CV Course4 Loss functions

Blake

Outlines

Introduction for loss functions

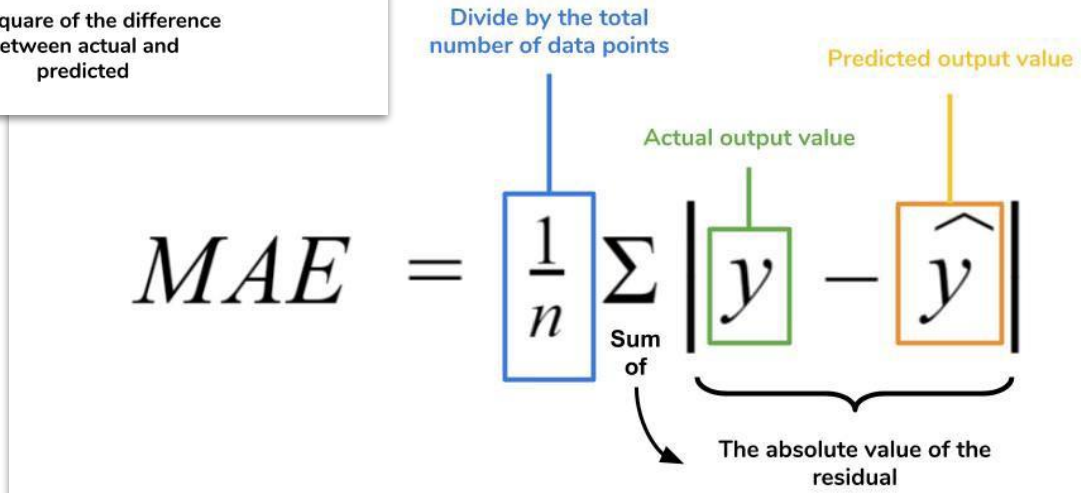
- **MSE/MAE**
- **Huber Loss**
- **Cross Entropy**
- **Focal Loss**
- **Center Loss**
- **Triplet Loss**

Hands-on

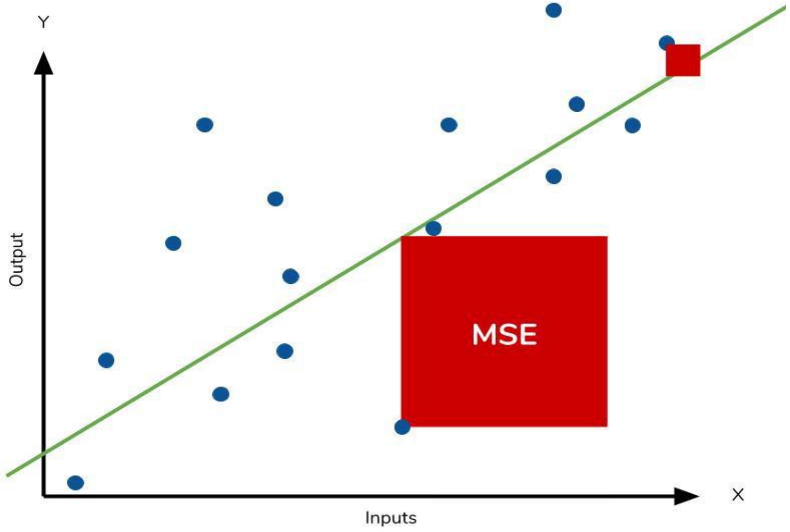
MSE（Mean-Square Error）
MAE（Mean-Absolute Error）

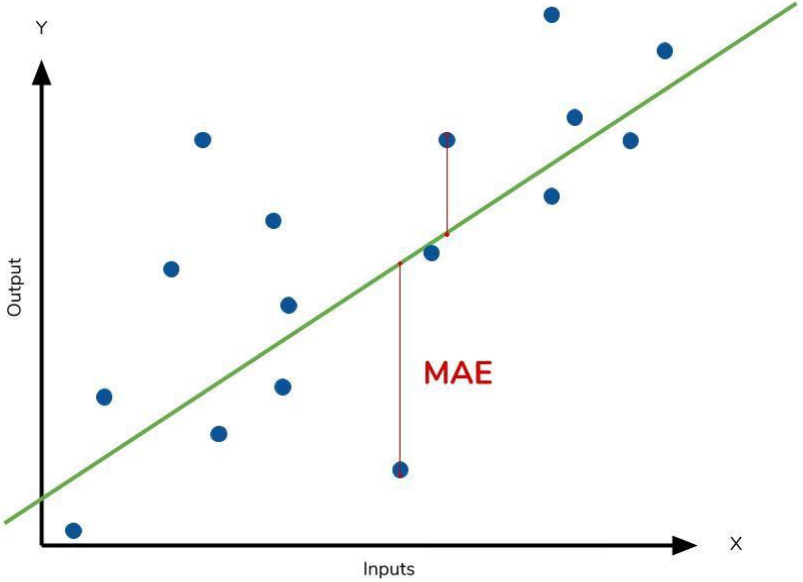
$$MSE = \frac{1}{n}\Sigma\left(y - \hat{y}\right)^2$$

The square of the difference between actual and predicted



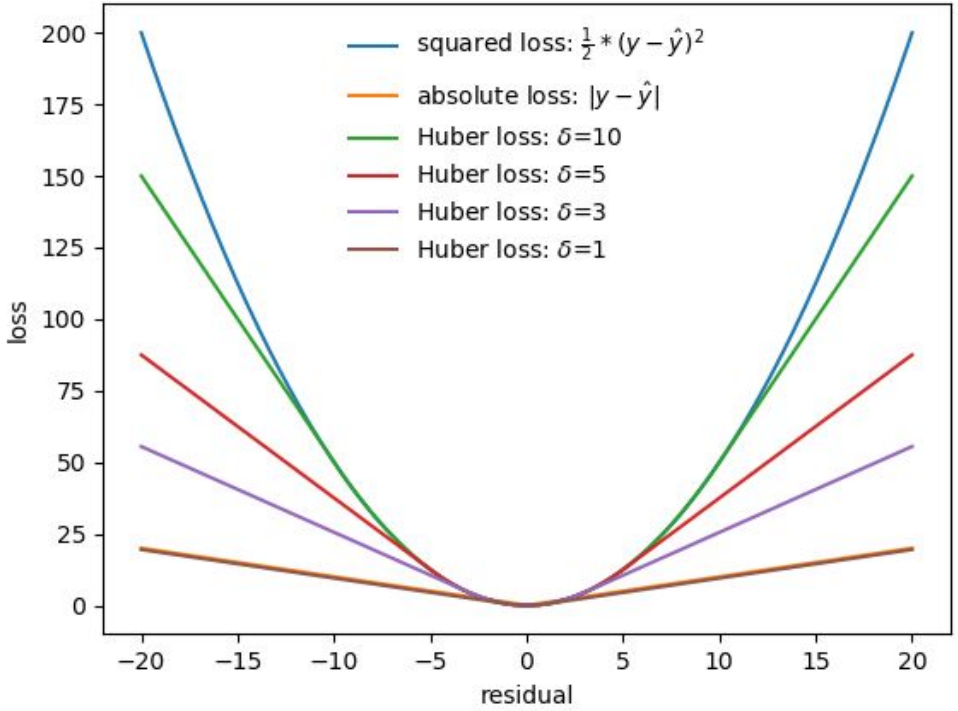
MSE（Mean-Square Error）
MAE（Mean-Absolute Error）





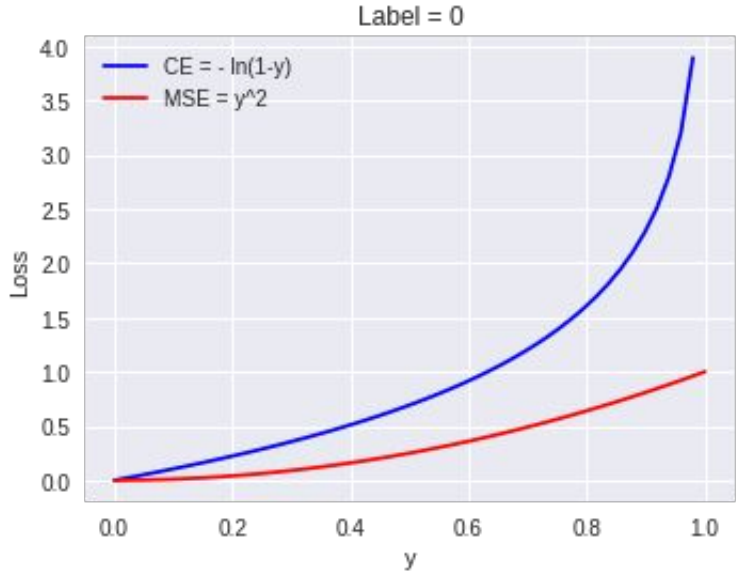
Huber Loss

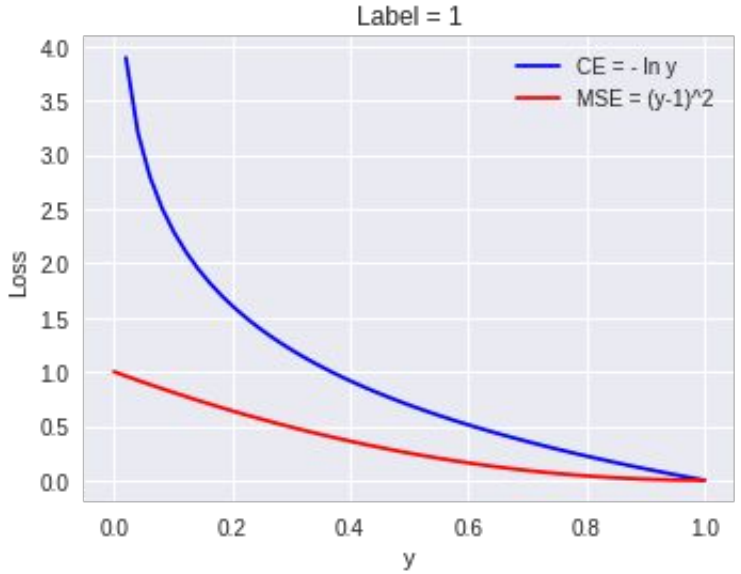
$$L_\delta(y, f(x)) = \begin{cases} \frac{1}{2}(y - f(x))^2, \text{ if } |y - f(x)| \leq \delta \\ \delta|y - f(x)| - \frac{1}{2}\delta^2, \text{ if } |y - f(x)| > \delta \end{cases}$$



Cross Entropy

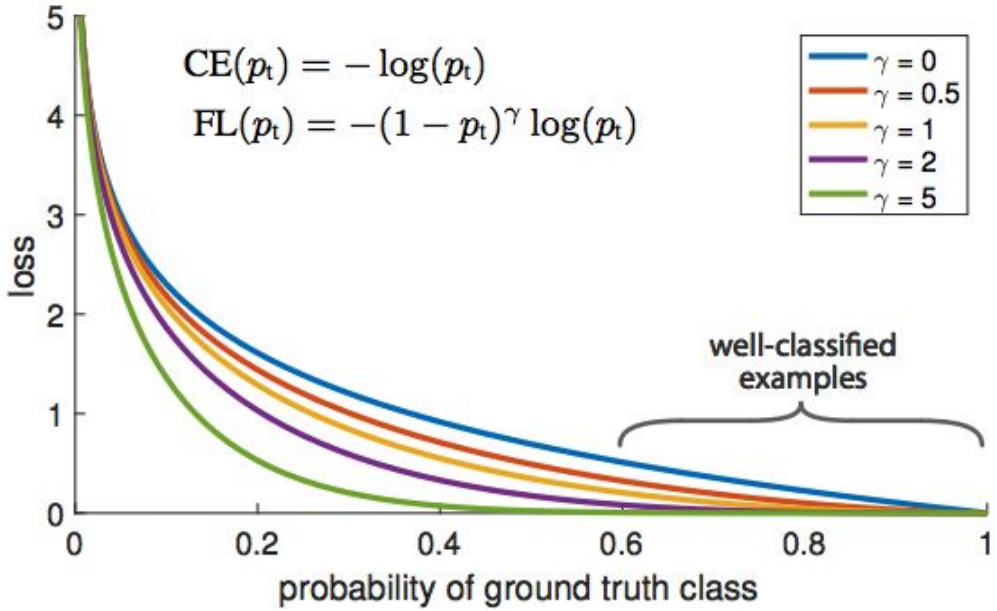
$$H(p, q) = -\sum_{x} p(x) \log q(x).$$





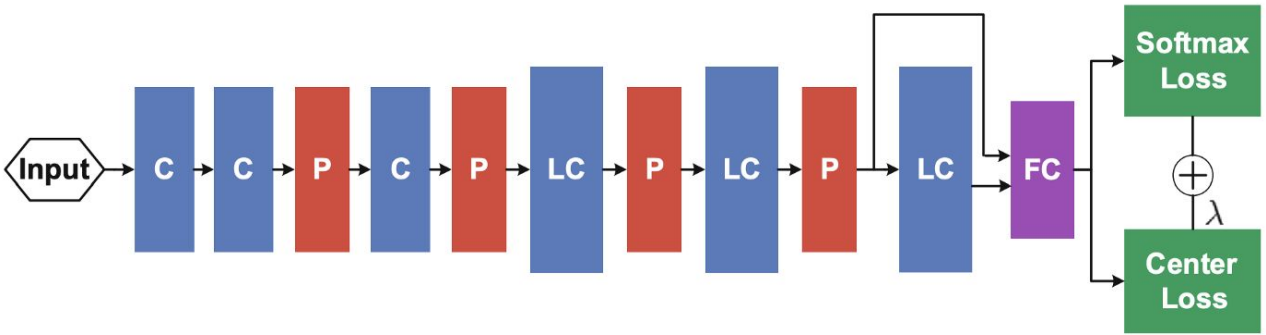
Focal Loss

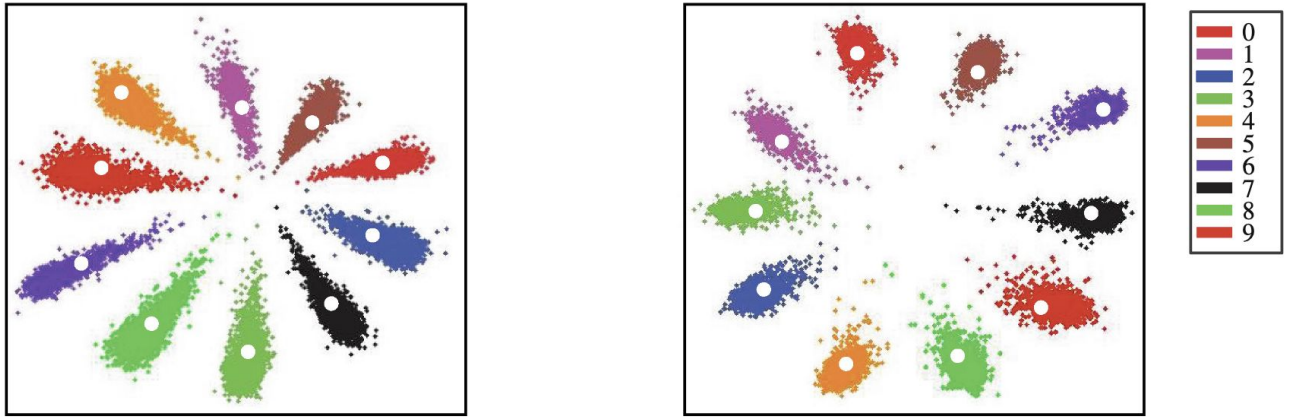
$$Loss(x, class) = -\alpha_{class}(1 - \frac{e^{x[class]}}{\sum_j e^{x[j]}})^{\gamma} \log(\frac{e^{x[class]}}{\sum_j e^{x[j]}})$$



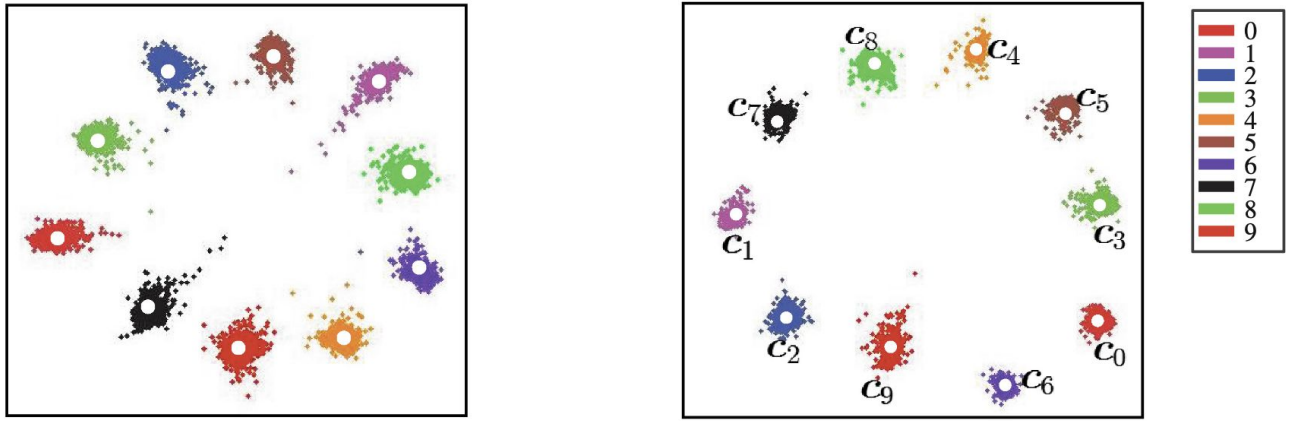
Center Loss

$$\mathcal{L}_C = \frac{1}{2}\sum_{i=1}^{m} \|\boldsymbol{x}_i - \boldsymbol{c}_{y_i}\|_2^2$$





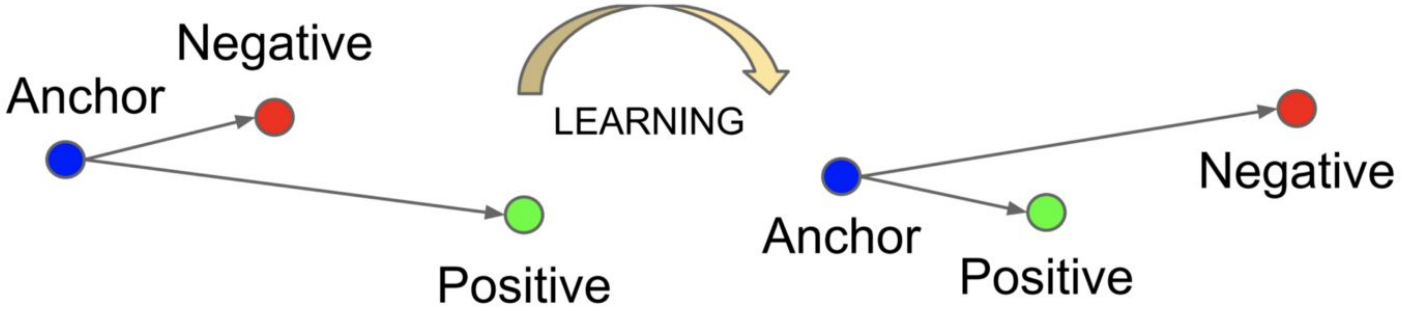
(a) $\lambda = 0.001$ (b) $\lambda = 0.01$



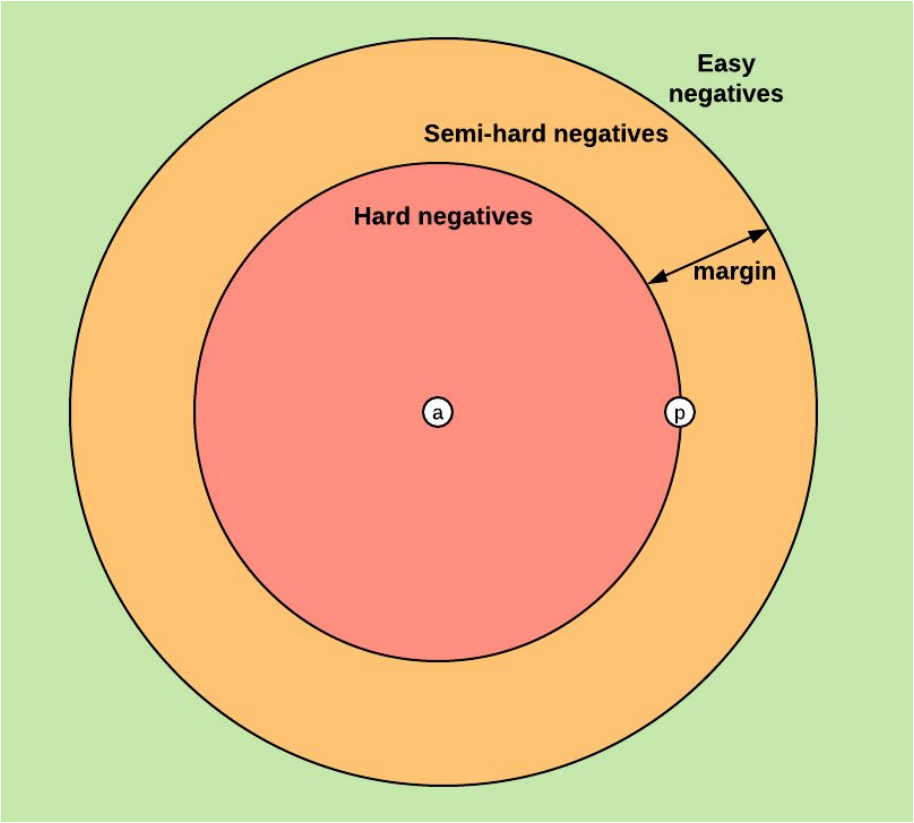
(c) $\lambda = 0.1$ (d) $\lambda = 1$

Triplet Loss

$$Loss = \sum_{i=1}^{N} \left[\| f_i^a - f_i^p \|_2^2 - \| f_i^a - f_i^n \|_2^2 + \alpha \right]_+$$



Triplet Loss
3 types of negative



Reference

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5. FaceNet https://arxiv.org/pdf/1503.03832.pdf
6. Triplet Loss https://omoindrot.github.io/triplet-loss

Thank You!