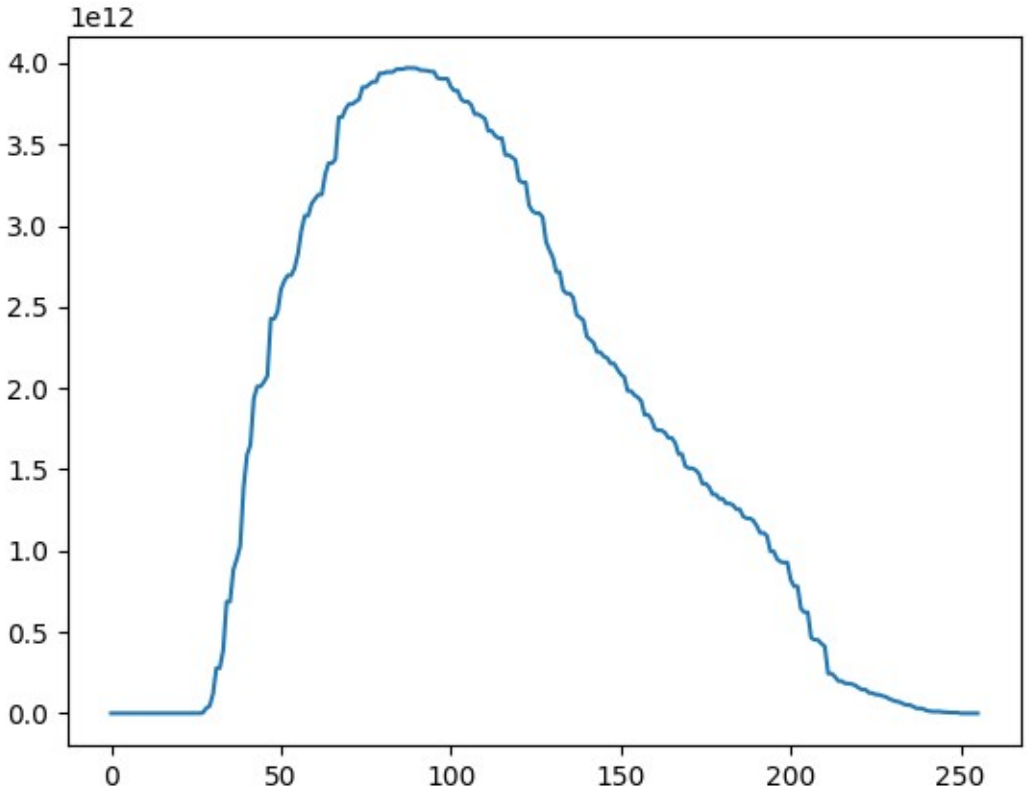
2b) Inter-Class variance



Inter-Class variance for Image A



Inter-Class variance for Image B



Inter-Class variance for Image C

2 c) Inter-Class variances the images are as follows:

- Image A : 14126645214540.172
- Image B : 35799060794408.016
- Image C : 3971526893268.4272

2 d) Intensity thresholds chosen are as follows:

- Image A : 88
- Image B : 212
- Image C : 88

2 e) The images produced by the Otsu method are shown above along with the other images.

2 f) Yes, we do get a decent image with the Otsu method and it helps us to separate the objects in the image if the objects we need to extract are in the foreground.

Like in image A we can see that using Otsu method we can easily extract the image of the man but it is difficult to extract the images of the buildings in the background.

In image B we see no difference because even in the original image we can easily extract the objects.

In image C we see that the circles with higher brightness can be easily extracted.