

Lecture 21

Loss Functions Regression

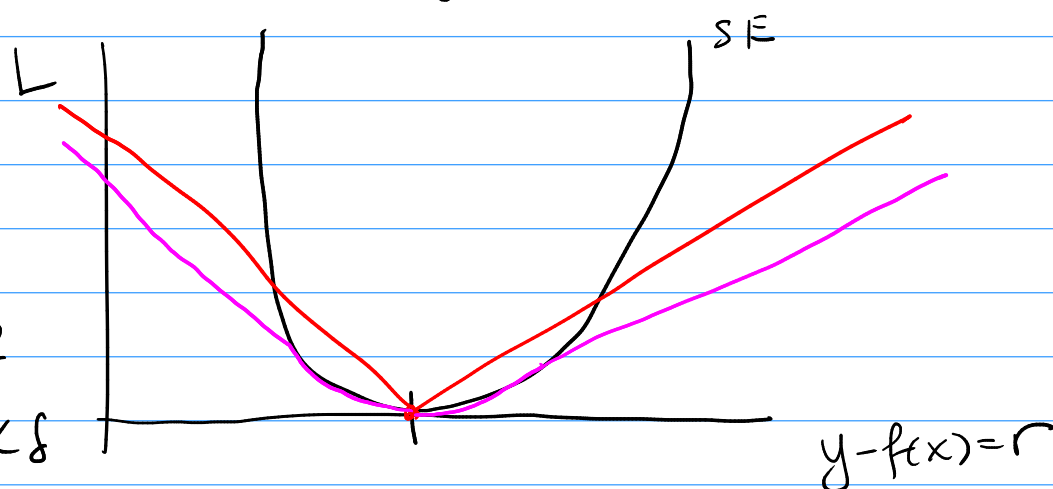
SE loss : $L(y, f(x)) = (y - f(x))^2$

Abs. Loss: $L(y, f(x)) = |y - f(x)|$

Huber Loss:

$$L(y, f(x)) = \begin{cases} \frac{1}{2}(y - f(x))^2 & \text{if } |y - f(x)| < \delta \end{cases}$$

$$\delta(|y - f(x)| - \frac{1}{2}\delta) \text{ if } |y - f(x)| > \delta$$

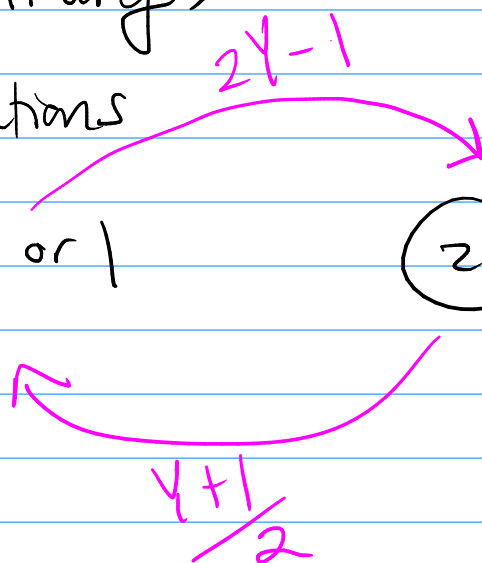


Classification (Binary)

Two parameterizations

① $Y = 0 \text{ or } 1$

② $Y = \pm 1$



0-1 : $L(y, f(x)) = \mathbb{1}(y \neq f(x))$

If I use ± 1 parametrization then
 correct classification \Leftrightarrow signs $y, f(x)$ match
 incorrect " \Leftrightarrow signs don't match

For any f there is some f_h h so
 that

$$f(x) = \text{Sign}(h(x))$$

idea: $h(x) > 0$ for class 1
 $h(x) < 0$ for class -1

margin of a classifier: $y h(x)$

$y h > 0 \Leftrightarrow$ correct classification

$y h < 0 \Leftrightarrow$ incorrect "

$|y h| =$ correctness of class. of pt
 \approx residual for regression

0-1 : $L(y h) = \mathbb{1}(y h < 0)$

Exponential loss: $L(yh) = e^{-yh}$

Hinge loss: $L(yh) = \max(0, 1 - yh)$

Bin Dev: $L(yh) = \log(1 + e^{-2yh})$

Sq Err: $L(yh) = (yh - \frac{1}{2})^2$

