№9

x_1	0	1	0	2	2	2	4	3
x_2	-1	0	0	0	1	0	1	2
y	0	0	0	0	0	1	1	1

$$\hat{Pr}(Y=0)=\frac{5}{8} \qquad \hat{Pr}(Y=1)=\frac{3}{8}$$

$$\hat{\mu}_0=\begin{pmatrix}1\\0\end{pmatrix} \qquad \hat{\mu}_1=\begin{pmatrix}3\\1\end{pmatrix}$$

$$\hat{\Sigma}_0=\frac{1}{4}\left(\begin{pmatrix}-1\\-1\end{pmatrix}(-1\ \ -1)+(0\ \ 0)^T(0\ \ 0)+\begin{pmatrix}-1\\0\end{pmatrix}(-1\ \ 0)+\begin{pmatrix}1\\0\end{pmatrix}(1\ \ 0)+\begin{pmatrix}1\\1\end{pmatrix}(1\ \ 1)\right)$$

$$=\begin{pmatrix}1 & \frac{1}{2}\\ 1/2 & 1/2\end{pmatrix}$$

$$\hat{\Sigma}_1=\frac{1}{2}\left(\begin{pmatrix}-1\\-1\end{pmatrix}(-1\ \ -1)+\begin{pmatrix}1\\0\end{pmatrix}(1\ \ 0)+\begin{pmatrix}0\\1\end{pmatrix}(0\ \ 1)\right)=\frac{1}{2}\begin{pmatrix}2 & 1\\ 1 & 2\end{pmatrix}$$

$$\hat{\Sigma} = \frac{1}{6}\left(\begin{pmatrix} 4 & 2 \\ 2 & 2 \end{pmatrix} + \begin{pmatrix} 2 & 1 \\ 1 & 2 \end{pmatrix}\right) = \frac{1}{6}\begin{pmatrix} 6 & 3 \\ 3 & 4 \end{pmatrix}$$

$$\hat{\Sigma}_0^{-1} = \begin{pmatrix} 2 & -2 \\ -2 & 4 \end{pmatrix} \quad \hat{\Sigma}_1^{-1} = \frac{1}{3}\begin{pmatrix} 4 & -2 \\ -2 & 4 \end{pmatrix}$$

$$\hat{\Sigma}^{-1} = \frac{1}{5}\begin{pmatrix} 8 & -6 \\ -6 & 12 \end{pmatrix}$$

Линейн

- $\delta_0(X) = X^T \hat{\Sigma}^{-1} \hat{\mu}_0 - \frac{1}{2}\hat{\mu}_0^T \hat{\Sigma}^{-1} \hat{\mu}_0 + \ln \widehat{Pr}\{Y=0\} =$

$= \frac{8}{5}x_1 - \frac{6}{5}x_2 - \frac{8}{10} + \ln\frac{5}{8}$

- $\delta_1(X) = X^T \hat{\Sigma}^{-1} \hat{\mu}_1 - \frac{1}{2}\hat{\mu}_1^T \hat{\Sigma}^{-1} \hat{\mu}_1 + \ln \widehat{Pr}\{Y=1\} =$

$= \frac{18}{5}x_1 - \frac{6}{5}x_2 - \frac{48}{10} + \ln\frac{3}{8}$

$\delta_0 = \delta_1$

$$-2x_1 + 4 + \ln\frac{5}{3} = 0$$

Квадр

- $\delta_0(x) = -\frac{1}{2}\ln\det\hat{\Sigma}_0 - \frac{1}{2}(x-\hat{\mu}_0)^T \hat{\Sigma}_0^{-1}(x-\hat{\mu}_0) + \ln \hat{P}r\{Y=0\} =$

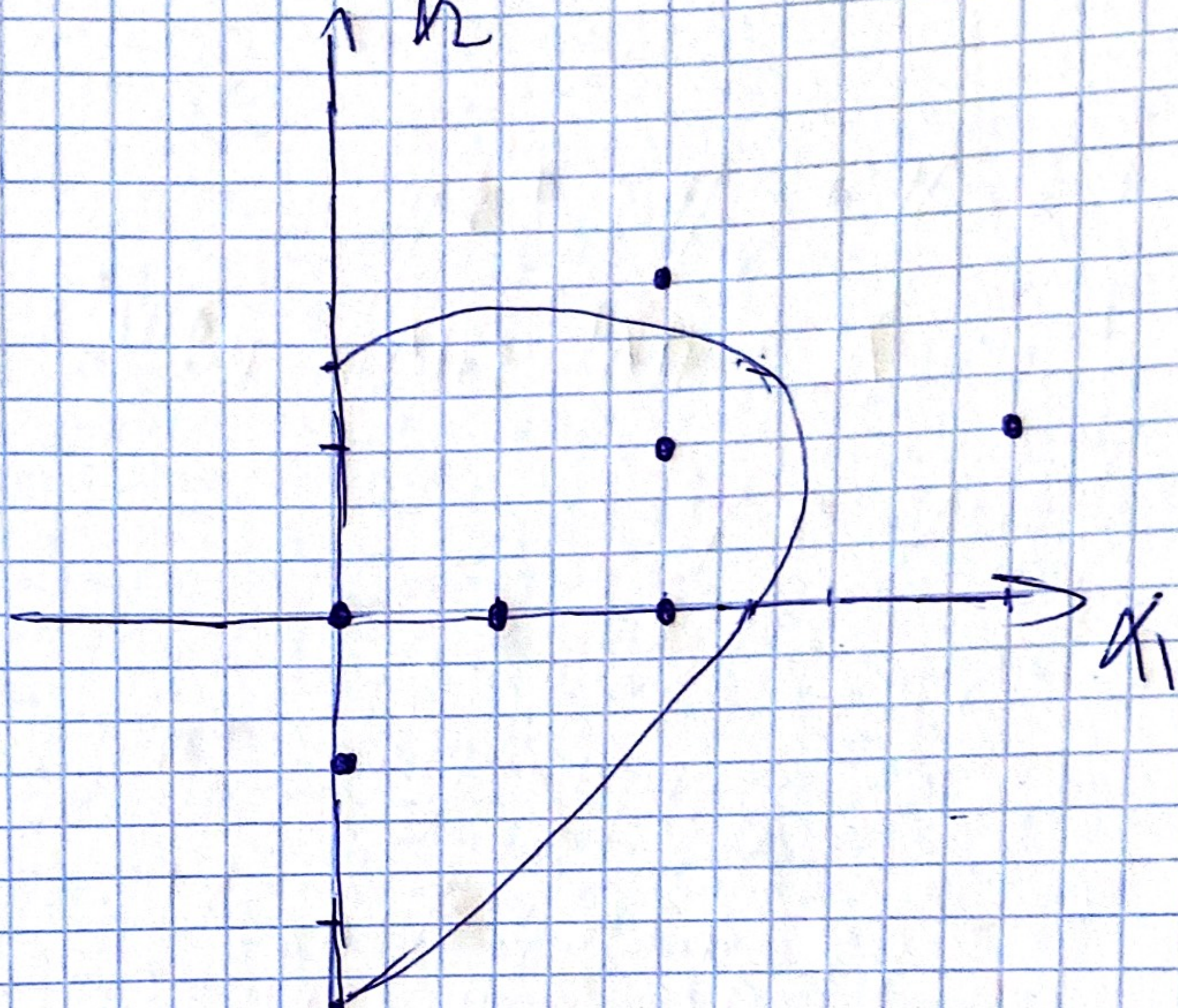
$$= -\frac{1}{2}\ln\frac{1}{4} + \ln\frac{5}{8} - x_1^2 + 2x_1 + 2x_1x_2 - 2x_2^2 - 2x_2 - 2$$

- $\delta_1(x) = -\frac{1}{2}\ln\det\hat{\Sigma}_0 - \frac{1}{2}(x-\hat{\mu}_1)^T \hat{\Sigma}_1^{-1}(x-\hat{\mu}_1) + \ln \hat{P}r(Y=1) =$

$$= -\frac{1}{2}\ln\frac{3}{4} + \ln\frac{3}{8} - \frac{2}{3}x_1^2 + \frac{10}{3}x_1 + \frac{2}{3}x_1x_2 - \frac{2}{3}x_2^2 - \frac{2}{3}x_2 - \frac{14}{3}$$

$$\delta_0 = \delta_1$$

$$\begin{cases} x_1^2 + 4x_1 + 4x_2 - 4x_1x_2 + 4x_2^2 = \\ = 11 + \frac{3}{2}\ln 3 + 3\ln\frac{5}{3} \end{cases}$$



k_2
k_1

N 15

X_1	0	0	1	1	0	0	1	1	1	0
X_2	1	1	0	1	1	1	1	1	1	1
y	0	0	0	0	0	1	1	1	1	1

$\widehat{Pr}\{Y=0\} = \widehat{Pr}\{Y=1\} = \frac{1}{2}$

$\widehat{Pr}\{X_1=0 \mid Y=0\} = \frac{3}{5}$

$\widehat{Pr}\{X_2=0 \mid Y=0\} = \frac{2}{5}$

$\widehat{Pr}\{X_1=1 \mid Y=0\} = \frac{2}{5}$

$\widehat{Pr}\{X_2=1 \mid Y=0\} = \frac{3}{5}$

$\widehat{Pr}(X_1=0 \mid Y=1) = \frac{2}{5}$

$\widehat{Pr}(X_1=1 \mid Y=1) = \frac{3}{5}$

$\widehat{Pr}(X_2=0 \mid Y=1) = 0$

$\widehat{Pr}(X_2=1 \mid Y=1) = 1$

$Pr\{Y=0 \mid X_1=1, X_2=1\} =$

$$= \frac{Pr\{X_1 = 1 \mid Y = 0\} \cdot Pr\{X_2 = 1 \mid Y = 0\} \, Pr\{Y = 0\}}{Pr\{X_1 = 0, X_2 = 1\}}$$

$$= \frac{2}{8}$$

- $Pr\{Y = 1 \mid X_1 = 0, X_2 = 1\} =$

$$= \frac{Pr\{X_1 = 1 \mid Y = 1\} \cdot Pr\{X_2 = 1 \mid Y = 0\} \cdot Pr\{Y = 0\}}{Pr\{X_1 = 0, X_2 = 1\}}$$

$$= \frac{5}{8}$$