

KL SCHOOL OF AI PRESENTS

# THE AGE OF GANs

**Generative Adversarial Networks**

**By: Faris Hassan - farisology**

# Farisology

- I'm Faris Hassan
- Graduated from MMU majored in AI
- Research in medical imaging and automated
- diagnoses systems for Tuberculosis using chest radiographs
- Worked in Sedania Innovator as a data Scientist.
- Now joined Fave.



# Agenda

## Topics to be Discussed

GANs and Fake stuff

Applications of GANs

GANs Concept

The Arch. of GANs.

The difference with Neural Nets.

hands-on a bit

New Archs. and variants of GANs.

Disadvantages of GANs.

Steps of build Generative models.

Tips for better performance

# Have you heard of Deep Fake?

You can say it one of the creepiest things you will know about AI. If you think that detecting fake news have is a headache, you will be freaked out by deep fake. It is fake in totally new level.

The fancy definition: Deepfake, a portmanteau of "deep learning" and "fake", is an artificial intelligence-based human image synthesis technique. It is used to combine and superimpose existing images and videos onto source images or videos. It is an artificial intelligence assisted technology that make the creation of fake videos very convincing. Watch the video: [Deepfake](#)

**Are you scared now ?**

**Why am I sharing this ?**

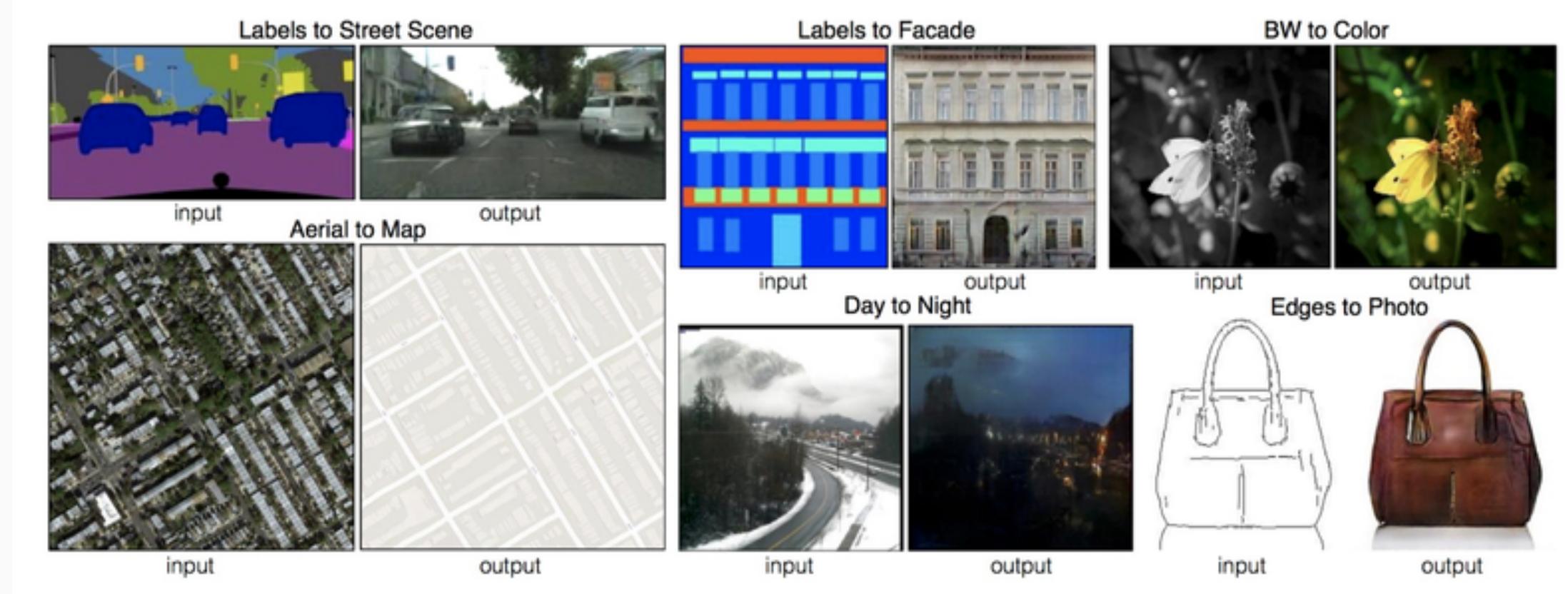
BECAUSE

*Democratizing  
Artificial  
Intelligence*

Will bring more good and transform humanity

# Generative Adversarial Networks

The idea of adversarial networks have been around for awhile but there hasn't been any development or a significant development till a research published in 2014 by the scholar of OpenAI Ian Goodfellow.



## Face Aging

0-18



19-29



30-39



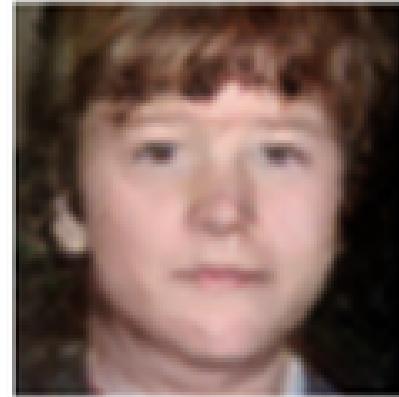
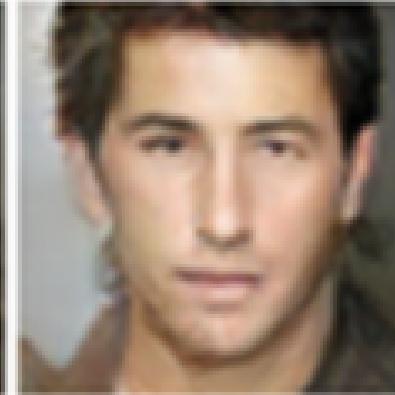
40-49

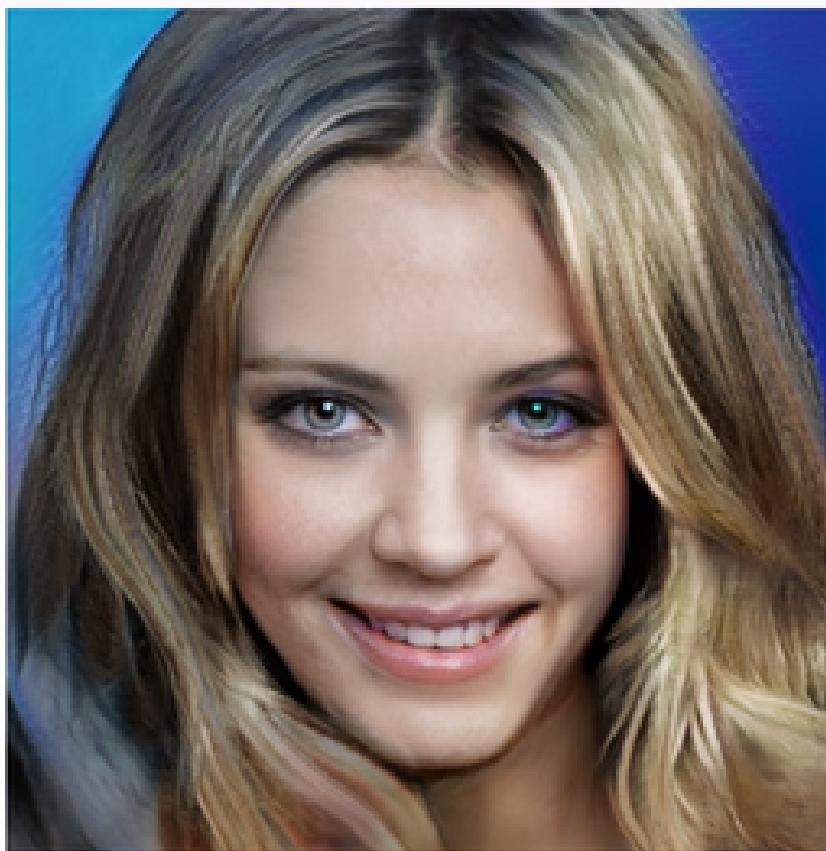


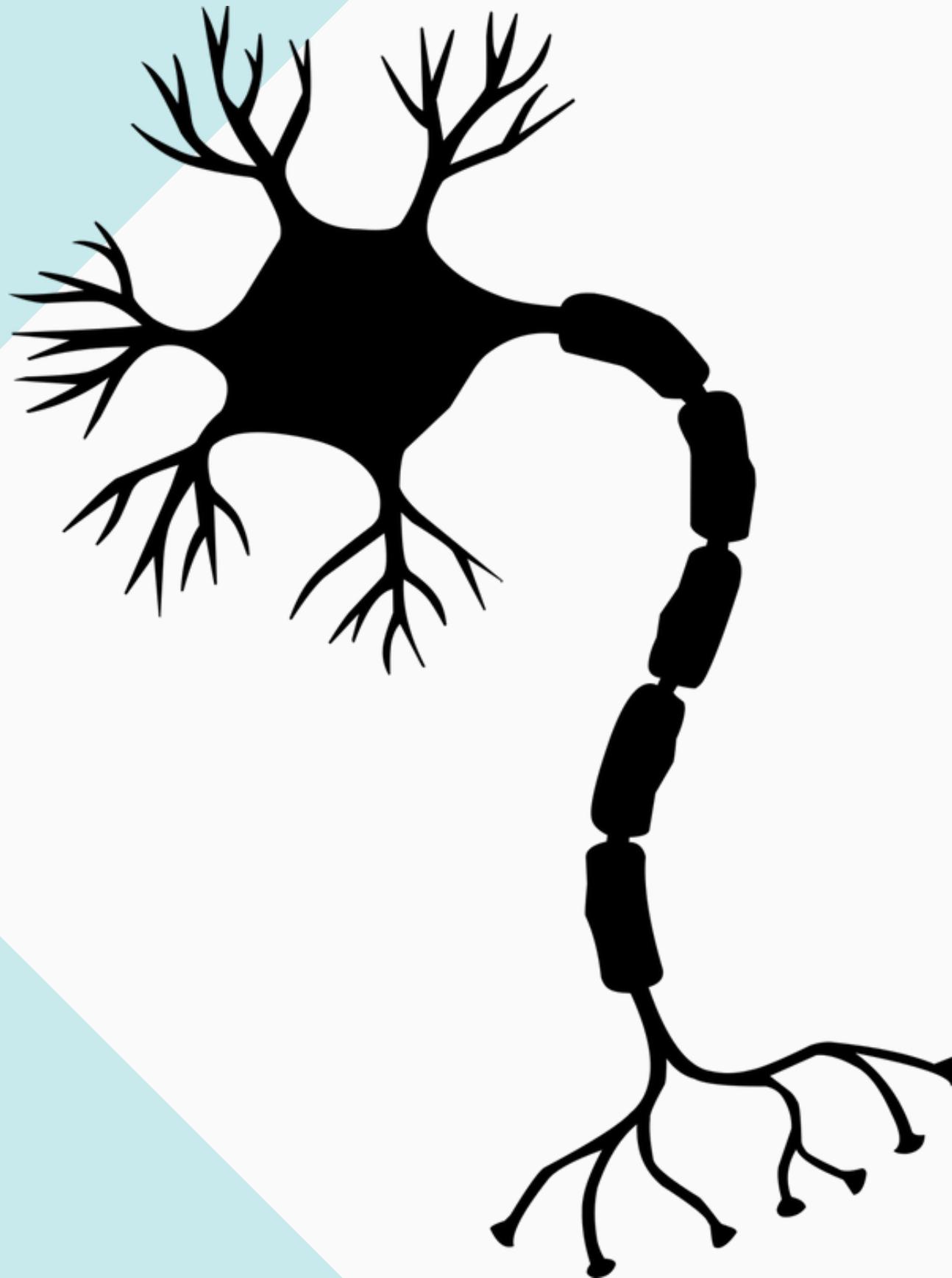
50-59



60+







# GANs

## Concept

Unlike a conventional neural networks GANs have a game theoretic approach. The structure involves the training of two neural networks. The networks learn from a training distribution via a 2 player game. The two components are the generator and discriminator.

**These two gonna be in a constant battle through out the training process till the forger make awesome fake stuff**



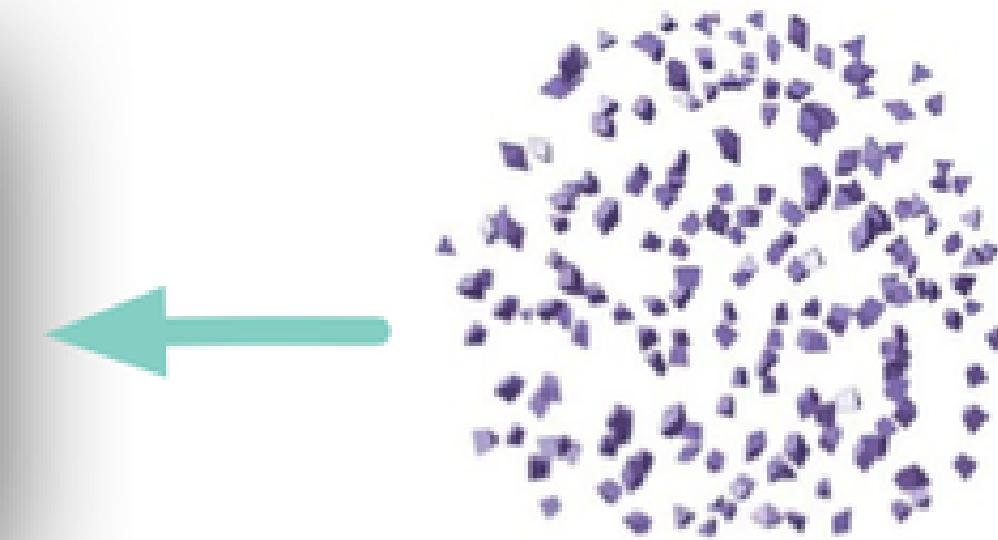
R: Real Data



D: Detective



G: Generator (Forger)



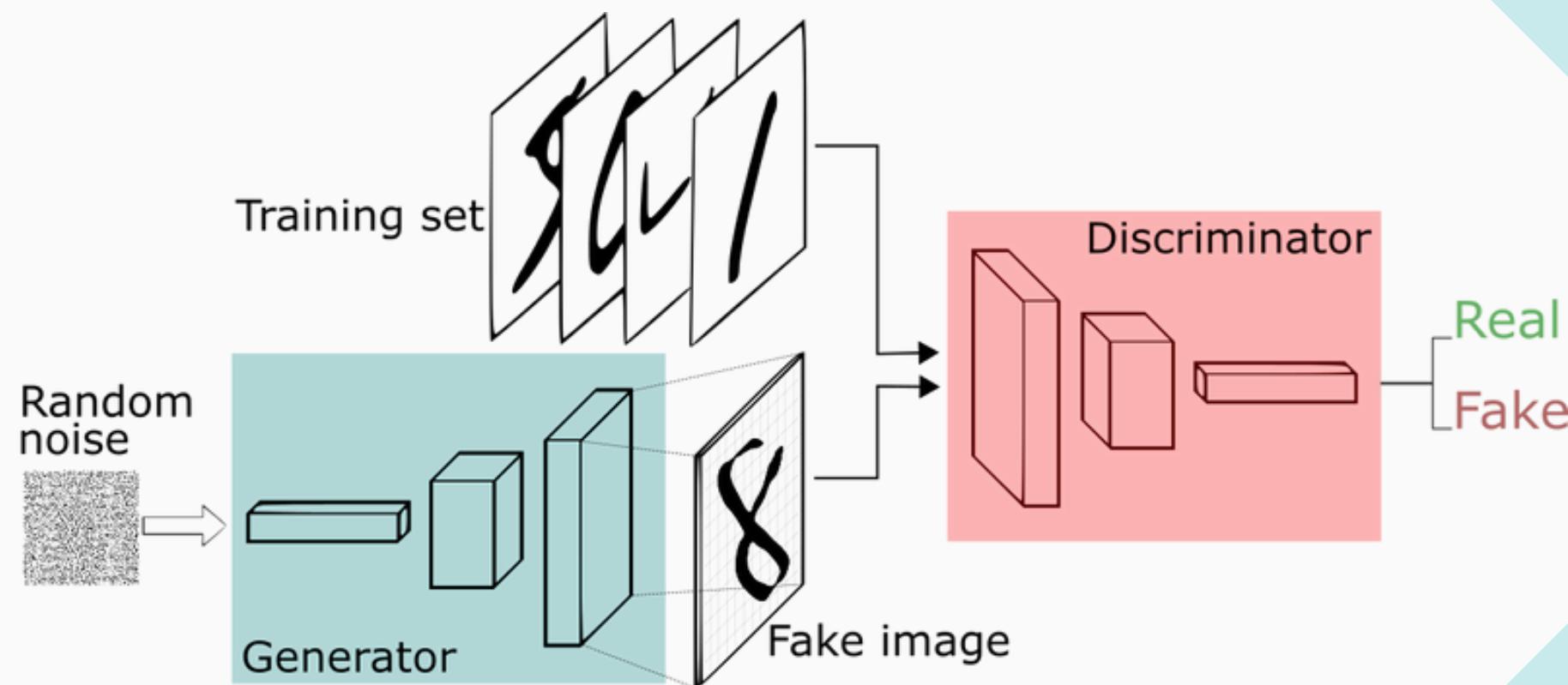
I: Input for Generator



# Two competing networks

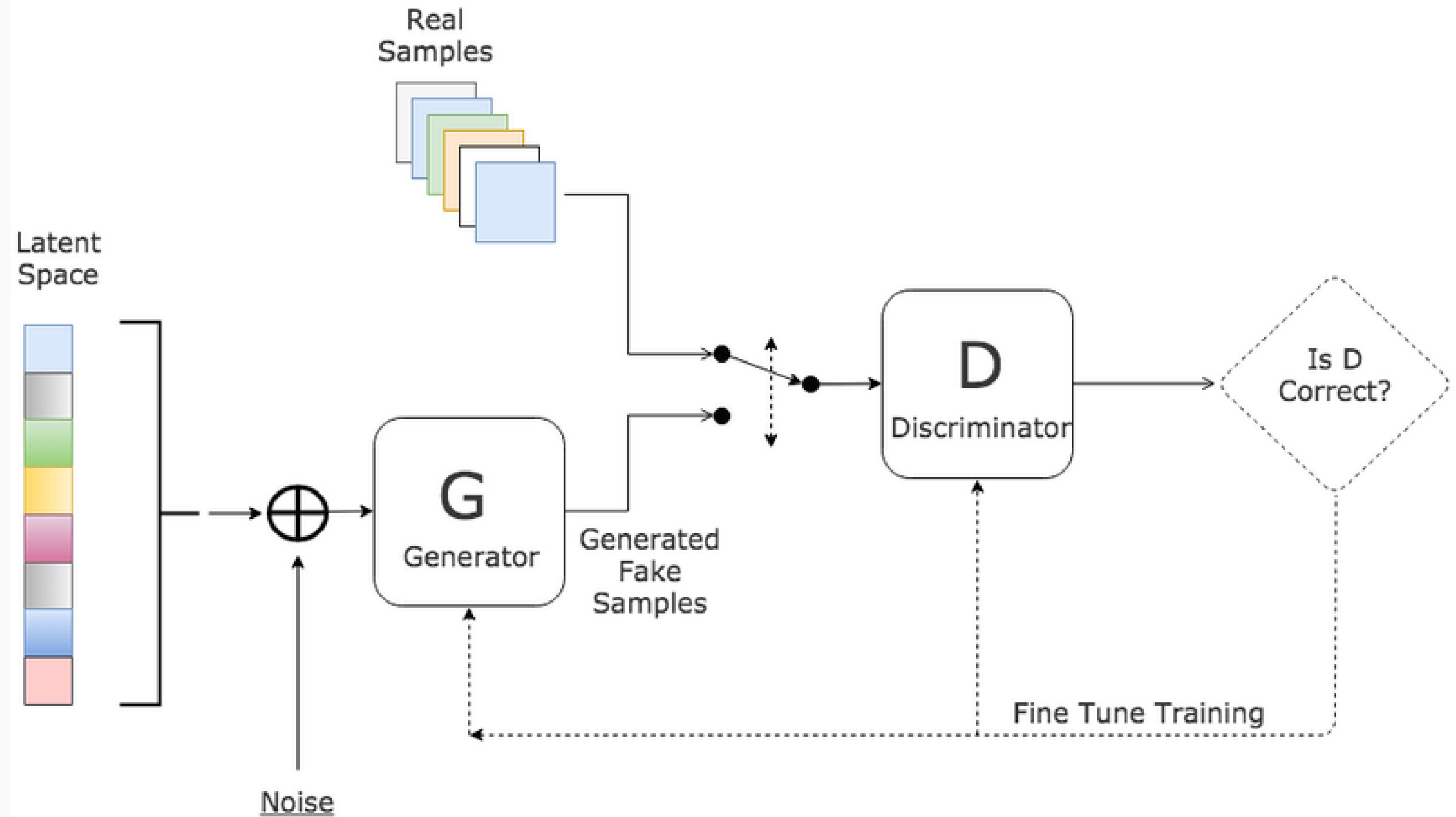
The Struggle is real bro...

There are two networks competing in this unsupervised learning environment. The aim of the generator is to create some representation of input using a random seed - usually Gaussian noise - and present it to the discriminator. The discriminator then decide which of the generated data is real or fake.



# Generative Adversarial Network

The nash equilibrium in this scenario is realized when the generator learns enough to make the discriminator unable to recognize the fake data.



# The difference with neural networks.

GAN & NEURAL NET

The major difference lies in the need of cost function. Traditionally cost function has to be carefully designed by human engineers. But adversarial networks learn their own cost function (based on each other's feedback). Discriminator network tries to learn the boundary between the classes so that it can flag the fake data. Generator network tries to learn the distribution of class.

# **GANs are too much till you need a GAN.**

WHEN YOUR DATA IS  
NOT ENOUGH .....

Deep learning applications require huge amount of data for training. The availability of huge training dataset has always been the pain point not as easy task for people in several fields. GANs can come to rescue in this problem. We can use GANs to generate our own datasets using little examples.

The quality might not be very accurate but people have started employing GANs for this task.

Hands-on

# Let's build a standard GAN

*In Code we Trust*

**There are  
more GANs  
than Gangs**

just saying

**GAN Archive**

Press here if you wish

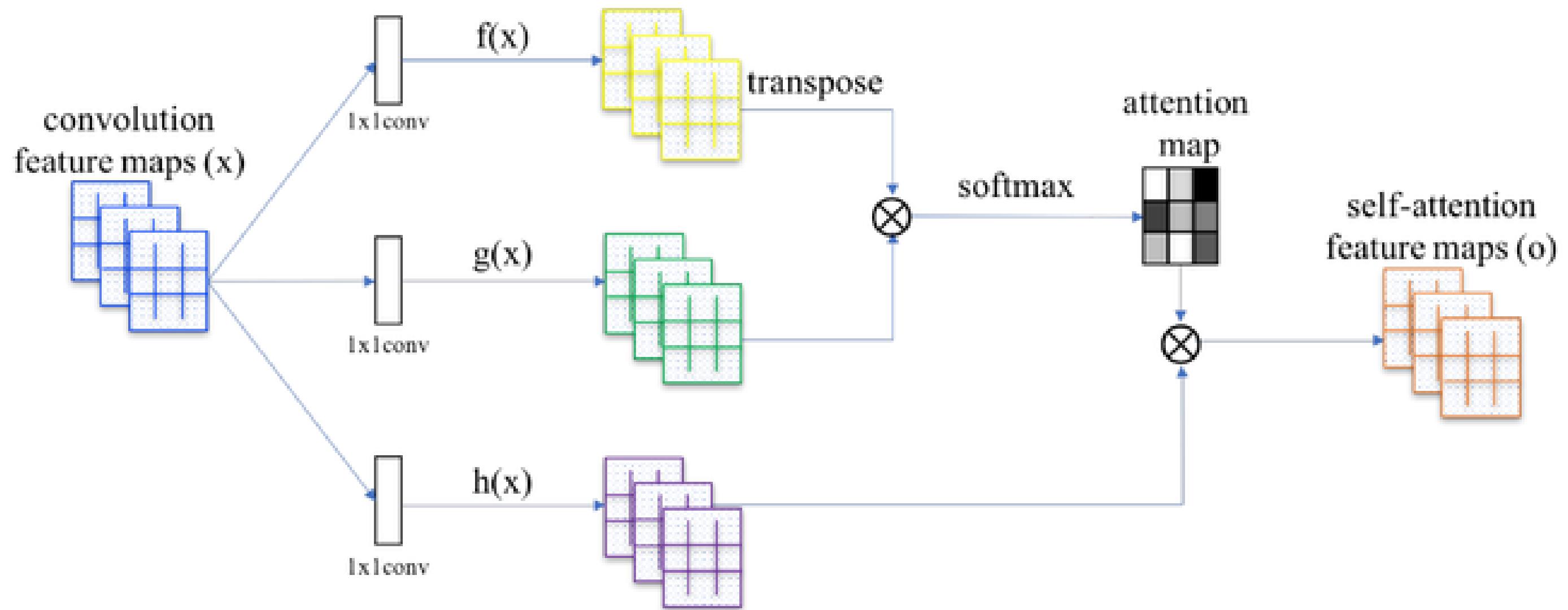


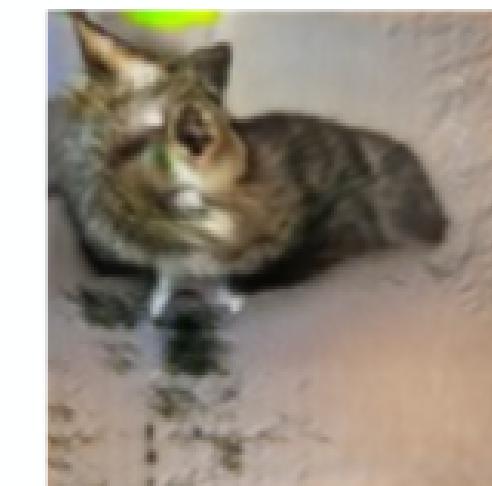
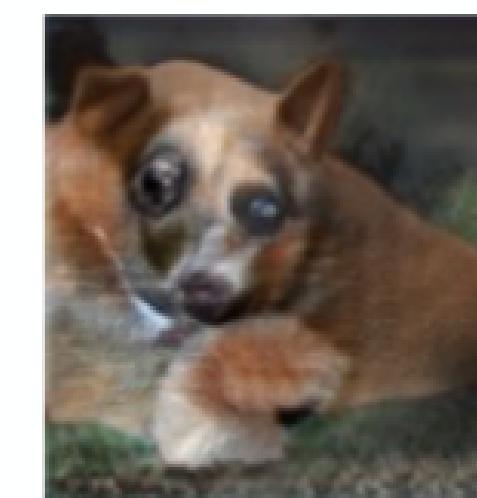
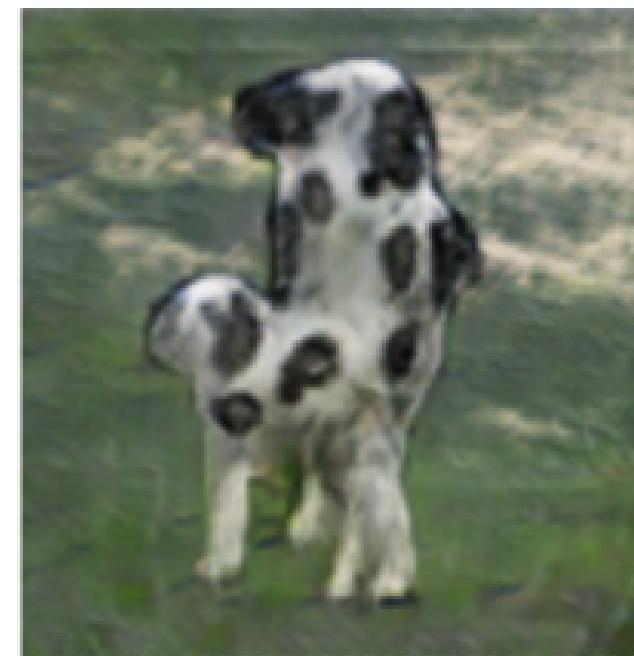
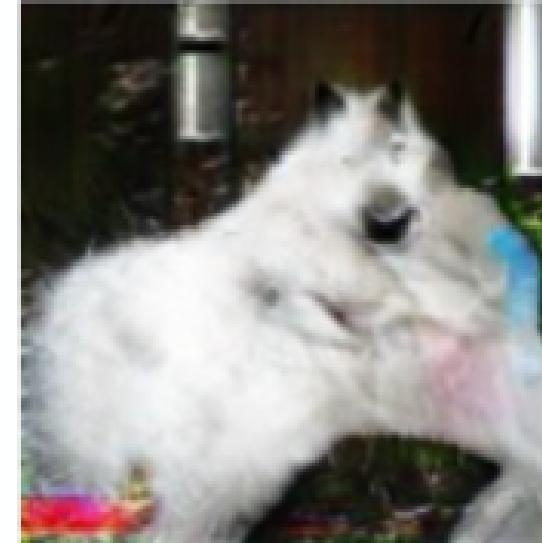
Figure 2: The proposed self-attention mechanism. The  $\otimes$  denotes matrix multiplication. The softmax operation is performed on each row.



Reality hits hard

### 3 MAJOR PROBLEMS WITH GAN

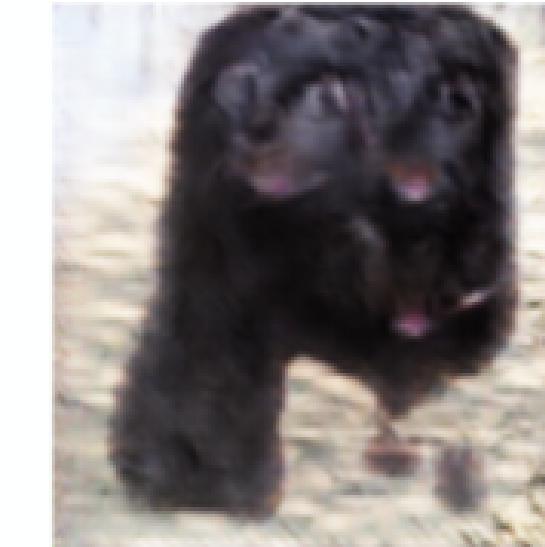
#### Problems with Global Structure



(Goodfellow 2016)

## 3 MAJOR PROBLEMS WITH GAN

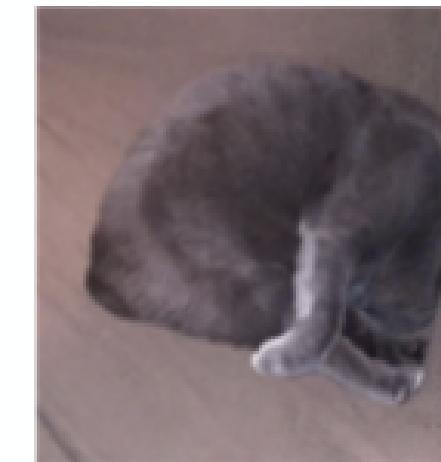
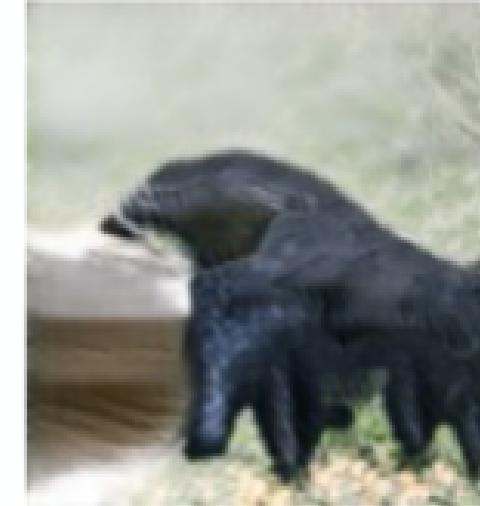
### Problems with Counting



(Goodfellow 2016)

## 3 MAJOR PROBLEMS WITH GAN

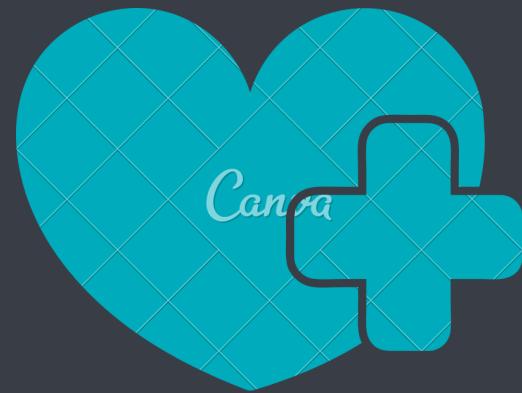
### Problems with Perspective



(Goodfellow 2016)

# DISADVANTAGES OF GAN

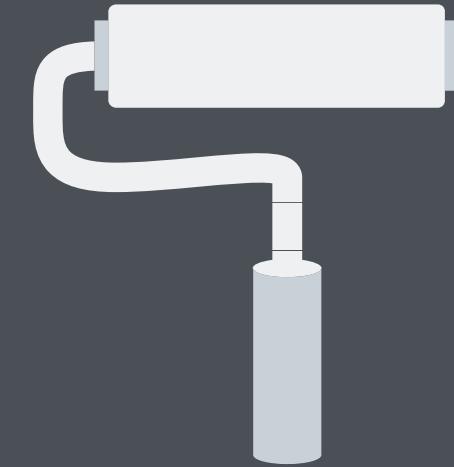
*issues*



**Unstable to train  
you have two networks  
using the same  
backpropagation**



**Cannot perform  
inference queries or  
seek any form of  
interpretation**



**it requires a clear  
objective, otherwise  
you won't know what is  
it doing**

# Steps to build cool GAN

**Step1:** Define the problem.

**Step2:** Define architecture.

**Step3:** Train Discriminator on real data for n epochs.

**Step4:** Generate fake inputs for generator and train discriminator on fake data.

**Step5:** Train generator with the output of discriminator.

Do **Step3 - Step5** for n epochs.

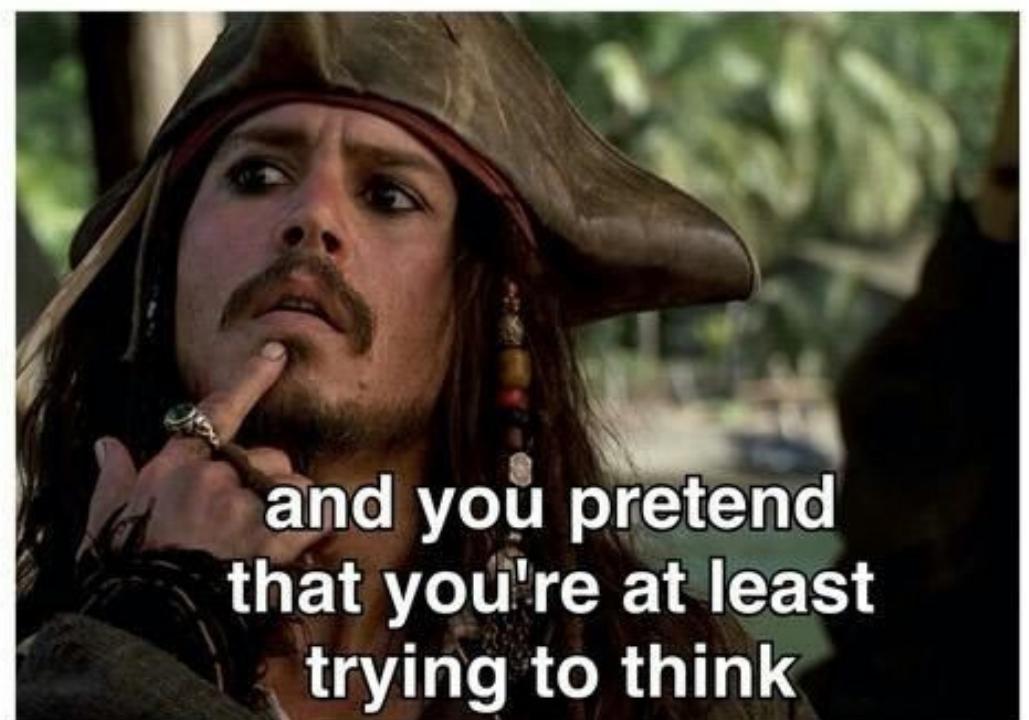
**Step6:** Check the fake data manually. Do they look legit? If not get back to **Step3-Step5** for more epochs till you have some awesome fake stuff.

# How to make GANS work?

## Tips

- 1- Normalize your input.
- 2- Use DCGAN when you can because its always better than just GAN.
- 3- Use SGD for discriminator and ADAM for generator.
- 4- Read more from [GAN-Hacks](#)

When the teacher is watching you during a test..

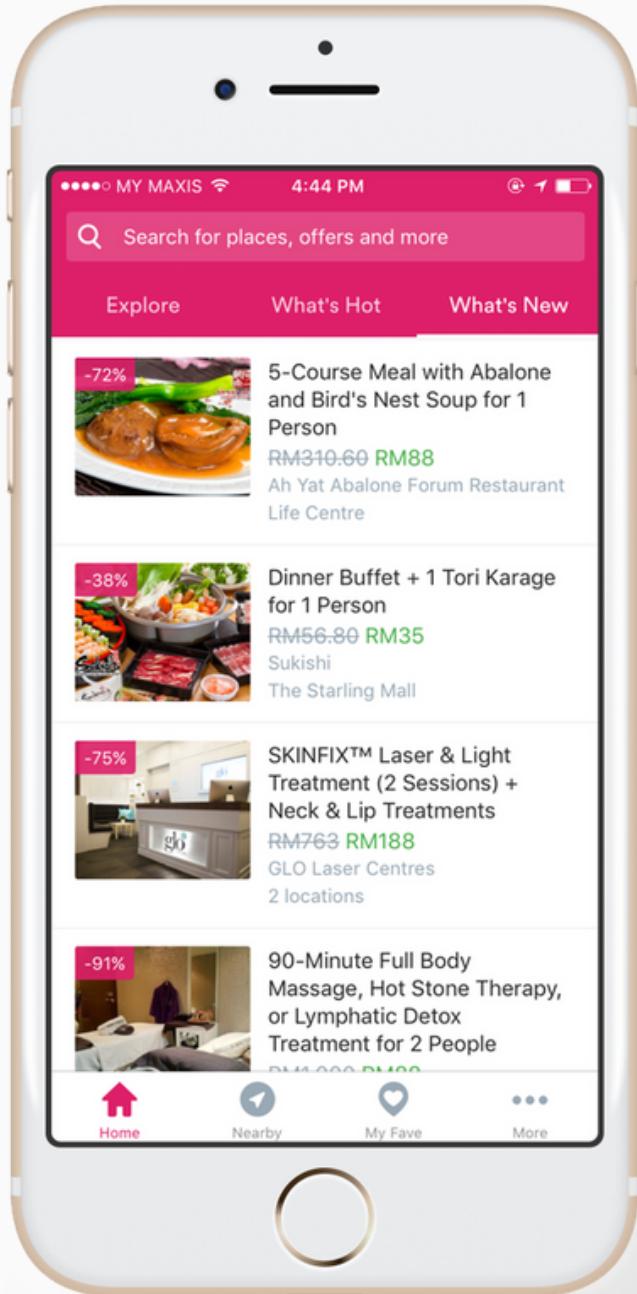


# Resources:

- 1- Get your hands on more [DCGAN](#)
- 2- Build your own celebrity [GANs](#)
- 3- You can also do it in pytorch much easier. [PYTORCH](#)

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