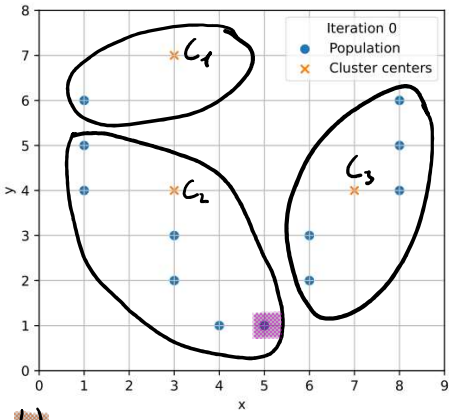
Aufgabe 21

Samstag, 25. Juni 2022 15:53

a)



same distance to C_2 and C_3
↳ put into C_2

New Cluster Centers:

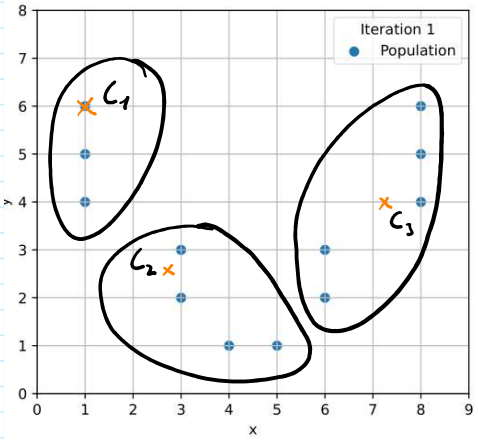
$C_1' = \begin{pmatrix}1\\6\end{pmatrix}$

$C_2' = \vec{\mu}_2 = \frac{1}{6}\cdot\left(\begin{pmatrix}1\\5\end{pmatrix}+\begin{pmatrix}1\\4\end{pmatrix}+\begin{pmatrix}3\\3\end{pmatrix}+\begin{pmatrix}3\\2\end{pmatrix}+\begin{pmatrix}4\\1\end{pmatrix}+\begin{pmatrix}5\\1\end{pmatrix}\right)$

$= \frac{1}{6}\cdot\begin{pmatrix}17\\16\end{pmatrix} \approx \begin{pmatrix}2{,}83\\2{,}67\end{pmatrix}$

$C_3' = \vec{\mu}_3 = \frac{1}{5}\begin{pmatrix}2\cdot 6+3\cdot 8\\2+3+4+5+6\end{pmatrix} = \frac{1}{5}\begin{pmatrix}36\\20\end{pmatrix} = \begin{pmatrix}7{,}2\\4\end{pmatrix}$

b)



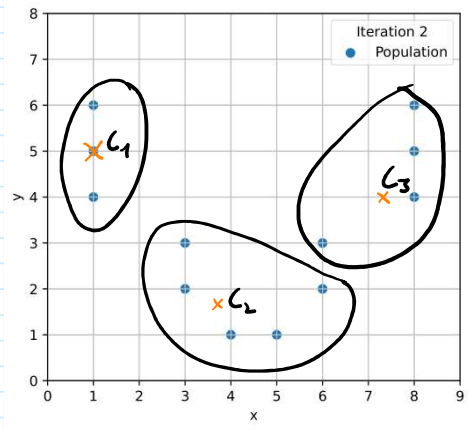
$\left|\begin{pmatrix}1\\4\end{pmatrix} - C_1\right| = 2$ (can be seen)

$\left|\begin{pmatrix}1\\4\end{pmatrix} - C_2\right| = \sqrt{1{,}83^2+1{,}33^2} > 2$ $\Rightarrow$ assign to C_1

$C_1' = \vec{\mu}_1 = \frac{1}{3}\begin{pmatrix}3\cdot 1\\4+5+6\end{pmatrix} = \begin{pmatrix}1\\5\end{pmatrix}$

$C_2' = \vec{\mu}_2 = \frac{1}{4}\begin{pmatrix}2\cdot 3+4+5\\2+3+2\cdot 1\end{pmatrix} = \frac{1}{4}\begin{pmatrix}15\\7\end{pmatrix} = \begin{pmatrix}3{,}75\\1{,}75\end{pmatrix}$

$C_3' = \vec{\mu}_3 = \frac{1}{5}\begin{pmatrix}2\cdot 6+3\cdot 8\\2+3+4+5+6\end{pmatrix} = \frac{1}{5}\begin{pmatrix}36\\20\end{pmatrix} = \begin{pmatrix}7{,}2\\4\end{pmatrix}$



$\left|\begin{pmatrix}6\\2\end{pmatrix} - C_2\right| = \sqrt{2{,}25^2+0{,}25^2} = \sqrt{5{,}125}$

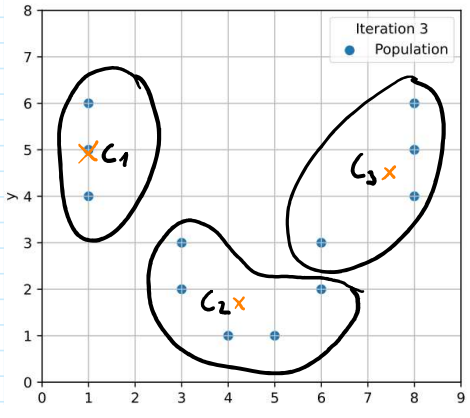
$\left|\begin{pmatrix}6\\2\end{pmatrix} - C_3\right| = \sqrt{1{,}2^2+2^2} = \sqrt{5{,}44} > \sqrt{5{,}125}$

$\Rightarrow$ assign to C_2

$C_1' = C_1 = \begin{pmatrix}1\\5\end{pmatrix}$

$C_2' = \frac{1}{5}\begin{pmatrix}2\cdot 3+4+5+6\\2\cdot 1+2\cdot 2+3\end{pmatrix} = \frac{1}{5}\begin{pmatrix}21\\9\end{pmatrix} = \begin{pmatrix}4{,}2\\1{,}8\end{pmatrix}$

$C_3' = \frac{1}{4}\begin{pmatrix}6+3\cdot 8\\3+4+5+6\end{pmatrix} = \begin{pmatrix}30\\18\end{pmatrix} = \begin{pmatrix}7{,}5\\4{,}5\end{pmatrix}$



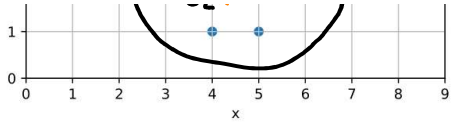
$C_1' = C_1 = \begin{pmatrix}1\\5\end{pmatrix}$

$\left|\begin{pmatrix}6\\3\end{pmatrix} - C_2\right| = \sqrt{1{,}8^2+1{,}2^2} = \sqrt{4{,}68}$

$\left|\begin{pmatrix}6\\3\end{pmatrix} - C_3\right| = \sqrt{1{,}5^2+1{,}5^2} = \sqrt{4{,}5}$ $\Rightarrow$ assign to C_3

$C_2' = C_2$
$C_3' = C_3$ (same points)

$\Rightarrow$ Convergence of the algorithm after 3rd iteration



$C_3 = C_3$

⇒ Convergence of the algorithm after 3rd iteration

c) The result does not match the expectations, because the point (6 3) seems to belong to C_1.