SNS COLLEGE OF ENGINEERING

Kurumbapalayam(Po), Coimbatore – 641 107
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Department of AI &DS

Course Name – 19AD602 DEEP LEARNING

III Year / VI Semester

Unit 2-DEEP NETWORKS
Topic: GAN

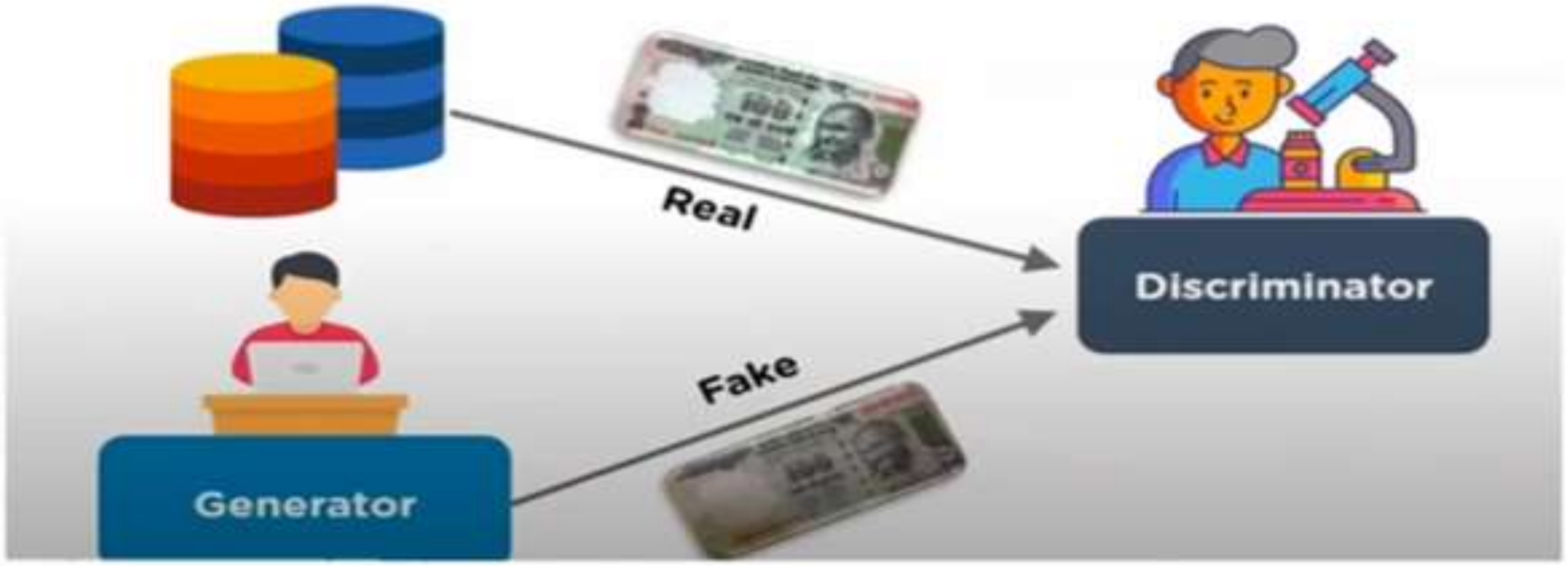
GULSHAN BANU.A/AP/AI AND DS /CNN /SNSCE

Case Study

A gaming company used Generative Adversarial Networks (GANs) to generate realistic character textures, reducing the design time by 40%. The GAN produced diverse textures by learning from existing designs while maintaining creativity and detail. This approach significantly streamlined the content creation process for new game releases.

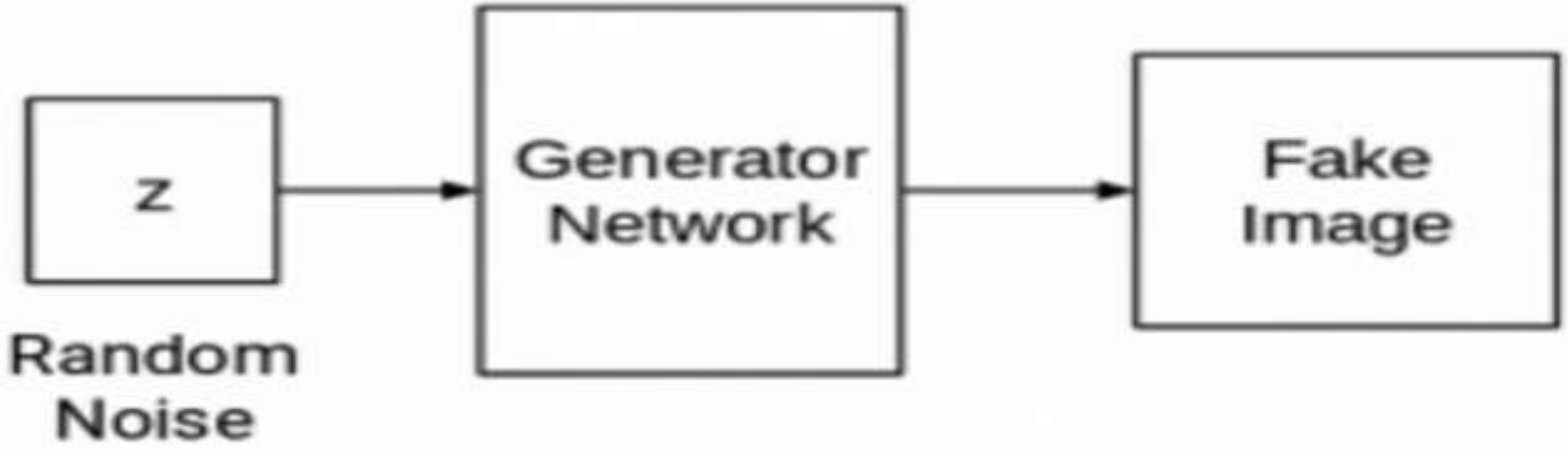
Generative Adversarial Networks (GANs)

- Generative Adversarial Networks (GANs) are a powerful class of neural networks that are used for unsupervised learning. It was developed and introduced by Ian J. Goodfellow in 2014.
- GAN consist of two models that compete with each other to analyze, capture and copy the variations within a dataset.

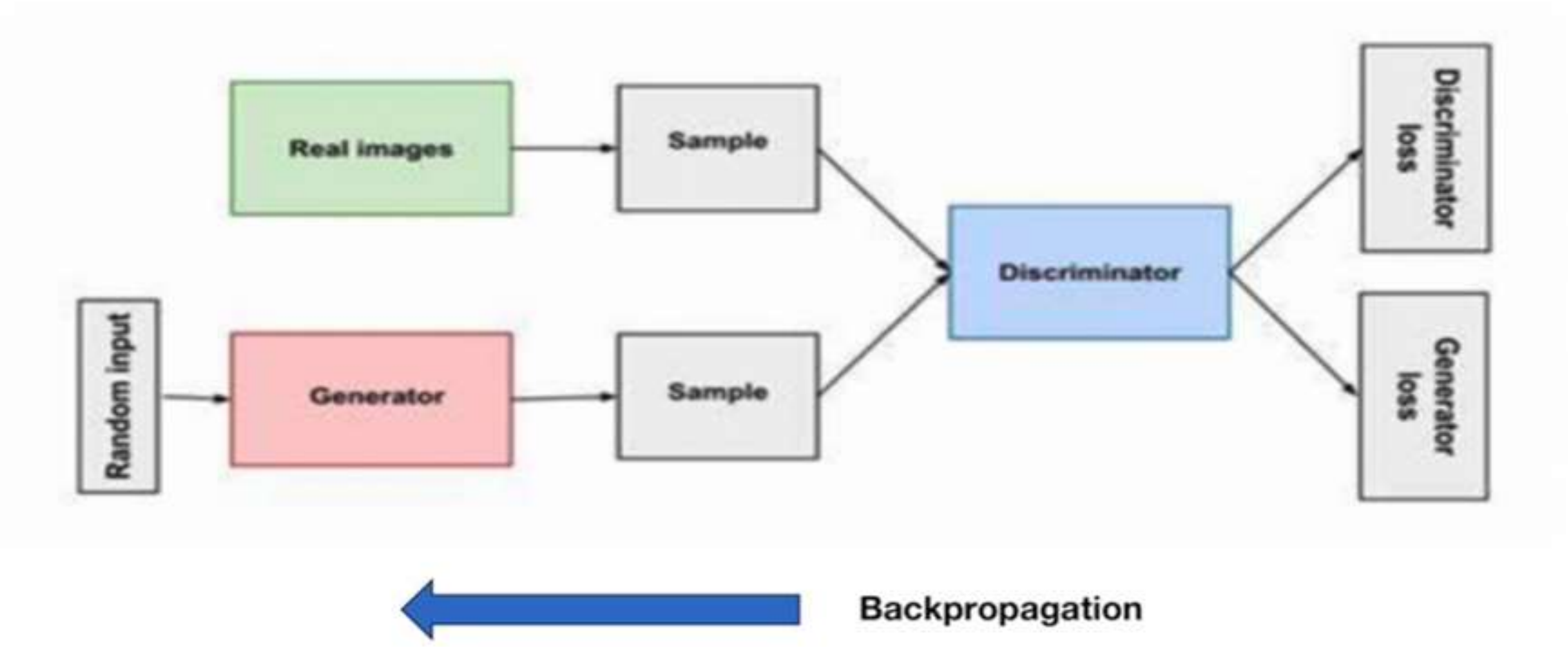


Generator

- The Generator in GAN learns to create fake data by incorporating feedback from the discriminator.

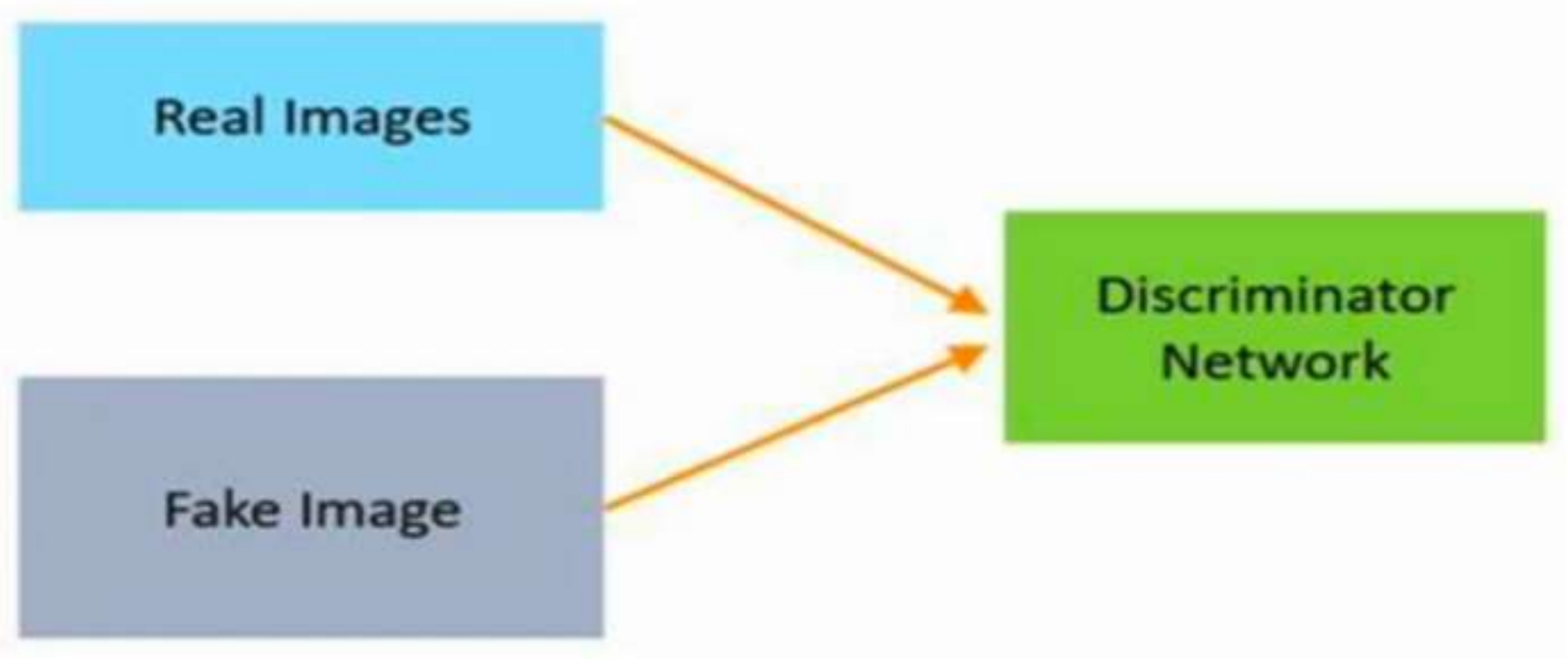


Generator Training

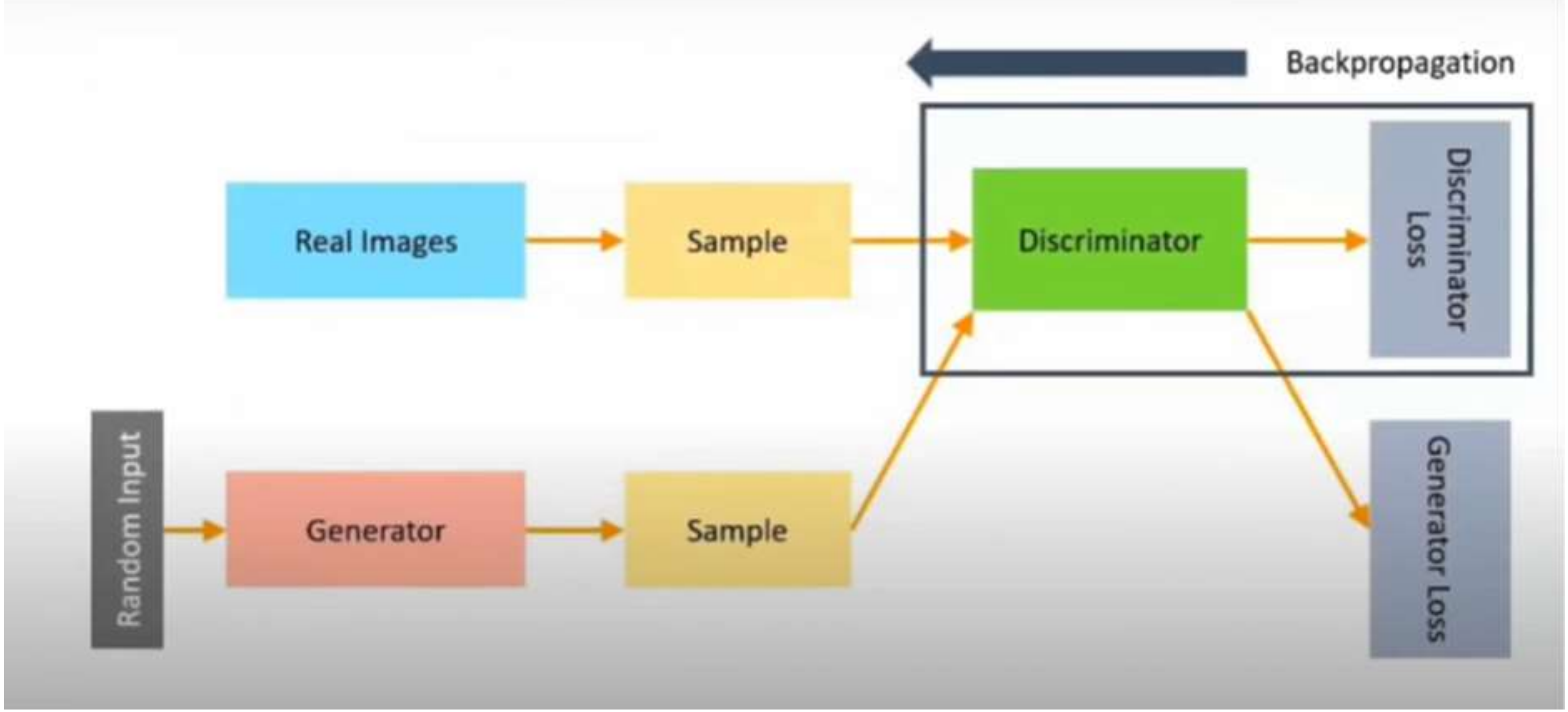


Discriminator

- The Discriminator in GAN is a classifier that identifies real data from the fake data created by the Generator.

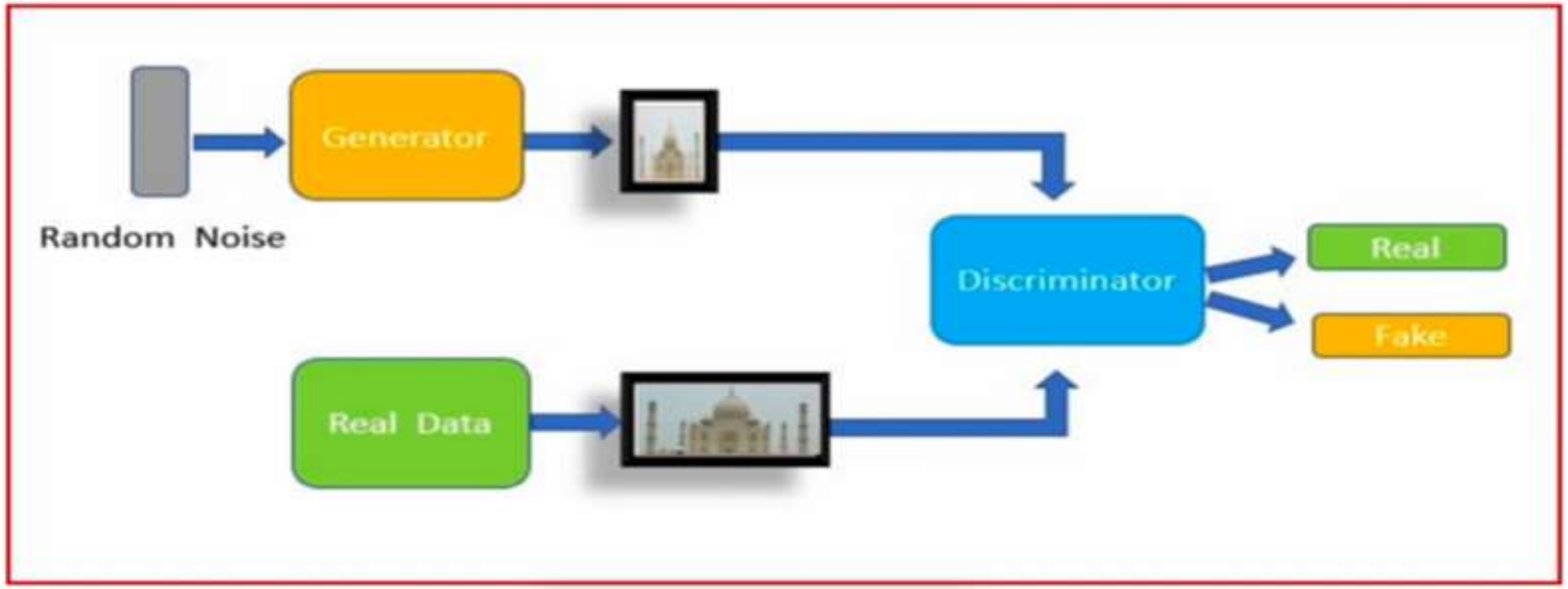


Discriminator Training



How GAN Work?

GANs consist of 2 networks,a Generator G(x) and a discriminator D(x).



- The mathematical formula of GAN is given below -
- **V (D,G)=E x~pdata (x) [log?D (x)]+ Ez~pz (z) [log? (1–D (G (z))]**
- D = Discriminator
- G = Generator
- pdata(x) = real data distribution
- x = pdata(x) sample
- D(x) = Network for Discriminator
- G(x)=Generator network
- p(z) = Generator distribution
- z = p(z) sample

Steps for Training GAN

- Define the problem
- Choose the architecture of GAN
- Train Discriminator on real data.
- Generate fake data for Generator.
- Train Discriminator on fake data.
- Train Generator with the output of Discriminator.

TYPES:

- The Different Types of Generative Adversarial Networks (GANs) are:

Vanilla GAN:

Simplest type of GAN where the Generator and Discriminator are simple multi-layer perceptron's.

Deep Convolutional GAN (DCGAN):

- DCGAN comprise of ConvNets and are more stable and generate higher quality images.

Conditional Gan (CGAN):

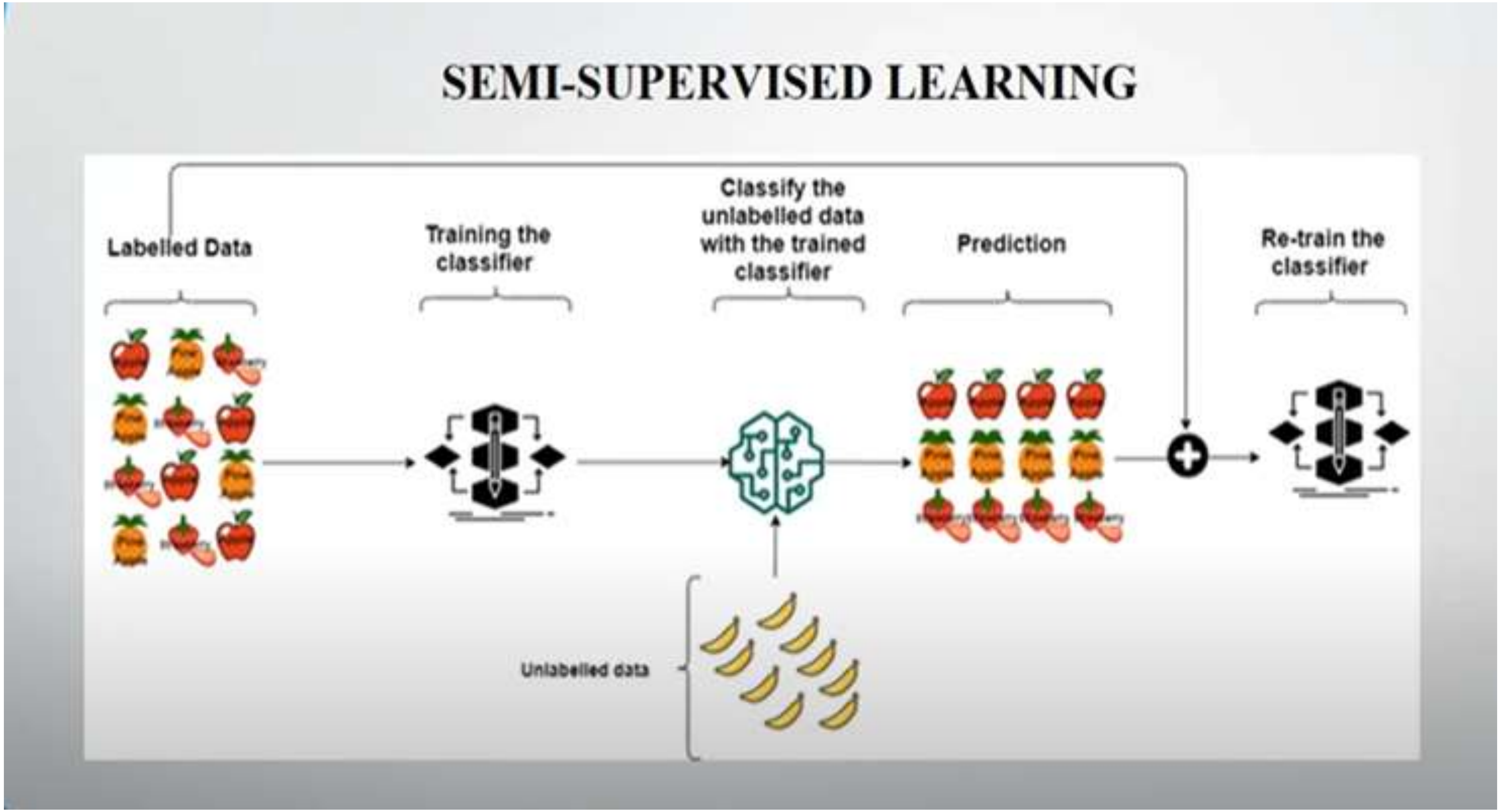
CGANs use extra label information to generate better results.

Super Resolution GAN (SRGAN):

SRGAN generate a photorealistic high-resolution image when given a low-resolution image.

Applications of GANs

- The different applications of GANs are:
- Image inpainting with GANs
- Using GANs for Steganography (SSGAN)
- Generating Synthetic Data
- Image Super Resolution Using GANs
- Image translation
- 3D Object Generation using GANs


SEMI-SUPERVISED LEARNING
Labelled Data
Training the classifier
Classify the unlabelled data with the trained classifier
Prediction
Re-train the classifier
Unlabelled data

Continuity Assumption: The algorithm assumes that the points which are closer to each other are more likely to have the same output label.

Cluster Assumption: The data can be divided into discrete clusters and points in the same cluster are more likely to share an output label.

Manifold Assumption: The data lie approximately on a manifold of much lower dimension than the input space. This assumption allows the use of distances and densities which are defined on a manifold.

APPLICATIONS

- Speech Analysis
- Web content classification
- Protein sequence classification
- Text document classifier

Activity

Train a GAN to generate new handwritten digit images using the MNIST dataset, and compare the quality of generated images at different training stages to understand the adversarial learning process.

THANK YOU