⑤ PIRL

PIRL (pretext invariant representation learning)

Notation: Dataset $D = \{I_1, I_2 \dots I_D\}$

$$I_n \in \mathbb{R}^{W \times H \times 3}$$

Transformation set, $\mathcal{T}$

Network $\phi_\theta(\cdot)$

$$V_I = \phi_\theta(I)$$

Target optimization:

$$l_{inv}(\theta, D) = \mathbb{E}_{t \sim P(\mathcal{T})}\left[\frac{1}{|D|}\sum_{I \in D} L(V_I, V_{I^t})\right]$$

contrastive target:

$$l_{co}(\theta, D) = \mathbb{E}_{t \sim P(\mathcal{T})}\left[\frac{1}{|D|}\sum_{I \in D} L_{co}(V_I, z(t))\right]$$

measure properties of transformation + Keep semantic irrelevant info.

Loss function:

$$h(V_I, V_{I^t}) = \frac{\exp\left(\frac{s(V_I, V_{I^t})}{\tau}\right)}{\exp\left(\frac{s(V_I, V_{I^t})}{\tau}\right) + \sum_{I' \in D_N} \exp\left(\frac{s(V_{I^t}, V_{I'})}{\tau}\right)}$$

$$L_{NCE}(I, I^t) = -\log\left[h(f(V_I), g(V_{I^t}))\right] - \sum_{I' \in D_N} \log\left[1 - h(g(V_{I^t}), f(V_{I'}))\right]$$

final loss function:

step 2.

$$L(I, I^{+}) = \lambda\, L_{CNs}(m_I, g(v_{I^+})) + (1-\lambda)\, L_{NCE}(m_I, f(v_I))$$

Step 1

kinda two step

(i) $f(v_I)$ similare to m_I // Dampening .

(ii) $f(v_I)$, $f(v_{I'})$ dissimilar.