Data

500 data, each 2-dimensional, created by *mk_data.m* of ECE641 Laboratory 1 which are generated from a third order Gaussian mixture with

$$\pi = [0.4, 0.4, 0.2]$$
$$\mu_0 = [2, 2]^t$$
$$\mu_1 = [-2, -2]^t$$
$$\mu_2 = [5.5, 2]^t$$

$$R_0 = \begin{bmatrix} 1 & 0.1 \\ 0.1 & 1 \end{bmatrix}$$

$$R_1 = \begin{bmatrix} 1 & -0.1 \\ -0.1 & 1 \end{bmatrix}$$

$$R_2 = \begin{bmatrix} 1 & 0.2 \\ 0.2 & 0.5 \end{bmatrix}$$

Matlab version output:

The optimum order is K*=3, with the following program output

```
>> [mtrs,omtr]=GaussianMixture(pixels, 10, 0, true)
K: 10     rissanen: 2089.448421
combining cluster: 6 and 7
K: 9  rissanen: 2068.272884
combining cluster: 4 and 9
K: 8  rissanen: 2046.017118
combining cluster: 5 and 6
K: 7  rissanen: 2023.441892
combining cluster: 2 and 4
K: 6  rissanen: 2004.413112
combining cluster: 5 and 6
K: 5  rissanen: 1990.168182
combining cluster: 2 and 3
K: 4  rissanen: 1974.557575
combining cluster: 3 and 4
K: 3  rissanen: 1960.168578
combining cluster: 1 and 2
K: 2  rissanen: 1986.796000
combining cluster: 1 and 2
K: 1  rissanen: 2160.737859
```

The parameters estimated are:

k	π_k	$\overline{\mu}_k$	R_k
0	0.172	[5.62, 2.02]	$\begin{bmatrix} 0.67 & 0.26 \\ 0.26 & 0.56 \end{bmatrix}$
1	0.411	[2.08, 2.02]	$\begin{bmatrix} 1.12 & 0.14 \\ 0.14 & 1.00 \end{bmatrix}$
2	0.417	[-1.98, -1.95]	$\begin{bmatrix} 1.18 & -0.12 \\ -0.12 & 1.14 \end{bmatrix}$

C version output:

The optimum order is K*=3, with the following program output

```
$ ~smap-1.6.4/cluster-3.6.4/clust 10 info_file params full 0
Start clustering class 0

Subclasses = 10; Rissanen = 2089.448421;
Combining Subclasses (5,6)
Subclasses = 9; Rissanen = 2068.272884;
Combining Subclasses (3,8)
Subclasses = 8; Rissanen = 2046.017119;
Combining Subclasses (4,5)
Subclasses = 7; Rissanen = 2023.441892;
Combining Subclasses (1,3)
Subclasses = 6; Rissanen = 2004.413112;
Combining Subclasses (4,5)
Subclasses = 5; Rissanen = 1990.168182;
```

```
Combining Subclasses (1,2)
Subclasses = 4; Rissanen = 1974.557575;
Combining Subclasses (2,3)
Subclasses = 3; Rissanen = 1960.168578;
Combining Subclasses (0,1)
Subclasses = 2; Rissanen = 1986.796000;
Combining Subclasses (0,1)
Subclasses = 1; Rissanen = 2160.737859;
Maximum number of subclasses = 165
```

The parameters estimated are:

k	π_k	$\bar{\mu}_k$	$\mathbf{R}_k$
0	0.172	[5.62, 2.02]	$\begin{bmatrix} 0.67 & 0.26 \\ 0.26 & 0.56 \end{bmatrix}$
1	0.411	[2.08, 2.02]	$\begin{bmatrix} 1.12 & 0.14 \\ 0.14 & 1.00 \end{bmatrix}$
2	0.417	[-1.98, -1.95]	$\begin{bmatrix} 1.18 & -0.12 \\ -0.12 & 1.14 \end{bmatrix}$