Lecture 12 – Generative Adversarial Networks

Prof. André Gustavo Hochuli

gustavo.hochuli@pucpr.br
aghochuli@ppgia.pucpr.br

Topics

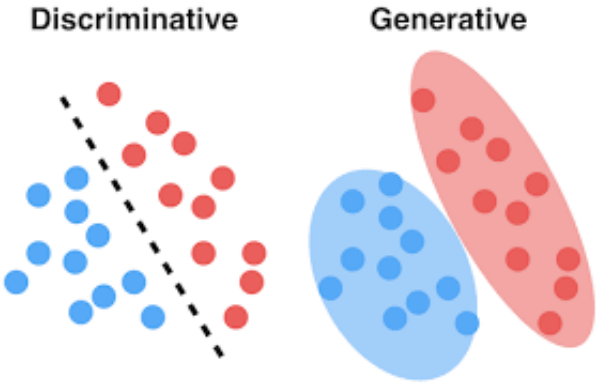
- Review of Lecture 11 – Image Segmentation
  - Object Segmentation (Bounding Box Level)
  - Instance / Semantic Segmentation (Pixel Level)

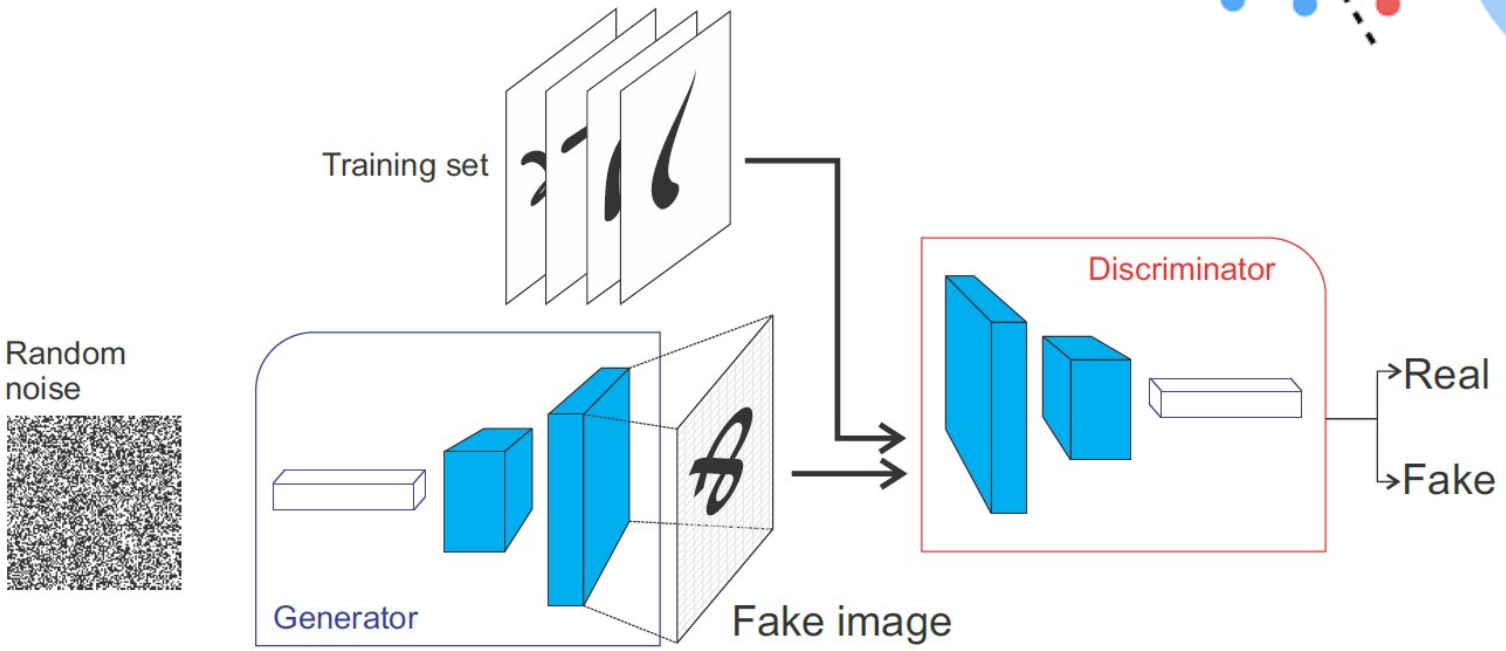
- Generative Adversarial Networks
  - DCGAN
  - PIX2PIX

- Practice

Generative Adversarial Networks (GAN's)

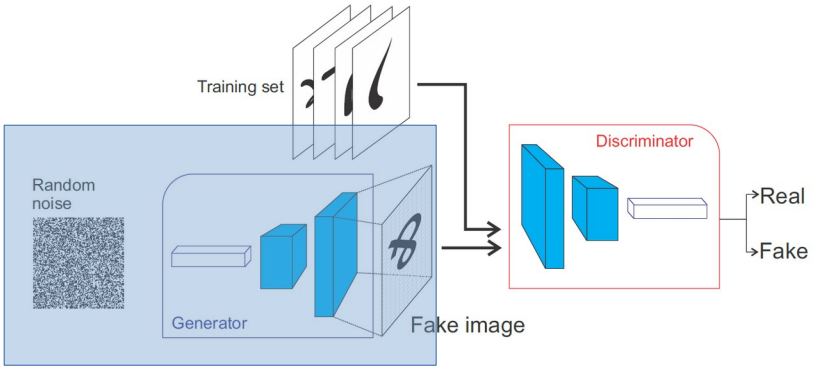
- Generator: Noise → Data
- Discriminator: Classification

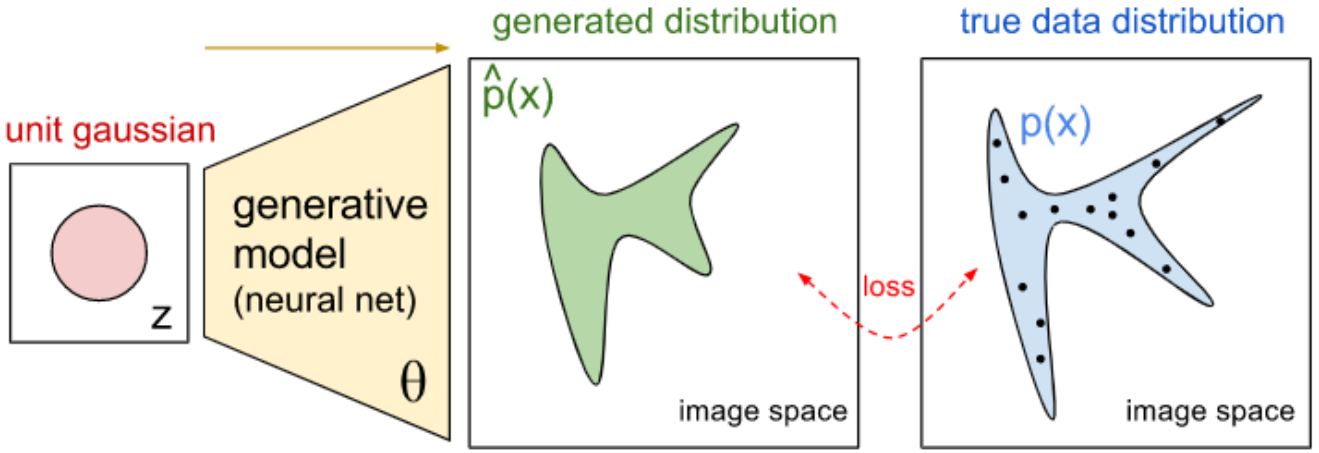




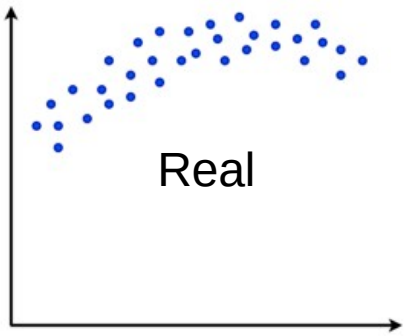
Generative Model

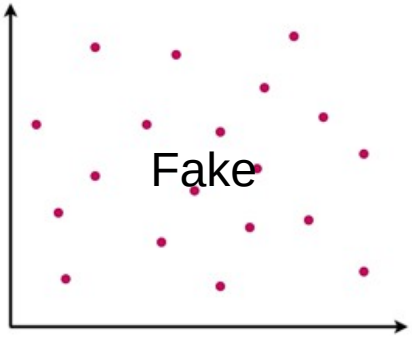
- Learns data distribution

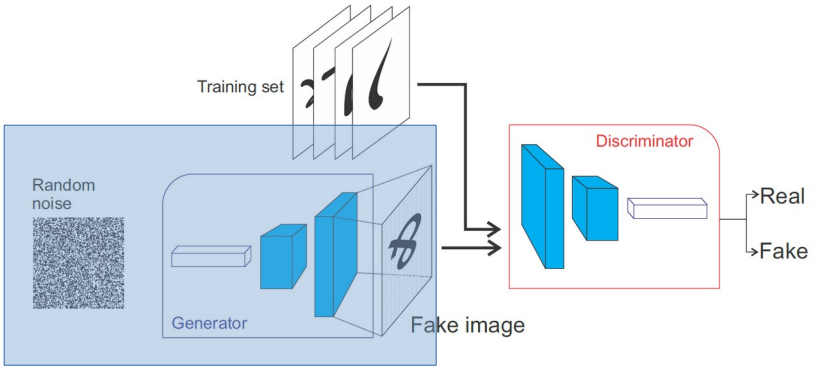


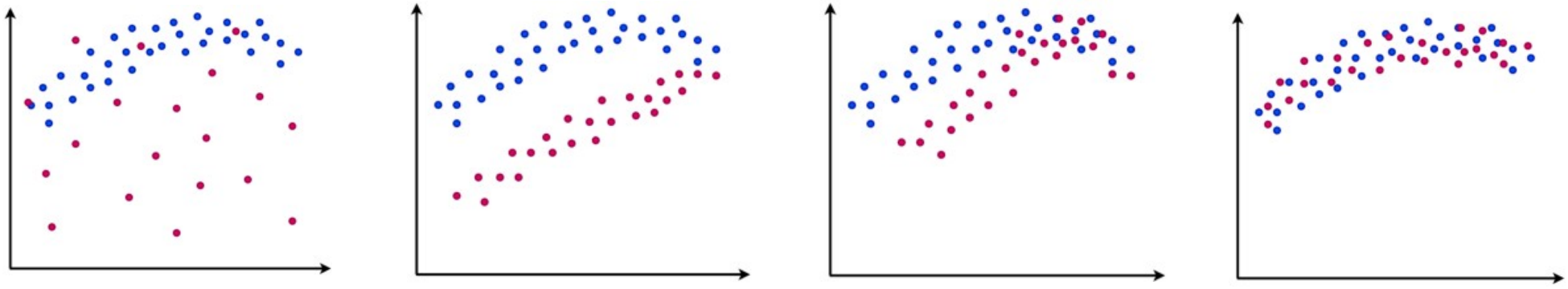


Generative Model





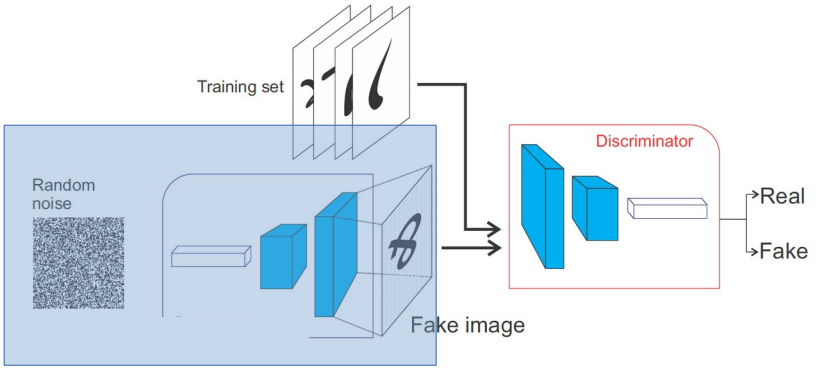


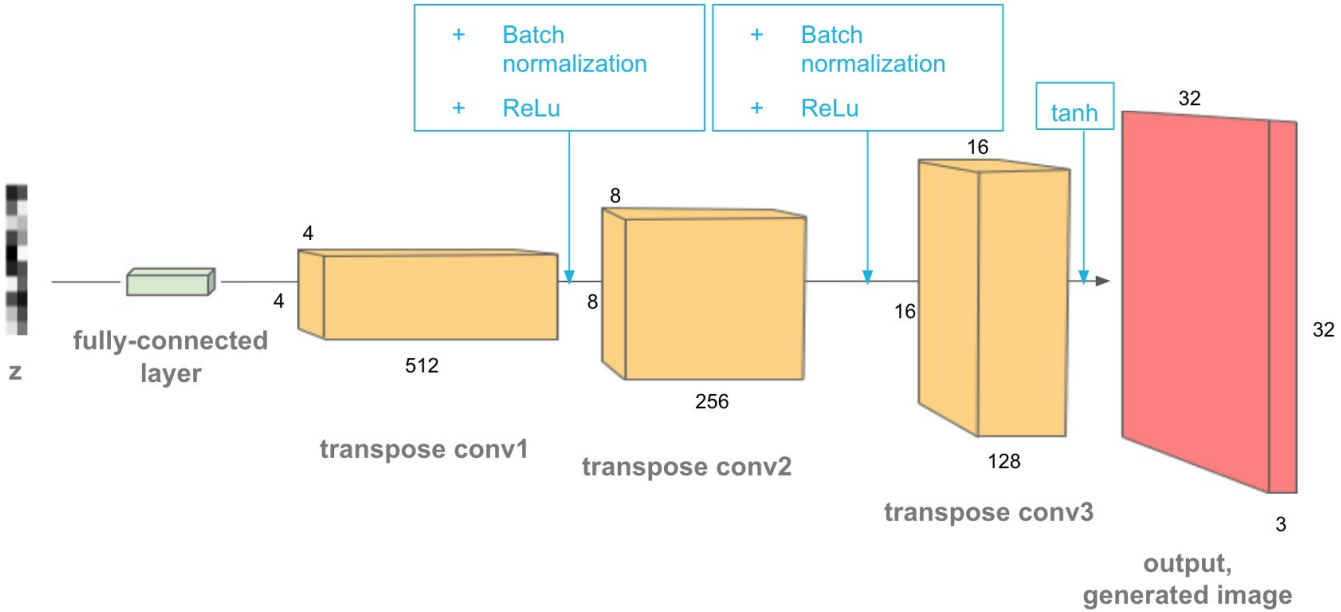


Training

Deep Generative Model

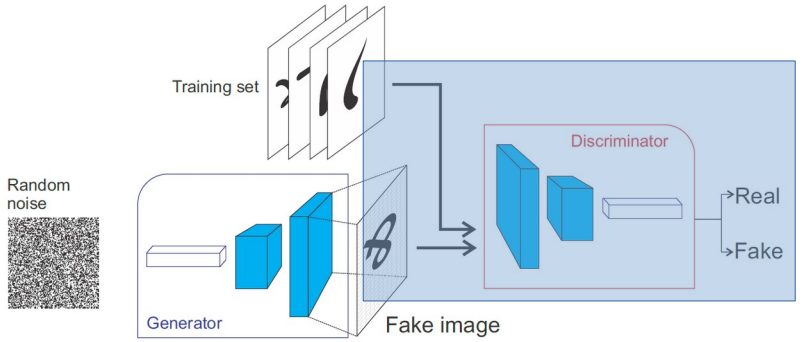
- De-Convolutional Layers (upsampling)
  - Noise to Fake Image

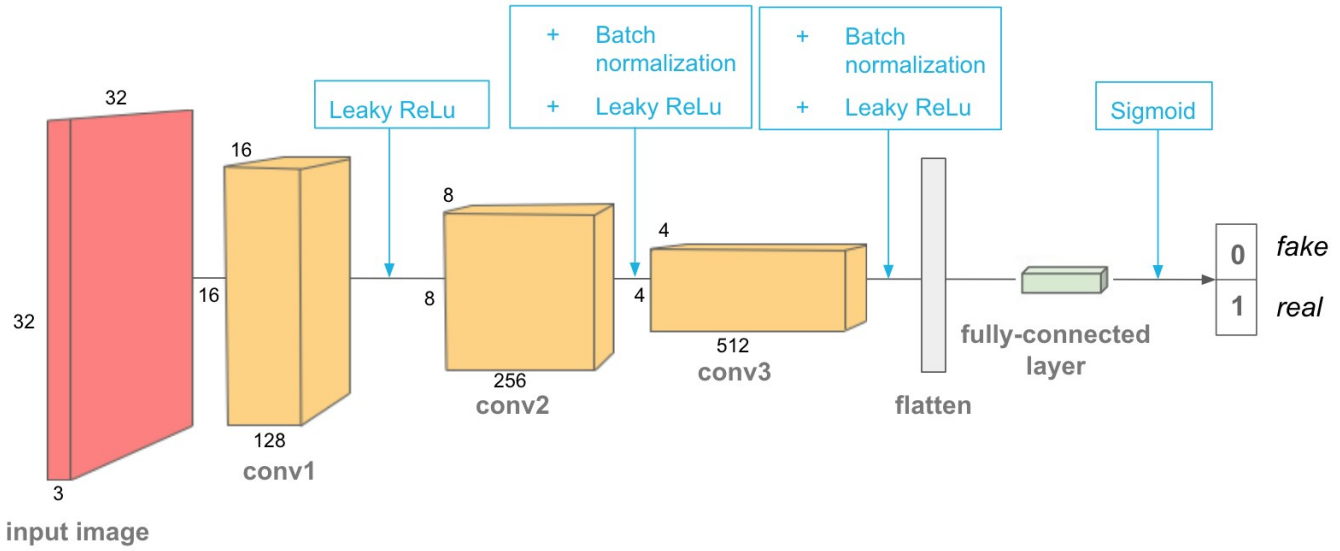




Discriminator Model

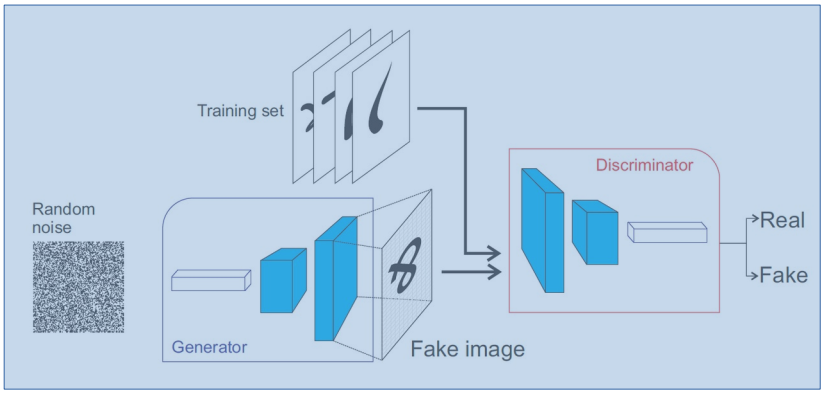
- Classification: Fake or Real
  - CNN



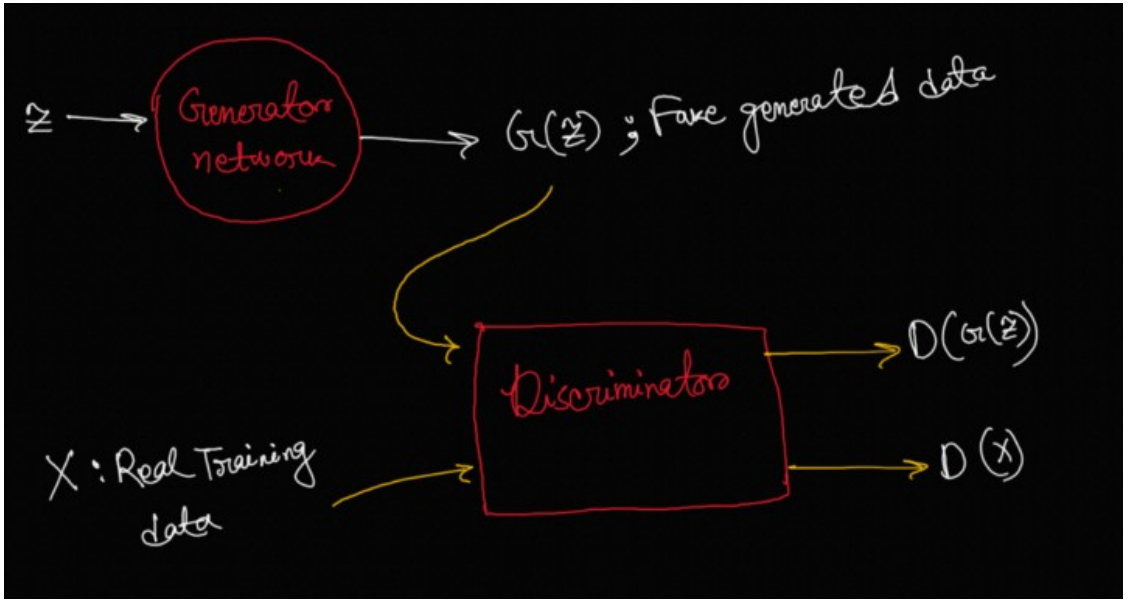


Adversarial Training

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

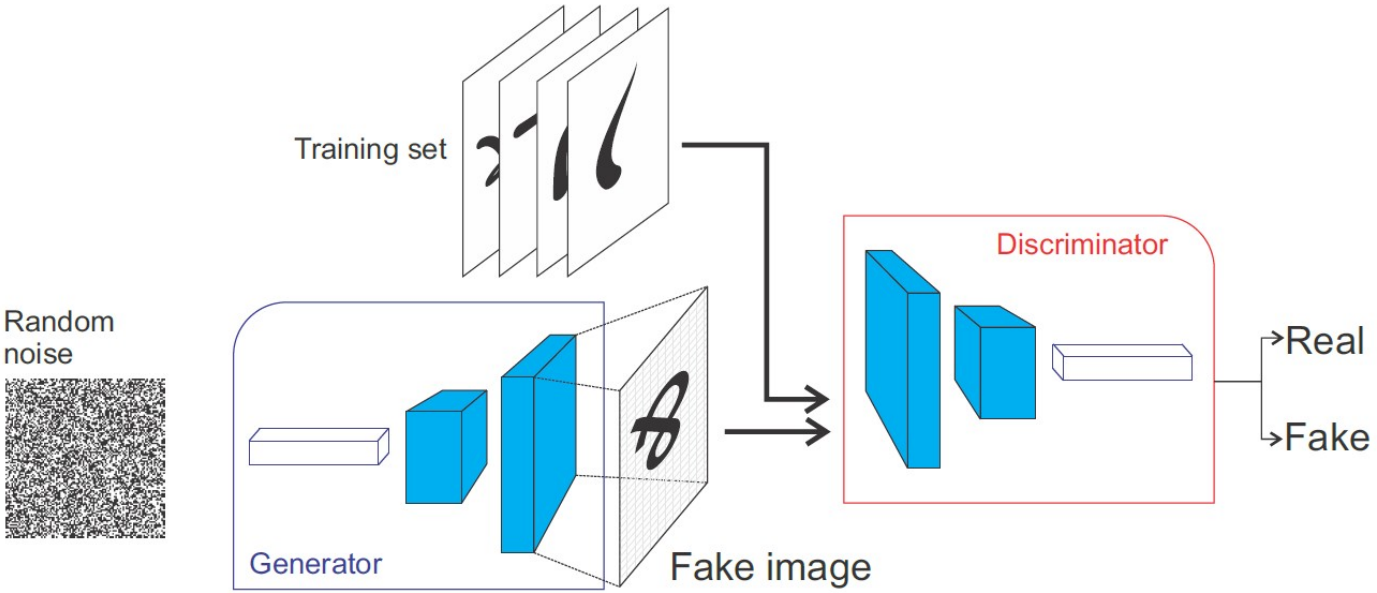


$$\min_G \max_D V(D,G) = \mathbb{E}_{x \sim p_{data}}[\log D(x)] + \mathbb{E}_{z \sim p_z(z)}[\log(1 - D(G(z)))]$$



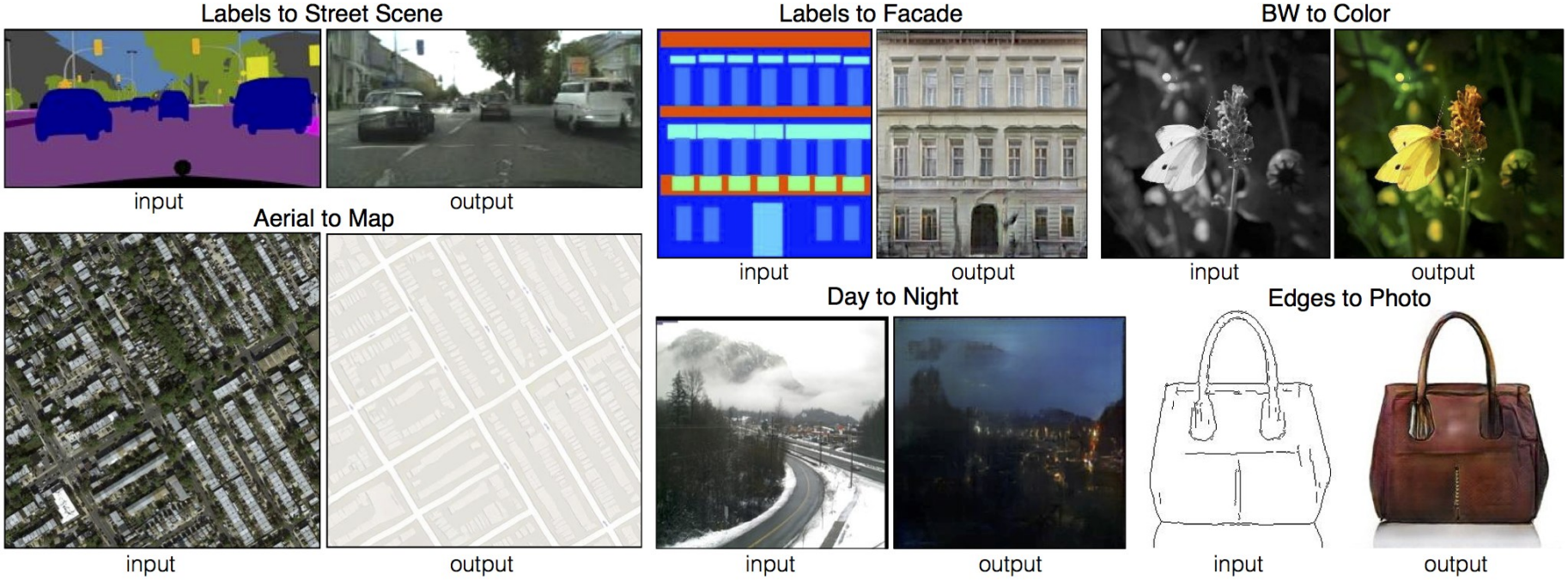
Let’s Code

- LINK: Lecture_12-DCGAN.ipynb



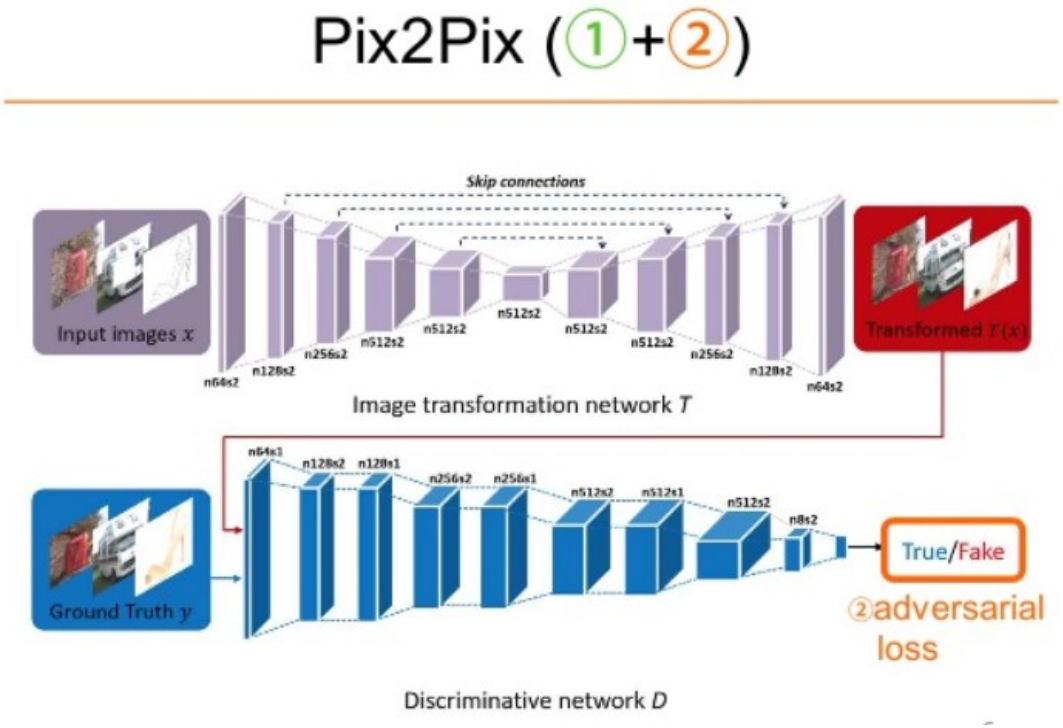
Pix2Pix

- Image-Translation



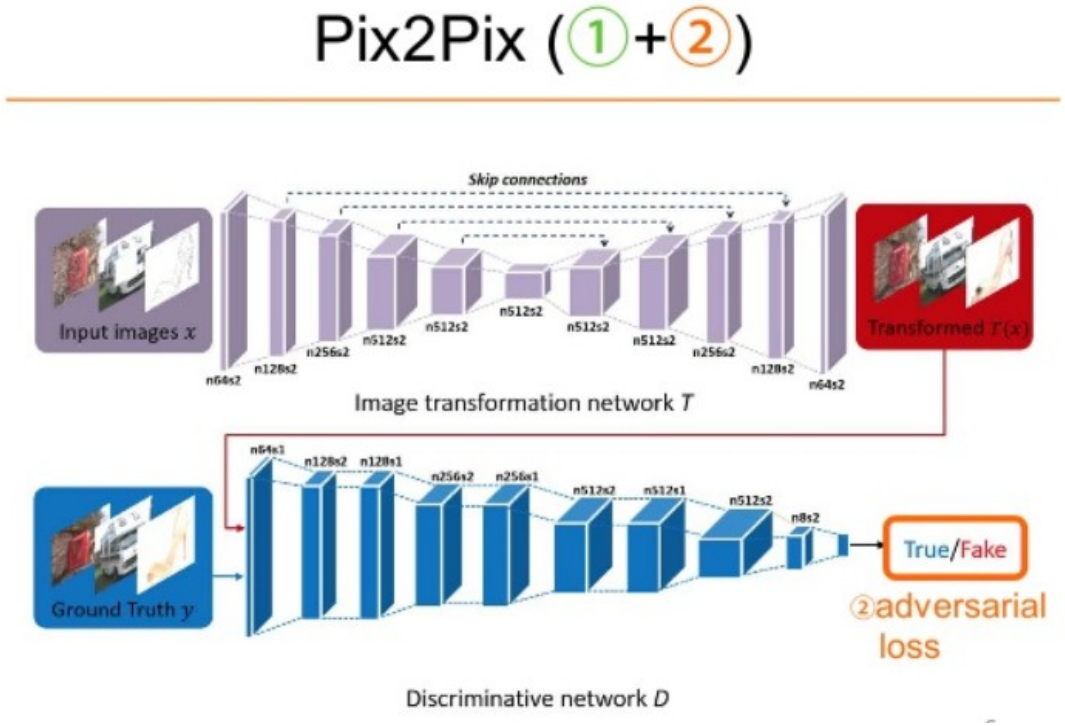
Pix2Pix

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



Let’s Code

- LINK: Lecture_12-pix2pix.ipynb



Course Final Remarks

- 12 Lectures / Topics
  - Image Processing
  - Image Classification
    - Feature Extraction
    - Shallow Classification
    - Deep Learning
      - Classification
      - Segmentation
      - GANs
  - 04 assessment tasks
    - License Plate Segmentation
    - Simpsons Classification (Shallow Based Models)
    - Simpsons Classification (CNN Based)
    - Simpsons Fake (GANs based)