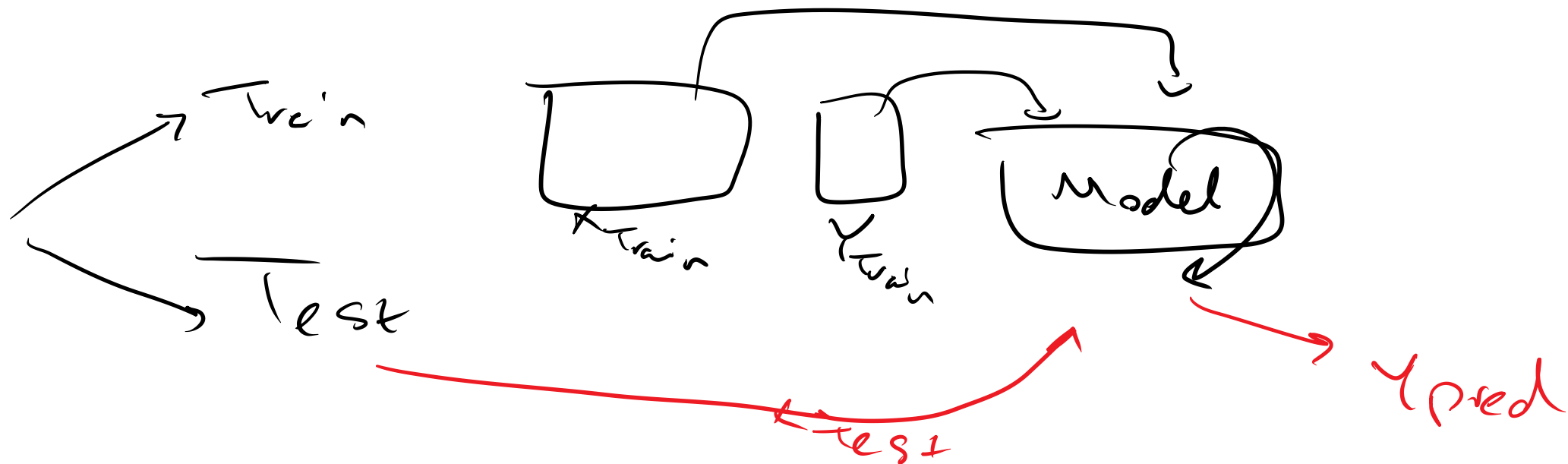
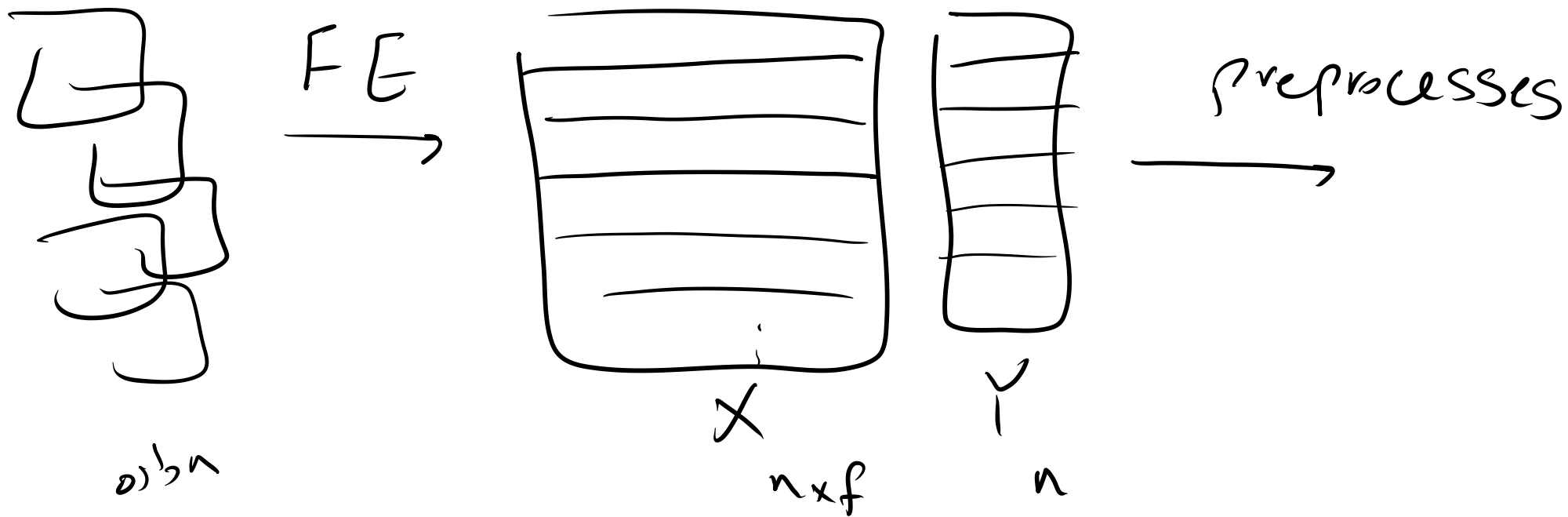
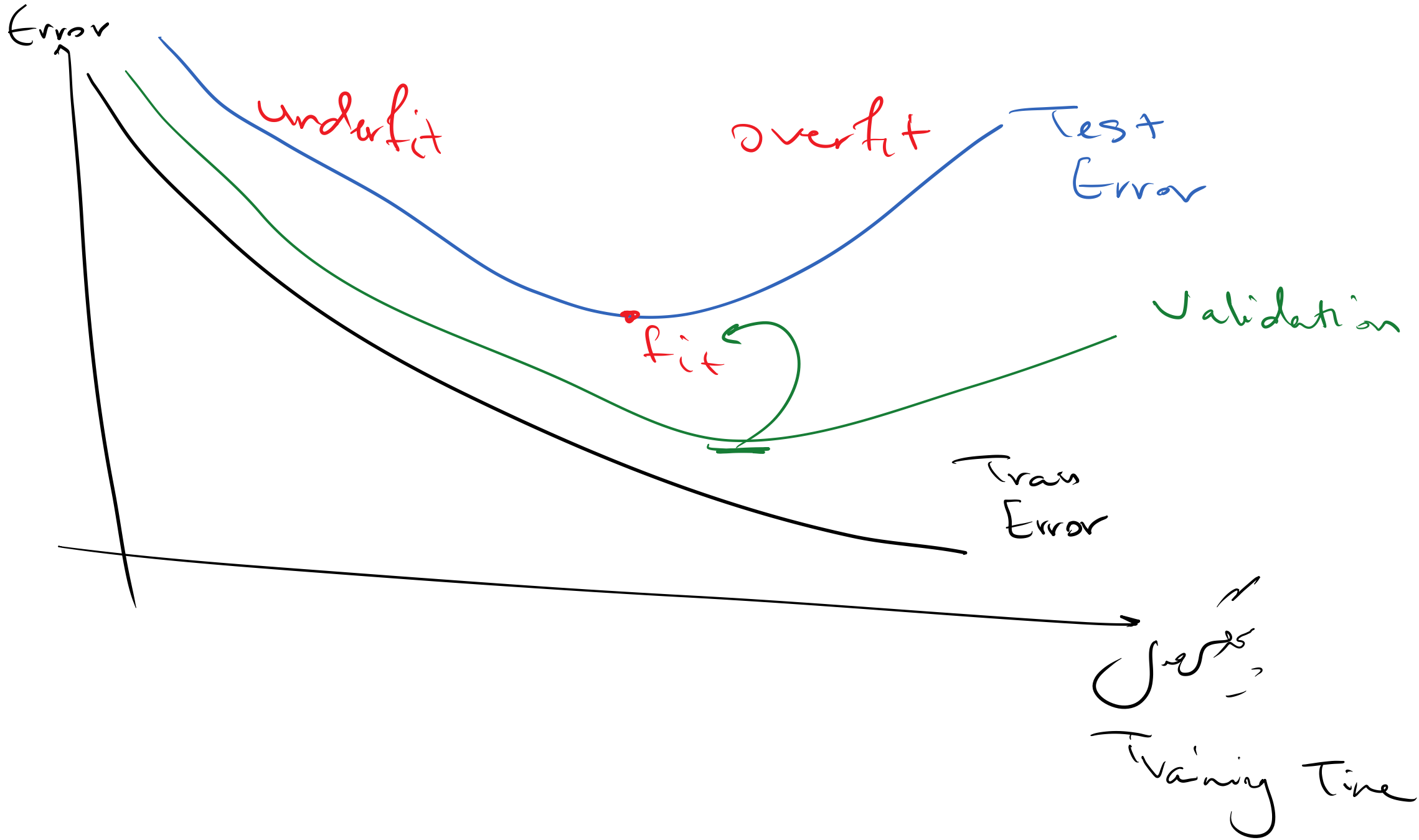


ملفوظات

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# Linear Regression

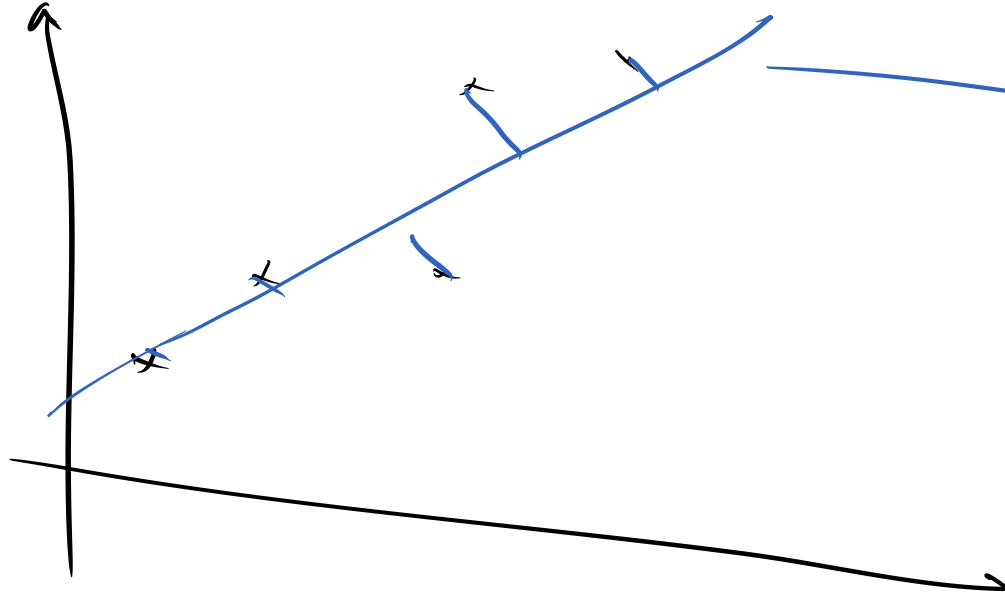
$$y = w_1 x_1 + w_2 x_2 + \dots + w_f x_f + b$$

متنب      مدخل      مخرج       $p_i$        $x_i$

مجموع

Min(MSE)

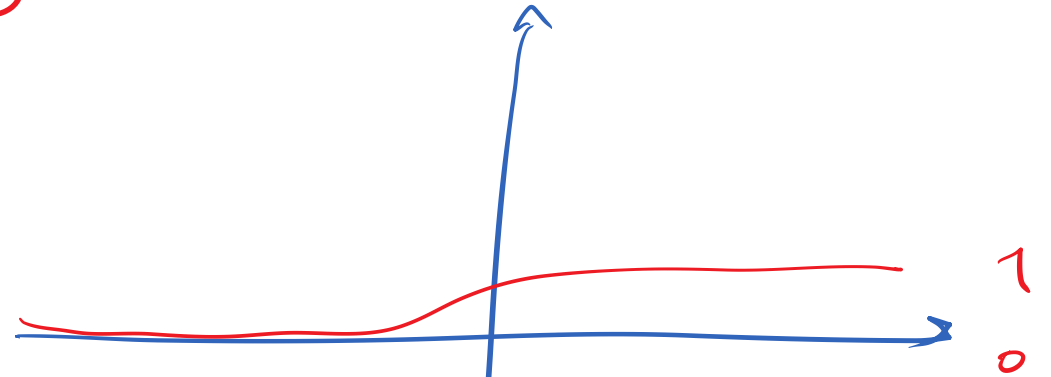
$$y = w x + b$$



$$y = \sum_{i=1}^f w_i u_i + b \Rightarrow y = \sum_{i=0}^f w_i u_i \quad \left\{ \begin{array}{l} w = x^T y \\ u_0 = 1 \\ \hline w_0 \rightarrow b \end{array} \right.$$

## Logistic Regression

Logistic Sigmoid  $(x) = \frac{1}{1 + e^{-x}}$



$$y = LS \left( \sum_{i=0}^f w_i u_i \right) \rightarrow \text{classification}$$

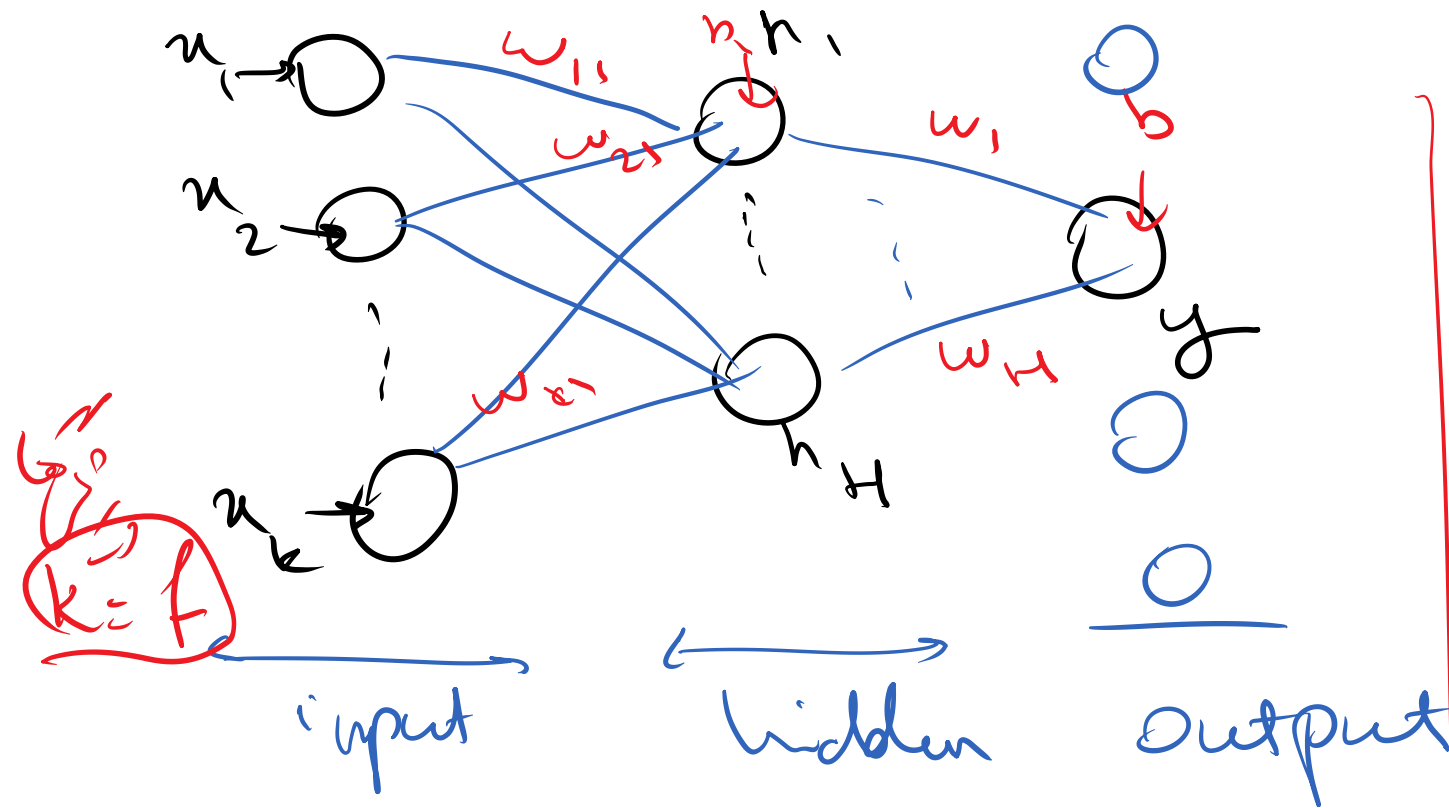
Loss : MSE

$$\text{Loss} : \text{MSE} + \underbrace{\alpha \|w\|}_{\text{Regularization}}$$

$\alpha \downarrow \rightarrow \text{overfit}$

$\alpha \uparrow \rightarrow \text{underfit}$

# Multi layer Perceptron



$$h_1 = x_1 w_{11} + x_2 w_{21} + \dots + x_k w_{k1} + b$$

$$h_1 = \sum_{i=1}^k x_i w_{i1} + b_1$$

$$h_j = \text{Aff}_1 \left( \sum_{i=1}^k x_i w_{ij} + b_j \right)$$

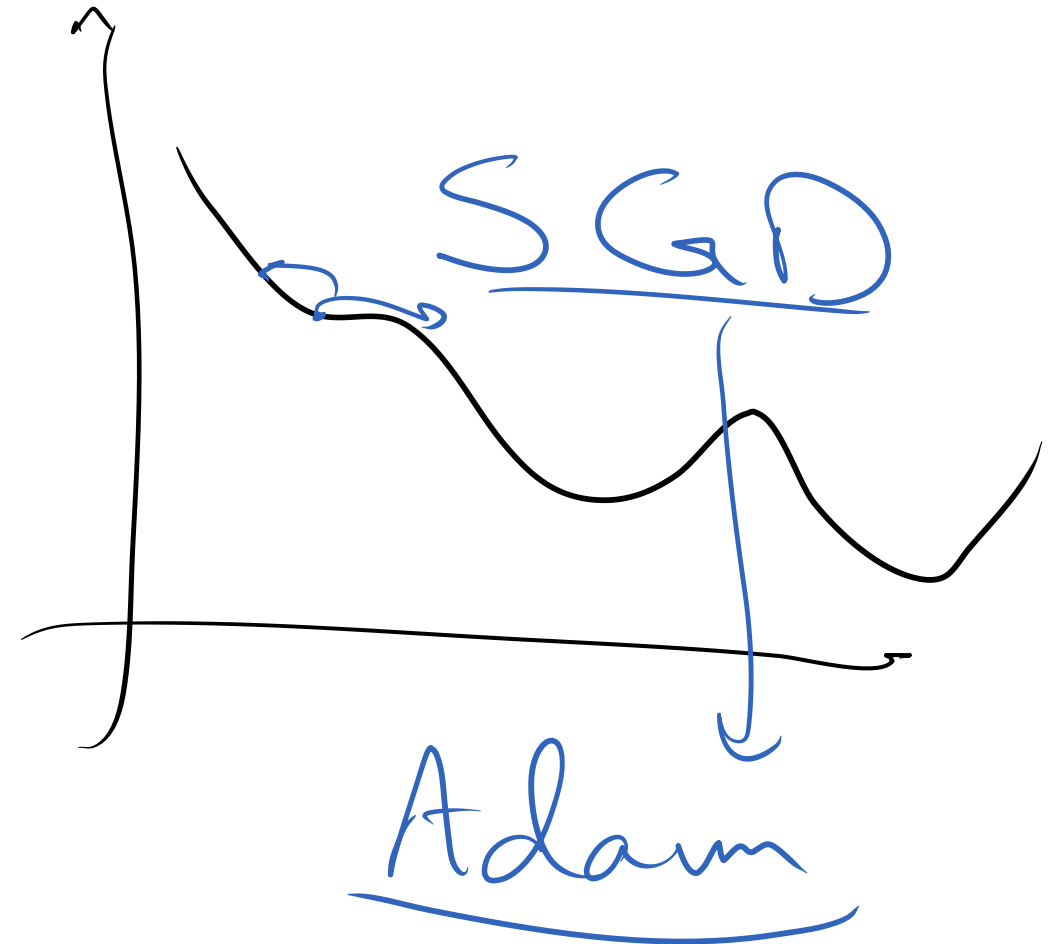
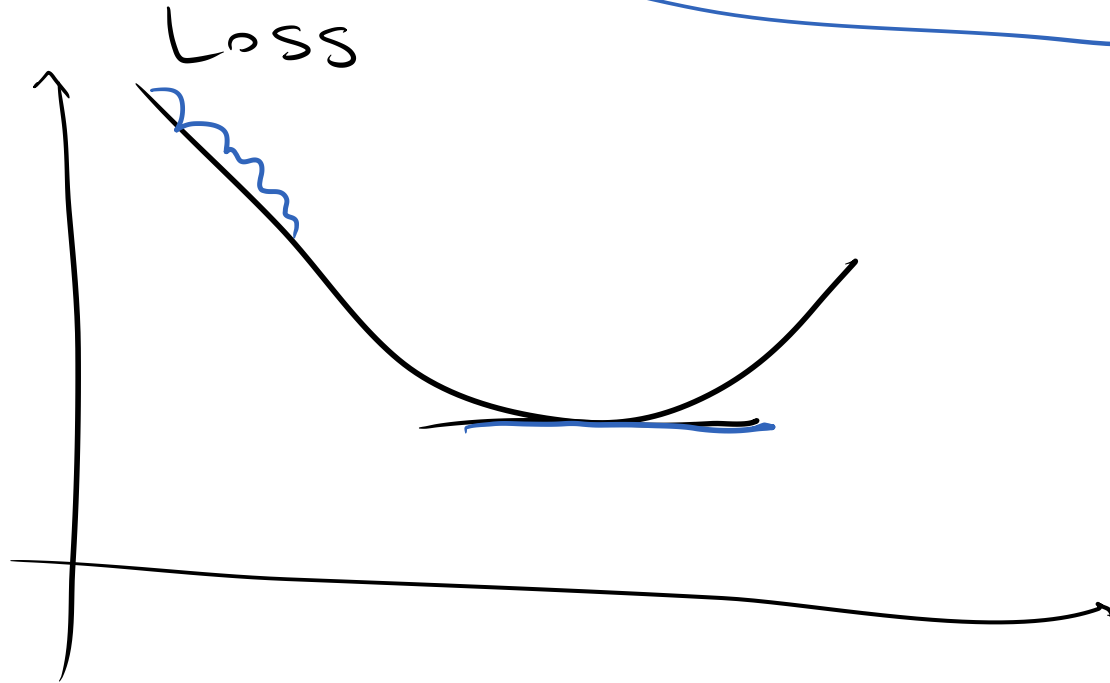
$$y = \text{Aff}_2 \left( \sum_{j=1}^H h_j w_j + b \right)$$

Gradient Descent

$$w_N = w_0 - \eta \frac{\partial L}{\partial w}$$

# Gradient Descent

$$w_N = w_0 - \eta \frac{\partial L}{\partial w}$$





Regression  $\xrightarrow{\text{Loss}}$   $\text{MSE} + \alpha \|w\|_2$

Classification  $\longrightarrow$   $\text{CE} + \alpha \|w\|_2$

التركيبي

$y_{pr}$  2 1.9 3.4 4

$y_{Tr}$  2.2 2.1 3.7 3.8

النتيجة

1 2 2 10

4 2 3 5

4 classes

$y_1$

$y_2$

$y_3$

$y_4$

0

1

0

0

→ 2

0

0

1

0

→ 3

~~Softmax~~

.2

.1

.7

.9

$y_i$

0

0

0

1

$$\text{Softmax}(y_i) = \frac{e^{y_i}}{\sum e^{y_i}}$$





