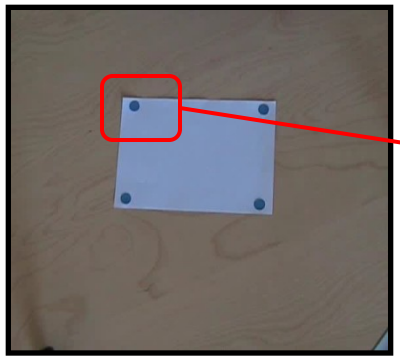
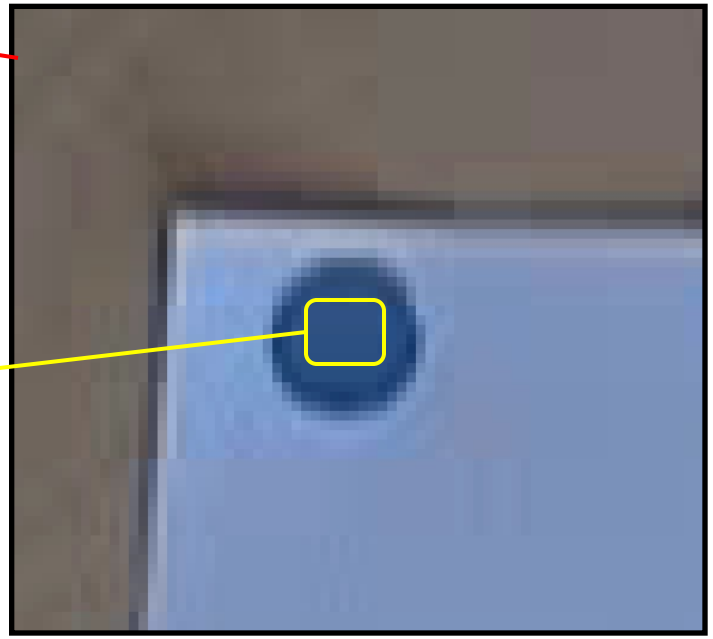
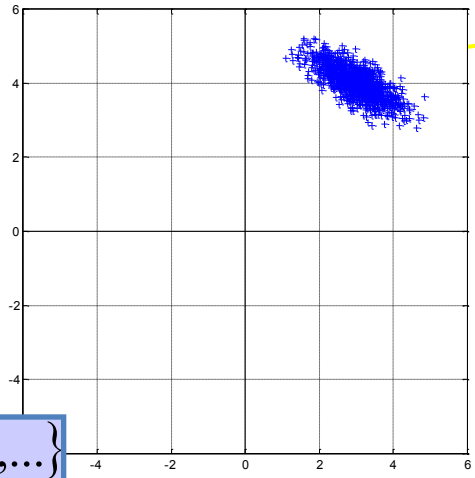
Segmentation couleur

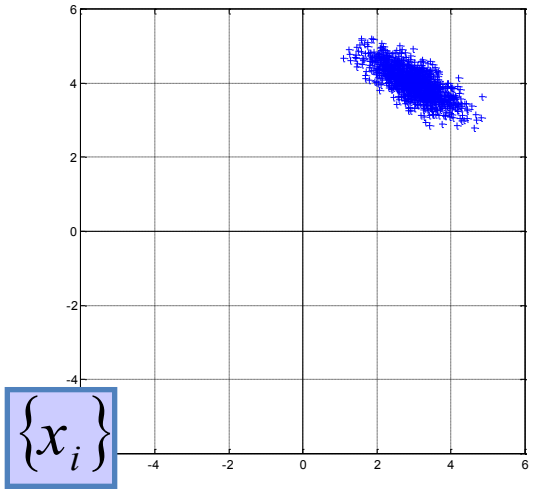






$\{R, G, B, \ldots\}$

Nuage colorimétrique



$$\mu = \begin{bmatrix} \mu^1 \\ \mu^2 \end{bmatrix} = \overline{x_i} = \frac{1}{N}\sum_{i=1}^{N} x_i$$

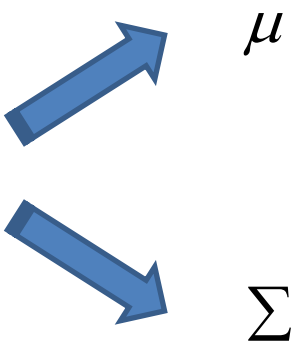
Moyenne

$$\Sigma = \begin{pmatrix} \Sigma^{1,1} & \Sigma^{1,2} \\ \Sigma^{2,1} & \Sigma^{2,2} \end{pmatrix} = \frac{1}{N}\begin{pmatrix} \sum_{i=1}^{N}\left(x_i^1 - \mu^1\right)\left(x_i^1 - \mu^1\right) & \sum_{i=1}^{N}\left(x_i^1 - \mu^1\right)\left(x_i^2 - \mu^2\right) \\ \sum_{i=1}^{N}\left(x_i^1 - \mu^1\right)\left(x_i^2 - \mu^2\right) & \sum_{i=1}^{N}\left(x_i^2 - \mu^2\right)\left(x_i^2 - \mu^2\right) \end{pmatrix}$$

Matrice de covariance

Méthode de segmentation

Modèle de segmentation



Distance de segmentation

$$D^{Maha}(x_i) = (x_i - \mu)^T \Sigma^{-1} (x_i - \mu)$$

seuillage pour obtenir une segmentation

Interprétation

$$\Sigma = VDV^T = \begin{pmatrix} U^1 & U^2 \end{pmatrix} \begin{pmatrix} \lambda_1 & 0 \\ 0 & \lambda_2 \end{pmatrix} \begin{pmatrix} U^1 & U^2 \end{pmatrix}^T$$

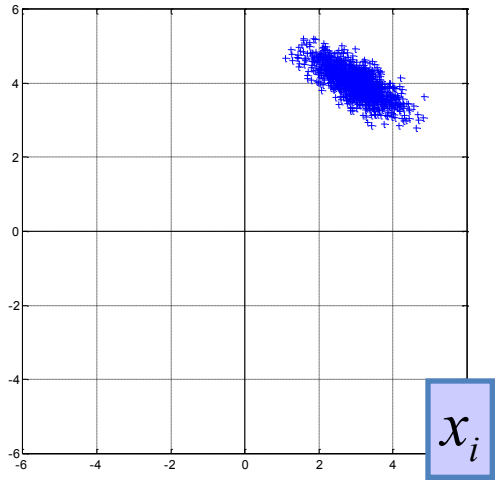
Affinité
(valeurs propres)

Rotation
(vecteurs propres)

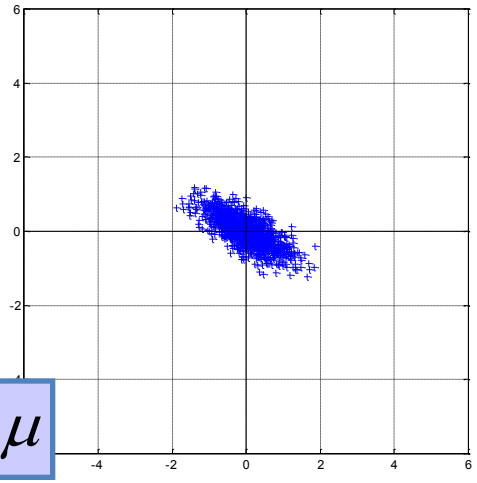
$$\Sigma^{-1} = VD^{-1}V^T$$

$$D^{Maha}(x_i) = (x_i - \mu)^T \Sigma^{-1} (x_i - \mu)$$

$$D^{Maha} = \left(D^{-0.5}V^T\left(x_i - \mu\right)\right)^T \left(D^{-0.5}V^T\left(x_i - \mu\right)\right)$$

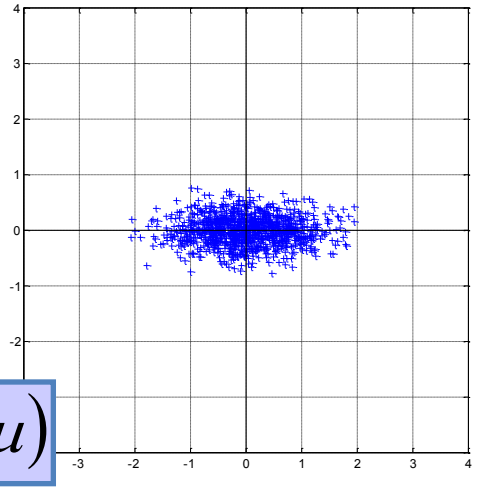


x_i

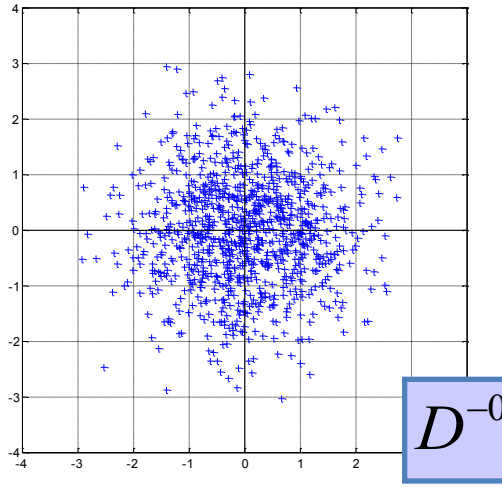


$x_i - \mu$

$$D^{Maha} = \left(D^{-0.5}V^T\left(x_i - \mu\right)\right)^T\left(D^{-0.5}V^T\left(x_i - \mu\right)\right)?$$

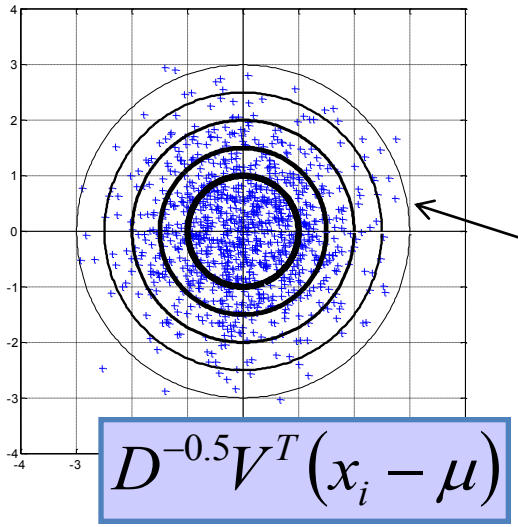


$V^T\left(x_i - \mu\right)$



$D^{-0.5}V^T\left(x_i - \mu\right)$

Distance dans l'espace transformé



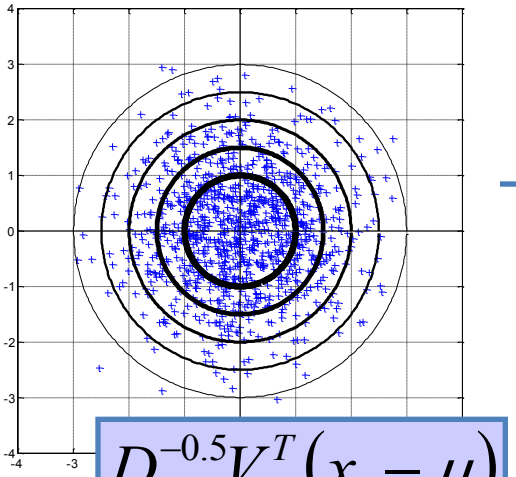
Cercles de rayon (distance) croissant

$$W = D^{-0.5}V\left(x_i-\mu\right)$$

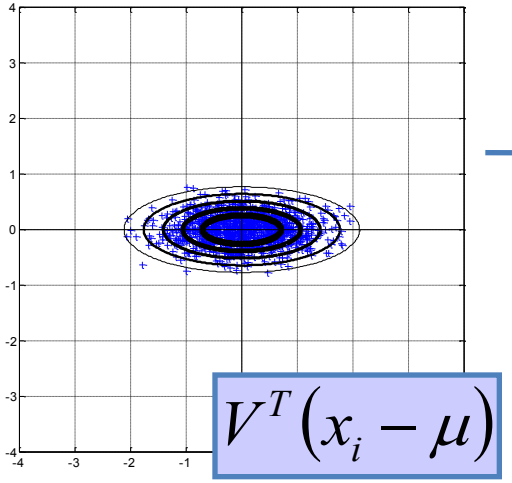
$$D^{Maha} = W^T W = \left\|W\right\|^2$$

Distance radiale

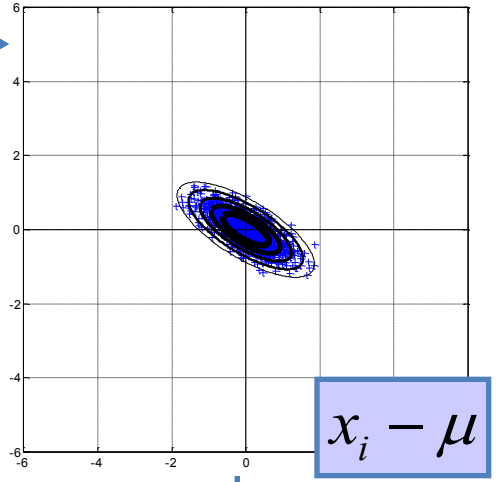
Distance dans l'espace originel



$D^{-0.5}V^T(x_i - \mu)$



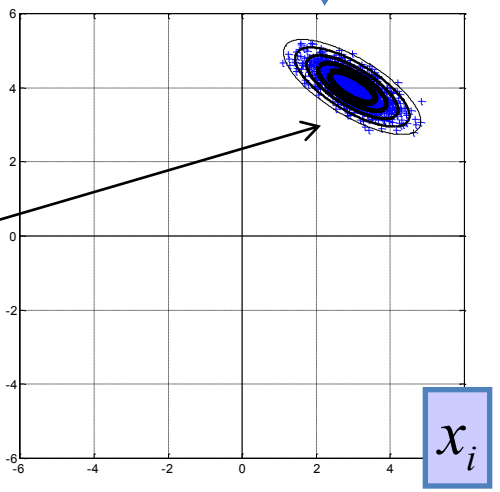
$V^T(x_i - \mu)$



$x_i - \mu$

Séquence inverse

Ellipses de distance croissante



x_i