COMPUTER VISION AND IMAGE PROCESSING ASSIGNMENT

UNIT II: SPATIAL TRANSFORMATION AND ENHANCEMENT

COMMON CODE TO IMPORT IMAGE IN MATLAB

```
clc; clear; close all;

[file, path] = uigetfile({'*.jpg;*.png;*.bmp'}, 'Select an Image');

if isequal(file,0)
disp('No image selected');
return;
end

I = imread(fullfile(path, file));

if size(I,3)==3
I = rgb2gray(I);
end

imshow(I);
title('Image Loaded Successfully');
```

INTERPOLATION METHOD

```
I_nn = imresize(I,2,'nearest');
I_bl = imresize(I,2,'bilinear');
I_bc = imresize(I,2,'bicubic');

figure;
subplot(1,3,1), imshow(I_nn), title('Nearest');
subplot(1,3,2), imshow(I_bl), title('Bilinear');
subplot(1,3,3), imshow(I_bc), title('Bicubic');
```

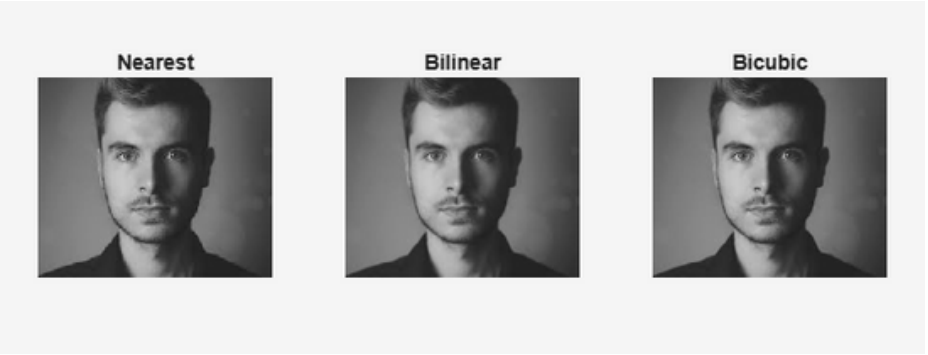


IMAGE RESIZING

```
I_small = imresize(I, 0.5);

figure;
subplot(1,2,1), imshow(I), title('Original');
subplot(1,2,2), imshow(I_small), title('Resized');
```

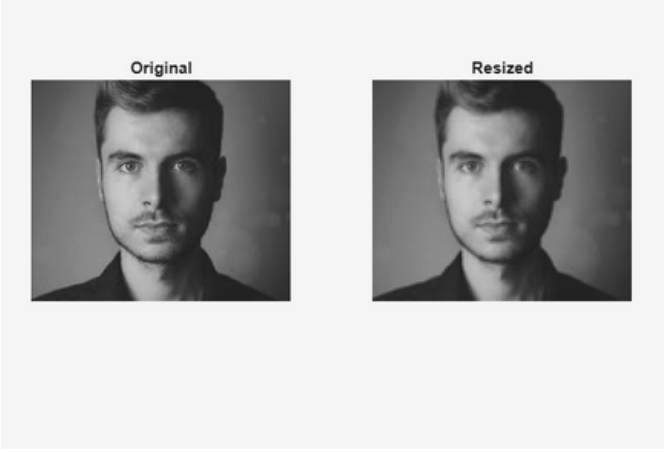


IMAGE ROTATION

```
I_rot = imrotate(I, 45, 'bilinear', 'crop');

figure;
imshow(I_rot);
title('Rotated Image');
```

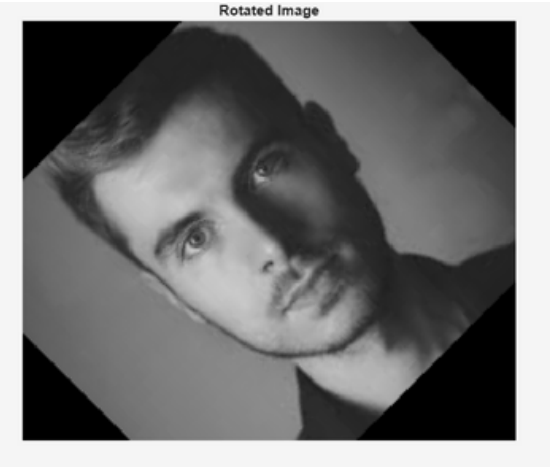
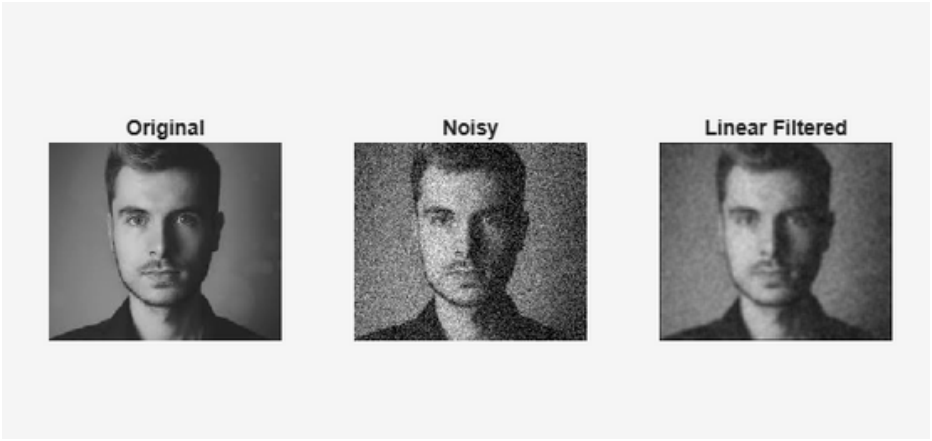


IMAGE CROPPING

```
crop_img = imcrop(I, [100 100 400 400]);

figure;
imshow(crop_img);
title('Cropped Image');
```

NOISE REMOVAL – LINEAR FILTERING

```
noisy = imnoise(I, 'gaussian', 0, 0.01);
h = fspecial('average', [5 5]);
filtered = imfilter(noisy, h);

figure;
subplot(1,3,1), imshow(I), title('Original');
subplot(1,3,2), imshow(noisy), title('Noisy');
subplot(1,3,3), imshow(filtered), title('Linear Filtered');
```



ADAPTIVE FILTERING (MEDIAN FILTER)

```
noisy = imnoise(I, 'salt & pepper', 0.05);
filtered = medfilt2(noisy, [5 5]);

figure;
subplot(1,2,1), imshow(noisy), title('Noisy');
subplot(1,2,2), imshow(filtered), title('Adaptive Filtered');
```

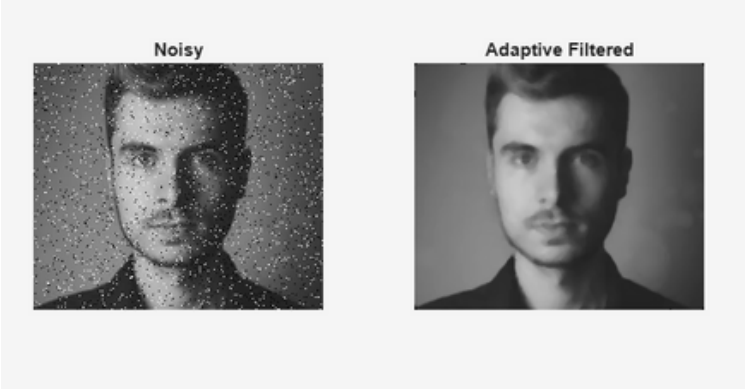


IMAGE HISTOGRAM (ORIGINAL VS NOISY)

```
noisy = imnoise(I,'gaussian',0,0.01);

figure;
subplot(1,2,1);
imhist(I);
title('Original Histogram');

subplot(1,2,2);
imhist(noisy);
title('Noisy Histogram');
```

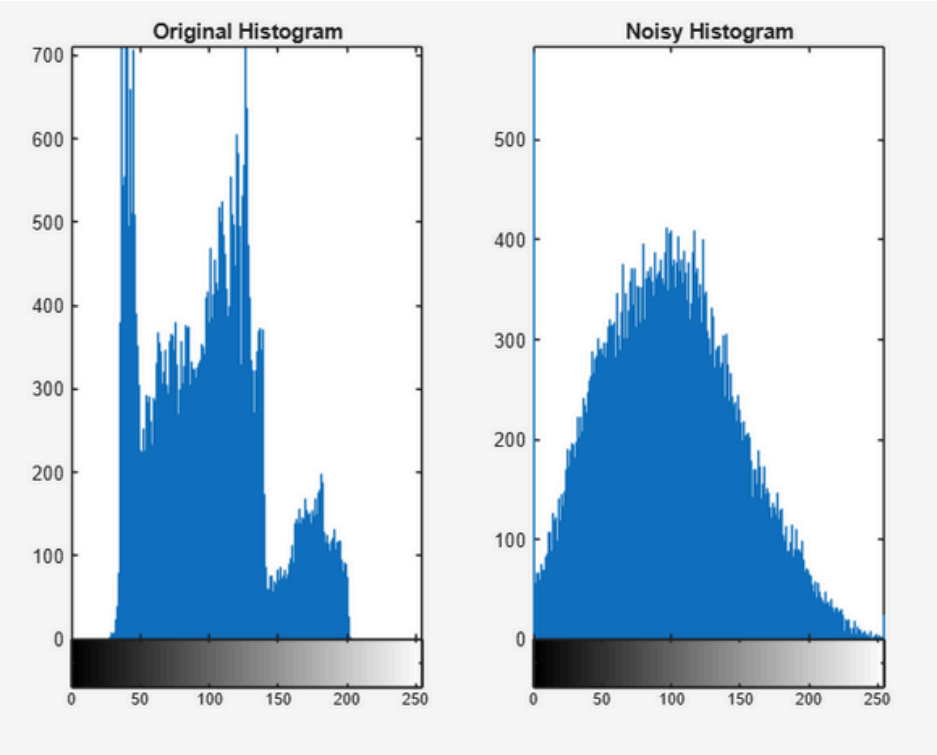
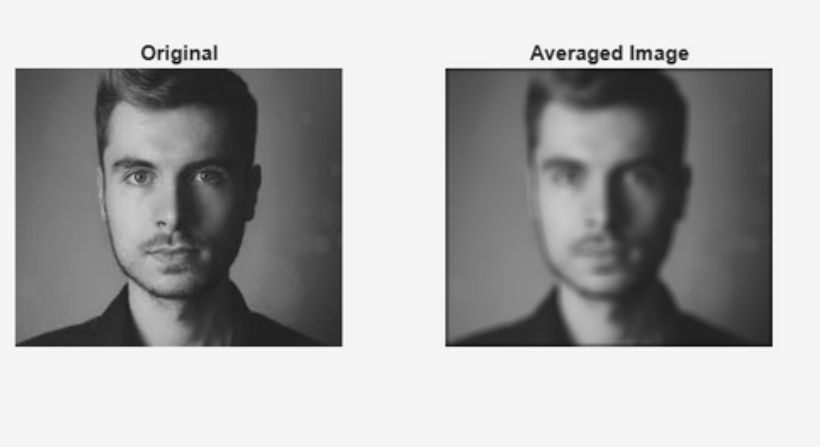


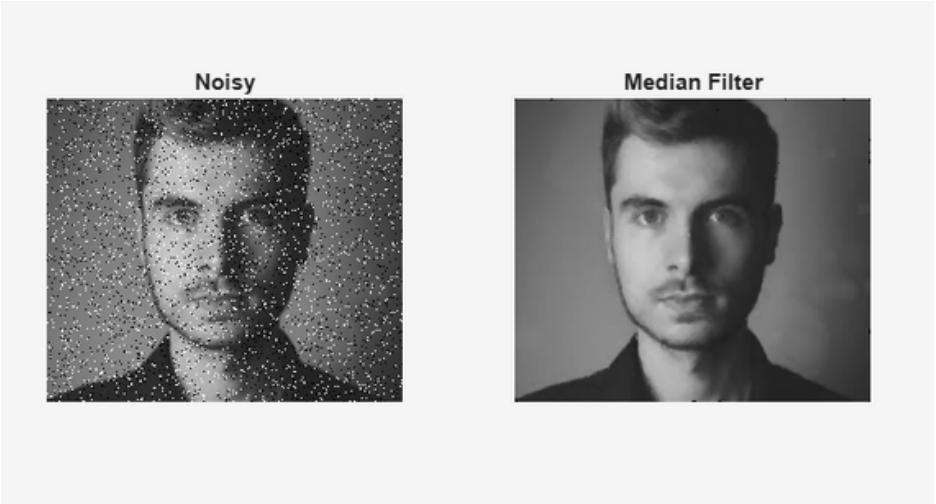
IMAGE AVERAGING (SMOOTHING)

```
h = fspecial('average',[7 7]);
smooth = imfilter(I,h);

figure;
subplot(1,2,1), imshow(I), title('Original');
subplot(1,2,2), imshow(smooth), title('Averaged
Image');
```



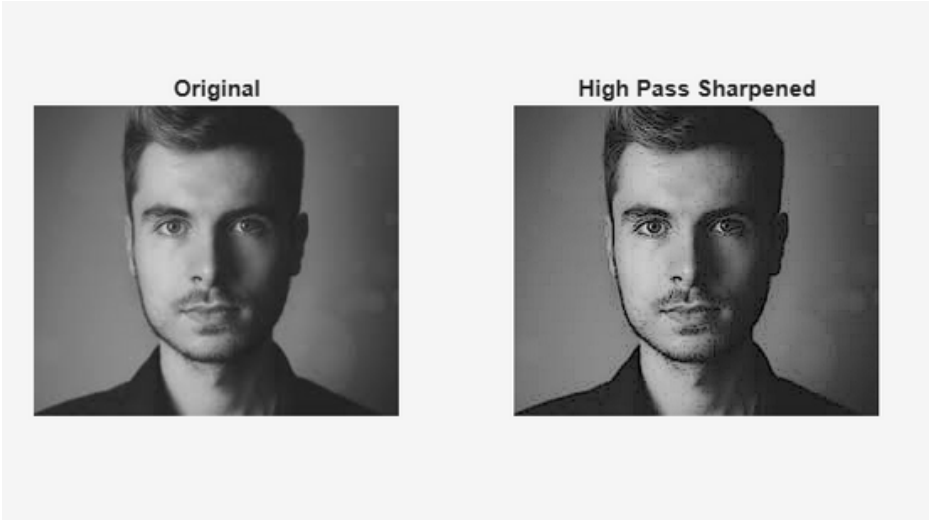
ORDERED STATISTICS FILTER (MEDIAN)

```
noisy = imnoise(I,'salt & pepper',0.08);
median_img = medfilt2(noisy,[3 3]);

figure;
subplot(1,2,1), imshow(noisy), title('Noisy');
subplot(1,2,2), imshow(median_img), title('Median
Filter');
```



HIGH PASS FILTER (SHARPENING)

```
h = fspecial('laplacian',0.2);
sharp = I - imfilter(I,h);

figure;
subplot(1,2,1), imshow(I), title('Original');
subplot(1,2,2), imshow(sharp), title('High Pass
Sharpened');
```



HOMOMORPHIC FILTERING

```
I = imread('/MATLAB Drive/face.jpg'); % Read your grayscale image
if size(I,3) == 3
I = rgb2gray(I); % Convert to grayscale if RGB
end
I = im2double(I); % Convert to double

I_log = log(1 + I);

F = fft2(I_log);

[M,N] = size(I);
[u,v] = meshgrid(1:N,1:M);
D = sqrt((u - N/2).^2 + (v - M/2).^2);

D0 = 30; % cutoff frequency
H = 1 - exp(-(D.^2) / (2*D0^2));
H = fftshift(H); % shift filter to center

G = H .* F;

I_out = real(ifft2(G));

I_out = exp(I_out) - 1;

figure;
subplot(1,2,1), imshow(I), title('Original');
subplot(1,2,2), imshow(I_out, []), title('Homomorphic Filtered');
```