Exercise 1

You can use histograms to compare images.

(2P) Subtask 1.1
Implement a function distance, which computes the L_2-distance between the vectors V and U.

(4P) Subtask 1.2
Implement a function histogram, which computes a histogram-vector $V \in \mathbb{N}^v$ of a given matrix $W \in \mathbb{N}^{n \times m}$. Assume that each element in $W$ is between 0 and 255. Normaly, the $v$-bins are uniform, so you get a bin-length of $b = \frac{255 - 0}{v}$. Now you can compute $V$ as follows: $V(n) = \# \{ x \in W | ((n - 1) \cdot b) \leq x < (n \cdot b) \}$, $\forall n$.

(2P) Subtask 1.3
Implement a function that compares two images on the basis of a feature-vector. Compute for each channel a histogram-vector of length 15 and concatenate these to one feature-vector of length $3 \cdot 15$ per image. Compute the distance between the two images on our webpage. What can you find out?

(4P) Subtask 1.4
Implement a function, that makes a $4 \times 4$ and $16 \times 16$ segmentation of an image and compute a histogram for each segment like it is described in subtask 1.3. Concatenate all these histogram-vectors to one feature-vector of length $v = (3 \cdot 15) \cdot (4 \cdot 4)$ and $v = (3 \cdot 15) \cdot (16 \cdot 16)$. Compute the distance between the two images on our webpage and compare this results with the one of Subtask 1.3.

---

Footnote:
1Feel free to experiment also with other distance-metrics.

Questions: Munir.Georges@lsv.uni-saarland.de

1 www.lsv.uni-saarland.de