Foundations of Data Science
DSL201

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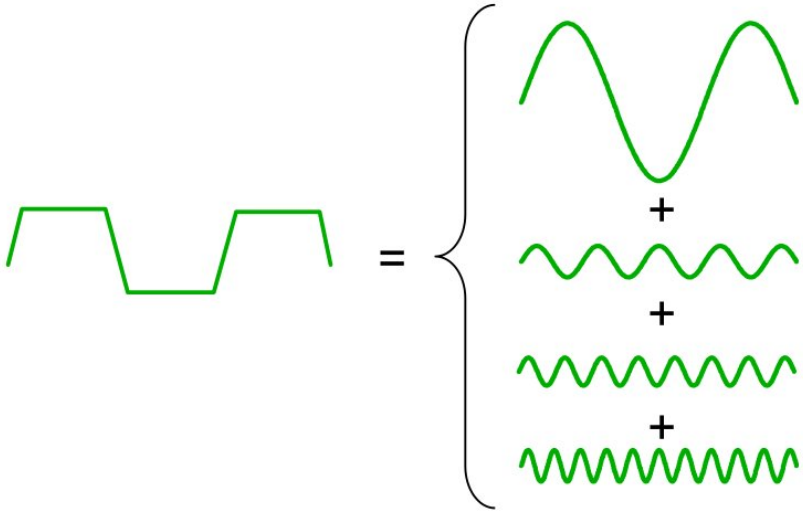
Decomposition of signal using Fourier transform



Decomposition of signal using Fourier transform

- Original (sampled at 48KHz): Original
- LPF 2000Hz: LPF 2000Hz
- LPF 3000Hz: LPF 3000Hz
- LPF 4000Hz: LPF 4000Hz
- LPF 5000Hz: LPF 5000Hz
- LPF 6000Hz: LPF 6000Hz
- LPF 7000Hz: LPF 7000Hz
- HPF 8000Hz: HPF 8000Hz

- Original (sampled at 48KHz): Original
- LPF 2000Hz: LPF 2000Hz
- LPF 3000Hz: LPF 3000Hz
- LPF 4000Hz: LPF 4000Hz
- LPF 5000Hz: LPF 5000Hz
- LPF 6000Hz: LPF 6000Hz
- LPF 7000Hz: LPF 7000Hz
- LPF 8000Hz: LPF 8000Hz
- HPF 8000Hz: HPF 8000Hz

2-D sinusoidal function

$$\sin(2\pi(\frac{u}{M}m + \frac{v}{N}n))$$

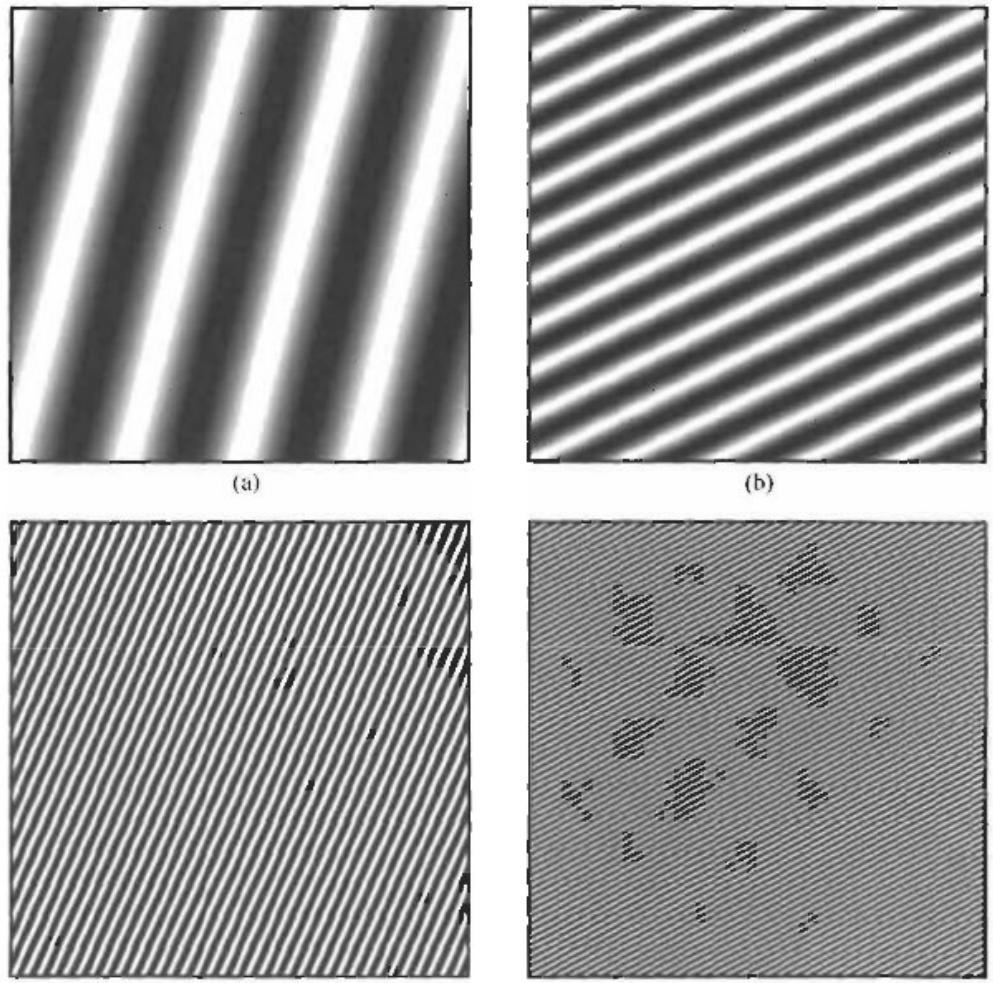


FIGURE 1 Examples of finite two-dimensional discrete-space sinusoidal functions. The scaled frequencies of Eq. (6) measured in cycles/image are (a) $u = 1$, $v = 4$; (b) $u = 10$, $v = 5$; (c) $u = 15$, $v = 35$; and (d) $u = 65$, $v = 35$.

Results of Gaussian lowpass filter

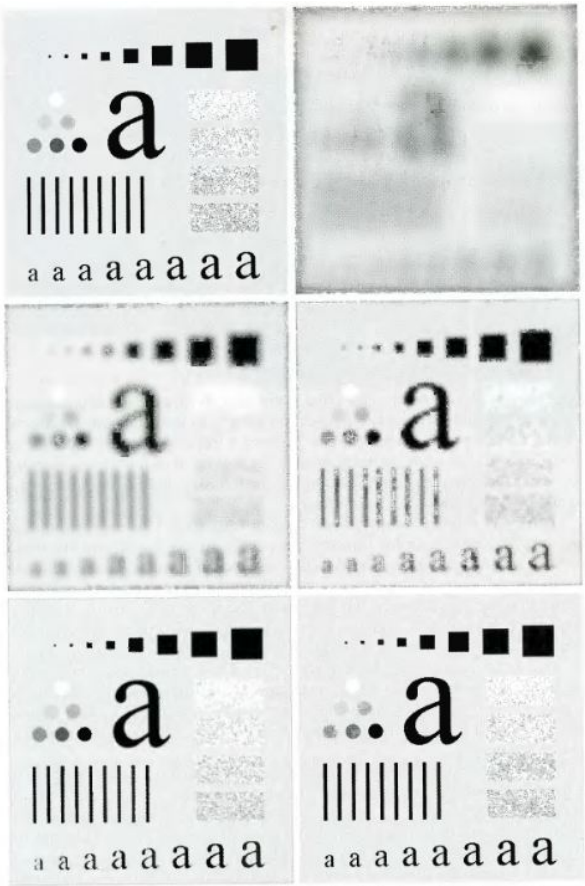


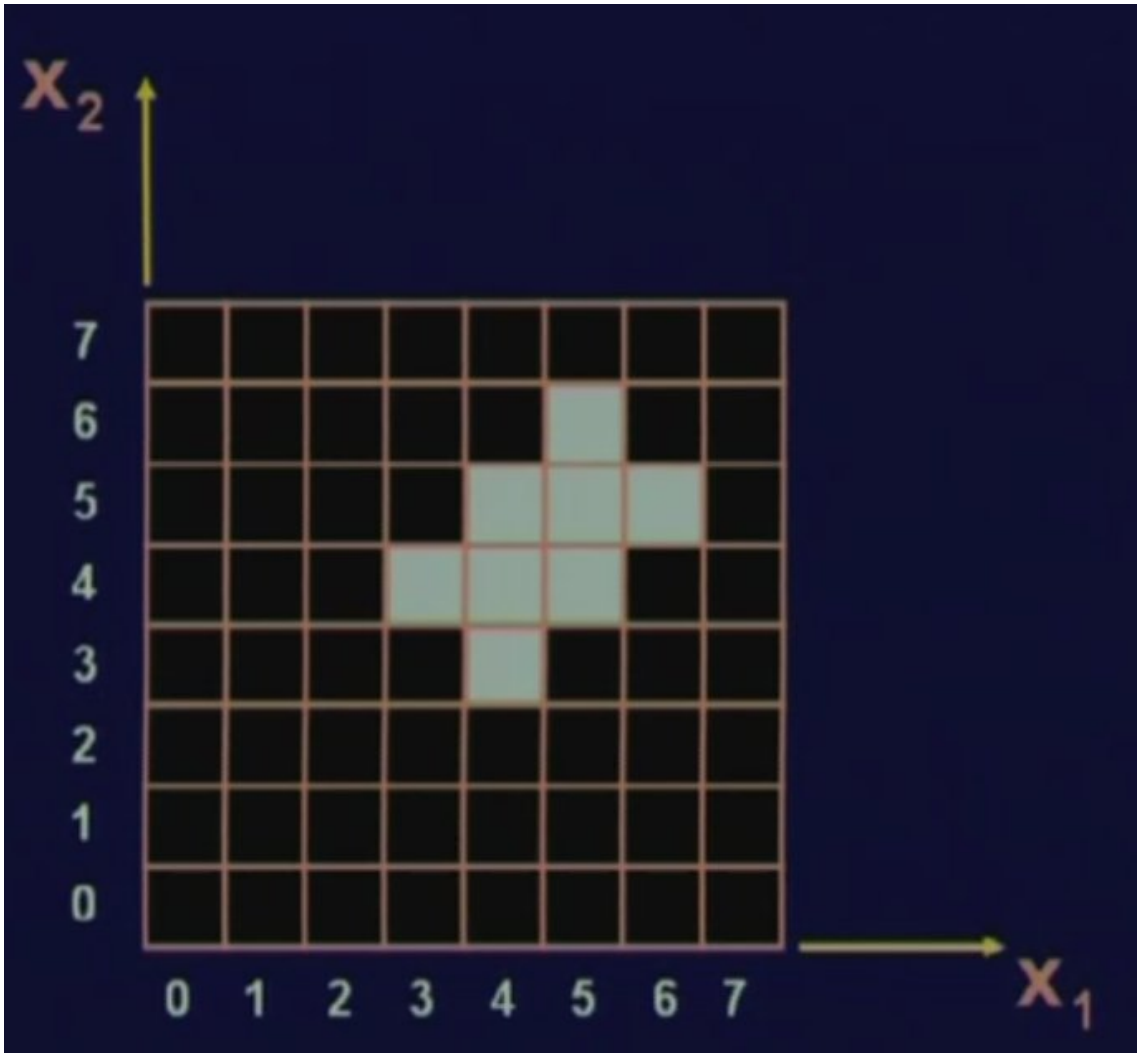
FIGURE 4.18 (a) Original image. (b)–(f) Results of filtering with Gaussian lowpass filters with cutoff frequencies set at radii values of 5, 15, 30, 80, and 230, as shown in Fig. 4.11(b). Compare with Figs. 4.12 and 4.15. a b c d e f

Results of Gaussian highpass filter for different cut-off frequency

a b c

FIGURE Results of highpass filtering the image in Fig. 4.41(a) using a GHPF with $D_0 = 30$, 60, and 160, corresponding to the circles in Fig. 4.41(b). Compare with Figs. 4.54 and 4.55.

KL transform



KL Transform

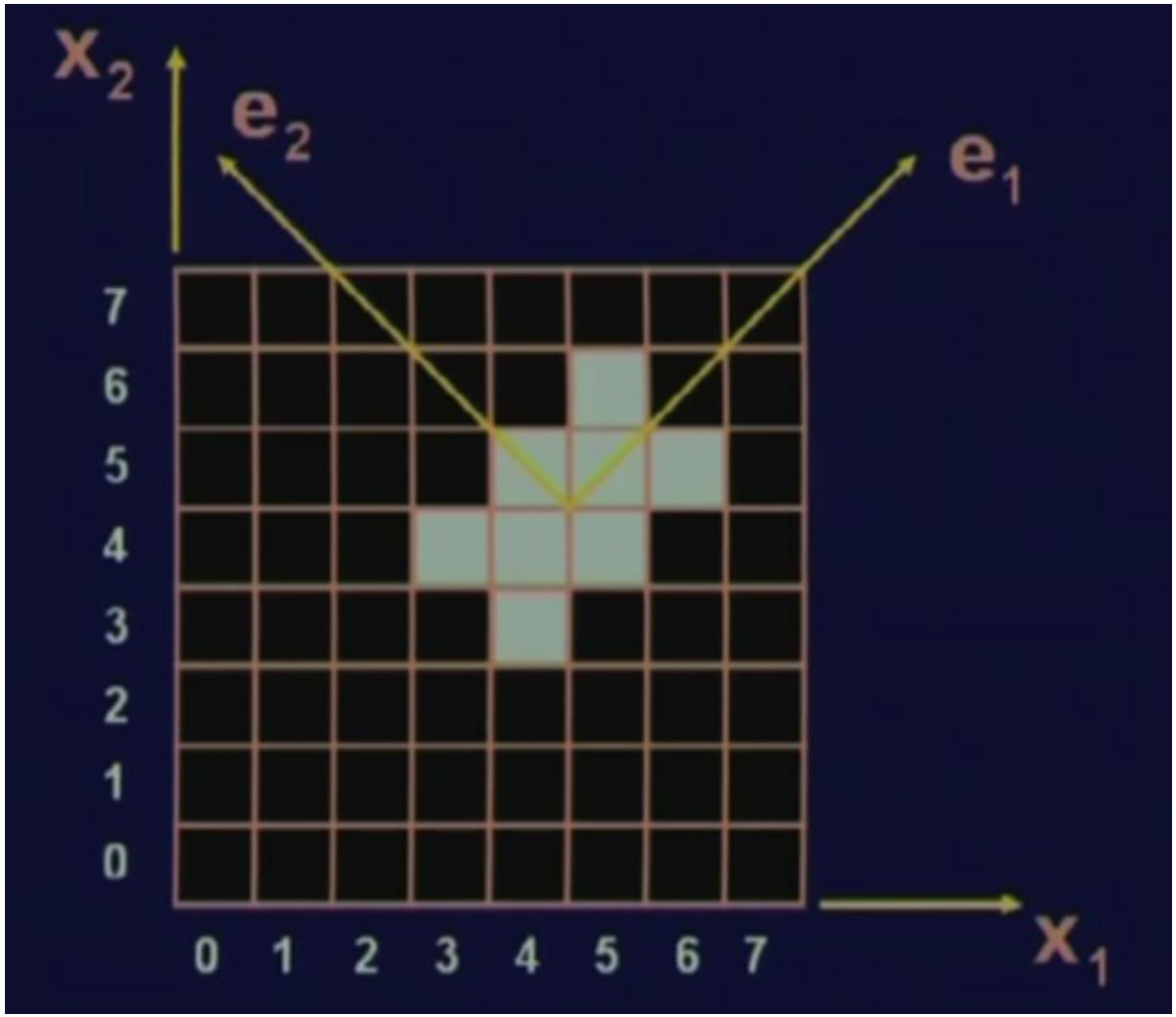
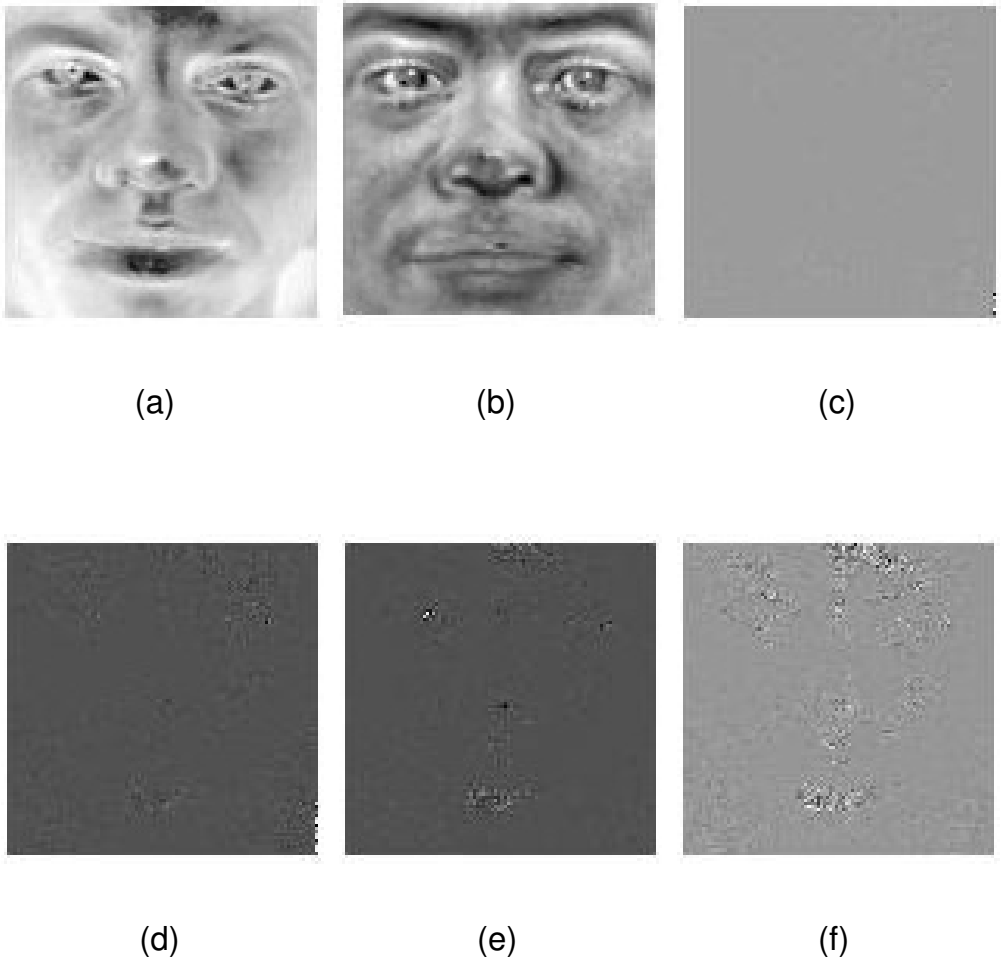


Figure: Examples of images used to compute the principal components



(a) (b) (c)

(d) (e) (f)

Figure: Eigen Vectors- (a)1st, (b) 3rd, (c)5th, (d)10th, (e) 15th, (f)100th

- Eigen vectors are also known as eigenfaces in the literature of face recognition

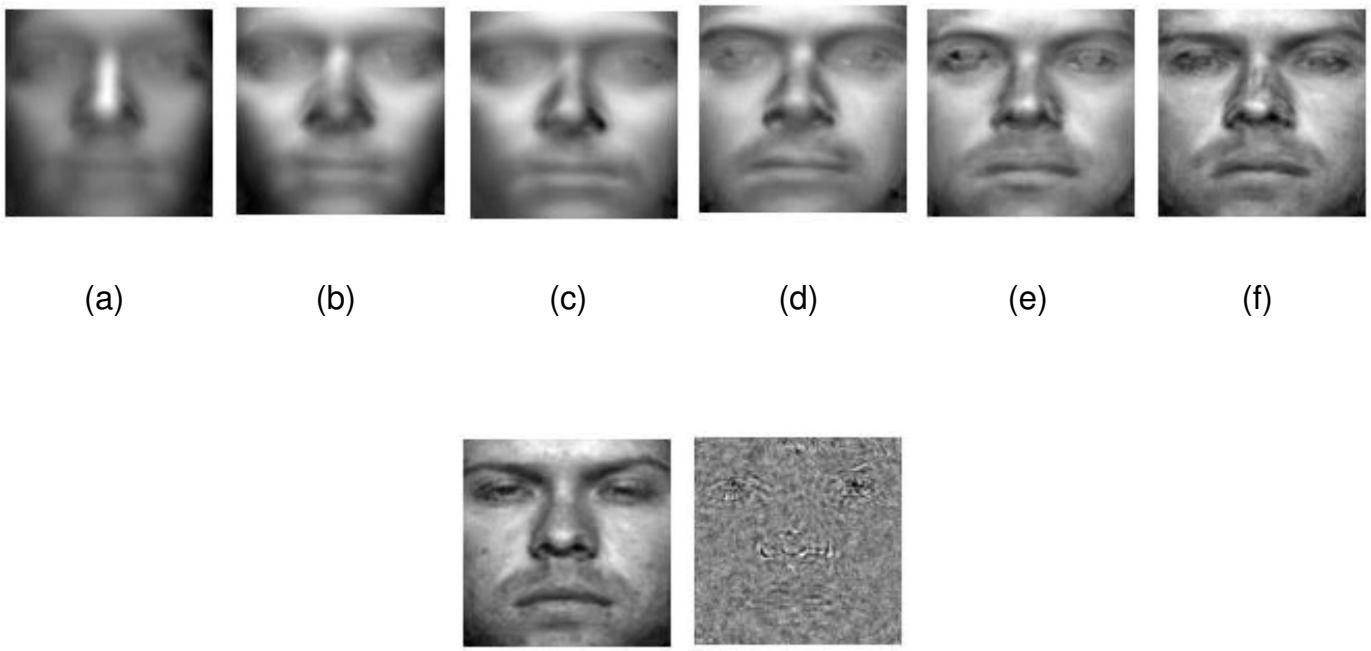


Figure: Reconstructed image using Eigen Vectors-
(a)1-5,(b)1-10,(c)1-20,(d)1-50,(e)1-100,(f)1-200,(g)1-500,(h)500-Remaining

(a) (b)

Figure: (a)Original Image,(b) Reconstructed using first 500 eigen vectors from the previous datasets subspace

(c) (d)

Figure: (a)Original Image,(b) Reconstructed using first 500 eigen vectors from the previous datasets subspace

(a) (b)

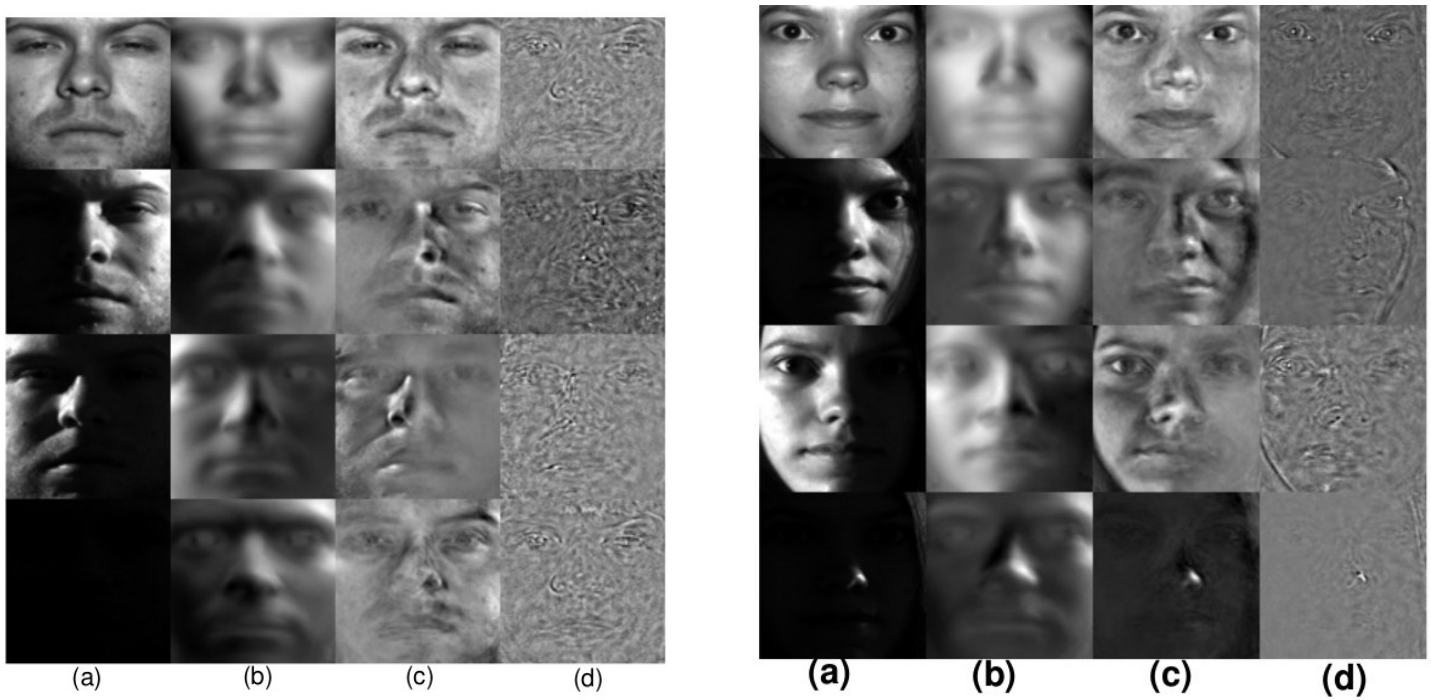


Figure: Illustration of subject specific unique information derived using eigen decomposition. (a) Gray level image. The reconstructed face image using (b) first 10 eigenvectors, (c) 11-350 eigenvectors, (d) 351-10000 eigenvectors.