①Ⓕ Lifted structure.

Lifted Structure

Loss function:

$$J = \frac{1}{2|\hat{P}|} \sum_{(i,j)\in\hat{P}} \max(0, J_{i,j})^2$$

↳ positive pairs

$$J_{i,j} = \max\left(\max_{(i,k)\in\hat{N}} \alpha - D_{i,k},\ \max_{(j,l)\in\hat{N}} \alpha - D_{j,l} \right) + D_{i,j} + \text{ve}$$

Distance between

↳ Negative pairs.

maximize for what neg pairs.

Embedded feature vector $X \in \mathbb{R}^{m \times c}$ → class no

∴ embedding dimension

squared Norem, $\tilde{x} = \left[\|f(x_1)\|_2^2, \|f(x_2)\|_2^2, \ldots, \|f(x_m)\|_2^2 \right]$

Pairwise density matrix $D^2 = \tilde{x}\mathbf{1}^T + \mathbf{1}\tilde{x}^T - 2XX^T$

/// which leads (Efficient computation)

where $D_{i,j} = \|f(x_i) - f(x_j)\|_2^2$

simple compute.

using upper bound, the loss function.

$$\tilde{J}_{i,j} = \log\left(\sum_{(i,k)\in N} \exp\{\alpha - D_{i,k}\} + \sum_{(j,l)\in N} \exp(\alpha - D_{j,l}) \right) + D_{i,j}$$

should be as close as possible to 0

$$J = \frac{1}{2|P|} \sum_{(i,j)\in P} \max(0, \tilde{J}_{i,j})^2$$