# Recognition

While each input images are different, they are not completely random. Some patterns exist in all facial images, such as the presence of eyes, nose and mouth and the relative position of these organs. By applying Principal Component Analysis (PCA), we may extract these principal components (or eigenfaces in the facial recognition domain) out from the input image data.

Each eigenfaces represents a certain feature of the face. The original face image is a linear expression of some eigenfaces with various weights. Therefore, a facial image can be represented by a weight vector.

Figure Training

By comparing the weight vector of an input image and those of images in the training dataset, it can be determined which training sample is closest to the input in terms of eigenfaces features.

The feature extraction process, i.e. eigenfaces(), can be viewed as the following flow.

Figure Feature extraction

To reconstruct the original image, we need all the eigenfaces and weights for each. In order to just recognize a face, some eigenfaces are more important than others. Considering only the most important eigenfaces may reduce the computation and offer a shorter recognition time as a result.

In our experiment, we chose the top 20 eigenfaces.

Figure Recognition

# Database Used

We used the database of faces from AT&T[[1]](#footnote-1). The database consists of face images of 40 distinct subjects, 10 for each. The following aspects are different for different samples of a single subject.

* Time of photo capture
* Lighting condition
* Facial expression
* Accessories (with/without glasses)

All the subjects are facing the camera while some subjects have some side movements.

The file format:

* PGM format
* 92\*112 pixels
* 256 grey levels per pixel

1. <http://www.cl.cam.ac.uk/research/dtg/attarchive/facedatabase.html> [↑](#footnote-ref-1)