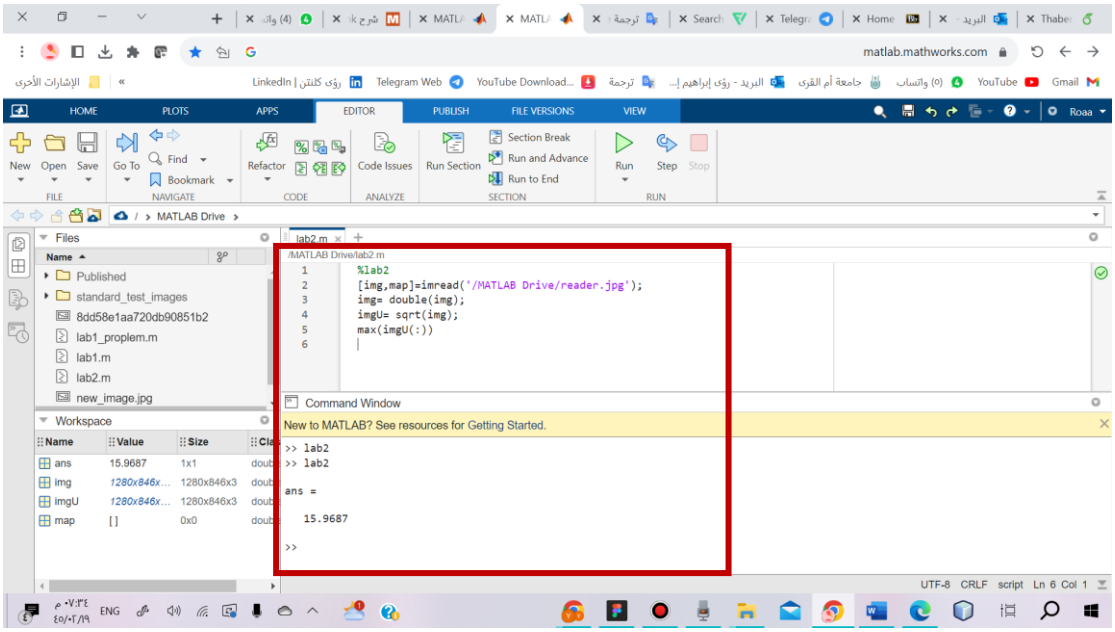
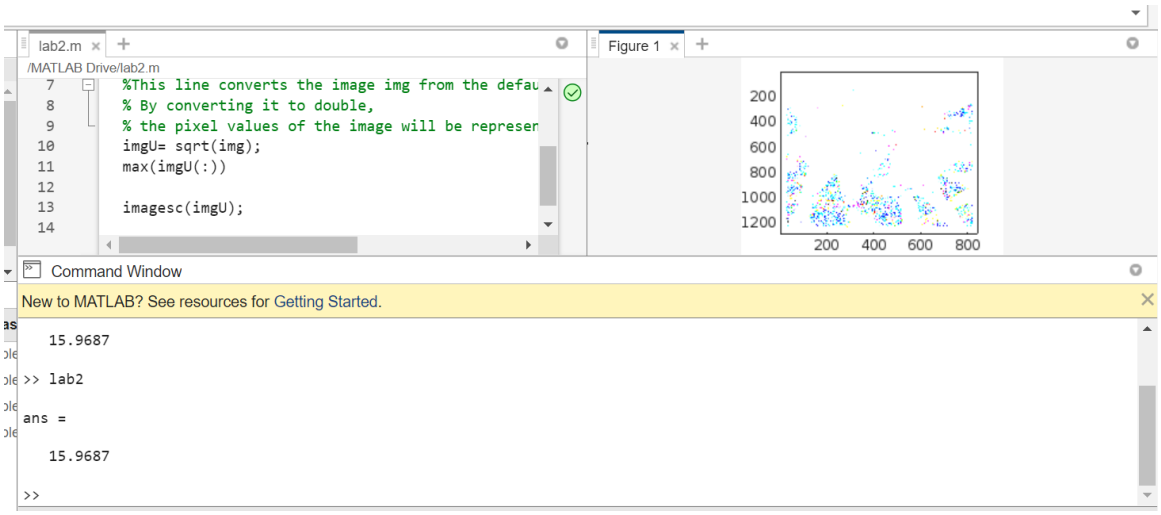


Line 2) The imread function is used to read the image, and it returns two outputs: img and map. img represents the image data, while map contains the colormap if the image is indexed.

Line 3) This line converts the image img from the default data type to double precision. By converting it to double, the pixel values of the image will be represented as floating-point numbers.

Line 4) This line calculates the square root of each pixel value in the img image. The sqrt function is applied element-wise to the image matrix, resulting in a new image imgU where each pixel value is the square root of the corresponding pixel value in the original image.

Line 5) This line finds the maximum value in the imgU image. The (:) syntax is used to linearize the image into a column vector, allowing the max function to find the maximum value across all the pixels in the image.

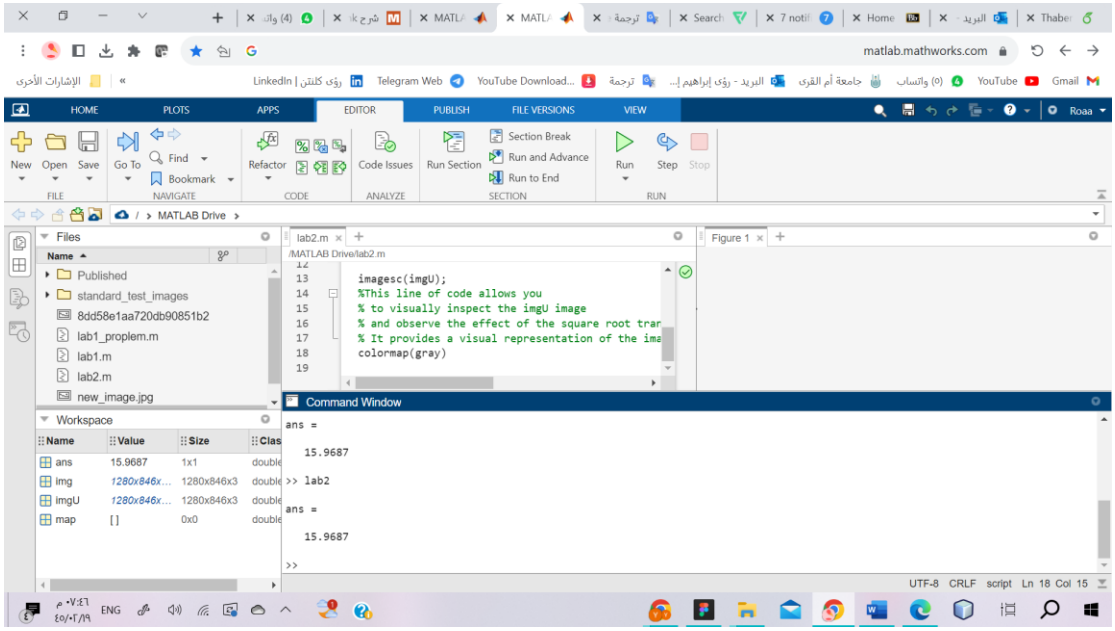


imagesc: imagesc is a MATLAB function used to display an image with scaled colors. It is commonly used for visualizing images with a color scale that represents the intensity values of the image.

imgU: imgU is the input image that is being displayed using imagesc. It represents the image where the square root of each pixel value has been calculated, as mentioned in the code you provided earlier.

When the line imagesc(imgU); is executed, it generates a figure window displaying the image imgU. The color scale of the image will be automatically adjusted to represent the range of intensity values in imgU, with lower values shown as darker shades and higher values shown as brighter shades.

This line of code allows you to visually inspect the imgU image and observe the effect of the square root transformation on the pixel intensities. It provides a visual representation of the image, making it easier to analyze and interpret the data.

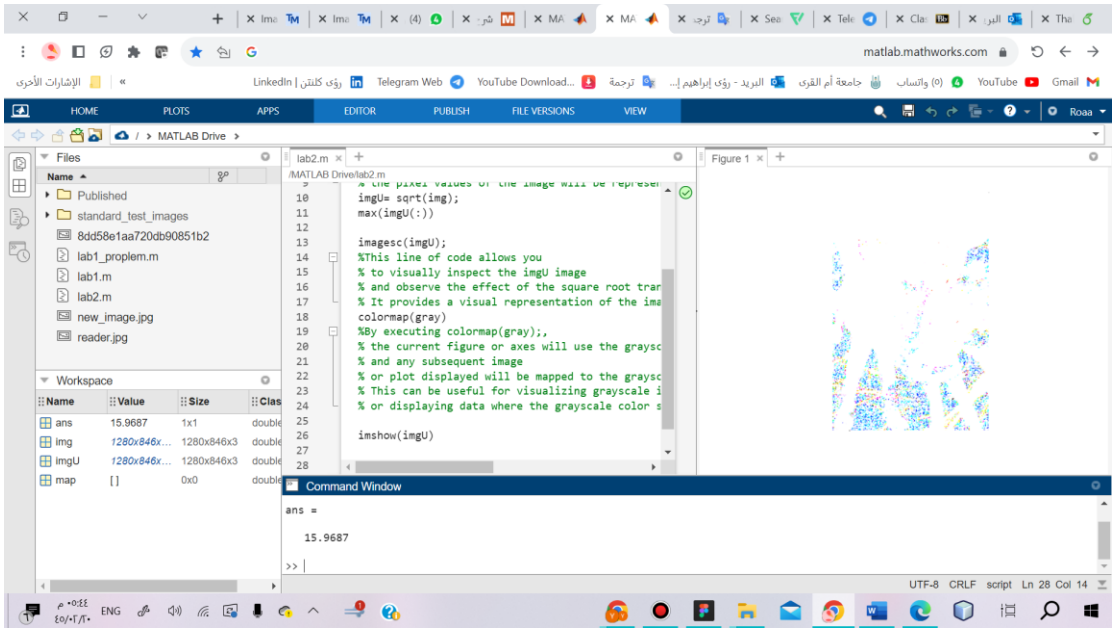


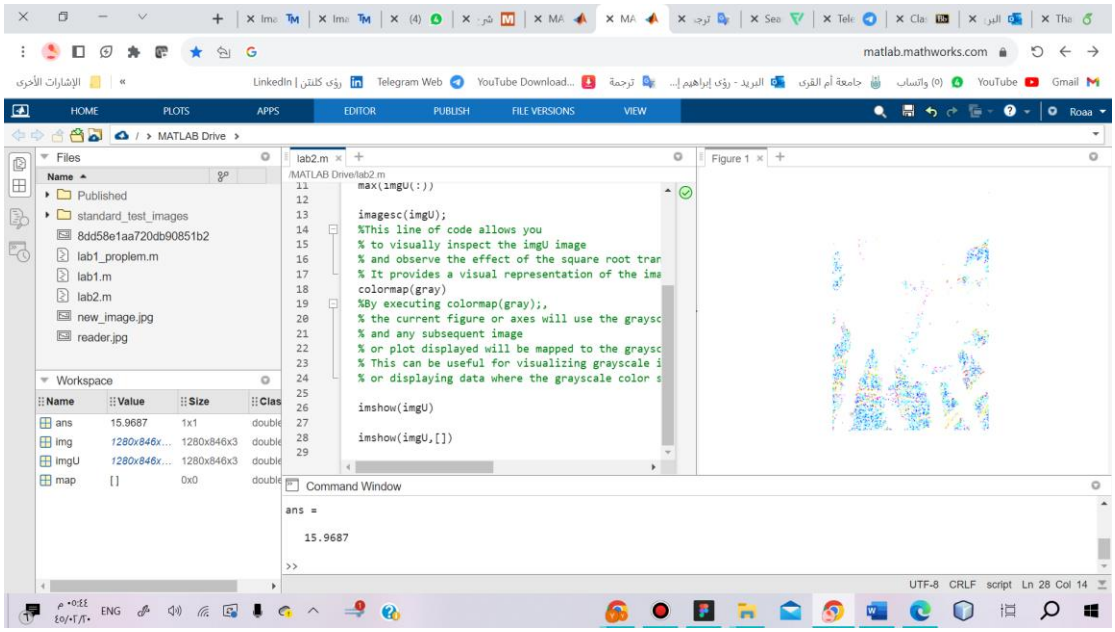
The code colormap(gray); is used in MATLAB to set the colormap of the current figure or axes to grayscale.

In MATLAB, a colormap is a set of colors that are used to represent the intensity values of an image or data. By default, MATLAB uses the "jet" colormap, which represents lower values with blue tones, intermediate values with green and yellow, and higher values with red tones.

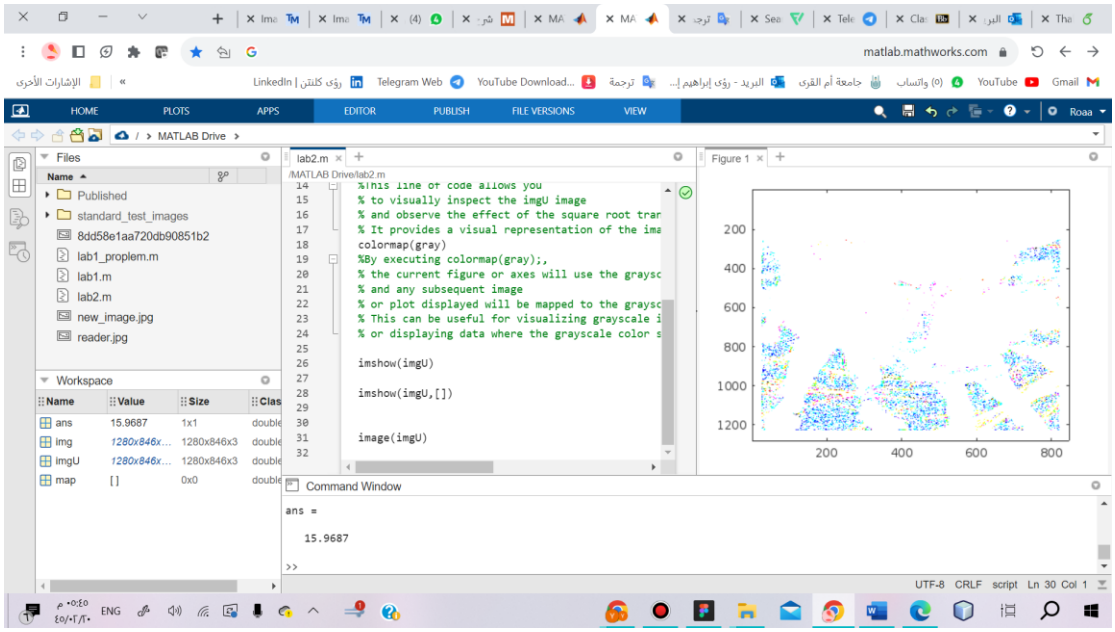
However, in the code colormap(gray);, the gray colormap is specified. The "gray" colormap consists of shades of gray ranging from black for lower values to white for higher values. This colormap is often used to display grayscale images or to represent data where the intensity values are best represented by a grayscale color scheme.

By executing colormap(gray);, the current figure or axes will use the grayscale colormap, and any subsequent image or plot displayed will be mapped to the grayscale color scale. This can be useful for visualizing grayscale images or displaying data where the grayscale color scheme is appropriate.





رؤى إبراهيم كلنتن لاب٢
معالجة صور شعبة ١ نظري ، عملي شعبة٤ ==> شعبة ١

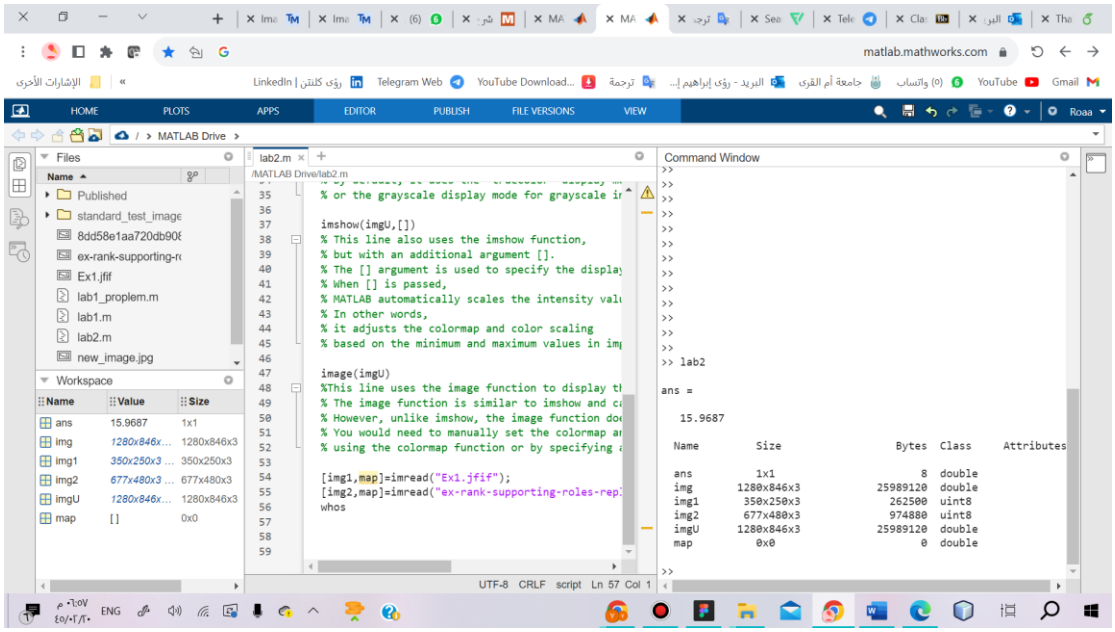


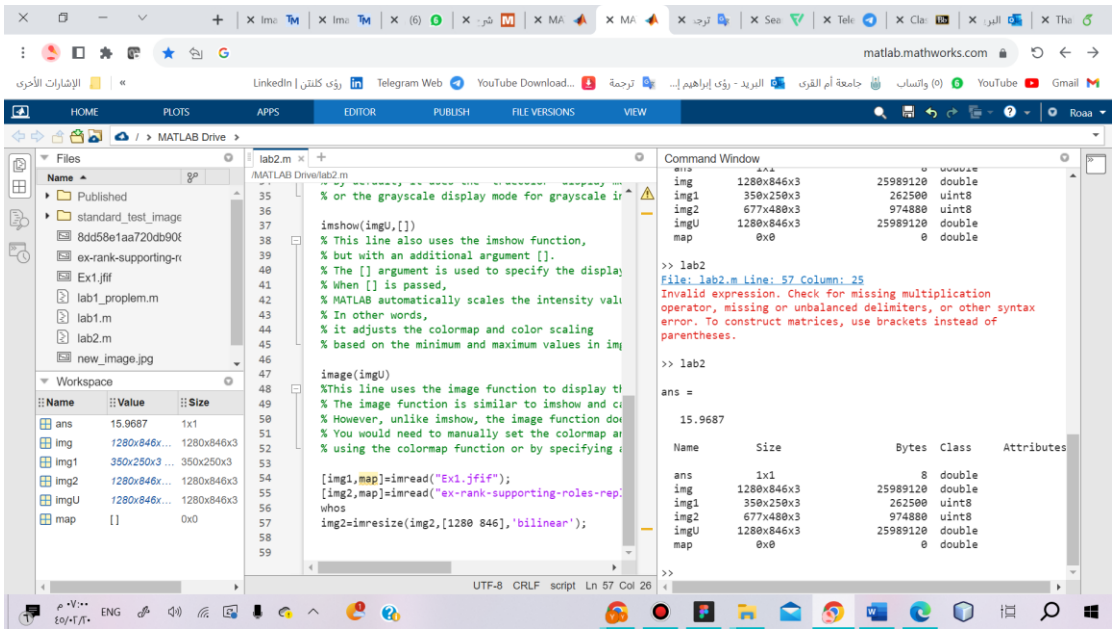
imshow(imgU): This line uses the imshow function to display the image imgU. The imshow function automatically scales the intensity values of the image to fit the display range. It adjusts the colormap and color scaling based on the minimum and maximum values in imgU. By default, it uses the "truecolor" display mode for RGB images or the grayscale display mode for grayscale images.

imshow(imgU,[]): This line also uses the imshow function, but with an additional argument []. The [] argument is used to specify the display range. When [] is passed, MATLAB automatically scales the intensity values of imgU to the full display range. In other words, it adjusts the colormap and color scaling based on the minimum and maximum values in imgU to utilize the full dynamic range of the colormap.

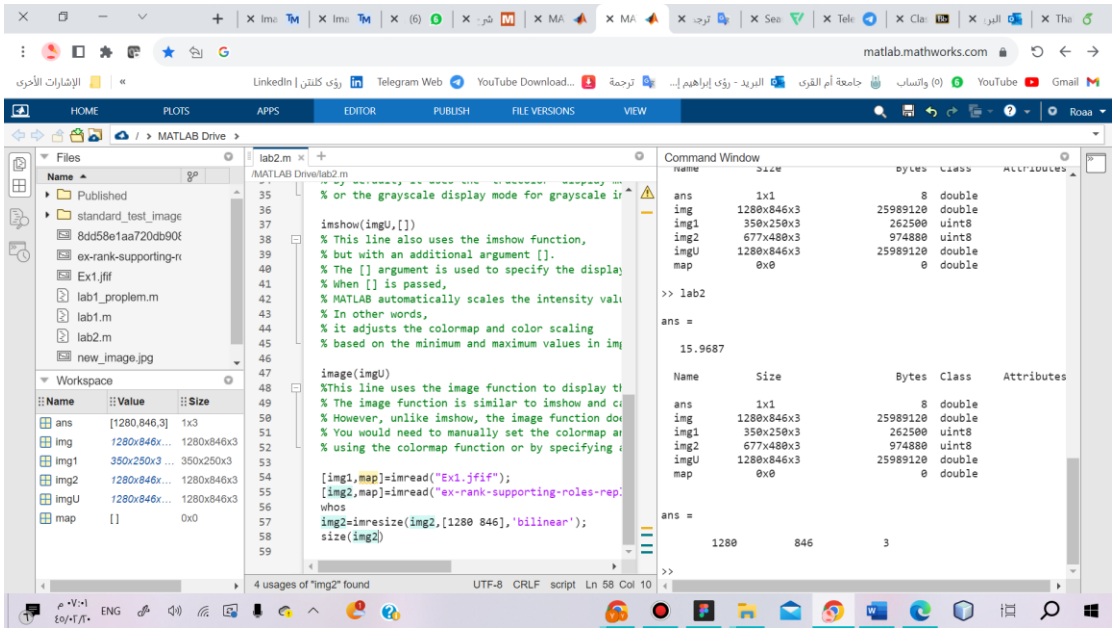
image(imgU): This line uses the image function to display the image imgU. The image function is similar to imshow and can be used to display images. However, unlike imshow, the image function does not automatically adjust the colormap or color scaling. You would need to manually set the colormap and color scaling using the colormap function or by specifying additional arguments to the image function.

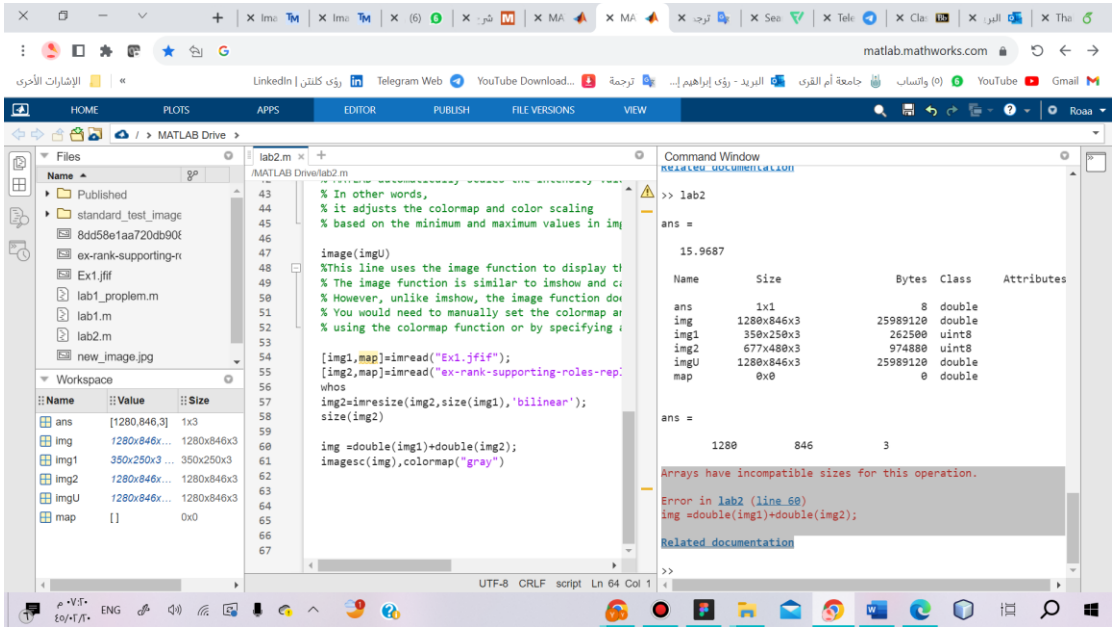
رؤى إبراهيم كلنتن لاب٢
معالجة صور شعبة ١ نظري ، عملي شعبة٤ ==> شعبة ١



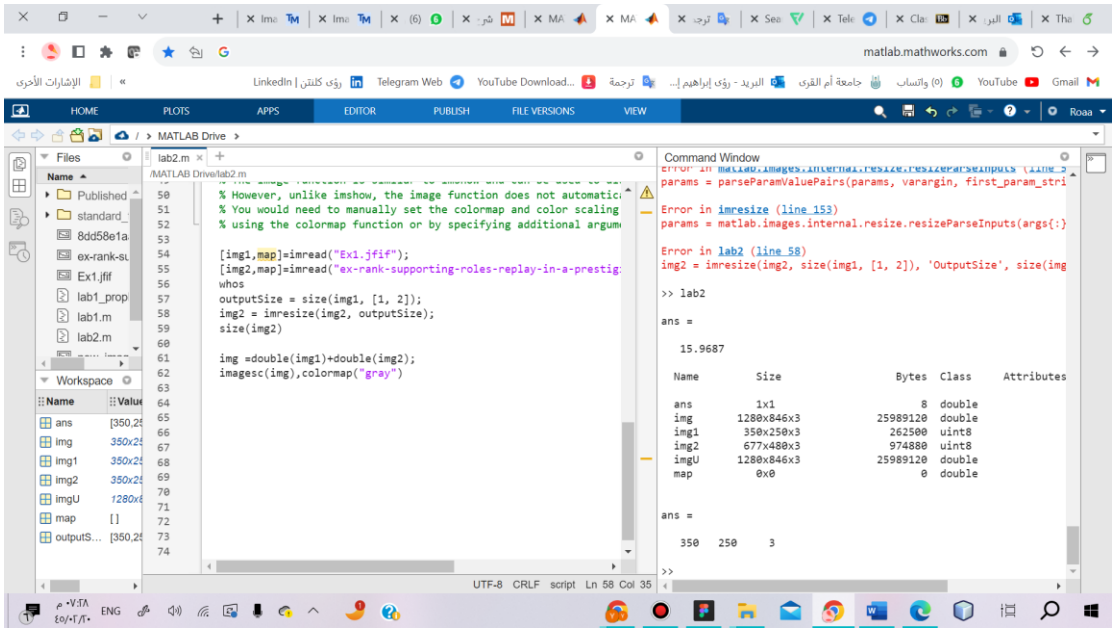


رؤى إبراهيم كلنتن لاب٢
معالجة صور شعبة ١ نظري ، عملي شعبة٤ ==> شعبة ١





رؤى إبراهيم كلنتن لاب٢
معالجة صور شعبة ١ نظري ، عملي شعبة٤ ==> شعبة ١



Certainly! Let's go through the code step by step to explain what each part does:

[img1, map] = imread("Ex1.jfif"); and [img2, map] = imread("ex-rank-supporting-roles-replay-in-a-prestigious-school.jpg"):;

These lines read the images from the files "Ex1.jfif" and "ex-rank-supporting-roles-replay-in-a-prestigious-school.jpg", respectively, using the imread function.

The resulting image data is stored in img1 and img2, and the colormap (if present) is stored in map.

whos:

This command displays information about the variables currently in the workspace.

It shows details such as the name, size, bytes, and class of each variable.

In this case, it provides information about img1, img2, map, and other variables.

outputSize = size(img1, [1, 2]):;

The size function is used to determine the dimensions of img1.

The [1, 2] argument specifies that we want to retrieve the size in the first and second dimensions (height and width) of img1.

The resulting size is assigned to the outputSize variable.

img2 = imresize(img2, outputSize):;

The imresize function is used to resize img2 to match the dimensions of img1.

The outputSize variable, which contains the desired dimensions, is passed as the second argument to imresize.

This ensures that img2 is resized to have the same size as img1.

size(img2):

This line displays the size of img2 after the resizing operation.

It shows the dimensions (height, width, and color channels) of the resized img2.

img = double(img1) + double(img2):;

The double function is used to convert img1 and img2 from the original data type (likely uint8) to double precision.

This conversion allows for performing element-wise addition between the two images.

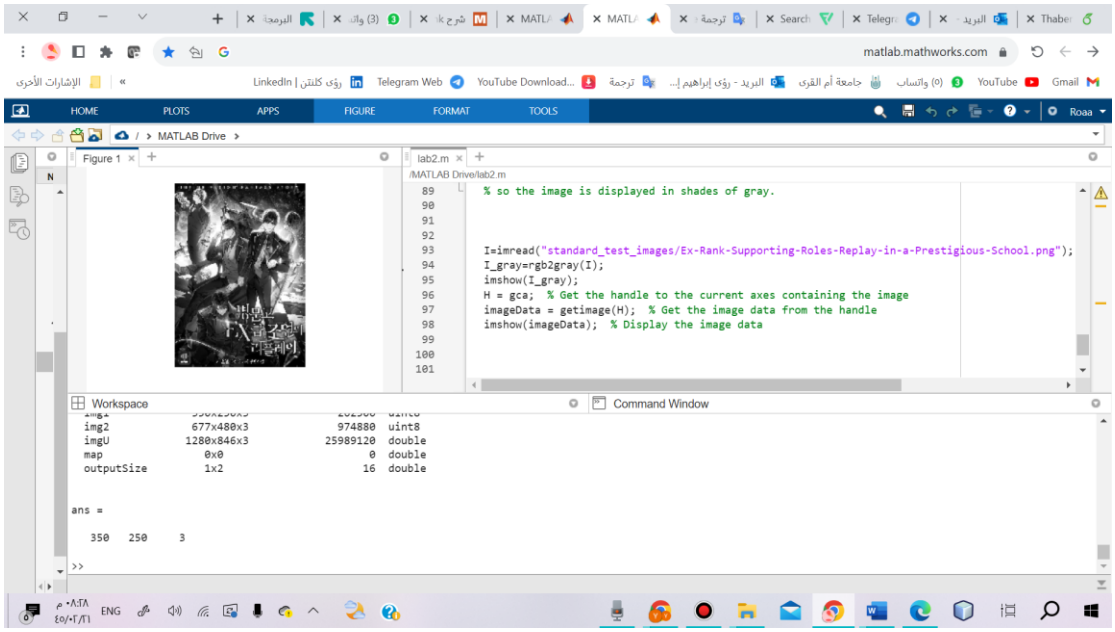
The resulting sum is stored in the img variable.

imagesc(img), colormap("gray"):

The imagesc function is used to display the img variable as an image.

The colormap("gray") command sets the colormap to grayscale, so the image is displayed in shades of gray.

Overall, the code reads two images, resizes one of them to match the dimensions of the other, adds the two images together, and displays the resulting image. The goal is to visualize the combined effect of adding the pixel values of the two original images.



H = gca;:

The gca function stands for "get current axes" and returns the handle to the current axes object that contains the image.

The handle is stored in the variable H for further use.

imageData = getimage(H);:

The getimage function is used to retrieve the image data from the axes handle H.

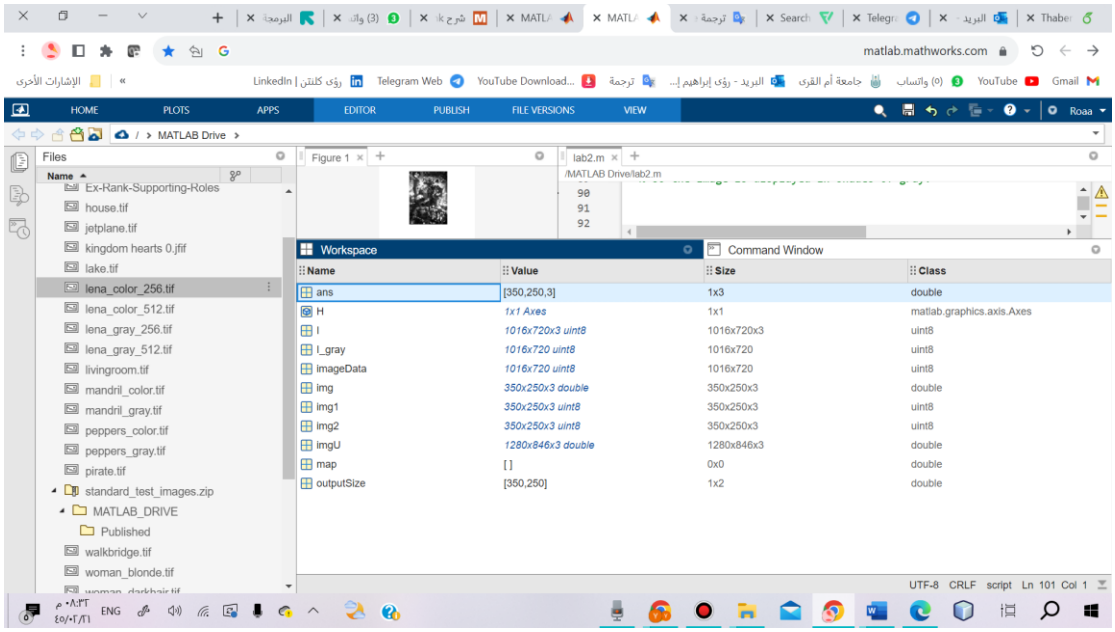
It extracts the image data displayed in the axes object, which in this case is the grayscale image I_gray.

The retrieved image data is stored in the variable imageData.

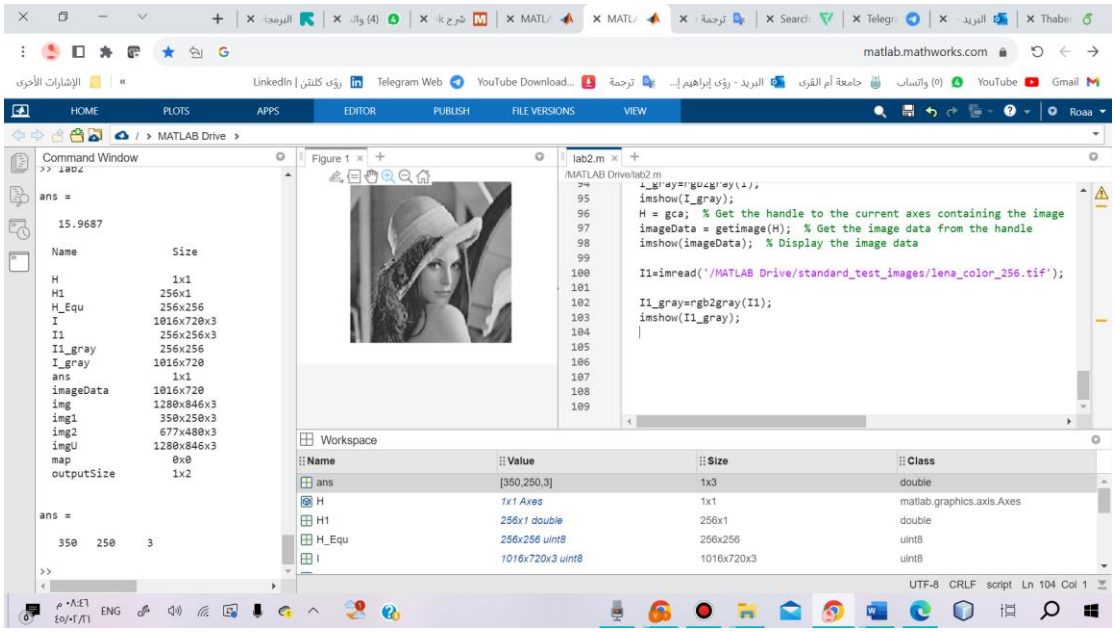
imshow(imageData);:

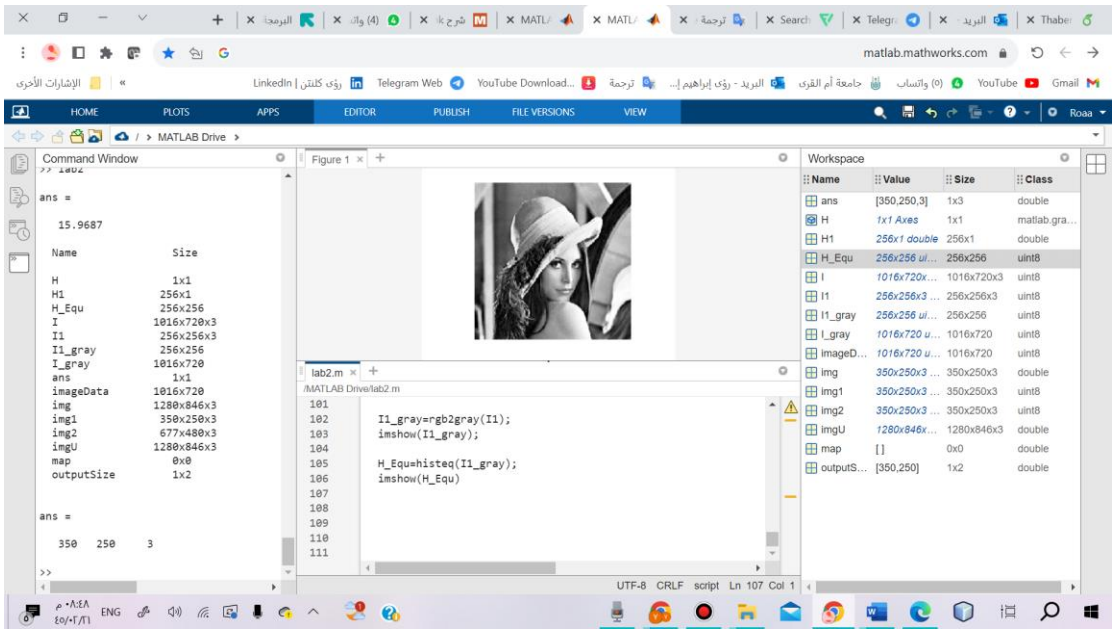
The imshow function is called again, but this time it displays the image data stored in imageData.

Since imageData contains the same grayscale image as before, this line essentially re-displays the image.

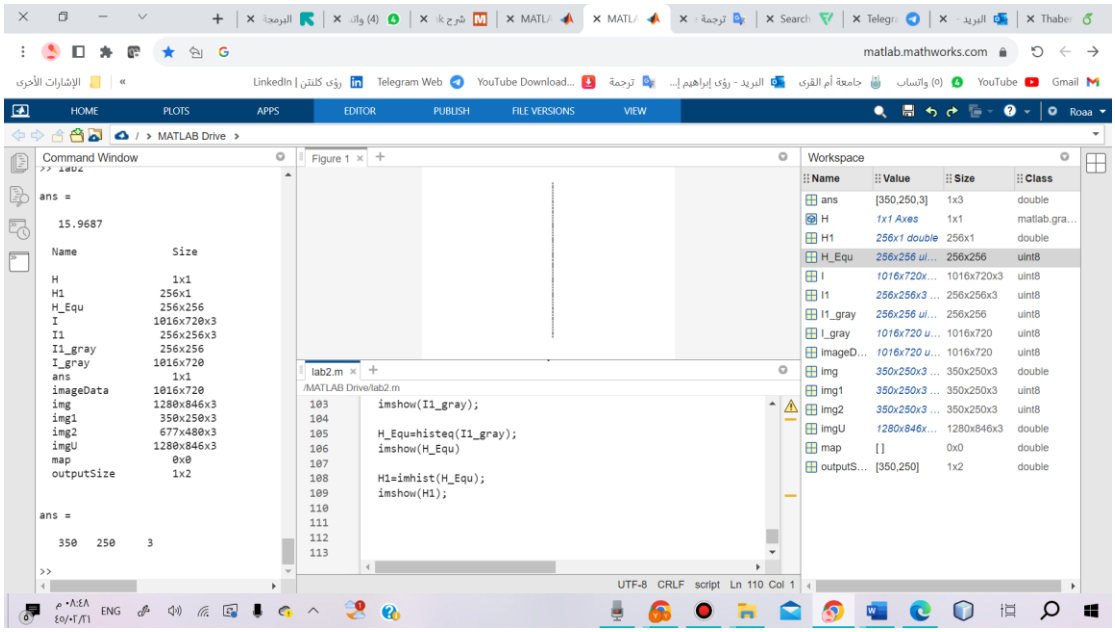


رؤى إبراهيم كلنتن لاب٢
معالجة صور شعبة ١ نظري ، عملي شعبة٤ ==> شعبة ١





رؤى إبراهيم كلنتن لاب٢
معالجة صور شعبة ١ نظري ، عملي شعبة٤ ==> شعبة ١



H_Equ = histeq(I1_gray);:

The histeq function performs histogram equalization on the grayscale image I1_gray.

Histogram equalization enhances the contrast of the image by redistributing pixel intensities.

The resulting equalized image is stored in the variable H_Equ.

imshow(H_Equ);:

The imshow function is called to display the equalized image H_Equ.

This line shows the equalized image in a new figure window.

H1 = imhist(H_Equ);:

The imhist function is used to compute the histogram of the equalized image H_Equ.

The histogram represents the frequency distribution of pixel intensities in the image.

The resulting histogram data is stored in the variable H1.

imshow(H1);:

The imshow function is called to display the histogram data H1.

Since H1 contains the histogram data, this line shows the histogram plot in a figure window.

##

```
%lab2
[img,map]=imread("reader.jpg");
```

```
%The imread function is used to read the image,
% and it returns two outputs: img and map. img represents the image data,
% while map contains the colormap if the image is indexed.
img= double(img);
%This line converts the image img from the default data type to double
precision.
% By converting it to double,
% the pixel values of the image will be represented as floating-point
numbers.
imgU= sqrt(img);
%This line calculates the square root
% of each pixel value in the img image.
% The sqrt function is applied element-wise to the image matrix,
% resulting in a new image imgU where each pixel value is the square root
of the corresponding pixel value in the original image.
max(imgU(:))
%This line finds the maximum value in the imgU image.
% The (:) syntax is used to linearize the image into a column vector,
% allowing the max function to find the maximum value across all the pixels
in the image.
imagesc(imgU);
%This line of code allows you
% to visually inspect the imgU image
% and observe the effect of the square root transformation on the pixel
intensities.
% It provides a visual representation of the image, making it easier to
analyze and interpret the data.
colormap(gray)
%By executing colormap(gray);,
% the current figure or axes will use the grayscale colormap,
% and any subsequent image
% or plot displayed will be mapped to the grayscale color scale.
% This can be useful for visualizing grayscale images
% or displaying data where the grayscale color scheme is appropriate.

imshow(imgU)
%This line uses the imshow function
% to display the image imgU.
% The imshow function automatically scales
% the intensity values of the image
% to fit the display range.
% It adjusts the colormap and color scaling
% based on the minimum and maximum values in imgU.
% By default, it uses the "truecolor" display mode for RGB images
% or the grayscale display mode for grayscale images.

imshow(imgU,[])
% This line also uses the imshow function,
% but with an additional argument [].
% The [] argument is used to specify the display range.
% When [] is passed,
% MATLAB automatically scales the intensity values of imgU to the full
display range.
% In other words,
% it adjusts the colormap and color scaling
% based on the minimum and maximum values in imgU to utilize the full
dynamic range of the colormap.
```

```
image(imgU)
%This line uses the image function to display the image imgU.
% The image function is similar to imshow and can be used to display
images.
% However, unlike imshow, the image function does not automatically adjust
the colormap or color scaling.
% You would need to manually set the colormap and color scaling
% using the colormap function or by specifying additional arguments to the
image function.

[img1,map]=imread("Ex1.jfif");
[img2,map]=imread("ex-rank-supporting-roles-replay-in-a-prestigious-
school.jpg");
%read from file
%The resulting image data is stored in img1 and img2, and the colormap (if
present) is stored in map.
whos
%This command displays information about the variables currently in the
workspace.
%It shows details such as the name, size, bytes, and class of each
variable.
outputSize = size(img1, [1, 2]);
%The size function is used to determine the dimensions of img1.
%the [1, 2] argument specifies that we want to retrieve the size in the
first and second dimensions (height and width) of img1.
%The resulting size is assigned to the outputSize variable.

img2 = imresize(img2, outputSize);
%The imresize function is used to resize img2 to match the dimensions of
img1.
% The outputSize variable,
% which contains the desired dimensions,
% is passed as the second argument to imresize.
% This ensures that img2 is resized to have the same size as img1
size(img2)
%This line displays the size of img2 after the resizing operation.
% It shows the dimensions (height, width, and color channels) of the
resized img2.
img =double(img1)+double(img2);
%The double function is used to convert img1 and img2 from the original
data type (likely uint8) to double precision.
% This conversion allows for performing element-wise addition between the
two images.
% The resulting sum is stored in the img variable.
imagesc(img),colormap("gray")
%The imagesc function is used to display the img variable as an image.
% The colormap("gray") command sets the colormap to grayscale,
% so the image is displayed in shades of gray.



I=imread("standard_test_images/Ex-Rank-Supporting-Roles-Replay-in-a-
Prestigious-School.png");
I_gray=rgb2gray(I);
imshow(I_gray);
H = gca;  % Get the handle to the current axes containing the image
imageData = getimage(H);  % Get the image data from the handle
imshow(imageData);  % Display the image data
```

رؤى إبراهيم كلنتن لاب٢
معالجة صور شعبة ١ نظري ، عملي شعبة٤ ==> شعبة ١

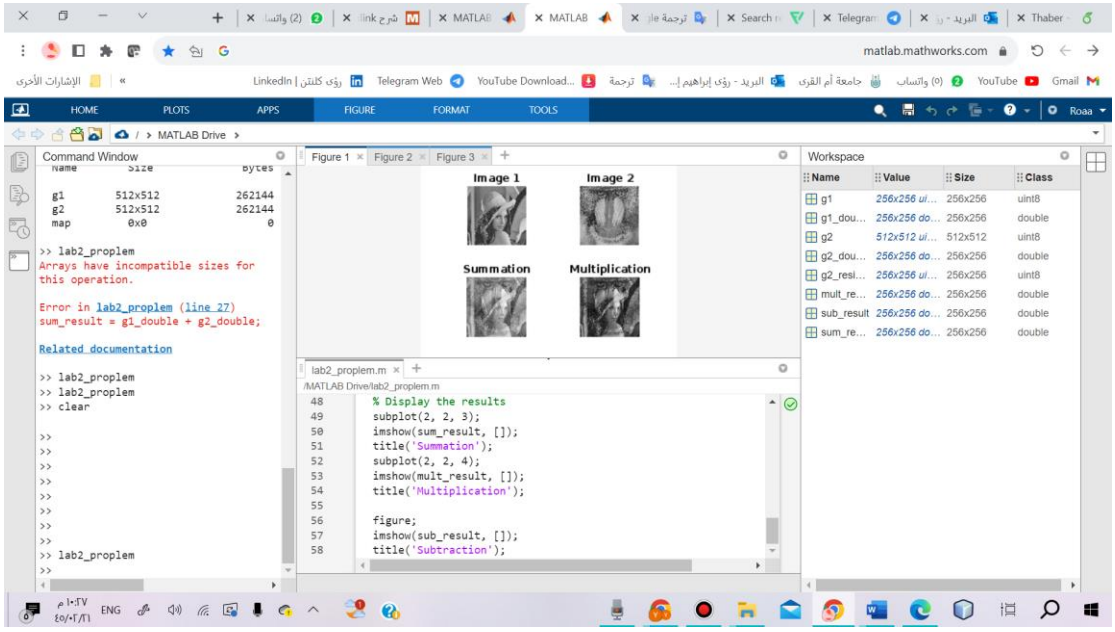
```
I1=imread('/MATLAB Drive/standard_test_images/lena_color_256.tif');

I1_gray=rgb2gray(I1);
imshow(I1_gray);

H_Equ=histeq(I1_gray);
%The histeq function performs histogram equalization
% on the grayscale image I1_gray.
% Histogram equalization enhances the contrast
% of the image by redistributing pixel intensities.
imshow(H_Equ)

H1=imhist(H_Equ);
%The imhist function is used to compute the histogram
% of the equalized image H_Equ.
% The histogram represents the frequency distribution
% of pixel intensities in the image.
imshow(H1);
```

Problems:

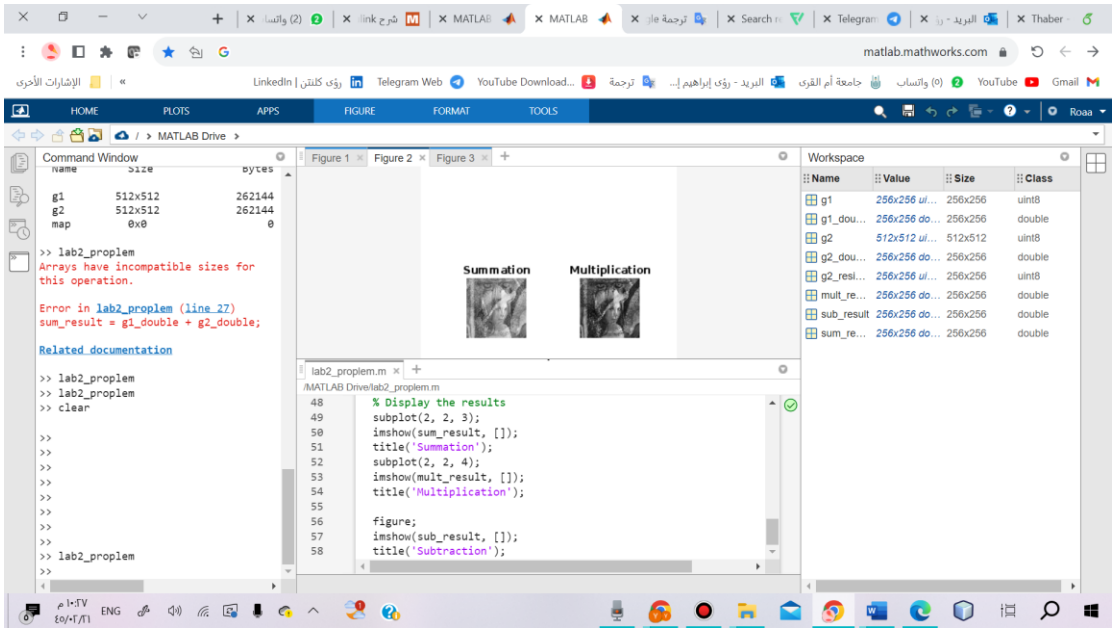
1- Read two grayscale images with different sizes. Try several binary operations on them: summation, multiplication, subtraction. Display the results and explain them.

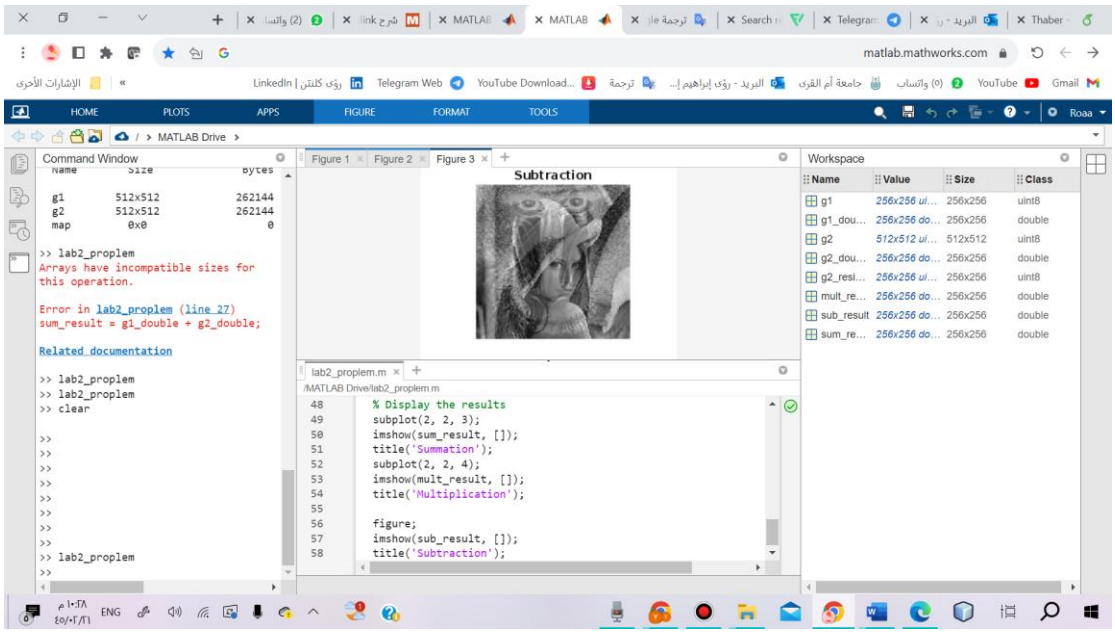
2- Read grayscale image them display the normal histogram for it

S1:



رؤى إبراهيم كلنتن لاب٢
معالجة صور شعبة ١ نظري ، عملي شعبة٤ ==> شعبة ١



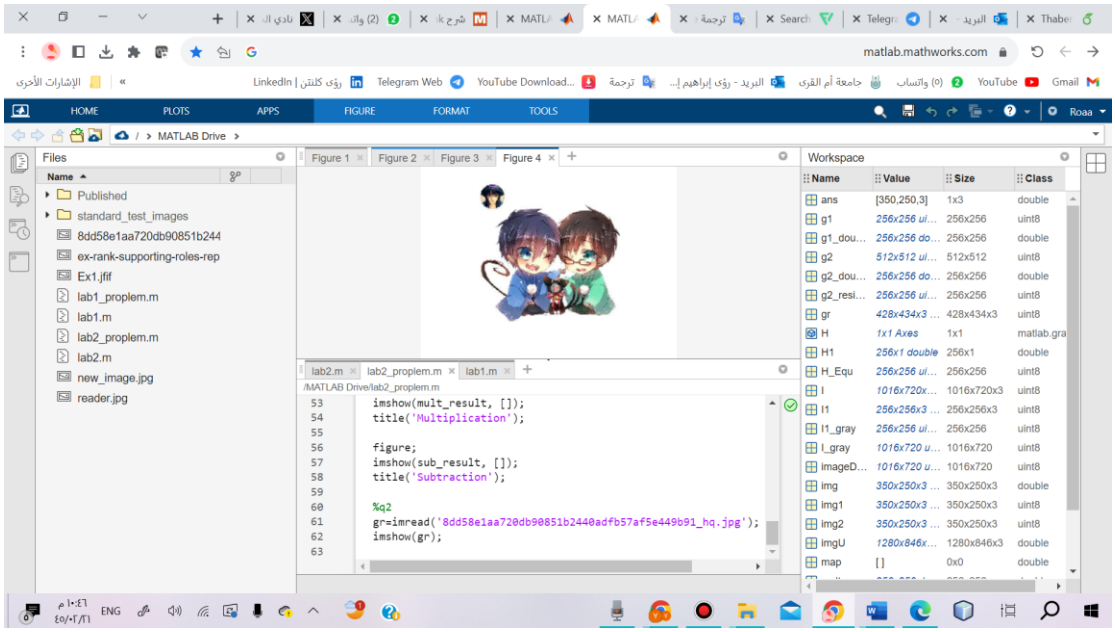


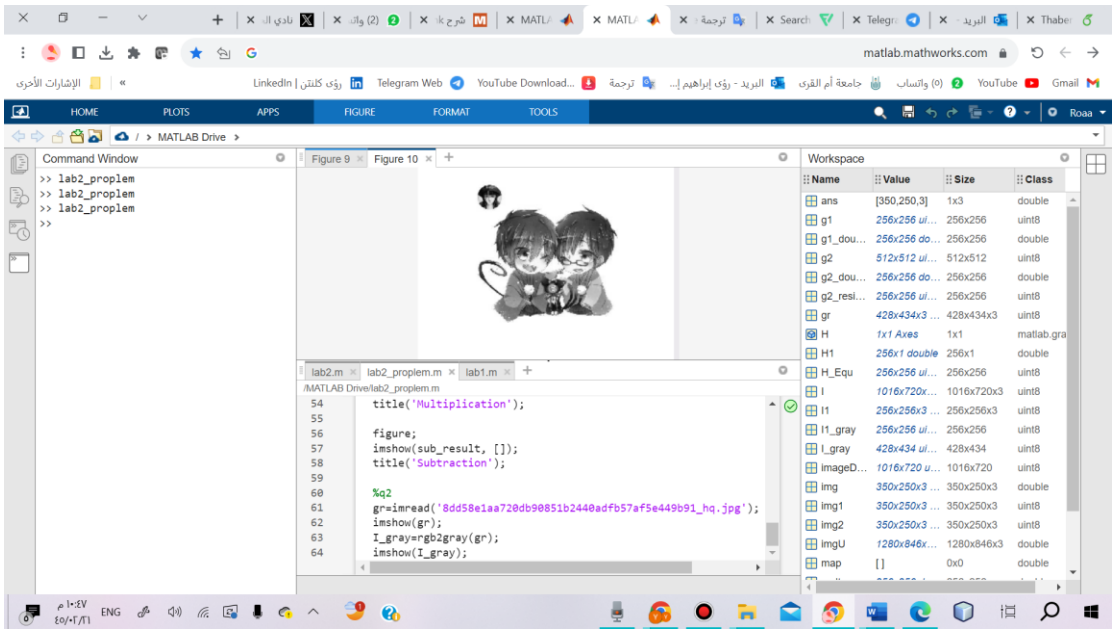

```
g1=imread("/MATLAB Drive/standard_test_images/lena_gray_256.tif");
g2=imread("/MATLAB Drive/standard_test_images/mandril_gray.tif");

%[g1,map]=imread("/MATLAB Drive/standard_test_images/lena_gray_256.tif");
%[g1,map]=imread("/MATLAB Drive/standard_test_images/mandril_gray.tif");

%whos
%g3=double(g1)+double(g2);

% Display the original images
figure;
subplot(2, 2, 1);
imshow(g1);
title('Image 1');
subplot(2, 2, 2);
imshow(g2);
title('Image 2');
```

```
% Resize g2 to match the size of g1
g2_resized = imresize(g2, size(g1));

% Convert the images to double precision for arithmetic operations
g1_double = double(g1);
g2_double = double(g2_resized);

% Perform binary operations
sum_result = g1_double + g2_double;
mult_result = g1_double .* g2_double;
sub_result = g1_double - g2_double;

% Display the results unti 8 or double
subplot(2, 2, 3);
imshow(sum_result, []);
title('Summation');
subplot(2, 2, 4);
imshow(mult_result, []);
title('Multiplication');

figure;
imshow(sub_result, []);
title('Subtraction');
% Perform binary operations
sum_result = g1_double + g2_double;
mult_result = g1_double .* g2_double;
sub_result = g1_double - g2_double;

% Display the results
subplot(2, 2, 3);
imshow(sum_result, []);
title('Summation');
subplot(2, 2, 4);
imshow(mult_result, []);
title('Multiplication');

figure;
imshow(sub_result, []);
title('Subtraction');
```

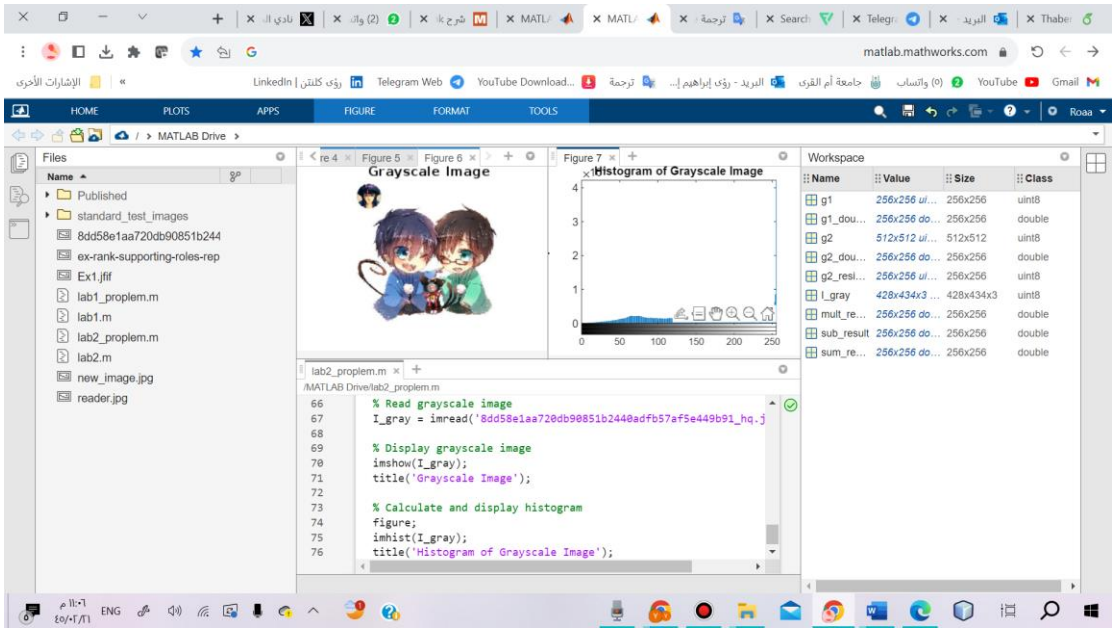
S2:

رؤى إبراهيم كلنتن لاب٢
معالجة صور شعبة ١ نظري ، عملي شعبة٤ ==> شعبة ١





رؤى إبراهيم كلنتن لاب٢
معالجة صور شعبة ١ نظري ، عملي شعبة٤ ==> شعبة ١




```
%q2
%gr=imread('8dd58e1aa720db90851b2440adfb57af5e449b91_hq.jpg');
%imshow(gr);
%I_gray=rgb2gray(gr);
%imshow(I_gray);

% Read grayscale image
I_gray = imread('8dd58e1aa720db90851b2440adfb57af5e449b91_hq.jpg');

% Display grayscale image
imshow(I_gray);
title('Grayscale Image');

% Calculate and display histogram
figure;
imhist(I_gray);
title('Histogram of Grayscale Image');
```