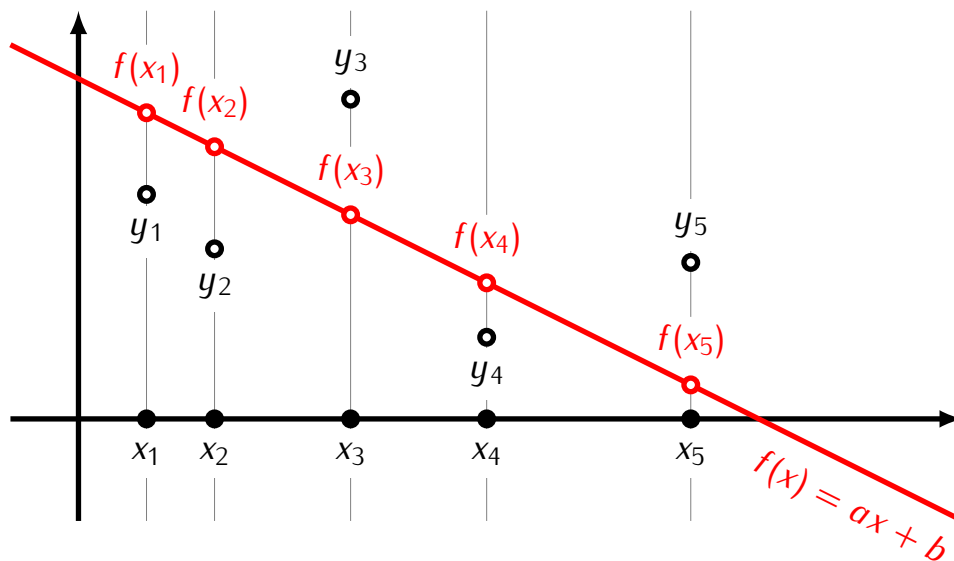


$L_1$  regression

**Problem.** Given points with coordinates  $(x_i, y_i)$  for  $i = 1, \dots, n$  find a function  $f(x) = ax + b$  such that the sum

$$\sum_{i=1}^n |f(x_i) - y_i|$$

is as small as possible.



**Note.** Compare with  $L_2$  regression (least squares): we want to minimize

$$\sqrt{\sum_{i=1}^n |f(x_i) - y_i|^2}$$

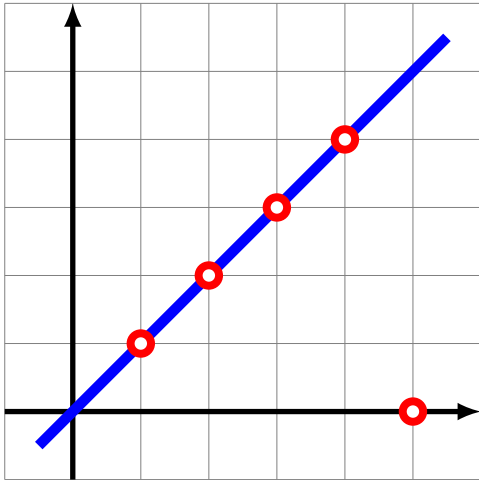
**Problem.** Given points with coordinates  $(x_i, y_i)$  for  $i = 1, \dots, n$  find a function  $f(x) = ax + b$  such that the sum

$$\sum_{i=1}^n |f(x_i) - y_i|$$

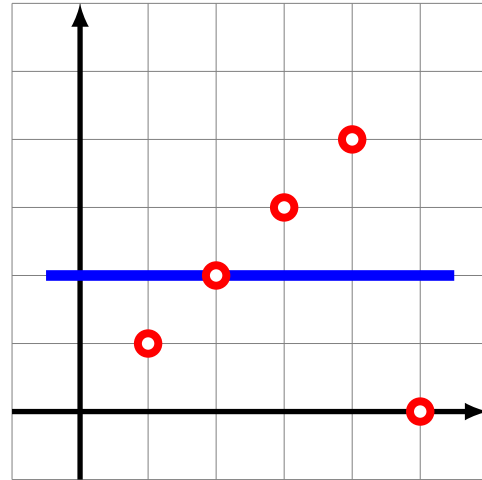
is as small as possible.

## $L_1$ regression vs $L_2$ regression

- $L_1$  regression is less sensitive than  $L_2$  if we change the value of a single point.



$L_1$  regression



$L_2$  regression

- $L_2$  regression gives a uniquely defined line if there are at least two points with different  $x$ -coordinates.  $L_1$  regression can have infinitely many solutions.

