

Drill 2

We want to calculate the median with the observations in \mathcal{X} using the L_1 distance function as below.

1. Equal weights.

(a) We have $\mathcal{X} = \{1, 2, 3, 4, 5\}$. (The number of observations is odd).

$$\text{Sketch } y = 0.2 \cdot |x - 1| + 0.2 \cdot |x - 2| + 0.2 \cdot |x - 3| + 0.2 \cdot |x - 4| + 0.2 \cdot |x - 5|.$$

What did you find?

(b) We have $\mathcal{X} = \{1, 2, 3, 4\}$. (The number of observations is even).

$$\text{Sketch } y = 0.25 \cdot |x - 1| + 0.25 \cdot |x - 2| + 0.25 \cdot |x - 3| + 0.25 \cdot |x - 4|.$$

What did you find?

2. Unequal weights.

(a) We have $\mathcal{X} = \{1, 2, 3, 4, 5\}$. (The number of observations is odd).

$$\text{Sketch } y = 0.3 \cdot |x - 1| + 0.2 \cdot |x - 2| + 0.1 \cdot |x - 3| + 0.2 \cdot |x - 4| + 0.2 \cdot |x - 5|.$$

What did you find?

(b) We have $\mathcal{X} = \{1, 2, 3, 4\}$. (The number of observations is even).

$$\text{Sketch } y = 0.25 \cdot |x - 1| + 0.30 \cdot |x - 2| + 0.20 \cdot |x - 3| + 0.25 \cdot |x - 4|.$$

What did you find?

3. Can you generalize the above results? What is the optimal location (weighted median)

with $y = \sum_{i=1}^n w_i |x - x_i|$?