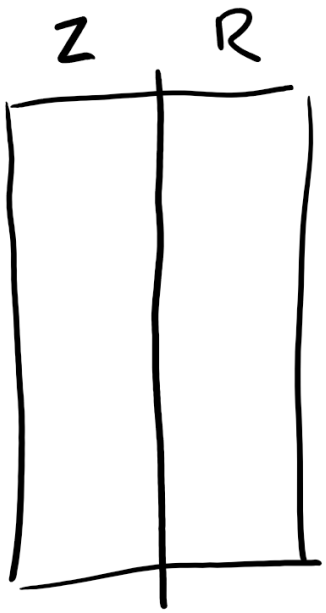
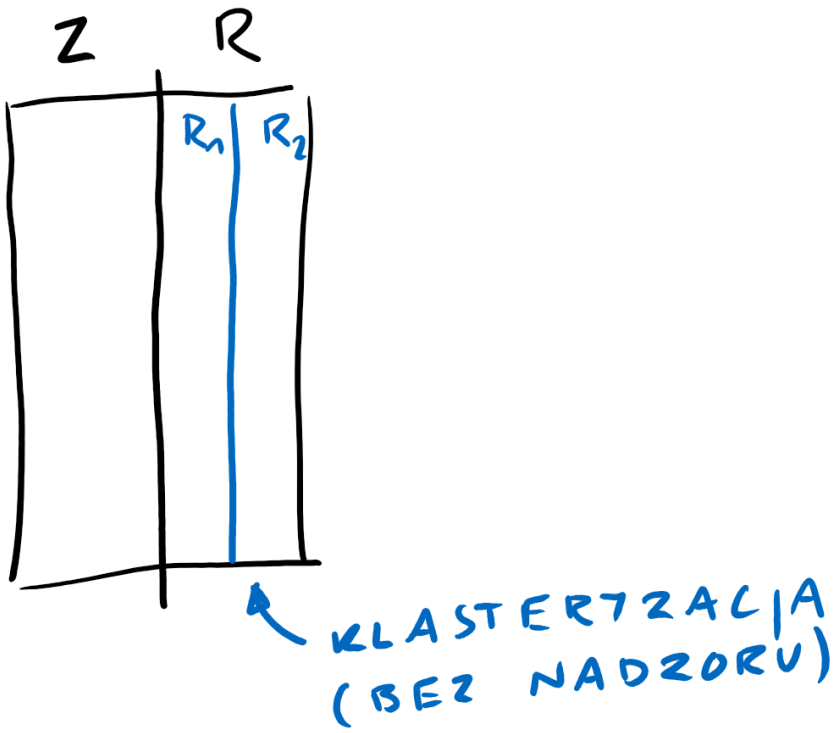
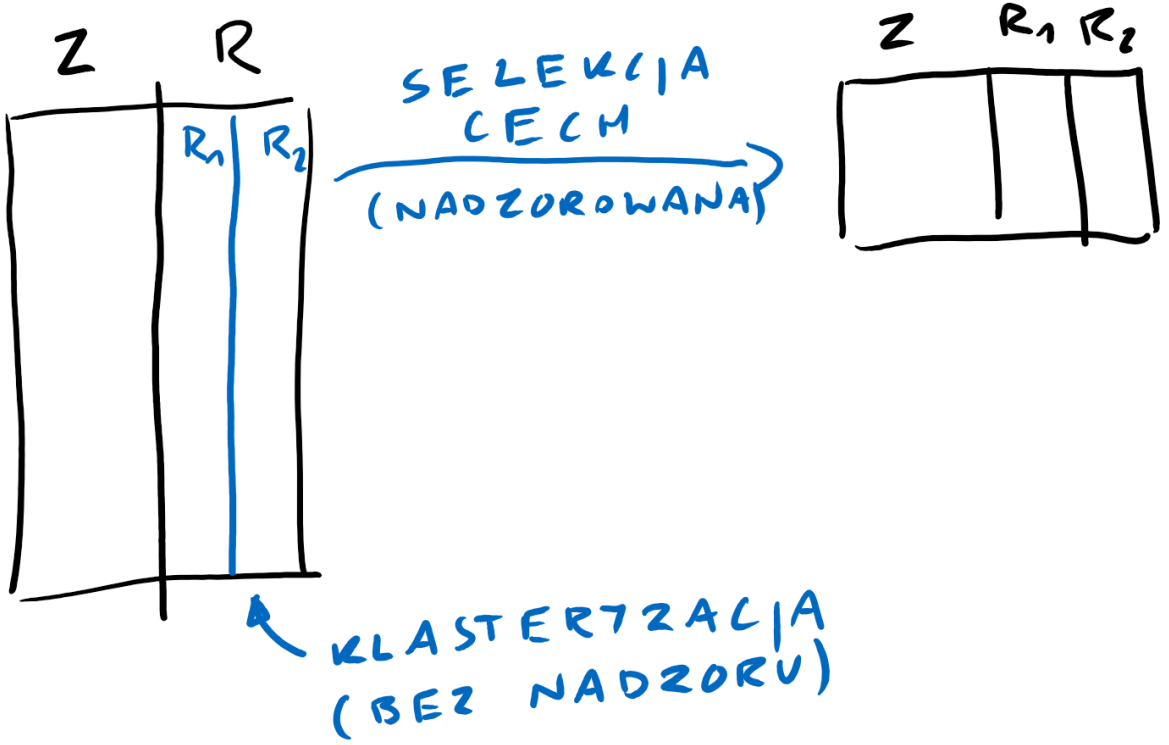
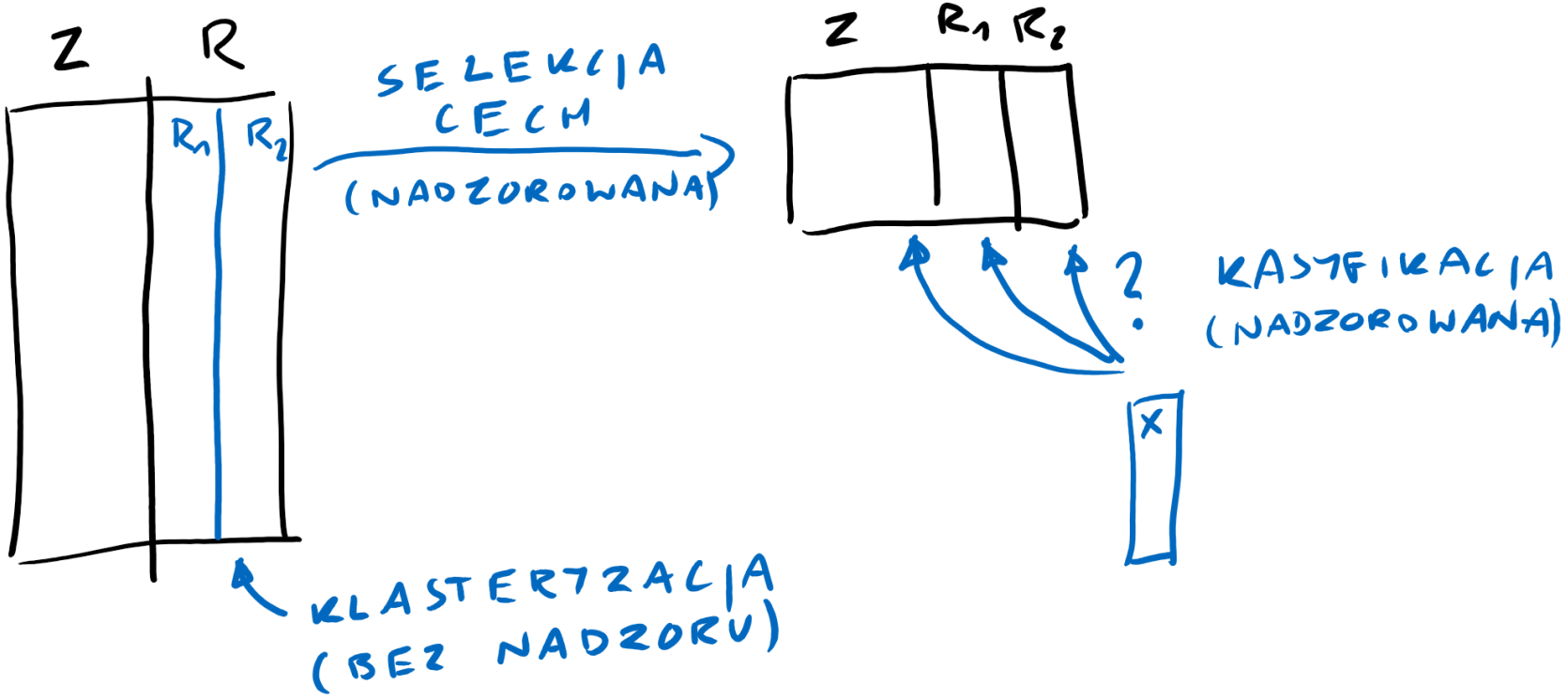

Z
R

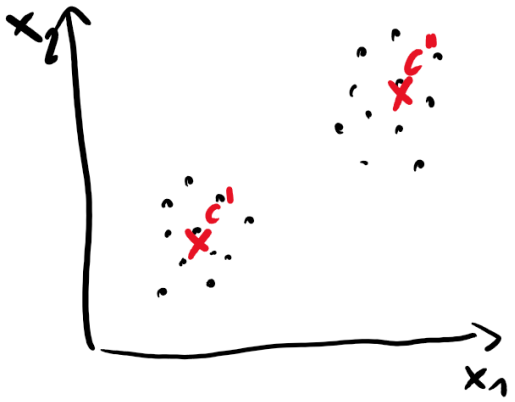

Z
R
R_1
R_2
KLASTERYZACJA
(BEZ NADZORU)

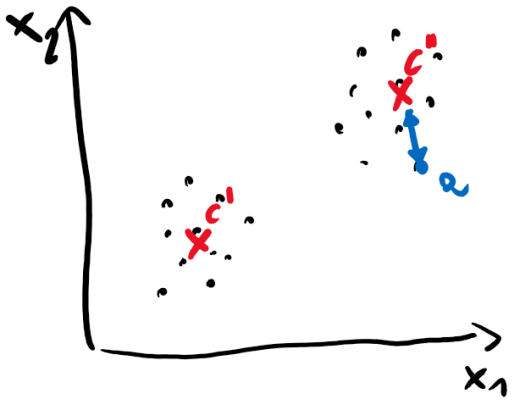

Z
R
R_1
R_2
SELEKCJA CECH (NADZOROWANA)
Z
R_1
R_2
KLASTERYZACJA (BEZ NADZORU)


Z
R
R_1
R_2
SELEKCJA CECH (NADZOROWANA)
Z
R_1 R_2
?
KLASYFIKACJA (NADZOROWANA)
X
KLASTERYZACJA (BEZ NADZORU)


x_2
x_1

$$c' = \begin{bmatrix} c'_1 \\ c'_2 \end{bmatrix} \qquad c'' = \begin{bmatrix} c''_1 \\ c''_2 \end{bmatrix}$$

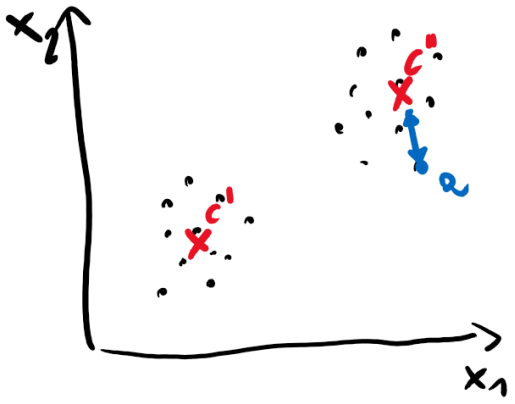




$$c' = \begin{bmatrix} c'_1 \\ c'_2 \end{bmatrix} \qquad c'' = \begin{bmatrix} c''_1 \\ c''_2 \end{bmatrix}$$

$$a = \begin{bmatrix} a_1 \\ a_2 \end{bmatrix}$$

$$d(a, c') = \sqrt{(a_1 - c'_1)^2 + (a_2 - c'_2)^2}$$



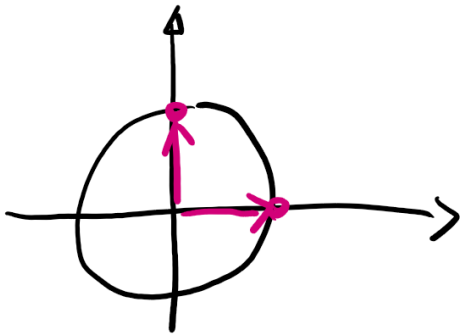
$$c' = \begin{bmatrix} c'_1 \\ c'_2 \end{bmatrix} \qquad c'' = \begin{bmatrix} c''_1 \\ c''_2 \end{bmatrix}$$

$$a = \begin{bmatrix} a_1 \\ a_2 \end{bmatrix}$$

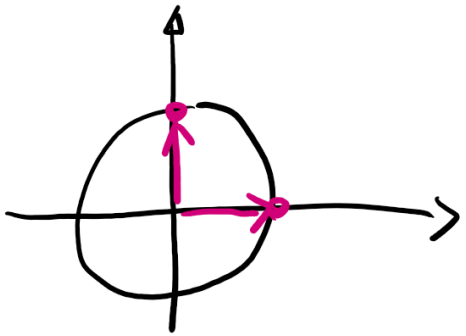
$$d(a, c') = \sqrt{(a_1 - c'_1)^2 + (a_2 - c'_2)^2}$$

$$\sum_{i=1}^{2} \sum_{a \in C^i} d(a, c^i) \to \min$$

$$d_E(a,b) = \sqrt{(a_1 - b_1)^2 + (a_2 - b_2)^2}$$

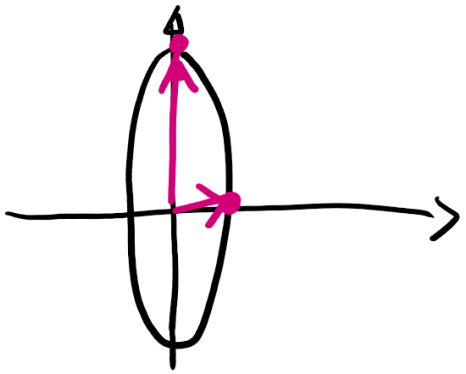


$$d_E(a,b) = \sqrt{\frac{1}{w_1}(a_1 - b_1)^2 + \frac{1}{w_2}(a_2 - b_2)^2}$$



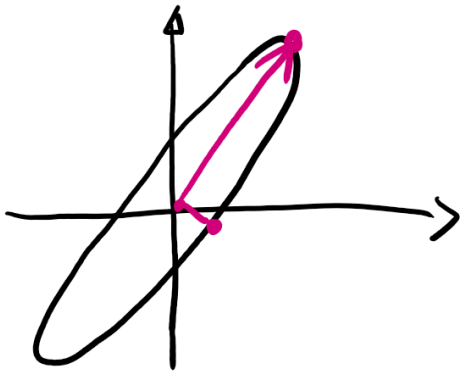
$$W = \begin{bmatrix} w_1 & 0 \\ 0 & w_2 \end{bmatrix} = \begin{bmatrix} \uparrow & 0 \\ 0 & \uparrow \end{bmatrix}$$

$$d_{EW}(a,b) = \sqrt{\frac{1}{w_1}(a_1 - b_1)^2 + \frac{1}{w_2}(a_2 - b_2)^2}$$

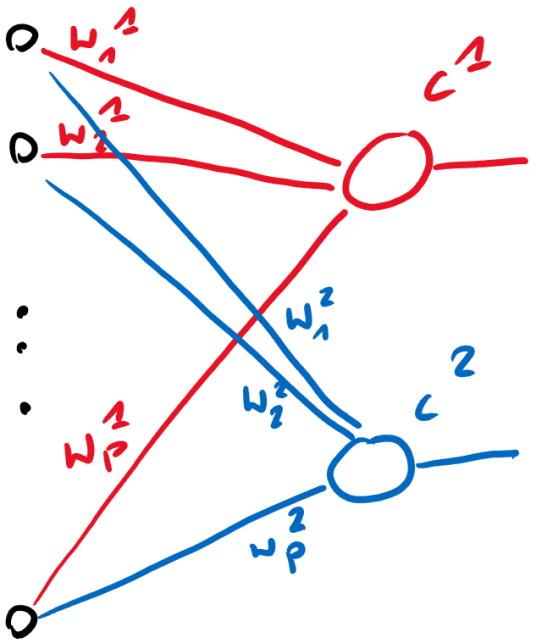


$$W = \begin{bmatrix} w_1 & \emptyset \\ \emptyset & w_2 \end{bmatrix} = \begin{bmatrix} \sigma_1^2 & \emptyset \\ \emptyset & \sigma_2^2 \end{bmatrix}$$

$$d_M(a,b) = \left[(a-b)^T W^{-1} (a-b) \right]^{1/2}$$



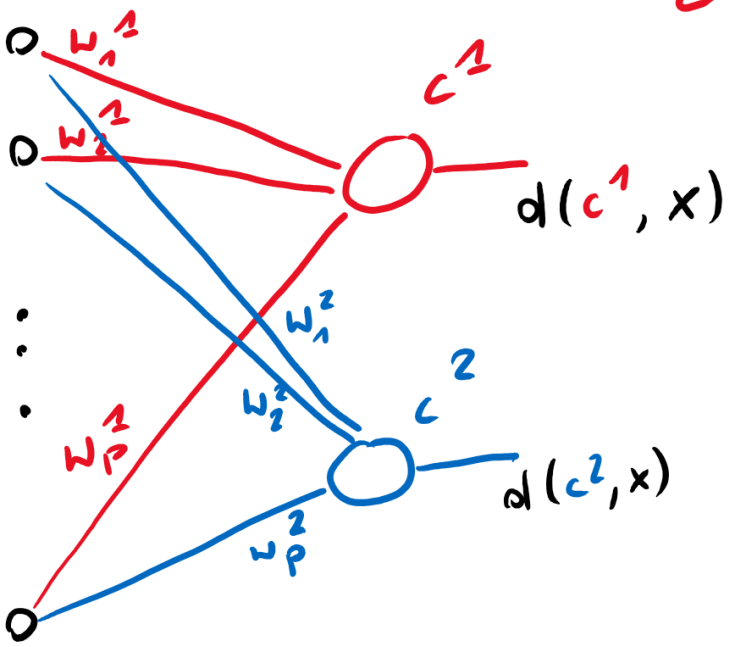
$$W = \begin{bmatrix} w_{11} & w_{12} \\ w_{21} & w_2 \end{bmatrix} = \begin{bmatrix} \sigma_1^2 & \sigma_{12} \\ \sigma_{21} & \sigma_2^2 \end{bmatrix}$$



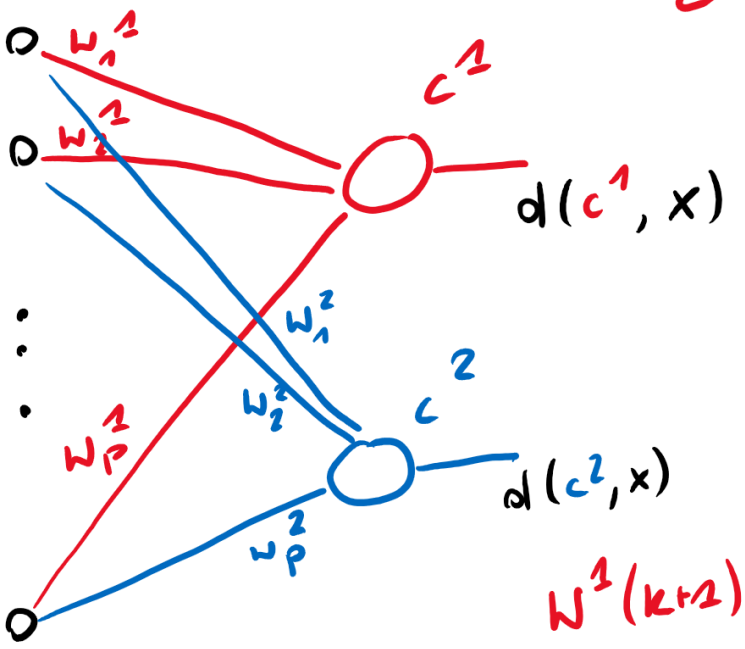
$$c^1 = \begin{bmatrix} w_1^1 \\ w_2^1 \\ \vdots \\ w_p^1 \end{bmatrix} \quad c^2 = \begin{bmatrix} w_1^2 \\ w_2^2 \\ \vdots \\ w_p^2 \end{bmatrix}$$

$$c^1 = \begin{bmatrix} w_1^1 \\ w_2^1 \\ \vdots \\ w_p^1 \end{bmatrix} \quad c^2 = \begin{bmatrix} w_1^2 \\ w_2^2 \\ \vdots \\ w_p^2 \end{bmatrix}$$

$$x = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_p \end{bmatrix}$$



$$x = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_p \end{bmatrix}$$



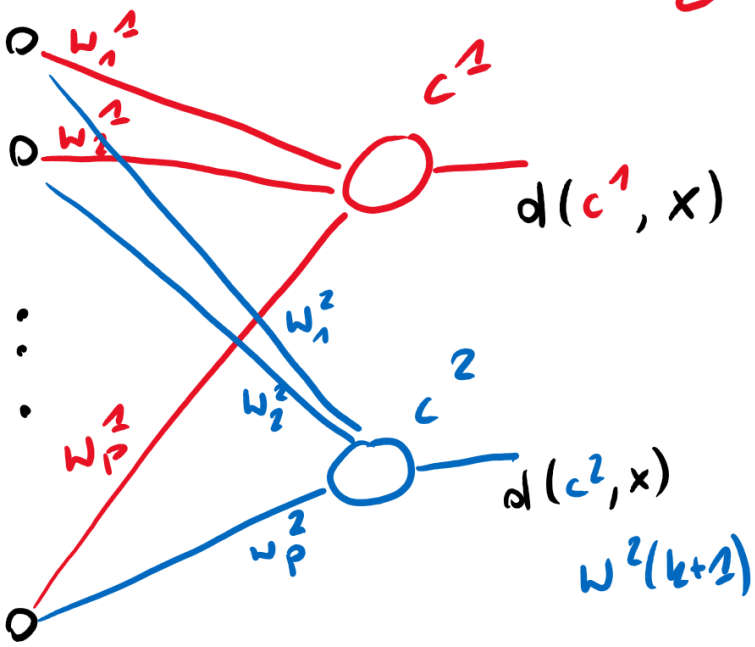
$$c^1 = \begin{bmatrix} w_1^1 \\ w_2^1 \\ \vdots \\ w_p^1 \end{bmatrix} \quad c^2 = \begin{bmatrix} w_1^2 \\ w_2^2 \\ \vdots \\ w_p^2 \end{bmatrix}$$

$$d(c^1, x) < d(c^2, x)$$

$$\Downarrow$$

$$w^1(k+1) = \eta \cdot x + (1-\eta) \cdot w^1(k)$$

$$x = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_p \end{bmatrix}$$

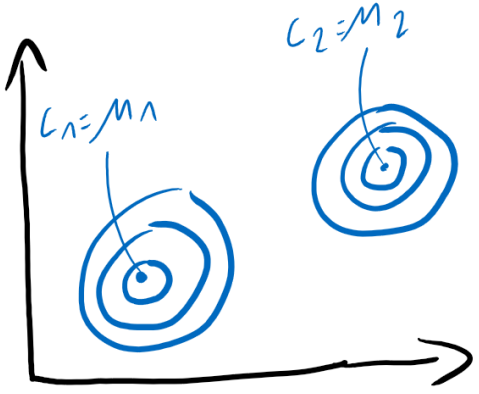


$$c^1 = \begin{bmatrix} w_1^1 \\ w_2^1 \\ \vdots \\ w_p^1 \end{bmatrix} \quad c^2 = \begin{bmatrix} w_1^2 \\ w_2^2 \\ \vdots \\ w_p^2 \end{bmatrix}$$

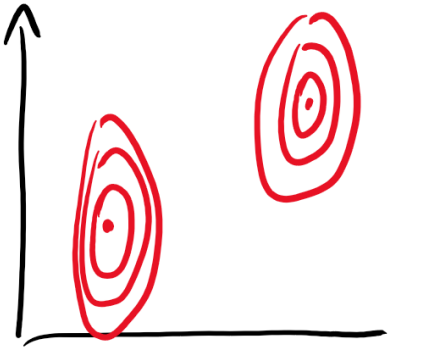
$$d(c^1, x) > d(c^2, x)$$

$$\Downarrow$$

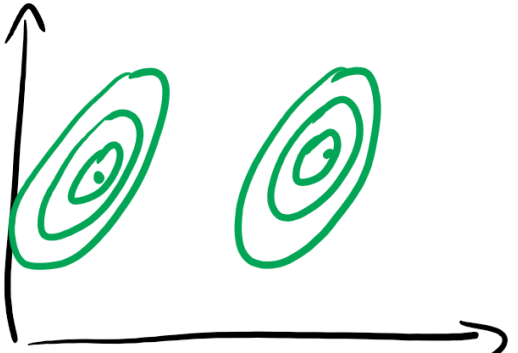
$$w^2(k+1) = \eta \cdot x + (1-\eta) \cdot w^2(k)$$



$$\Sigma = \begin{bmatrix} \sigma^2 & \rho \\ 0 & \sigma^2 \end{bmatrix}$$



$$\Sigma = \begin{bmatrix} \sigma_1^2 & \emptyset \\ \emptyset & \sigma_2^2 \end{bmatrix}$$



$$\Sigma = \begin{bmatrix} \sigma_1^2 & \sigma_{12} \\ \sigma_{21} & \sigma_2^2 \end{bmatrix}$$