Progressive Growing of GANs for Improved Quality, Stability, and Variation

Authors: Tero Karras, Timo Aila, Samuli Laine, Jaakko Lehtinen

Abstract:

The paper introduces a novel approach for training Generative Adversarial Networks (GANs) called "Progressive Growing of GANs" (ProGAN).

ProGAN addresses challenges in training GANs, such as mode collapse, training instability, and producing high-resolution images with diverse details.

Introduction:

Traditional GANs struggle with generating high-resolution images due to issues like mode collapse and training instability.

ProGAN tackles these problems by proposing a training scheme that progressively grows both the generator and discriminator networks.

It starts with a low-resolution image and gradually increases the resolution, allowing the networks to learn fine details over time.

Progressive Growing:

In ProGAN, training begins with a small-sized generator and discriminator, producing low-resolution images. As training progresses, new layers are added to both networks, increasing the image resolution and network complexity.

This step-by-step approach helps to stabilize training and enables the model to capture details at multiple scales.

Stability and Variation:

The progressive growing technique encourages stable training by preventing early layers from overpowering the later ones.

This leads to a balanced learning process and reduces the risk of mode collapse.

Additionally, the paper shows that ProGAN produces images with increased variation, capturing a wider range of features and styles.

Results:

The paper presents compelling results in terms of image quality and diversity. ProGAN achieves state-of-the-art performance on multiple datasets, generating high-resolution images that exhibit fine details and a rich variety of features.

The proposed method not only improves image quality but also helps mitigate issues like mode dropping and training instability.

Impact and Significance:

The Progressive Growing of GANs paper had a significant impact on the field of GANs and image generation. It demonstrated a practical approach to stabilize GAN training, generate high-resolution images, and enhance diversity in generated samples.

The paper's insights have influenced subsequent research in improving GAN architectures and training strategies.

Citation:

The citation for this paper is:

T. Karras, T. Aila, S. Laine, J. Lehtinen. "Progressive Growing of GANs for Improved Quality, Stability, and Variation." arXiv preprint arXiv:1710.10196 (2017).