Classification → Regression

Linear Regression

(X, Y) → □ → 3 43

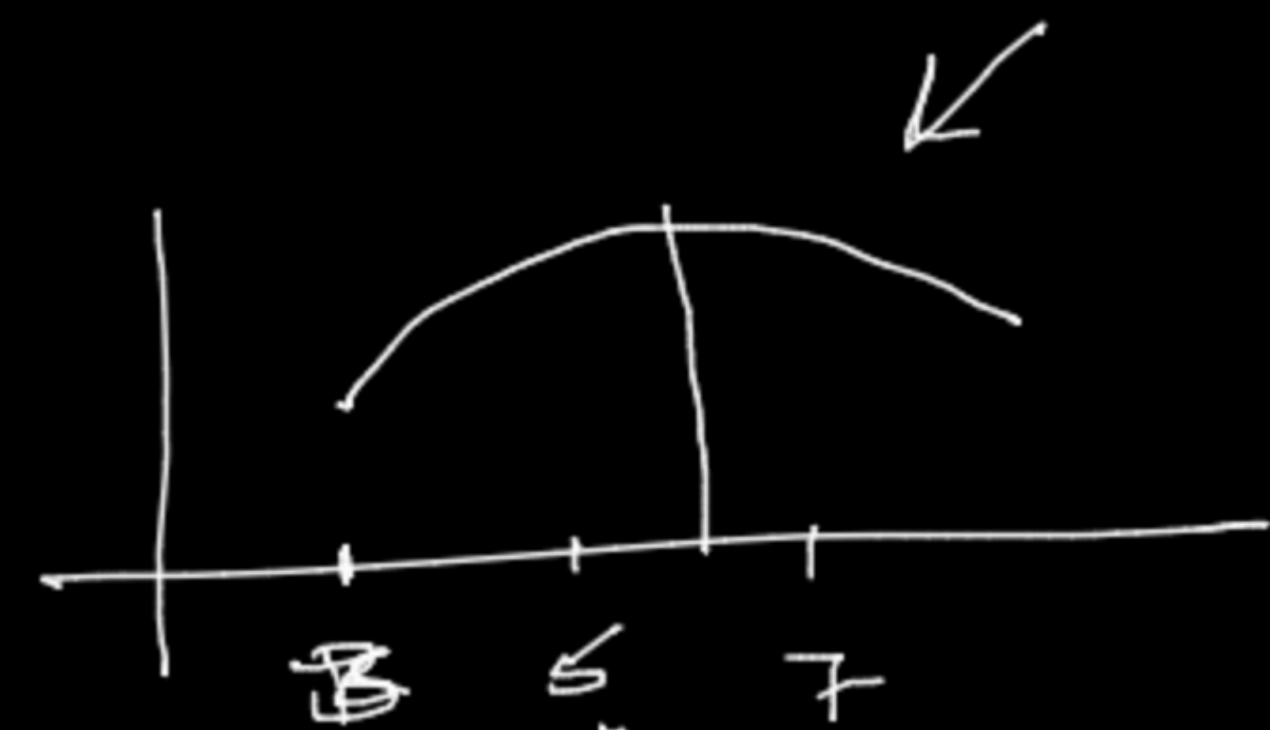
Real

[ 3 2 1 ]

KNN → K → Finetuning

Hyperparameter

K




KNN

GridsearchCV

RandomSearch

CV

↳ KNN(3) → f( ) → 70%

↳ KNN(5) → f( ) → 80%

Logistic Regression

Classification

Geometry | Prob | Loss-fn

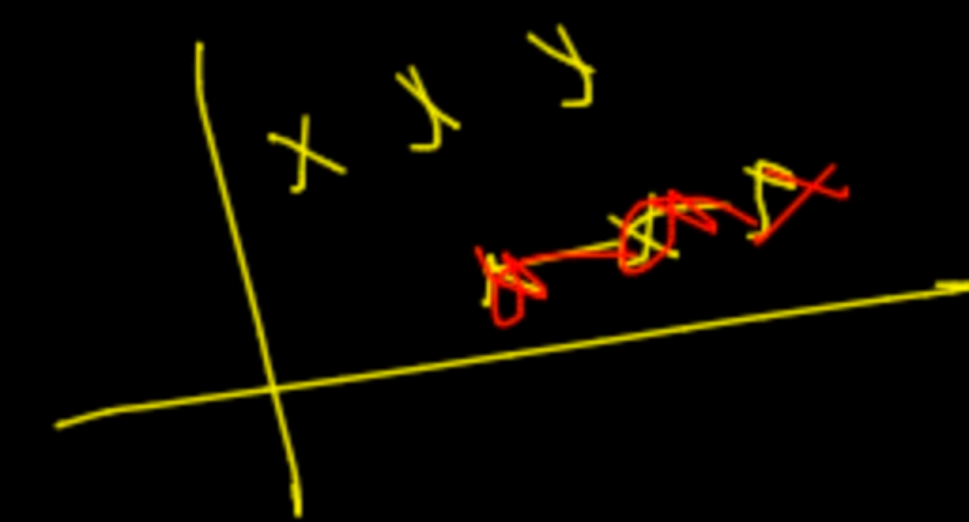
(Data)

$(X, Y) \rightarrow \boxed{LR} \rightarrow f(\ )$

$Y \in [0, 1]$

Big "Assumption"

↳ Classes are almost (perfectly) linearly separable




X
EDA
income
status
(case i)
CS
LR
class 0
y = mx + c
very well
Red (0)
Blu (1)
income
(class 1)

3 / 5

$D(x_i, y_i)$

nD

[+ve, -ve]

Best

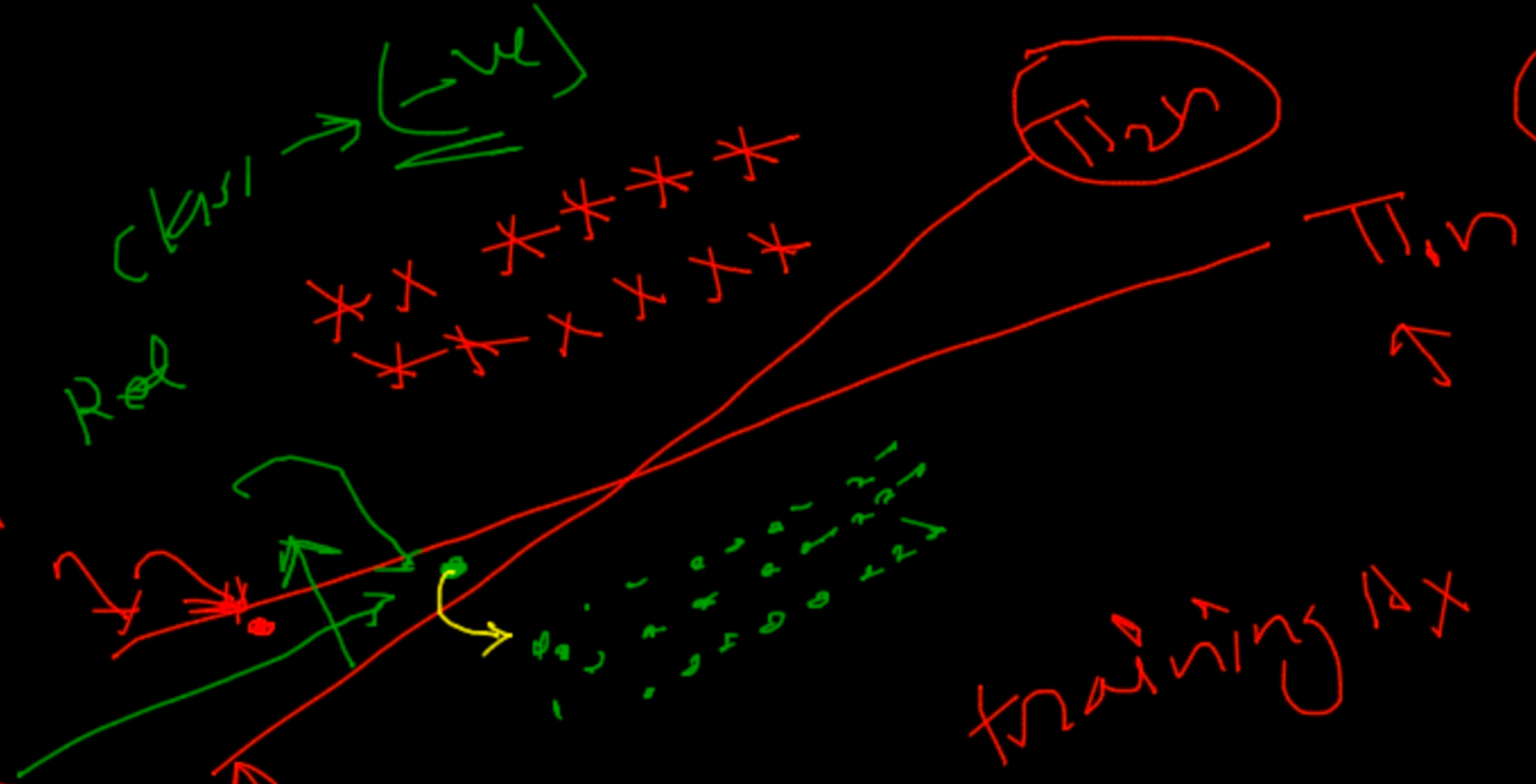
math

Best

(**)

plot

nD




plane?

minimum

[(1) (2) (3)]

Best planes

training idx

plane for $\pi_2$

$[\cancel{w_1, w_2, w_3}]$

$[\cancel{0.5, 0.3, 0.2}]$

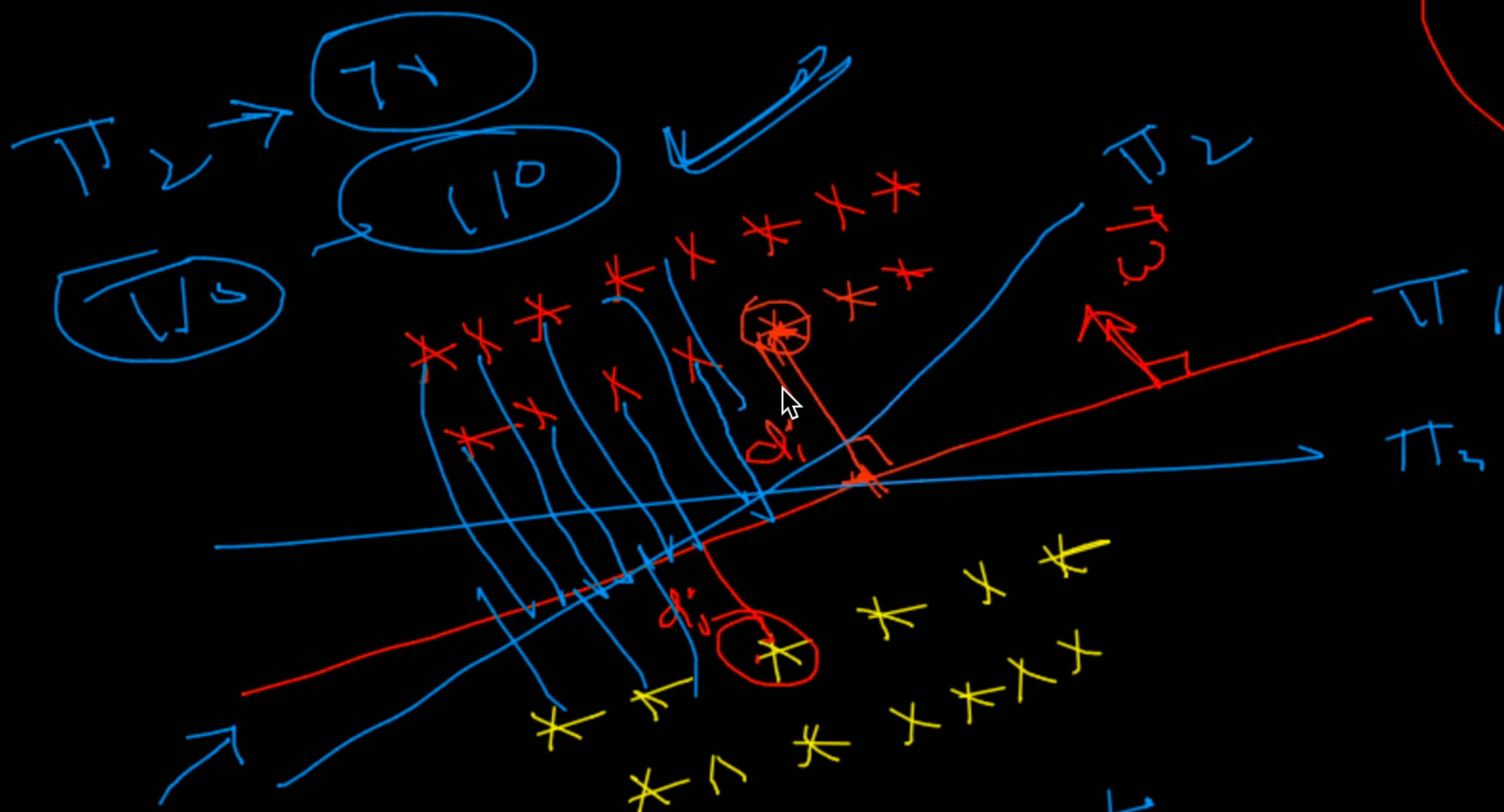
$w_0 = [0.4]$

equation of plane ⇒ $\pi = w^T \cdot x + w_0$

(Rule)

$(w^T, w_0)$

Task $\pi$ Best separated $\rightarrow$ (+ve) pts from −ve pts




$$d_i = \frac{w^T \cdot x_i}{\|w\|}$$

$\|w\| = 1$

Unit vec

$$d_i = w^T \cdot x_i$$

$$d_j = w^T \cdot x_j$$

$\pi_1 \Rightarrow$ summation st

$\rightarrow$ 100

$d_i = w^T x_i > 0$ (same side of Normal vector)

$d_j = w^T \cdot x_j < 0$ (both on opp

Classifier SVC

$w \to$ ~~[0.5, 0.1]~~

if $w^T x_i > 0$

then $y_i \to +1$

if $w^T x_i < 0 \to (-ve)$

$y_i w^T x_i$

$(+ve)(-ve) \to -ve \to$ ✗

$\to$ How to test

correct $\leftrightarrow$ $[y * w^T x_i] > 0$

$(ve)(-ve) > 0$

| $x_1$ | $x_2$ | $y$ | $\hat{y}$ |
|---|---|---|---|
| $-$ | $-$ | $+ve$ | $+ve$ |
| $-$ | $-$ | $-ve$ | $-ve$ |
| $-$ | $-$ | $+ve$ | $-ve$ |

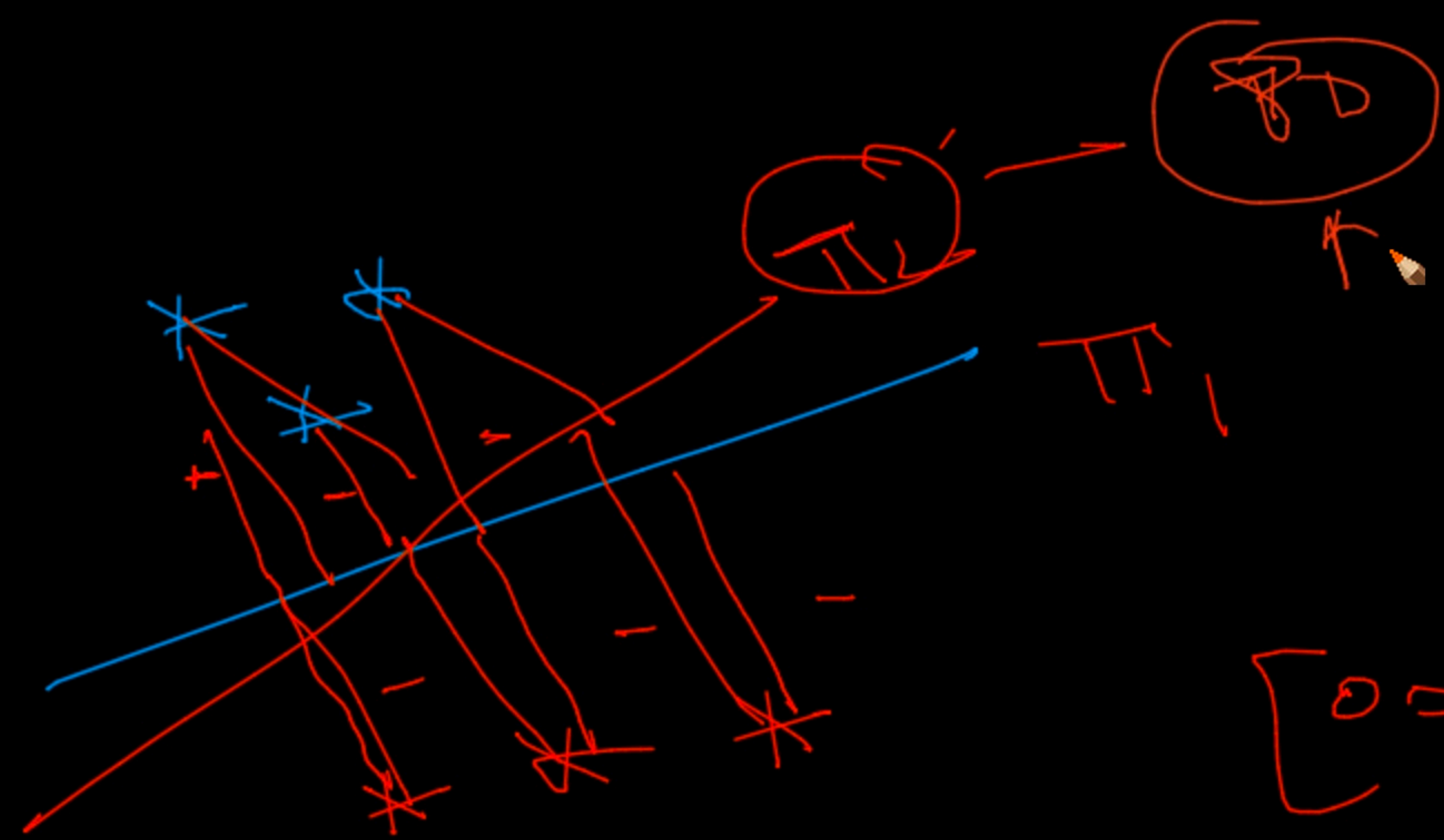
$\hat{y} = w^T x_i \to (-ve)$

$[0.5, 0.7] \times [\ldots]$

$\Downarrow$

$\hat{y}\ w^T x_i\ (+ve)$

$y_i w^T x_i > 0 \longrightarrow$ LR is correctly classified pts $x_i$




$[0.5, 0.7]$

$+ \Rightarrow 70$

Case

$y_i = +ve$

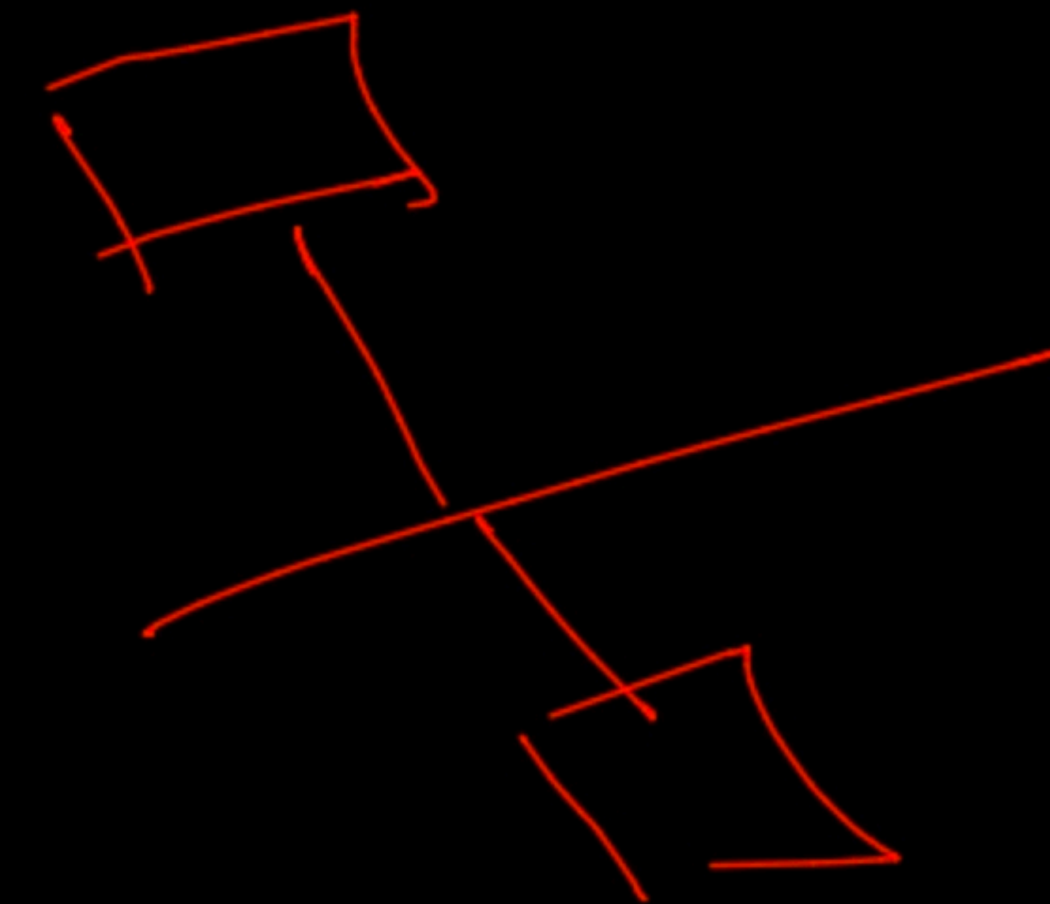
$w^T x_i < 0 \rightarrow$ LR say $y_i \rightarrow -ve$

$y_i w^T x_i > 0 \rightarrow$ T

$(+ve)(-ve) \rightarrow -ve$ F

$$\sum_{i=1}^{n} y_i w^T x_i$$

$\max \sum_{i=1}^{n} y_i w^T x_i)$



$w^*$ is only → find

$w^*$ which maximize $\sum_{i=1}^{n} y_i w^T x_i$

plot it max

optimisation

$\pi_1 \rightarrow [0.5, 0.7] \xrightarrow{\nearrow 1 \quad 70\%}$ $\quad y_i w^T x_i > 0 \rightarrow$

$\pi_2 \rightarrow [0.7, 0.8] \xrightarrow{80}$

40

$\pi_3 \rightarrow [0.8, -0.4]$

$\uparrow$

$(y_i w^T x_i) + y_i w^T x$

$w \; x_i$

$w^T x_i$

$w^T x_i$

$y = f(x)$