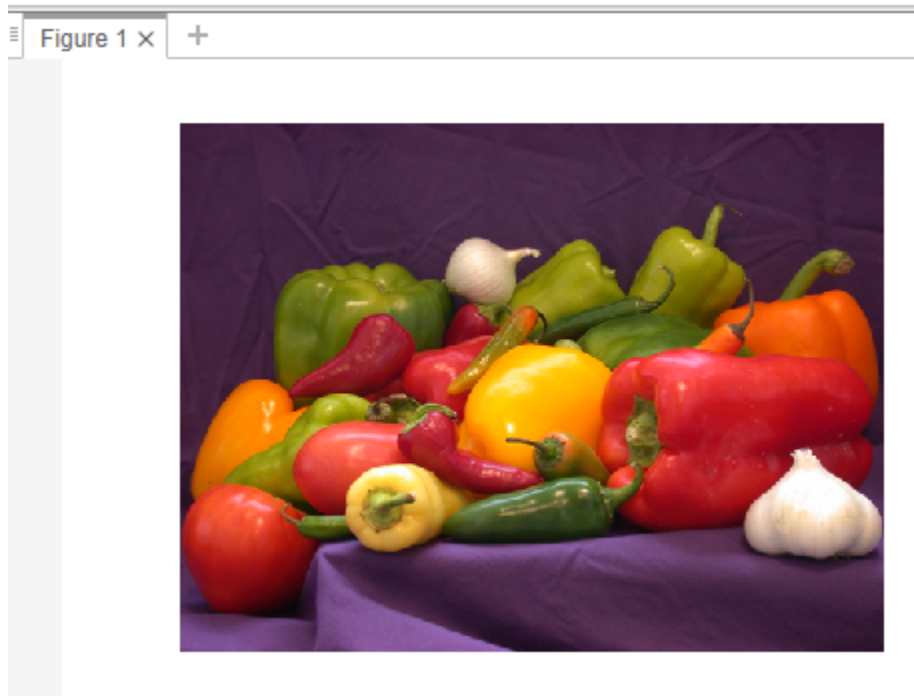


QUESTIONS AND ANSWERS FOR IMAGE PROCESSING – NAAN MUDHALVAN

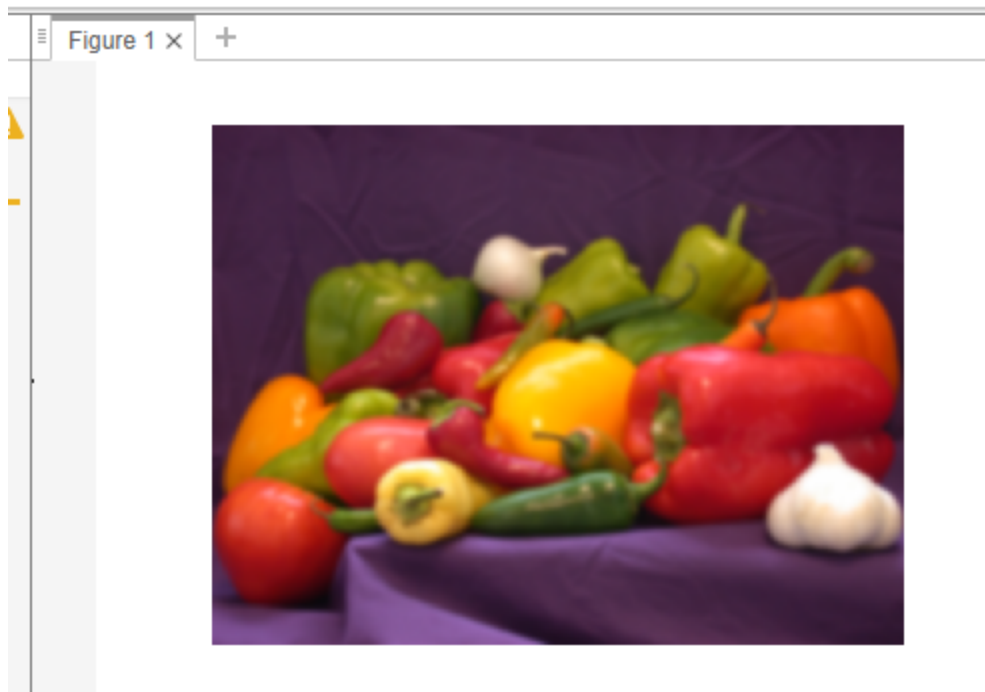
1) How to Load and Display an Image in MATLAB?

```
clc; clear all; close all;  
% Load an image  
img = imread('peppers.png');  
% Display the image  
imshow(img);
```



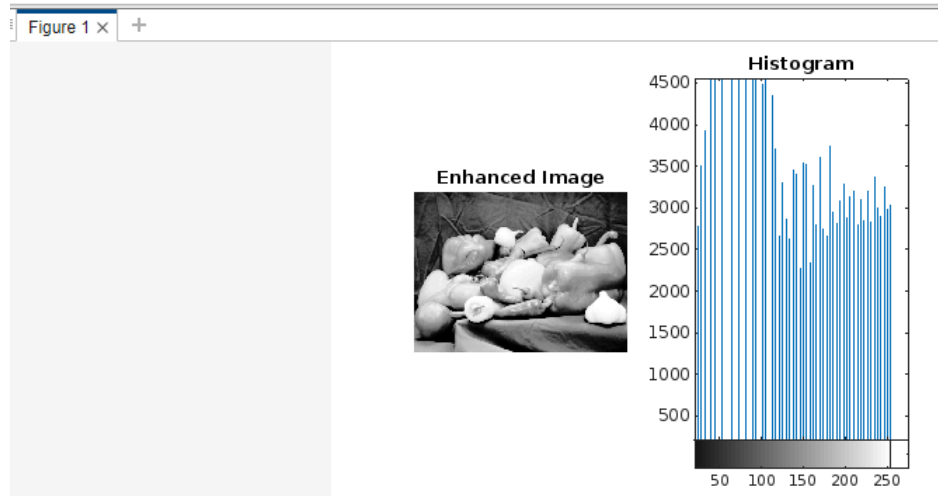
2) How to Blur an Image in MATLAB?

```
clc; clear all; close all;  
% Load the image  
img = imread('peppers.png');  
% Apply Gaussian blur  
blurred_img = imgaussfilt(img, 2);  
% Display the blurred image  
imshow(blurred_img);
```



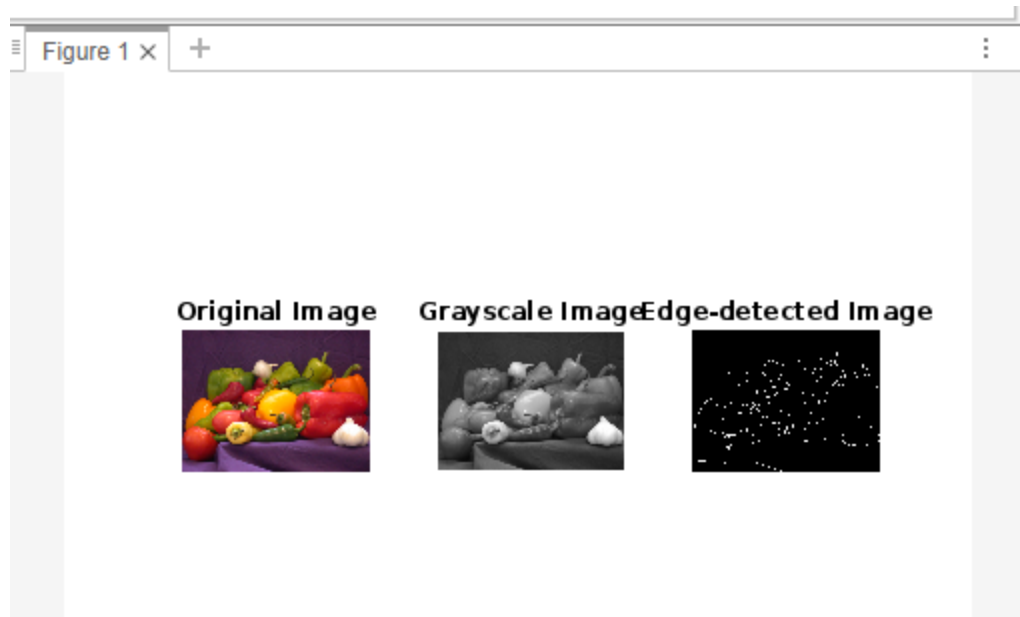
3) How to Enhance Image Contrast using Histogram Equalization in MATLAB?

```
clc; clear all; close all;
img = imread('peppers.png');
gray_img = rgb2gray(img); % Convert to grayscale
filtered_img = medfilt2(gray_img); % Apply median filtering
enhanced_img = histeq(filtered_img); % Perform histogram equalization
subplot(1, 2, 1);
imshow(enhanced_img);
title('Enhanced Image');
subplot(1, 2, 2);
imhist(enhanced_img);
title('Histogram');
```



4) How to Apply a Sobel Filter for Edge Detection in MATLAB?

```
clc; clear all; close all;
% Load the image
img = imread('peppers.png');
% Convert to grayscale
img_gray = rgb2gray(img);
% Apply Sobel filter
edge_img = edge(img_gray, 'sobel' );
% Display all three images
subplot(1,3,1);
imshow(img);
title('Original Image');
subplot(1,3,2);
imshow(img_gray);
title('Grayscale Image');
subplot(1,3,3);
imshow(edge_img);
title('Edge-detected Image');
```



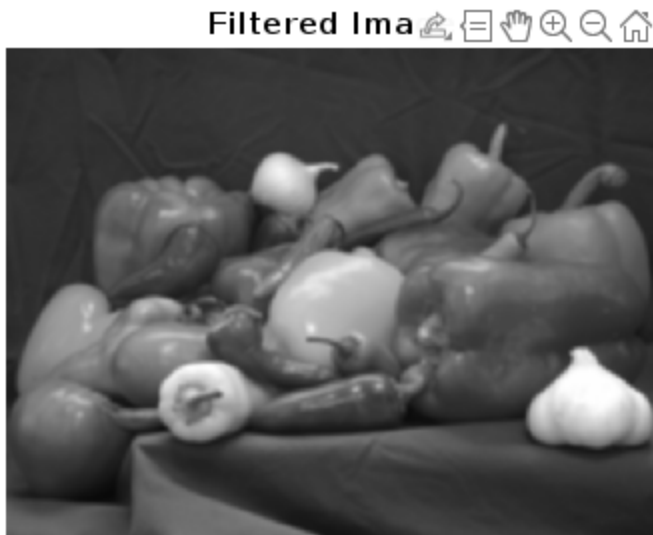
5)How to Apply Fourier Transform to an Image in MATLAB?

```
clc; clear all; close all;
% Load the image
img = imread('peppers.png');
% Convert to grayscale
img_gray = rgb2gray(img);
% Compute Fourier Transform
fft_img = fft2(img_gray);
% Display the magnitude spectrum
magnitude_spectrum = log(1 + abs(fftshift(fft_img)));
imshow(magnitude_spectrum, []);
% Print results
disp('Max value in magnitude spectrum:');
disp(max(magnitude_spectrum(:)));
disp('Min value in magnitude spectrum:');
disp(min(magnitude_spectrum(:)));
```



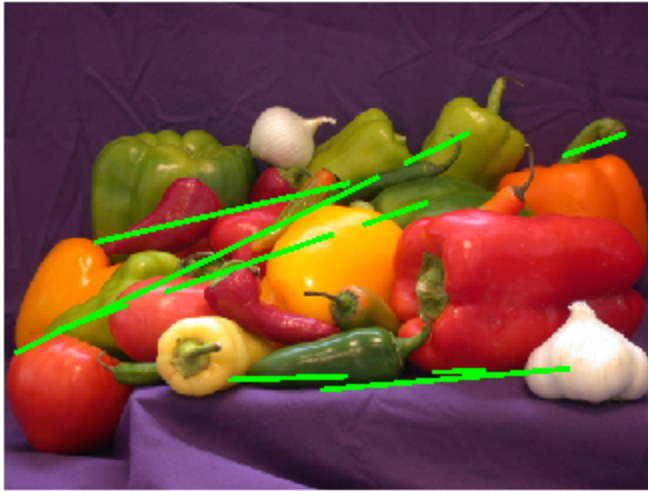
6)How can you import an image, apply a Gaussian filter to it, print the mean value and standard deviation of the filtered image in MATLAB?

```
clc; clear all; close all;
% Import the image
img = imread('peppers.png');
% Convert the image to grayscale
img_gray = rgb2gray(img);
% Define Gaussian parameters
kernel_size = 5; % Size of the kernel (odd number)
sigma = 2; % Standard deviation of the Gaussian distribution
% Create Gaussian kernel
gaussian_kernel = fspecial('gaussian', kernel_size, sigma);
% Apply Gaussian filter
filtered_img = imfilter(img_gray, gaussian_kernel, 'conv', 'replicate');
% Display the filtered image
imshow(filtered_img);
title('Filtered Image');
% Compute some features (e.g., mean and standard deviation)
mean_val = mean(filtered_img(:));
std_dev = std(double(filtered_img(:)));
% Print the computed features
fprintf('Mean value of filtered image: %f\n', mean_val);
fprintf('Standard deviation of filtered image: %f\n', std_dev);
```



7)How to Identify Lane Boundaries in an Image using MATLAB?

```
clc; clear all; close all;
% Load the image
img = imread('peppers.png');
% Convert to grayscale
img_gray = rgb2gray(img);
% Apply edge detection
edge_img = edge(img_gray, 'Canny');
% Identify lane boundaries using Hough transform
[H,theta,rho] = hough(edge_img);
peaks = houghpeaks(H,5);
lines = houghlines(edge_img,theta,rho,peaks);
% Draw the detected lines on the image
imshow(img), hold on
for k = 1:length(lines)
    xy = [lines(k).point1; lines(k).point2];
    plot(xy(:,1),xy(:,2), 'LineWidth',2, 'Color','green');
end
```



8)How to Perform Image Filtering and defiltering in MATLAB?

```
clc; clear all; close all;
% Load the image
img = imread('peppers.png');
% Define a filter
filter = fspecial('average', [5 5]);
% Apply the filter
filtered_img = imfilter(img, filter);
% Display the filtered image
subplot(1, 2, 1);
imshow(filtered_img);
title('Filtered Image');
% Define the inverse filter (deconvolution)
inv_filter = fspecial('unsharp', 0.5);
% Apply the inverse filter (deconvolution)
deconvolved_img = deconvwnr(filtered_img, inv_filter, 0.01);
% Display the deconvolved image
subplot(1, 2, 2);
imshow(deconvolved_img);
title('Deconvolved Image');
```

Filtered Image

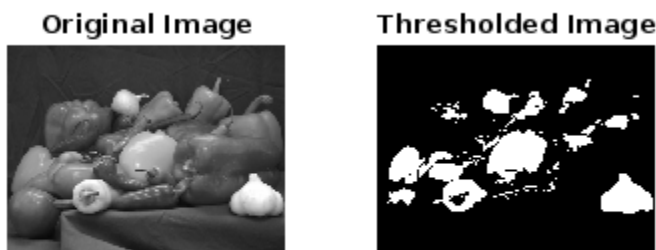


Deconvolved Image



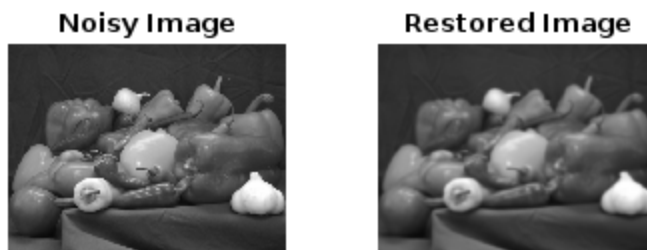
9) How to Perform Image Thresholding in MATLAB?

```
clc; clear all; close all;
% Read the image
img = imread('peppers.png');
% Convert to grayscale if necessary
if size(img, 3) == 3
    img = rgb2gray(img);
end
% Define the threshold value
threshold_value = 128;
% Perform thresholding
binary_img = img > threshold_value;
% Display the original and thresholded images
subplot(1,2,1), imshow(img), title('Original Image');
subplot(1,2,2), imshow(binary_img), title('Thresholded Image');
```



10)How to Perform Image Restoration ?

```
clc; clear all; close all;
% Read the noisy image
noisy_img = imread('peppers.png');
% Convert to grayscale if necessary
if size(noisy_img, 3) == 3
    noisy_img = rgb2gray(noisy_img);
end
% Define the size of the Gaussian filter
filter_size = 5;
% Define the standard deviation of the Gaussian filter
sigma = 2;
% Apply Gaussian filter for image restoration
restored_img = imgaussfilt(noisy_img, sigma);
% Display the original and restored images
subplot(1,2,1), imshow(noisy_img), title('Noisy Image');
subplot(1,2,2), imshow(restored_img), title('Restored Image');
```

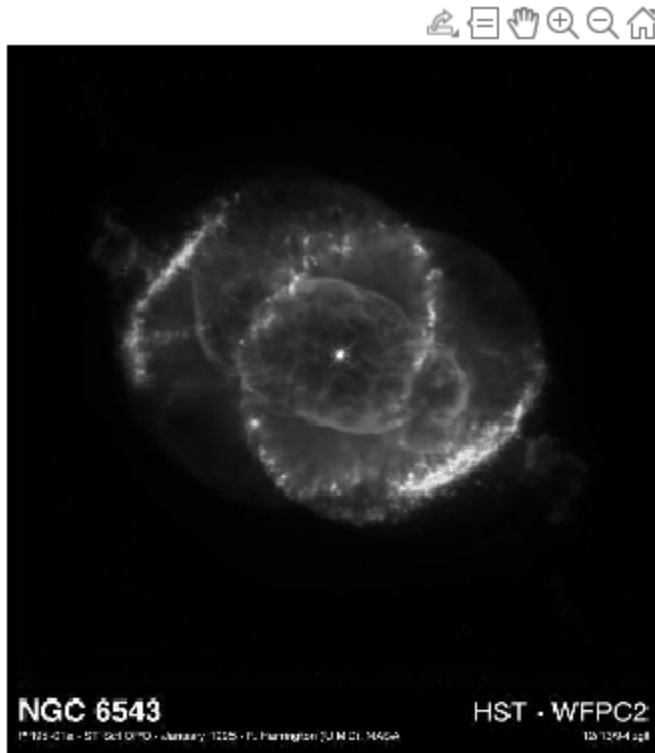
11) How to Import and Manipulate Excel Data in MATLAB?

```
clc; clear all; close all;
% Import Excel data
data = xlsread('patients.xls');
% Perform manipulation
manipulated_data = data * 2;
% Display the manipulated data
disp(manipulated_data);
```

nm_test.m							
		Command Window					
		New to MATLAB? See resources for Getting Started .					
		NaN	NaN	NaN	NaN	NaN	NaN
		76	NaN	142	352	NaN	248
		86	NaN	138	326	NaN	218
		76	NaN	128	262	NaN	250
		80	NaN	134	266	NaN	234
		98	NaN	128	238	NaN	244
		92	NaN	136	284	NaN	242
		66	NaN	128	284	NaN	260
		80	NaN	136	360	NaN	230
		56	NaN	136	366	NaN	230
		62	NaN	132	264	NaN	236
		90	NaN	136	256	NaN	228
		84	NaN	132	274	NaN	230
		50	NaN	142	348	NaN	254
		78	NaN	144	404	NaN	260
		72	NaN	130	258	NaN	228
		96	NaN	142	362	NaN	260
		64	NaN	138	382	NaN	248
		54	NaN	138	262	NaN	246
		74	NaN	140	358	NaN	238
		100	NaN	136	344	NaN	250
		96	NaN	130	266	NaN	242

12) How to Convert an Image from RGB to Grayscale in MATLAB?

```
clc; clear all; close all;  
% Load the RGB image  
rgb_img = imread('example.tif');  
% Convert to grayscale  
gray_img = rgb2gray(rgb_img);  
% Display the grayscale image  
imshow(gray_img);
```



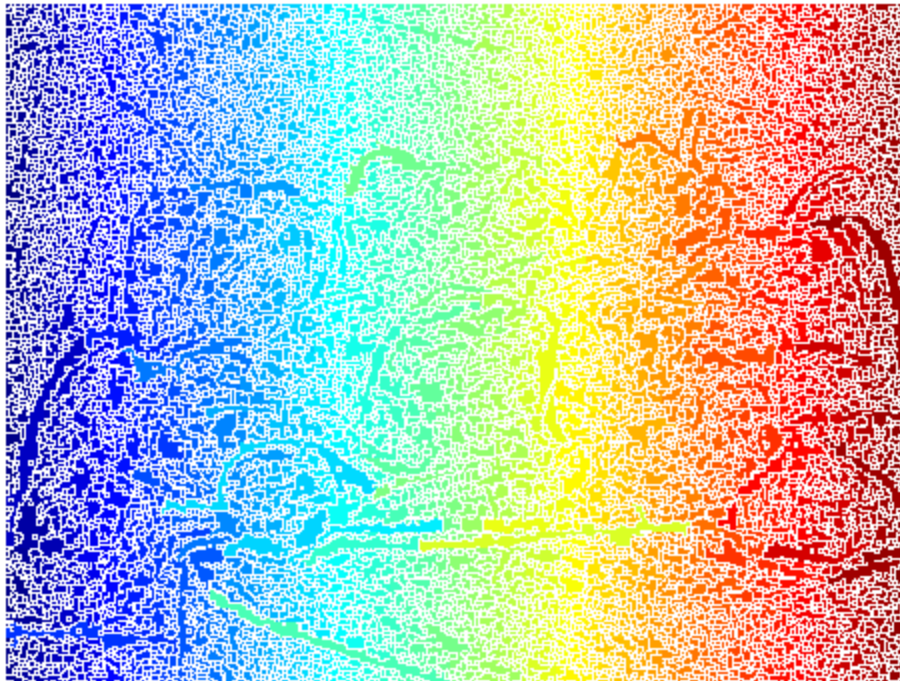
13) How to Perform Image Segmentation using Otsu's Method in MATLAB?

```
clc; clear all; close all;  
% Load the grayscale image  
img = imread('peppers.png');  
% Convert to grayscale if necessary  
if size(img, 3) == 3  
    img = rgb2gray(img);  
end  
% Perform segmentation using Otsu's method  
threshold = graythresh(img);  
binary_img = imbinarize(img, threshold);  
% Display the segmented image  
imshow(binary_img);
```



14) How to Perform Image Segmentation using Watershed Algorithm in MATLAB?

```
clc; clear all; close all;  
% Load the grayscale image  
img = imread('peppers.png');  
% Convert to grayscale if necessary  
if size(img, 3) == 3  
    img = rgb2gray(img);  
end  
% Compute gradient magnitude  
gradient_mag = imgradient(img);  
% Perform watershed segmentation  
marker = imextendedmin(gradient_mag, 0.2);  
marker = imimposemin(-gradient_mag, marker);  
labels = watershed(marker);  
% Display the segmented image  
imshow(label2rgb(labels));
```

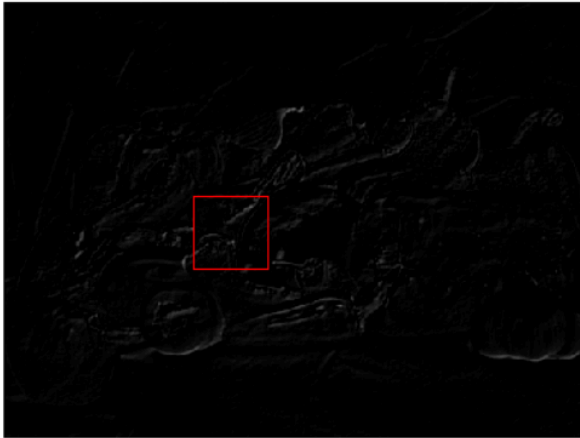


15) How to Perform Template Matching in MATLAB?

```

clc; clear all; close all;
input = imread('peppers.png');
mask = imread('Capture.PNG');
gleam = @(I) (1/3) * ((double(I(:,:,1)))/255).^(1/2.2) + ...
                    (double(I(:,:,2)))/255).^(1/2.2) + ...
                    (double(I(:,:,3)))/255).^(1/2.2));
normalize = @(I) (I-min(min(I)))/(max(max(I))-min(min(I)));
g_input = gleam(input);
g_mask = gleam(mask);
gd_input = conv2(g_input, [-1 0 1; -1 0 1; -1 0 1]/3, 'same') + ...
            conv2(g_input, [-1 -1 -1; 0 0 0; 1 1 1]/3, 'same');
gd_mask = conv2(g_mask, [-1 0 1; -1 0 1; -1 0 1]/3, 'same') + ...
            conv2(g_mask, [-1 -1 -1; 0 0 0; 1 1 1]/3, 'same');
gd_mask = rot90(gd_mask, 2);
convolved = conv2(gd_input, gd_mask, 'valid');
[min_value, min_index] = min(convolved(:));
[min_row, min_col] = ind2sub(size(convolved), min_index);
figure; imshow(normalize(convolved)); hold on;
rectangle('Position', [min_col-32+2 min_row-32+2 64 64], 'EdgeColor', [1 0
0]);
figure; imshow(input*0.75+64); hold on;
rectangle('Position', [min_col+2 min_row+2 64 64], ...
        'EdgeColor', [0.5 0 0], ...
        'LineWidth', 3, ...
        'LineStyle', ':');

```



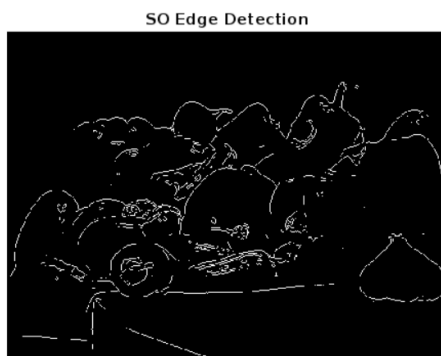
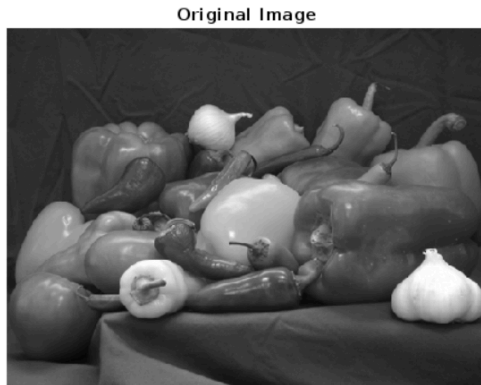
16) How to Perform Image Segmentation using Region Growing in MATLAB?

```

clc;
clear all;
close all;
gray1=imread('peppers.png'); %to read img 1
gray=rgb2gray(gray1)
figure();
imshow(gray)
title('Original Image');
% gray=rgb2gray(var);
so=edge(gray,'sobel'); %type -1 sobel edge detection
ca=edge(gray,'canny'); %type -2 canny edge detection
% subplot(3,1,2)
figure();
imshow(so);
title('SO Edge Detection');

```

```
% subplot(3,1,3)
figure();
imshow(ca);
title('ca Edge Detection');
```



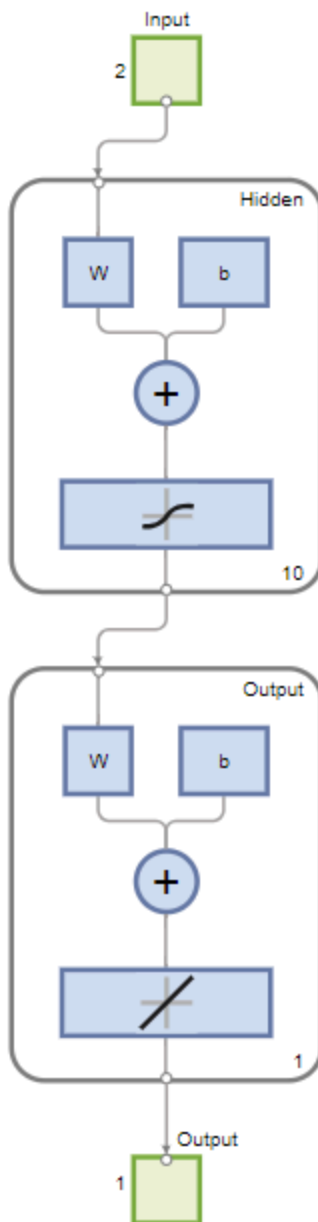
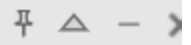
17) Create Simple Neural Network in MATLAB?

```
clc;
clear all;
close all;
```

```
% Define the input data
X = [0 0; 0 1; 1 0; 1 1]; % Input features
Y = [0; 1; 1; 0]; % Target outputs
% Create a feedforward neural network
net = feedforwardnet(10); % 10 neurons in the hidden layer
% Train the neural network
net = train(net, X', Y');
% Test the neural network with new data
output = net(X');
% Display the output
disp('Predicted Output:');
disp(output);
```


```
Predicted Output:
-0.0000    -0.2238    -0.1319    -0.0000
```

Feed-Forward Neural Network (view)



Network Diagram

Training Results

Training finished: Reached minimum gradient 

Training Progress

Unit	Initial Value	Stopped Value	Target Value	
Epoch	0	3	1000	▲
Elapsed Time	-	00:00:09	-	
Performance	1.17	1.55e-17	0	
Gradient	2.6	6.96e-09	1e-07	
Mu	0.001	1e-06	1e+10	
Validation Checks	0	0	6	▼

Training Algorithms

Data Division: Random dividerand
Training: Levenberg-Marquardt trainlm
Performance: Mean Squared Error mse
Calculations: MEX

Training Plots

Performance

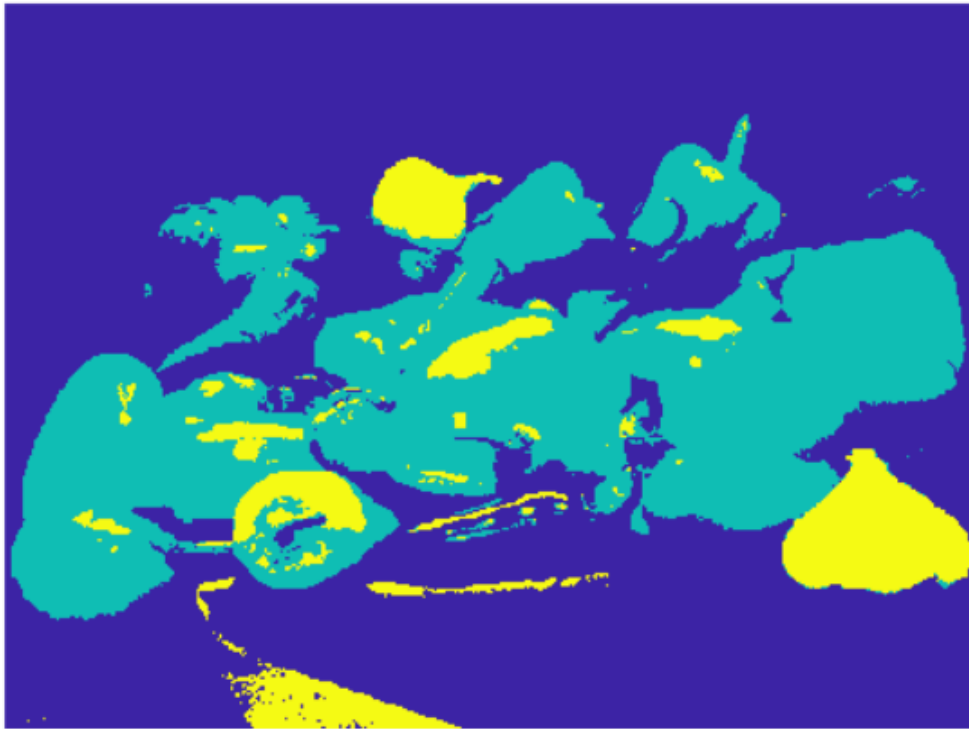
Training State

Error Histogram

Regression

18) How to Perform Image Segmentation using K-Means Clustering in MATLAB?

```
clc;
clear all;
close all;
% Load the image
img = imread('peppers.png');
% Reshape the image into a 2D array
[rows, cols, ~] = size(img);
X = reshape(img, rows * cols, []);
% Perform K-Means clustering
K = 3; % Number of clusters
[idx, centers] = kmeans(double(X), K);
% Reshape the clustered image
segmented_img = reshape(idx, rows, cols);
% Display the segmented image
imshow(segmented_img, []); colormap(gca, 'parula');
```



19) How to Extract Features using Harris Corner Detection in MATLAB?

```
clc;
clear all;
close all;
% Load the grayscale image
```

```

img = imread('peppers.png');
% Convert to grayscale
img_gray = rgb2gray(img);
% Perform Harris corner detection
corners = detectHarrisFeatures(img_gray);
% Display the detected corners
imshow(img);
hold on;
plot(corners);

```



20) How to plot boundary box on object present in the image using MATLAB?

```

clc;
clear all;
close all;
% Read the image
image = imread('peppers.png');
% Convert the image to grayscale
image_gray = rgb2gray(image);
% Perform edge detection
edges = edge(image_gray, 'Canny');
% Perform connected component analysis
cc = bwconncomp(edges);

```

```

% Get bounding boxes of connected components
bounding_boxes = regionprops(cc, 'BoundingBox');
% Draw bounding boxes on the original image
imshow(image);
hold on;
for i = 1:numel(bounding_boxes)
    rectangle('Position', bounding_boxes(i).BoundingBox, 'EdgeColor', 'r',
        'LineWidth', 2);
end
title('Bounding Box Detection');
hold off;

```

