**Introduction**

- **Problem**
  - GANs become seriously unstable as the output resolution increases.
  - How to enable high-quality image synthesis at megapixel resolutions?

- **Approach**
  - New training methodology
  - Grow both the generator and discriminator progressively
  - Add new layers to model increasingly fine details as training progresses
  - Several tricks to increase variation and avoid mode collapse
  - New metric for assessing result quality

- **Benefits**
  - Considerably faster and more stable training, especially at high resolutions
  - Able to produce images of unprecedented quality at 1024x1024
  - Achieves record inception score of 8.80 in unsupervised CIFAR10

**Contributions**

- **Progressive growing**
  - Stable training and speed up convergence

**Mimibatch standard deviation**

- Improves variation
- Special layer in discriminator measures variation across minibatch
- Discourages generator from producing too homogeneous results

**Equalized learning rate**

- Makes layers learn at same pace
- Initializes weights to unit variance, re-scale at runtime
- Effective learning rate becomes independent of layer dimensions

**Pixelwise feature vector normalization**

- Avoid collapse
- Normalizes generator activations to unit length at each pixel
- Prevents generated pixel values from varying from -1 to infinity

**Sliced Wasserstein distance (SWD)**

- Access quality
- Takes small 7x7 pixel patches from generated & training images
- Compares distributions on multiple scales (full res., halved, ...)