

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 image
2. Train generator via combined model

Generate and visualize images.

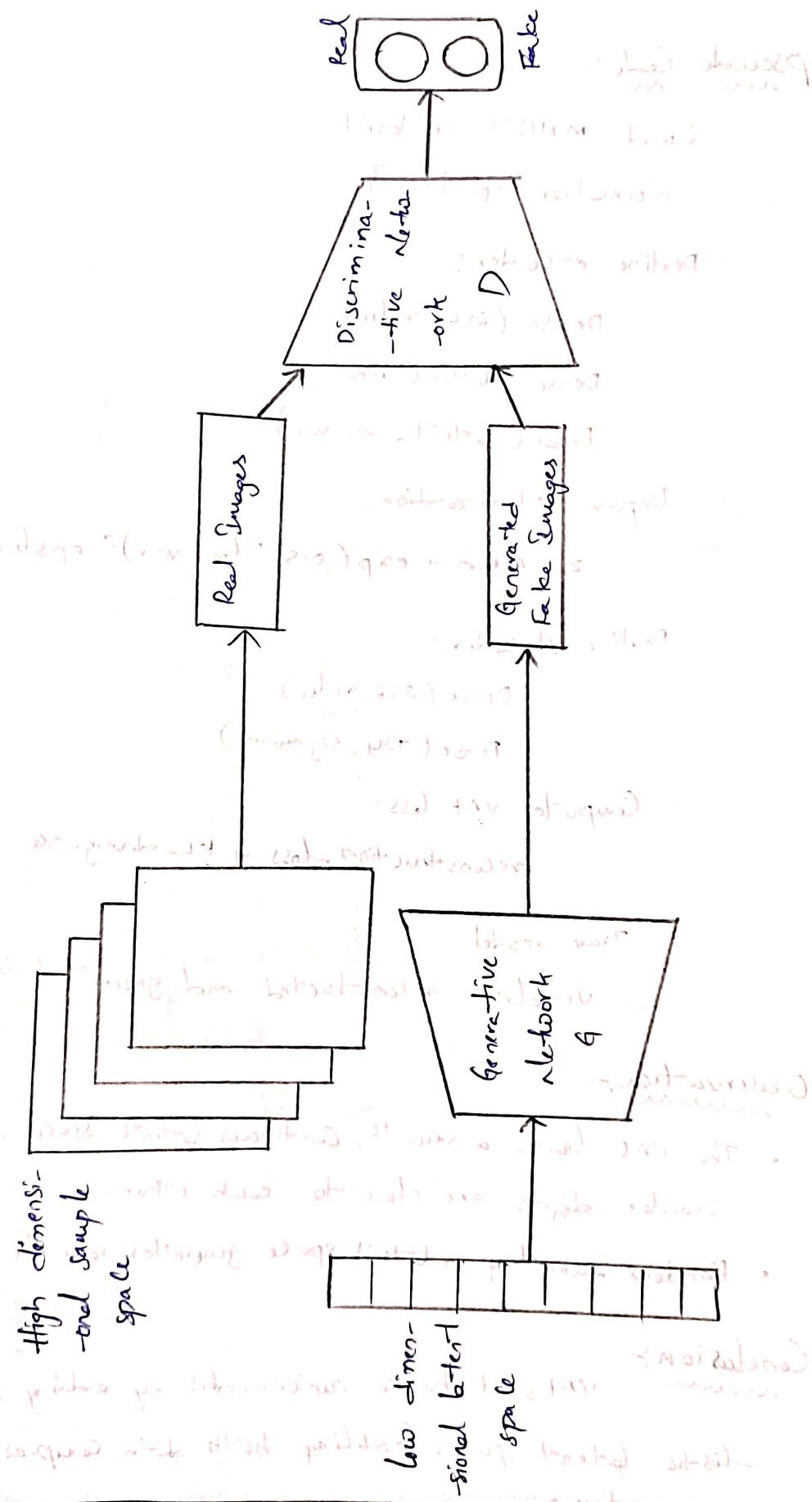
Observation:

- 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 [0/10] D loss: 1.0992, G loss: 0.5678
Epoch [1/10] D loss: 0.5060, G loss: 2.7113
Epoch [2/10] D loss: 1.2431, G loss: 3.9227
Epoch [3/10] D loss: 0.4229, G loss: 2.2684
Epoch [4/10] D loss: 1.1486, G loss: 3.1007
Epoch [5/10] D loss: 1.0081, G loss: 6.7625
Epoch [6/10] D loss: 0.0252, G loss: 4.5714
Epoch [7/10] D loss: 0.0043, G loss: 6.3371
Epoch [8/10] D loss: 0.1380, G loss: 4.7357
Epoch [9/10] D loss: 0.3294, G loss: 14.0363

Epoch vs Loss (GAN).

