Loss Function

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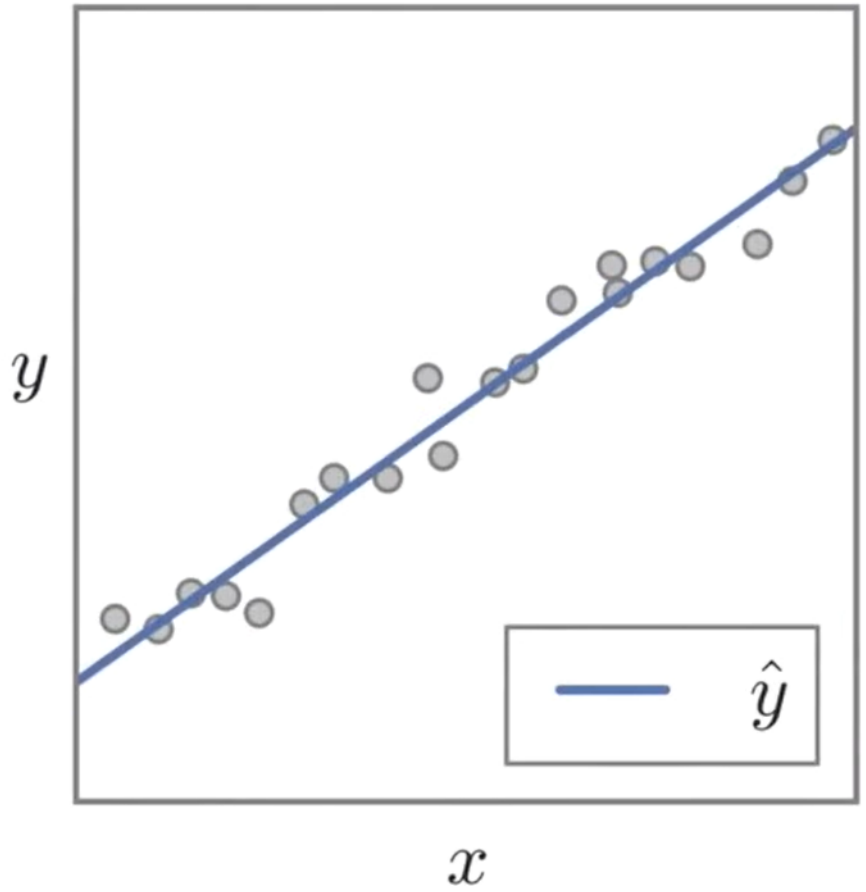
Use of loss functions

- “[…]a loss function is a measure of how good your prediction model does in terms of being able to predict the expected outcome(or value). We convert the learning problem into an optimization problem, define a loss function and then optimize the algorithm to minimize the loss function.”

Example – Regression Squared Loss

$$\text{Squared Loss} = (\hat{y} - y)^2$$



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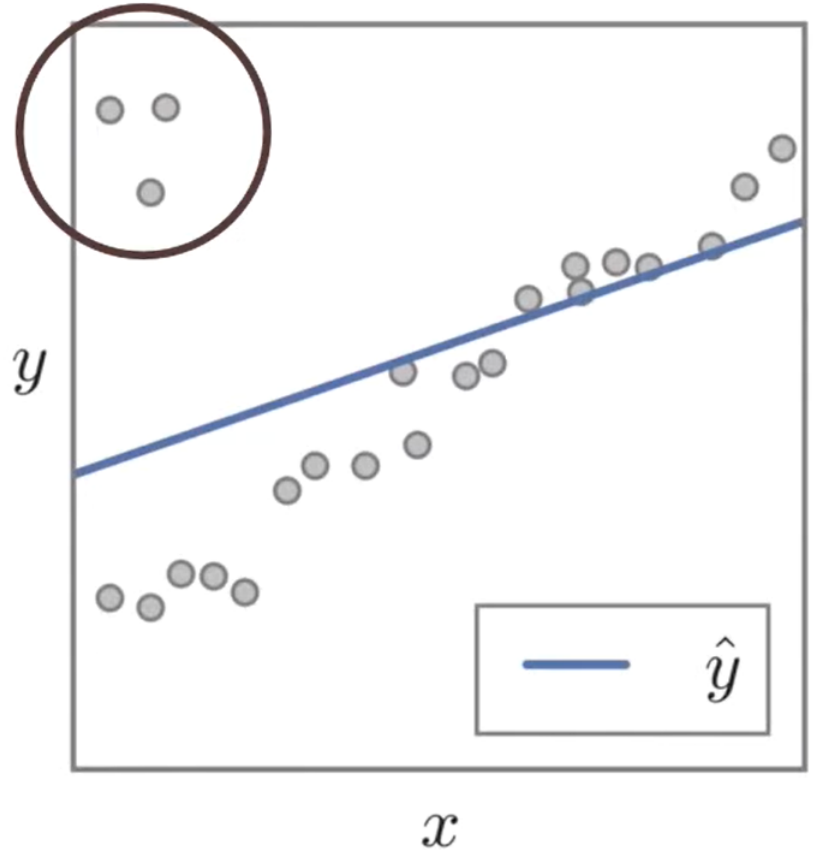
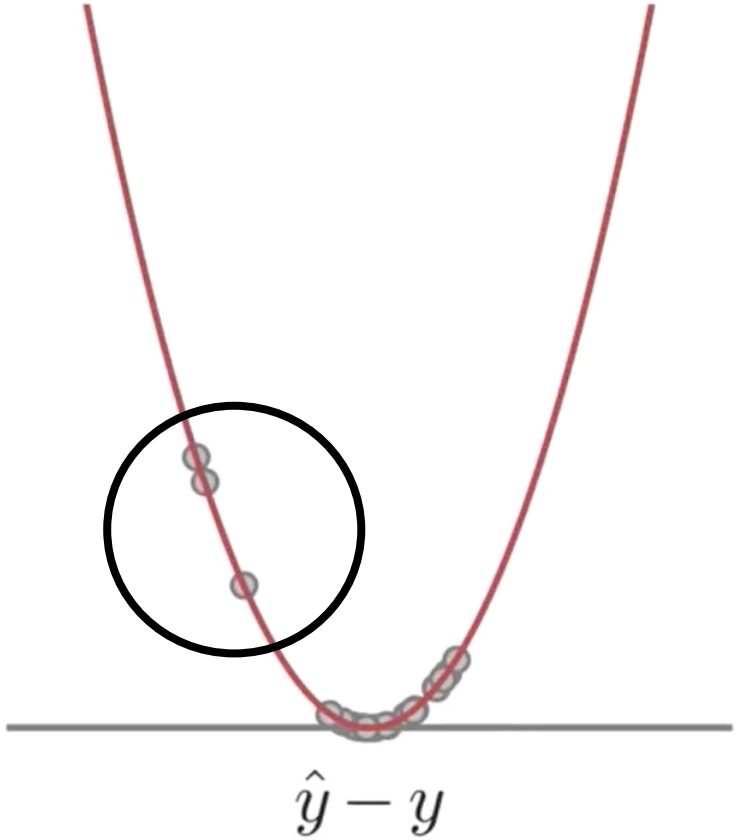
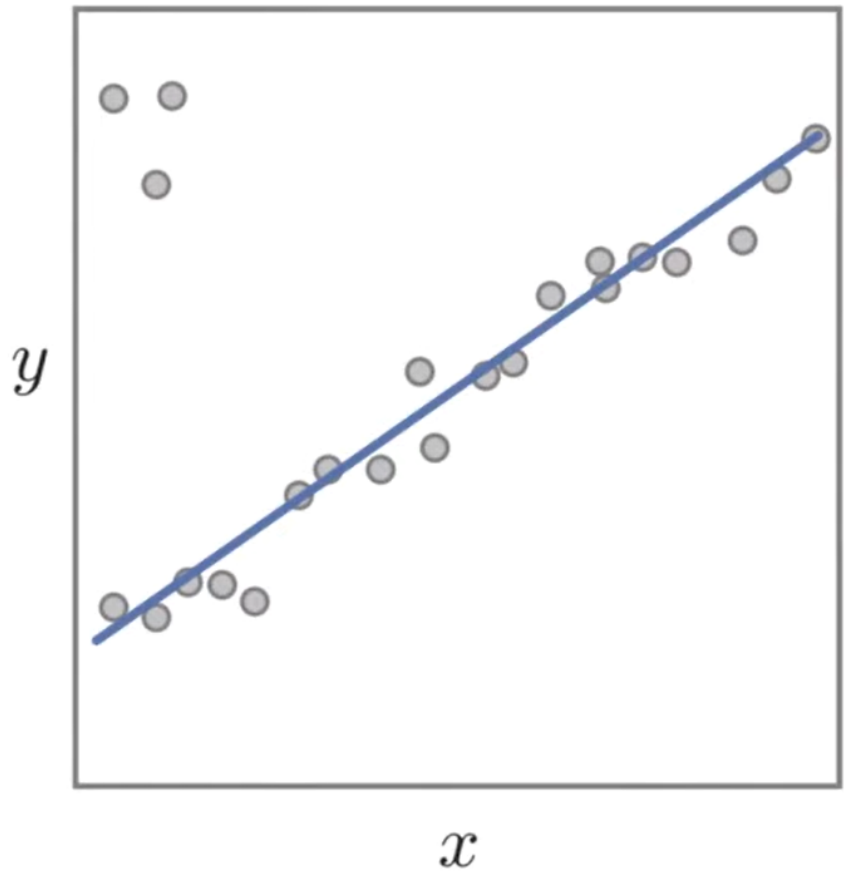




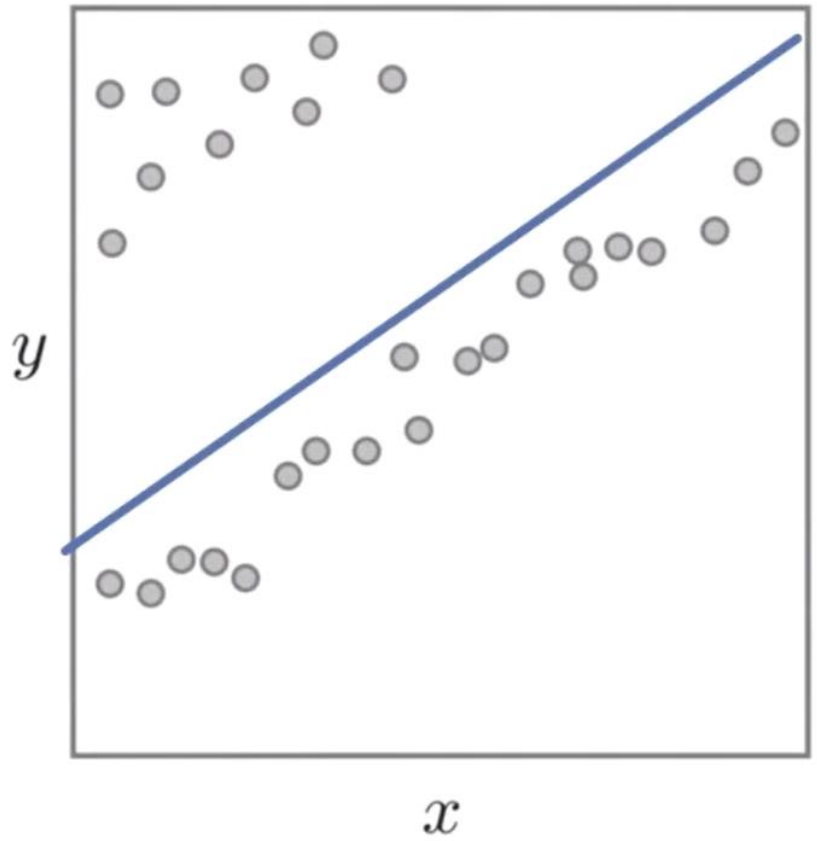
Example – Regression Absolute Loss

$$\text{Absolute Loss} = |\hat{y} - y|$$



Example – Regression Pseudo-Huber Loss

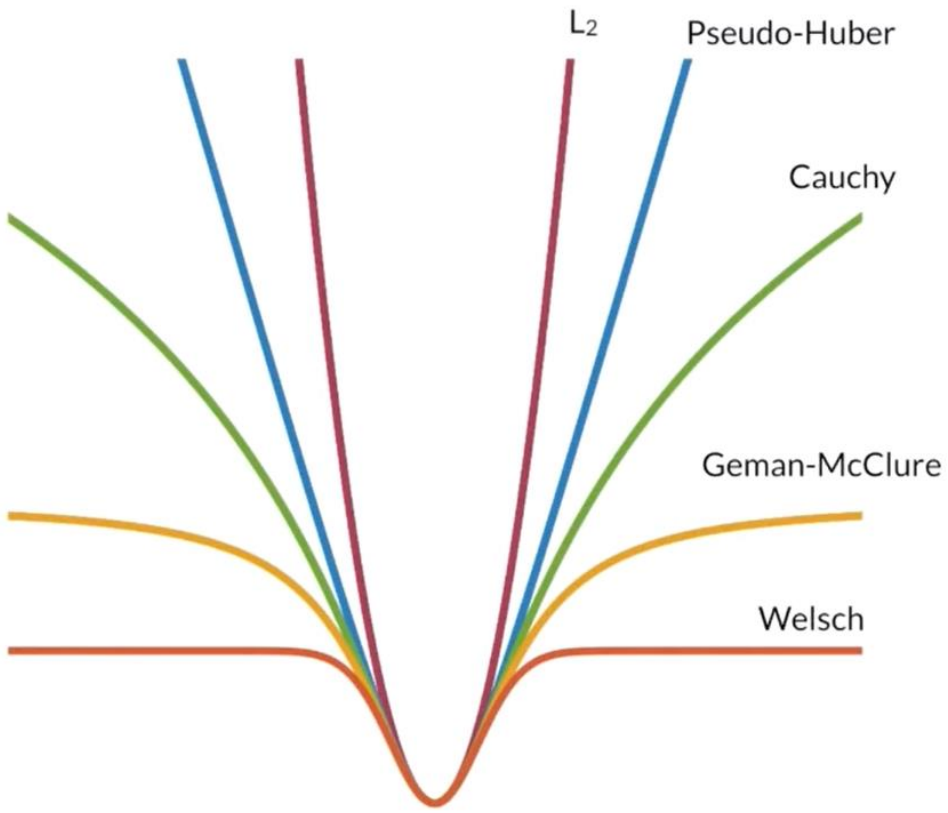
$$\text{Pseudo-Huber Loss} = \begin{cases} (y-\hat{y})^2 & ; |y-\hat{y}| \le \alpha \\ |y-\hat{y}| & ; otherwise \end{cases}$$



List of loss functions and areas of application

- Classification
  - Cross Entropy Loss
  - KL Divergence
  - Hinge Loss
- Regression
  - Squared Loss
  - Absolute Loss
  - Pseudo-Huber Loss

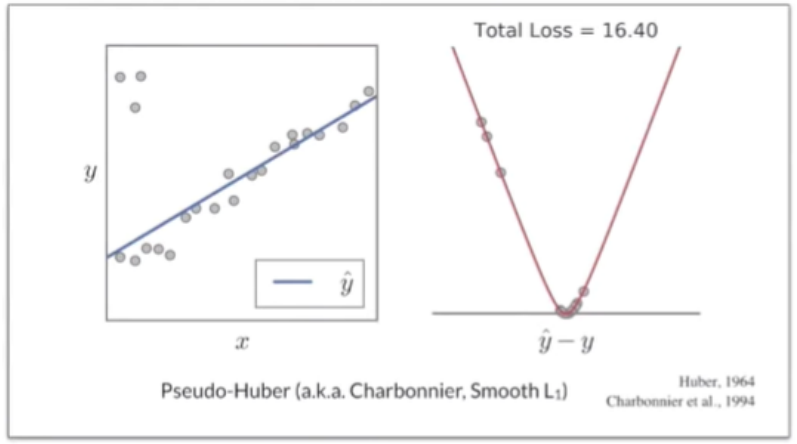
Generalized Loss Function

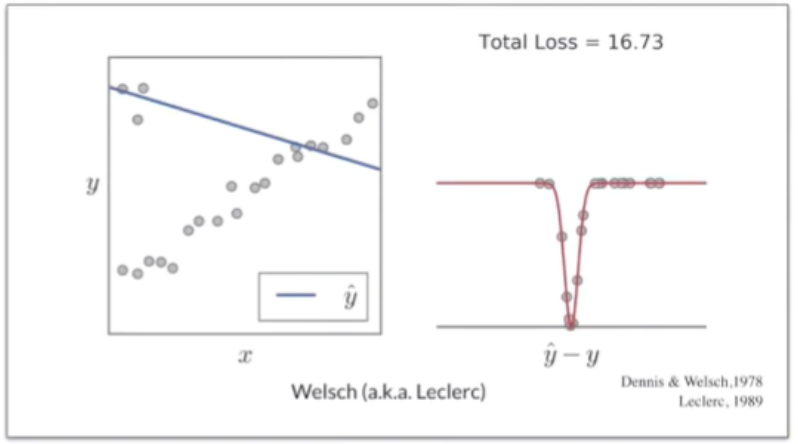


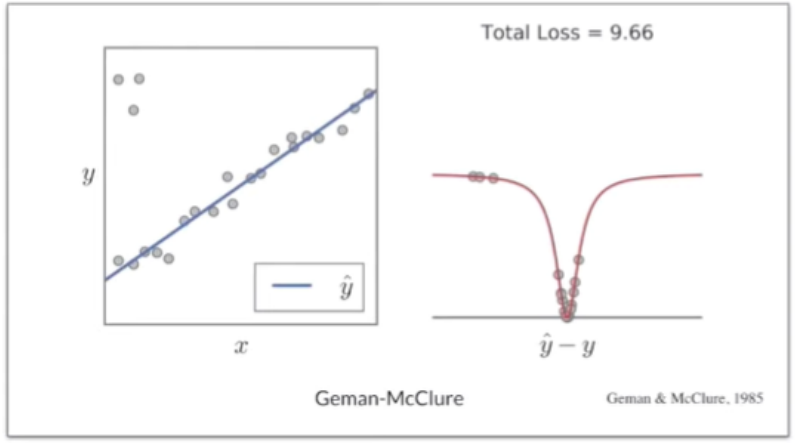
$$\rho(x,\alpha) = \frac{|2-\alpha|}{\alpha}\left(\left(\frac{x^2}{|2-\alpha|}+1\right)^{\frac{\alpha}{2}}-1\right)$$

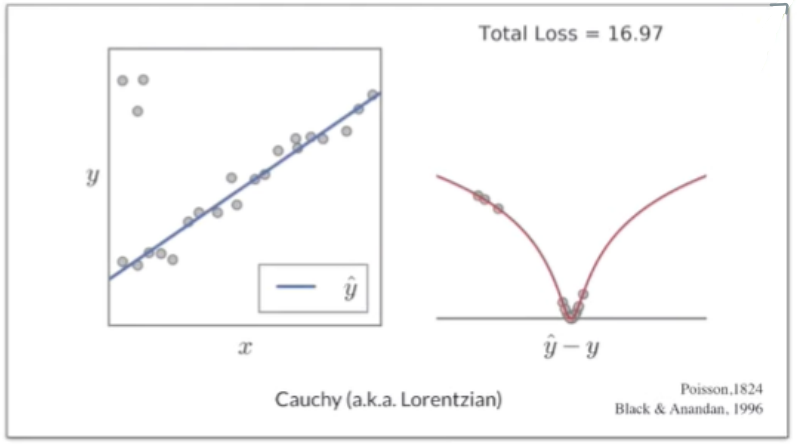
$$NLL(\theta,\alpha) = \min_{\theta,\alpha} \rho(x,\alpha) + \log Z(\alpha)$$

Sum-Up Example

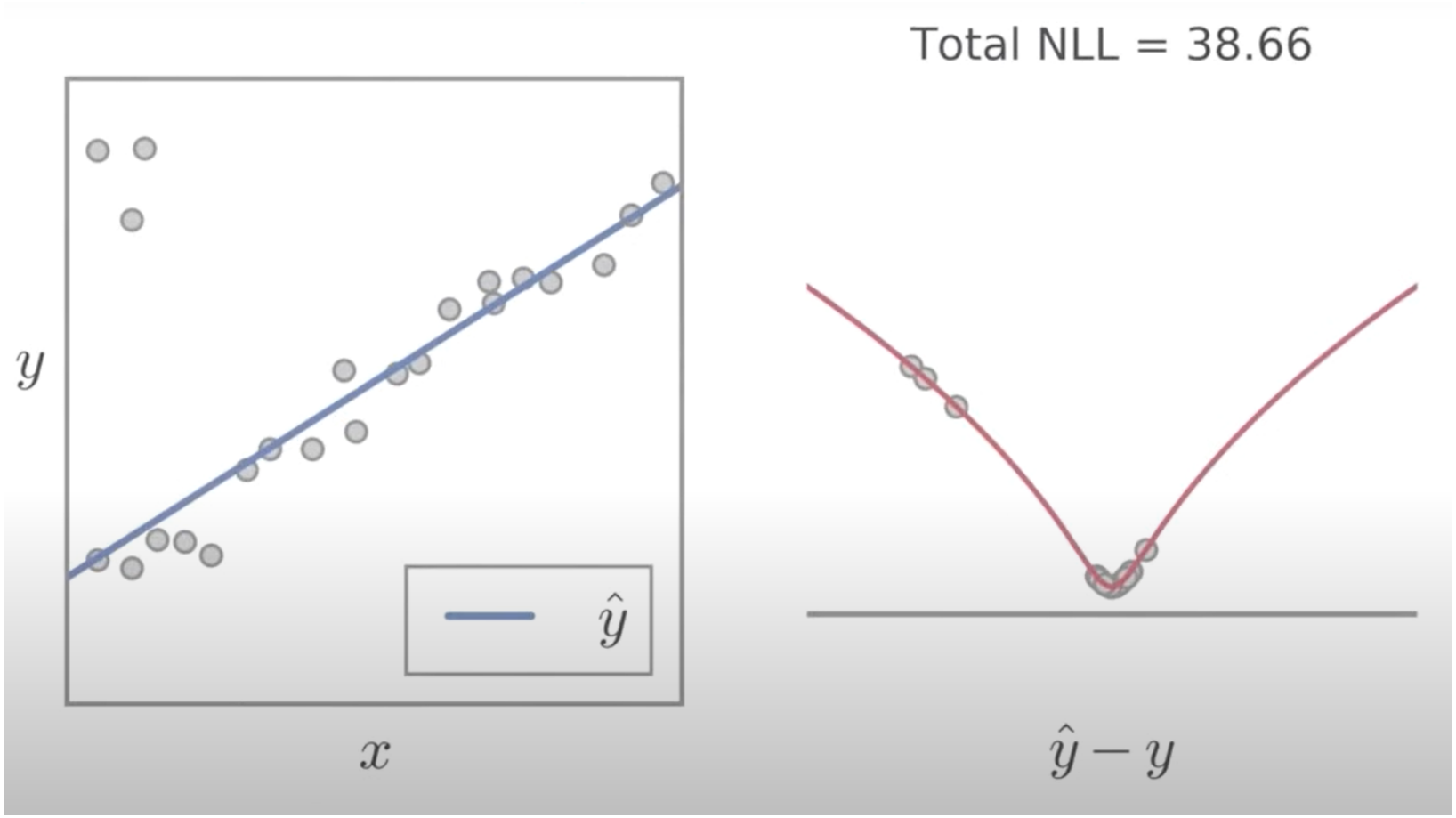








Adaptive Loss



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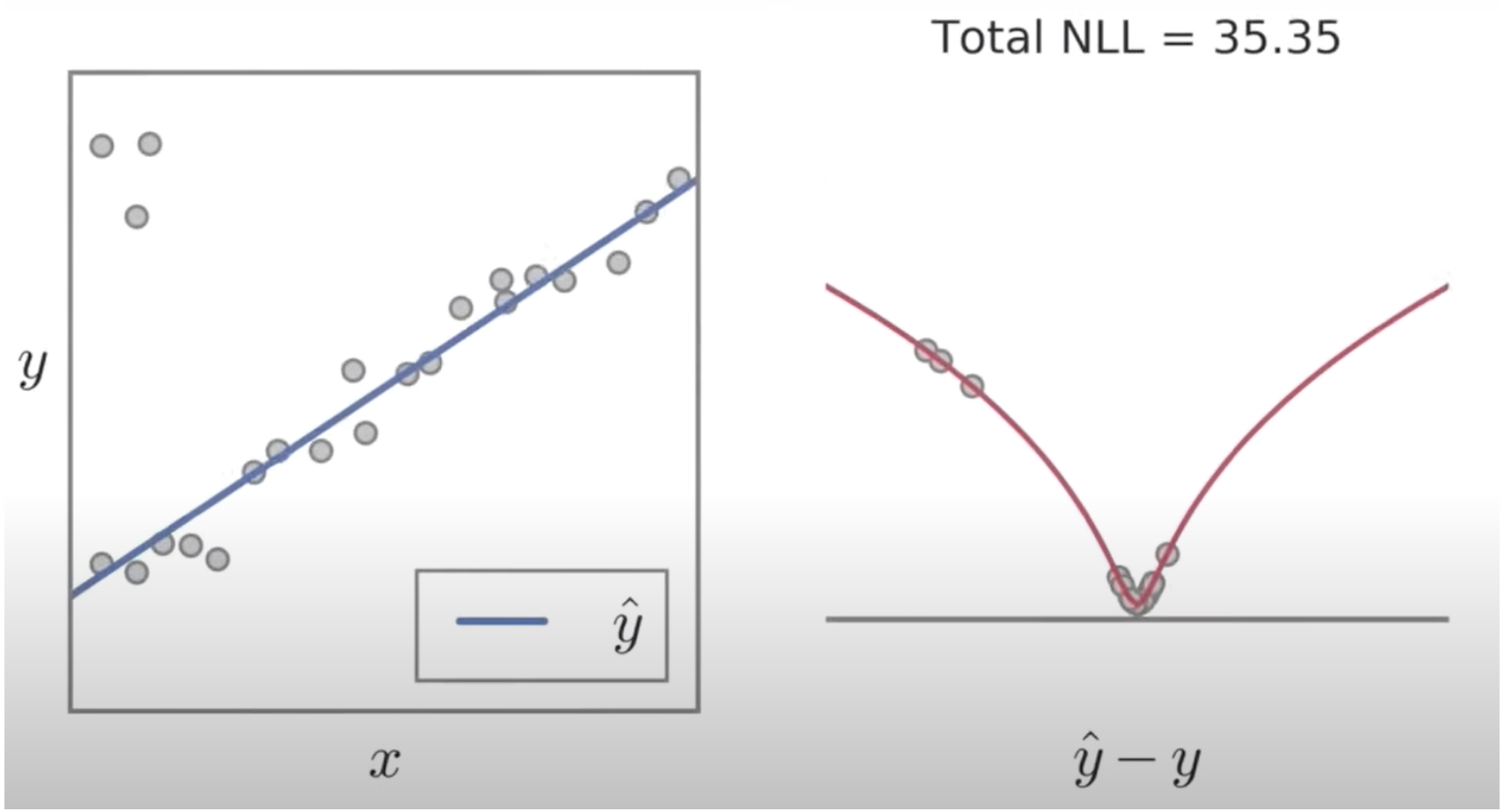
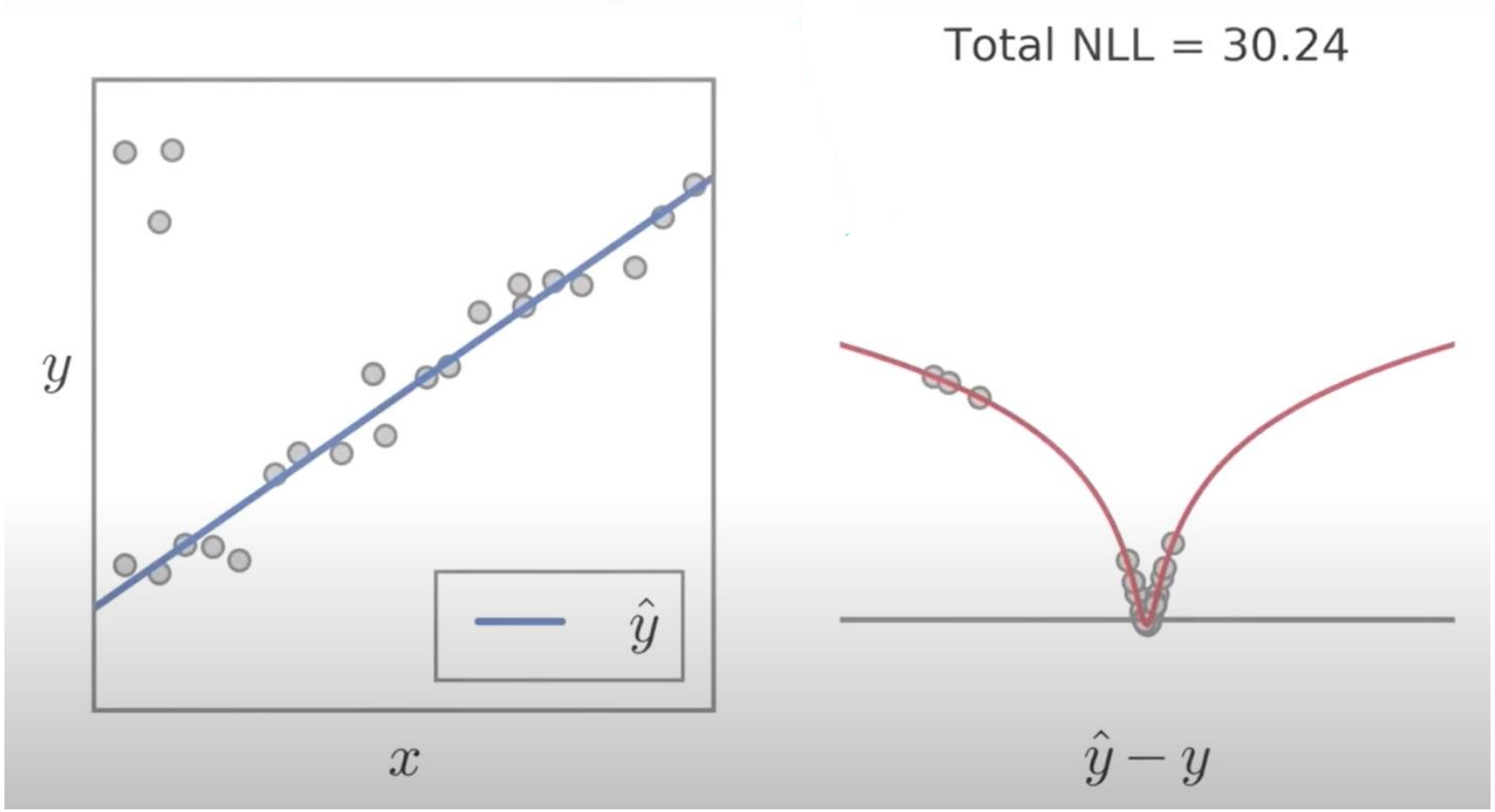


Adaptive Loss



Sources

- https://www.youtube.com/watch?v=QBbC3Cjsnjg&t=30s
- https://towardsdatascience.com/importance-of-loss-function-in-machine-learning-eddaaec69519