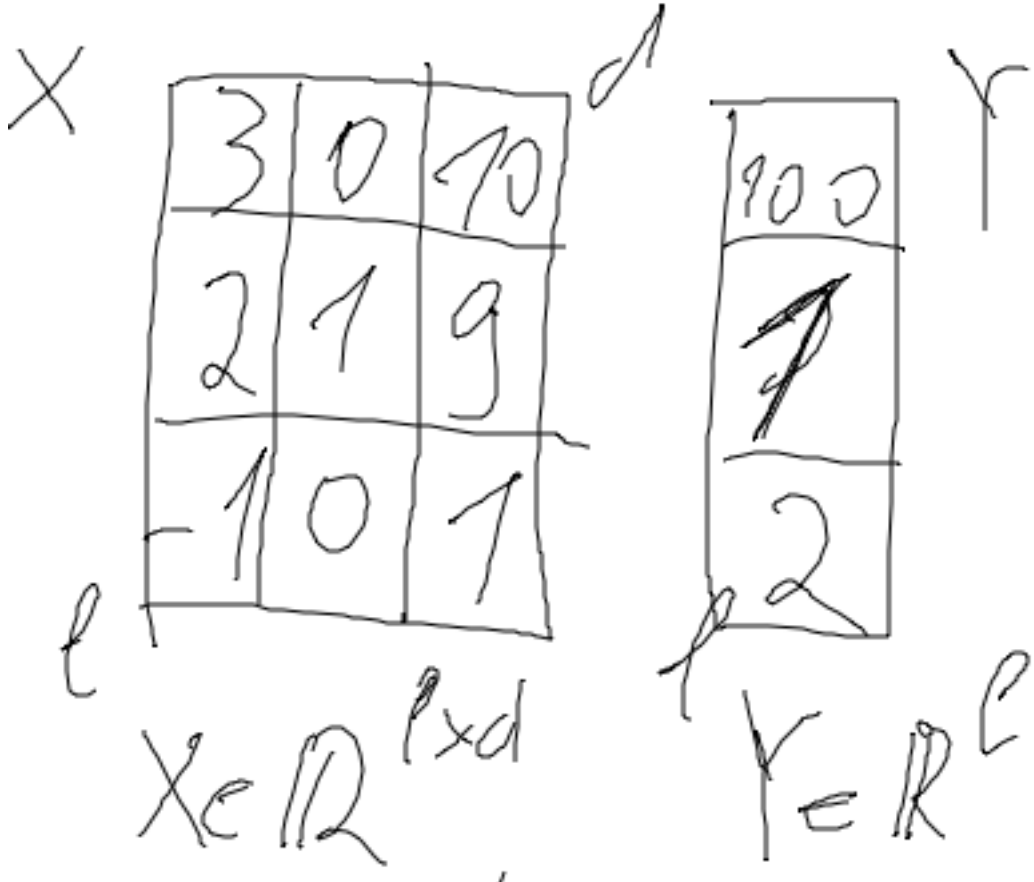


$X \in \mathbb{R}^{\ell \times d}$ $Y \in \mathbb{R}^{\ell}$

$\ell = 3$ $d = 3$

v	v	v
?	?	?

Линейная регрес

Дано: X, Y

Найти: $a(x) \approx y$

$a(x, w) = w_1 x_1 + w_2 x_2 +$

Задача № 1 $w = (0.5, 1$

Дано: X, Y

Модель: $a(x) = \sum_{j=1}^{d} w_j x_j + b =$

$w_1 x_1 + \dots + w_d$

Обучение: $b - ?$ $w_1 \dots w_d - ?$

$Q(w,b) = \sum_{i=1}^{\ell} L(y_i, a(x_i)) \overset{\text{кв. р.п.}}{=} \sum_{i=1}^{\ell} (y_i - a(x_i$

$$Q(w, b) = \sum_i (y_i - a(x_i))^2 =$$

$$\sum_i (y_i - (w_1 x_{i1} + w_2 x_{i2} + \dots + w_d x_{id}$$

$\Rightarrow$ min

Задача 2: $a(x) \equiv b$ — константа

$b - ?$, $Q(b) = \sum_{i=1}^{l} (y_i - b)^2 \to \min_b$

$$Q(\beta) = \sum_{i=1}^{\ell} (y_i - \beta)^2 \to \min_{\beta}$$

$$Q(\beta) = (y_1 - \beta)^2 + \ldots + (y_\ell - \beta)^2$$

$$Q'(\beta) = -2(y_1 - \beta) + \ldots + -2(y_\ell - \beta)$$

$$y_1 + \ldots + y_\ell - \beta \cdot \ell = 0$$

$$\beta = \frac{y_1 + \ldots + y_\ell}{\ell} = \frac{1}{\ell} \sum_{i=1}^{\ell}$$

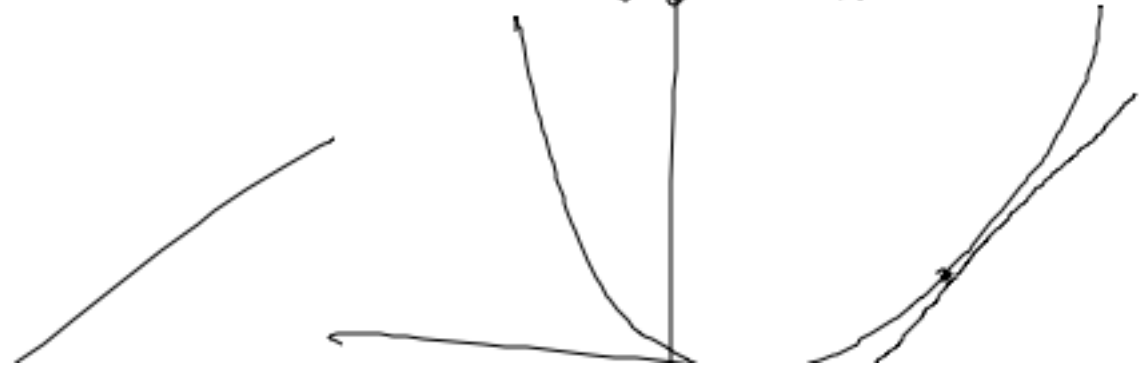
$$Q(b) = (b - y_1)^2 + \dots + (b - y_e)^2$$

$$2(b - y_1)$$

$$y^{2\,1} = y \cdot (b - y)^2$$

$$y^{2\,1} = 2y$$

$$y^{1} = 1$$



$$Q(b) = \sum_i (y_i - b)^2 \to \min_b$$

mean squared error
MSE

$b = \text{mean}(y_1$

$Y = (100, 1, 2)$

$b = 34,3$

$$Q(b) = \sum_i \|y_i - b\| \to \min_b$$

mean absolute error

y = (100, 1, 2)

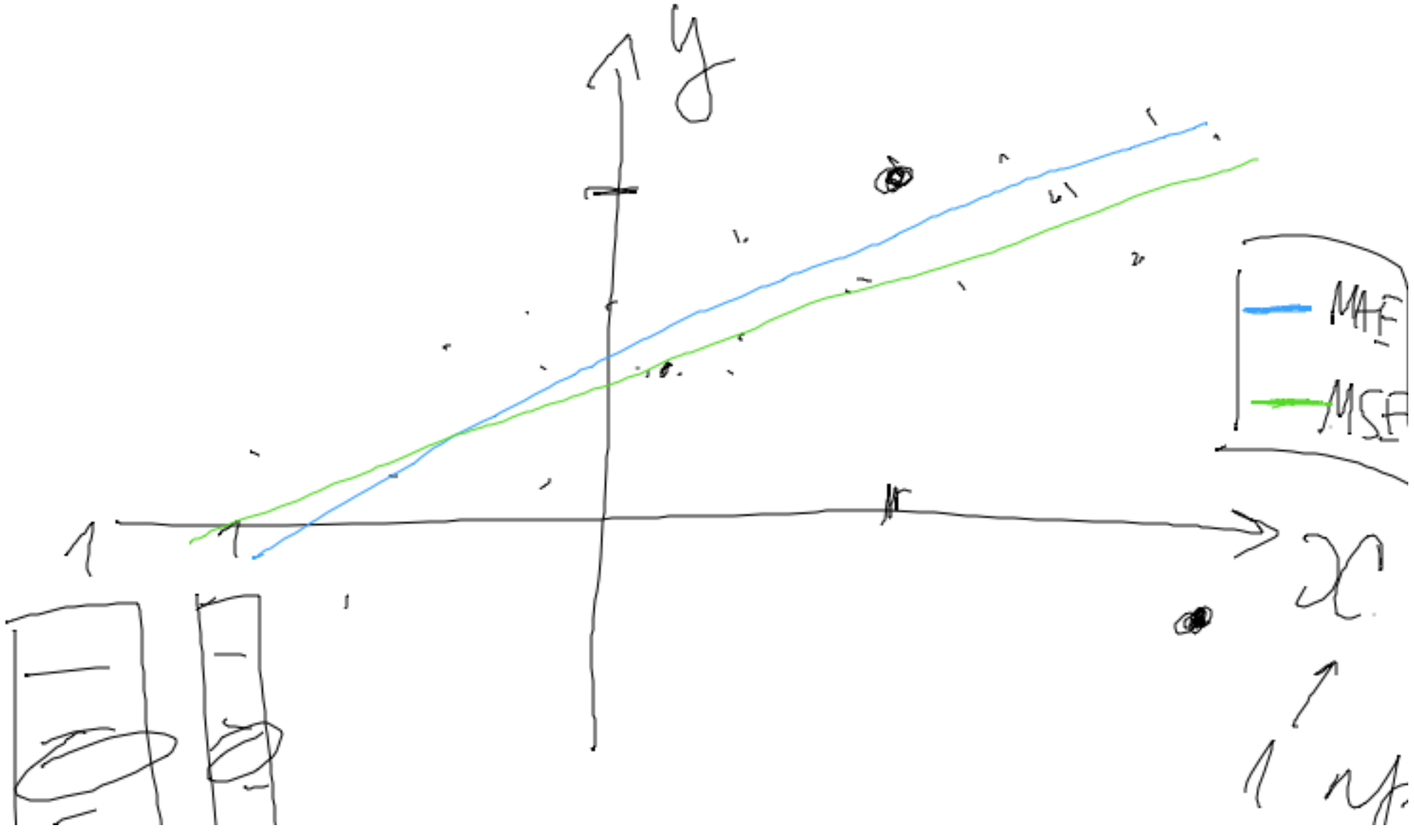
1 2 100

↑

Y = (3 5 100 1 2)

mean(y) = (0 + 1 + 2) / 3

median(y) =


y
x
MAF
MSF

$$a(x) = w_1 x_1 + \dots + w_d x_d$$

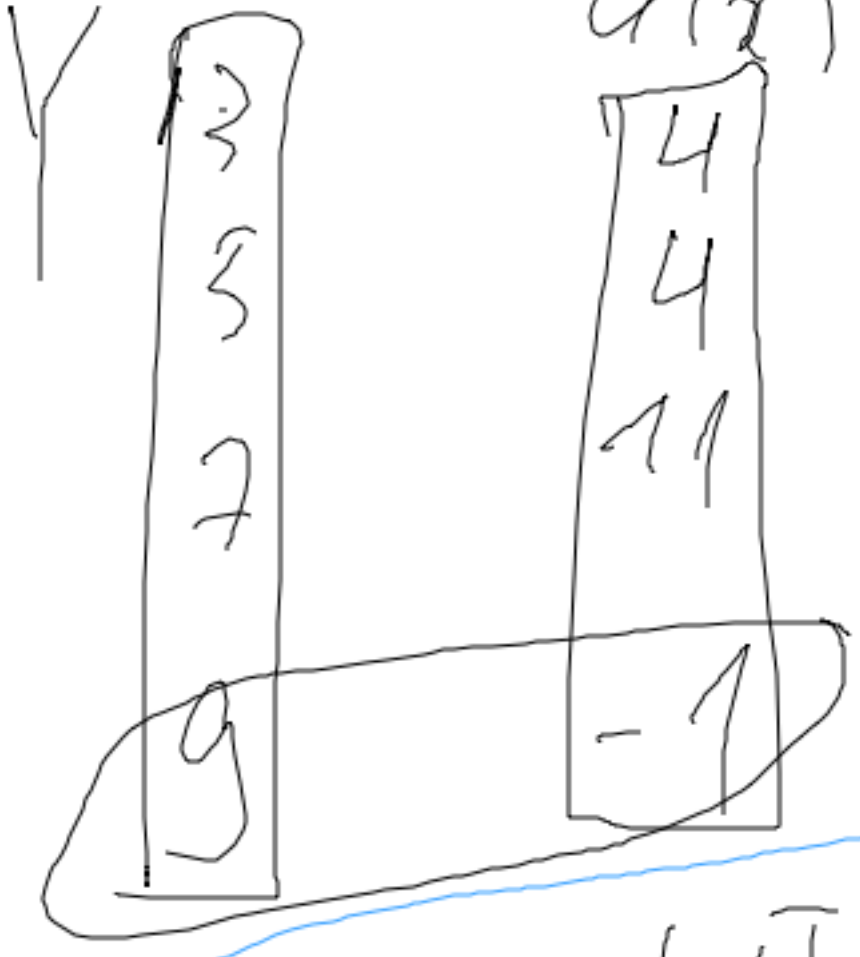
$$Q(w) = \sum_i (y_i - a(x_i))^2 \to$$

$$\frac{\partial Q}{\partial w_j} = 0, \text{ решаем}$$

$$\hat{w} = (X^T X)^{-1} X^T Y$$

$d \times 1$ $\quad d \times \ell$ $\quad \ell \times d$ $\quad \ell \times 1$

T.



MSE

$= \frac{1}{\ell} \sum (y_i - a(x_i))^2$

$= \frac{1}{4} ((3-4)^2 + (5-4)^2 + (7-11)^2 + (9+1)^2) = \frac{118}{4} = 29 \ldots$

MAE

$= \frac{1}{\ell} \sum |y_i -$

$= \frac{1}{4} (|3 |5 |7- |9+$

$w = (X^T X)^{-1} X^T Y$

hp. lin

matrix