NLNL: Negative Learning for Noisy Labels
Appendix

1 Gradient after NL

Eq. 1 shows detailed outline of computing gradient after training CNN with NL.

\[
\frac{\partial L(f, \bar{y})}{\partial f_i} = - \sum_{k=1}^{C} \bar{y}_k \frac{\partial \log(1 - p_k)}{\partial f_i} = \sum_{k=1}^{C} \bar{y}_k \frac{\partial \log(1 - p_k)}{\partial p_k} \frac{\partial p_k}{\partial f_i} \\
= \sum_{k=1}^{C} \frac{\bar{y}_k}{1 - p_k} p_k (1 \{k = i\} - p_i) = \bar{y}_i p_i - \sum_{k \neq i} \frac{\bar{y}_k p_k}{1 - p_k} p_i \\
= \begin{cases} 
  p_i \approx \frac{1}{c} & \text{if } i = \bar{y} \\
  -\frac{\bar{y}_i}{1 - \bar{y}} p_i \approx - \frac{1}{c(c-1)} & \text{if } i \neq \bar{y}
\end{cases}
\]