```
clear;close all; clc;
% Prepare image
f = imread('ImgPIA.jpg');
%convert image to gray
Igray = rgb2gray(f);

% https://uk.mathworks.com/matlabcentral/answers/24669-down-
quantization-8-bit-grey-to-n-bit-grey-n-8
% Reduce the number of bits to 6
reducedImage_6 = uint8((single(Igray)/256)*2^6);

% Reduce the number of bits to 4
reducedImage_4 = uint8((single(Igray)/256)*2^4);

% Reduce the number of bits to 2
reducedImage_2 = uint8((single(Igray)/256)*2^2);

%call functions and display relevant info
disp('Grayscale image');
histogram_features(Igray)

disp('6 Bit image');
histogram_features(reducedImage_6)

disp('4 Bit image');
histogram_features(reducedImage_4)

disp('2 Bit image');
histogram_features(reducedImage_2)


function histogram_features(Igray)
figure;
imshow(Igray);
figure;
x = histogram(Igray);
xlabel('Value')
ylabel('Frequency')
%create histogram for calculations
[pixelCounts, graybin] = imhist(Igray);
%count number of pixels
pixels = sum(pixelCounts);
%average  sum of gray bins * pixel count/pixle num
averagebin = sum(graybin .* (pixelCounts / pixels));
%set variance
variance = 0;
%set skewness
skew = 0;
%set kurtosis
kurtosis = 0;
%For loop to calculate the features
for i=0:1:length(pixelCounts)-1
```

```
    %variance calculation
    variance = variance + (i-averagebin)^2 * (pixelCounts(i+1)/
pixels);
    %skew calculation
    skew = skew + (i-averagebin)^3 * (pixelCounts(i+1)/pixels);
    %kurtosis calculation
    kurtosis = kurtosis + (i-averagebin)^4 * (pixelCounts(i+1)/
pixels)-3;
end
%find skewness
skew = skew * variance ^-3;
%find kurtosis
kurtosis = kurtosis * variance ^-4; % kurtosis
%display results in a table
t = table(averagebin, variance, skew, kurtosis);
t
end
```

Grayscale image

t =

1×4 table

averagebin	variance	skew	kurtosis
115.028027006173	1371.54101618446	1.05677824896143e-05	1.7670486073541e-06

6 Bit image

t =

1×4 table

averagebin	variance	skew	kurtosis
28.8819830246914	85.7976244626748	0.000674174042404827	0.000437472981546988

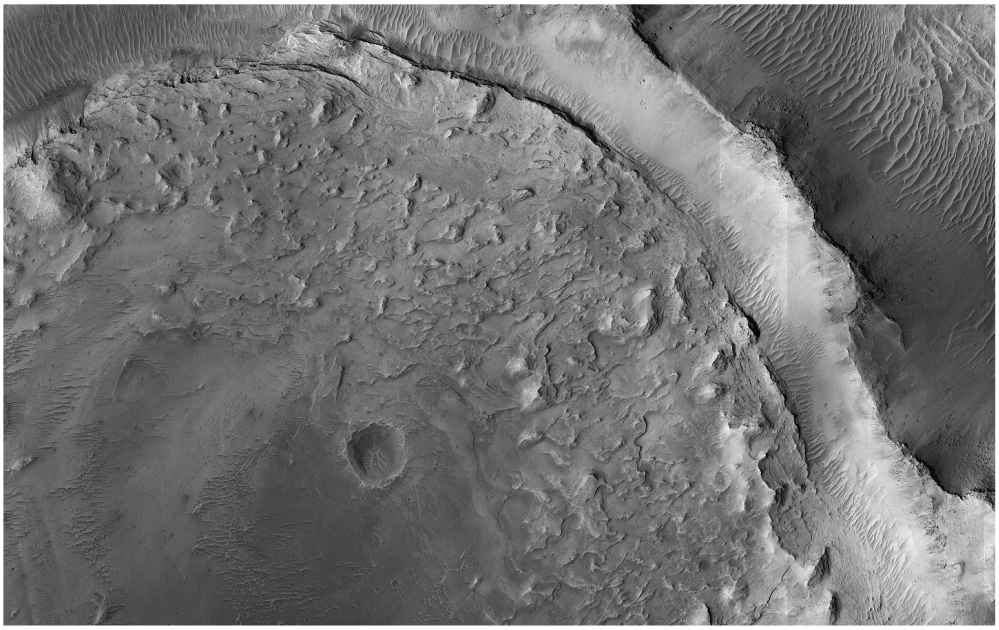
4 Bit image

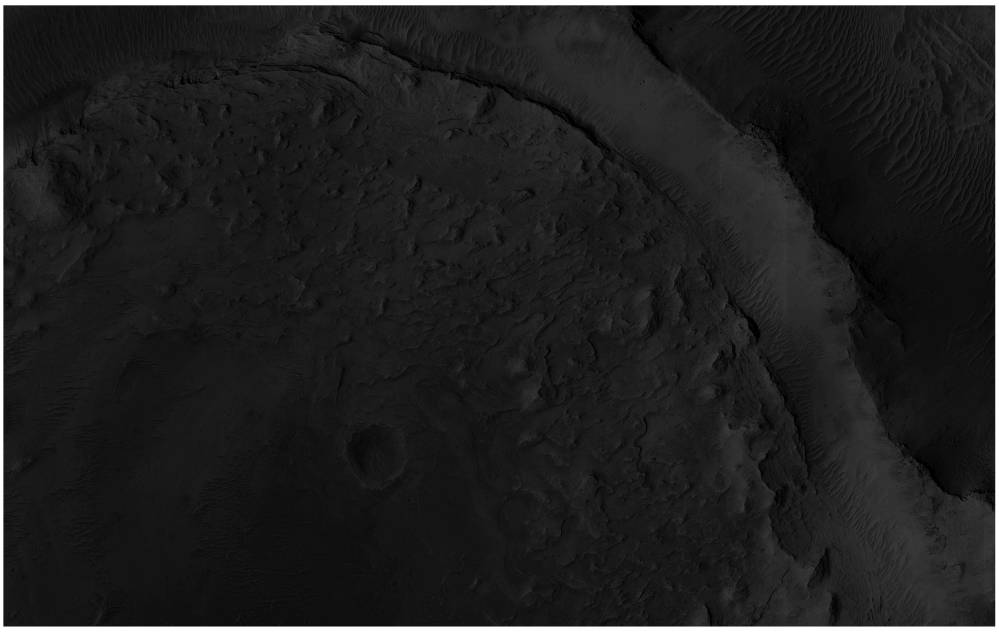
t =

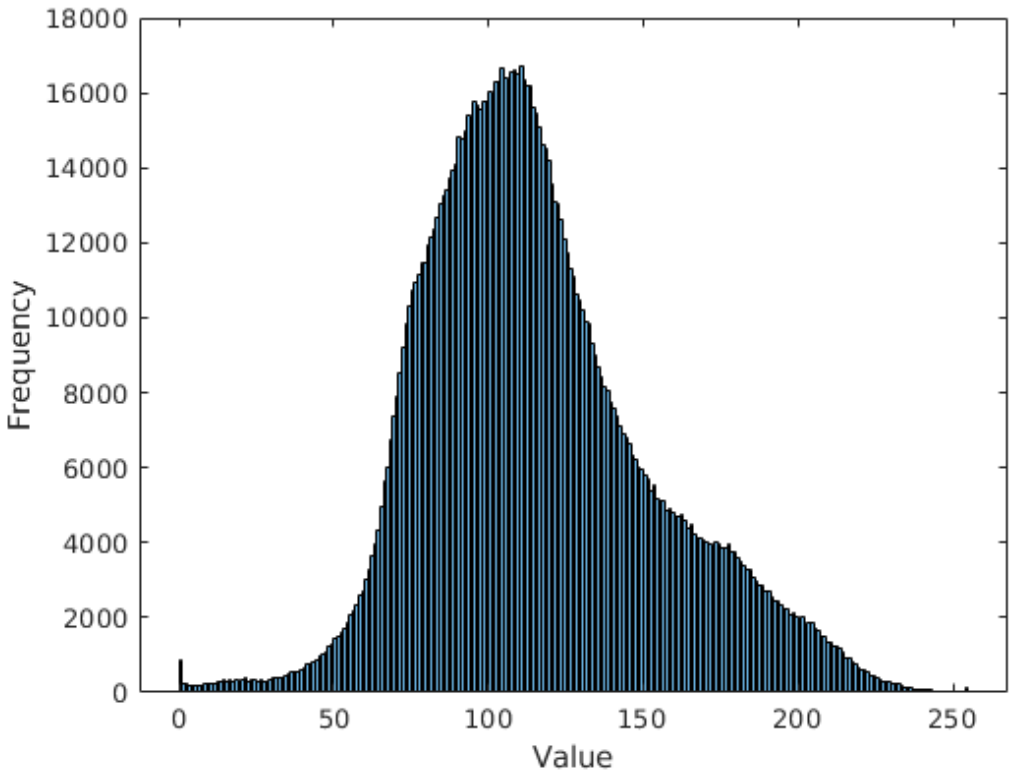
1×4 table

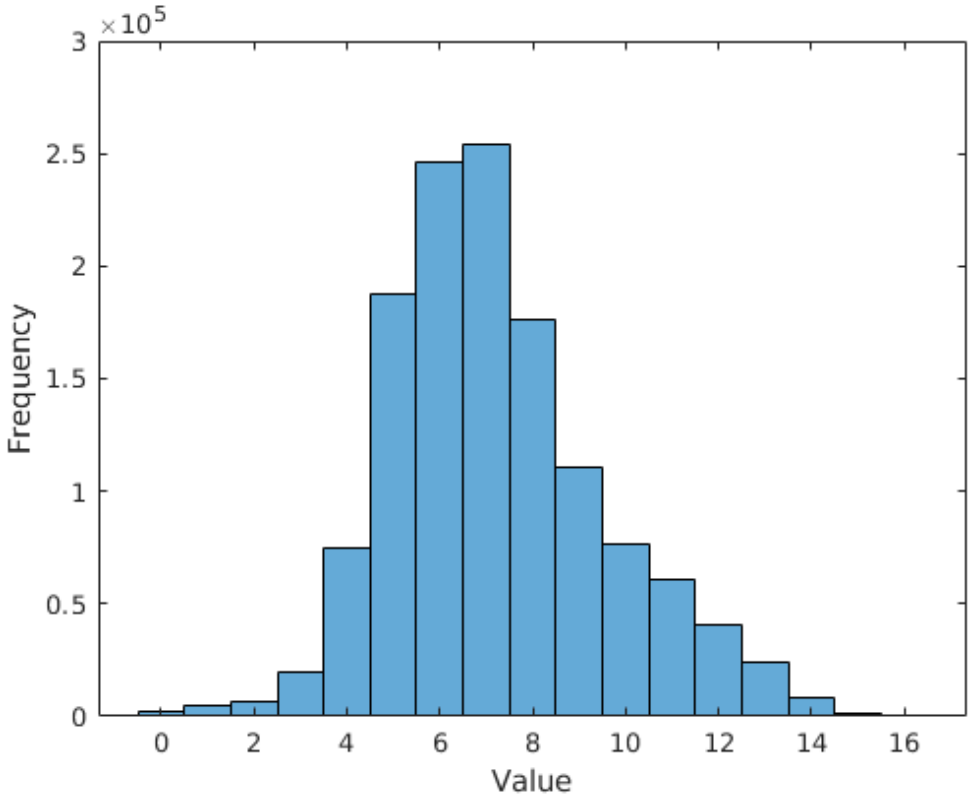
averagebin	variance	skew	kurtosis

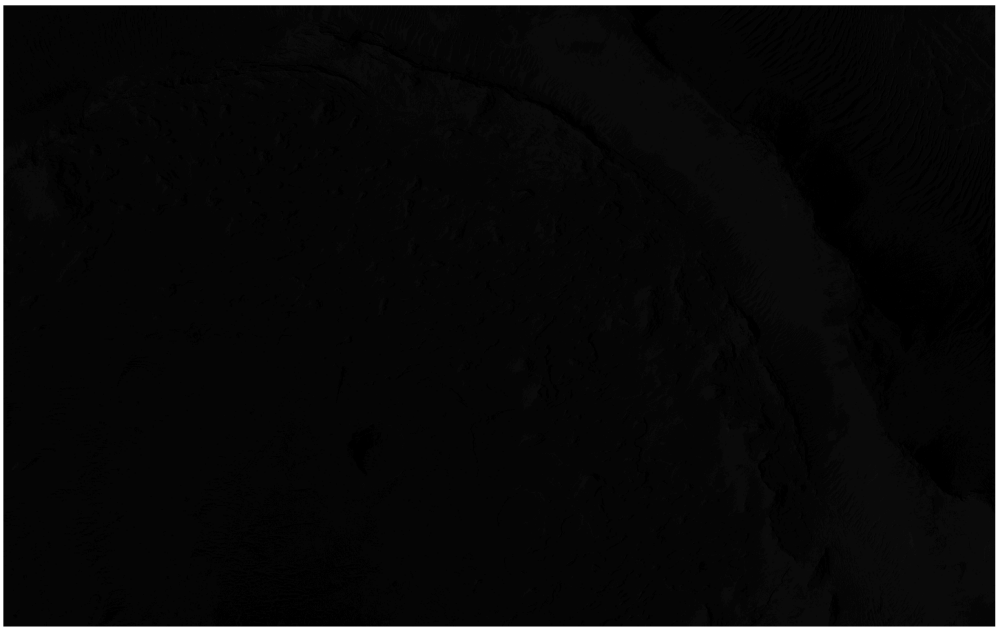
```
    _____________    _____________    _____________    _____________

    7.22074074074074    5.43755901920439    0.0412787008205884
 -0.766156159839631

2 Bit image

t =

  1×4 table

       averagebin            variance              skew
 kurtosis
    _____________    _____________    _____________    _____________

    1.80739351851852    0.447873422303669    0.528206650145689
 -19073.4527198493
```

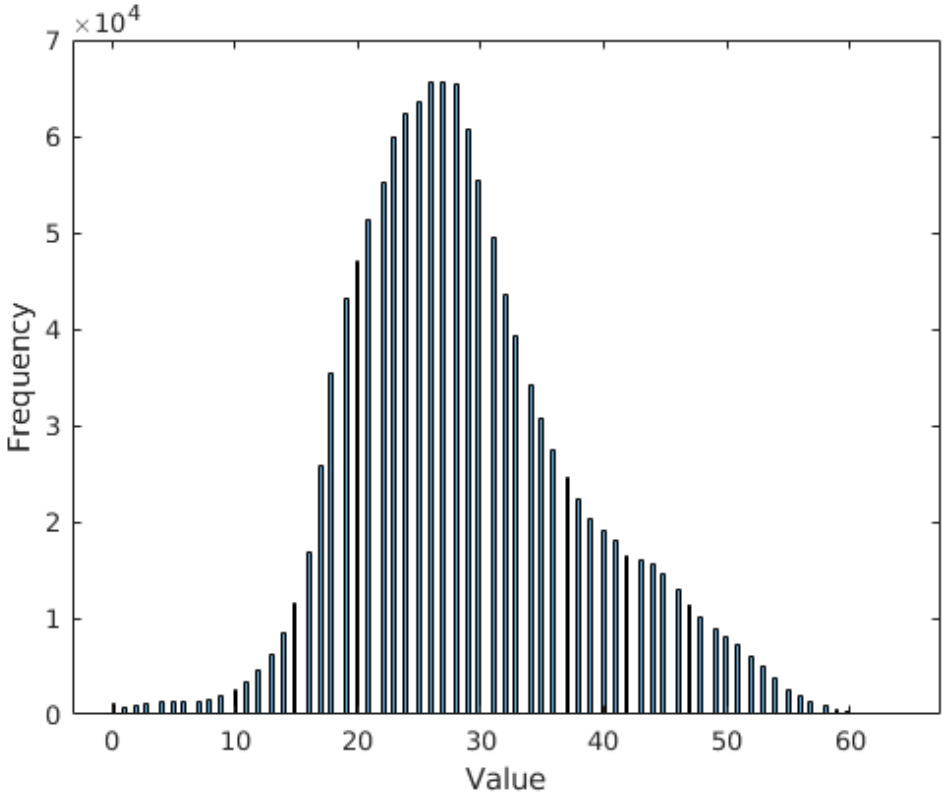


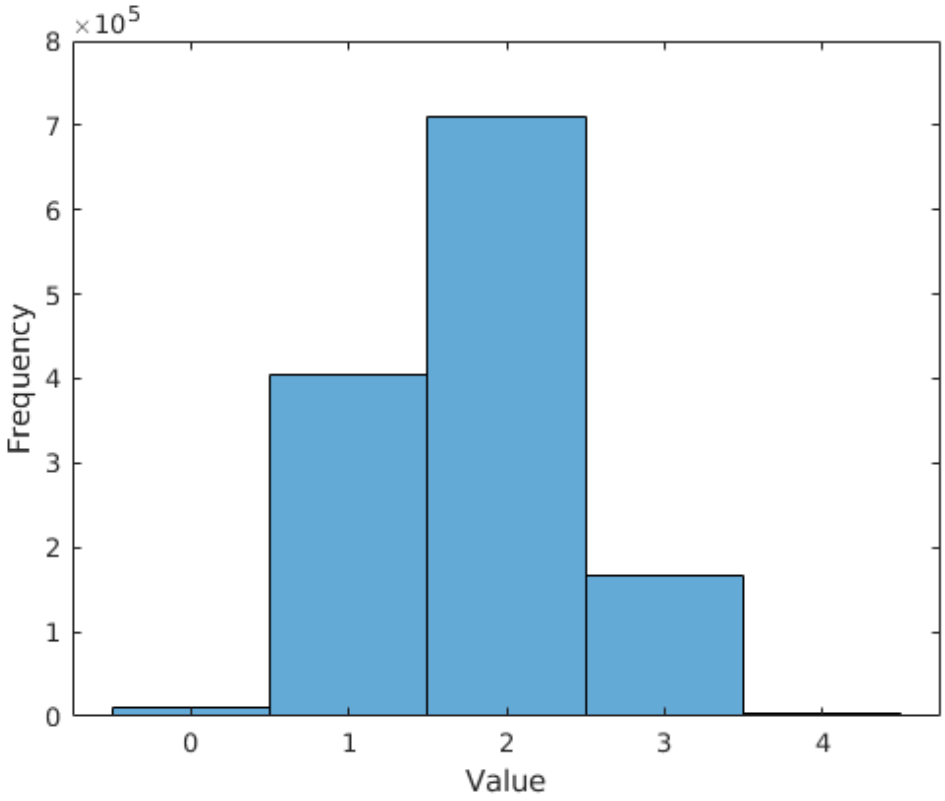



18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Frequency
0
50
100
150
200
250
Value


×10^5
3
2.5
2
1.5
1
0.5
0
Frequency
0
2
4
6
8
10
12
14
16
Value




×10^4
7
6
5
4
3
2
1
0
Frequency
0
10
20
30
40
50
60
Value



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