Related Work

The principle of Generative Adversarial Networks (GANs) is to create an adversarial loss that forces the generated images to be indistinguishable

from real images. This idea has been adopted by many recent methods like text2image, image inpainting and future prediction. But all this work require paired training examples, which refer to the concept of Image-to-Image Translation.

The idea of image-to-image translation is to employ a nonparametric texture model on a single input-output training image pair. Some similar ideas have been applied to various tasks such as generating photographs from sketches or from attribute and semantic layouts, obvious these kind of methods still need he paired training examples.

Another way to perform image-to-image translation is neural style transfer, which synthesizes a novel image by combining the content of one image with

the style of another image, but this kind of single sample transfer methods do not perform well in the transfiguration of painting to photo, etc.

As a result of the shortcomings of image-to-image translation, several other

methods tackle the unpaired Image-to-Image Translation. Like CoGAN and cross-modal scene networks use a weight-sharing strategy to learn a common representation across domains. Another line of concurrent work encourages the input and output to share certain “content” features even though they may differ in “style“. Nevertheless, unlike the above approaches, our formulation does not rely on any task-specific, predefined similarity function between the input and output, nor do we assume that the input and output have to lie in the same low-dimensional embedding space.

Another concept related to the idea of unpaired Image-to-Image translation is cycle consistency, which use transitivity as a way to regularize structured data. Recently, higher-order cycle consistency has been applied by many researches. Zhou et al and Godard et al use a cycle consistency loss as a way of using transitivity to supervise CNN training. Yi et al ndependently use a similar objective for unpaired image-to-image translation.