Generative Adversarial Networks for Image Synthesis

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Abstract

Generative Adversarial Networks (GANs) have shown remarkable success in various tasks. However, they still face challenges in generating high quality images. To tackle those challenges, we conduct studies on designing new network architectures, modifying the learning objectives and dynamics, adding regularization and introducing heuristic tricks.

First, Stacked Generative Adversarial Networks (StackGANs) are proposed to break the difficult generative task into more manageable sub-problems, i.e., progressively generate low-to-high resolution images. Then, the self-attention mechanism is introduced into convolutional GANs. The proposed self-attention module is complementary to convolutions and helpful for modeling long-range multi-level dependencies across image regions for image generation. Moreover, a new metric, called mini-batch energy distance, is proposed to measure the distance between the generator distribution and the data distribution. This metric combines optimal transport in primal form with an energy distance defined in an adversarially learned feature space, resulting in a highly discriminative distance function with unbiased mini-batch gradients.

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