

class Exercise #2

Probabilistic Interpretation of the Squared Error

In the slides, it is explained that our statistical model is defined as:

$$t^{(i)} = w^T x^{(i)} + \epsilon^{(i)}$$

where $\epsilon^{(i)}$ follows the Laplace distribution, with its probability density function defined as:

$$\frac{1}{2b} \exp\left(-\frac{|t^{(i)} - w^T x^{(i)}|}{b}\right)$$

Question 1

Based on this model, if we want to estimate the weights \mathbf{w} using Maximum Likelihood Estimation (MLE), which of the following options corresponds to the loss function?

- Option 1:

$$\frac{1}{N} \sum_{i=1}^N |t^{(i)} - w^T x^{(i)}|^{1/2}$$

- Option 2:

$$\frac{1}{N} \sum_{i=1}^N \left(t^{(i)} - w^T x^{(i)}\right)^2$$

- Option 3:

$$\frac{1}{N} \sum_{i=1}^N |t^{(i)} - w^T x^{(i)}|$$

- Option 4:

$$\frac{1}{N} \left| \sum_{i=1}^N t^{(i)} - w^T x^{(i)} \right|$$

Question 2

Provide an example of an application where non-Gaussian probabilistic models (e.g., Laplace distribution) are used.