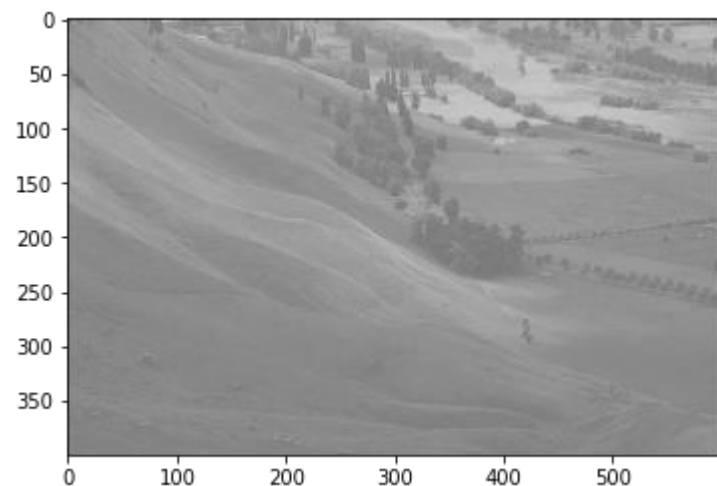# CSE 4128
Lab 3

Instructors:

Dr. Sk. Md. Masudul Ahsan
Professor,
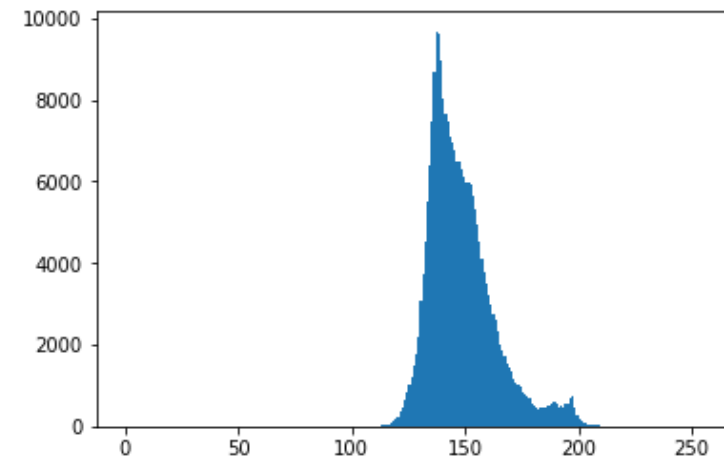Dept. of Computer Science and Engineering,
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Mr. Sunanda Das
Assistant Professor,
Dept. of Computer Science and Engineering,
KUET

Input Image

```python
import cv2
import matplotlib.pyplot as plt
#image read … …

plt.hist(img.ravel(),256,[0,256])
plt.show()
```


Histogram of the Input Image

Histogram Equalization

- For discrete values we deal with probabilities and summation instead of PDF and integrals.

$$p_r(r_k) = \frac{n_k}{MN} \qquad k = 0, 1, 2, \ldots, L - 1$$

$$s_k = T(r_k) = (L - 1) \sum_{j=0}^{k} p_r(r_j)$$

TABLE 3.1

Intensity distribution and histogram values for a 3-bit, 64 × 64 digital image.

r_k	n_k	$p_r(r_k) = n_k/MN$
$r_0 = 0$	790	0.19
$r_1 = 1$	1023	0.25
$r_2 = 2$	850	0.21
$r_3 = 3$	656	0.16
$r_4 = 4$	329	0.08
$r_5 = 5$	245	0.06
$r_6 = 6$	122	0.03
$r_7 = 7$	81	0.02

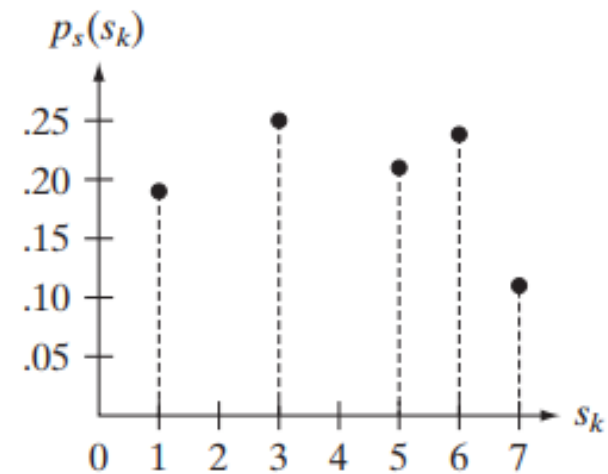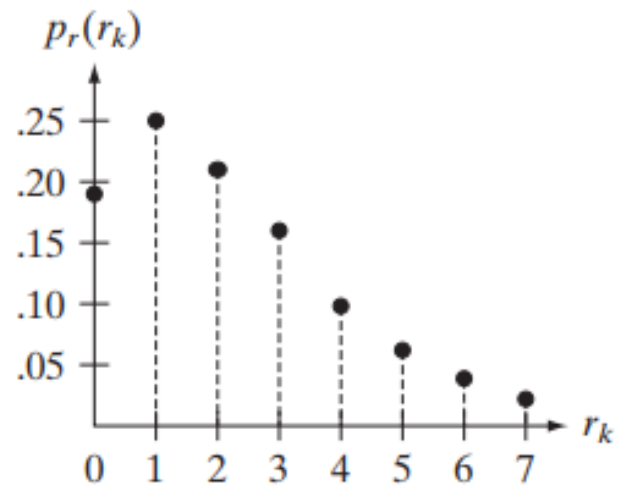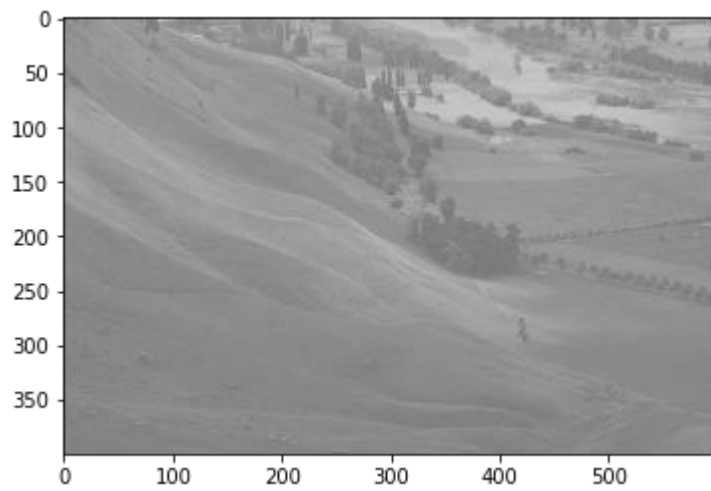$$s_0 = T(r_0) = 7\sum_{j=0}^{0} p_r(r_j) = 7p_r(r_0) = 1.33$$

Similarly,

$$s_1 = T(r_1) = 7\sum_{j=0}^{1} p_r(r_j) = 7p_r(r_0) + 7p_r(r_1) = 3.08$$

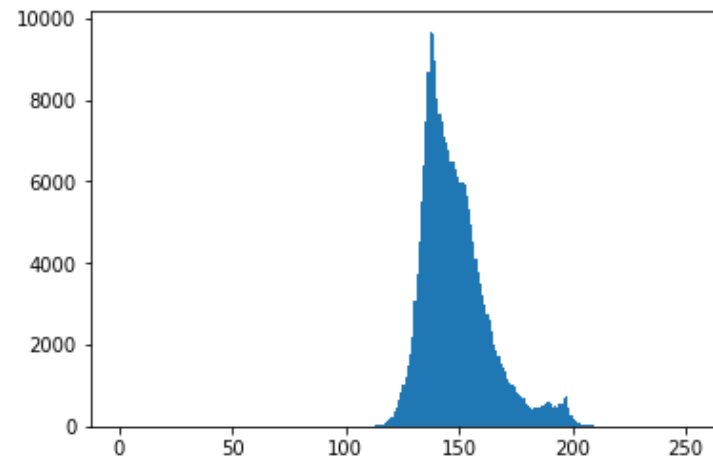and $s_2 = 4.55$, $s_3 = 5.67$, $s_4 = 6.23$, $s_5 = 6.65$, $s_6 = 6.86$, $s_7 = 7.00$.

r_k	n_k	$p_r(r_k) = n_k/MN$
$r_0 = 0$	790	0.19
$r_1 = 1$	1023	0.25
$r_2 = 2$	850	0.21
$r_3 = 3$	656	0.16
$r_4 = 4$	329	0.08
$r_5 = 5$	245	0.06
$r_6 = 6$	122	0.03
$r_7 = 7$	81	0.02

$S_0 = 1.33 = 1$

$S_1 = 3.08 = 3$

$S_2 = 4.55 = 5$

$S_3 = 5.67 = 6$

$S_4 = 6.23 = 6$

$S_5 = 6.65 = 7$

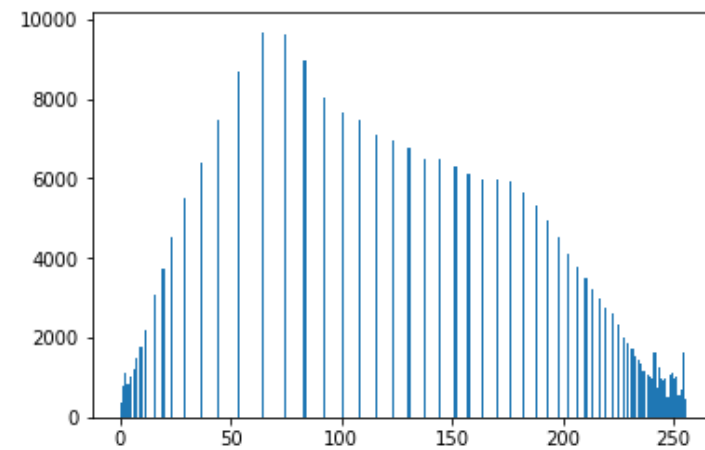$S_6 = 6.86 = 7$

$S_7 = 7.00 = 7$

Input Image

Histogram of the Input Image

Equalized Image

Histogram of the Equalized Image

Assignment

- **Histogram Matching (Specification)**
  -- using Exponential Function