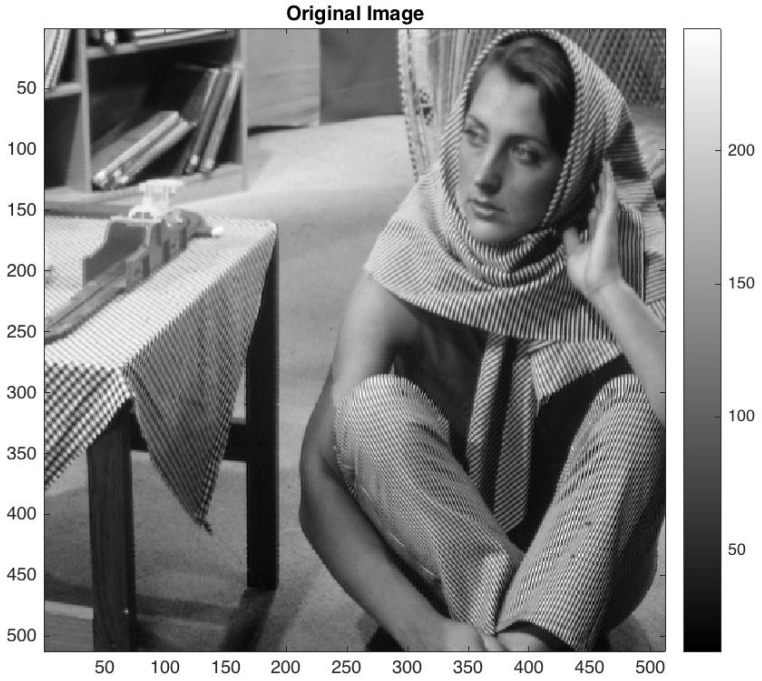
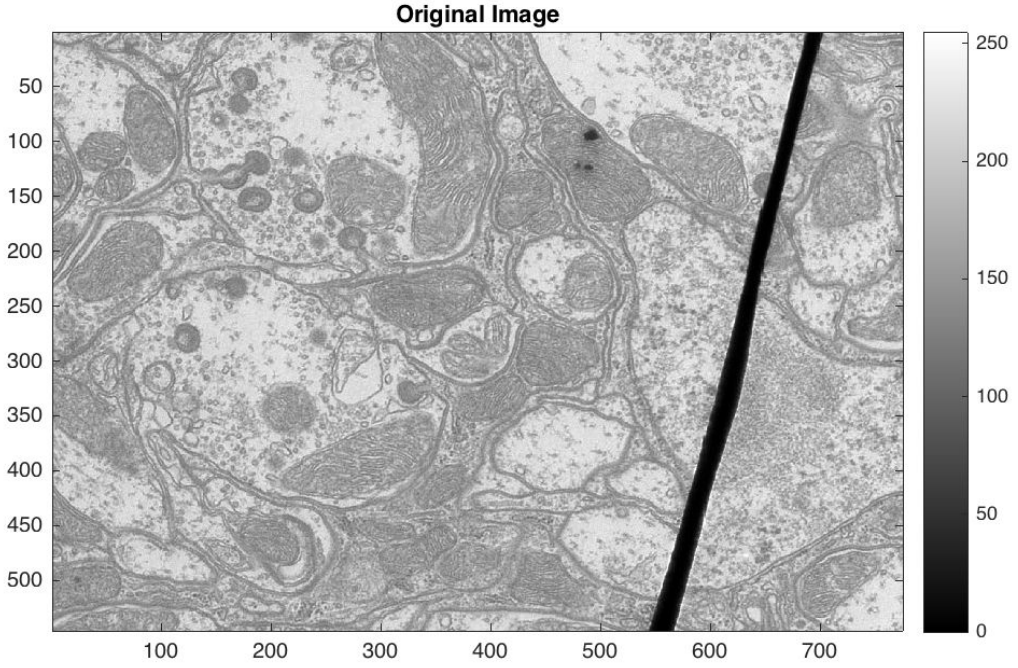
CS663: Assignment 1

Yash Shah (160050002), Utkarsh Gupta (160050032)

Question 2

Q2(a)




Original Image
50
100
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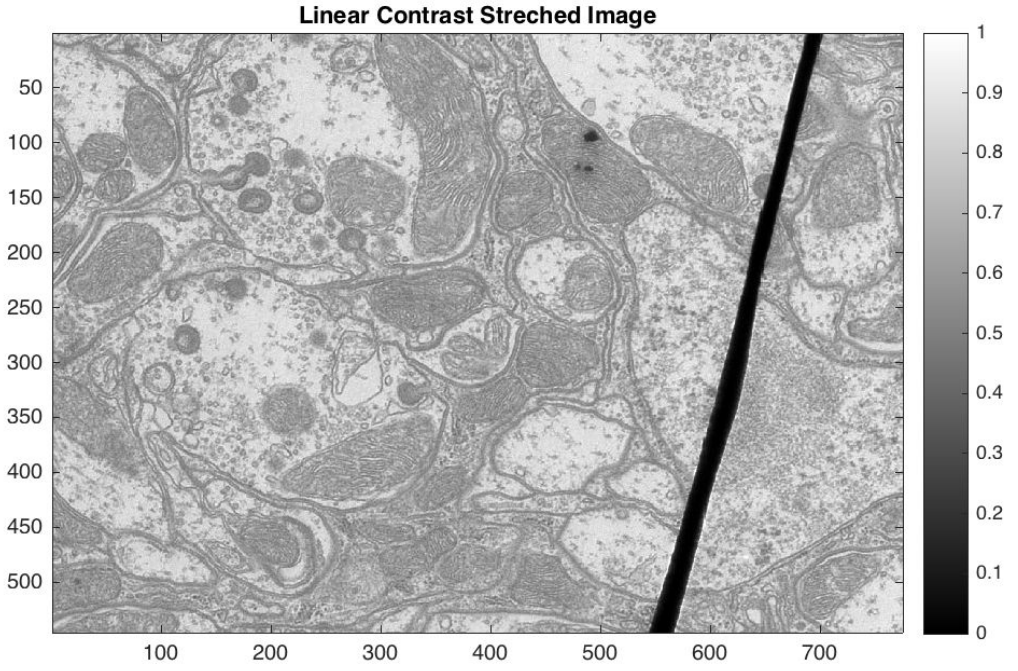
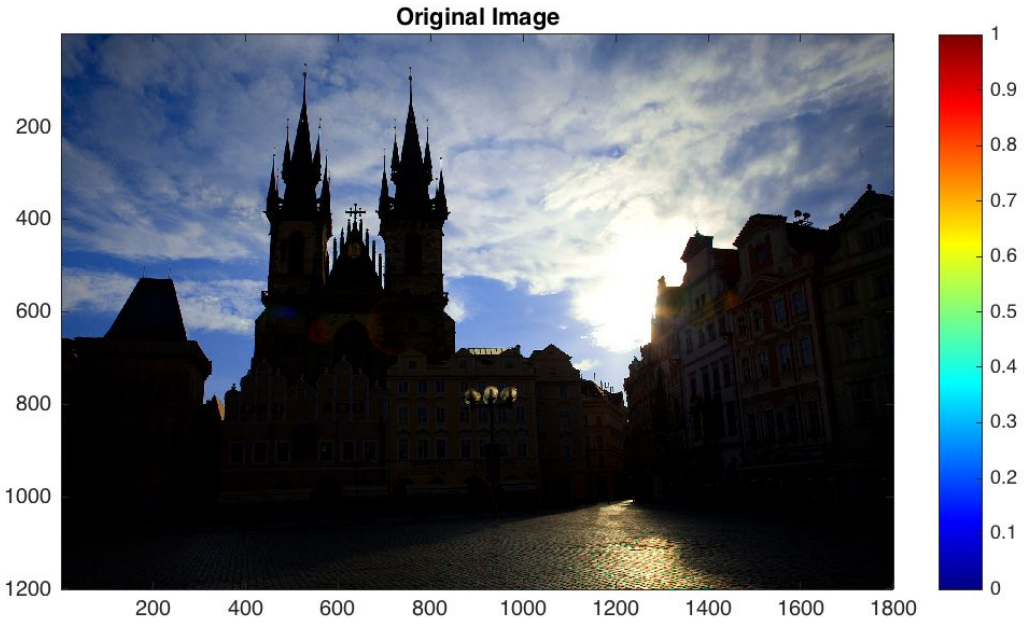
200
250
300
350
400
450
500
100
200
300
400
500
600
700
250
200
150
100
50
0


Linear Contrast Streched Image
50
100
150
200
250
300
350
400
450
500
100
200
300
400
500
600
700
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0



The linear image contrasting isn't effective here as the lowest and highest pixel values are already 0 and 255 respectively so the Linear contrasting doesn't change anything in the image.

Q2(b)


Original Image
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100
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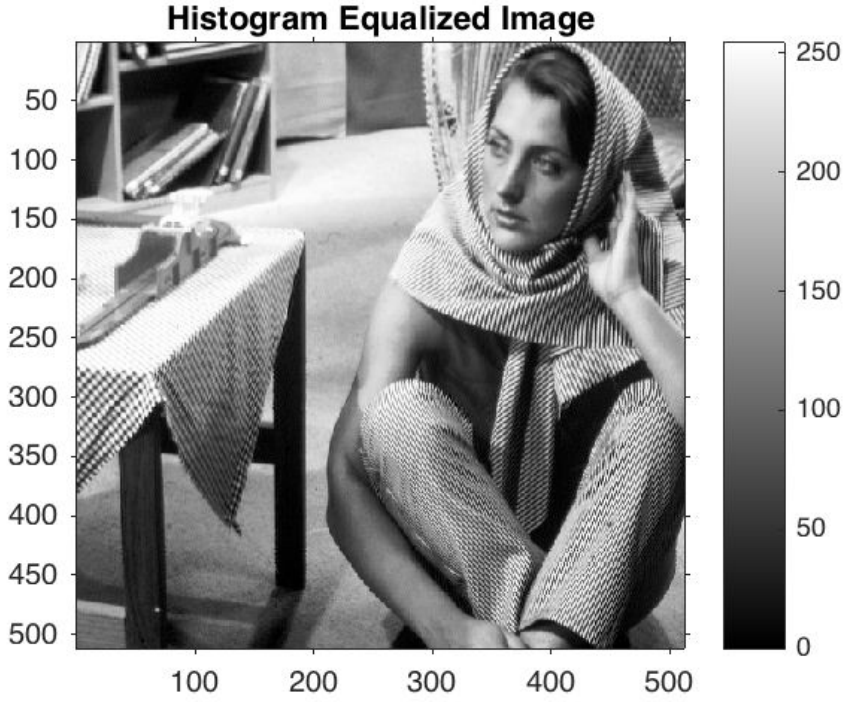
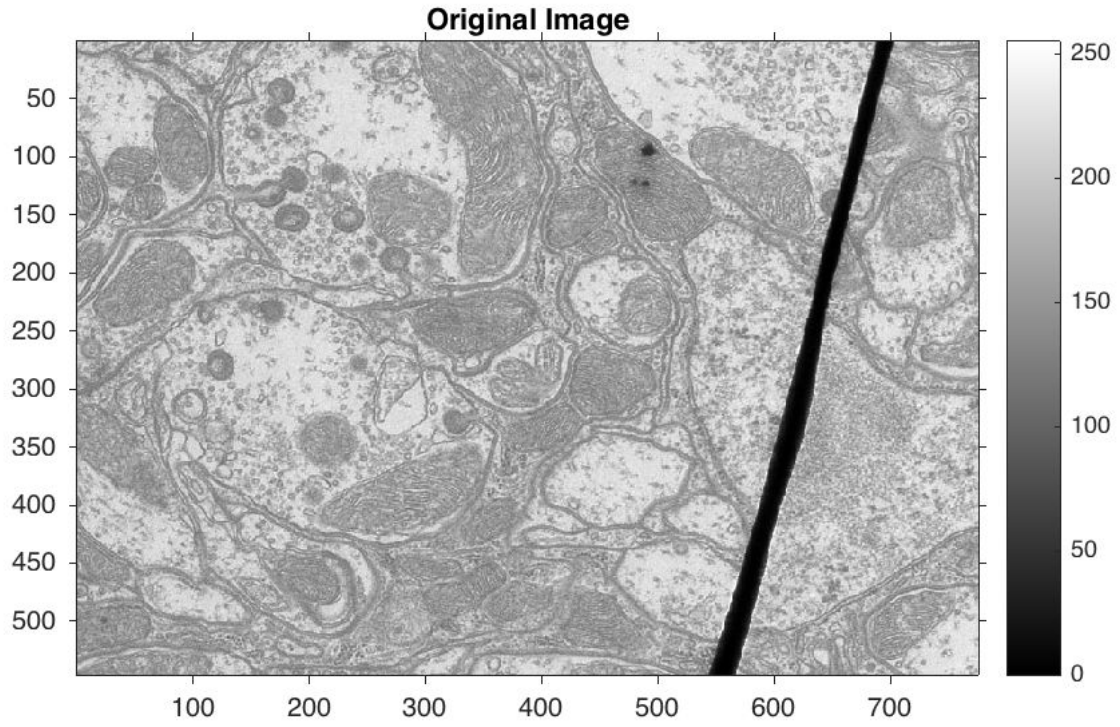
100
200
300
400
500
200
150
100
50


Histogram Equalized Image
50
100
150
200
250
300
350
400
450
500
100
200
300
400
500
250
200
150
100
50
0


Original Image
50
100
150
200
250
300
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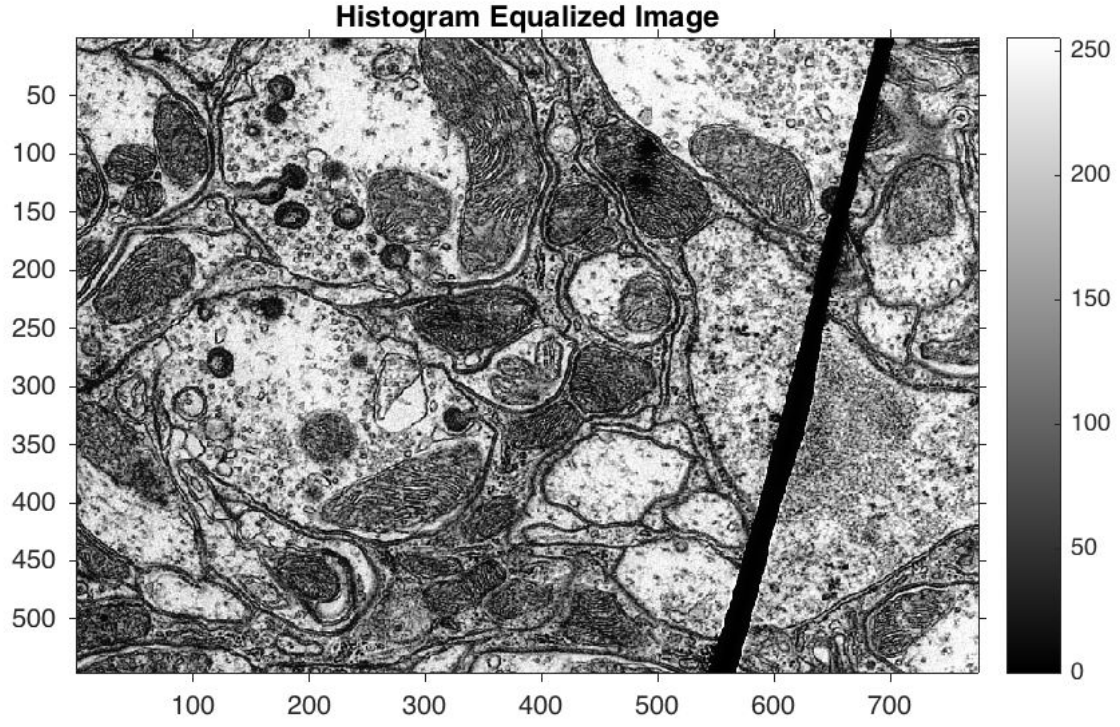
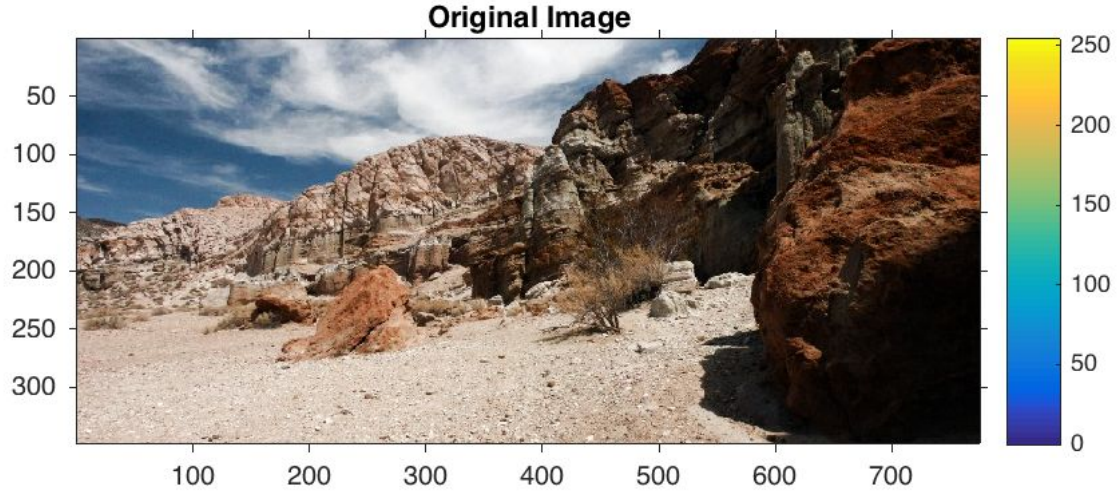
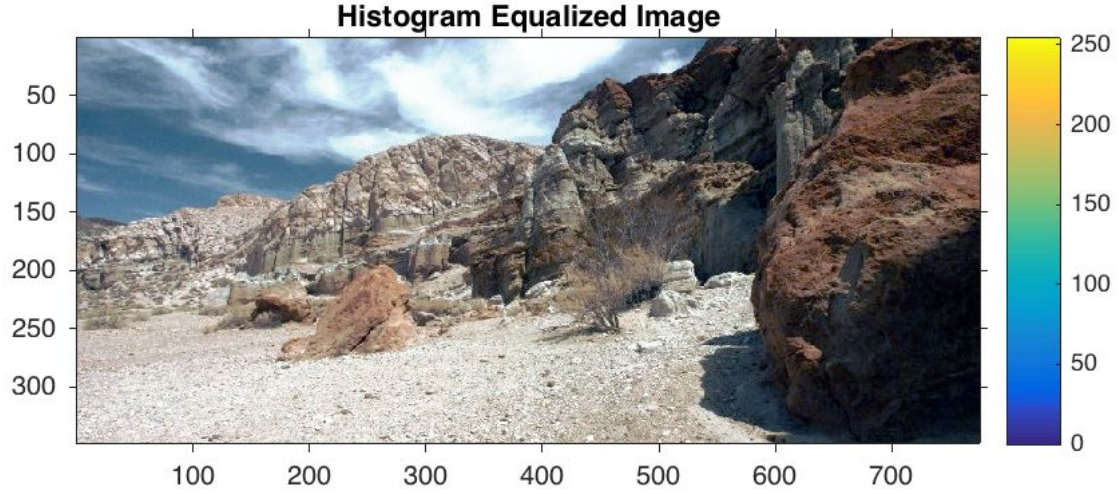
400
450
500
100
200
300
400
500
600
700
250
200
150
100
50
0


Histogram Equalized Image
50
100
150
200
250
300
350
400
450
500
100
200
300
400
500
600
700
250
200
150
100
50
0


Original Image
50
100
150
200
250
300
100
200
300
400
500
600
700
250
200
150
100
50
0


Histogram Equalized Image
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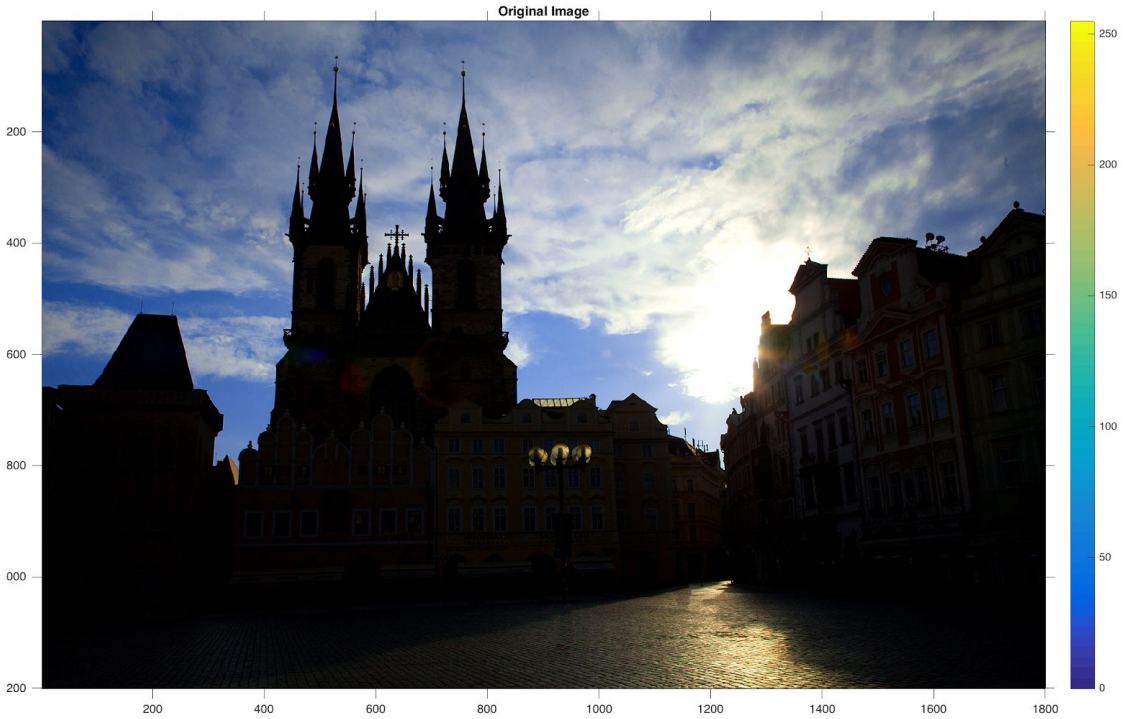
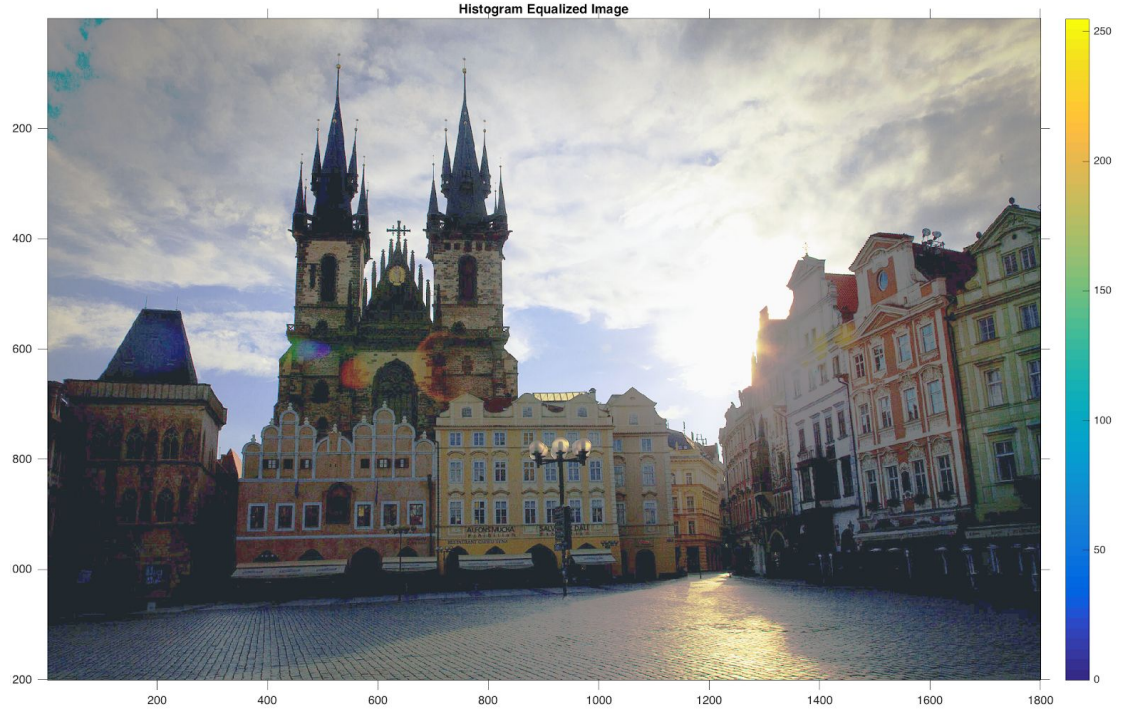
100
150
200
250
300
100
200
300
400
500
600
700
250
200
150
100
50
0

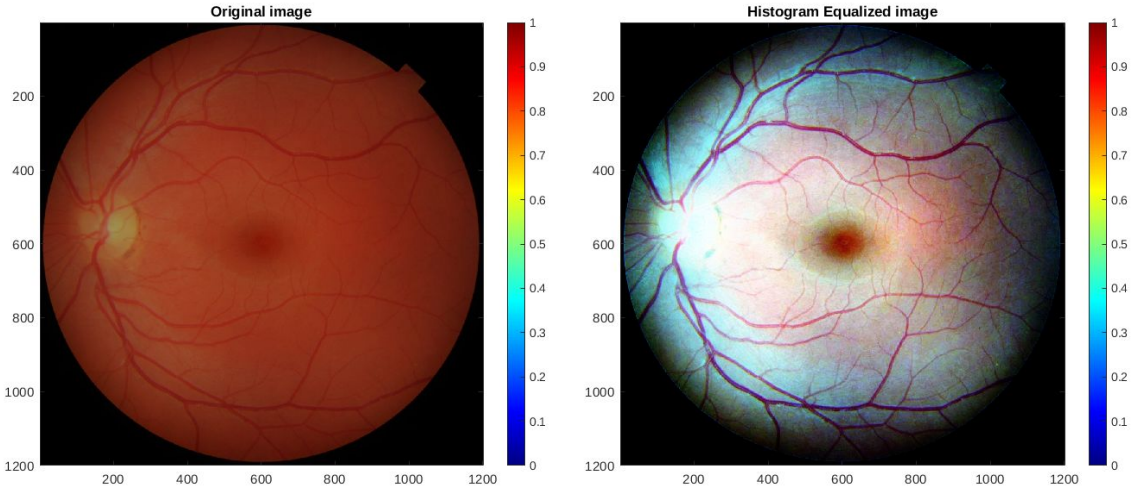
P.T.O.

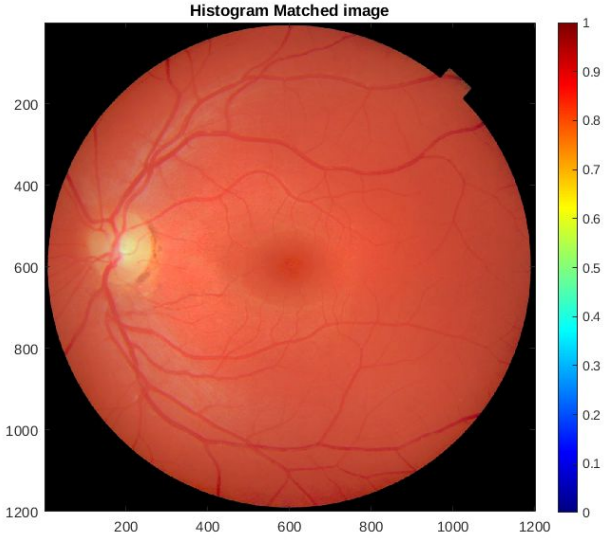




We would prefer Histogram equalization for image 5 as the HE gives a much more enhanced contrast compared to Linear contrast. In the final image we can see a lot more details that were not visible in the original image. The enhanced contrast is because histogram equalization tends to make the PDF uniform and initially the PDF is highly skewed - thus in the original image even the pixel which have very small difference get mapped to very different intensities in the transformed image. Linear contrasting, on the other hand, doesn't affect the image due to the presence of pixels of intensities 0 and 255, due to which the transformation boils down to the identity function.

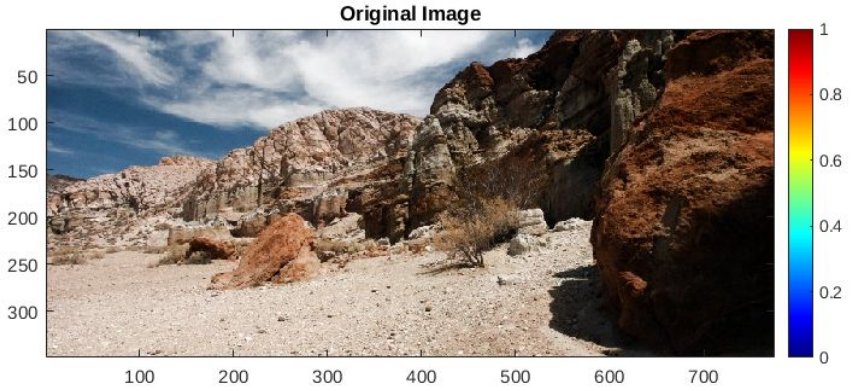
Q2(c)





We observe that Histogram equalization highly distorts the image, whereas Histogram matching makes the image cleaner without affecting its color drastically. This is because we are applying HE independently on all 3 channels - in this case (most of the pixels are red, so R color space has an unskewed distribution) the minimal, concentrated, intensities in the G and B color space get mapped to higher values, leading to their dominant appearance in the output. HM, on the other hand, preserves the distribution of the intensities in the 3 color spaces and hence gives a better image.

Q2(d)


Original Image
50
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250
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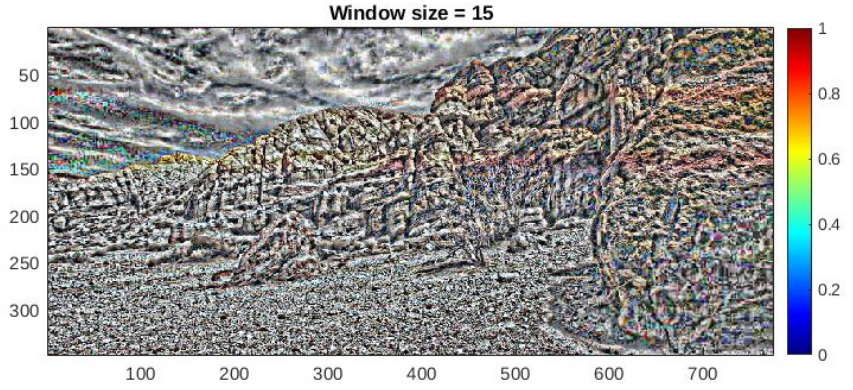
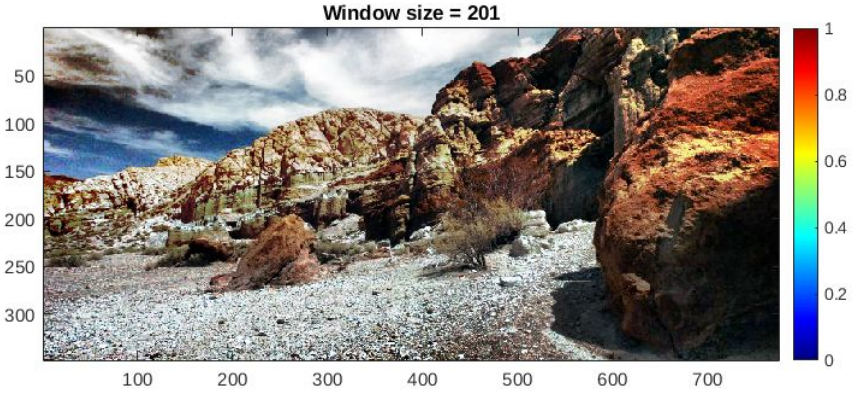
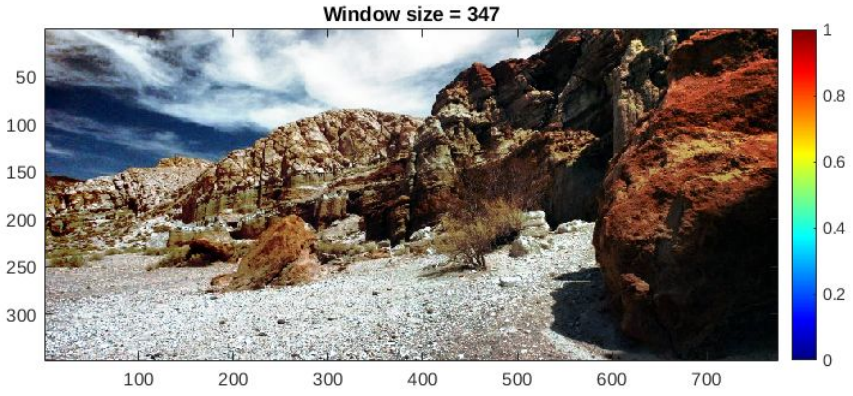
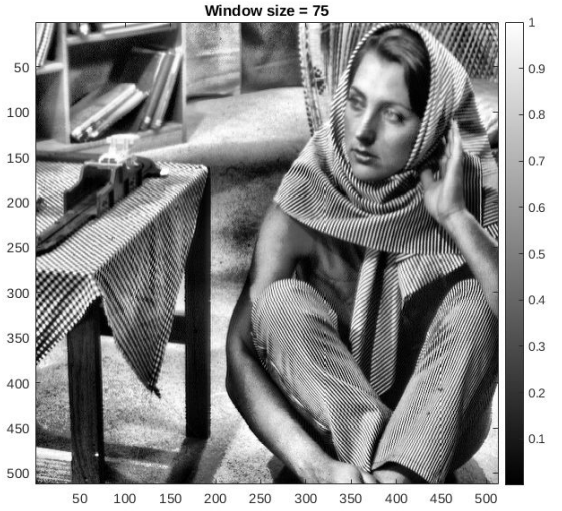
100
200
300
400
500
600
700
1
0.8
0.6
0.4
0.2
0


Window size = 15
50
100
150
200
250
300
100
200
300
400
500
600
700
1
0.8
0.6
0.4
0.2
0


Window size = 201
50
100
150
200
250
300
100
200
300
400
500
600
700
1
0.8
0.6
0.4
0.2
0


Window size = 347
50
100
150
200
250
300
100
200
300
400
500
600
700
1
0.8
0.6
0.4
0.2
0


Window size = 15
50 100 150 200 250 300 350 400 450 500
1 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1


Window size = 75
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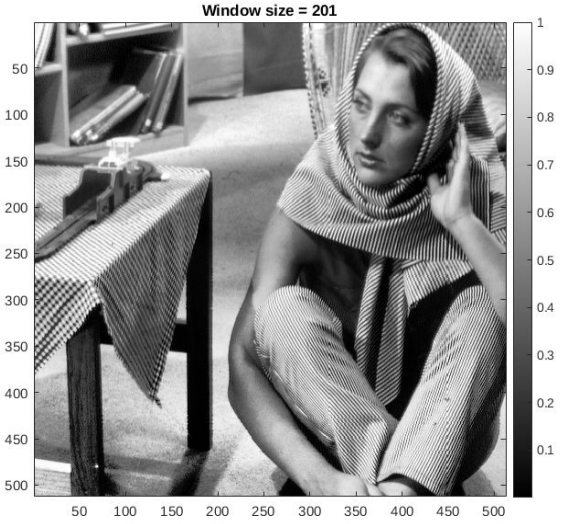
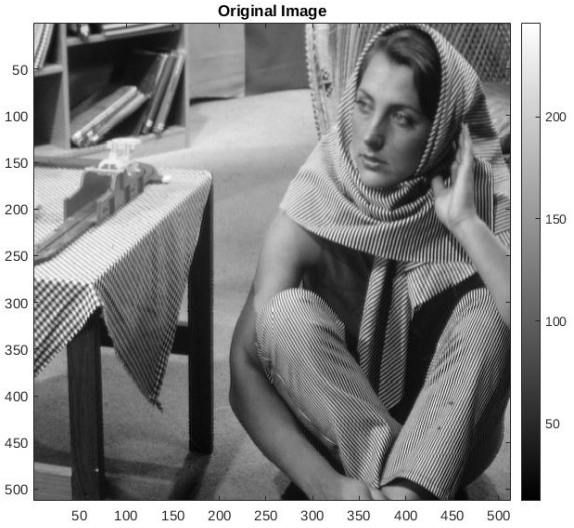
1 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1


Window size = 201
50 100 150 200 250 300 350 400 450 500
1 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1


Original Image
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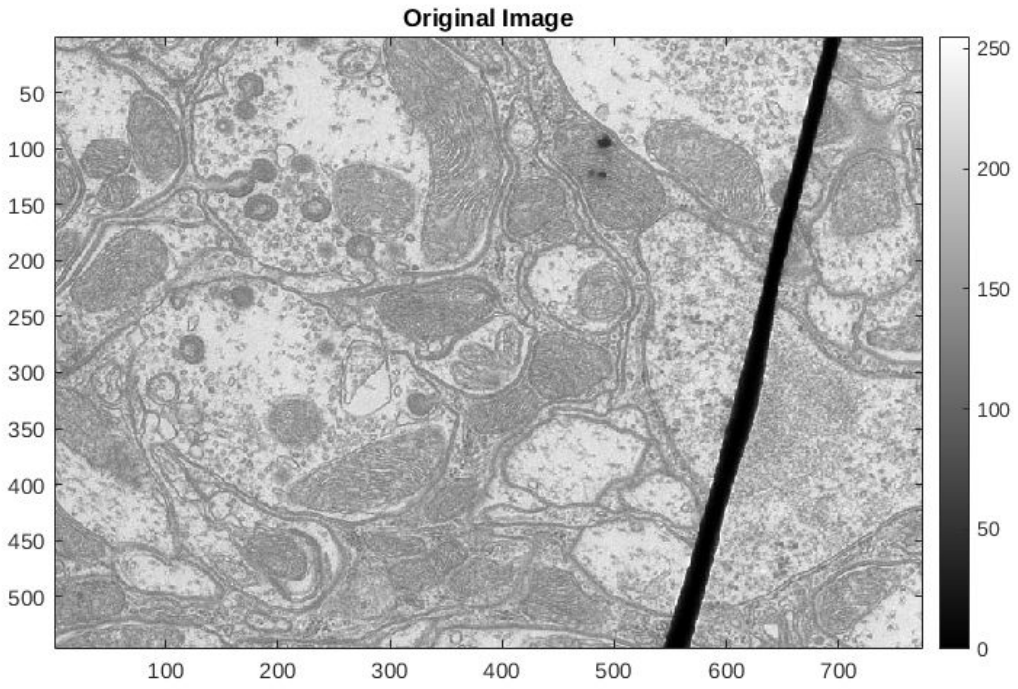
200 150 100 50


Original Image
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250
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500
100
200
300
400
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600
700
250
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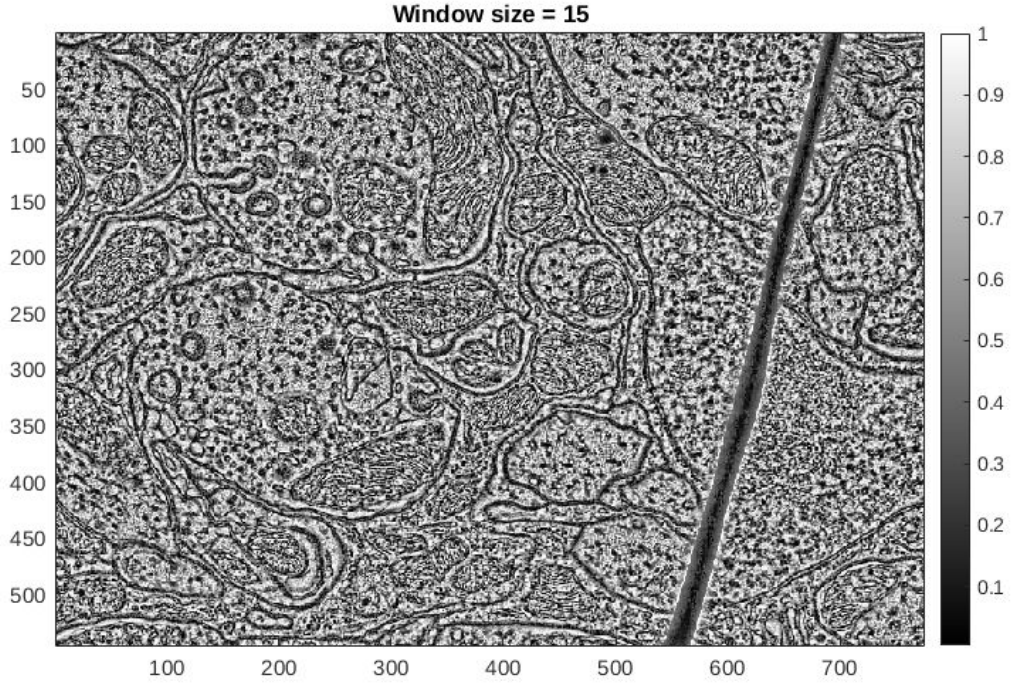
150
100
50
0


Window size = 15
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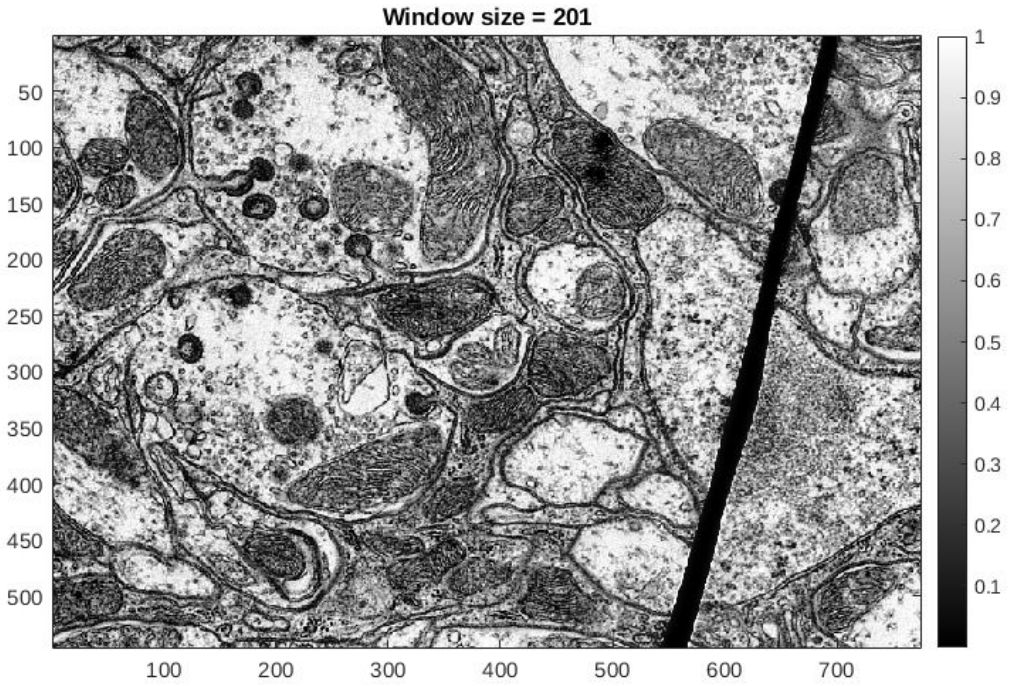
250
300
350
400
450
500
100
200
300
400
500
600
700
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1


Window size = 201
50
100
150
200
250
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350
400
450
500
100
200
300
400
500
600
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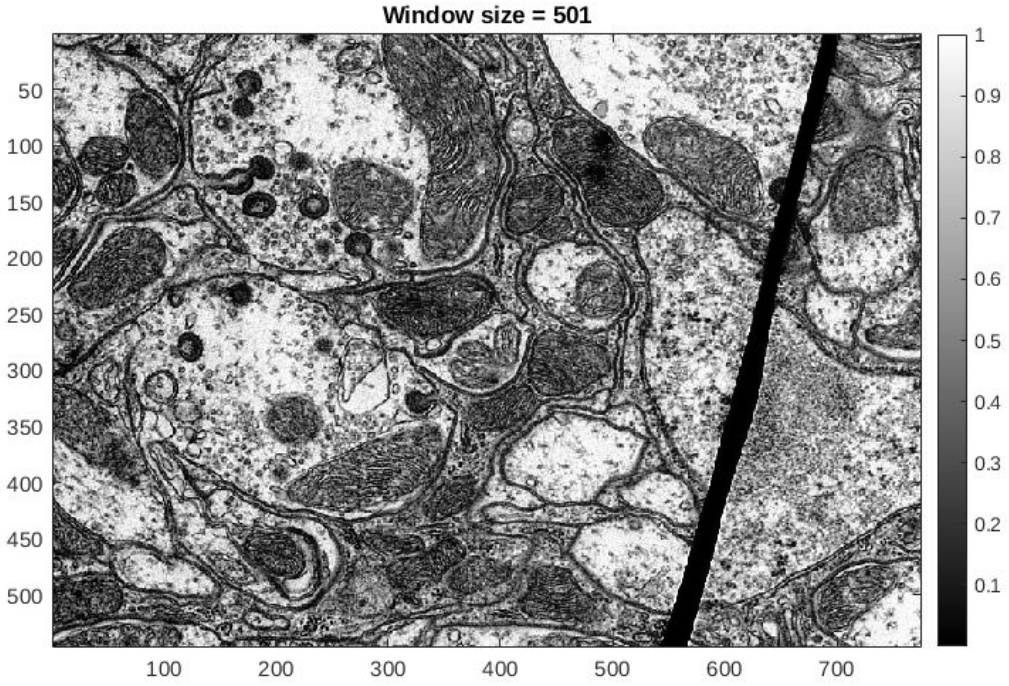
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1


Window size = 501
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100
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500
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200
300
400
500
600
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0.8
0.7
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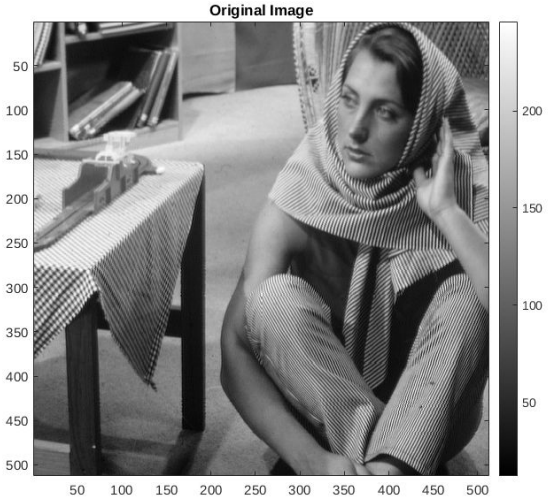
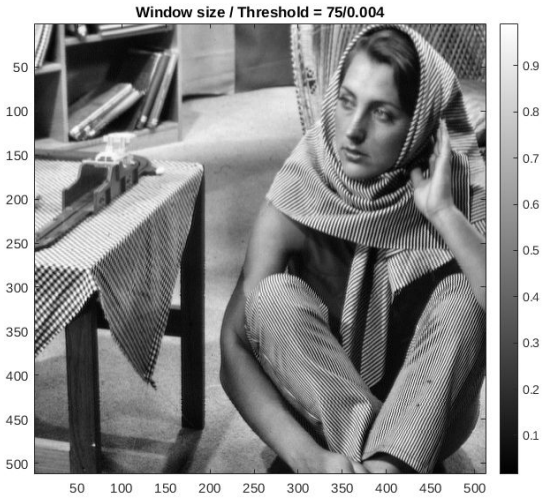
0.5
0.4
0.3
0.2
0.1

Q2(e)


Original Image
50
100
150
200
250
300
350
400
450
500
200
150
100
50


Window size / Threshold = 75/0.004
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100
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200
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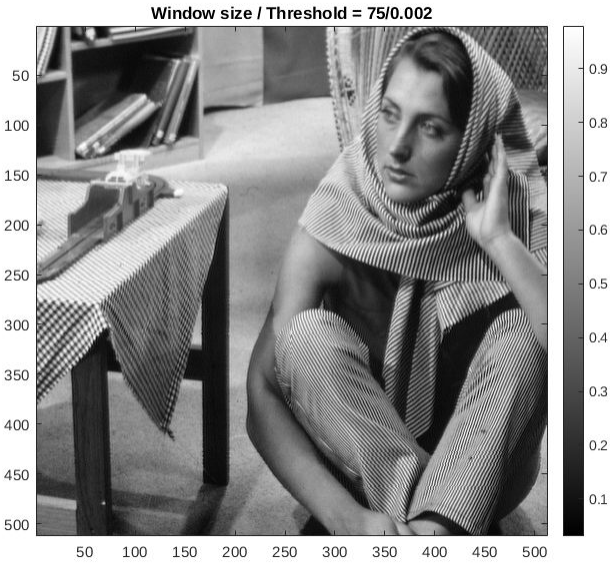
500
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1


Window size / Threshold = 75/0.002
50
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0.9
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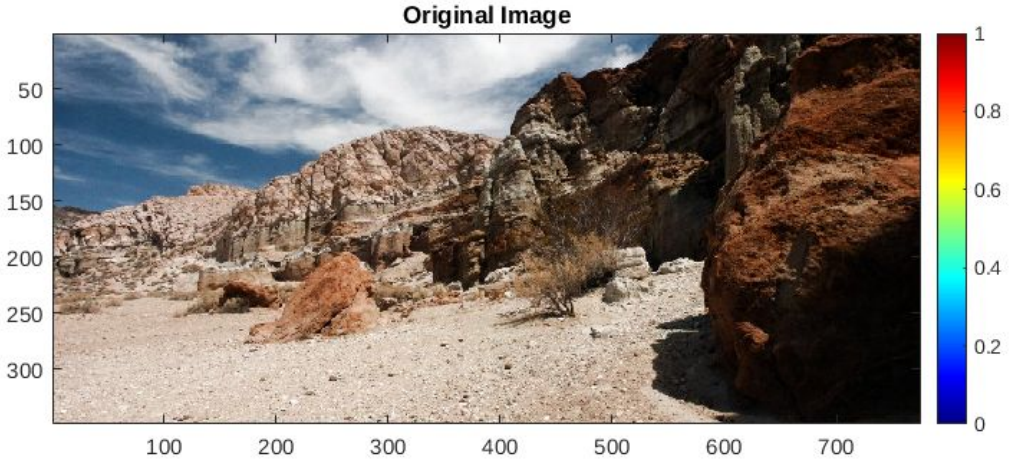
0.7
0.6
0.5
0.4
0.3
0.2
0.1


Original Image
50
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250
300
100
200
300
400
500
600
700
1
0.8
0.6
0.4
0.2
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Window size / Threshold = 201/0.002
50
100
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250
300
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200
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600
700
1
0.8
0.6
0.4
0.2
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Window size / Threshold = 201/0.001
50
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0.2
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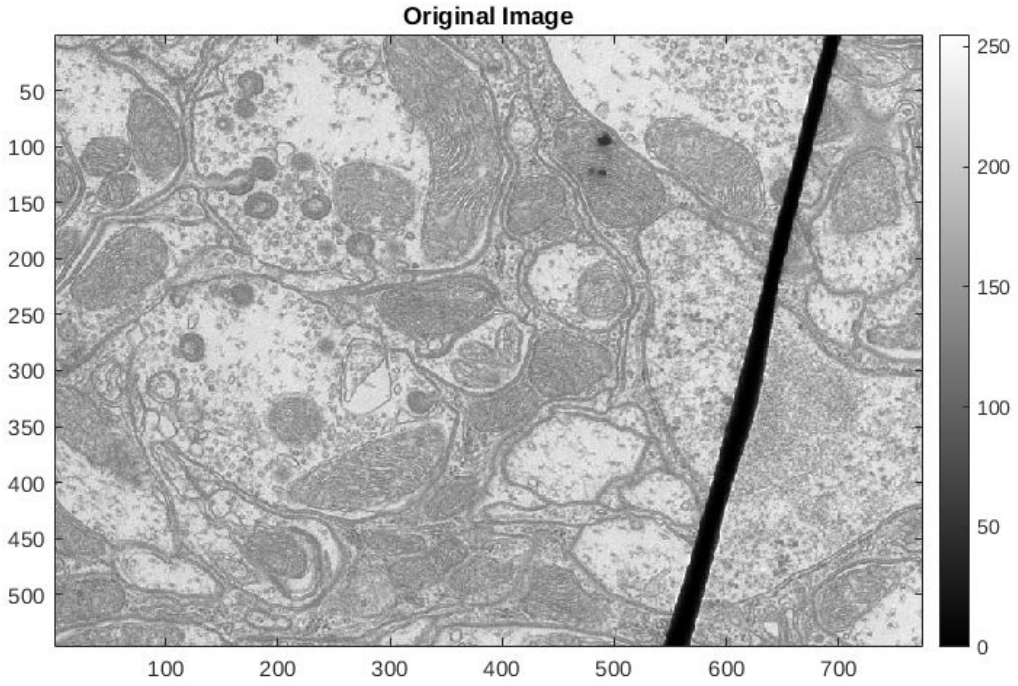
Original Image
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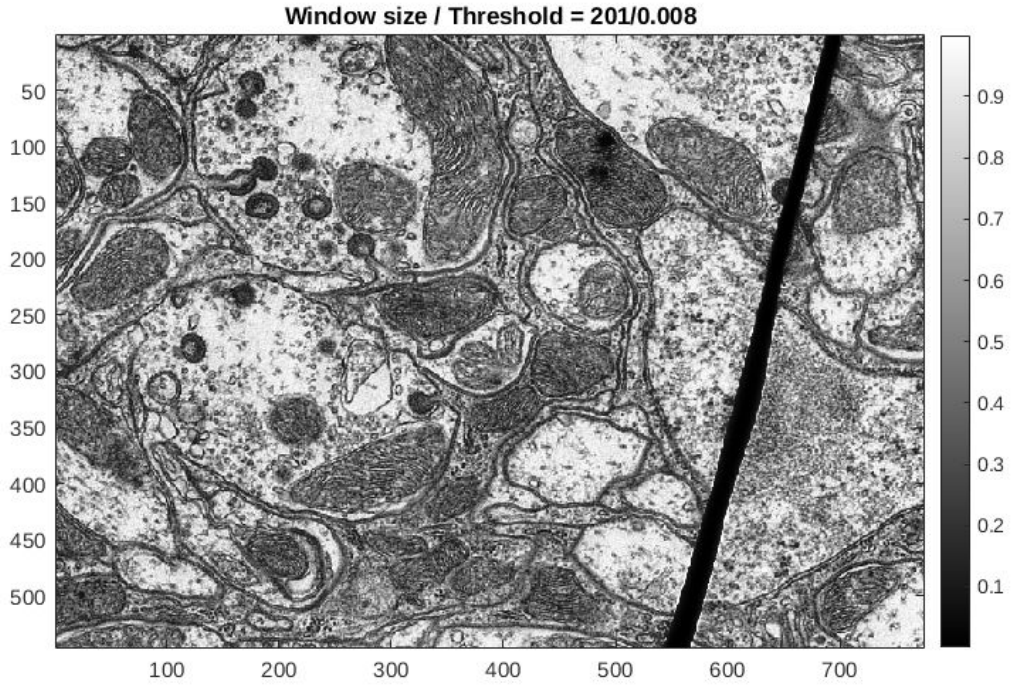
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250
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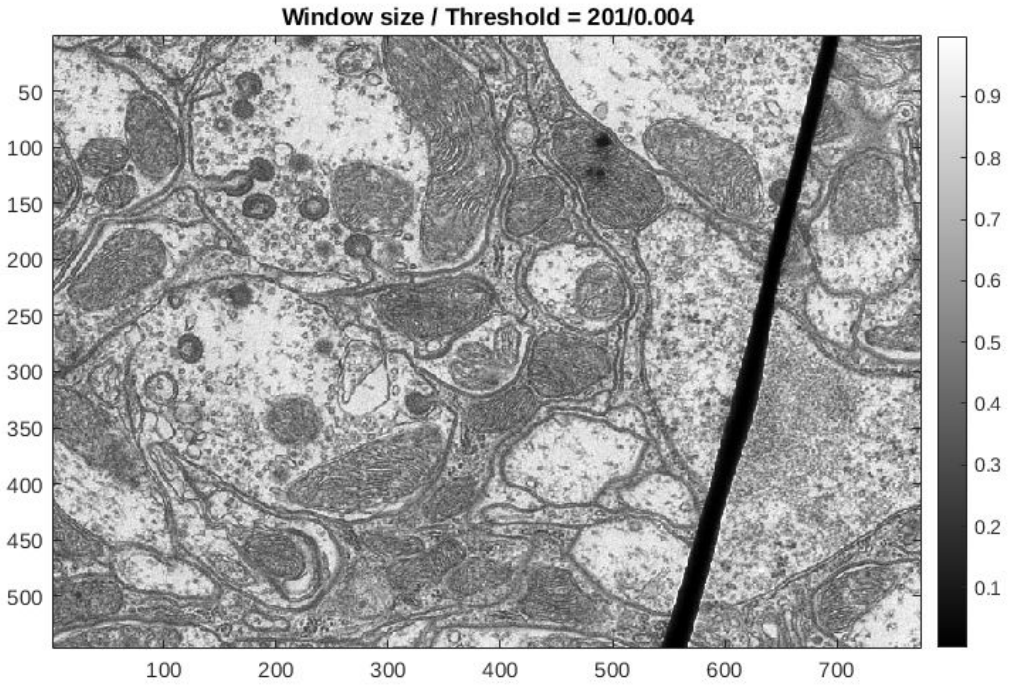
Window size / Threshold = 201/0.004
50
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500
600
700
0.9
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0.7
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0.5
0.4
0.3
0.2
0.1