$i := 3 \quad j := 3$

$ORIGIN := 1$

$XA11 := 450 \quad XA12 := 525 \quad XA13 := 500$
$XA21 := 648 \quad XA22 := 708 \quad XA23 := 690$
$XA31 := 29 \quad XA32 := 28 \quad XA33 := 31$

$XB11 := 250 \quad XB12 := 225 \quad XB13 := 300$
$XB21 := 406 \quad XB22 := 412 \quad XB23 := 385$
$XB31 := 18 \quad XB32 := 12 \quad XB33 := 14$

$XC11 := 425 \quad XC12 := 400 \quad XC13 := 375 \quad XC14 := 350$
$XC21 := 450 \quad XC22 := 550 \quad XC23 := 500 \quad XC24 := 650$
$XC31 := 20 \quad XC32 := 30 \quad XC33 := 28 \quad XC34 := 29$

$$A := \begin{pmatrix} XA11 & XA12 & XA12 \\ XA21 & XA22 & XA23 \\ XA31 & XA32 & XA33 \end{pmatrix} = \begin{pmatrix} 450 & 525 & 525 \\ 648 & 708 & 690 \\ 29 & 28 & 31 \end{pmatrix}$$

$$B := \begin{pmatrix} XB11 & XB12 & XB12 \\ XB21 & XB22 & XB23 \\ XB31 & XB32 & XB33 \end{pmatrix} = \begin{pmatrix} 250 & 225 & 225 \\ 406 & 412 & 385 \\ 18 & 12 & 14 \end{pmatrix}$$

$$\frac{\left(A_{1,1} + A_{1,2} + A_{1,3}\right)}{3} = 500$$

$$\frac{\left(B_{1,1} + B_{1,2} + B_{1,3}\right)}{3} = 233.333$$

$$\frac{\left(A_{2,1} + A_{2,2} + A_{2,3}\right)}{3} = 682$$

$$\frac{\left(B_{2,1} + B_{2,2} + B_{2,3}\right)}{3} = 401$$

$$\frac{\left(A_{3,1} + A_{3,2} + A_{3,3}\right)}{3} = 29.333$$

$$\frac{\left(B_{3,1} + B_{3,2} + B_{3,3}\right)}{3} = 14.667$$

$$C := \begin{pmatrix} XC11 & XC12 & XC13 & XC14 \\ XC21 & XC22 & XC23 & XC24 \\ XC31 & XC32 & XC33 & XC34 \end{pmatrix} = \begin{pmatrix} 425 & 400 & 375 & 350 \\ 450 & 550 & 500 & 650 \\ 20 & 30 & 28 & 29 \end{pmatrix}$$

$$\frac{\left(C_{1,1} + C_{1,2} + C_{1,3} + C_{1,4}\right)}{4} = 387.5$$

$$\frac{\left(C_{2,1} + C_{2,2} + C_{2,3} + C_{2,4}\right)}{4} = 537.5$$

$$\frac{\left(C_{3,1} + C_{3,2} + C_{3,3} + C_{3,4}\right)}{4} = 26.75$$

$$XA := \begin{bmatrix} \dfrac{\sum \left(A^T\right)^{\langle 1 \rangle T}}{3} \\ \dfrac{\sum \left(A^T\right)^{\langle 2 \rangle T}}{3} \\ \dfrac{\sum \left(A^T\right)^{\langle 3 \rangle T}}{3} \end{bmatrix} = \begin{pmatrix} 500 \\ 682 \\ 29.333 \end{pmatrix}$$

$$XB := \begin{bmatrix} \dfrac{\sum \left(B^T\right)^{\langle 1 \rangle T}}{3} \\ \dfrac{\sum \left(B^T\right)^{\langle 2 \rangle T}}{3} \\ \dfrac{\sum \left(B^T\right)^{\langle 3 \rangle T}}{3} \end{bmatrix} = \begin{pmatrix} 233.333 \\ 401 \\ 14.667 \end{pmatrix}$$

$$XC := \begin{bmatrix} \dfrac{\sum \left(C^T\right)^{\langle 1 \rangle T}}{4} \\ \dfrac{\sum \left(C^T\right)^{\langle 2 \rangle T}}{4} \\ \dfrac{\sum \left(C^T\right)^{\langle 3 \rangle T}}{4} \end{bmatrix} = \begin{pmatrix} 387.5 \\ 537.5 \\ 26.75 \end{pmatrix}$$

$$Sa := \begin{bmatrix} \sum_{j=1}^{3} (A_{1,j} - XA_1)^2 & \sum_{j=1}^{3} [(A_{1,j} - XA_1)\cdot(A_{2,j} - XA_2)] & \sum_{j=1}^{3} [(A_{1,j} - XA_1)\cdot(A_{3,j} - XA_3)] \\ \sum_{j=1}^{3} [(A_{1,j} - XA_1)\cdot(A_{2,j} - XA_2)] & \sum_{j=1}^{3} (A_{2,j} - XA_2)^2 & \sum_{j=1}^{3} [(A_{2,j} - XA_2)\cdot(A_{3,j} - XA_3)] \\ \sum_{j=1}^{3} [(A_{1,j} - XA_1)\cdot(A_{3,j} - XA_3)] & \sum_{j=1}^{3} [(A_{2,j} - XA_2)\cdot(A_{3,j} - XA_3)] & \sum_{j=1}^{3} (A_{3,j} - XA_3)^2 \end{bmatrix} = \begin{pmatrix} 3.75 \times 10^3 & 2.55 \times 10^3 & 25 \\ 2.55 \times 10^3 & 1.896 \times 10^3 & -10 \\ 25 & -10 & 4.667 \end{pmatrix}$$

$$Sb := \begin{bmatrix} \sum_{j=1}^{3} (B_{1,j} - XB_1)^2 & \sum_{j=1}^{3} [(B_{1,j} - XB_1)\cdot(B_{2,j} - XB_2)] & \sum_{j=1}^{3} [(B_{1,j} - XB_1)\cdot(B_{3,j} - XB_3)] \\ \sum_{j=1}^{3} [(B_{1,j} - XB_1)\cdot(B_{2,j} - XB_2)] & \sum_{j=1}^{3} (B_{2,j} - XB_2)^2 & \sum_{j=1}^{3} [(B_{2,j} - XB_2)\cdot(B_{3,j} - XB_3)] \\ \sum_{j=1}^{3} [(B_{1,j} - XB_1)\cdot(B_{3,j} - XB_3)] & \sum_{j=1}^{3} [(B_{2,j} - XB_2)\cdot(B_{3,j} - XB_3)] & \sum_{j=1}^{3} (B_{3,j} - XB_3)^2 \end{bmatrix} = \begin{pmatrix} 416.667 & 125 & 83.333 \\ 125 & 402 & -2 \\ 83.333 & -2 & 18.667 \end{pmatrix}$$

$$Sc := \begin{bmatrix} \sum_{j=1}^{3} (C_{1,j} - XC_1)^2 & \sum_{j=1}^{3} [(C_{1,j} - XC_1)\cdot(C_{2,j} - XC_2)] & \sum_{j=1}^{3} [(C_{1,j} - XC_1)\cdot(C_{3,j} - XC_3)] \\ \sum_{j=1}^{3} [(C_{1,j} - XC_1)\cdot(C_{2,j} - XC_2)] & \sum_{j=1}^{3} (C_{2,j} - XC_2)^2 & \sum_{j=1}^{3} [(C_{2,j} - XC_2)\cdot(C_{3,j} - XC_3)] \\ \sum_{j=1}^{3} [(C_{1,j} - XC_1)\cdot(C_{3,j} - XC_3)] & \sum_{j=1}^{3} [(C_{2,j} - XC_2)\cdot(C_{3,j} - XC_3)] & \sum_{j=1}^{3} (C_{3,j} - XC_3)^2 \end{bmatrix} = \begin{pmatrix} 1.719 \times 10^3 & -2.656 \times 10^3 & -228.125 \\ -2.656 \times 10^3 & 9.219 \times 10^3 & 584.375 \\ -228.125 & 584.375 & 57.688 \end{pmatrix}$$

$N2 := 3 \qquad N1 := 3$

$$M := \left(\frac{1}{N2 + N1 - 2}\right)\cdot(Sa - Sb) = \begin{pmatrix} 833.333 & 606.25 & -14.583 \\ 606.25 & 373.5 & -2 \\ -14.583 & -2 & -3.5 \end{pmatrix}$$

$$CC := M^{-1} = \begin{pmatrix} -8.764\times 10^{-3} & 0.014 & 0.028 \\ 0.014 & -0.021 & -0.048 \\ 0.028 & -0.048 & -0.376 \end{pmatrix}$$

$$|M| = 1.496\times 10^{5}$$

$$q := \begin{bmatrix} \sum_{i=1}^{3} (M_{1,i})^2 & \sum_{i=1}^{3} \left[(M_{1,i})\cdot M_{2,i}\right] & \sum_{i=1}^{3} M_{1,i} \\ \sum_{i=1}^{3} \left[(M_{1,i})\cdot M_{2,i}\right] & \sum_{i=1}^{3} (M_{2,i})^2 & \sum_{i=1}^{3} M_{2,i} \\ \sum_{i=1}^{3} M_{1,i} & \sum_{i=1}^{3} M_{2,i} & 3 \end{bmatrix} \qquad q = \begin{pmatrix} 1.062\times 10^{6} & 7.317\times 10^{5} & 1.425\times 10^{3} \\ 7.317\times 10^{5} & 5.07\times 10^{5} & 977.75 \\ 1.425\times 10^{3} & 977.75 & 3 \end{pmatrix}$$

Вывод: В данной лабораторной работе изучили построение классификации т.е. распознавание геологических объектов на примере дискриминантного анализа.