The Next Generation Image Translation App with GPU Acceleration

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1. Abstract

In the recent century, the development of deep learning brings us to handle computer vision task from impossible-to-be-done to possible-to-be-done. This revolution to computer vision attributed from the advancement of deep learning by which the learning model are getting complex enough to resolve many problems from image classification, Captioning, Object Detection, Object Tracking, Style Transfer, Image Translation, Deep Dream and Semantic Segmentation. Especially, several deep learning architectures have been explored for solving image classification, object detection, object tracking and activity recognition challenges which widely adopted in the real world.

2. Introduction

In this paper, we will focus on demonstration and the explore the use cases of Generative Adversarial Network (GAN). This model was invented by Goodfellow et al. in 2014 [1]. It is deep learning model which can generate new image data by synthesizing the sample images used in training processes. GAN take two input, firstly extract the features and its distribution from the real-world sample image, then further generate another sample image with noise. Then, a discriminator is used to synthesize both inputs to produce a totally different new image which preserving the meaning of the sample image, with the computation of loss between the real and fake image.

Demonstration will take the enhanced use of GAN to do the Neural Style Transfer which is capable to transfer the style of one sample image and then apply to another content image. For example, the model can change a photo scene with switching from day environment to night environment or from spring environment to winter environment.

Another demonstration will be the implementation of Deep Dream, which invented by Google Engineer Alexander Mordvintsev. It makes use of Convolutional Neural Network to find patterns in image and enhance the patterns seen by the network by adding them back to the original image via deep learning algorithm, result to a dream like image.

3. Related Work

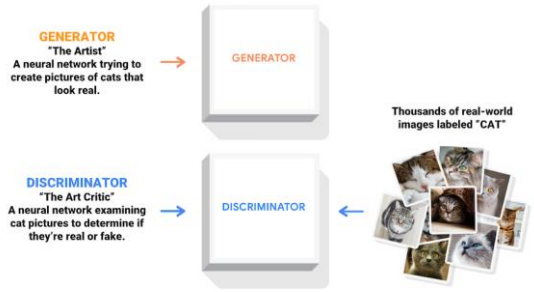
The full potential of the above GAN and DeepDream creative models has not yet been explored in real world. But many resources from GitHub and TensorFlow tutorial demonstrated the implementation of both models.

Below are the links of the related work of this paper.

https://www.tensorflow.org/tutorials/generative/dcgan [2]
https://www.tensorflow.org/tutorials/generative/style_transfer [3]
https://www.tensorflow.org/tutorials/generative/deepdream [4]

4. Technical Overview

4.1 Generative Adversarial Network [2]



4.2 Deep Dream & Neural Style Transfer

Choose an image and a layer in a CNN; repeat:
1. Forward: compute activations at chosen layer
2. Set gradient of chosen layer equal to its activation
3. Backward: Compute gradient on image
4. Update image

5. Expected Result

The project will build an app that can generate a lot of images by user's clicking. Ranging from style transfer image, deep dream image to GAN image.

6. References

[1] Ian J. Goodfellow et al. "Generative Adversarial Nets". In: Proceedings of the 27th International Conference on Neural Information Processing Systems - Volume 2. NIPS'14. Montreal, Canada: MIT Press, 2014, pp. 2672–2680.
[2] https://www.tensorflow.org/tutorials/generative/dcgan
[3] https://www.tensorflow.org/tutorials/generative/style_transfer
[4] https://www.tensorflow.org/tutorials/generative/deepdream