# Pattern Recognition Report3
# Chapter3

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## 1 Question1

In my program of this question,function u1.m compute question(a),u2.m for question(b) ,u3.m for question(c),u4.m for question(d).

### 1.1 (a)

According to the maximum likelihood estimation on the Gaussian distribution,we can get :

$$\hat{\mu} = \frac{1}{N}\sigma_{k=1}Nx_k \tag{1}$$

$$\hat{\Sigma} = \frac{1}{N}\Sigma_{k=1}^{N}(x_k - \hat{\mu})(x_k - \hat{\mu})^T \tag{2}$$

In terms of (1) and (2),we could compute the value of the parameters by the program . The results are as follows:

| feature | $\hat{\mu}$ | $\hat{\sigma}^2$ |
|---|---|---|
| $x_1$ | -0.0709 | 0.9062 |
| $x_2$ | -0.6047 | 4.2007 |
| $x_3$ | -0.9110 | 4.5419 |

### 1.2 (b)

Similar with (1) and (2),we can get the results as follows:

$$\mu_{12} = (-0.0709, -0.6047)^T \quad \Sigma_{12} = \begin{matrix} 0.9062 & 0.5678 \\ 0.5678 & 4.2007 \end{matrix}$$

$$\mu_{23} = (-0.6047, -0.9110)^T \quad \Sigma_{23} = \begin{matrix} 4.2007 & 0.7337 \\ 0.7337 & 44.5419 \end{matrix}$$

$$\mu_{13} = (-0.0709, -0.9110)^T \quad \Sigma_{13} = \begin{matrix} 0.9062 & 0.3941 \\ 0.3941 & 4.5419 \end{matrix}$$

### 1.3 (c)

According to (1) and (2),we get the results as follows:

$$\mu = (-0.0709, -0.6047, -0.9110)^T$$

$$\Sigma = \begin{matrix} 0.9062 & 0.5678 & -0.9110 \\ 0.5678 & 4.2007 & 0.7337 \\ 0.3941 & 0.7337 & 4.5419 \end{matrix}$$

### 1.4 (d)

The results computed by the program :

$$\mu = (-0.1126, 0.4299, 0.0037)^T$$

$$\Sigma = \begin{matrix} 0.0539 & 0 & 0 \\ 0 & 0.0460 & 0 \\ 0 & 0 & 0.0073 \end{matrix}$$

### 1.5 (e)

The value of $\mu_i$ computed by the first three algorithms are the same. In terms of that the estimate of $\mu$ is not affected by other dimensional data.So we have the same results .

Similar ,the forth method's results are the same .

### 1.6 (f)

According to the forms of (2).The results are the same.

## 2 Question2

### 2.1 (a)

### 2.2 (b)