

# IMAGE ENHANCEMENT



# Digital signal processing

## Sem-Project

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Image enhancement, one of the image pre-processing image is the procedure of improving the quality and information content of a digital image .

In other words improving noise, sharpening ,deblurring or brightening an image is its enhancement.





The aim of image enhancement is to improve the interpretability or perception of information in images for human viewers, or to provide 'better' input for other automated image processing techniques.



They are used in Aerial imaging, Satellite imaging, Medical imaging, Digital camera application , Remote sensing etc.





Image processing techniques are broadly classified into two major methods. They are:

### **SPATIAL DOMAIN METHODS**

**Includes direct manipulation on pixels of an image. The two main approaches include**

**1.Point processing**

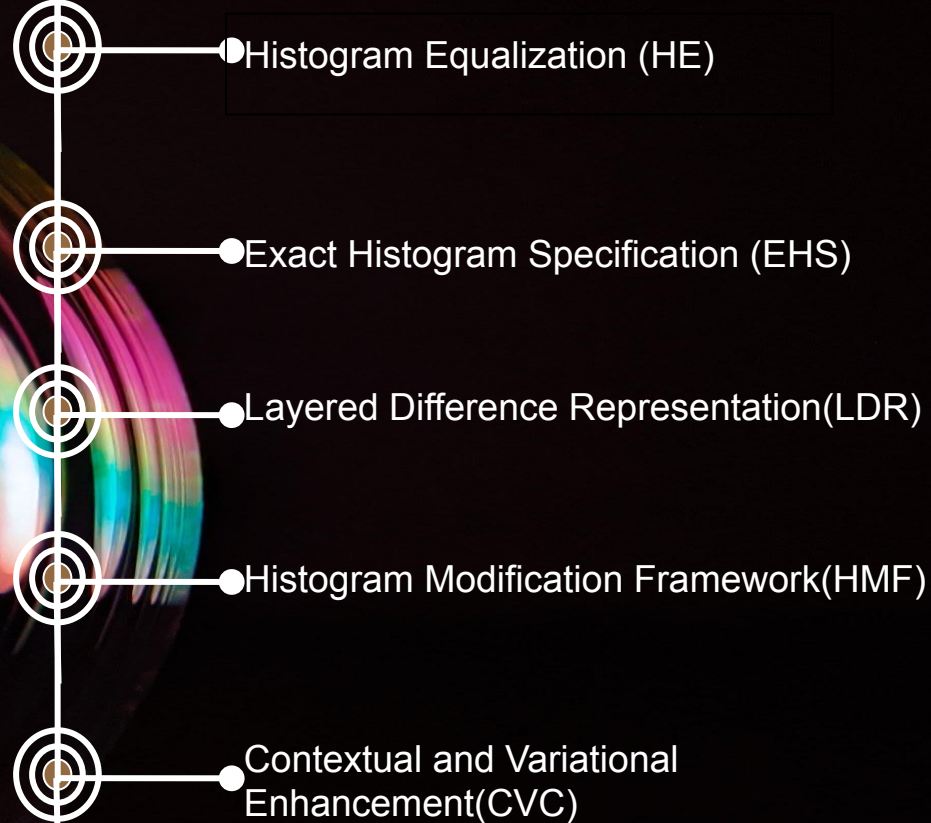
**2.Neighbourhood Operations**

### **FREQUENCY DOMAIN METHODS**

We compute the fourier transform of the image to be enhanced, multiply the result by a filter and take the inverse transform to produce the enhanced image.

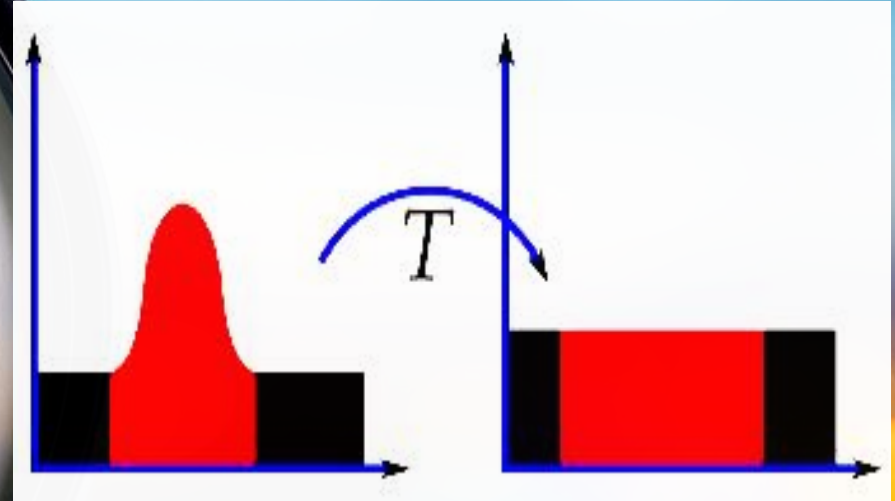
# 1. Histogram Processing:

This includes Spatial domain methods taking into account a histogram of an overall / part of an image when processing is done.



# Histogram Equalization:

Histogram Equalization is an image processing technique that adjusts the contrast of an image by using its histogram. To enhance the image's contrast, it spreads out the most frequent pixel intensity values or stretches out the intensity range of the image. By accomplishing this, histogram equalization allows the image's areas with lower contrast to gain a higher contrast.





A close-up of a camera lens, showing its internal elements and the outer ring. The lens is positioned on the left side of the frame. The background is a blurred bokeh of various colored lights, including yellow, orange, red, and blue, against a dark blue gradient.

## Why do we need Histogram equalization?

Histogram Equalization can be used when you have images that look washed out because they do not have sufficient contrast. In such photographs, the light and dark areas blend together creating a flatter image that lacks highlights and shadows.



# Code:

```
import cv2 as cv
```

```
import numpy as np
```

```
from matplotlib import pyplot as plt
```

```
path = " _____ "
```

```
img = cv.imread(path)
```

```
cv.imshow('image',img)
```

```
hist,bins = np.histogram(img.flatten(),256,[0,256])
```

```
cdf = hist.cumsum()
```

```
cdf_normalized = cdf * float(hist.max()) / cdf.max()

plt.plot(cdf_normalized, color = 'b')

plt.hist(img.flatten(),256,[0,256], color = 'r')

plt.xlim([0,256])

plt.legend(('cdf','histogram'), loc = 'upper left')

plt.show()

R, G, B = cv.split(img)

output1_R = cv.equalizeHist(R)

output1_G = cv.equalizeHist(G)

output1_B = cv.equalizeHist(B)

equ = cv.merge((output1_R, output1_G, output1_B))

cv.imshow('equ.png',equ)

hist,bins = np.histogram(equ.flatten(),256,[0,256])

cdf = hist.cumsum()

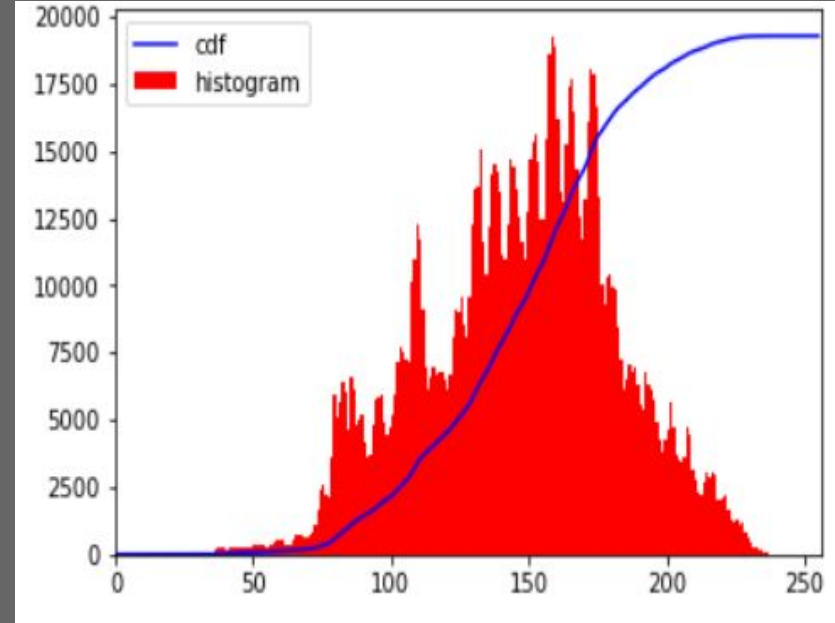
cdf_normalized = cdf * float(hist.max()) / cdf.max()
```

```
plt.plot(cdf_normalized, color = 'b')  
plt.hist(equ.flatten(),256,[0,256], color = 'r')  
plt.xlim([0,256])  
plt.legend(('cdf','histogram'), loc = 'upper left')  
plt.show()
```

Input Image



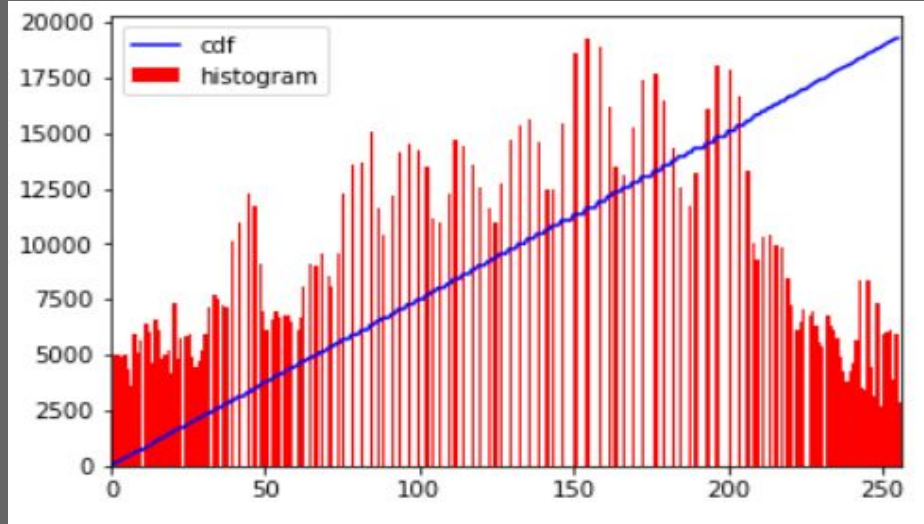
Histogram



Output Image



Histogram of a enhanced image



Thank you