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?arccos(1/(1 − n))n
??

$$\mathcal{L}_{SL} = -\frac{1}{m}\sum_{i=1}^{m} log\frac{e^{w_{y_i}^T x_i}}{\sum_{k\in D} e^{w_k^T x_i}} \tag{1}$$

D =
$1, \ldots, n(\cdot)^T x_i \in$
$R^d y_i \in$
$Dw_k \in$
$R^d W =$
$[w_1, w_2, \ldots, w_n] \in$
$R^{d\times n} nm$
$kw_k w_k k A_{kl} kl A_{kl}$

$$\cos(A_{kl}) = \frac{w_k^T}{\|w_k\|}\frac{w_l}{\|w_l\|} = \widehat{w}_k^T \widehat{w}_l \tag{2}$$

$\hat{w}_k \hat{w}_l w_k w_l |||| \cos(A_{kl}) A_{kl}$
??

$$\mathcal{L}_{Angle} = \sum_{\mathrm{k}\in\mathcal{D}} \sum_{l\in\mathcal{D}, l\neq k} \widehat{w}_k^T \widehat{w}_l \tag{3}$$

$\mathcal{L}_{Angle} \mathcal{L}_{Angle}$
$d \geq$
$n-$
$1\widehat{w}_k^T \widehat{w}_l =$
$1/(1-$
$n)\mathcal{L}_{Angle} - n\mathcal{L}_{Angle} =$
$-nA_{kl} =$
$\arccos(1/(1-$
$n))\mathcal{L}_{Angle}$
$A_{kl} =$
$\arccos(1/(1-$
$n))\mathcal{L}_{Angle} =$
$-n\mathcal{L}_{Angle} A_{kl} A_{kl} =$
$\arccos(1/(1-$
$n))?A_{kl} =$
$\arccos(1/(1-$
$n))$
??

$$\mathcal{L}_{ASL} = -\frac{1}{m}\sum_{i=1}^{m} log\frac{e^{w_{y_i}^T x_i}}{\sum_{k\in D} e^{w_k^T x_i}} \tag{4}$$

$$s.t. \|w_k\| = 1 and w_k^T w_l = \frac{1}{1-n}\cdot(k, l \in \mathcal{D})$$

????w_k?
???

$$\mathcal{L}_{CL} = \frac{1}{2m}\sum_{i=1}^{m} \|x_i - c_{y_i}\|^2 \tag{5}$$

$c_{y_i} y_i$

$$\mathcal{L} = \mathcal{L}_{SL} + \lambda\mathcal{L}_{CL} \tag{6}$$

0λ $\lambda\lambda =$
$w_k \Upsilon_k w_k \Upsilon_k$??

$$\mathcal{L}_C = \frac{1}{2m}\sum_{i=1}^{m} \|x_i - \Upsilon_{y_i} w_{y_i}\|^2 \tag{7}$$

$\Upsilon_{y_i} w_{y_i} x_i y_i x_i \Upsilon_{y_i} w_{y_i} \mathcal{L}_C$