Linear Regression →

↑
⌐ math
⌐

eg.
$\underline{\underline{=}}$  [ weight , gender -- -- ]   [ height ? ]
              X                                    Y

          X   Y
         [✓ | ✓]
         [✓ | ]

$D = \langle X_i \, Y_i \rangle$

$X \in R^d$

$Y_i \in Real$

✓ Linear Regression    [2D]
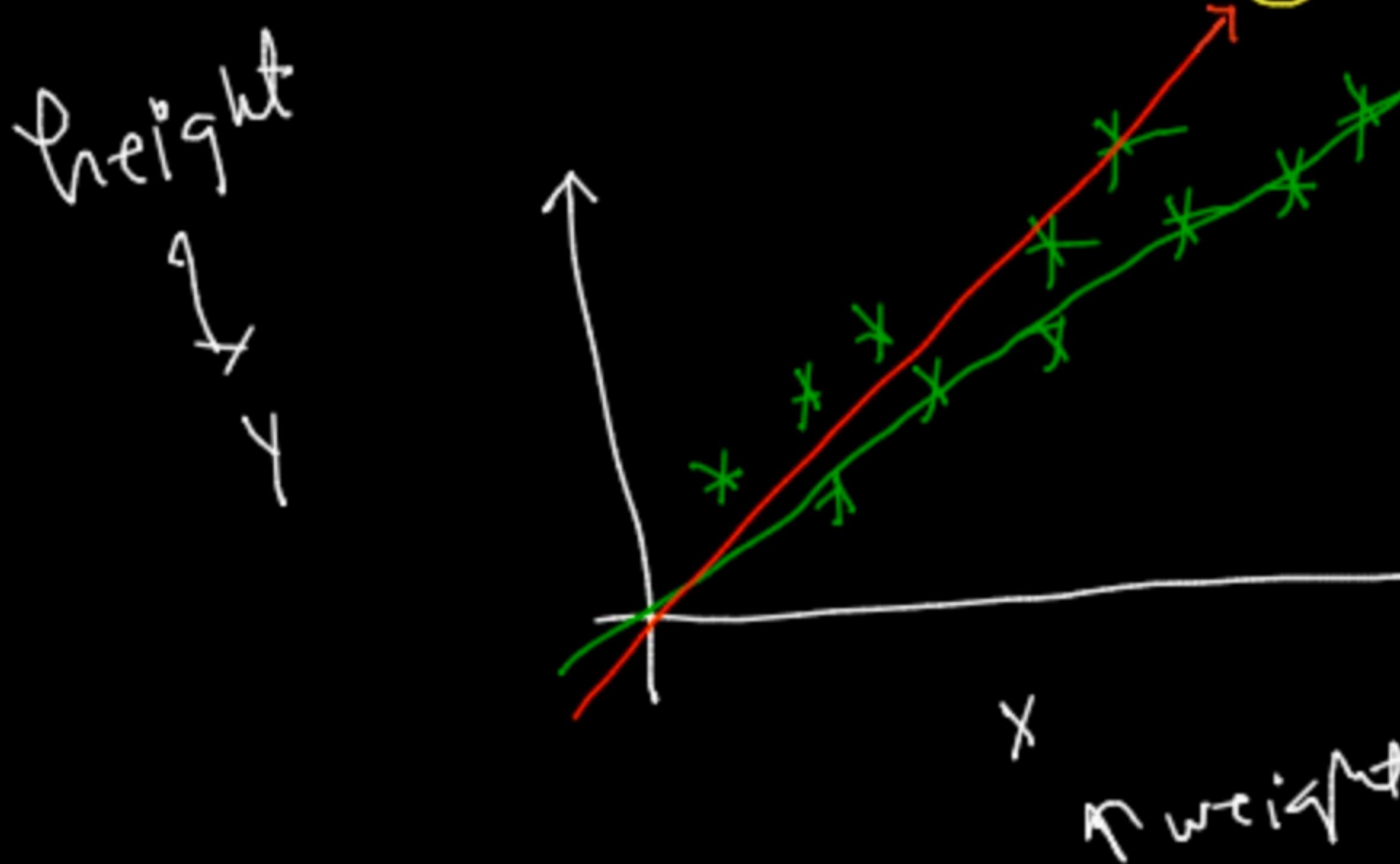
↳ find a [line] that fits the given data
→

ie.    $h = W_1 \times weight + W_0$

              ↑                          ↓
$l_2$                          $W_0$
$l_1$ → [ $W_1 \Rightarrow 3$ ] , $W_0$

                            $(l_1 \, l_2)$ →  [ min err ]
                                              ↑
height                            ↓!
↕
Y                            (Best)

X
↑ weight

3D

plane
↑

Best →

n plane
↑

Best → min error
↑

error → $(Y - \hat{Y})$ ↓

$f_1$

$f_2$
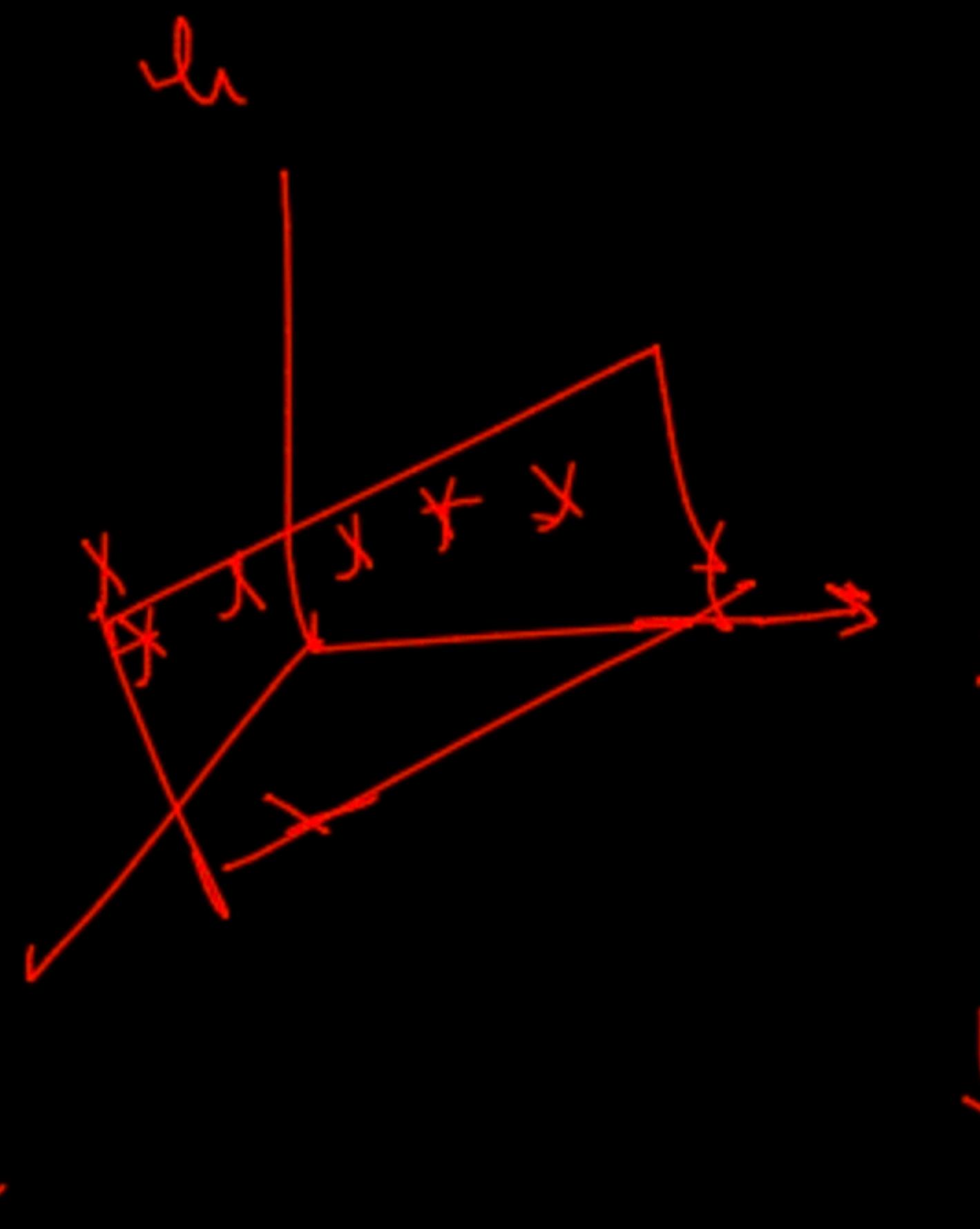
our objective

$\begin{cases} \text{find a } \overline{\text{Plane} \mid \text{Line} \mid \text{hyperplane}} \rightarrow \boxed{\text{Best fit}} \\ \quad \text{'data'} \end{cases}$
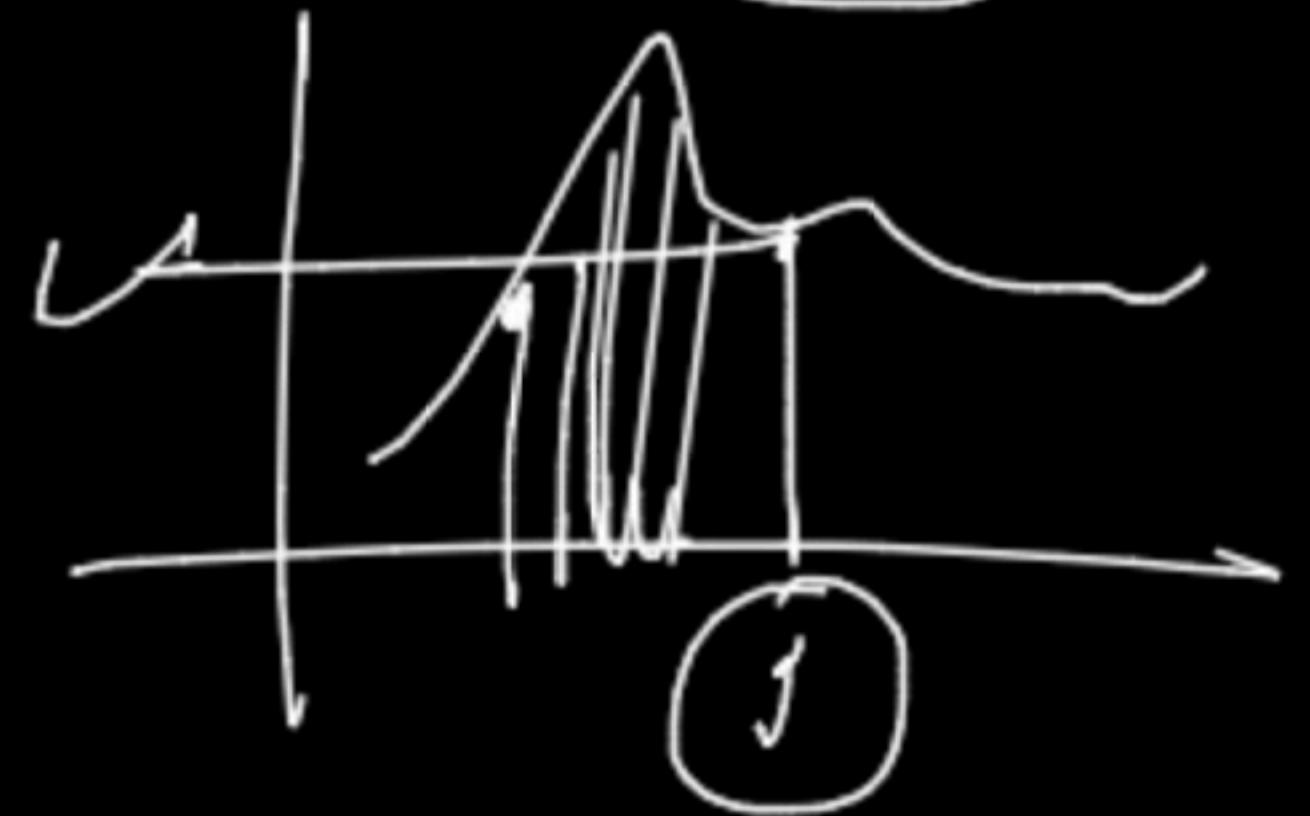
minimize $\sum\limits_{i=1}^{n} error_i$

$(Y - \hat{Y})$

$Y_i = W_1 f_1 + W_2 * f_2 + W_0$

(min error)

ie.

$\boxed{nD} \rightarrow \bigcirc{LR} \rightarrow$ Hyperplane
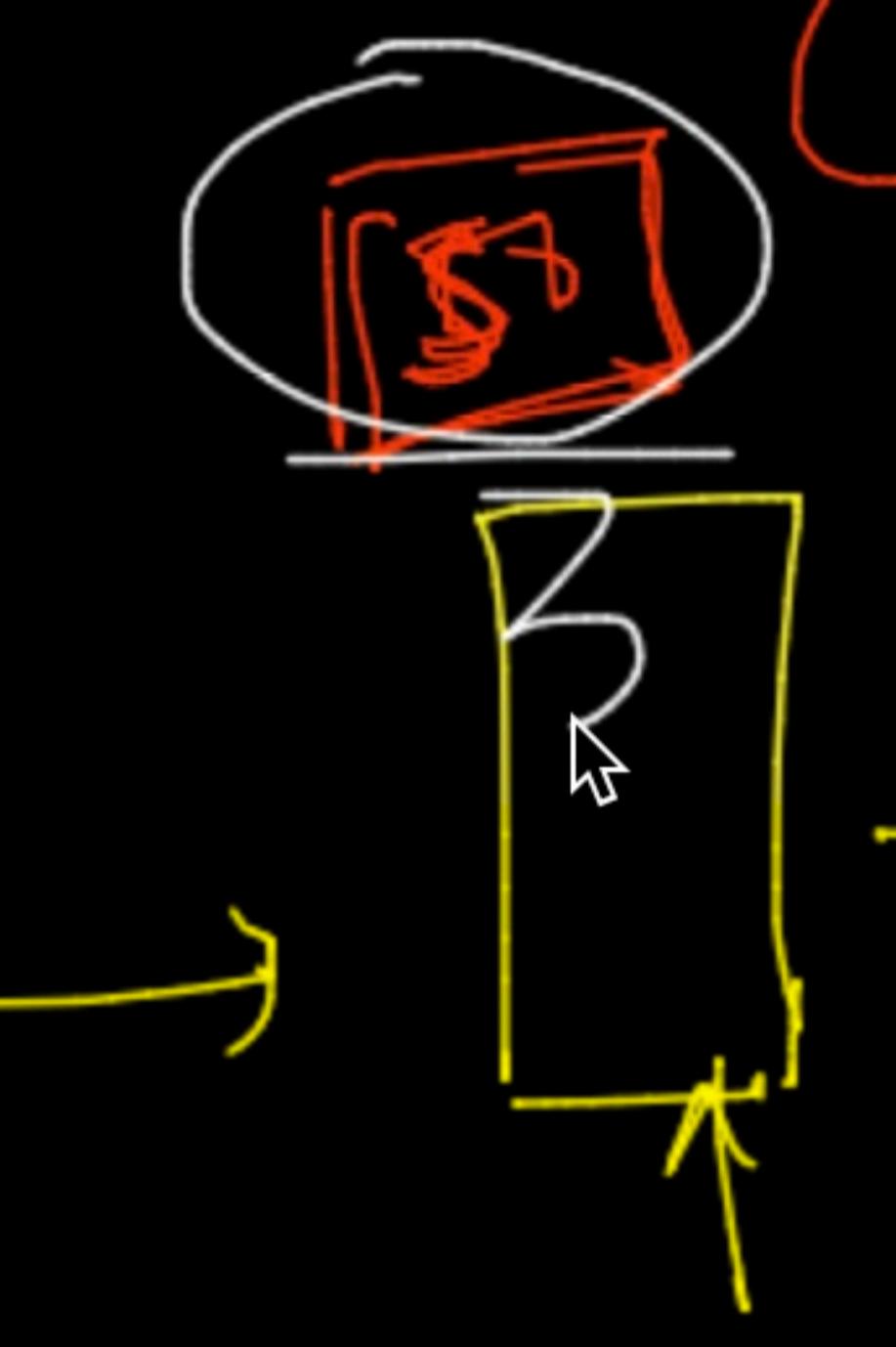
SGD

$\boxed{Y_i = W^T \cdot X_i + X_0}$

$\hookrightarrow \quad x \in R^d$

eg.

| X | Y | $\hat{y}$ | erros | $\hat{y}_2$ | erro |
|---|---|---|---|---|---|
| X1 | 150 → 145 | $(-5)^2$ | 149 | +1 | |
| X2 | 155 → 150 | $(-5)^2$ | 154 | +1 | |
| X3 | 165 → 165 | 0 | 175 | -10 | |

50

145

150

$Y = \omega_1 * x_1$

0

-25

-8

$2 \nearrow$

$100 \to (102)$

outliers

(X, Y)

$l_2$ $l_1$

$\omega_1 = 0.1$

$(\omega_1, \omega_3^0)$

$= 0.1$

$x_1$ $x_2$

X

Y

(105) more

| W | 0.1 | 0.5 |
|---|---|---|
| en | -0.25 | -8 |

Best

$(-0.25, -0.8)$

(Best fit)

50
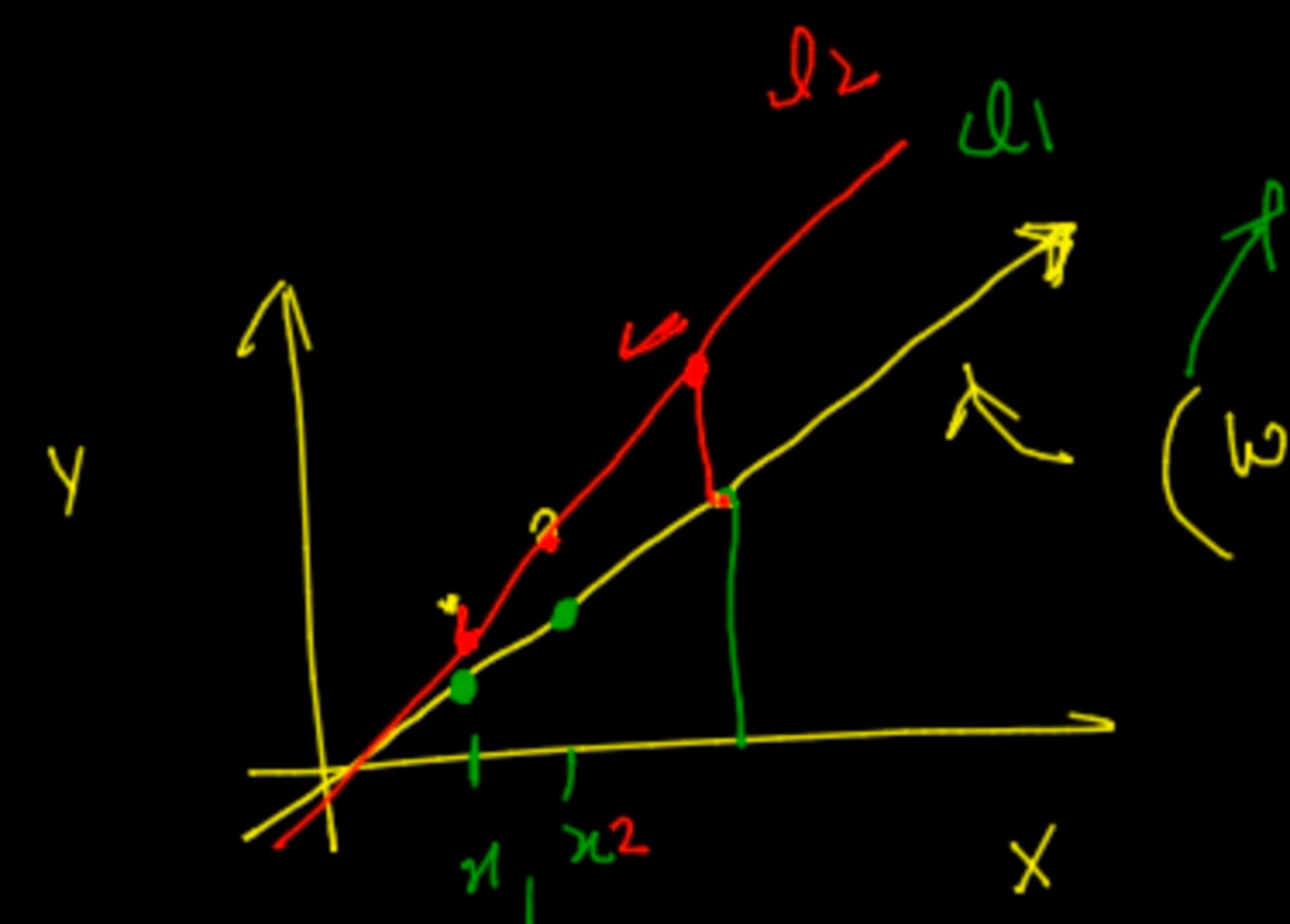
⇒ mathematical formulation

⇓

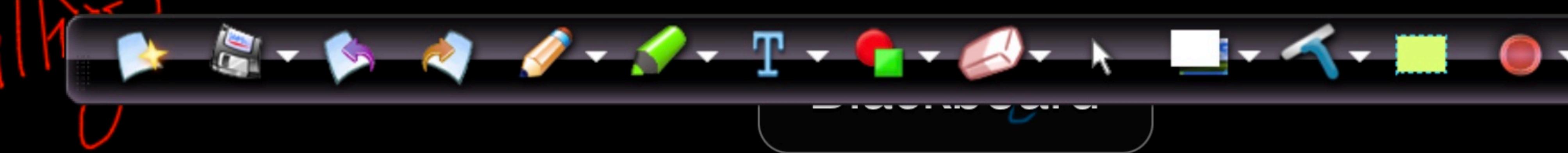$$\underset{W, W_0}{\arg\min} \sum_{i=1}^{n} \left( Y_i - (W^T \cdot x_i + W_0) \right)^2 + \lambda \|W\|^2$$

Great

Hyper-params

$\lambda = 0$

↑ bias

↑ square-loss

L2

Log·Regression

↓

overfitting

and

underfitting

→ Regularization $\begin{cases} L1 \\ OR \\ L2 \end{cases}$

interviewed

r

λ

Documentation

Retail domain $\rightarrow$ LR

$f_1$ $f_2$ $f_3$ $f_4$ $\nwarrow$ holiday

$\nwarrow$ B|N|

discoat  isweekend
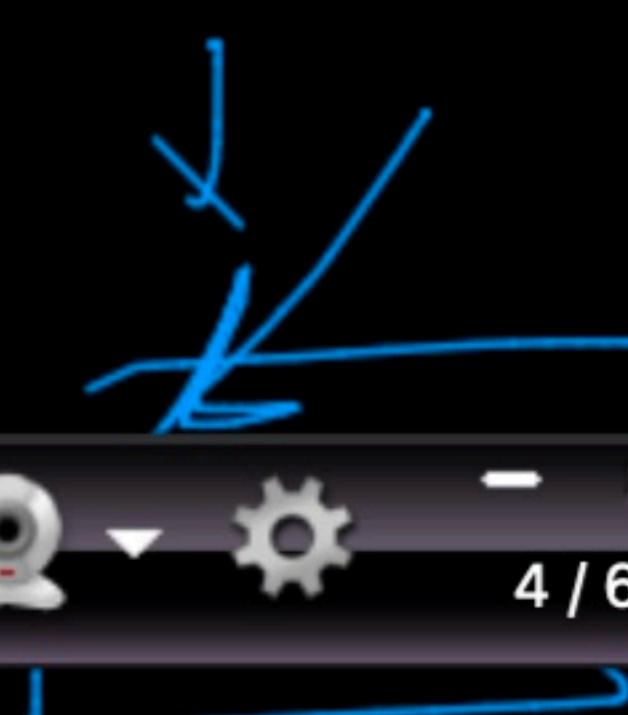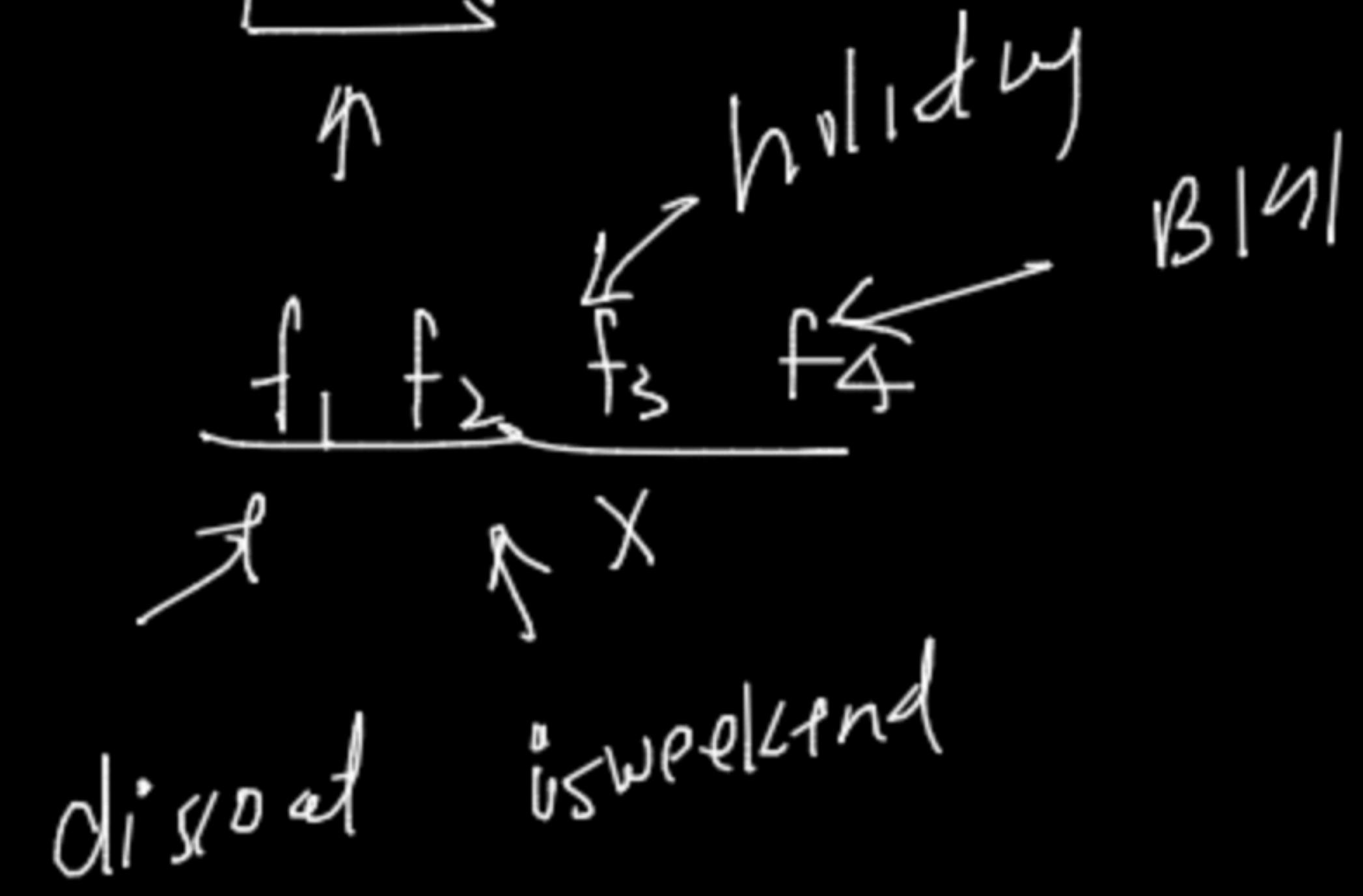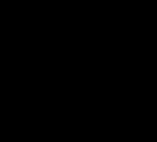
(RFE)

sales

$\rightarrow$ Assign

F-S

$\ell$

Basic

4 Lasso  Ridge

$(X, Y) \rightarrow$ LR $\rightarrow$ sales $= (W_1) * (\hat{f}) + W_2 \times f_2 - \ -$

LR

Reasoning $\rightarrow$ LR

| Regression
$\downarrow$
| Log. Regression

(D) $\rightarrow$ $\square$ $\rightarrow \downarrow$

$(W_1)(W_2)$

'0'

$\Rightarrow$ Cases

1) Assumption
   $\llcorner$ Data should be linearly separable

2) Imbalance $\rightarrow$ [No]

3) Feature Importance
   $\llcorner$ —

4) Outliers
   ↑