Normalized Feature

$\dfrac{\phi_i^a}{\|\phi_i^a\|}$

$\dfrac{\phi_i^v}{\|\phi_i^v\|}$

$\cos \theta_j^a$

W_j^a ϕ_i^a

Normalized Weights

$\dfrac{W_j^a}{\|W_i^a\|}$

$\dfrac{W_j^v}{\|W_i^v\|}$

W_j^v ϕ_i^v

$\cos \theta_j^v$

$\otimes \rightarrow \oplus$

Re-scale

$s *$

Softmax

Cross-entropy loss

$s\left(\cos \theta_j^a + \cos \theta_j^v\right)$

$j \in [1, \cdots, n]$

Logits