Network Flows Sample Space

RPM-Net

Margin Loss

Fisher Loss

CE Loss

λ

β

α

Combined Loss Function

$\alpha L_{CE} + \lambda L_{margin} + \beta L_{Fisher}$

R^1 R^2 R^3 R^4

P^1 P^2 P^3 P^4

Distance Discriminator

Margin Loss

$$L_{margin} = \frac{1}{N}\sum_{i=1}^{N}\max(d_e(z_i, P^{y_i}) - R^{y_i}, 0)$$

Fisher Loss

$$L_{\text{Fisher}} = \frac{1}{1 + \operatorname{tr}(S_b)/\operatorname{tr}(S_w)}$$

Classifcation Loss

$$L_{CE} = -\frac{1}{N}\sum_{i=1}^{N}\sum_{k=1}^{K} y_{i,k}\log\frac{\exp(d(z_i, P^k))}{\sum_{j=1}^{K}\exp(d(z_j, P^j))}$$

Unknown Threat Distribution Area

P

P

P

Attack1

Attack3

Unknow attack

Attack2

Benign

Label

Feature Embedding Space

Known class Reciprocal point Vector

(simplified diagram)

Increased probability

Probability reduced