

Lecture 09 – Generative Adversarial Networks

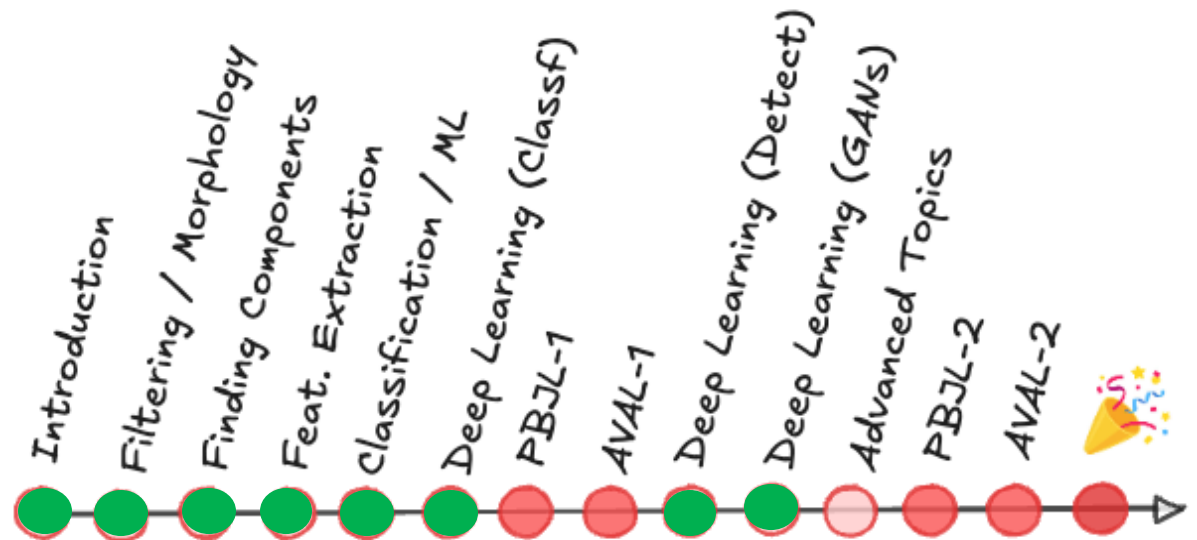
Prof. André Gustavo Hochuli

gustavo.hochuli@pucpr.br

aghochuli@ppgia.pucpr.br

Topics

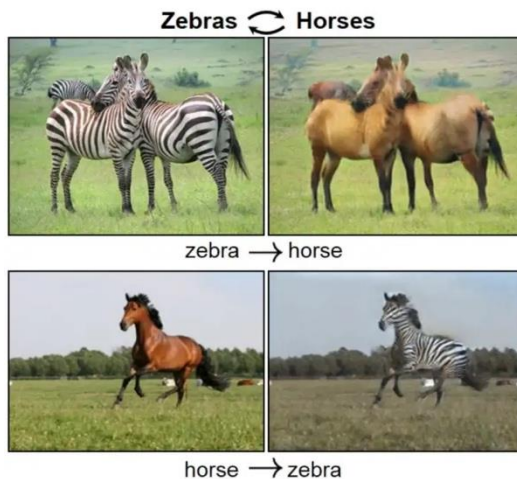
- Review of Lecture 08 – Image Segmentation
 - Object Detection (Bounding Box Level)
 - Object Segmentation (Pixel Level)
- Generative Adversarial Networks
 - DCGAN
 - PIX2PIX
- Practice



Generative Adversarial Networks (GAN)

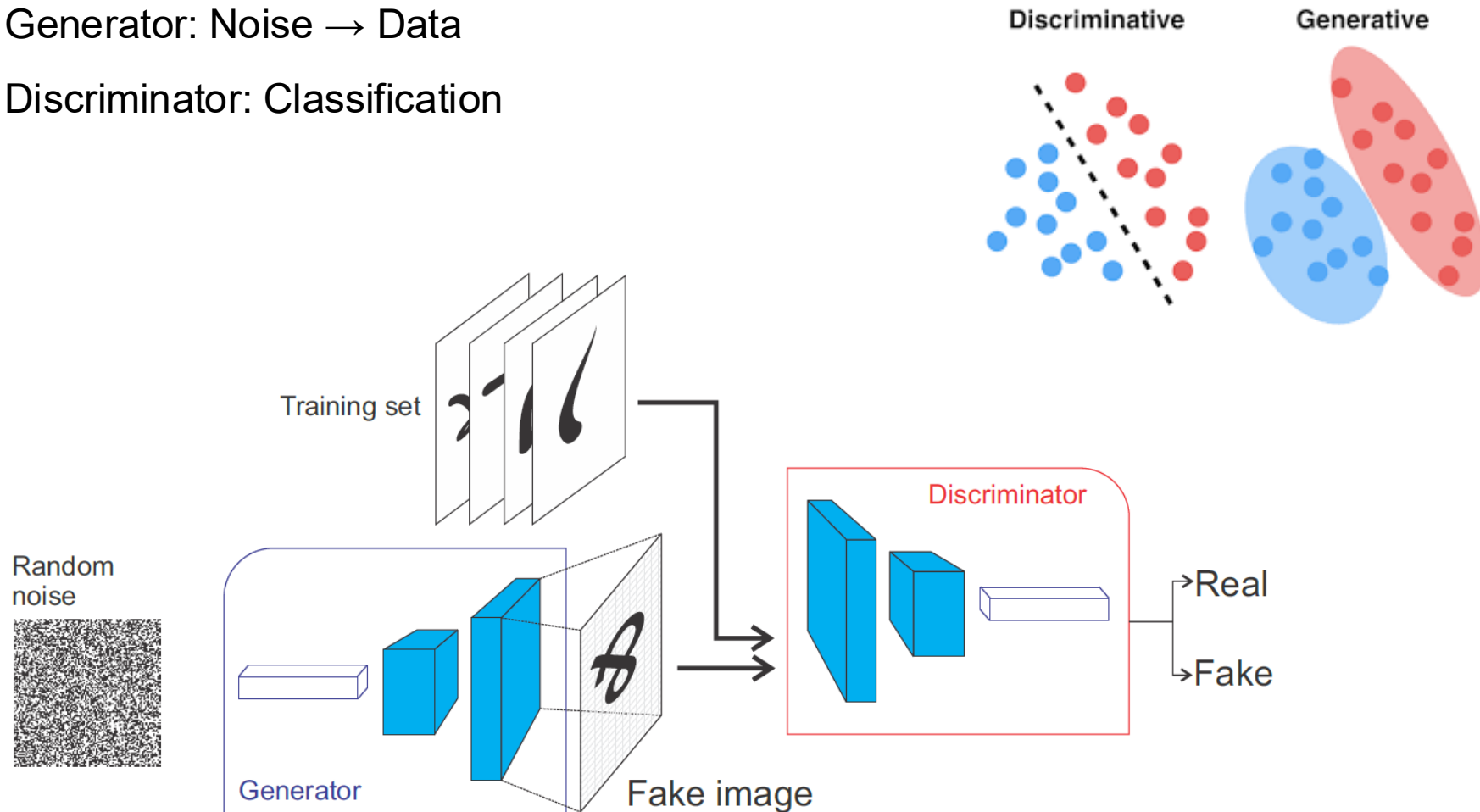
Deep Fakes

- Generalization: Synthetic data produced from the learning of real data distribution
- Several Applications
 - Movies (Fake Scenes)
 - Photo Enhancement (Pose Estimation, Gray2Color, Noise Reduction)
 - Image Translation
 -



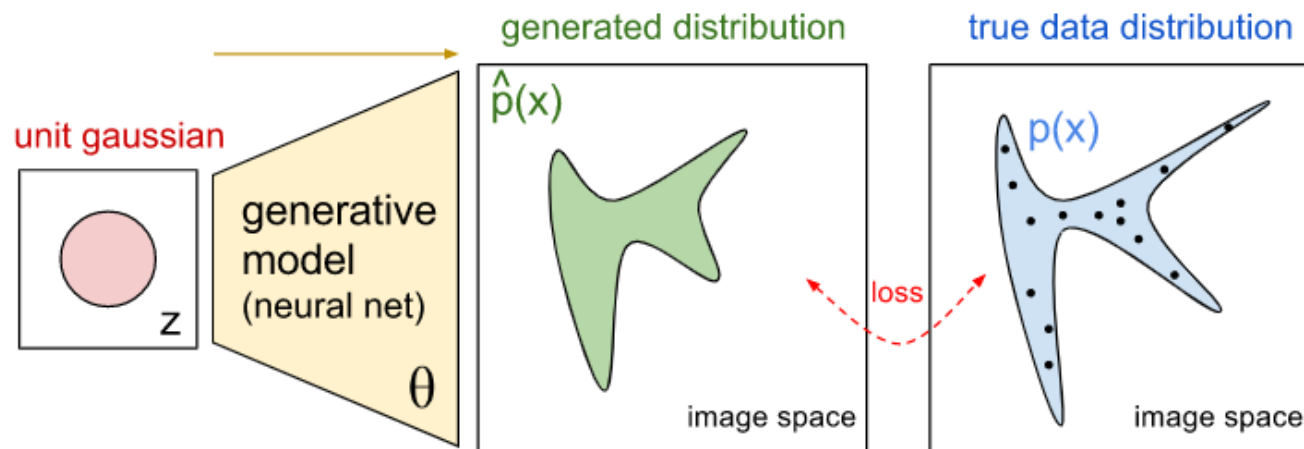
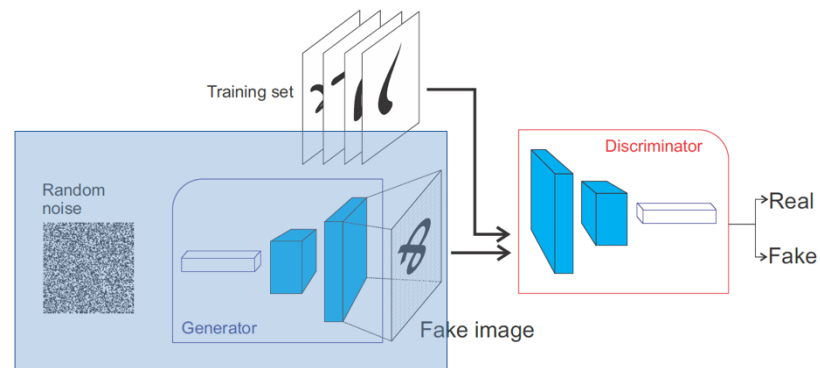
Generative Adversarial Networks (GAN's)

- Generator: Noise \rightarrow Data
- Discriminator: Classification

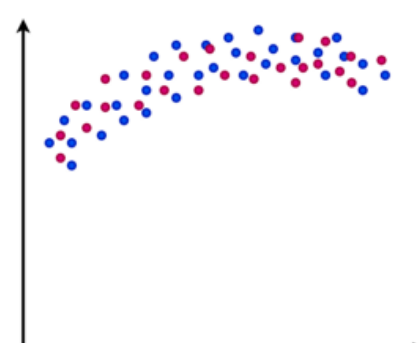
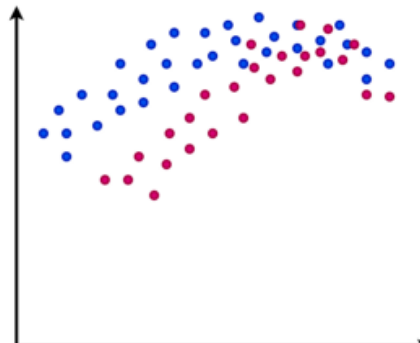
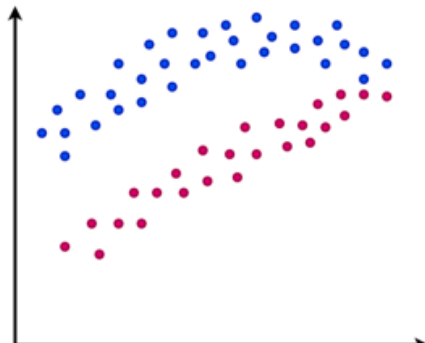
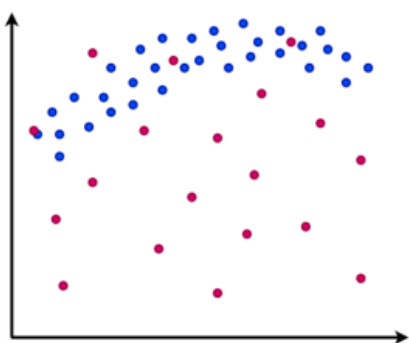
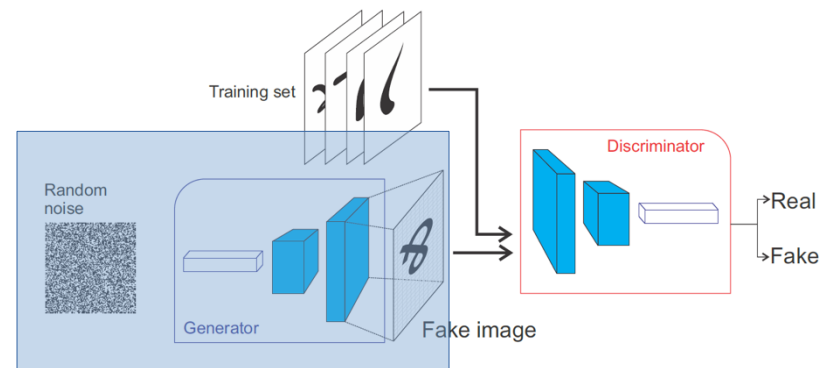
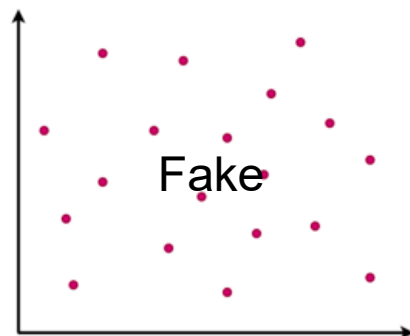
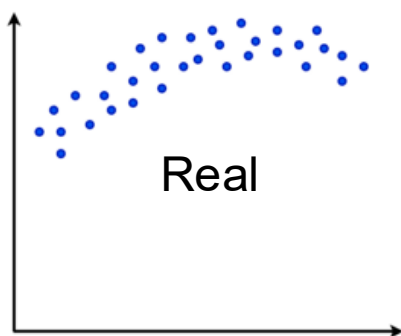


Generative Model

- Learns data distribution



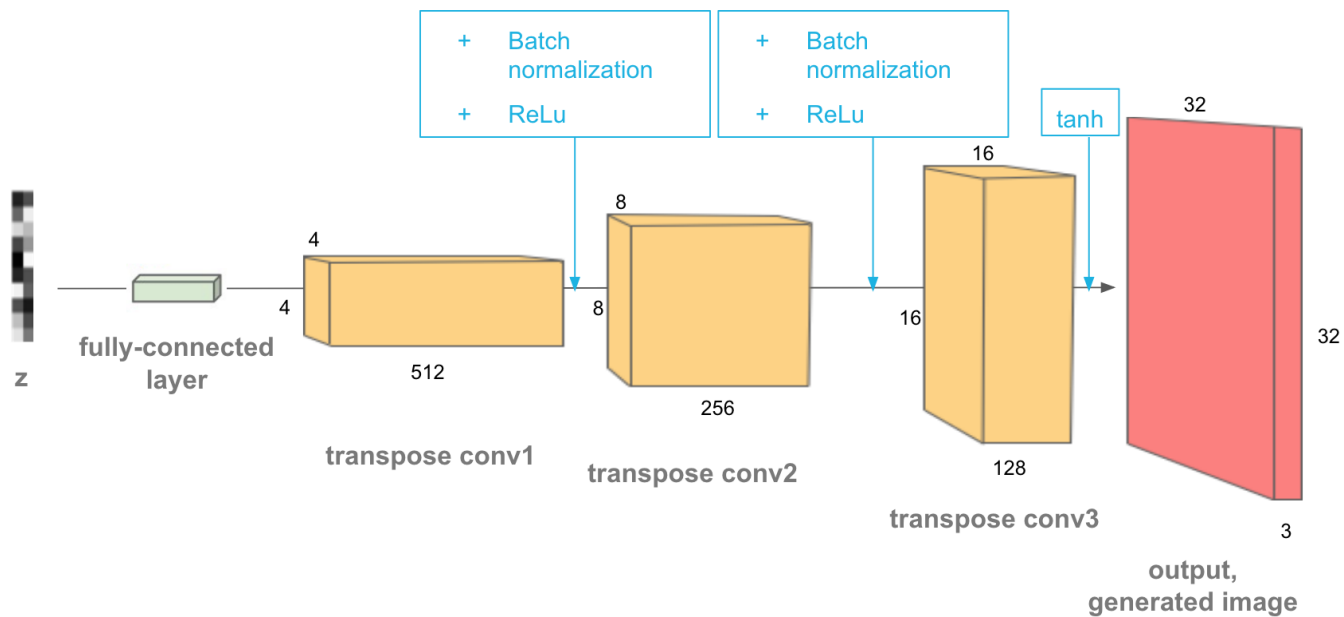
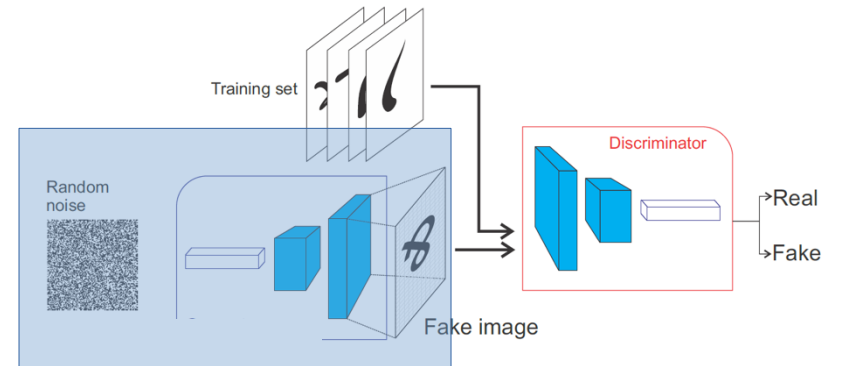
Generative Model



Training

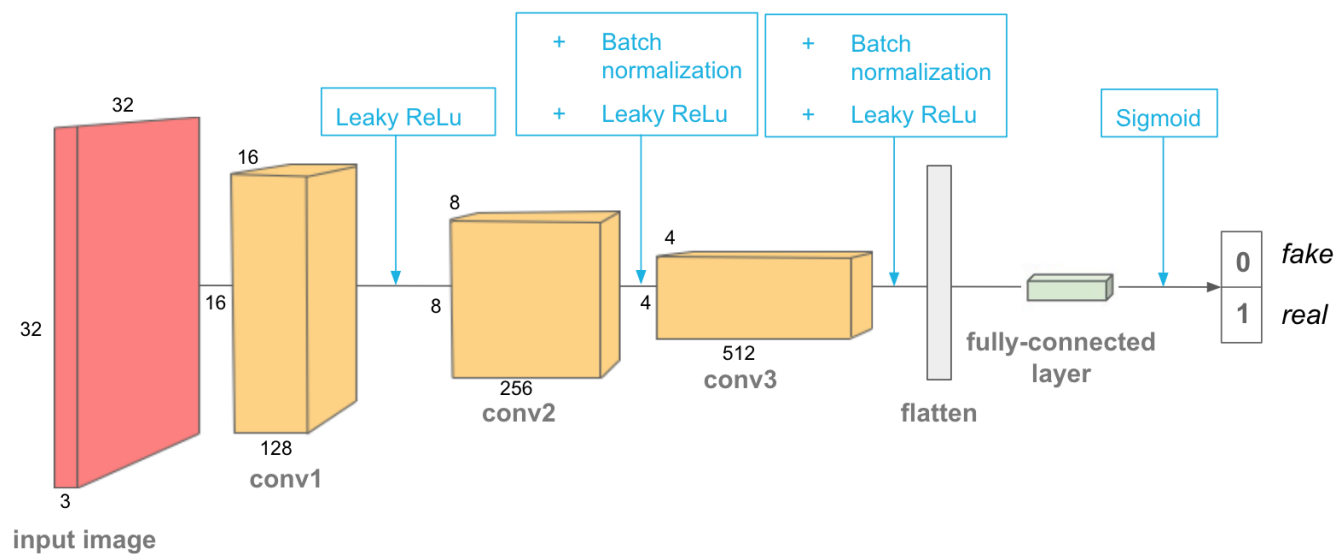
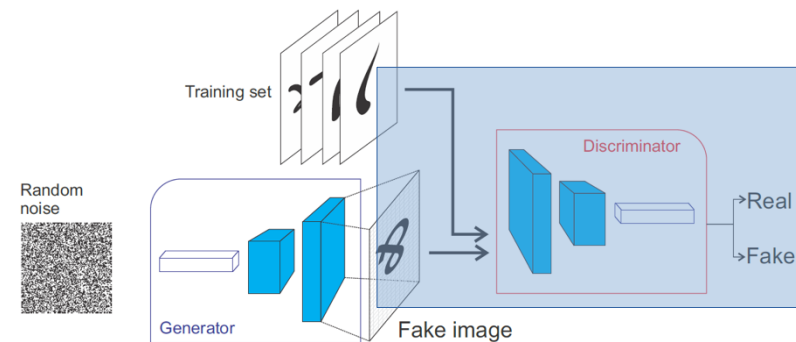
Deep Generative Model

- De-Convolutional Layers (upsampling)
 - Noise to Fake Image



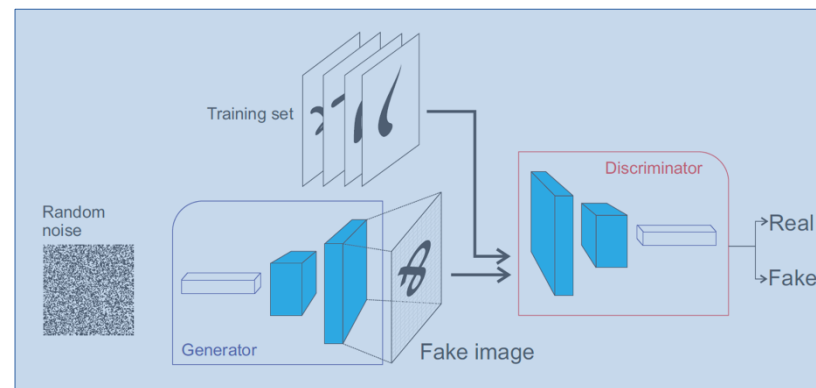
Discriminator Model

- Classification: Fake or Real
 - CNN

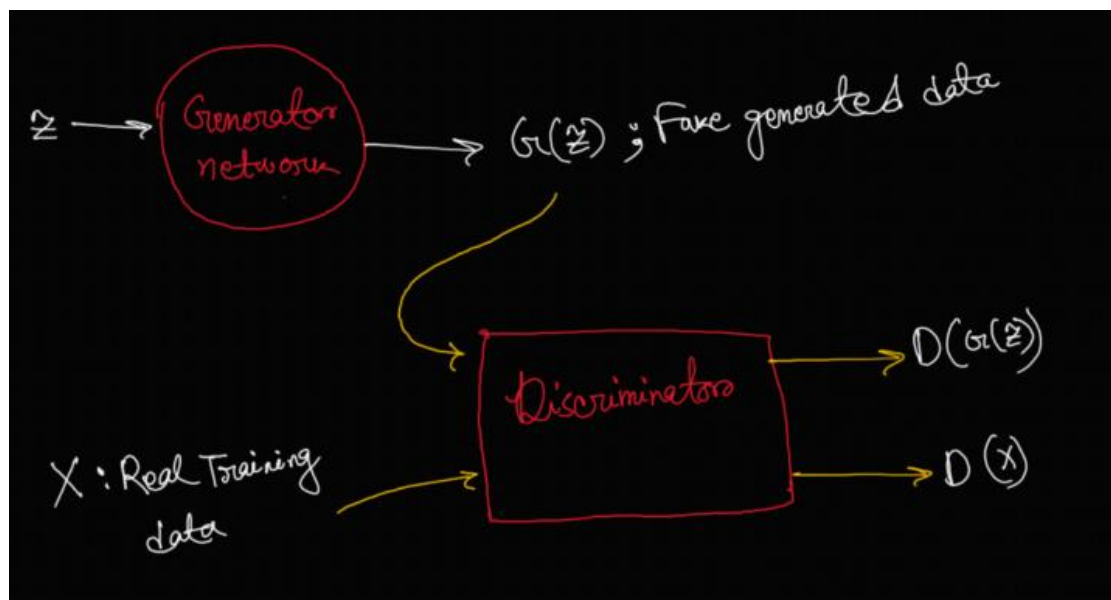


Adversarial Training

- Adversarial Loss (Min-Max)
 - Minimize Generator
 - Maximize Discriminator

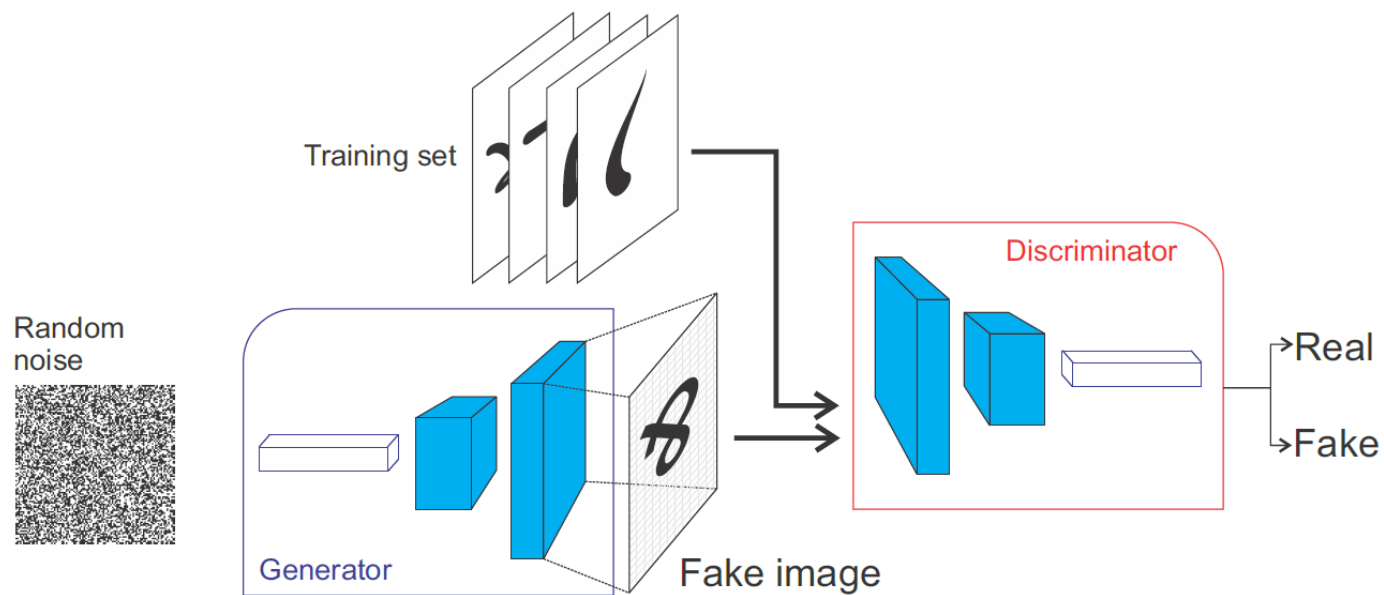


$$\min_G \max_D V(D, G) = \mathbb{E}_{x \sim p_{data}} [\log D(x)] + \mathbb{E}_{z \sim p_z(z)} [\log(1 - D(G(z)))]$$



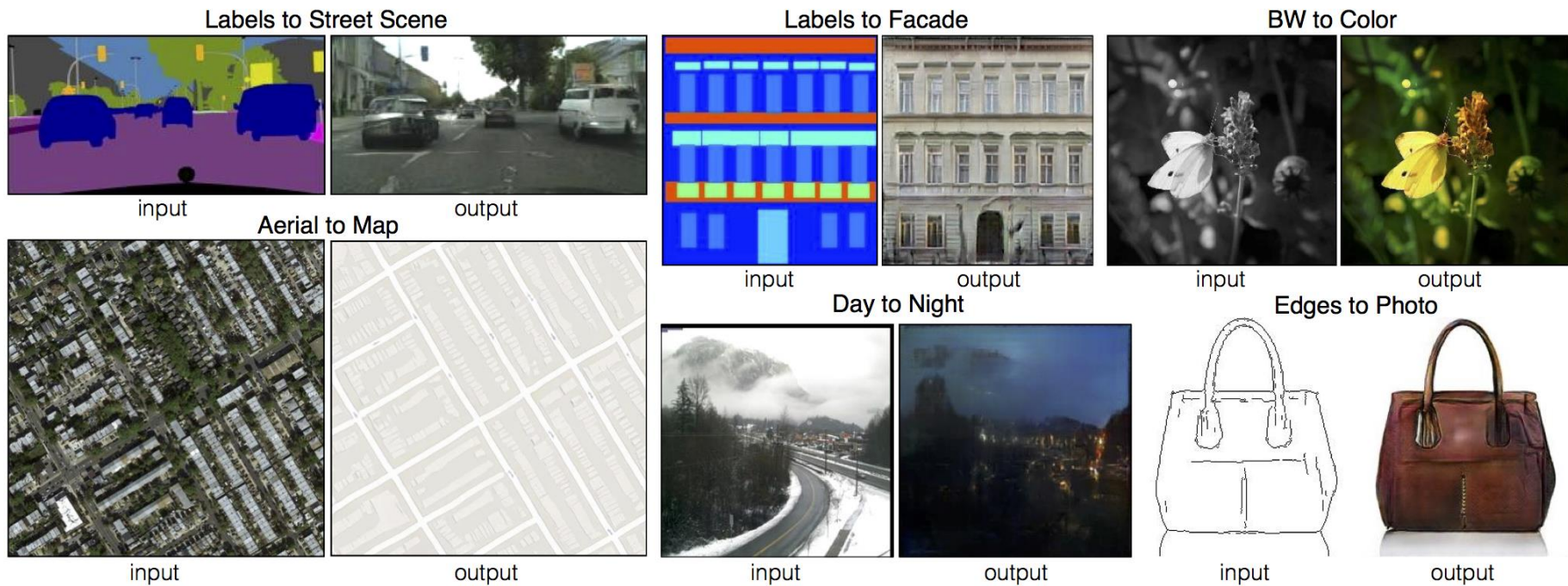
Let's Code

- [LINK: Lecture_12-DCGAN.ipynb](#)



Pix2Pix

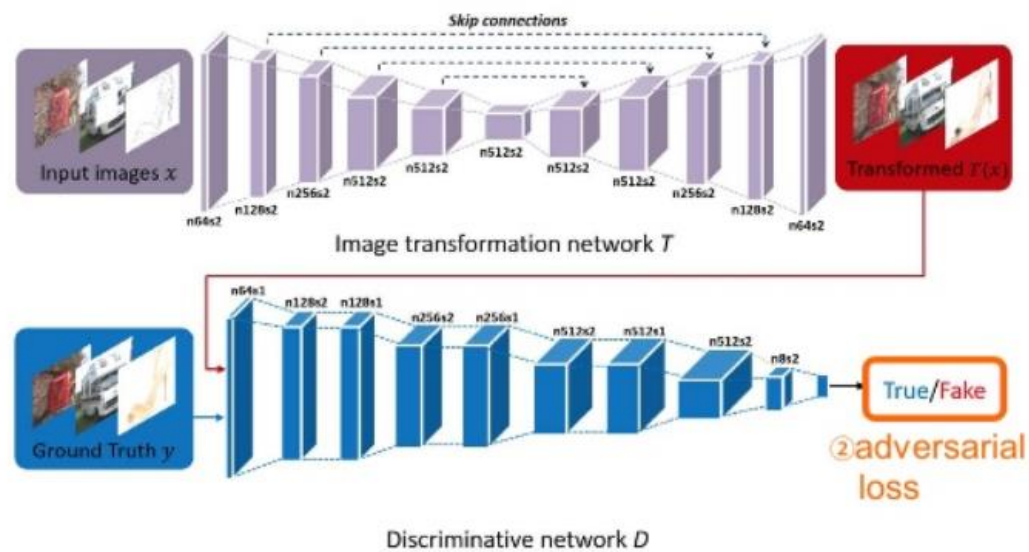
- Image-Translation



Pix2Pix

- Generative Model: Encoder-Decoder Architecture (i.e U-Net)
- Paired Annotated Dataset

Pix2Pix (①+②)



Let's Code

- [LINK: Lecture_12-pix2pix.ipynb](#)

Pix2Pix (①+②)

