- 两类问题且其类模式都是正态分布的情况多类模式时已推出：

$$d_i(\boldsymbol{x}) = \ln P(\omega_i) - \frac{1}{2}\ln|\boldsymbol{C}_i| - \frac{1}{2}(\boldsymbol{x}-\boldsymbol{m}_i)\boldsymbol{C}_i^{-1}(\boldsymbol{x}-\boldsymbol{m}_i), i = 1, 2, \cdots, M$$

（1）当 $\boldsymbol{C}_1 \neq \boldsymbol{C}_2$ 时，两类模式的正态分布为：$p(\boldsymbol{x}|\omega_1)$表示为 $N(\boldsymbol{m}_1, \boldsymbol{C}_1)$，

$p(\boldsymbol{x}|\omega_2)$表示为 $N(\boldsymbol{m}_2, \boldsymbol{C}_2)$，$\omega_1$ 和 ω_2 两类的判别函数对应为：

$$d_1(\boldsymbol{x}) = \ln P(\omega_1) - \frac{1}{2}\ln|\boldsymbol{C}_1| - \frac{1}{2}(\boldsymbol{x}-\boldsymbol{m}_1)^T\boldsymbol{C}_1^{-1}(\boldsymbol{x}-\boldsymbol{m}_1)$$

$$d_2(x) = \ln P(\omega_2) - \frac{1}{2}\ln|\boldsymbol{C}_2| - \frac{1}{2}(\boldsymbol{x}-\boldsymbol{m}_2)^T\boldsymbol{C}_2^{-1}(\boldsymbol{x}-\boldsymbol{m}_2)$$

$$d_1(\boldsymbol{x}) - d_2(\boldsymbol{x}) = \begin{cases} > 0 & \boldsymbol{x} \in \omega_1 \\ < 0 & \boldsymbol{x} \in \omega_2 \end{cases}$$

（2）当 $\boldsymbol{C}_1=\boldsymbol{C}_2=\boldsymbol{C}$ 时，有：

$$d_i(\boldsymbol{x}) = \ln P(\omega_i) - \frac{1}{2}\ln|\boldsymbol{C}| - \frac{1}{2}\boldsymbol{x}^T\boldsymbol{C}^{-1}\boldsymbol{x} + \frac{1}{2}\boldsymbol{x}^T\boldsymbol{C}^{-1}\boldsymbol{m}_i + \frac{1}{2}\boldsymbol{m}_i^T\boldsymbol{C}^{-1}\boldsymbol{x} - \frac{1}{2}\boldsymbol{m}_i^T\boldsymbol{C}^{-1}\boldsymbol{m}_i, i = 1, 2$$

因 $\boldsymbol{C}$ 为对称矩阵，上式可简化为：

$$d_i(x) = \ln P(\omega_i) - \frac{1}{2}\ln|\boldsymbol{C}| - \frac{1}{2}\boldsymbol{x}^T\boldsymbol{C}^{-1}\boldsymbol{x} + \boldsymbol{m}_i^T\boldsymbol{C}^{-1}\boldsymbol{x} - \frac{1}{2}\boldsymbol{m}_i^T\boldsymbol{C}^{-1}\boldsymbol{m}_i, i = 1, 2$$

由此可导出类别 ω_1 和 ω_2 间的判别界面为：

$$d_1(\boldsymbol{x}) - d_2(\boldsymbol{x}) = \ln P(\omega_1) - \ln P(\omega_2) + (\boldsymbol{m}_1 - \boldsymbol{m}_2)^T\boldsymbol{C}^{-1}\boldsymbol{x} - \frac{1}{2}\boldsymbol{m}_1^T\boldsymbol{C}^{-1}\boldsymbol{m}_1 + \frac{1}{2}\boldsymbol{m}_2^T\boldsymbol{C}^{-1}\boldsymbol{m}_2 = 0$$