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Ukiyo-e Generation

Japanese Ukiyoe Style Generation with Generative Deep Learning Technique

Overview

- Project description
- What is Ukiyo-e?
- What is **unsupervised** machine learning technique?
- Selected best models for Ukiyo-e generation.
  - **Distance-GAN** based on **Cycle-GAN**
  - **Cycle-GAN**
  - **Dual-GAN**
  - Special mention: **TraVeL-GAN**
- Findings
- What I am learning throughout this project?

Project Description

- Ukiyo-e generation
    - Given a set of *Ukiyo-e* like images for training the model.
    - To generate *Ukiyo-e* like image for corresponding a real input image.
    - Which model choose for generating *Ukiyo-e*?
        - To choose best **GAN** based model for generating *Ukiyo-e*

- What is Ukiyoe
  - *Ukiyo-e* is a traditional woodprints and picture formed in 17th through 19th centuries in Japan.(https://en.wikipedia.org/wiki/Ukiyo-e)
  - *Ukiyo-e* is not a realistic picture but it depicts from the real pictures and it has clear outlines.
- What is unsupervised technique?
  - Data: X
    - Just data, no labels!
  - Learning some underlying hidden structures of the unlabeled data.
  - Ex: Density estimation, clustering etc.

Proposed Model

- According to the *image to image translation with texture style transfer* research papers, Come to the conclusion that **Distance-GAN** is the better model for generating *Ukiyo-e*.
- Previously all of the mentioned model, only **Cycle-GAN's** authors try to generate *Ukiyo-e* like image.
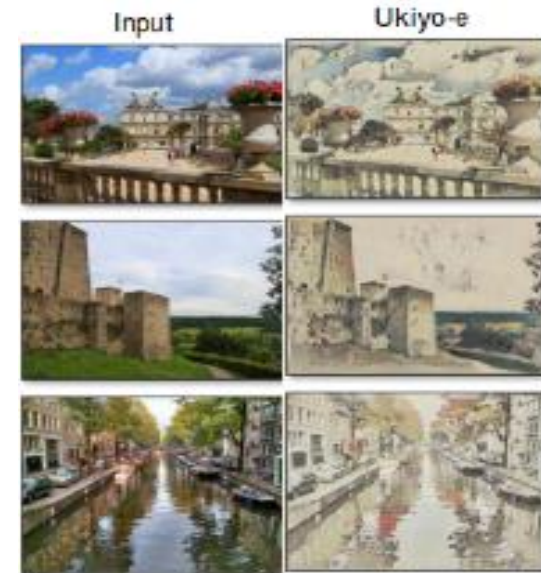

Fig:*Ukiyo-e* by **Cycle-GAN**

- As **Distance-GAN** works based on **Cycle-GAN** and it is mapping the domain only one direction, it will be easy to feed the model and easy to generate *the* image.
- **Dual-GAN** is also capable to generate *Ukiyo-e* but the performance would not be better than the **Cycle-GAN**

Distance-GAN

- Its architecture is based on cycle-gan or distance-gan.
- Following only single directional mapping.
- Considering adversarial, cycle and distance constraint.
  - There are two types of distance constraint
    - Self distance constraint
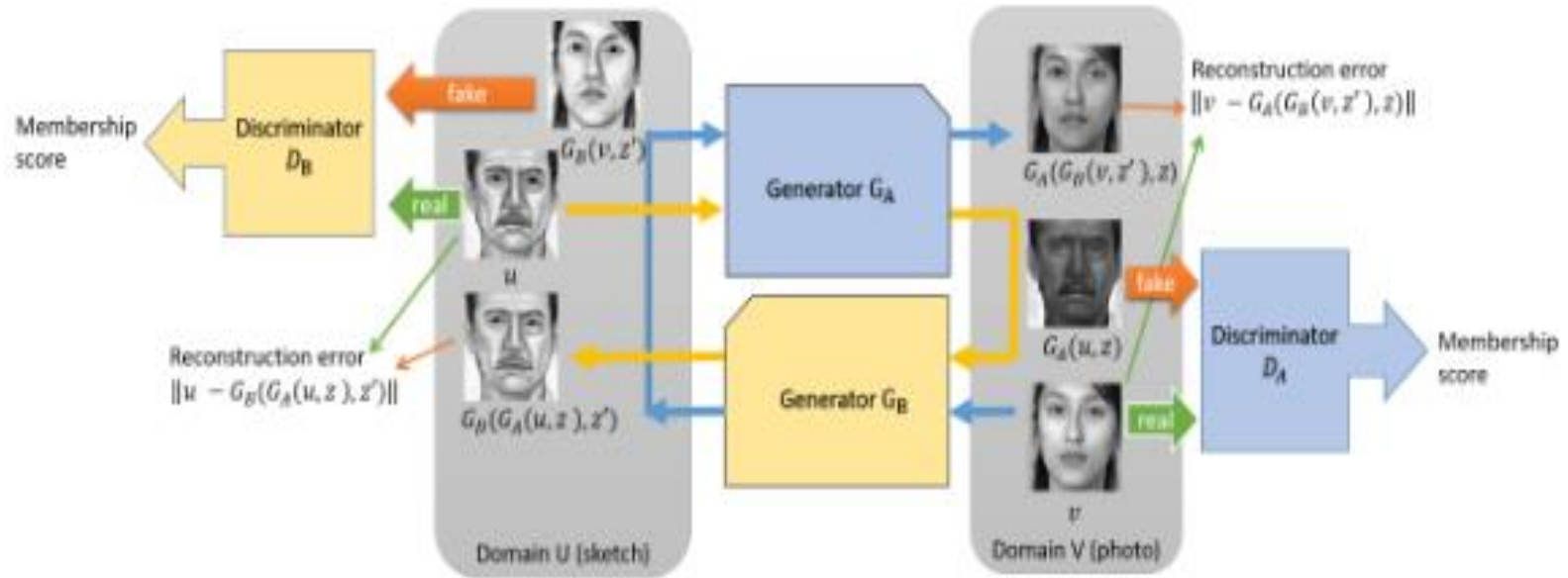   - Or paired distance constraint

Dual-GAN

Figure 1: Network architecture and data flow chart of DualGAN for image-to-image translation.

Findings

- At first, I have tried to generate *Ukiyo-e* with **DCGAN** but after few attempts realised that its so difficult to generate.
- Trained the **Dual-gan** model and generated the following output and its fail to generate desired output.
- It seems lots of improvement is possible.
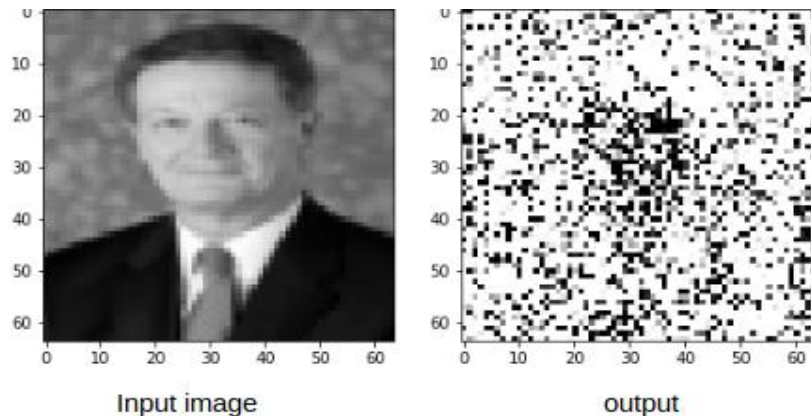

Input image   output

Fig: generated by Dual-GAN

- Attempting to train the distance-gan model but it takes time for me.
- Almost getting into that to train but time is over.
- Got confidence that if I get few days to train the **Distance-GAN,** will do it**.**

TraVeL-GAN

- TraVeL-GAN is the latest publication over image to image translation.
    - Paper link : https://arxiv.org/abs/1902.09631
    - Authors have generated landscapes image to Ukiyo-e and vice-versa.
    - It introduces a third networks called siamese networks which guides the two network generator and discriminator for better learning.
    - It reduces the cycle consistency in the networks which is difficult for the networks to maintains.
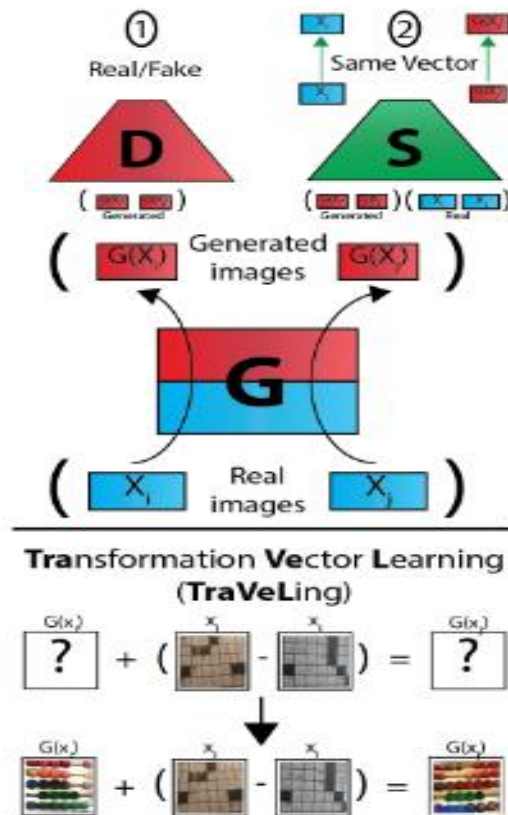
- The TraVeL-GAN architecture

Figure 1: The TraVeLGAN architecture, which adds a siamese network S to the traditional generator G and discriminator D and trains to preserve vector arithmetic between points in the latent space of S.

Take-aways Throughout this Project?

- Throughout this project, learned lot of things in deep learning.
- To learn CNN, different versions of CNN
- Generative models
  - VAE(literature only)
  - GANs.
- Image preprocessing and augmentation
- Two popular deep learning frameworks like tensorflow-Keras and PyTorch
- Most importantly, Understanding research papers on related to the problem.

どうもありがとうございました