Q8

```
img1 = imread('C:\Users\Admin\OneDrive - Indian Institute of Technology Bombay\CS663\
img2 = imread('C:\Users\Admin\OneDrive - Indian Institute of Technology Bombay\CS663\

% Applying global histogram equalization
img1_global_eq = histeq(img1);
img2_global_eq = histeq(img2);

% Apply CLAHE (local histogram equalization) to the images with different window size
img1_win_7x7 = adapthisteq(img1, 'NumTiles', [7 7], 'ClipLimit', 0.01);
img1_win_31x31 = adapthisteq(img1, 'NumTiles', [31 31], 'ClipLimit', 0.01);
img1_win_51x51 = adapthisteq(img1, 'NumTiles', [51 51], 'ClipLimit', 0.01);
img1_win_71x71 = adapthisteq(img1, 'NumTiles', [71 71], 'ClipLimit', 0.01);

img2_win_7x7 = adapthisteq(img2, 'NumTiles', [7 7], 'ClipLimit', 0.01);
img2_win_31x31 = adapthisteq(img2, 'NumTiles', [31 31], 'ClipLimit', 0.01);
img2_win_51x51 = adapthisteq(img2, 'NumTiles', [51 51], 'ClipLimit', 0.01);
img2_win_71x71 = adapthisteq(img2, 'NumTiles', [71 71], 'ClipLimit', 0.01);

% Display each result in a separate interactive figure window for Image 1
figure('Name', 'Original Image 1', 'NumberTitle', 'off');
imshow(img1);

figure('Name', 'Global Histogram Equalization - Image 1', 'NumberTitle', 'off');
imshow(img1_global_eq);

figure('Name', 'Local EQ (WIN 7x7) - Image 1', 'NumberTitle', 'off');
imshow(img1_win_7x7);

figure('Name', 'Local EQ (WIN 31x31) - Image 1', 'NumberTitle', 'off');
imshow(img1_win_31x31);

figure('Name', 'Local EQ (WIN 51x51) - Image 1', 'NumberTitle', 'off');
imshow(img1_win_51x51);

figure('Name', 'Local EQ (WIN 71x71) - Image 1', 'NumberTitle', 'off');
imshow(img1_win_71x71);

% Display each result in a separate interactive figure window for Image 2
figure('Name', 'Original Image 2', 'NumberTitle', 'off');
imshow(img2);

figure('Name', 'Global Histogram Equalization - Image 2', 'NumberTitle', 'off');
imshow(img2_global_eq);

figure('Name', 'Local EQ (WIN 7x7) - Image 2', 'NumberTitle', 'off');
imshow(img2_win_7x7);
```

```
figure('Name', 'Local EQ (WIN 31x31) - Image 2', 'NumberTitle', 'off');
imshow(img2_win_31x31);

figure('Name', 'Local EQ (WIN 51x51) - Image 2', 'NumberTitle', 'off');
imshow(img2_win_51x51);

figure('Name', 'Local EQ (WIN 71x71) - Image 2', 'NumberTitle', 'off');
imshow(img2_win_71x71);
```

Figure 1: Original LC1

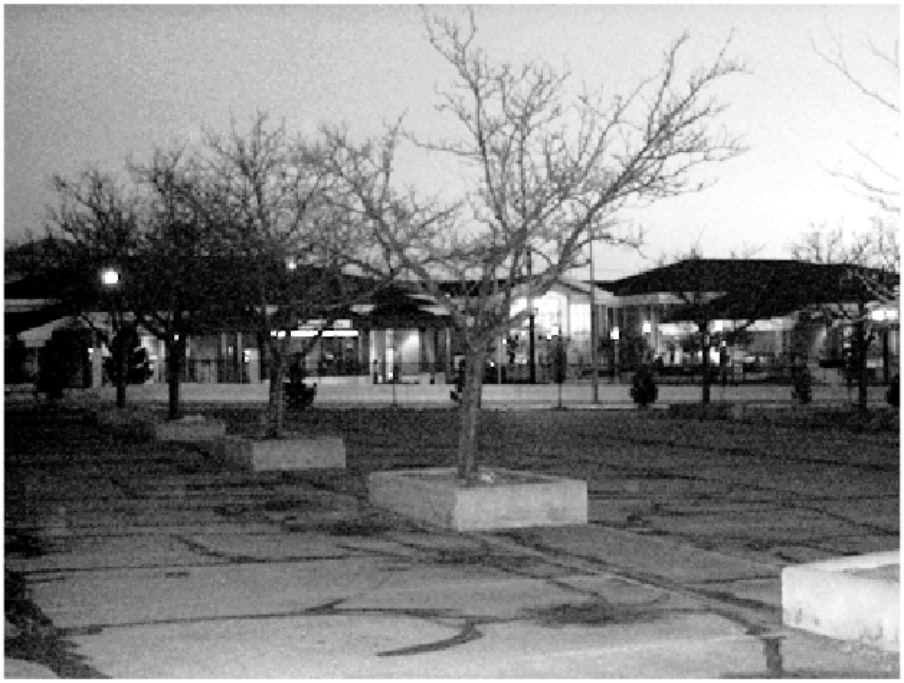

Figure 2: Global Histogram Equalisation LC1

Figure 3: Local Histogram Equalisation LC1 7x7

Figure 4: Local Histogram Equalisation LC1 31x31

Figure 5: Local Histogram Equalisation LC1 51x51

Figure 6: Local Histogram Equalisation LC1 71x71

Figure 7: Original LC2

Figure 8: Global Histogram Equalisation LC2

Figure 9: Local Histogram Equalisation LC2 7x7

Figure 10: Local Histogram Equalisation LC2 31x31

Figure 11: Local Histogram Equalisation LC2 51x51

Figure 12: Local Histogram Equalisation LC2 71x71

In order to improve contrast and assess the efficacy of each strategy, we processed the photos LC1.jpg and LC2.jpg using both global and local histogram equalization techniques. Using MATLAB's histeq function, the global histogram equalization redistributes the intensity values throughout the picture. This technique worked well to increase the contrast of the image overall and highlight specifics. It did, however, also create some over-enhancement in places with homogeneous lighting, which caused audible noise and artifacts in certain areas.

Conversely, local histogram equalization applies contrast modifications to more focused, smaller areas of the picture using Contrast Limited Adaptive Histogram Equalization with window sizes of 7x7, 31x31, 51x51, and 71x71. The 7x7 window size greatly emphasized the local features while also increasing the noise, giving areas with consistent illumination a louder appearance. The system had some shortcomings for locations that require a more uniform adjustment, but it performed admirably when it came to displaying small features in highly changeable regions.

The augmentation of local contrast and the decrease of noise are balanced by the 31x31 window size. This option reduced the quantity of artifacts while enhancing details in highlighted and shaded areas. In contrast, a smoother enhancement was achieved with a $51 \times 51$ window size, while noise reduction was somewhat lost in some locations with significant contrasts. The approach to global histogram equalization was reached at the maximum window size of 71x71, with some localized contrast increases. This size did not produce the finer detail improvement that the smaller window sizes produced, but it was beneficial in photos with wide regions of uniform contrast.

We see that in the LC1 image on using the local histogram equalisation, we see better local contrast aorund the trees and the roof tops also we also see that in LC2 the leaves shows greater detail on the leaves of the trees