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% Histogram Equalization of an Image using MATLAB
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% Branch : ECE 3rd Year
% Aim    : To perform histogram equalization on a grayscale image
% Date   : 14-01-2026
clc;
clear all;
close all;
I=imread("display_img.jpeg");
if size(I,3) == 3
    I = rgb2gray(I);
end

% the below code gives the mathematical approach for the desired outcome
[M,N]=size(I); %Calculating the size of the image
numPixels=M*N; %multiplying the rows and columns for total number of pixels
hist=zeros(256,1); %creating a row matrix for the pixel intensity for 0 to 256
for i=1:M
for j=1:N
        intensity=I(i,j);
        hist(intensity+1)=hist(intensity+1)+1;
end
end
%Loop to calculate each and every pixel and add the number of pixels at a
%certain intensity in the row matrix with that value.
pdf=hist/numPixels; %normalising or calculating the average of the intensity
of pixels
cdf = zeros(256,1);
cdf(1) = pdf(1);
for k = 2:256
    cdf(k) = cdf(k-1) + pdf(k);
end
%calclating the cumulative frequency distribution of the given image
L = 256;
mapping = round((L - 1) * cdf);
%mapping the new intensity values with respect to the old frequency values
I_eq = zeros(M,N,'uint8'); %typecasting to the correct format
for i = 1:M
for j = 1:N
        oldVal = I(i,j);
        I_eq(i,j) = mapping(oldVal + 1);
end
end
%putting the new equalised values in the image format
figure;
subplot(2,2,1);
imshow(I);
title('Original Image');
subplot(2,2,2);
imhist(I);
title('Original Histogram');
subplot(2,2,3);
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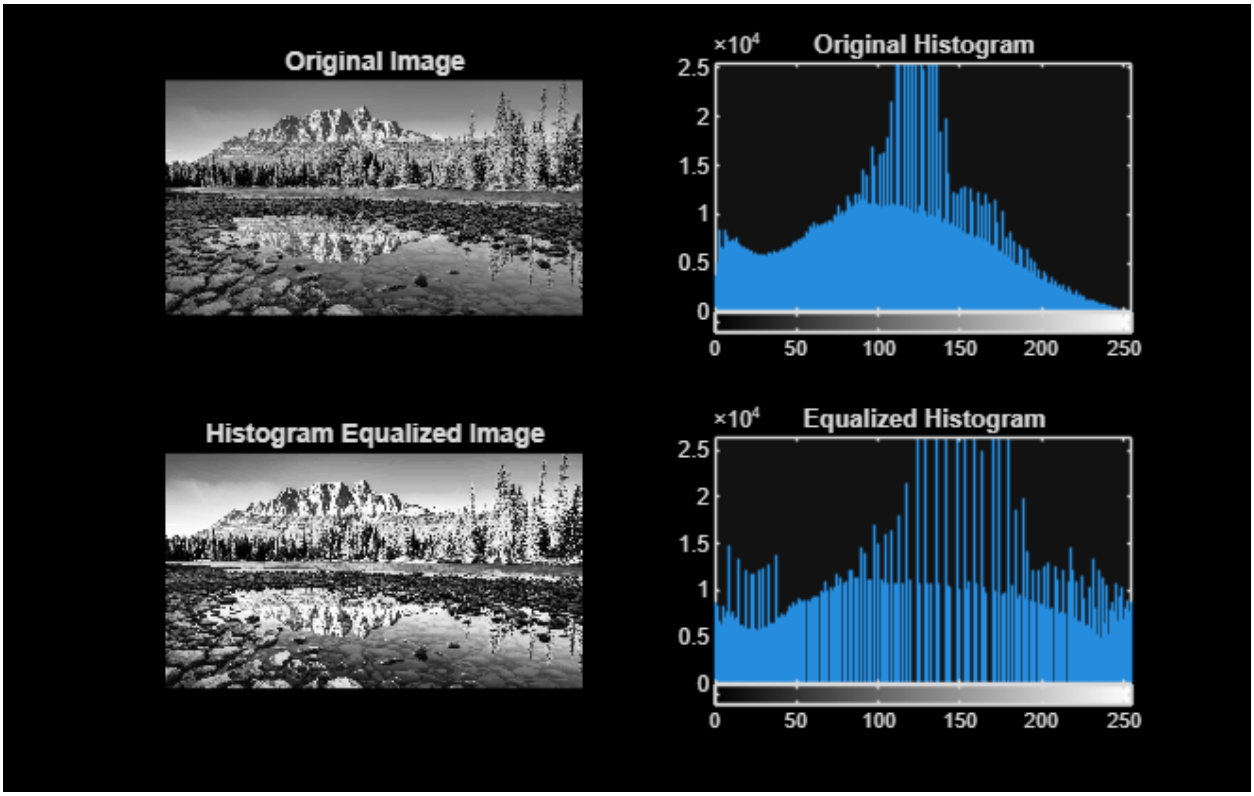
imshow(I_eq);
title('Histogram Equalized Image');
subplot(2,2,4);
imhist(I_eq);
title('Equalized Histogram');
```



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