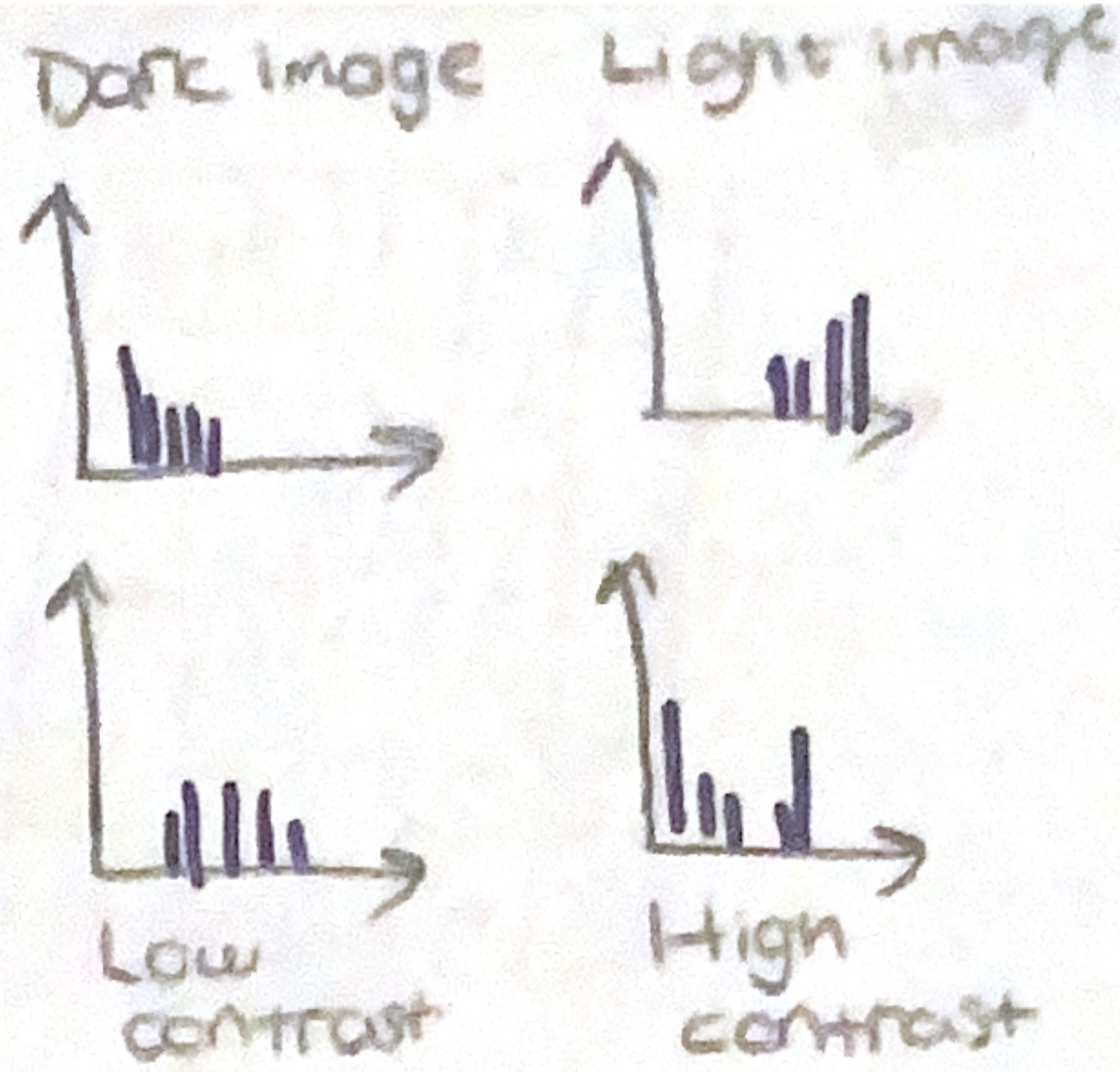
Histogram Processing



Distribution of intensity values.

$h(r_k) = n_k$ for $k = 0, 1 \dots L-1$

r_k → intensity level

n_k → number of pixels in f with intensity r_k

$$p(r_k) = \frac{h(r_k)}{MN} = \frac{n_k}{MN}$$

$p(r_k)$ → estimates of probabilities of intensity levels

M → row, N → column

Histogram Equalization

Used to improve contrast.

Cumulative Distribution Func → $\sum_{0}^{255} \frac{n_j}{n}$

$P_r(r_k) = \frac{n_k}{n}$ → probability density function

What we do → $s_i = cdf_i \cdot (L-1)$

1	1	1	1
1	5	6	1
1	6	5	1
1	1	1	1

$Pr_1 = 12/16$ $\quad cdf_1 = 12/16$ $\quad s_1 = \frac{12}{16} \cdot 6 = 4.5$ → 4

$Pr_5 = 2/16$ $\quad cdf_5 = 14/16$ $\quad s_5 = \frac{14}{16} \cdot 6 = \frac{21}{4}$ → 5

$Pr_6 = 2/16$ $\quad cdf_5 = 16/16$ $\quad s_6 = 1 \cdot 6 = 6$

Histogram Matching

Modifying images based on the contrast of another one.

1. First equalize the histogram of both images. $\left((L-1) \sum_{j=0}^{k} Pr(r_j)\right)$
2. Map each pixel of image A to B → $G(z_q) = s_k$
3. Modify A according to B → $z_q = G^{-1}(s_k)$

→