Computer Vision I

Assignment 2

Prof. Stefan Roth
Jannik Schmitt
Jan-Martin Steitz

TECHNISCHE UNIVERSITÄT DARMSTADT

This assignment is due on December 13th, 2020 at 23:59.

Aufgabe 1: Image Pyramids and Image Sharpening (15 Punkte)

What is the difference between the top (coarsest) level of Gaussian and Laplacian pyramids?

Lösungsvorschlag:

There is none difference between the top level of Gaussian and Laplacian pyramids.
Both of them are identical.

Aufgabe 2: PCA on Face Images (15 Punkte)

You can now select a face image of your choice and visualise its projection on a few basis vectors. Experiment with different percentiles, e.g. $\eta = 0.5, 0.75, 0.9,$ and analyse the result.

Lösungsvorschlag:

The size of basis vector has none different in $\eta = 0.5, 0.75, 0.9,$, all of them just have 1 vector, which means the first vector account for over 90 percent.
In this experiment, the target image is:

The Search result $\eta = 0.5, 0.75, 0.9,$ is shown as below:

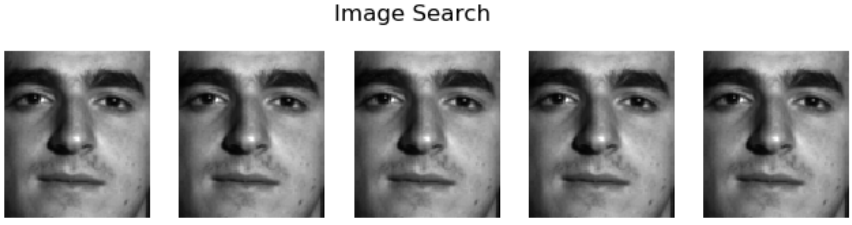

Abbildung 1: Search Result under $\eta = 0.5, 0.75, 0.9,$

With this basis vector we can not find any correct image in image library.

When we change the η from 0.9 to 0.95, the number of basis vectors is increased to 5. The Search result is shown as below:

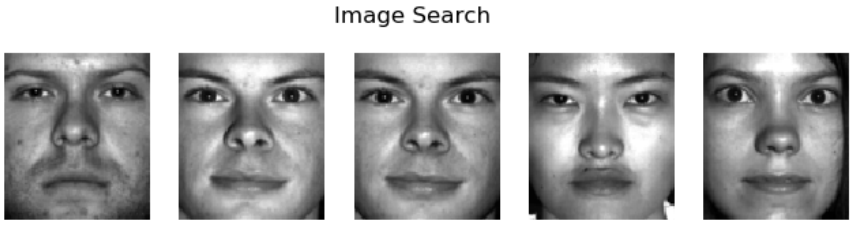

Abbildung 2: Search Result under $\eta = 0.95,$

Though increasing of basis vectors, the search result is still under-fitting.

When we change the η from 0.95 to 0.99, the number of basis vectors is increased to 39. The Search result is shown as below:

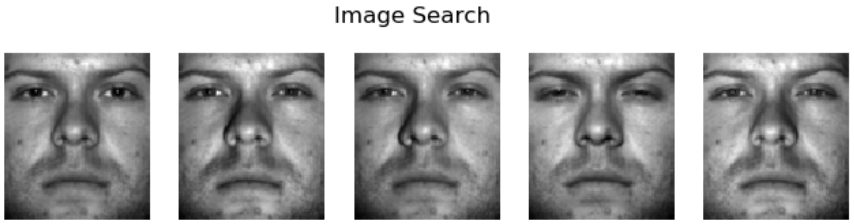

Abbildung 3: Search Result under $\eta = 0.99,$

Now we can find correct relevant images.

This experiments prove the importance of threshold choose. Though the threshold already to 0.99 increased, the number of basis vectors change not much, which means the most of basis vectors are useless to image recognition, so that they could be ignored as noise.