A Brief Introduction to

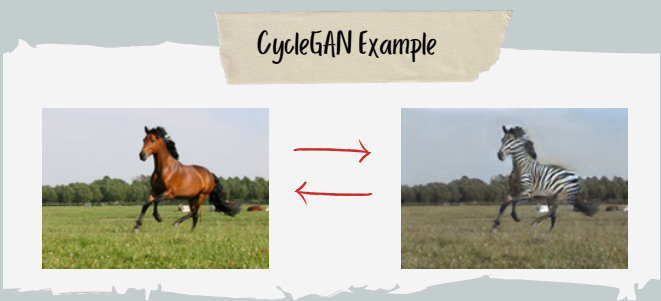
# CycleGAN

CycleGAN is a technique used for training **unpaired image-to-image translation** models via the GAN (generative adversarial network) architecture

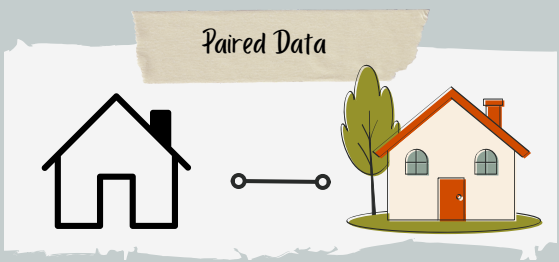
CycleGAN was introduced by Zhu et al. in a 2017 research paper titled "Unpaired Image-to-Image Translation using Cycle-Consistent Adversarial Network"

Given two sets of images from **two different domains**, collection 1 (horses) and collection 2 (zebras), CycleGAN:

- learns to recognise features and patterns of each collection
- transforms an image of a horse to an image of a zebra by changing the features and patterns and **vice versa**

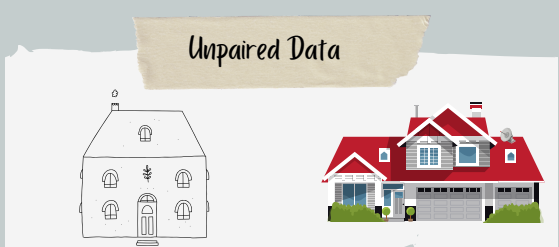



## Unpaired Data

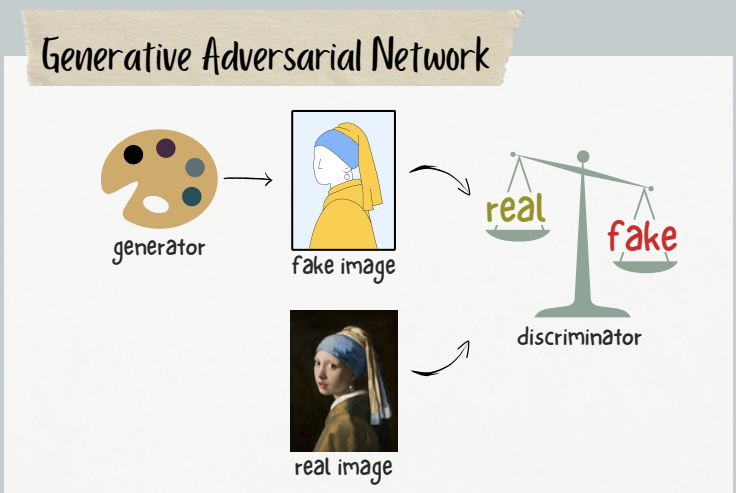



Paired data is data where collection 1 and 2 have a **one-to-one correspondence**

Unpaired data is data where there is **no direct one-to-one correspondence** between collections




## GAN Architecture




the generator creates images realistic enough so that the discriminator can't tell real from fake

CycleGAN uses two GANs working in tandem:

- GAN1: translates photos of collection 1 to collection 2
- GAN2: translates photos of collection 2 to collection 1

## Applications

Examples

**Style Transfer:**
transforming photos to paintings, and vice versa

**Transfiguration:**
transforming an object in an image to resemble another object while preserving the overall scene context

**CT-to-MRI Synthesis:**
each imaging technique has their pros and cons, but together they can complement each other to assist in better diagnosis and treatment

## Resources

research paper • Machine Learning Mastery • CycleGAN project page