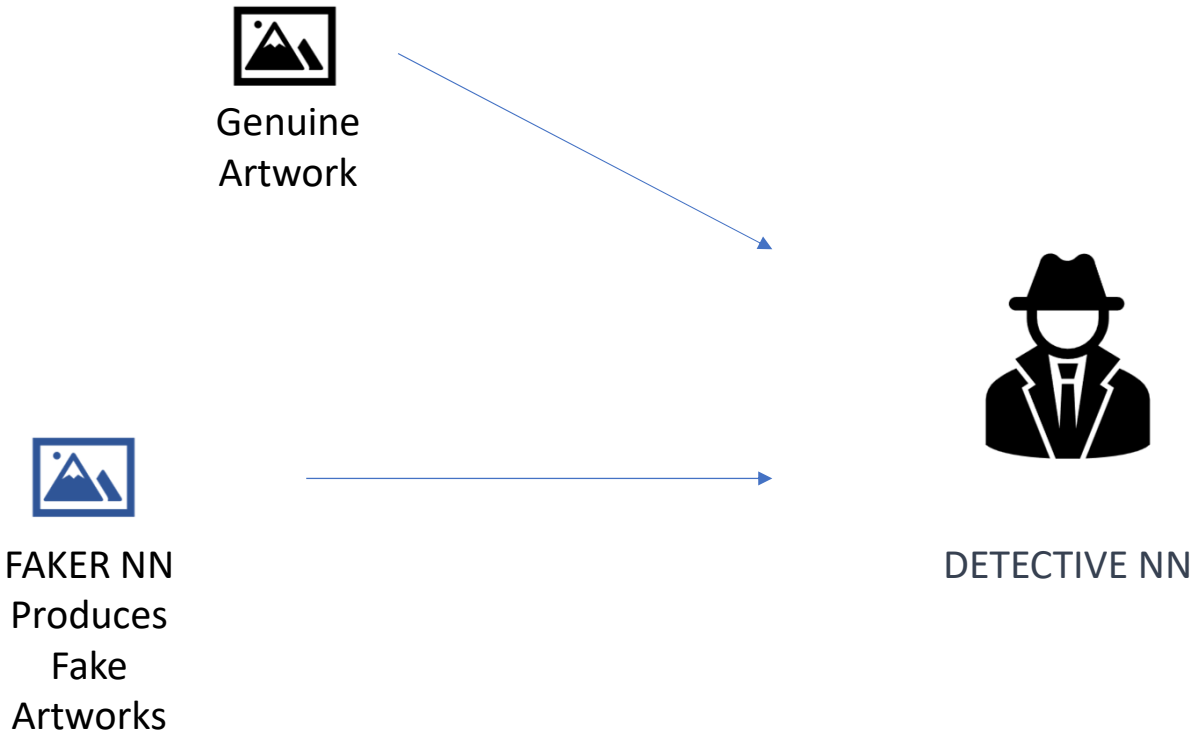
GANs


Genuine
Artwork
FAKER NN
Produces
Fake
Artworks
DETECTIVE NN

GANs

- Generative Adversarial Network

- GANs are a type of machine learning model composed of two neural networks: the Generator (G) and the Discriminator (D).
- The objective of G: Create data (such as images) that appear real.
- The objective of D: Distinguish between real data and data generated by G.
- Real data are needed to train a GAN.

GAN

Generator **(G)**

Discriminator **(D)**

Objective: Try to deceive D, producing images that D thinks are real

Objective: Be able to distinguish real images from fake ones

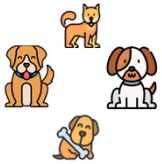
	Loss
High	Not deceiving D
Low	Is deceiving D

	Loss
High	Cannot Distinguish
Low	Can Distinguish

Training the Discriminator D

Objective: Be able to distinguish real images from fake ones

Step 1



Discriminaor **(D)**

Loss

Real Image

Step 2

0.7452, 0.2378, 0.4927, 0.6341

0.2345, 0.4897, 0.1236, 0.7549

0.6431, 0.2875, 0.9652, 0.5164

0.8762, 0.1384, 0.4598, 0.6427

Generator **(G)**

Step 3

Discriminator **(D)**

Loss

Fake Images

Step 4

Loss

Real Images

+

Loss

Fake Images

Total Loss D

Training Loss

Step 5

BackPropagation

Total Loss D

Discriminator **(D)**

Training the Generator G

Objective: Try to deceive D, producing fake images that D thinks are real

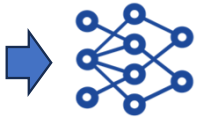
Step 1

0.7452, 0.2378, 0.4927, 0.6341

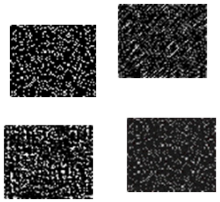
0.2345, 0.4897, 0.1236, 0.7549

0.6431, 0.2875, 0.9652, 0.5164

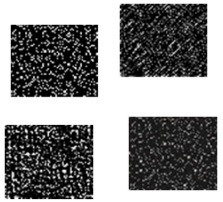
0.8762, 0.1384, 0.4598, 0.6427



Generator **(G)**



Step 2



Discriminator **(D)**

Probability of being real

Step 3

Probability of being real

Generator **(G)**

Loss

Training Loss

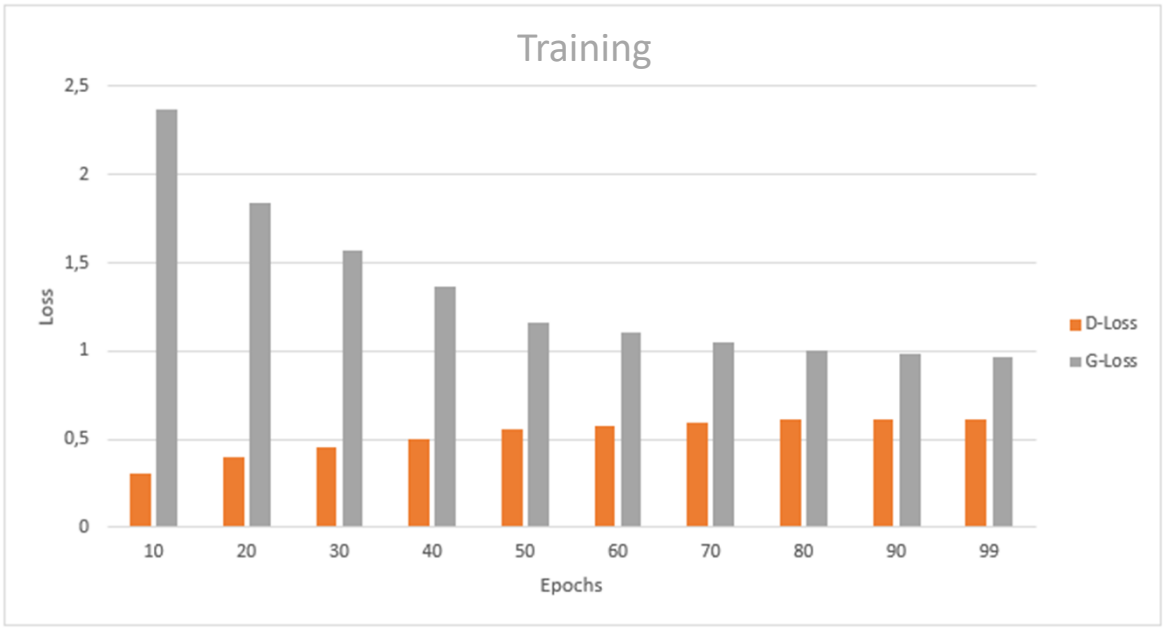
Step 4

BackPropagation Loss G

Generator **(G)**

Many Epochs Later...

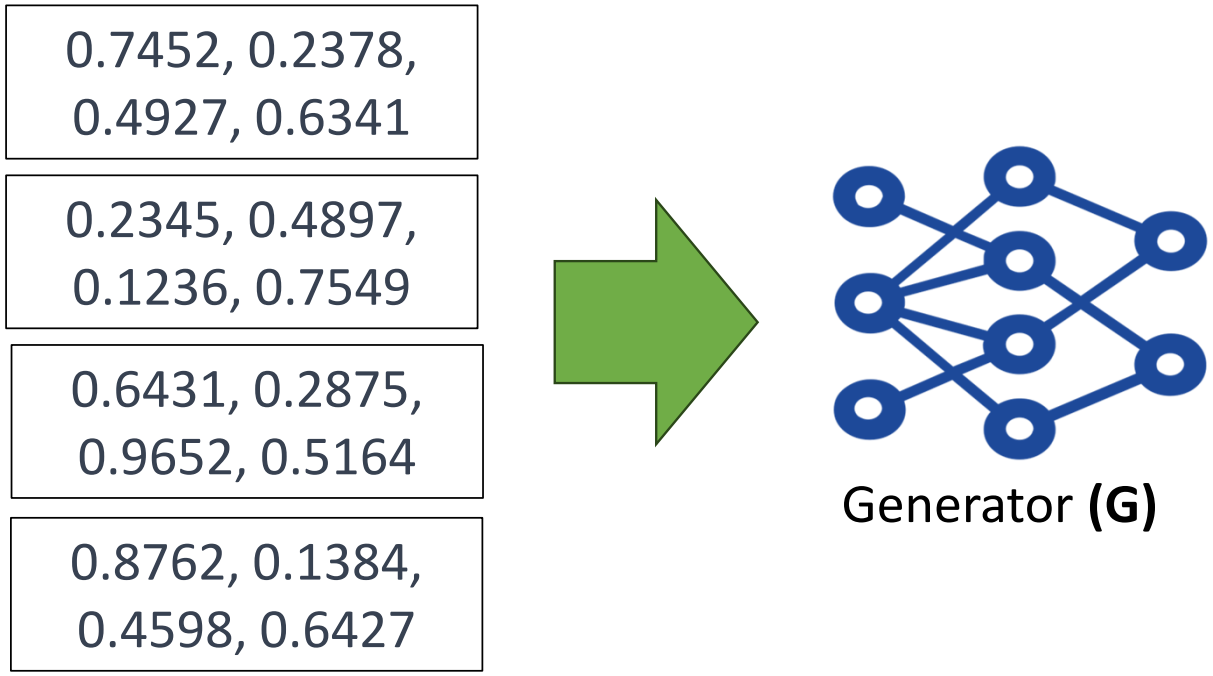
- The discriminator will be better at distinguishing fake images from real ones.
- The generator will be better at producing images that resemble real ones.



End of The Training

- Epochs
- Observe the Generator and Discriminator Loss
  - Discriminator Loss: If the value is too low, it indicates that it is very good at distinguishing fake images from real ones, which means that the Generator is not managing to deceive it.
  - Generator Loss: If the value is too low, it's a good sign, as the discriminator is having difficulty differentiating real images from fake ones.
- Visual Inspection of Image Quality
- Visual Inspection of Image Variety

Use of the Model



Training a GAN

- Complex Process
- High Costs
- Requires Specialized Hardware
- Trial/Error

Final Considerations

Generator: It should learn to create the image, but it will never see a real training image.

Periodically, during training, you might want to save generated images to visually inspect G's progression.