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$_f ailure.pdf CycleGAN$
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???
$XYM_X M_Y x \in$
$Xm_x \in$
$M_X Y$
$_i nstance.pdf$
$???M_X M_Y G_S :$
$M_X \rightarrow$
$M_Y F_S :$
$M_Y \rightarrow$
$M_X m_x \in$
$M_X G_S \hat{m}_y =$
$G_S(m_x) D_T \hat{m}_y m_y \in$
$M_Y F_S \hat{m}_y \tilde{m}_x F_S(G_S(m_x)) \approx$
m_x
$?G_S F_S ?G_S :$
$M_X \rightarrow$
$M_Y D_{S_y}$

$$\mathcal{L}_{advx}^{shape} = E_{m_y}[\log D_{S_y}(m_y)] + E_{m_x}[\log(1 - D_{s_y}(G_S(m_x))] \tag{1}$$

$G_S M_Y D_{S_y} \hat{m}_y m_y F_S :$
$M_Y \rightarrow$
$M_X D_{S_x}$

$$\mathcal{L}_{advy}^{shape} = E_{m_x}[\log D_{S_x}(m_x)] + E_{m_y}[\log(1 - D_{s_x}(F_S(m_y))] \tag{2}$$

$F_S D_{S_x} G_S D_{S_y}$

$$\mathcal{L}_{adv}^{shape} = \mathcal{L}_{advx}^{shape} + \mathcal{L}_{advy}^{shape} \tag{3}$$

$M_X m_x F_S(G_S(m_x)) \approx$
$m_x M_Y m_y G_S(F_S(m_y)) \approx$
m_y

$$\mathcal{L}_{cyc}^{shape} = E_{m_x}[\| F_S(G_S(m_x)) - m_x \|_1] + E_{m_y}[\| G_S(F_S(m_y)) - m_y \|_1] \tag{4}$$

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$$\min_{G_S, F_S} \max_{D_{S_x}, D_{S_y}} \mathcal{L}_{total}^{shape} = \lambda_{adv}^{shape} \mathcal{L}_{adv}^{shape} + \lambda_{cyc}^{shape} \mathcal{L}_{cyc}^{shape} \tag{5}$$

$\lambda_{adv}^{shape} \lambda_{cyc}^{shape}$
$\hat{m}_y \hat{m}_y Y ??? m_y$
$yym_y \in$
$M_Y y G_T G_T :$
$M_Y \rightarrow$
$Yym_y y_f D_T \hat{y}_f =$
$G_T(\hat{m}_y) y_f$
$\hat{y}_f Y_F$

$$\mathcal{L}_{adv}^{texture} = E_{m_y, y}[\log D_T(m_y, y)] + E_{m_y, y}[\log(1 - D_T(m_y, G_T(m_y)))] \tag{6}$$

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$$\mathcal{L}_{rec}^{texture} = E_{m_y, y}[\| G_T(m_y) - y \|_1] \tag{7}$$

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$$\mathcal{L}_{col}^{texture} = \sum_p \angle((G_T(m_y)_p), (y)_p) \tag{8}$$

$()_p \angle(,)$

$$\min_{G_T} \max_{D_T} \mathcal{L}_{total}^{texture} = \lambda_{adv}^{texture} \mathcal{L}_{adv}^{texture} + \lambda_{rec}^{texture} \mathcal{L}_{rec}^{texture} + \lambda_{col}^{texture} \mathcal{L}_{col}^{texture} \tag{9}$$

$\lambda_{adv}^{texture} \lambda_{rec}^{texture} \lambda_{col}^{texture} \mathcal{L}_{adv}^{texture} \mathcal{L}_{rec}^{texture} \mathcal{L}_{col}^{texture}$
$?xm_x \hat{x}_b$
$\hat{m}_y \hat{y}_f \hat{x}_b ???? \hat{y}_r G_R \hat{y} =$
$G_R(\hat{y}_r)$

$$\hat{y}_r = \hat{y}_f \times \hat{m}_y + \hat{x}_b \times (1 - \hat{m}_y) \tag{10}$$

$Y \hat{y} \hat{y}_r$

$$\mathcal{L}_{refine}^{texture} = E_{m_y, y}[\| G_R(\hat{y}_r) - (1 - \hat{m}_y) \hat{x}_b \|_1]$$