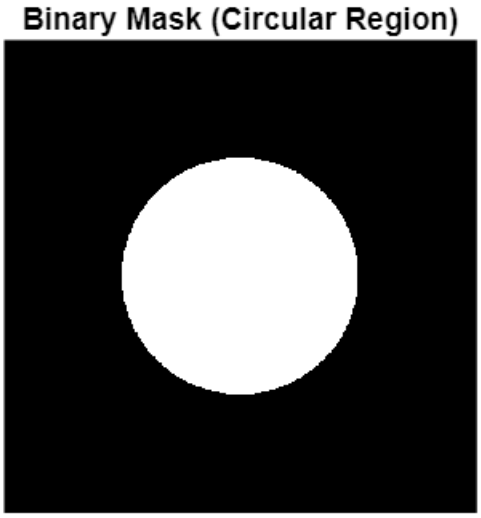
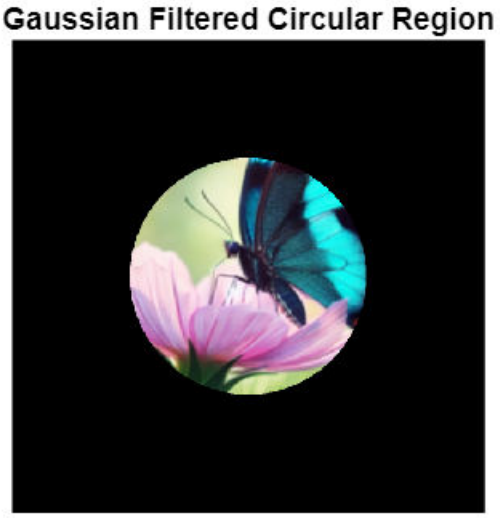
```
% Step 1: Load the Image
image = imread('Images/Butterfly.jpg');
figure;
imshow(image);
title('Original Image');
```


```
% Step 2: Define the Circular Mask Parameters
% Specify the center and radius of the circle for the mask
[rows, cols, ~] = size(image);  % Get the dimensions of the image
centerX = round(cols / 2);  % X-coordinate of the center
centerY = round(rows / 2);  % Y-coordinate of the center
radius = min(rows, cols) / 4;  % Set radius (adjust as needed)

% Step 3: Create a Circular Binary Mask
% Create a grid of coordinates
[x, y] = meshgrid(1:cols, 1:rows);  % Create a grid based on image size
mask = (x - centerX).^2 + (y - centerY).^2 <= radius^2;  % Circular mask

% Display the binary mask
figure;
imshow(mask);
title('Binary Mask (Circular Region)');
```

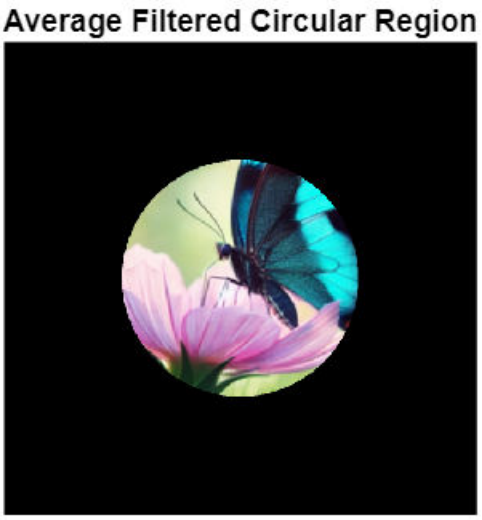



```
% Step 4: Apply Low-Pass Filters (Gaussian and Average)

% 4a. Gaussian Filter
gaussianFiltered = imgaussfilt(image, 2);  % Apply Gaussian filter with
sigma=2
filteredRegionGaussian = gaussianFiltered .* uint8(mask);  % Apply mask to
filter result
figure;
imshow(filteredRegionGaussian);
title('Gaussian Filtered');
```

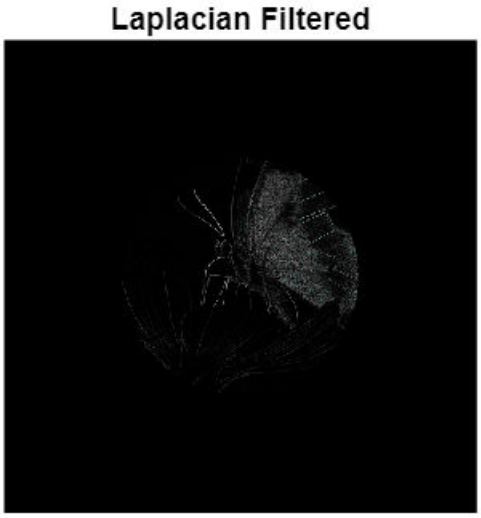



```
% 4b. Average Filter
averageFilter = fspecial('average', [5 5]);  % Create a 5x5 averaging filter
averageFiltered = imfilter(image, averageFilter);  % Apply the average filter
```

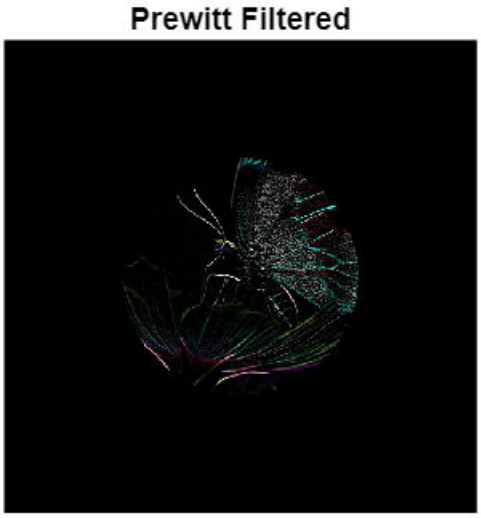
```
filteredRegionAverage = averageFiltered .* uint8(mask);  % Apply mask to
filter result
figure;
imshow(filteredRegionAverage);
title('Average Filtered');
```




```
% Step 5: Apply High-Pass Filters (Laplacian and Prewitt)

% 5a. Laplacian Filter
laplacianFilter = fspecial('laplacian', 0.2);  % Create a Laplacian filter
with alpha=0.2
laplacianFiltered = imfilter(image, laplacianFilter);  % Apply the Laplacian
filter
filteredRegionLaplacian = laplacianFiltered .* uint8(mask);  % Apply mask to
filter result
figure;
imshow(filteredRegionLaplacian);
title('Laplacian Filtered');
```




```
% 5b. Prewitt Filter
prewittFilterX = fspecial('prewitt');  % Create a Prewitt filter for
detecting horizontal edges
prewittFiltered = imfilter(image, prewittFilterX);  % Apply the Prewitt
filter
filteredRegionPrewitt = prewittFiltered .* uint8(mask);  % Apply mask to
filter result
figure;
imshow(filteredRegionPrewitt);
title('Prewitt Filtered');
```




```
% Step 6: Display All Results in a Single Figure
figure;
subplot(2, 2, 1);
```

```
imshow(filteredRegionGaussian);
title('Gaussian Filtered');

subplot(2, 2, 2);
imshow(filteredRegionAverage);
title('Average Filtered');

subplot(2, 2, 3);
imshow(filteredRegionLaplacian);
title('Laplacian Filtered');

subplot(2, 2, 4);
imshow(filteredRegionPrewitt);
title('Prewitt Filtered');
```