

	M	T	W	T	F	S	S
J				1	2	3	4
U	5	6	7	8	9	10	11
L	12	13	14	15	16	17	18
	19	20	21	22	23	24	25
	26	27	28	29	30	31	

21

# SVM

2-0-2-1

01

WK 27 (182-183)

THURSDAY • JULY

$\vec{u}$  projected on  $\vec{w}$

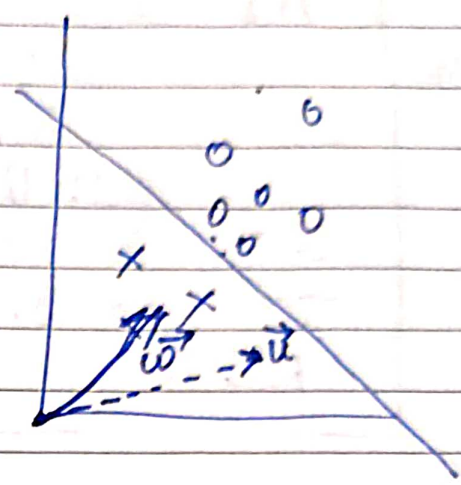
$$\vec{w} \cdot \vec{u} \geq c$$

$$\vec{w} \cdot \vec{u} - c \geq 0$$

$$\vec{w} \cdot \vec{u} + b \geq 0$$

$\geq 0$  +ve point

$< 0$  -ve point



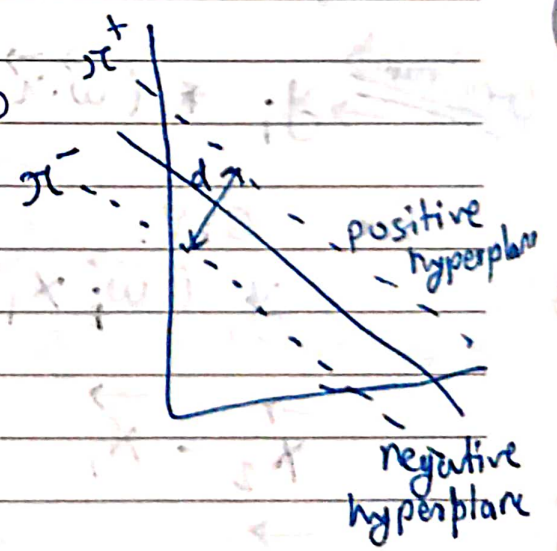
$$2x + 3y - 3 = 0 \quad (2, 3) \quad (-2, 0)$$

desmos.com/calculator

hyperplane eq<sup>n</sup>  $w^T x + b = 0$

$$+1 \text{ if } \vec{w} \cdot \vec{x}_i + b \geq 0$$

$$-1 \text{ if } \vec{w} \cdot \vec{x}_i + b < 0$$



Assumption

+ve hyperplane eq<sup>n</sup>  $w^T x + b = 1$

-ve " " eq<sup>n</sup>  $w^T x + b = -1$

$\begin{cases} 2x + 3y + 3 = 1 \\ 2x + 3y + 3 = -1 \end{cases}$  Margin if multiplied by factor greater than 1 on LHS only if less than 1 then margin expands

for  $\sigma_1 + \vec{w} \cdot \vec{x} + b \geq 1$  should always be true

for  $\sigma_2 \vec{w} \cdot \vec{x} + b \leq -1$  " " "

positive points  $y_i = +1$   $y_i * (\vec{w} \cdot \vec{x}_i + b) \geq 1$  for any +ve point  
 $\rightarrow$  always  $> 1$

constraints  $y_i * (\vec{w} \cdot \vec{x}_i + b) \geq 1$  for any -ve point

for S.V.

$$y_i (\vec{w} \cdot \vec{x}_i + b) = 1$$

$$\vec{x}_2 - \vec{x}_1$$

$$d = \frac{(\vec{x}_2 - \vec{x}_1) \cdot \vec{w}}{\|\vec{w}\|}$$

$$\frac{\vec{w}}{\|\vec{w}\|}$$

$$d = \frac{\vec{x}_2 \cdot \vec{w} - \vec{x}_1 \cdot \vec{w}}{\|\vec{w}\|}$$

$$= \frac{(1 - b) - (-b - 1)}{\|\vec{w}\|} = \frac{2}{\|\vec{w}\|}$$



	M	T	W	T	F	S	S
A	30	31					1
U	2	3	4	5	6	7	8
G	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
	23	24	25	26	27	28	29

'21

2 0 - 2 - 1

03

WK 27 (184-181)

SATURDAY • JULY

$$y_i (\vec{w} \cdot \vec{x}_i + b) = 1$$

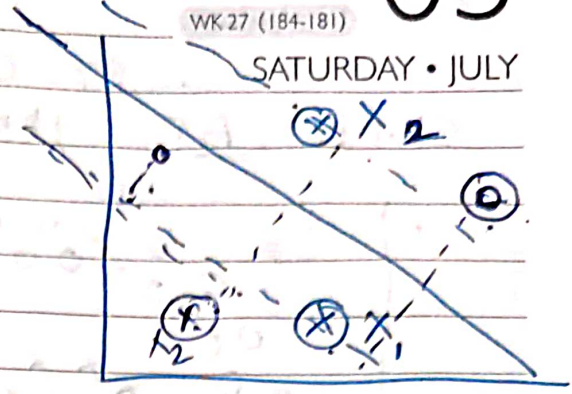
$$1 (\vec{w} \cdot \vec{x}_2 + b) = 1$$

$$\vec{w} \cdot \vec{x}_2 = 1 - b$$

$$-1 (\vec{w} \cdot \vec{x}_1 + b) = 1$$

$$-\vec{w} \cdot \vec{x}_1 - b = 1$$

$$-1 - b$$



$$\operatorname{argmax} (\vec{w}^*, b^*) \frac{2}{\|\vec{w}\|} \text{ such that}$$

$$y_i (\vec{w} \cdot \vec{x}_i + b) \geq 1$$

ML Lab 13/8/2024 present numbers.

B3 Batch ML Lab 69, 63, 67

$$\operatorname{argmin} \frac{\|\vec{w}\|}{2} + \overset{\text{hyperparameter}}{C} \sum_{i=1}^n \xi_i \quad (\text{error term})$$

SUNDAY 04

margin error + Classification error

C any free number

10

11

12

1

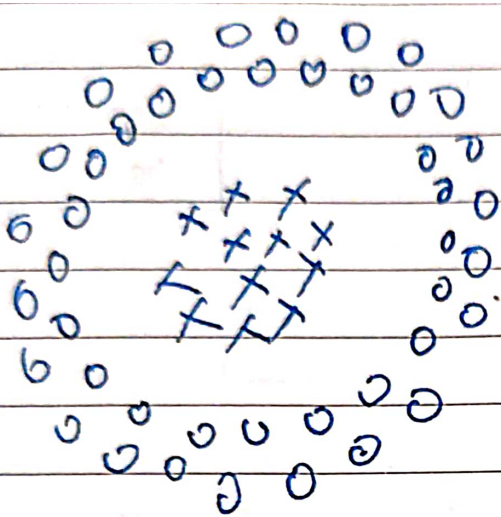
2

3

4

5

6



$$f(x) = e^{-x^2}$$

