# Generative Adversarial Networks (GANs)

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02 High frame rate video?

03 Ứng dụng

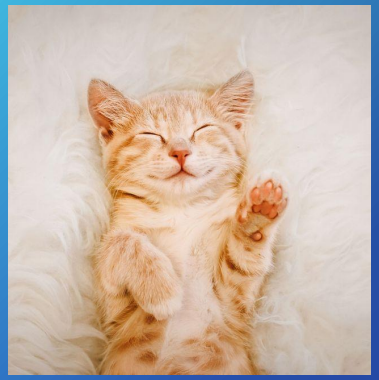
04 Lợi ích cho nhóm

# 01 Tóm lược GANs

# GANs (Generative Adversarial Networks)

- Generative: learn a generative model
- Adversarial: Trained in an adversarial setting
- Networks: Use Deep Neural Networks

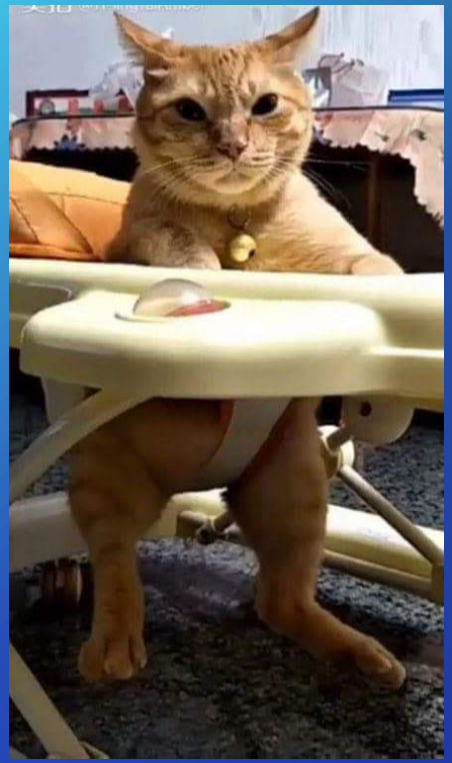
# Vai trò của GANs



Cat

Cat

# Vai trò của GANs



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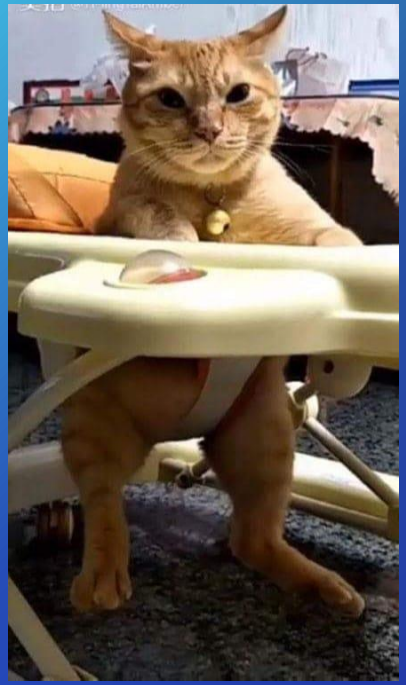


# Vai trò của GANs

Traditional classified/discriminative models:

- Given an image X, predict label Y
- Estimate P(Y|X)

Discriminate models limitations:

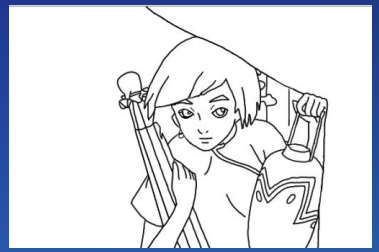
- Can't model P(X), i.e the probability of seeing a certain image.
- Thus, can't sample from P(X), i.e can't generate new images

Generative models

- Can model P(X)
- Can generate new images

# Magic of GANs

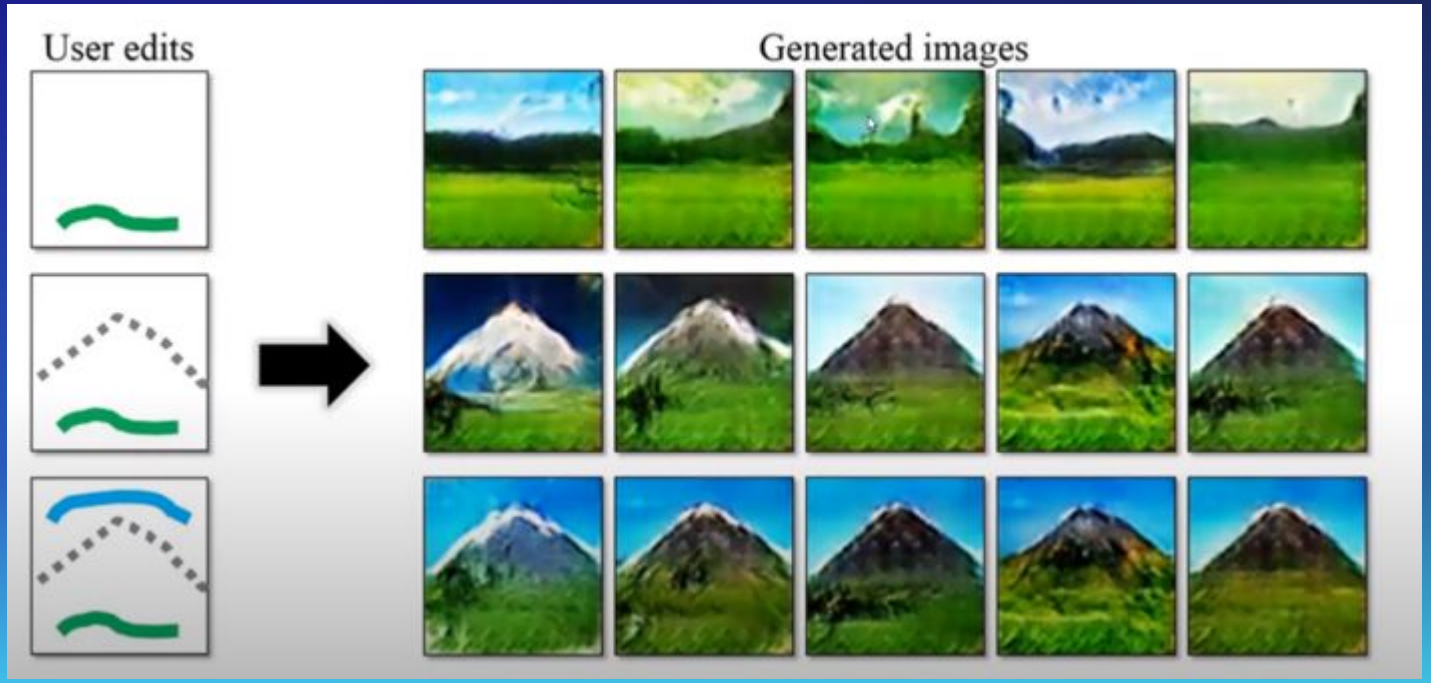
Raw material



Basic GAN

Advanced GAN

# Magic of GANs



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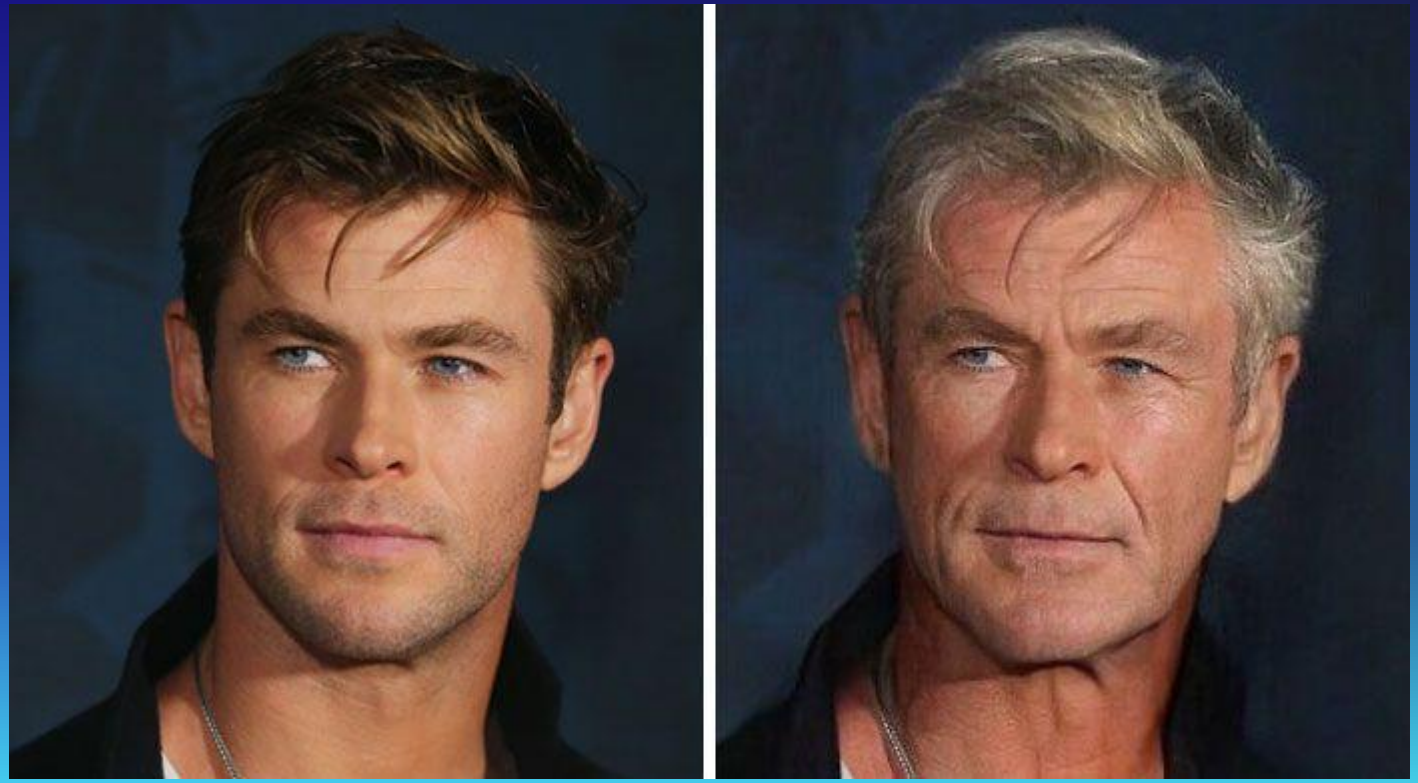
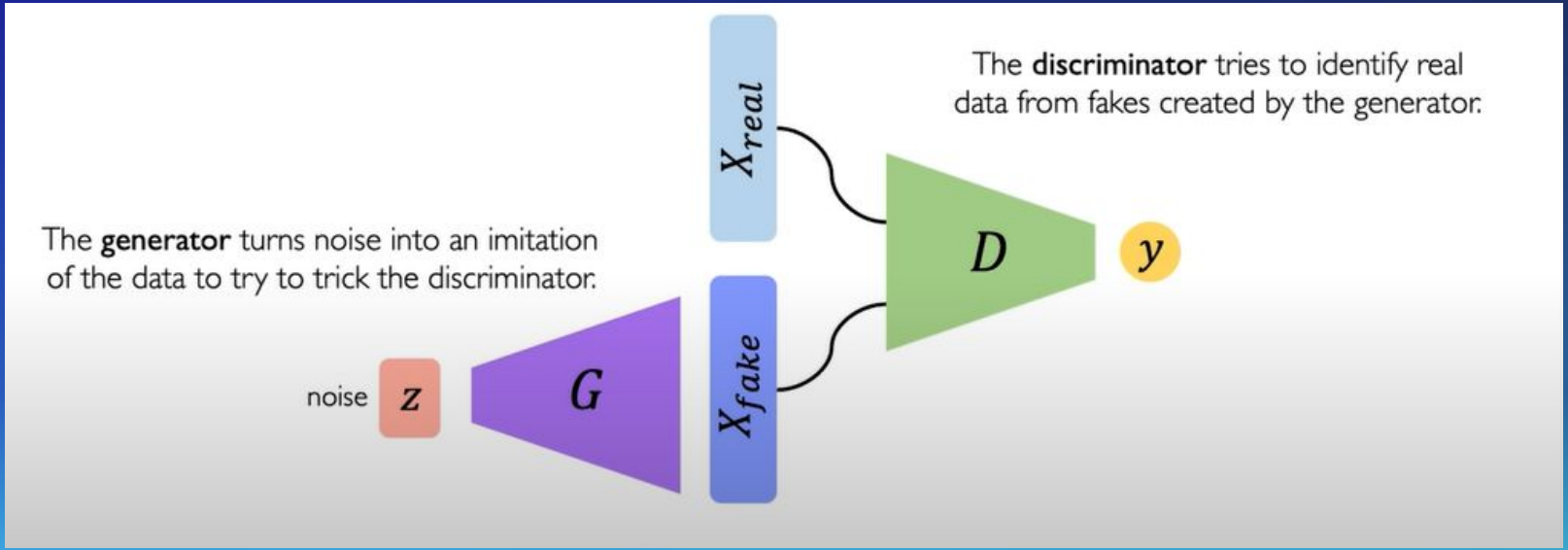
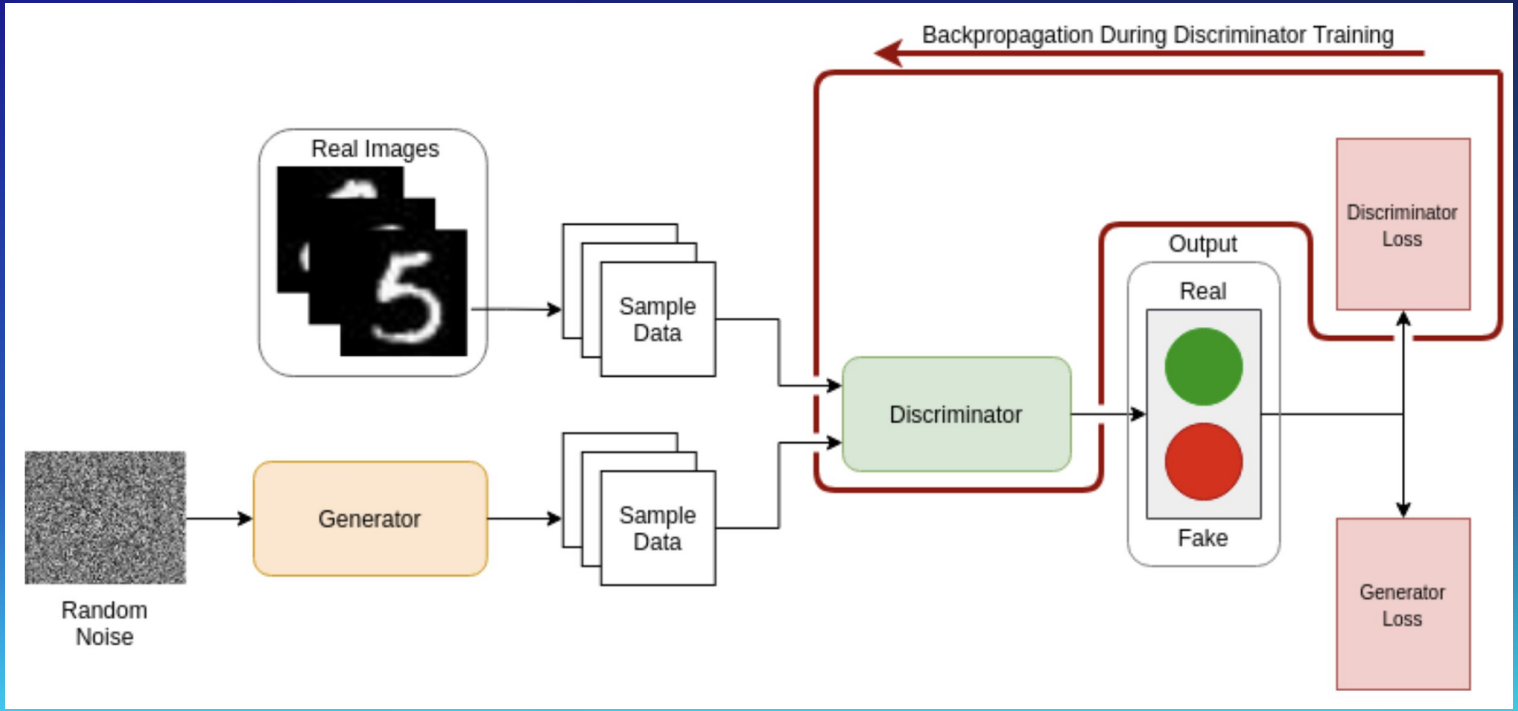


# 02 Kiến trúc mạng GANs

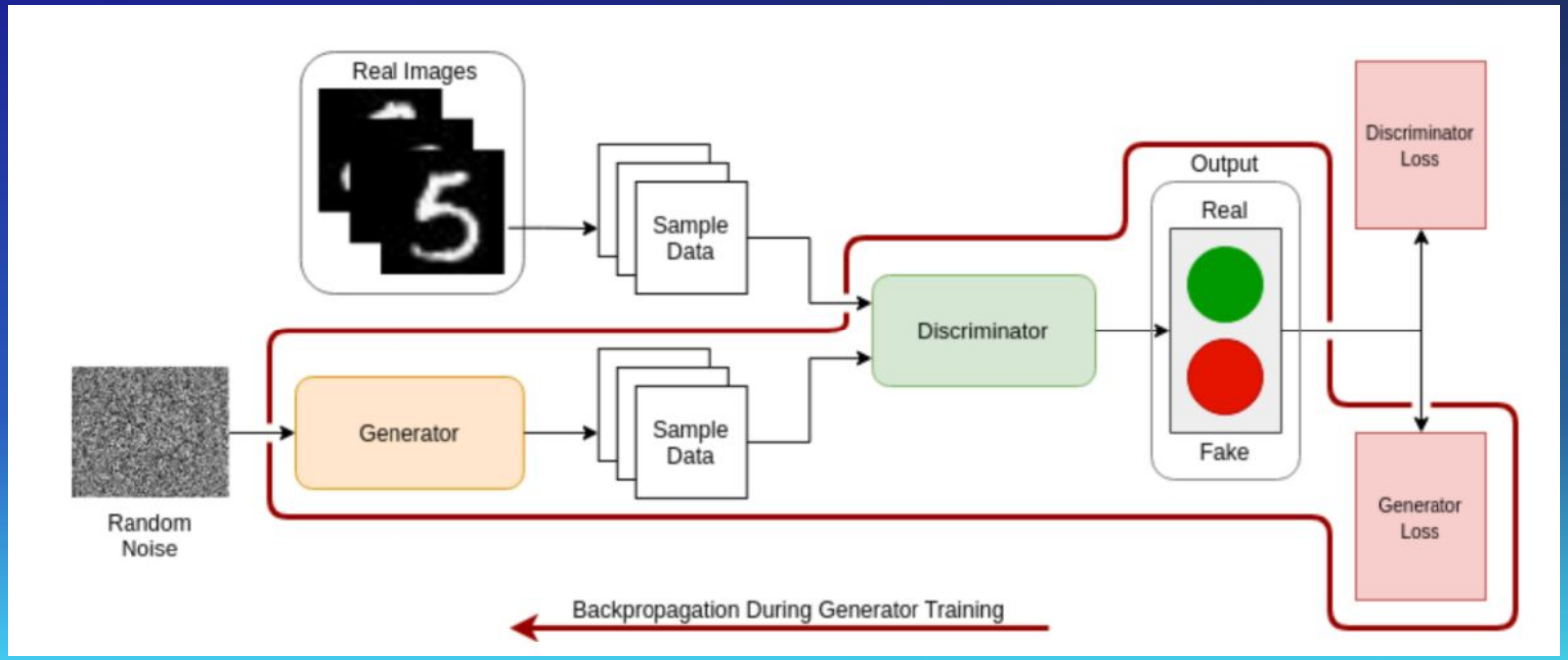
# Architecture of GANs



# Discriminator Training



# Generator Training



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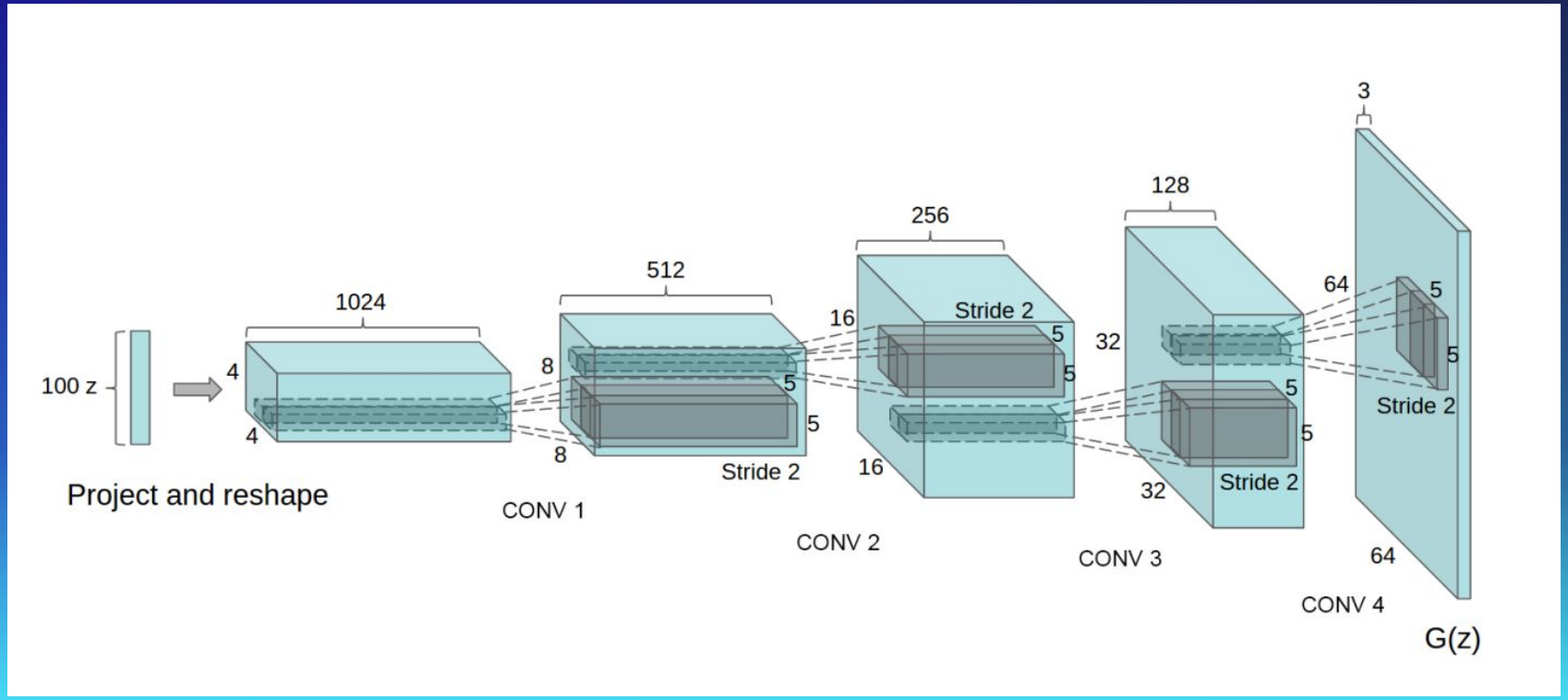


# GANs Game

Gan is formulated as a game, where:

- The Discriminator is trying to maximize its reward ***V(D,G)***
- The Generator is trying to minimize Discriminator reward (or maximize loss)

$$\min_G \max_D V(D,G)$$

$$V(D,G) = \mathbb{E}_{x \sim p_{data}(x)}[\log D(x)] + \mathbb{E}_{z \sim p_z(z)}[\log(1 - D(G(z))]$$

So,

- Idea Discriminator result: for every x or z, D(x) = 1 and D(G(z)) = 0 (max V(D,G))
- Idea Generator result: for every x or z, D(x) = 0 and D(G(z)) = 1 (min V(D,G))

# GANs Game End Conditions

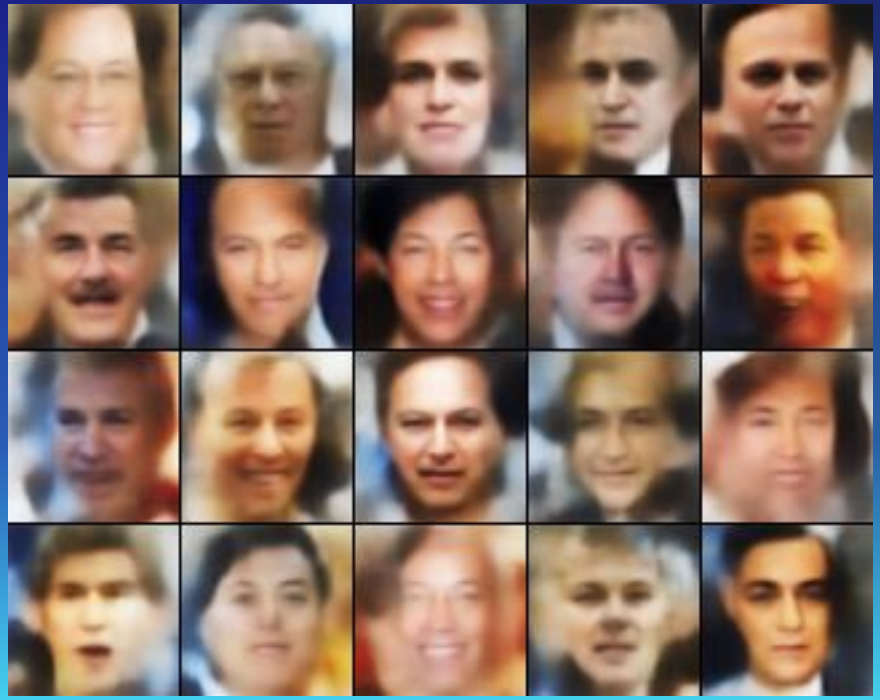
How does the game end?

- The Game end and only end, if and only if the GANs is convergence

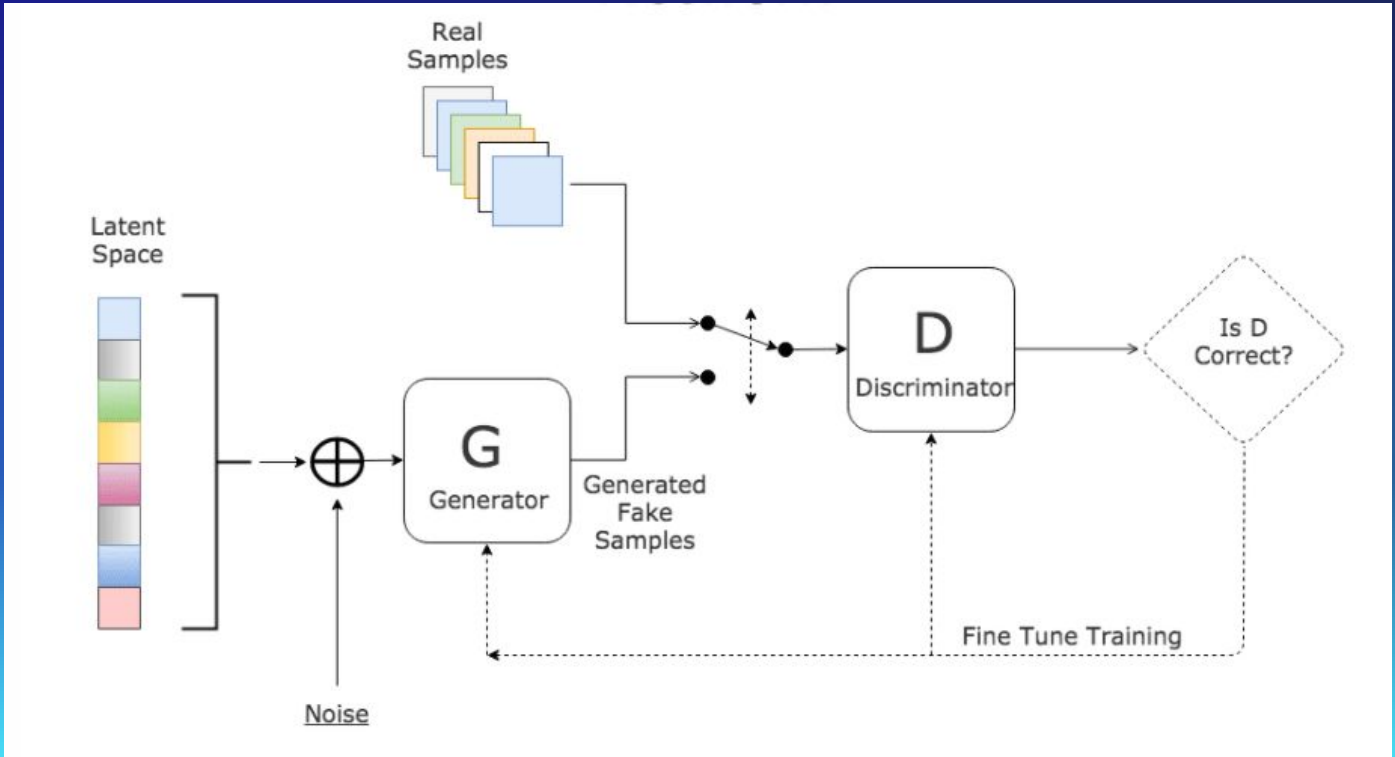
When does the game end?

- It’s depend on you and the resource you have !!

# Traditional GAN Problems



# Improved GAN architecture



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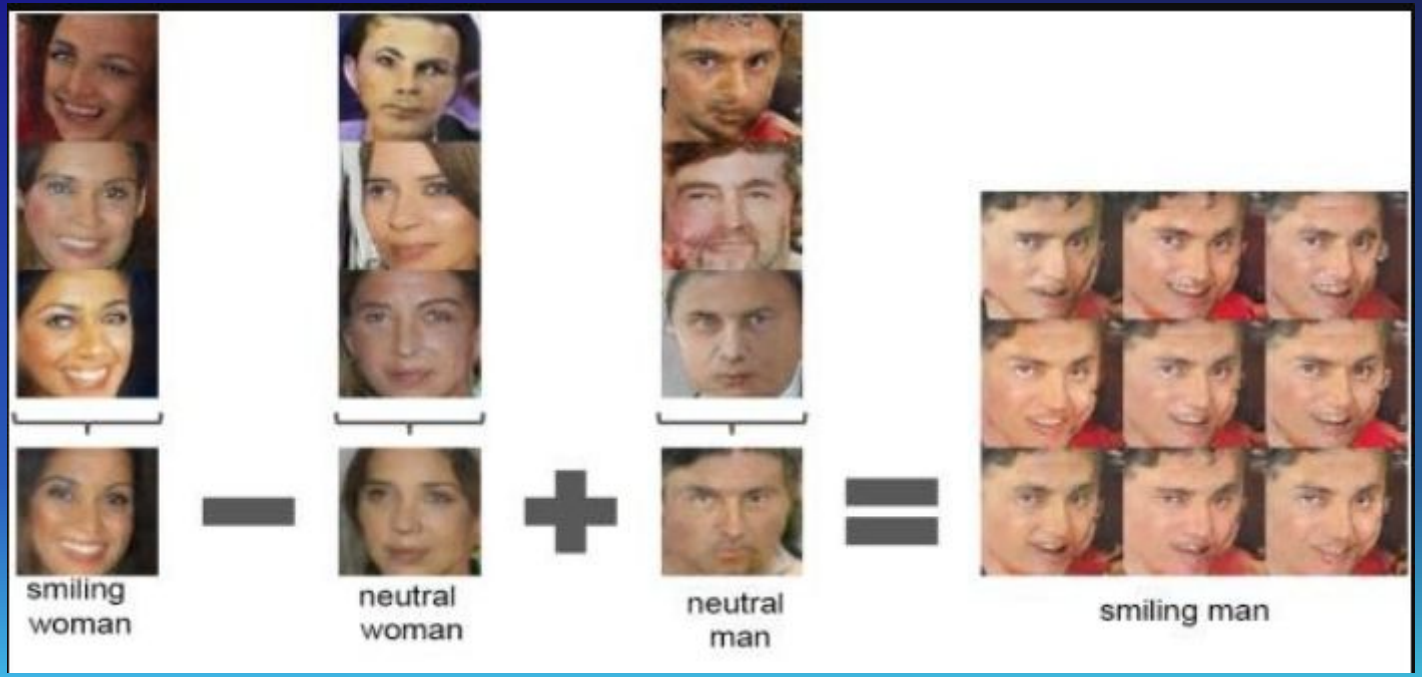


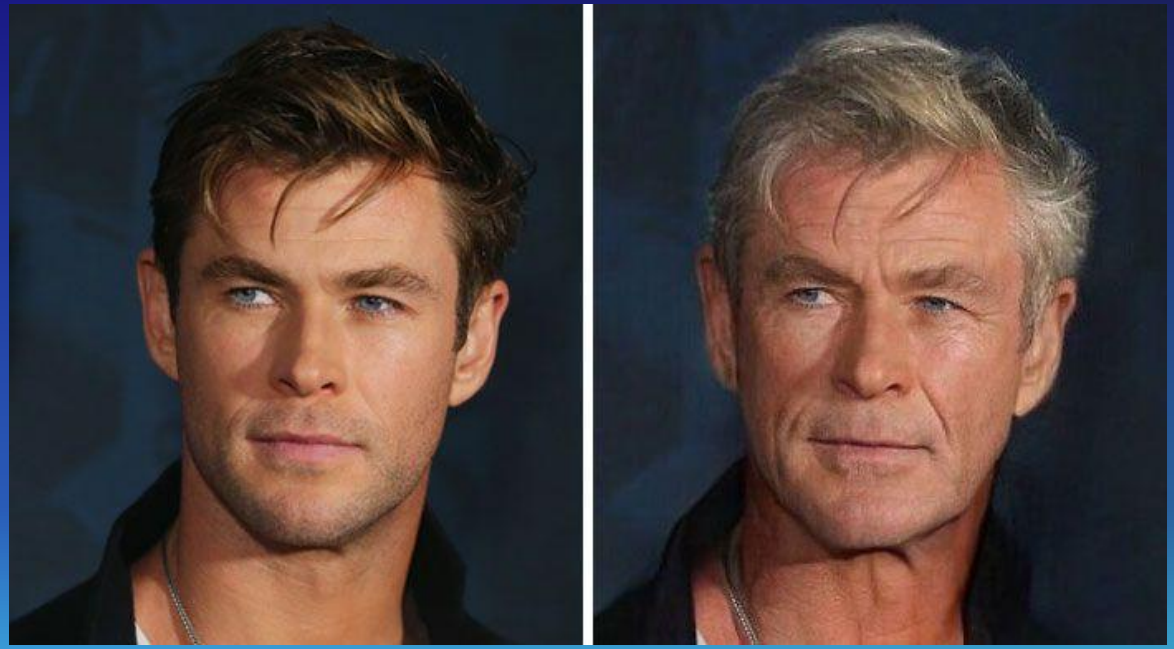
# GANs With Latent space

# GAN Advantages

Why GANs?

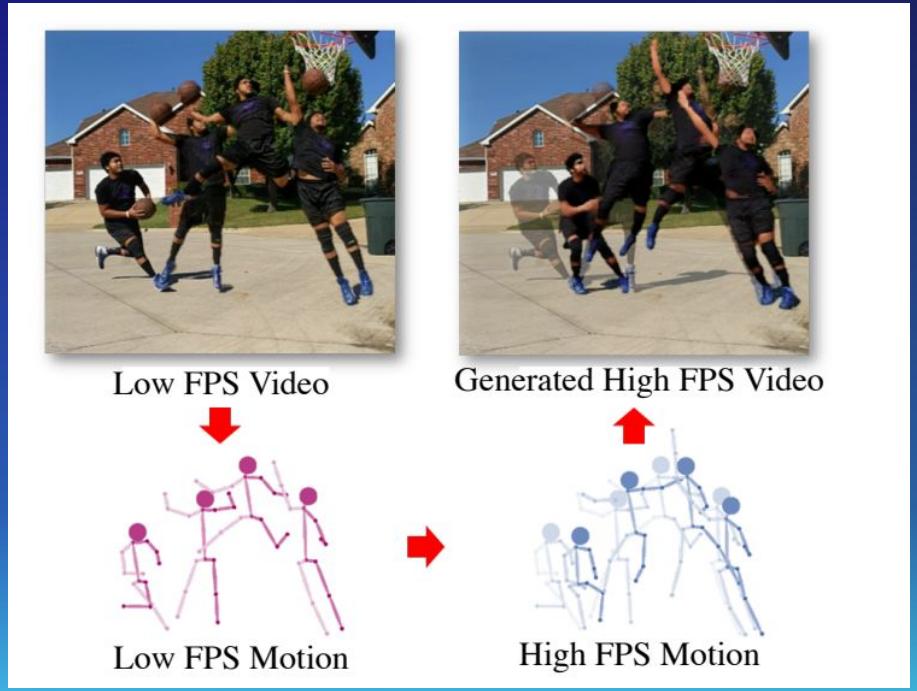
- Sampling (or generation) is straightforward
- Just use Backpropagation for updating weights loss function (or reward function)
- Robust to Overfitting since Generator never seen the training data\
- At the end, Discriminator and Generator can be separated and use a distinguished module in the other applications.

# GAN Applications



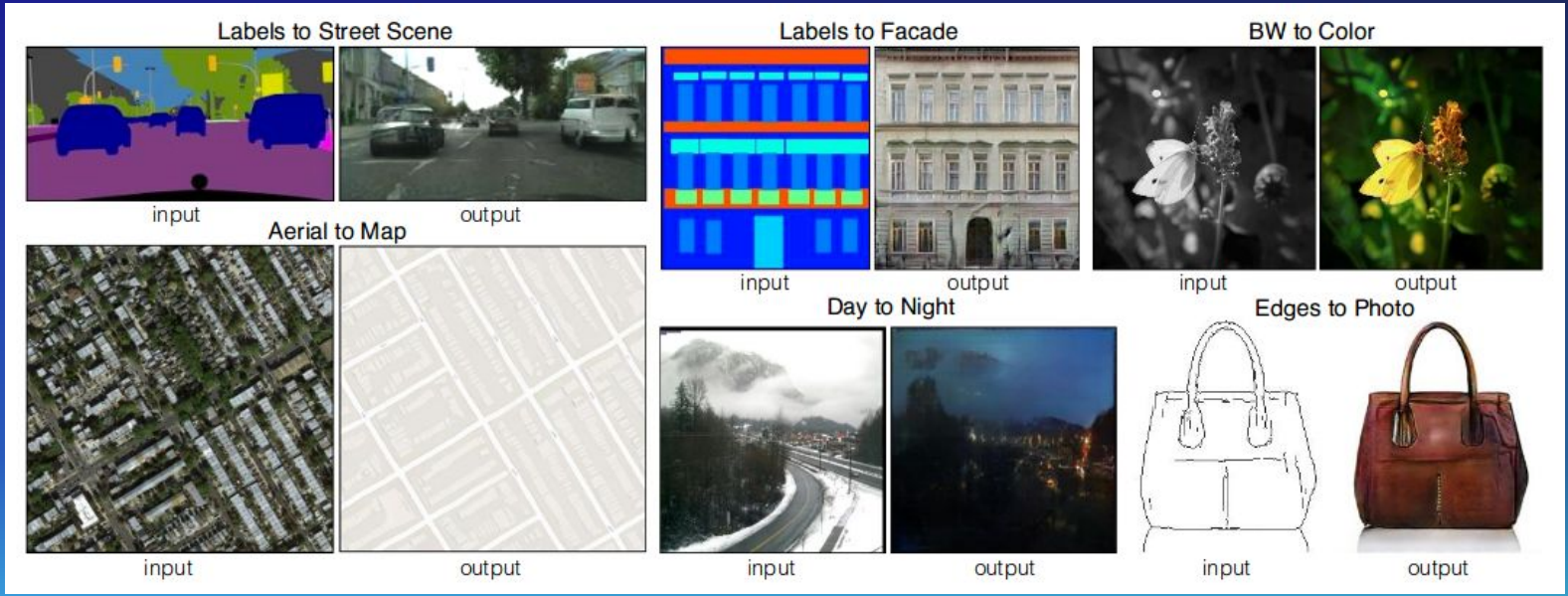
Face aging with conditional Gan

# GAN Applications




Video Render in Between

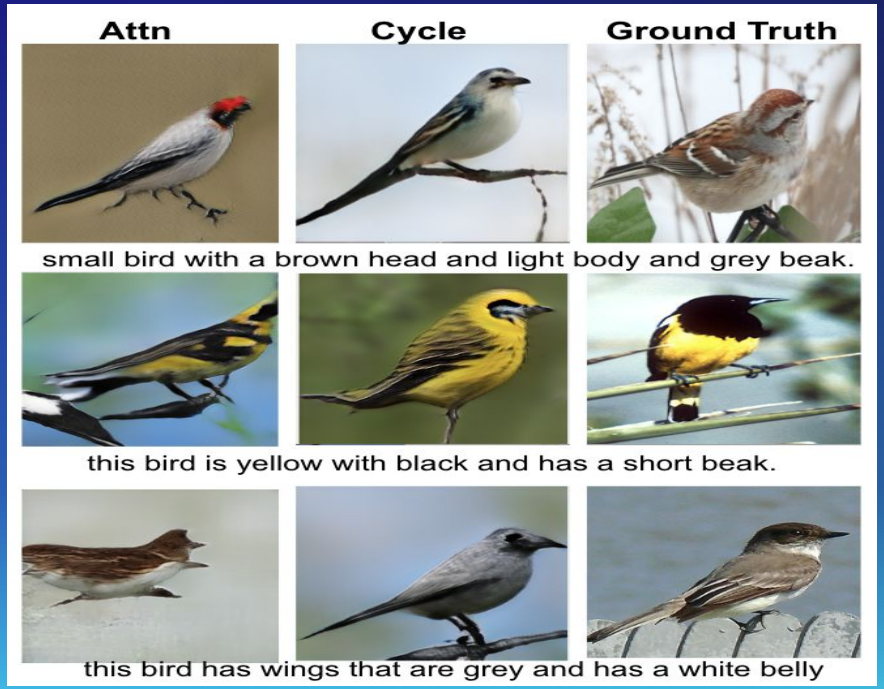
# GAN Applications



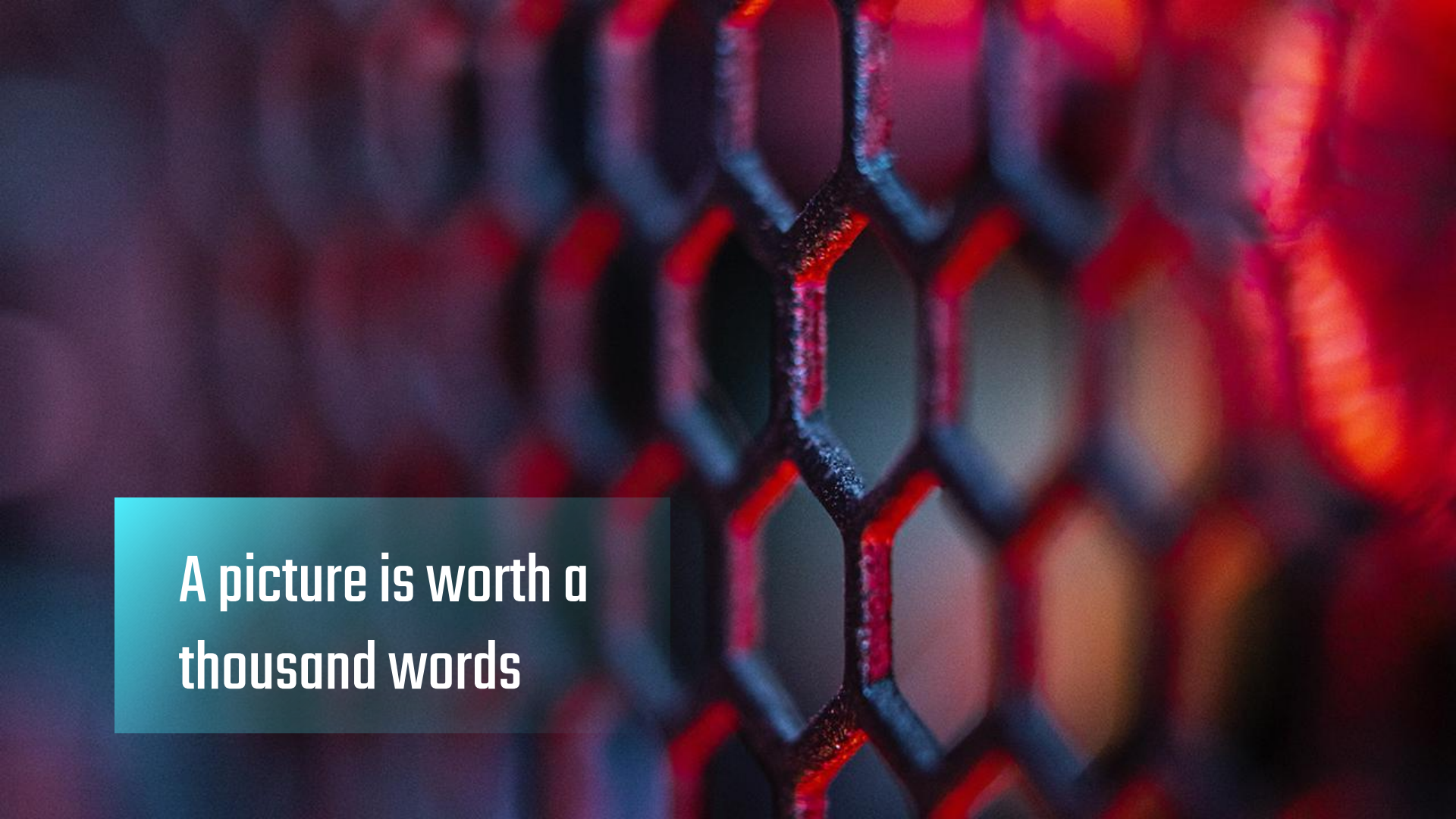
# GAN Applications

Vietnamese Painting Generated by VQGAN

# GAN Applications




Text to Images By Gan


A picture is worth a
thousand words