Computer Vision
Exercise 1

Gruppe 26
Laszlo Korte
Alexander Remmes-Weitz

November 2022

Task 3

Given the normalized histograms:

$$p(X) = [0.3, 0.1, 0.2, 0.0, 0.4, 0.0]$$
$$q(X) = [0.0, 0.1, 0.3, 0.0, 0.2, 0.4]$$

The expected values are:

$$\mathbb{E}[p(X)] = 0.3 \cdot 0 + 0.1 \cdot 1 + 0.2 \cdot 2 + 0 \cdot 3 + 0.4 \cdot 4 + 0 \cdot 5 = 2.1$$
$$\mathbb{E}[q(X)] = 0 \cdot 0 + 0.1 \cdot 1 + 0.3 \cdot 2 + 0 \cdot 3 + 0.2 \cdot 4 + 0.4 \cdot 5 = 3.5$$

The cumulative histograms are:

$$P(X) = [0.3, 0.4, 0.6, 0.6, 1.0, 1.0]$$
$$Q(X) = [0.0, 0.1, 0.4, 0.4, 0.6, 1.0]$$

bins	0	1	2	3	4	5
$P(X)$	0.3	0.4	0.6	0.6	1.0	1.0
$Q(X)$	0.0	0.1	0.4	0.4	0.6	1.0

The L_1 distance between the two histograms is:

$$L_1(p(X), q(X)) = 1.0$$
$$= \sqrt{|(0.3-0)| + |(0.1-0.1)| + |(0.2-0.3)| + |(0-0)| + |(0.4-0.2)| + |(0-0.4)|}$$