

# A Survey on GAN Networks

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**Abstract**— Generative adversarial networks are mostly related to structural networks that are using two neural networks, pitting one against the other in order to generate unique output, artificial instances of data that can pass for concrete data. We can look into the applications of the model specifically used in media generation. GAN networks can be used to solve many problems such as creating new identities, imitators, or many creative NFTs. With the help of GANs we can create a unique person image i.e AI generated human or 3D model which can be used to develop in games. These are being widely used in a project called open dalle AI. This innovative project has created NFTs generated art like an astronaut riding a horse in space merging two different environments. GANs can help detect real or fake images. Like Facebook meta tools we can click any image and convert it into a 3D model or use it for personalized GIFs or emojis.

## I. INTRODUCTION

Generative adversarial networks were first known in a paper by Ian Goodfellow, University of Montreal in 2014. GAN's advantages and disadvantages are huge because they can redesign into caricature any separation of data. To get a better understanding of GANs, we should know how generative algorithms work by conflicting them with discriminative algorithms.

There are two neural networks called the generator which generates new data and discriminator, it tries to identify which is real data from the data created by the generator. GANs can be used largely in anime industry to generate new Avatars by combining unique datasets. There is one difference between StyleGAN and PGGAN which is the of bilinear upsampling and downsampling and of R1 regularization which is a gradient penalty on the discriminator.

We can also generate manual numerals like those that can be initiated in the MNIST dataset, whose data can be retrieved by a real dataset. GAN networks are widely applicable in many cases. The main objective of the generator is to generate passable hand-written digits to lie without being caught or copied. The discriminator works to find images coming from the generator as fake. The discriminator changes its behavior, so does the generator, and vice versa. That results in their losses pushing against each other. Facebook's AI Analysis director Yann LeCun defined adversarial training as the most interesting research idea in the last 10 years in Machine Learning.

GANs are amazing to learn about and One one the most amazing topics to explore. GANs are convolutional neural networks where we can create anime characters, and generate unique human faces using data Augmentation, image style transfer using cycle GANs, and SGGAN using MNIST dataset. GANs also play a major role in the medical field such as it synthesizing the image for pulmonary chest X-rays.

## II. RELATED WORK

This topic of GAN is the mini project part we worked on foreground extraction which is a technique that allows an image to be extracted for further processing like object recognition, tracking, etc.

In image generation, the foreground is an essential part of the objective image. It has its applications in various fields.

### Foreground Extraction

Foreground extraction is a process that allows us to extract the image's foreground from the background.

In the above figure, we can extract the foreground of the image i.e the flower from the background.

We can also implement image segmentation using foreground extraction by applying the Grabcut algorithm which is based on graph cuts.

Some of the grab cut output is img, mask, rect, bgdModel, fgdModel, itercount, mode. At first we need to create a mask image which is almost equal to the loaded image, then we create fgdModel and bgdModel.



The steps followed in foreground extraction are :

1. Getting a foreground and a background image.
2. Convert the image in RGB to BGR
3. Using OpenCV and PyTorch libraries we remove the background.

**QGIS**

QGIS is abbreviated as Quantum GIS.It is an open-source platform that provides geographical information.

For instance:

To get the shared point on the highway from where the image was taken and compare it with the perspective image on DEM.

But before comparing we can apply GAN to make it realistic and then apply a similarity algorithm.

The below figure shows the output:



**Figure 2**

**Super-resolution**

Generation of a high-resolution image from a lower resolution image is called **super-resolution**.

Using this application, we can increase the resolution of an unclear image.

We use the PyTorch library in the coding part of the process. The process is as follows:

1. First, we upload the path of the image to be processed.
2. We squeeze the image into \*4 bicubic images.
3. The GAN model is applied to the generated bicubic image and it produces a higher resolution image without losing any of the structural composition of the image.

**Colorisation**

One of the most exciting applications of deep learning is coloring black and white images and black and white images to coloured image.This task required a lot of human efforts and a long set of coding several years ago but now it can be all done using some in built functions. I hv used some inbuilt functions to get the output and works so efficiently with less human inputs.There are pros and cons to each approach but we can use a different strategy.for example a car in the image can take on many different and valid colors and

we cannot be sure or we cannot predict about any color for it.this can be overcome by imsgce to image translation.I learned that some observations, although at first feeling like a bad mistake with a lot many errors, are worth paying attention to and further investigation.

**III. COMPARATIVE STUDY**

In deep learning computer vision aims to interpret and visualize real-world data. As computer vision is evolving as a crucial expansion in the field of machine learning, it is being increasingly used to develop automated services and systems. Since the technological advancements are on a constant rise for instance deep learning has become more usable than ever. The extent of newer deep learning technologies has given rise to practical applications of Generative Adversarial Networks (GANs). Thus GANs can be used in two different methods: To train a computer system to be resilient against adversarial attacks by training it with synthetic datasets generated by GAN or to break the integrity of the computer system. In adversarial mode, GANs can be used to extract adversarial datasets which force the trained classifier algorithms to wrongly classify the target classes. There are different types of GANs that are being used in various applications, the most common GANs that are used are Deep Convolutional GAN (DCGAN) and Cycle GANs. While DCGANs are majorly used to extract artificial data that is not comparable to a classifier, Cycle GANs are used to extract image-to-image transformation examples. Generative Adversarial Networks (GAN) have been exceptional at producing artificial data, especially realistic-looking images.

**IV. CONCLUSION**

From the carried out survey it can be concluded that the GANs have been widely used since the time Ian Goodfellow has introduced and published his research paper. GANs have their variations, some of which include StyleGAN, AnimeGAN, ESRGAN, etc. These GANs are used for different applications such as image editing, producing realistic faces having the instances from the original pictures, foreground extraction, producing a Super resolute image from a lower resolution image, converting a colored Image to black and white, and vice versa, etc. The advantage of GAN is that it generates data that is similar to the real dataset. Due to this property of GAN, we find various applications that are helpful in the real world. GANs have a wide range of applications that includes games, marketing, advertisements, and various other fields. As we know there are a large number of advantages of GANs, this also has some major disadvantages such as all the basic facilities are available online and the graph of online transactions and businesses has inclined towards the online mode (internet), the usage of GANs will increase day by day in the same pace, then trust issue would be a major drawback of the users. There are

many advantages of GANs that could be used effectively but it is still not in use. GANs uses complex and advanced learning and the development of results from the text or obtaining results from speech is not an easy task.

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