Implementation of Cycle-consistent Generative Adversarial Networks

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Introduction

Image-to-image Translation :

Learn the mapping between an input image and an output image.

Introduction

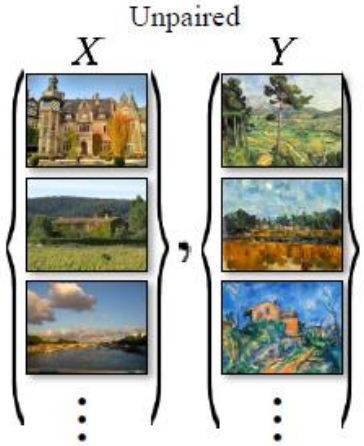
If data are paired

it's easy to find how the special characteristics of the input should be translate to the labeled output

What if data are un-paired?

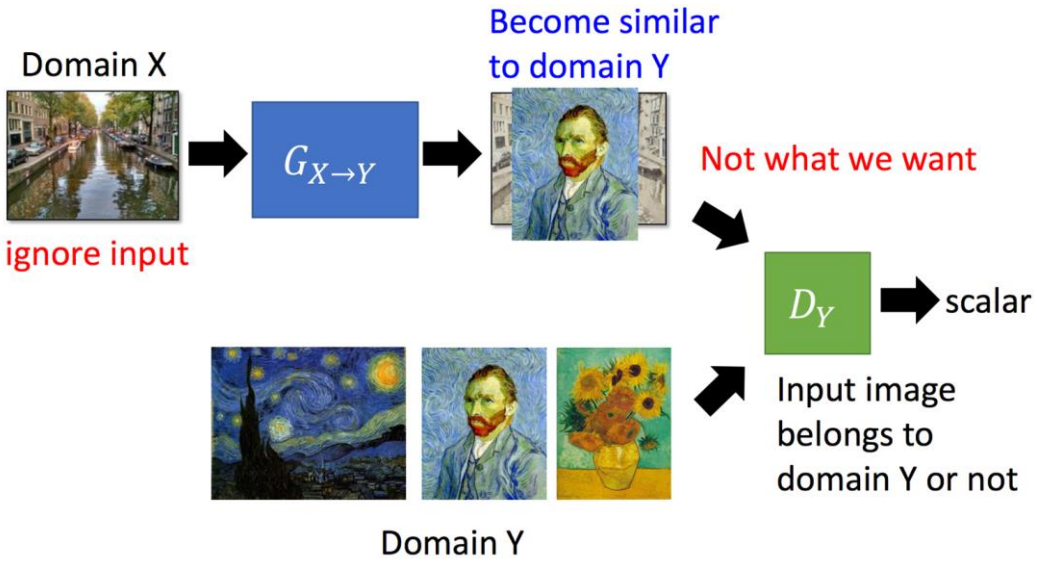
it seems to generate y' which is indistinguishable from domain Y after G.

But the G network may not be what you think



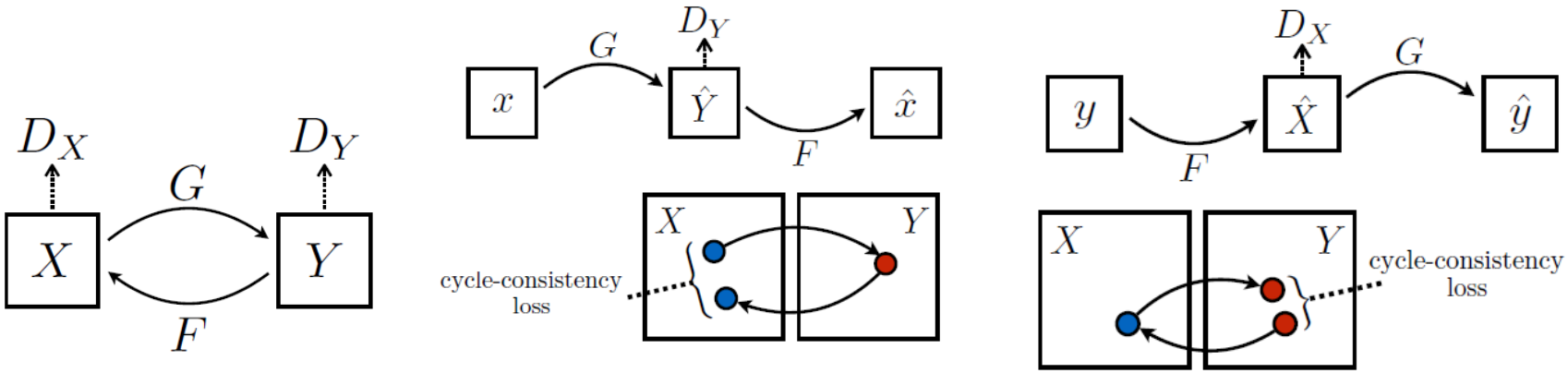
Introduction

Mode Collapse



Methoology

Our goal is to learn mapping functions between two domains X and Y



Formulation

Adversarial Loss

$$L_{GAN}(G, D_Y, X, Y) = E[log\ D_Y(y)] + E[log(1 - D_Y(G(x))]$$

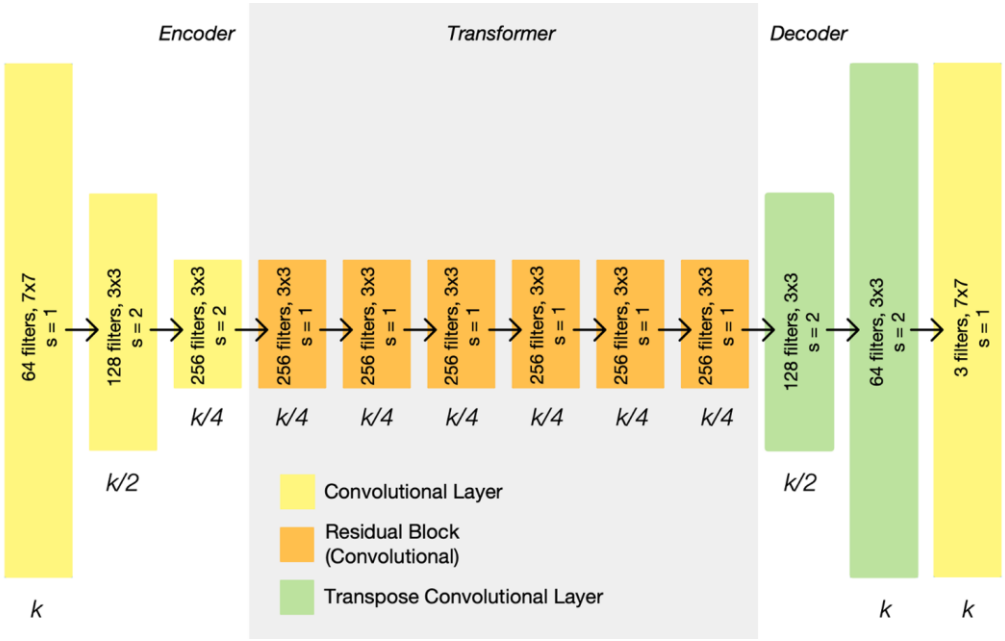
Cycle Consistency Loss

$$L_{cyc}(G, F) = E[||F(G(x)) - x||_1] + E[||G(F(y)) - y||_1$$

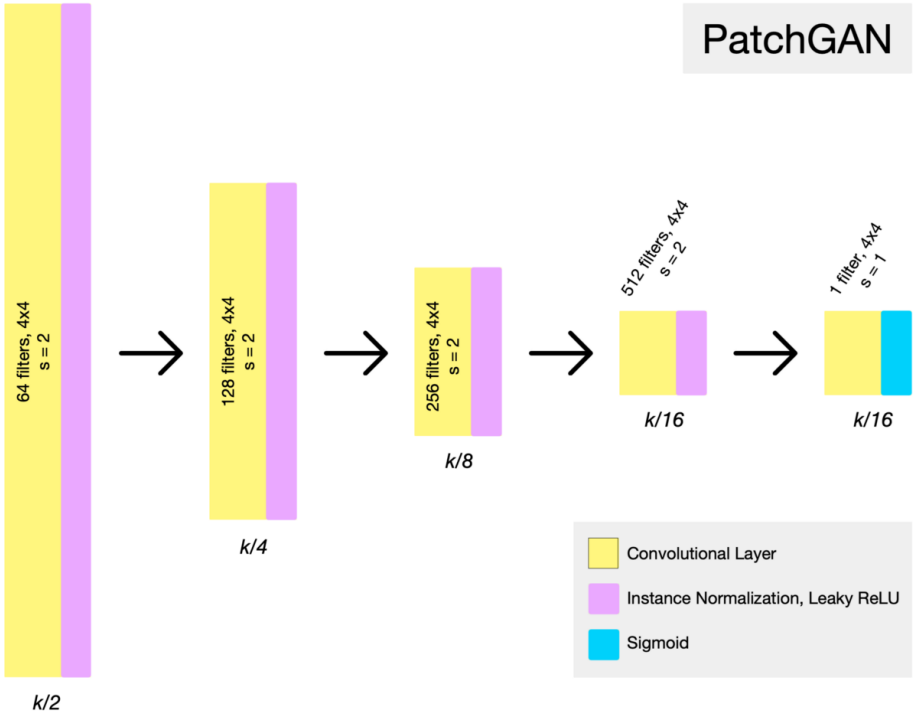
Objective Function

$$L = L_{GAN}(G, D_Y, X, Y) + L_{GAN}(F, D_x, Y, X) + \alpha L_{cyc}(G, F)$$

Generator Architecture



Discriminator Architecture



Results : Apple <-> Orange

Results : Monet <-> Photo

Results : Photo -> Monet

Input CycleGAN Reconstructed

More

2 Generators change the tint of input images when there is no need to

More : Adopt Additional Loss

$$L_{identity}(G,F) = E[||G(y)-y||_1] + E[||F(x)-x||_1$$

Input CycleGAN CycleGAN with L_{id}

More : Adopt Additional Loss

Input CycleGAN CycleGAN with L_{id}

More : Adopt Additional Loss

Input CycleGAN+L_{id} Reconstructed

Discussion

1. Just run 100 epochs and fix the learning rate (In the paper they run 200 epochs and fix the learning rate at the first half and linearly descended learning rate at the second half)

2. Even far from paired data image translation (pix2pix)

3. With the use of identity loss, the generated output is much like the original input

Work Distribution

李宣毅：論文相關研究與參考文獻撰寫、簡報製作

湯昊軒：程式碼模型建立、論文演算法撰寫

李柏彥：程式碼模型調整與訓練、論文結果與討論撰寫