

GAN to Generate Complex Color Images

EXP No: 12:- Implement a Deep Convolutional

Aim:-

To implement a Deep Convolutional Generative Adversarial Network Capable of generating realistic color images.

Objectives:-

1. To understand the working of GANs with generator and discriminator networks
2. To build a DCGAN using convolutional and transpose convolutional layers
3. To train the model to generate color images from random noise
4. To visualize and evaluate generated image quality

Algorithm:-

1. Import and preprocess color image dataset. (CIFAR-10)
2. Normalize image data to range $[-1, 1]$.
3. Build the Generator.
 - Use Conv2DTranspose layers with Batch Norm & ReLU.
 - output 3-channel (RGB) image using tanh activation
4. Build the Discriminator.
 - Use Conv2D layers with Leaky ReLU & Dropout.
 - output binary classification (real/fake)
5. Train both networks adversarially:
 - Discriminator learns to distinguish real/fake
 - Generator learns to fool the discriminator
6. Generate & visualize synthetic images.

Pseudo Code:-

Load CIFAR-10 dataset

Normalize images to $[-1, 1]$

Define Generator:

Dense \rightarrow Reshape \rightarrow Conv2D Transpose (ReLU)

output: Conv2D Transpose (3, tanh).

Define Discriminator:

Conv2D \rightarrow Leaky ReLU \rightarrow Dropout

output: Dense(1, sigmoid)

Combine models into DCGAN

Train:

For each epoch:

1. Train discriminator with Real + fake images
2. Train generator via Combined model

Generate and visualize images.

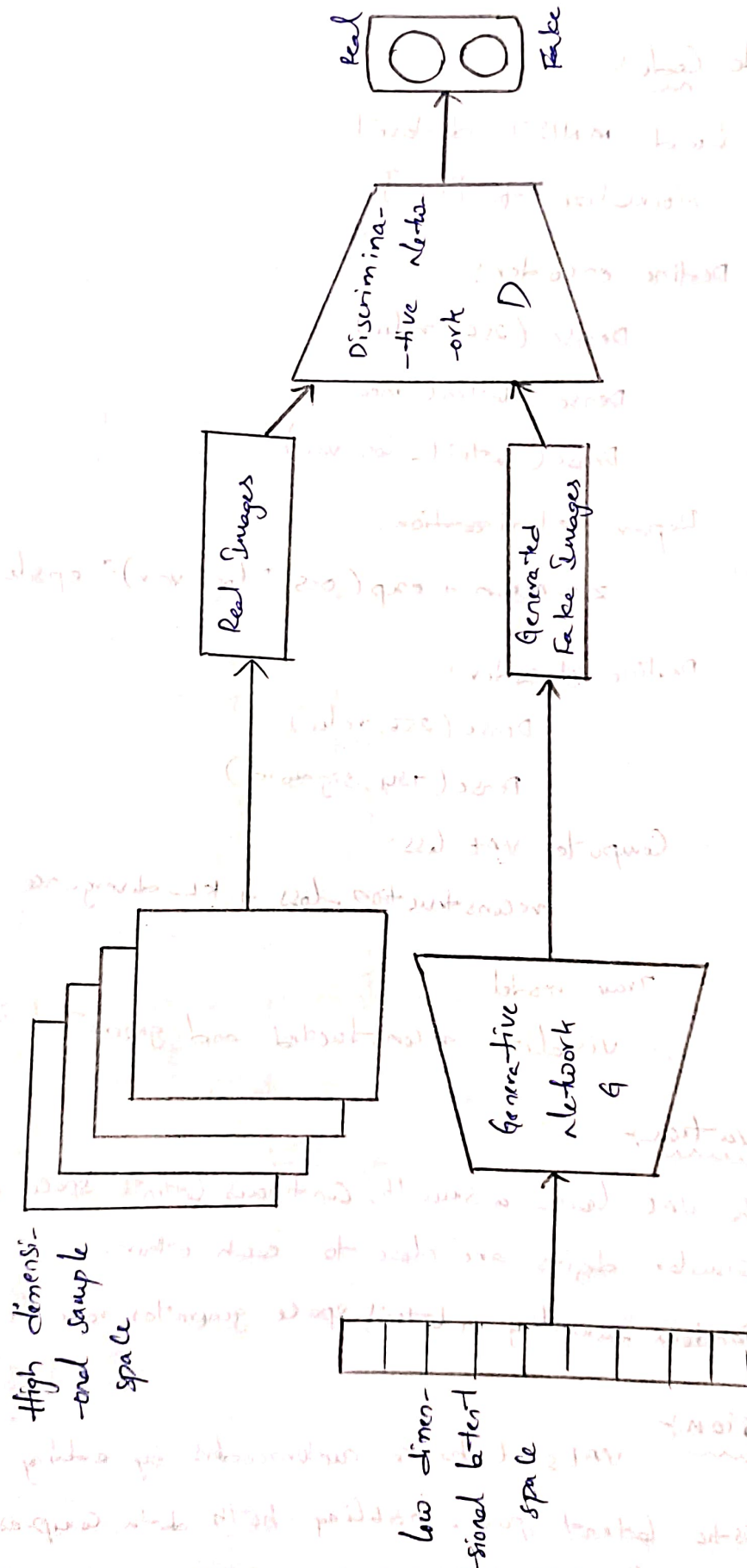
Observation:-

- The DCGAN learns to produce increasingly realistic color images as training progresses.
- Generated images evolve from random noise to clear structures.

Conclusion:-

DCGANs effectively learn to generate complex, realistic color images using adversarial training b/w the generator & discriminator. They demonstrate the power of deep convolutional networks for unsupervised image generation.

GAN ARCHITECTURE FOR IMAGE



Output:-

Epoch [1/10]	D loss: 1.0992,	G loss: 0.5278
Epoch [2/10]	D loss: 0.5060,	G loss: 2.7113
Epoch [3/10]	D loss: 1.2431,	G loss: 3.9827
Epoch [4/10]	D loss: 0.4229,	G loss: 2.2684
Epoch [5/10]	D loss: 1.1486,	G loss: 8.1007
Epoch [6/10]	D loss: 1.0081,	G loss: 6.7625
Epoch [7/10]	D loss: 0.0252,	G loss: 4.5714
Epoch [8/10]	D loss: 0.0043,	G loss: 6.3371
Epoch [9/10]	D loss: 0.1380,	G loss: 4.7357
Epoch [10/10]	D loss: 2.3294,	G loss: 14.0363

Epoch vs Loss (GAN).

