Support Vector classifier indepth Maths

① Eqn of line, plane, hyperplane.

$y = mx + c$

$y = \theta_0 + \theta_1 x_1$

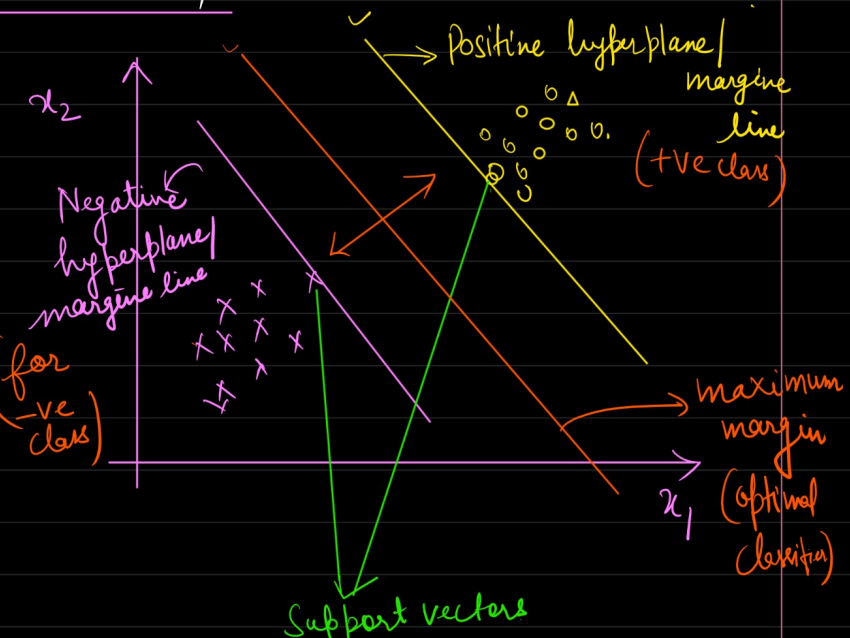
$ax + by + c = 0$

$by = -ax - c$

$y = \boxed{\frac{-a}{b}} x - \boxed{\frac{c}{b}}$

m

$y = mx + c$



in more than 3d

$y = \theta_0 + \theta_1 x_1$

$y = \theta_0 + \theta_1 x_1 + \theta_2 x_2 + \theta_3 x_3 + \cdots \theta_n x_n$ → hyperplane

$y = b + w_1 x_1 + w_2 x_2 + w_3 x_3 + \cdots w_n x_n$

b — bias
w — weights

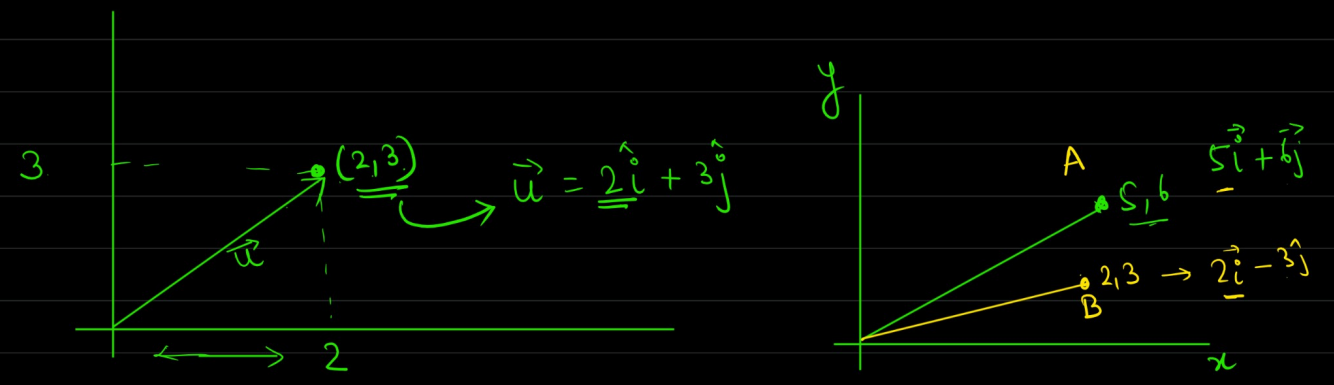
$y = b + w_1 x_1 + w_2 x_2 + w_3 x_3 + w_4 x_4$

$$w = \begin{bmatrix} w_1 \\ w_2 \\ w_3 \\ w_4 \end{bmatrix} \quad x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix}$$

$$w^T = \begin{bmatrix} w_1 & w_2 & w_3 & w_4 \end{bmatrix} \cdot \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} \Rightarrow w_1 x_1 + w_2 x_2 + w_3 x_3 + w_4 x_4 + b$$

w^T $\quad$ x

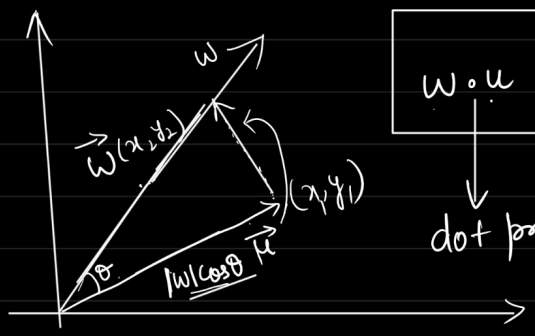
$$y = w^T x + b \quad (y = mx + c, \quad ax + by + c = 0 \Rightarrow w^T x + b = 0)$$

② 

③ Vector Subtraction $\vec{A} - \vec{B}$

$$(5-2)\hat{i} + (6-3)\hat{j} = 3\hat{i} + 3\hat{j}$$

④ Dot product of vectors.



magnitude of w, magnitude of u

$$w \cdot u = |w| \cos\theta \cdot |u|$$

dot product means projection of $\vec{u}$ on $\vec{w}$