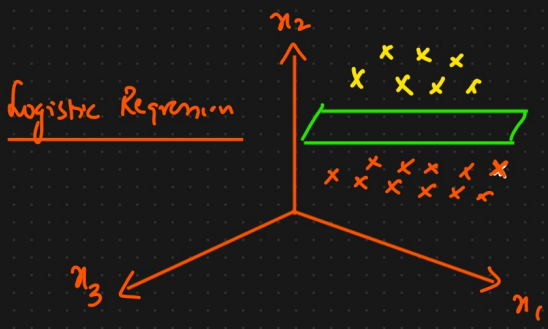
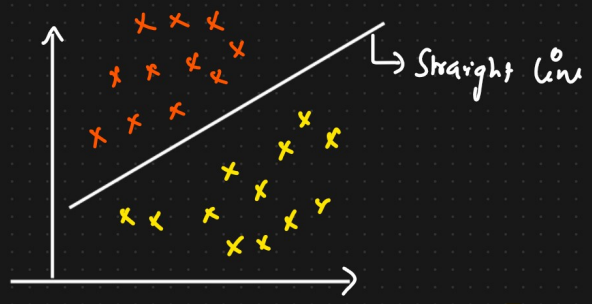
Support Vector Machines ML Algorithms.

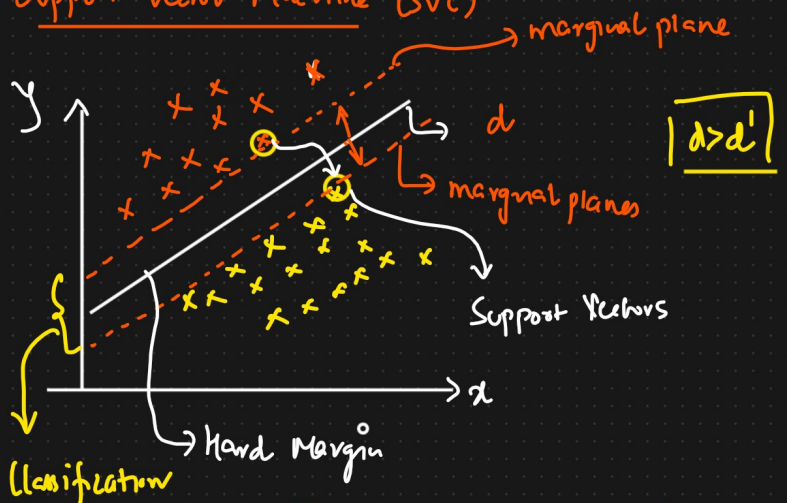
① SVC (Support Vector Classifier)

② SVR (Support Vector Regressor)

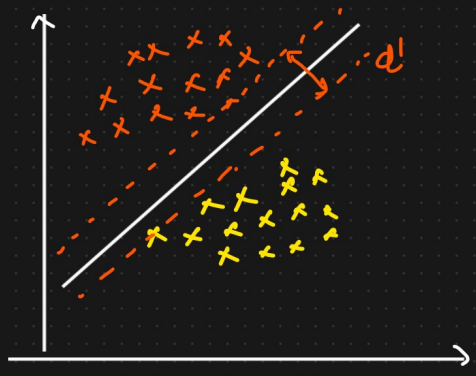


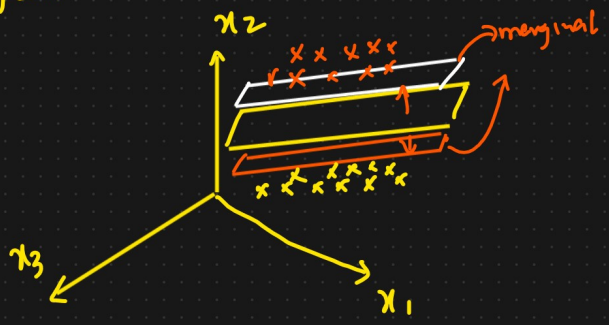


① Support Vector Machine (SVC)

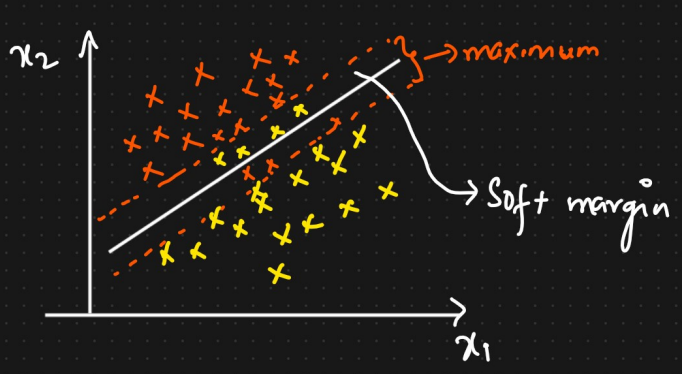


$d > d'$

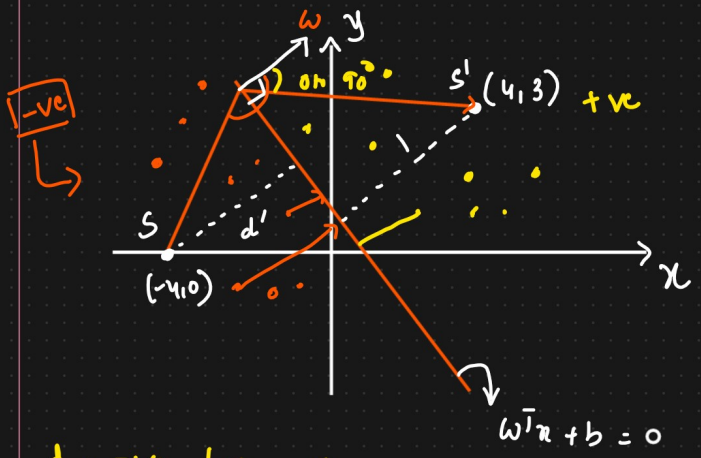




Soft Margin And Hard Margin In SVM



⑧ Support Vector Machines (SVC) Maths Intuition



$ax + by + c = 0$

$\Downarrow$

$w_1 x_1 + w_2 x_2 + b = 0$

$$\boxed{w^T x + b = 0}$$

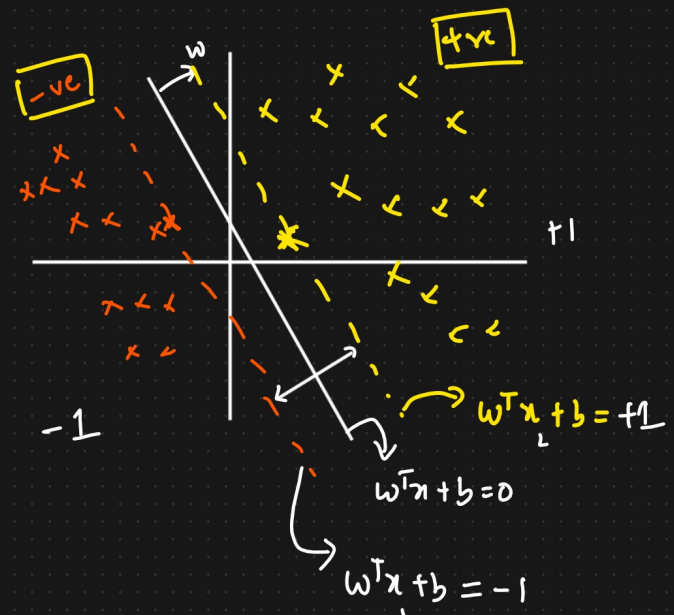
$\Downarrow$

$b = 0$

$$\boxed{w^T x = 0}$$

d = -ve below plane

d = +ve above plane



$w^T x_1 + b = 1$

$w^T x_2 + b = -1$

(-) (-) (+)

$$\frac{w^T (x_1 - x_2)}{\|w\|} = \frac{+2}{\|w\|}$$

Unit vector {Magnitude of the vector is 1}

Cost function

Maximize $\frac{2}{||w||}$ $\Rightarrow$ Distance between marginal plane

w, b

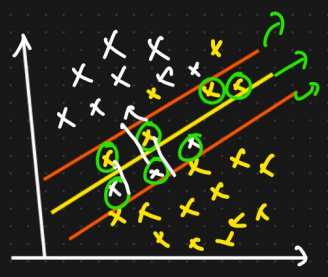
Constraint such that $y_i \begin{cases} +1 & w^T x + b \geq 1 \\ -1 & w^T x + b \leq -1 \end{cases}$ ⇗ correctly classified point

For all correct points

Constraint $\longrightarrow$ $\boxed{y_i * (w^T x + b) \geq 1}$

$C_i = 6$ ✓

Maximize $\frac{2}{||w||}$ $\Rightarrow$ $\boxed{\underset{(w,b)}{\text{Min}} \frac{||w||}{2}}$



Cost function of SVM (SVC)

hyperparameter

$\underset{w,b}{\text{Min}} \frac{||w||}{2} + \boxed{C_i \sum_{i=1}^{n} \xi_i} \Rightarrow$ Hinge loss

$\Downarrow$

Soft margin

{How many points we want to avoid misclassification}

{Summation of the distance of the incorrect data points from the marginal plane}