21/3/24

23 MAY'23 TUESDAY

21st Week • 143-222

45.

SVM

SUN	MON	TUE	WED	THU	FRI	SAT
	1	2	3	4	5	6
14	15	16	17	18	19	20
28	29	30	31			

MAY 2023

SUN	MON	TUE	WED	THU	FRI	SAT
7	8	9	10	11	12	
21	22	23	24	25	26	

09.00 Why we should use support vector machine?

10.00 (1) Robust to outlier

11.00 (2) no overfitting or less overfitting

12.00 (3) it's well for the non-linear data.

13.00 (4) it good for small to medium size of data.

14.00 (5) we can use SVM for multiple scenario.

15.00

$ax + by + c = 0$

16.00 ⇓

17.00 $y = \left(-\frac{a}{b}\right)x + \left(-\frac{c}{b}\right)$

18.00 $y = mx + c$

eqn is 2D

$ax + by + c = 0$

$=$

$w_1 x_1 + w_2 x_2 + w_0 = 0$

in SVM (3D)

$$w_1 x_1 + w_2 x_2 + w_3 x_3 + w_0 = 0$$

for n D

$$w_1 x_1 + w_2 x_2 + w_3 x_3 + \cdots + w_n x_n + w_0 = 0$$

in vector form →

$$\begin{bmatrix} w_1 \\ w_2 \\ \vdots \\ w_n \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix} \Rightarrow \boxed{W^T x + w_0 = 0}$$

@

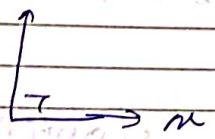
The tongue is but three inches long, yet it can kill a man six feet high.

→ if my plain or my line is passing through the origin $w_0 = 0$

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

$$(w)(x) \cos\theta = 0$$

$\theta = 90°$

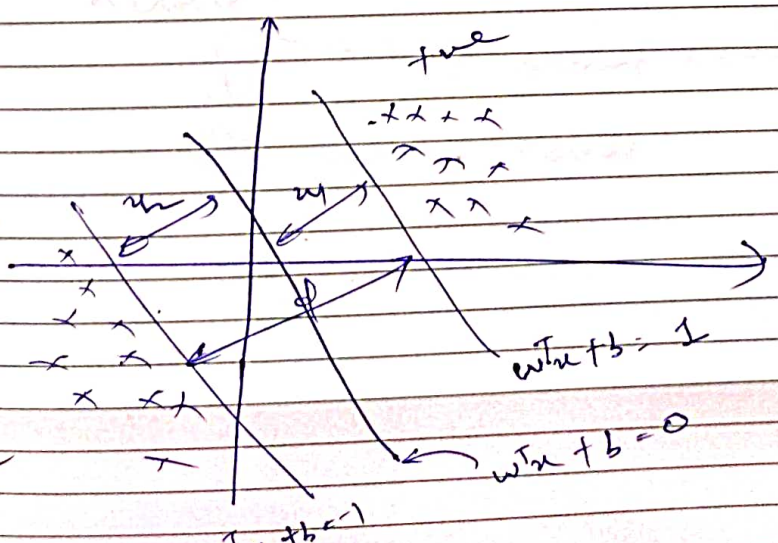


$$\boxed{\text{marginal } d = y_i (w^T \cdot x + b) > 1}$$

if $y = 1$

then $\boxed{\text{max } d = \frac{2}{\|w\|}}$ for hard classificatn.

⇓ proofs



$w^T x_1 + b = 1$

$w^T x_2 + b = -1$

$w^T (x_1 - x_2) = 2$

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

$\Rightarrow x_1 - x_2 = \frac{2}{\|w\|}$

max d

09.00 $y_i \begin{cases} +1 & \text{if } w^T x + b \geq 1 \\ -1 & \text{if } w^T x + b \leq -1 \end{cases}$

10.00 ⇓

11.00 +ve

12.00 it is for all the correctly classified point.

13.00 $y_i \times w^T x + b = +ve$ $y_i \times w^T x + b \geq 1$

14.00

15.00 soft classifier.

16.00 $\text{cost fun} = \frac{\|w\|}{2} + C_i \sum_{i=1}^{n} \lambda_i$ → summation of the distance of incorrect data pts to the marginal plane.

17.00 huber loss ⇐ (↑ C_i: hyperparameter)

18.00