

Ranking infoNCE

- in force:

query q

positive p

Negative $N = \{n_1, \dots, n_n\}$ similarity function

$$\text{loss} := -\log \frac{\exp\left\{\frac{h(p, q)}{c}\right\}}{\exp\left\{\frac{h(p, q)}{c}\right\} + \sum_N \exp\left\{\frac{h(q, n)}{c}\right\}}$$

facilitate Multipositive in two ways:

$$\textcircled{1} \mathcal{L}^{\text{out}} := -\sum_{p \in \mathcal{P}} \log \frac{\exp\left(\frac{h(p, q)}{c}\right)}{\exp\left(\frac{h(p, q)}{c}\right) + \sum_N \exp\left(\frac{h(p, n)}{c}\right)}$$

$$\textcircled{11} \mathcal{L}^{\text{in}} = -\log \frac{\sum_{p \in \mathcal{P}} \exp\left(\frac{h(p, q)}{c}\right)}{\sum_{p \in \mathcal{P}} \exp\left(\frac{h(p, q)}{c}\right) + \sum_{n \in N} \exp\left(\frac{h(p, n)}{c}\right)}$$

RINCE: Ranking Inforce

Assume: for a given query

→ access to ranked points P_1, P_2, P_3, \dots

$$h(q, p_1) > h(q, p_2) > \dots > h(q, p_n) > h(q, n)$$

$$\text{where } p_i \in P_i, n \in N$$

→ recursive implementation of NCE:

→ first use P_1 ... then P_2, \dots continue.

Each time the later are negative.

$$L_{\text{rank}} = \sum_i l_i \quad \text{where,}$$

$\rightarrow L_i^{\text{in}}$

$$l_i = -\log$$

$$\frac{\sum_{p \in P_i} \exp\left(\frac{h(p, q)}{\tau_i}\right)}{\sum_{p \in \bigcup_{j \geq i} P_j} \exp\left(\frac{h(q, p)}{\tau_i}\right) + \sum_n \exp\left(\frac{h(p, n)}{\tau_i}\right)}$$

$$\tau_i < \tau_{i+1} \quad // \text{reduce sensitivity}$$