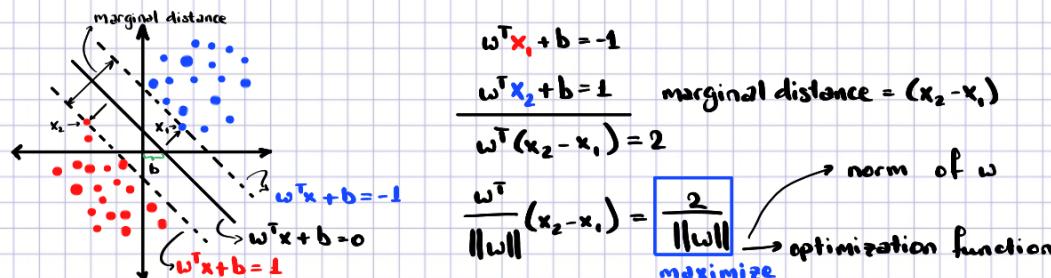
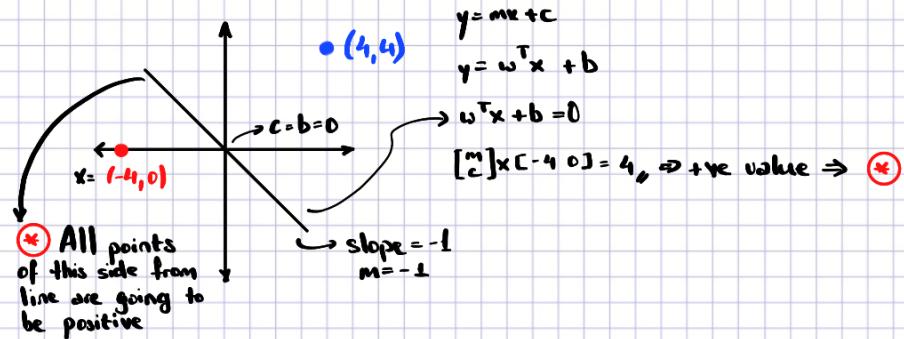
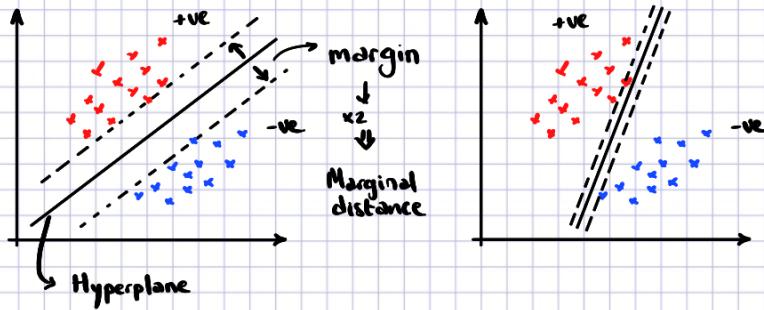


Support Vector Machines



$$(\omega^*, b^*) \max \frac{2}{\|w\|} \quad | \quad +1 \quad \omega^T x + b \geq 1 \\ -1 \quad \omega^T x + b \leq -1$$

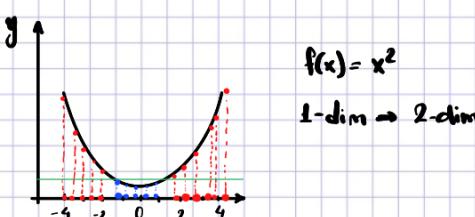
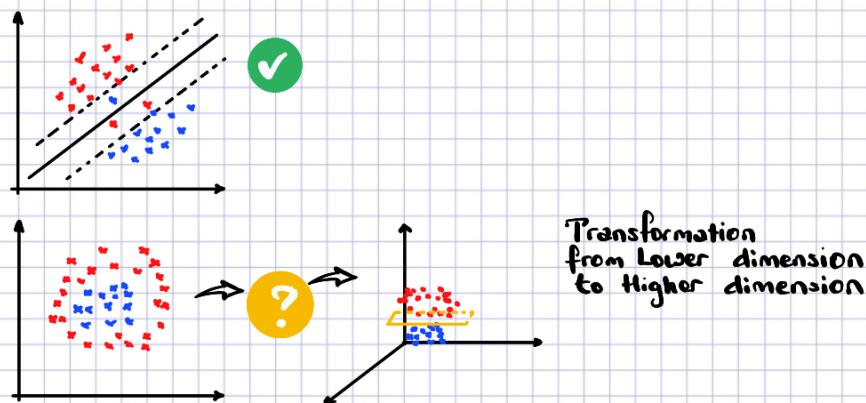
$$(\omega^*, b^*) \max \frac{2}{\|w\|} \quad | \quad y_i \cdot (\omega^T x_i + b_i) \geq 1$$

$$(\omega^*, b^*) = \min \frac{\|w\|^2}{2} + C \sum_{i=1}^n \xi_i$$

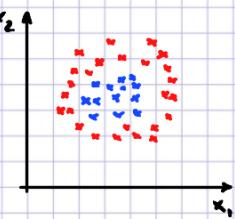
$C = \text{How many errors?}$

$\xi_i = \text{Value of the error}$

SVM Kernels



Polynomial Kernels



$$x_1 \quad x_2 \quad y \quad y = f(x_1, x_2)$$

$$f(x_1, x_2) = (x_1^T \cdot x_2 + 1)^d$$

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \cdot \begin{bmatrix} x_1 & x_2 \end{bmatrix} = \begin{bmatrix} x_1^2 & x_1 x_2 \\ x_1 x_2 & x_2^2 \end{bmatrix}$$

$$x_1 \quad x_2 \quad y \quad x_1^2 \quad x_2^2 \quad x_1 x_2$$

