UCL ARTIFICIAL
INTELLIGENCE SOCIETY

TUTORIAL #10

Session 10

Generative Models: Part 2

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LECTURE OVERVIEW

01

What are GANs?

Theoretical Introduction

02

History and present of GANs

Why are they so important now

03

Training your own GAN mode

Programming basic GAN model

Theory

WHAT ARE GANS?

Generative Adversarial Networks

- Works by pitting two neural networks against each other
- Generator
- Discriminator

Theory

GENERATOR

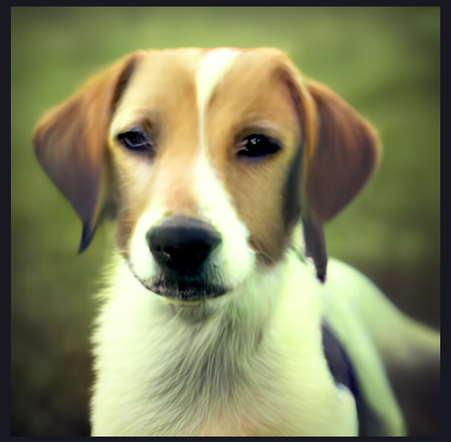
- Neural Network
- Depending on type of GAN, could be a Feedforward Network, or a CNN, or other
- Input : Random Vector
- Output: Fake Sample

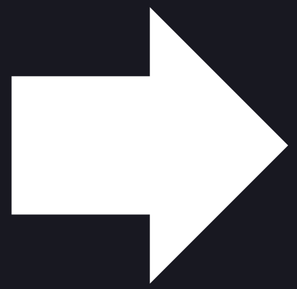
(1 0 2 3)

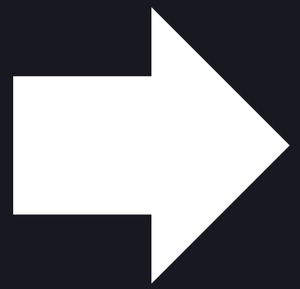
Theory

DISCRIMINATOR

- Neural Network
- Depending on type of GAN, could be a Feedforward Network, or a CNN, or other
- Is just a standard binary classification network
- Input : Fake or Real Image
- Output: E.G. 0 for fake, 1 for real







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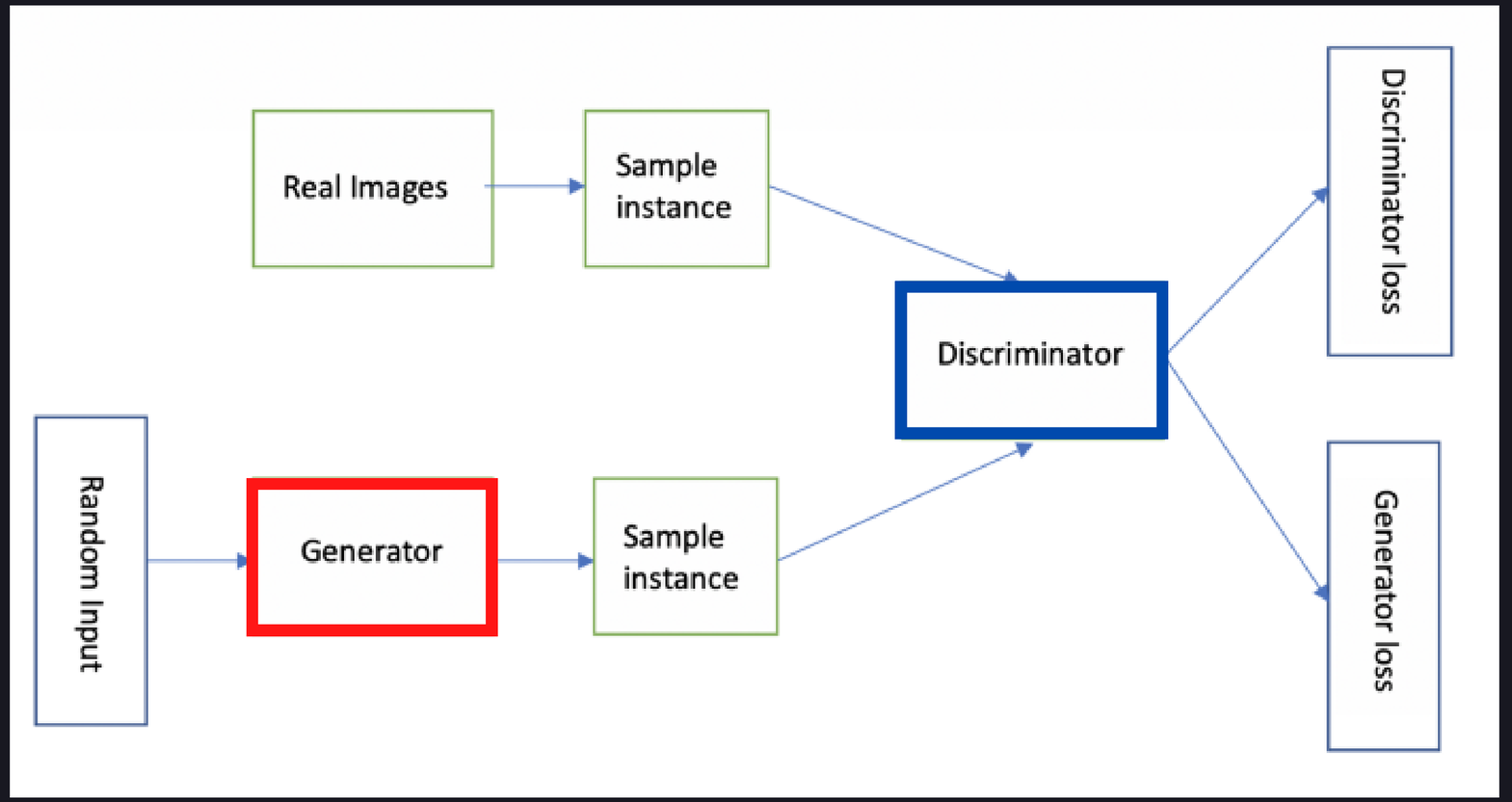
Theory

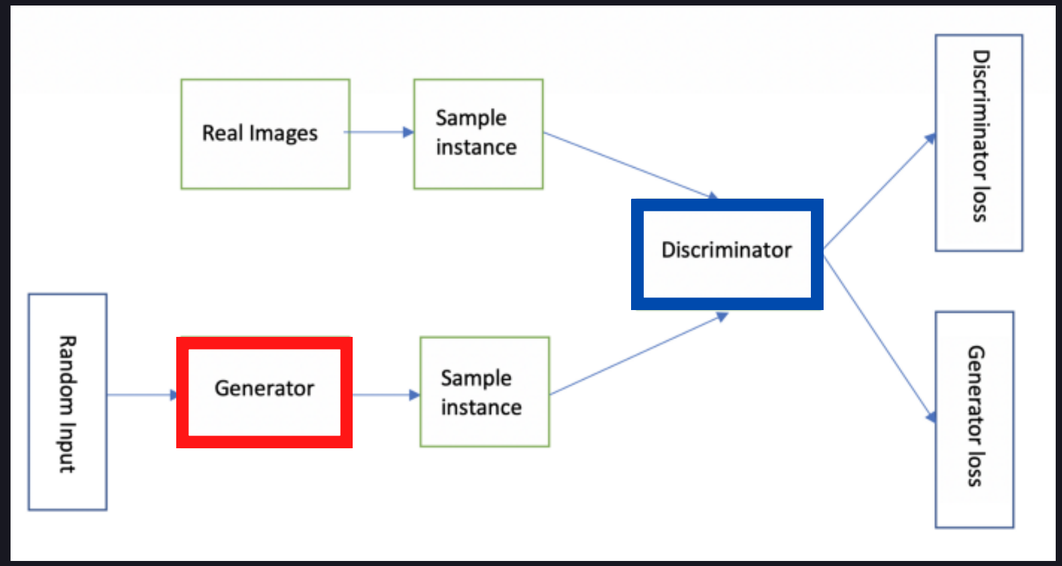
FULL GAN ARCHITECTURE



Theory

FULL GAN TRAINING

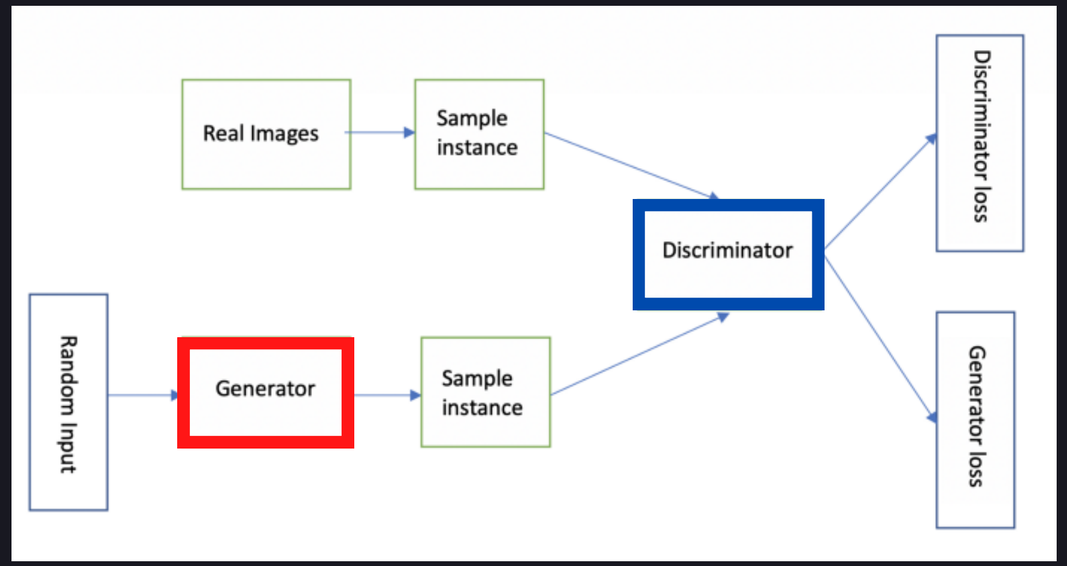
- Trains using Backpropagation, like all other neural networks
- The aim of Generator is to increase the loss of the network
- The aim of the discriminator is to reduce network loss
- For training, we fix the weights of discriminator for several iterations, changing only the generator weights
- Then alternate. This is to encourage convergence, instead of trying to hit a moving target



Theory

CONVERGENCE

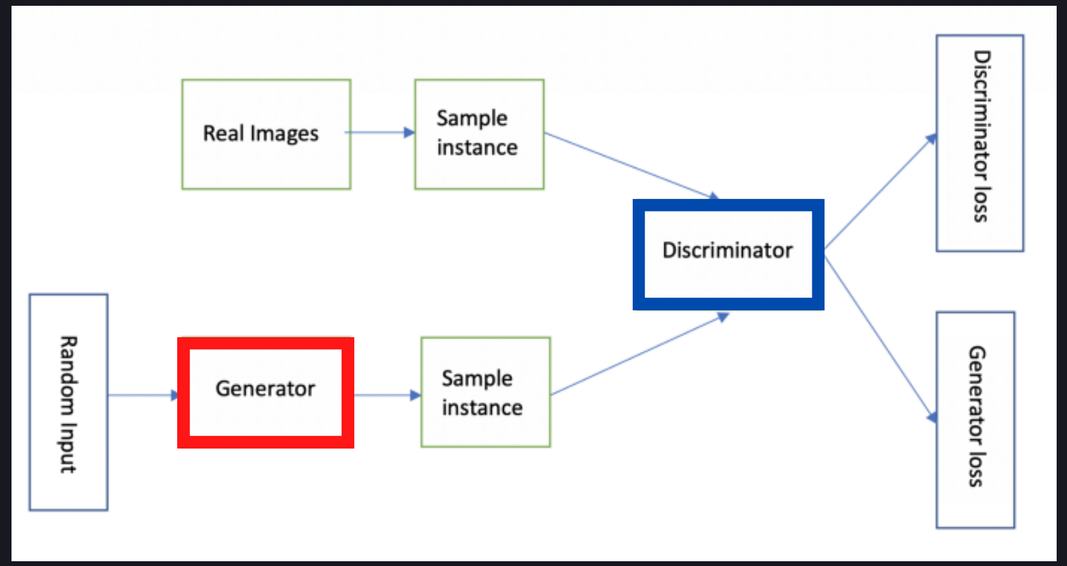
- Ideal case: The discriminator predicts fake or real with 50% probability
- This indicates that the quality of fakes are optimal.
- Unlike normal neural networks, we want to halt training here.



Theory

IMAGE GENERATION

- After training finishes, we "detach" the discriminator
- Just use the Generator to create images



Theory

SPACE OF IMAGES

- Now, we can generate from a space of images
- Generated images are deterministic
- Vector addition and subtraction makes sense!

Theory

HISTORY AND PRESENT OF GANS

We have seen a massive progress in the GAN technology in the last several years

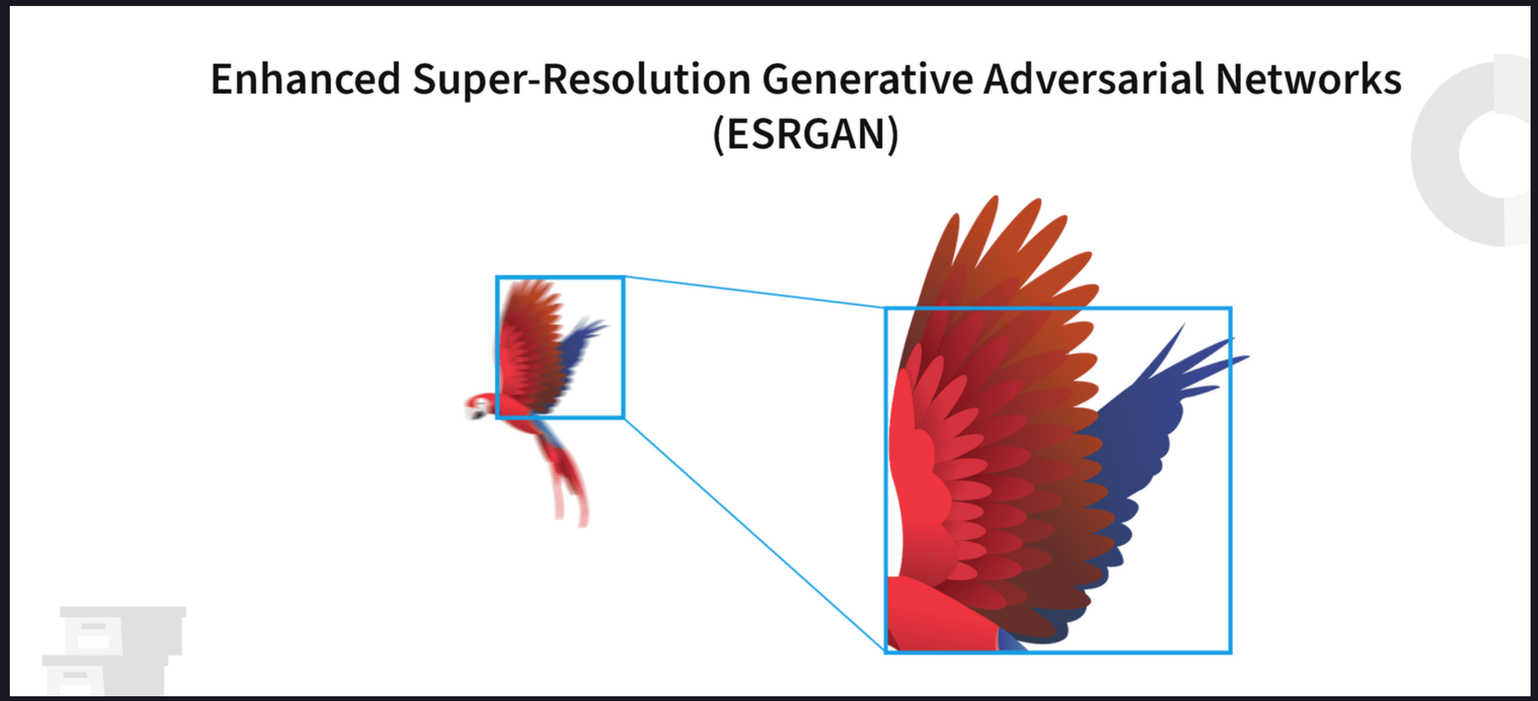
Theory

HISTORY AND PRESENT OF GANS

- Currently, they fell a bit out of favour since Difusion models started being more popular in 2022
- It is still a very important field in AI, since it essentially simulates evolution
- Important even outside of the Image Generation field

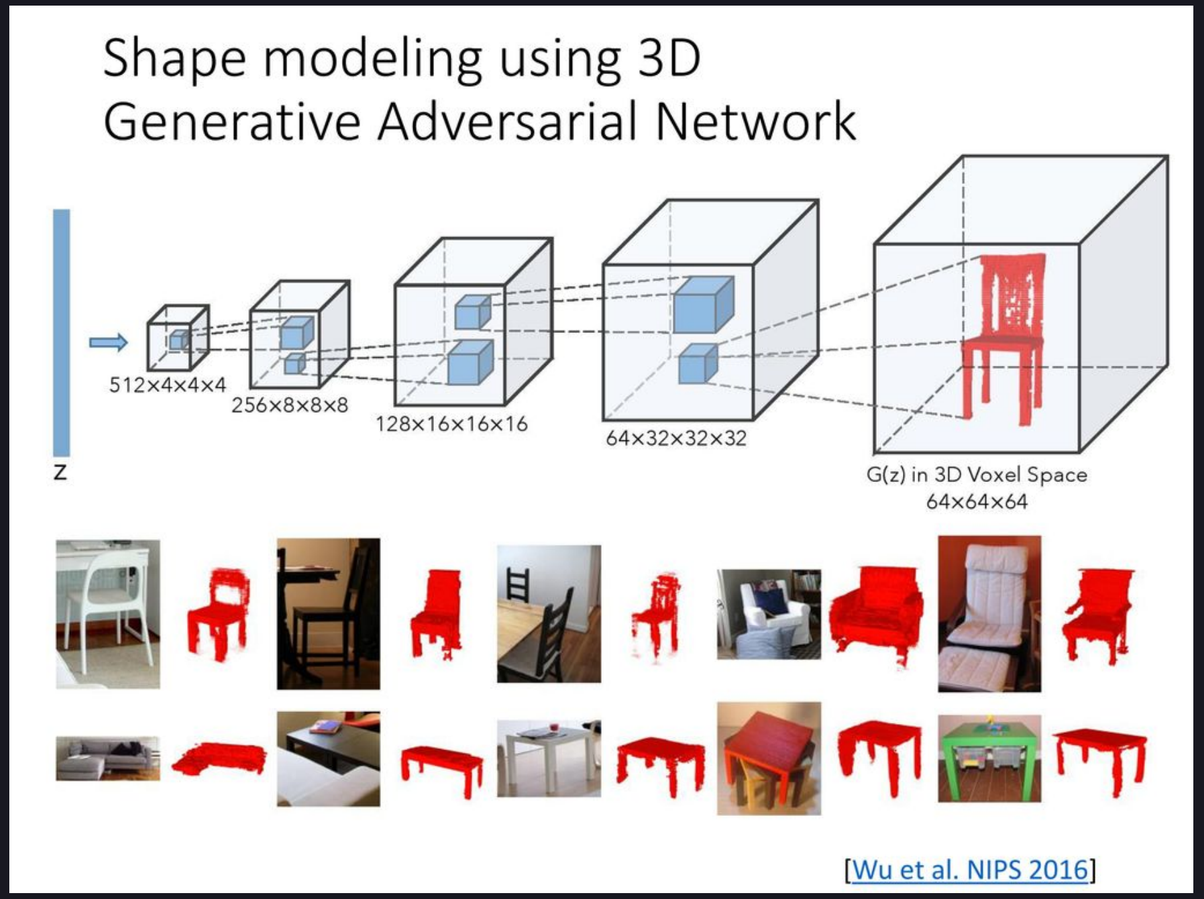
Theory

HISTORY AND PRESENT OF GANS



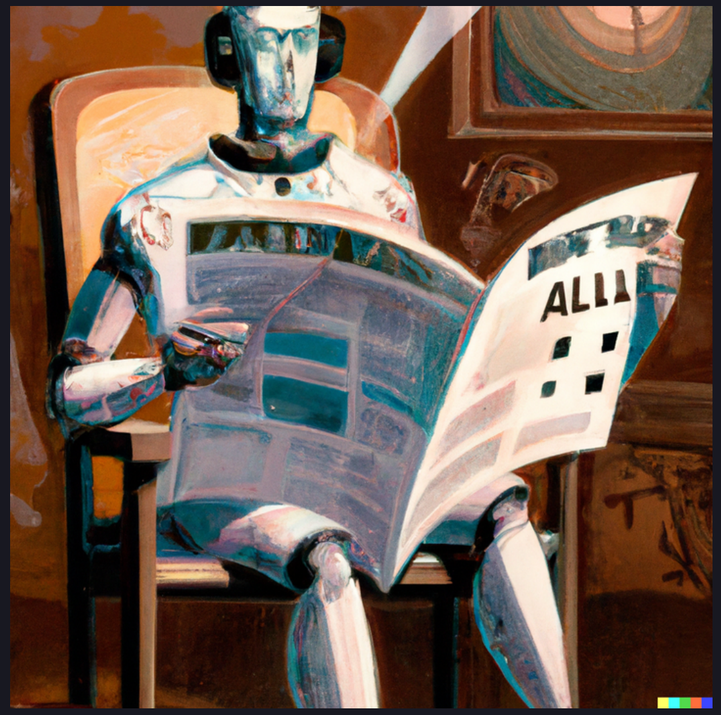
Theory

HISTORY AND PRESENT OF GANS



LETS HAVE A LOOK AT SOME CODE!

QUESTIONS?



SEE YOU NEXT TIME