U66709138 Shihao Xing

1. a) $a\begin{bmatrix}1\\0\end{bmatrix} = a = \begin{bmatrix}1\\0\end{bmatrix}\begin{bmatrix}a & 0\\0 & b\end{bmatrix}$

b. $\begin{bmatrix}0\\1\end{bmatrix} = b = \begin{bmatrix}0\\1\end{bmatrix}\begin{bmatrix}a & 0\\0 & b\end{bmatrix}$

b) $X = \begin{bmatrix}1 & 3\\1 & 7\\0 & 5\\2 & 5\end{bmatrix}$ $\mu_X = [1 \quad 5]$

$\hat{X} = X - \mu_X = \begin{bmatrix}0 & -2\\0 & 2\\-1 & 0\\1 & 0\end{bmatrix}$

$\frac{1}{4}\cdot\hat{X}^T\hat{X} = \begin{bmatrix}0 & 0 & -1 & 1\\-2 & 2 & 0 & 0\end{bmatrix}\cdot\begin{bmatrix}0 & -2\\0 & 2\\-1 & 0\\1 & 0\end{bmatrix} = \frac{1}{4}\cdot\begin{bmatrix}2 & 0\\0 & 8\end{bmatrix} = \begin{bmatrix}0.5 & 0\\0 & 2\end{bmatrix}$

c) $(0.5-\lambda)(2-\lambda) = 0$

$\lambda = 0.5$ or 2

$\begin{bmatrix}0 & 0\\0 & 2\end{bmatrix}\begin{bmatrix}V_{11}\\V_{12}\end{bmatrix} = \begin{bmatrix}0\\0\end{bmatrix}$ $2V_{12} = 0$ $V_{12} = 0$ $V_{11} = 1$

$\begin{bmatrix}-1.5 & 0\\0 & 0\end{bmatrix}\begin{bmatrix}V_{21}\\V_{22}\end{bmatrix} = \begin{bmatrix}0\\0\end{bmatrix}$ $-1.5\,V_{21} = 0$ $V_{21} = 0$ $V_{22} = 1$

$V_1 = \begin{bmatrix}1\\0\end{bmatrix}$ $\boxed{V_2 = \begin{bmatrix}0\\1\end{bmatrix}}$

largest

2 b) ① $2.8169 \cdot 10^6$

$2.0646 \cdot 10^6$

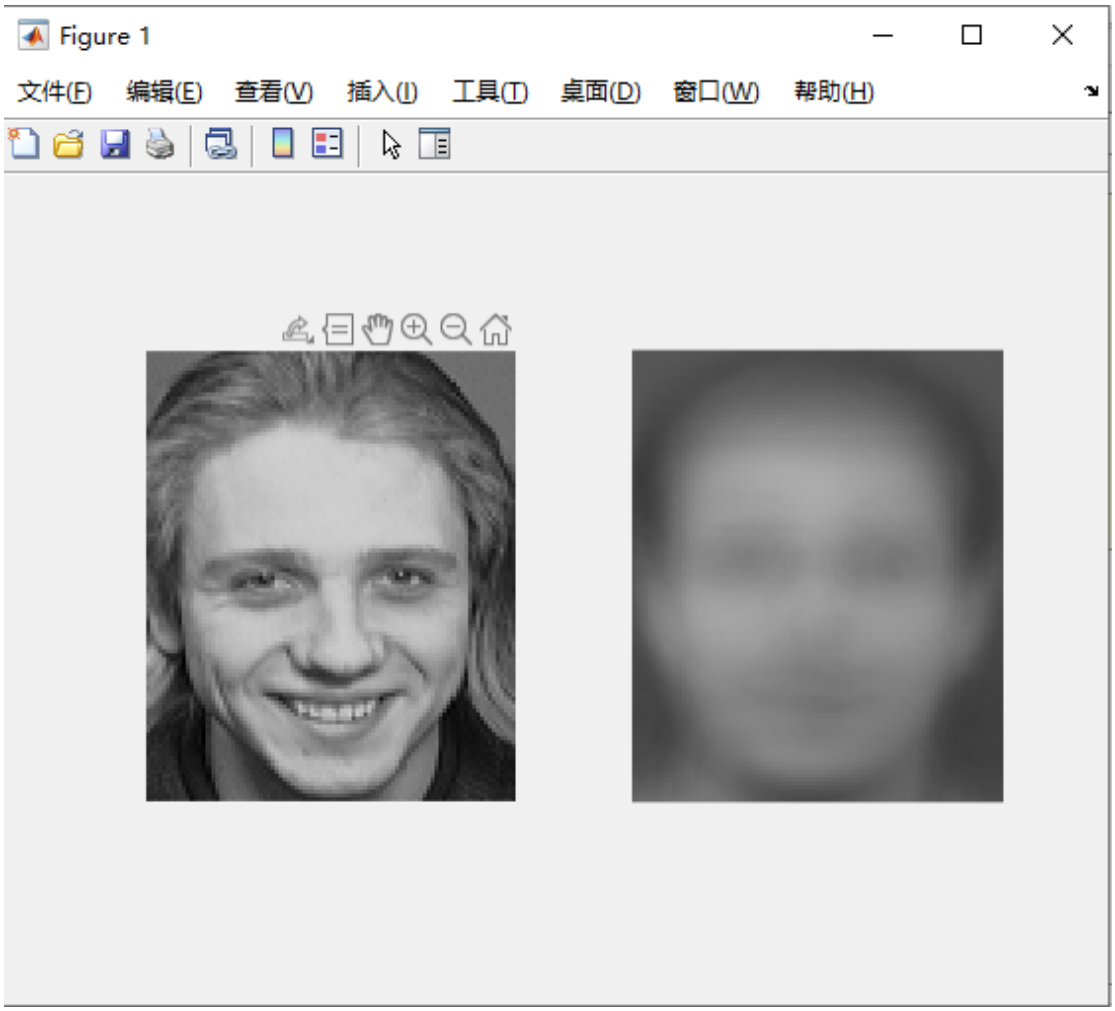
$1.0943 \cdot 10^6$

$8.9242 \cdot 10^5$

$8.1739 \cdot 10^5$

② There are only 400 effective data because there are only 400 rows

④ $k = 6, 29, 105, 179, 300$



It is a smooth shapeless “blob”.

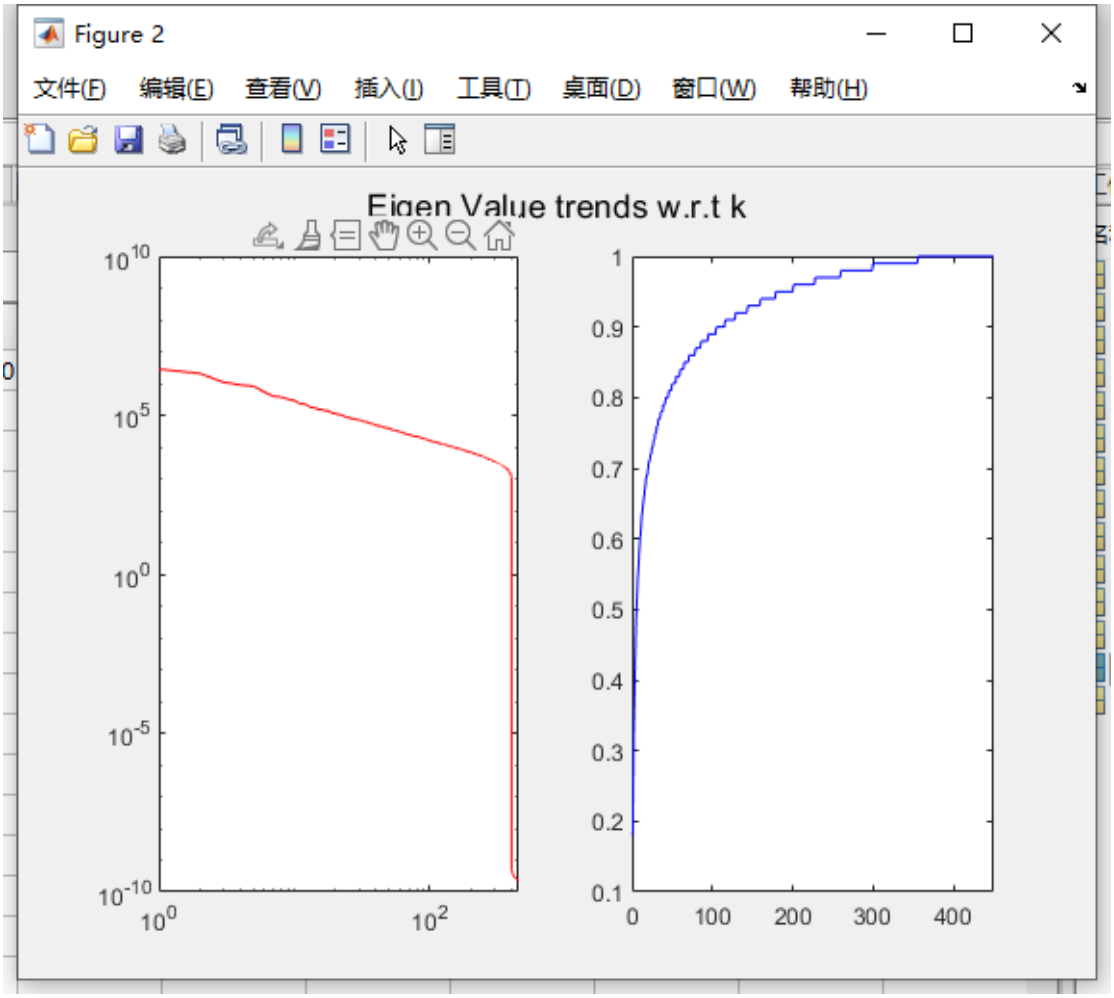
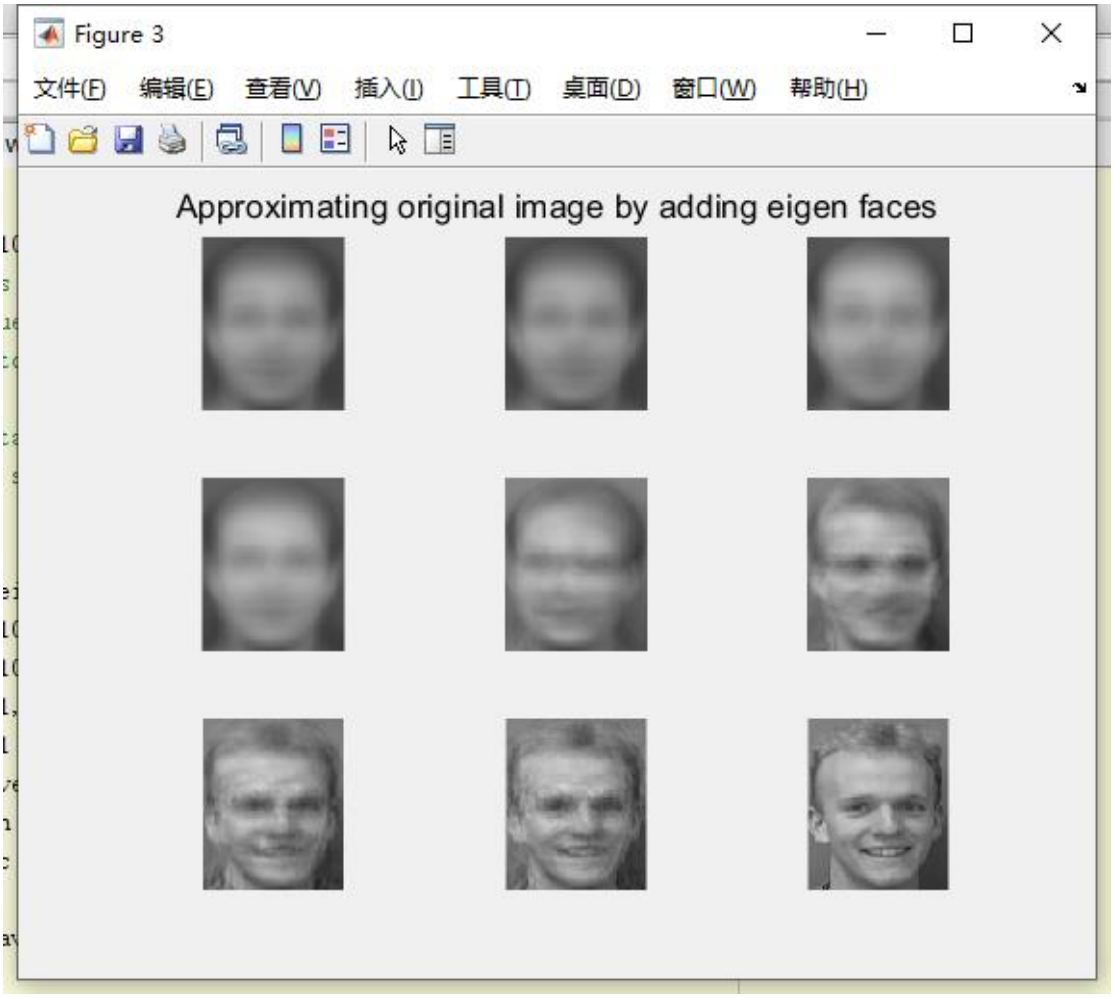


Figure 2
文件(F) 编辑(E) 查看(V) 插入(I) 工具(T) 桌面(D) 窗口(W) 帮助(H)
Eigen Value trends w.r.t k
10^{10}
10^{5}
10^{0}
10^{-5}
10^{-10}
10^{0}
10^{2}
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
100
200
300
400



Picture (1,1): k = mean
Picture (1,2): k = 1;
Picture (1,3): k = 2;
Picture (2,1): k = 6;
Picture (2,2): k = 29;
Picture (2,3): k = 105;
Picture (3,1): k = 179;
Picture (3,2): k = 300;
Picture (3,3): origin picture