ASSIGNMENT-04

Course Title: Image Processing
Course ID: CSC 420
Submitted By: Abu Bakar Siddik Nayem.
ID: 1510190.
Section: 01.

Date of Submission: 24th November, 2018.
Submitted To: Md. Ashraful Amin, PhD.

1. You are familiar with the following function for contrast improvement.

$$f(x)=\frac{255}{1+e^{\frac{-a(x-127)}{32}}}$$

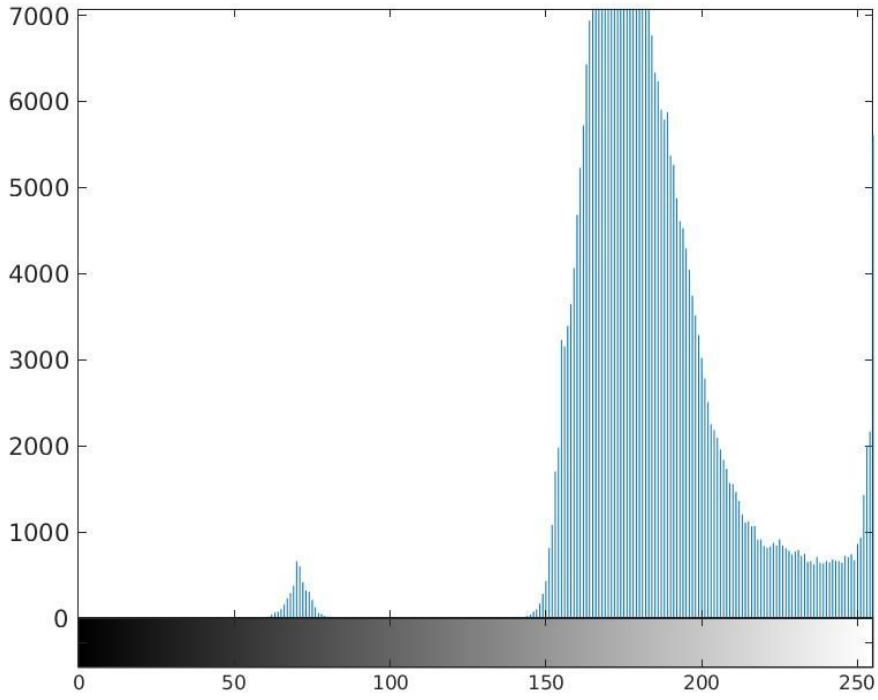
.

How can we modify the function to use it for contrast stretching? Explain with example image given below.

Ans:

Input image 1:

Histogram of the input image:

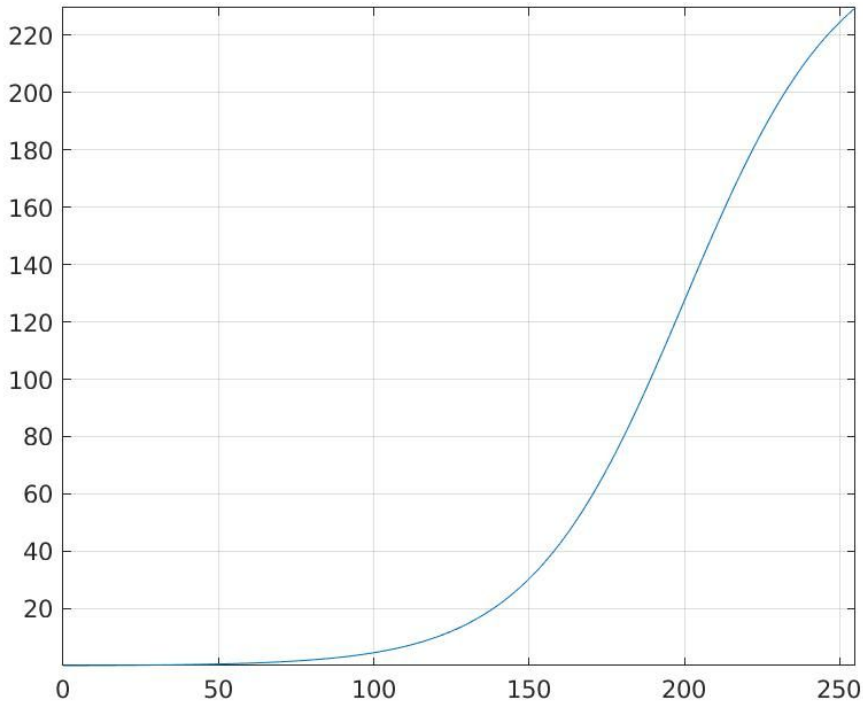


We can stretch the image between 50 and 255.
The small amount of pixels between 60 and 75 can be ignored since they are very small amount and are far off from the other pixels in the histogram.

So changing the formula like below will improve contrast of the image:

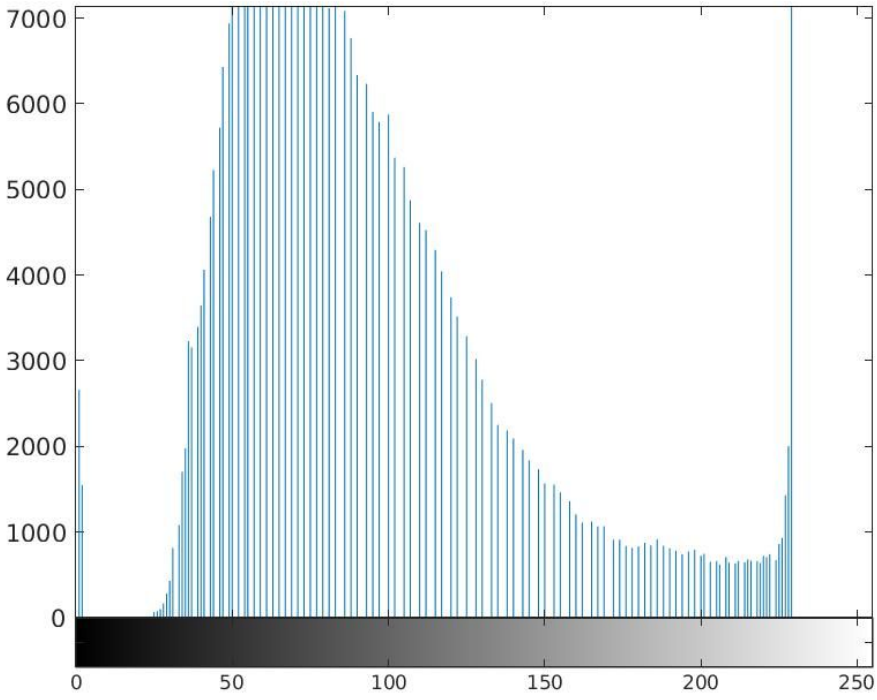
LUT = 255 ./ (1+exp(-a*(x-200)/50));
Highest value = 255
Midpoint = 200
Lowest value= 50

LUT:



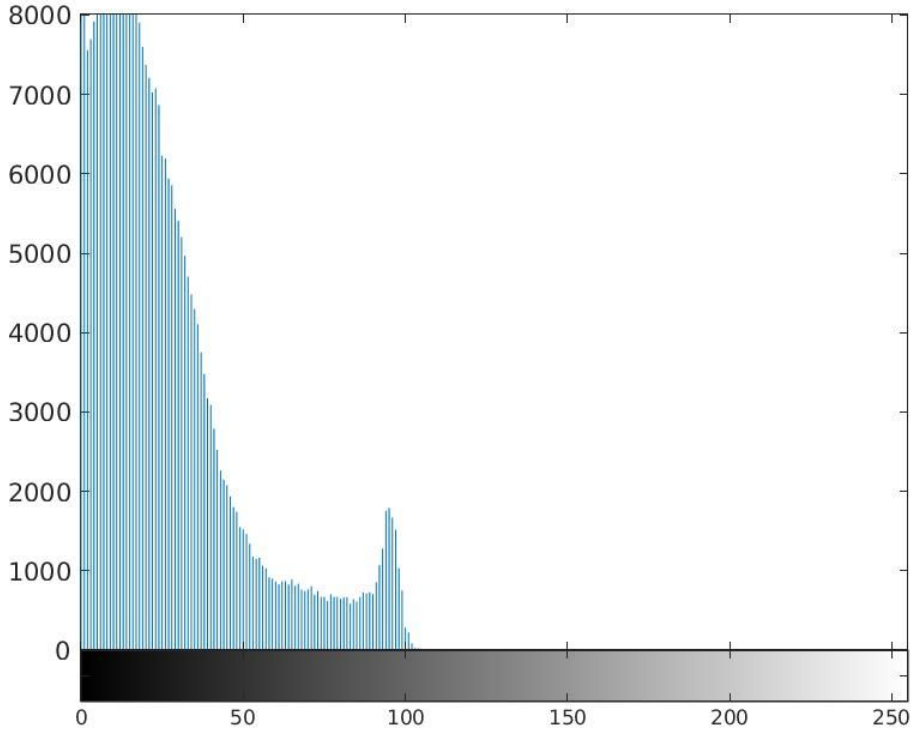
Output Image:

Histogram of the output image:



Input image 2:

Histogram of the input image:

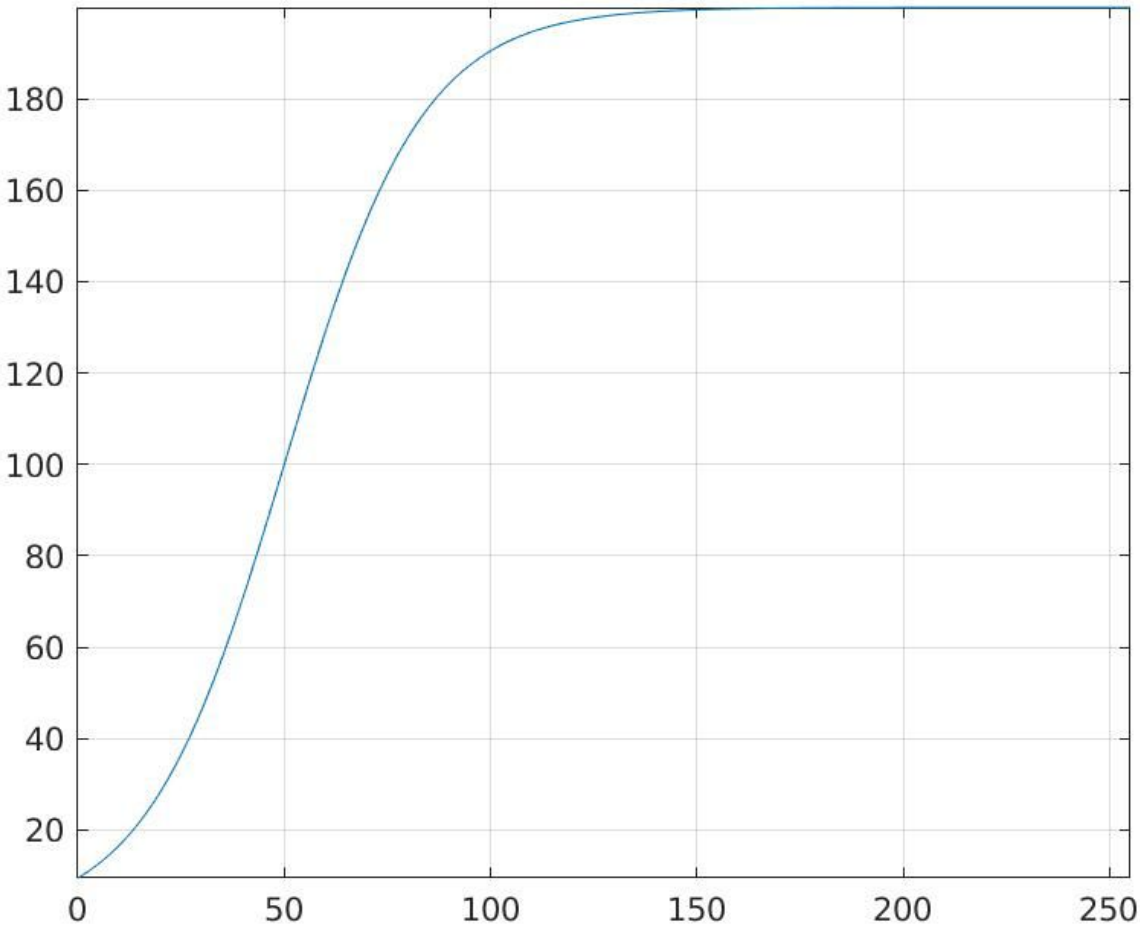


We can stretch the image between 0 and 150.
The small amount of pixels between 60 and 75 can be ignored since they are very small amount and are far off from the other pixels in the histogram.

So changing the formula like below will improve contrast of the image:

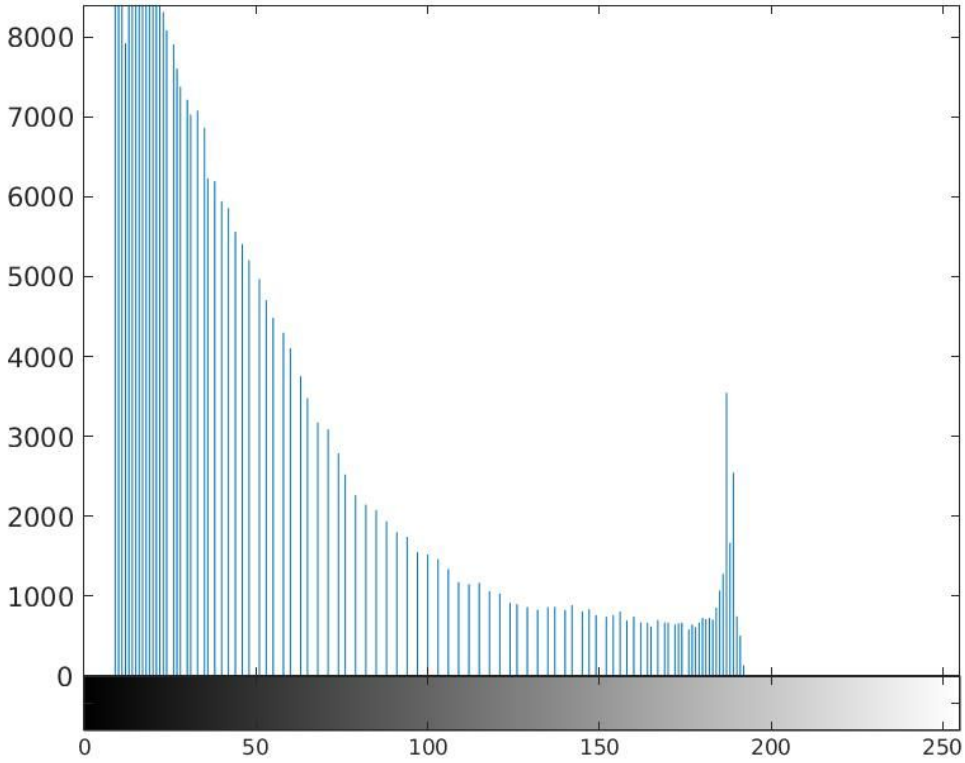
LUT = 255 ./ (1+exp(-a*(x-200)/50));
Highest value =110
Midpoint = 55
Lowest value= 0

Test 2 LUT:



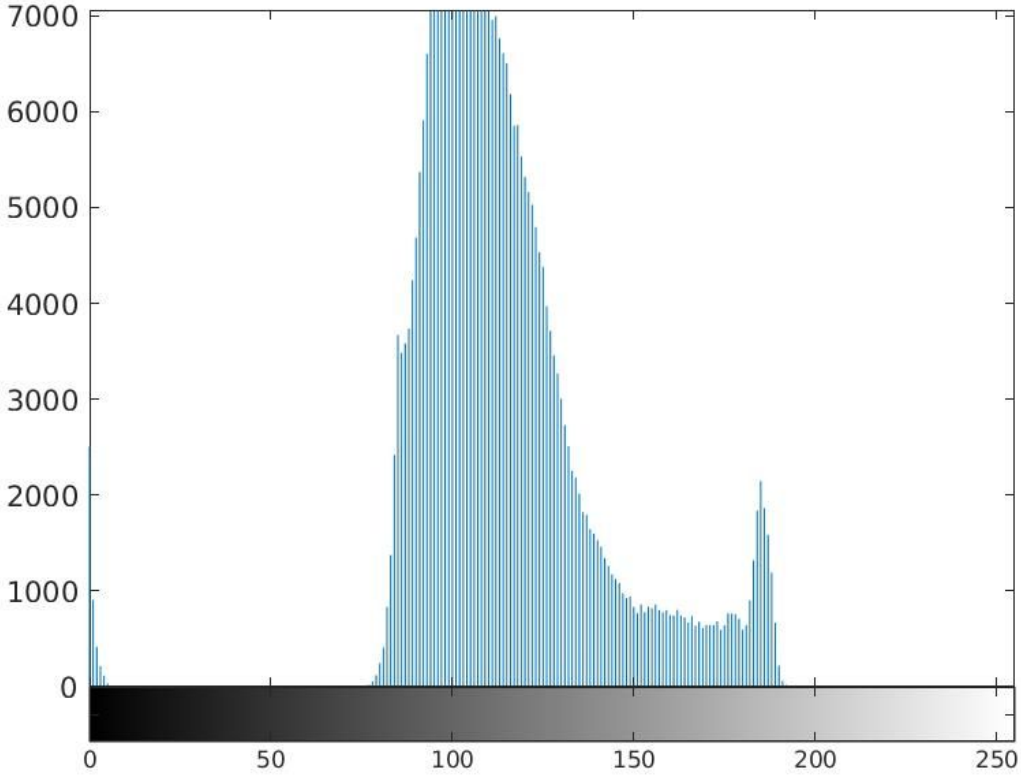
Output Image:

HIstogram of the output image:



Input image 3:

Histogram of the input image:

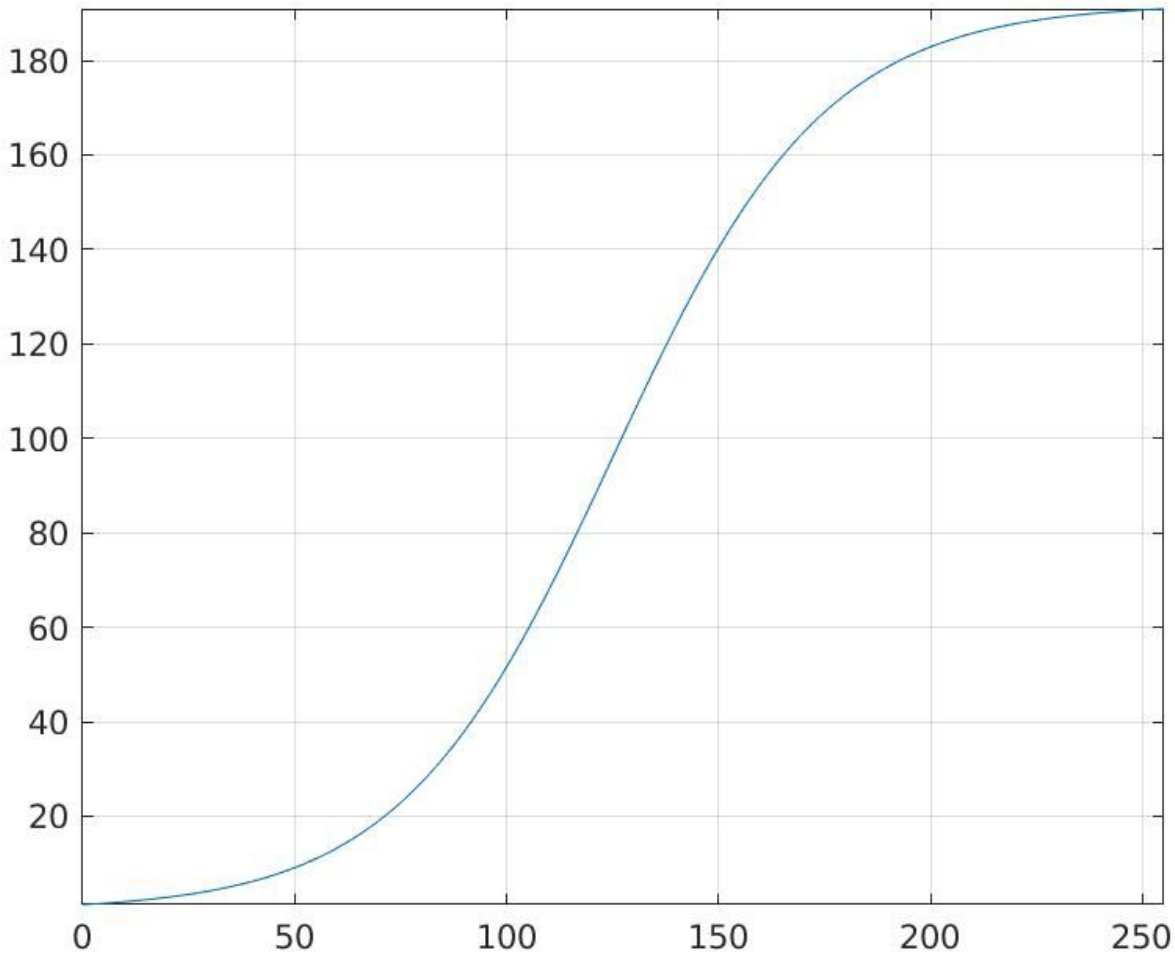


We can stretch the image between 75 and 185.
The small amount of pixels between 60 and 75 can be ignored since they are very small amount and are far off from the other pixels in the histogram.

So changing the formula like below will improve contrast of the image:

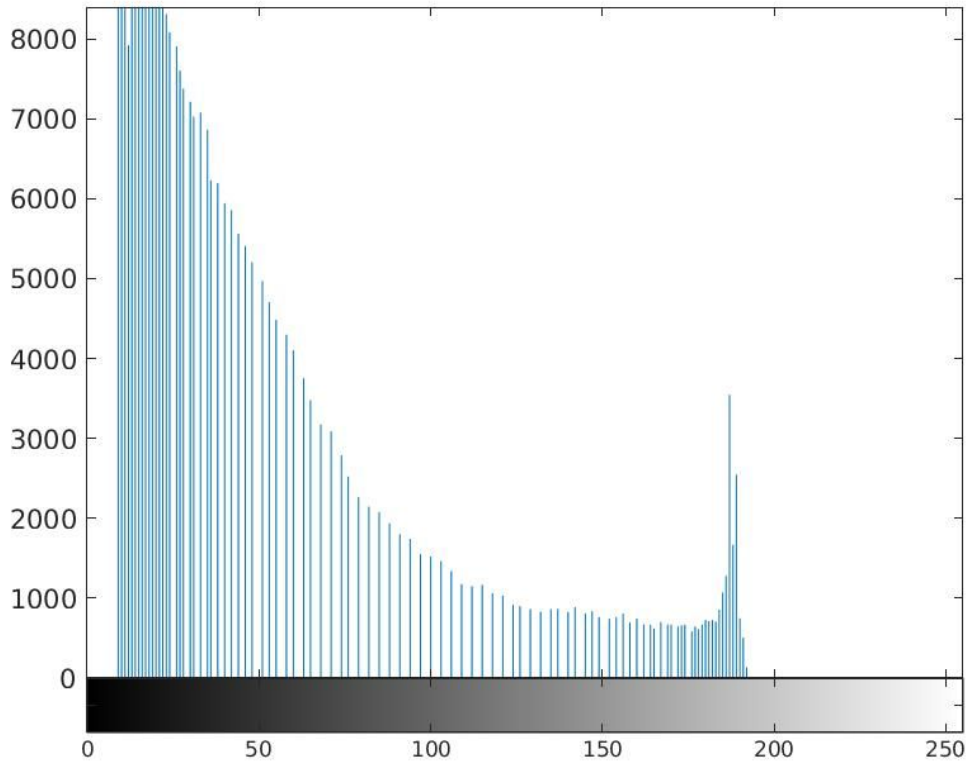
LUT = 185 ./ (1+exp(-a*(x-125)/75));
Highest value =185
Midpoint = 125
Lowest value= 75

Test 3 LUT:



Output Image:

HIstogram of the output image:



Appendix:

Stretch.m

```
% %%For test1.jpg
%
img1 = imread('test1.jpg');
a = 2;
x = 0:255;
LUT1 = 255 ./ (1+exp(-a*(x-200)/50));

plot(0:255, LUT1);
axis tight;
grid;

out1 = LUT1(img1 + 1);
out_image1 = uint8(out1);

imwrite(out_image1,'test1_out.jpg');

%%For test2.jpg

img2 = imread('test2.jpg');
a = 3;
x = 0:255;
LUT2 = 200 ./ (1+exp(-a*(x-50)/50));

plot(0:255, LUT2);
axis tight;
grid;

out2 = LUT2(img2 + 1);
out_image2 = uint8(out2);

imwrite(out_image2,'test2_out.jpg');
```

```
%
% %%For test3.jpg
%
img3 = imread('test3.jpg');
a = 3;
x = 0:255;
LUT3 = 192 ./ (1+exp(-a*(x-125)/75));

plot(0:255, LUT3);
axis tight;
grid;

out3 = LUT3(img3 + 1);
out_image3 = uint8(out3);

imwrite(out_image3,'test3_out.jpg');
```