Histogram Equalization

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Histogram equalization is a technique to enhance the contrast of an image by redistributing its intensity values across the full range of possible values (0-255)

Step 1 : Calculate the Histogram

The histogram shows the frequency of each intensity value (brightness) in the image.

Step 2 : Compute the Cumulative Distribution Function

The CDF accumulates the frequencies of intensity levels. It helps us understand how the intensity values are distributed across the image.

Step 3 : Map Intensity Values

Using the CDF, the old intensity values are mapped to new ones so that the distribution spreads across the entire intensity range.

Step 4 : Generate the Equalized Image

Replace the old pixel intensities with the new mapped values.

Step 1:

Image = [52, 55, 59, 52, 55, 59, 63, 52]

Intensity	Count
52	3
55	2
59	2
63	1

Step 2:

Add cumulative count

Intensity	Count	Normalised CDF (0 - 255)
52	3	(3/8) * 255 = 95
55	3 + 2	(5/8) * 255 = 159
59	3 + 2 + 2	(7/8) * 255 = 223
63	3 + 2 + 2 + 1	(8/8) * 255 = 255

Step 3:

Equalized Image = [95, 159, 223, 95, 159, 223, 255, 95]