Lecture 12 – Generative Adversarial Networks

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Topics

- Review of Lecture 11 – Image Segmentation

  - Object Segmentation (Bounding Box Level)

  - Instance / Semantic Segmentation (Pixel Level)

- Generative Adversarial Networks
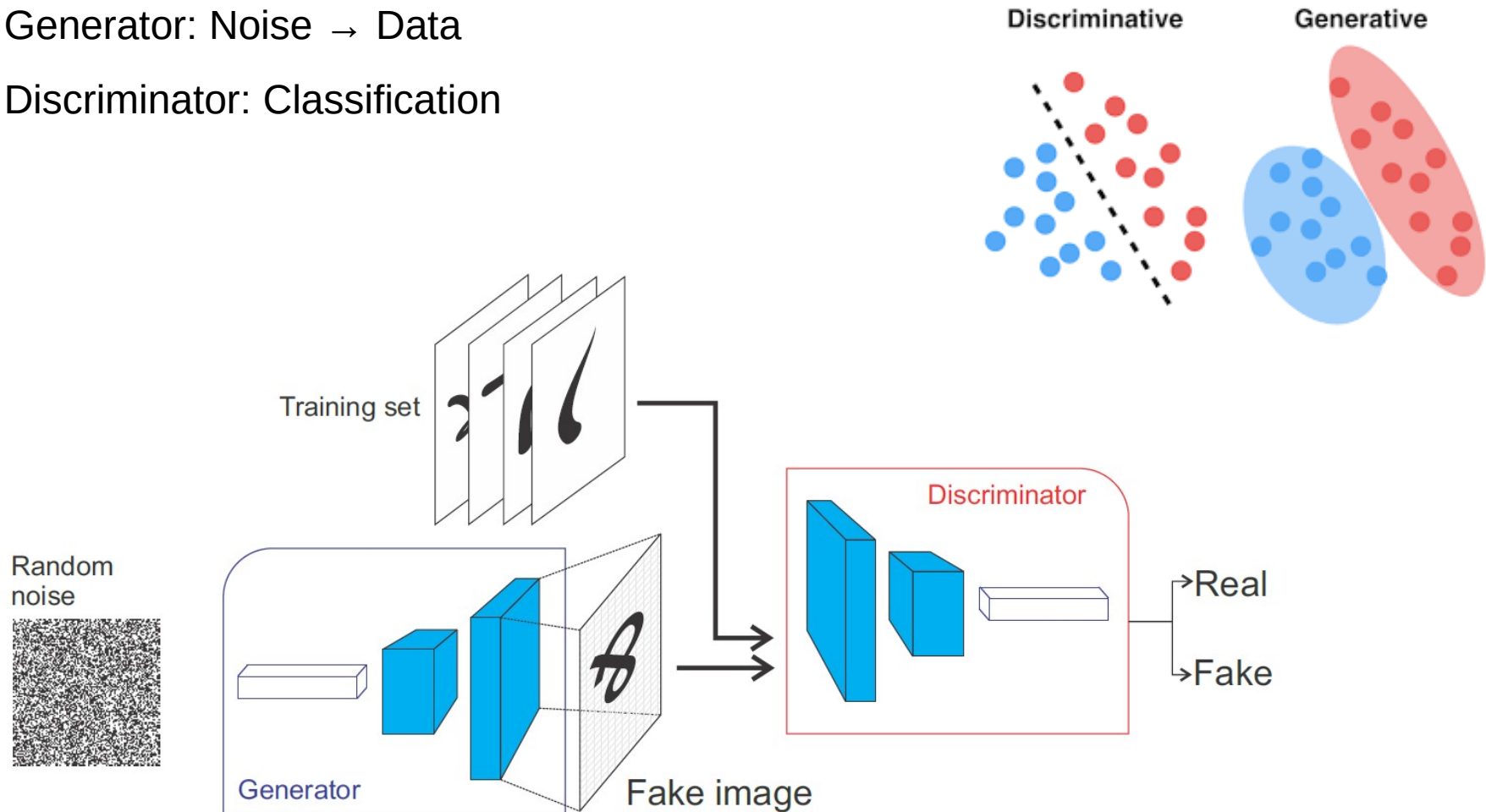
  - DCGAN

  - PIX2PIX

- Practice

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)
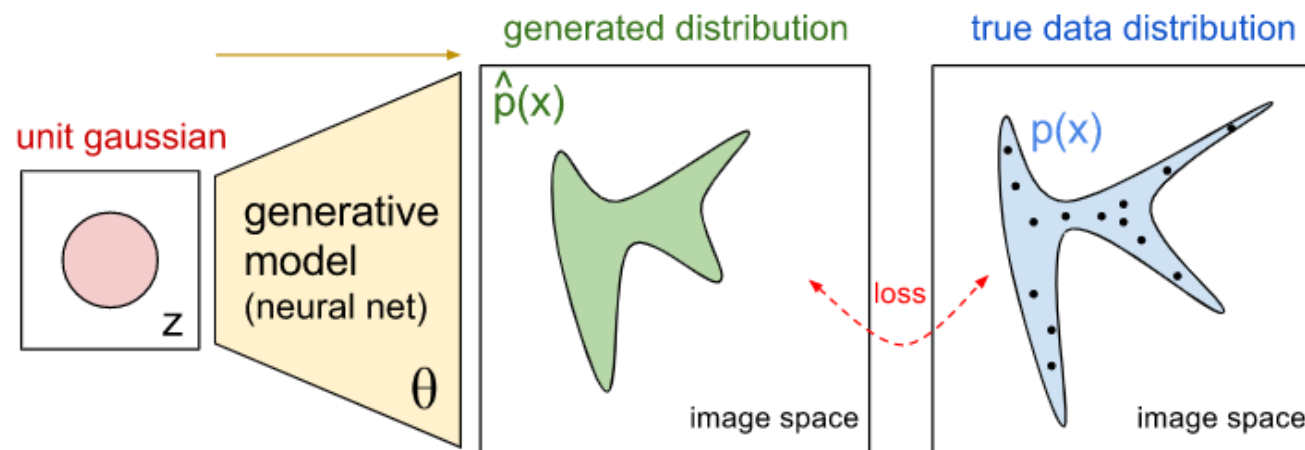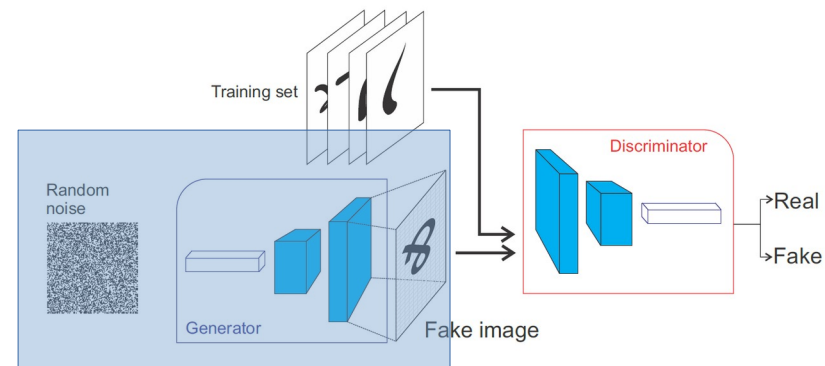
  - Image Translation

  - ....
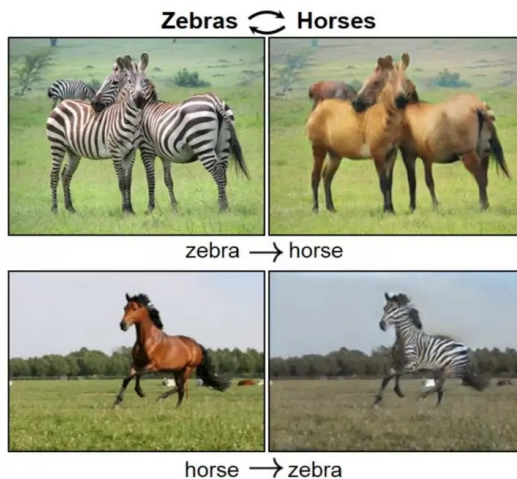
Generative Adversarial Networks (GAN's)
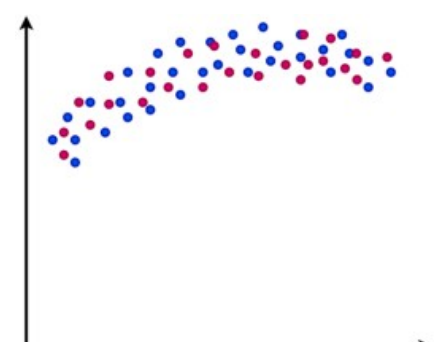
- Generator: Noise → Data

- Discriminator: Classification

Generative Model

- Learns data distribution
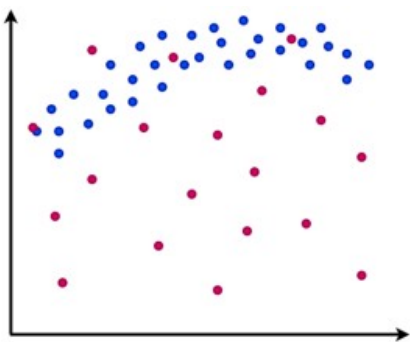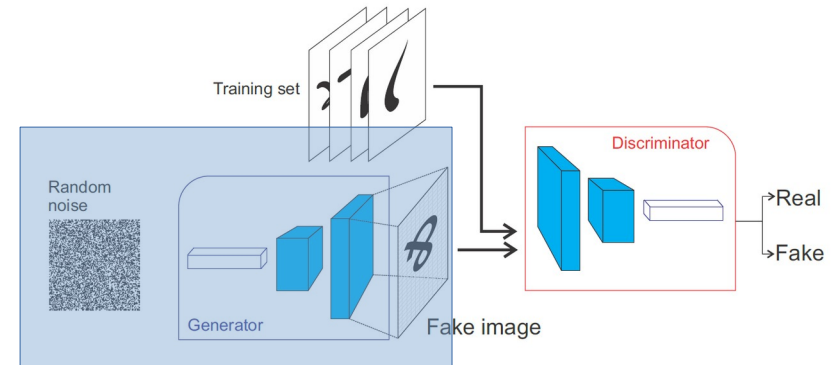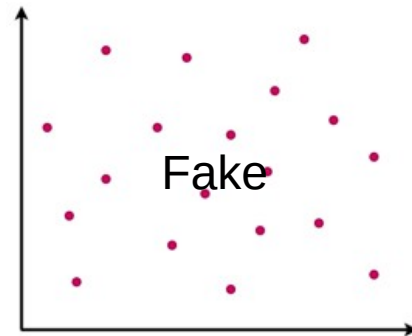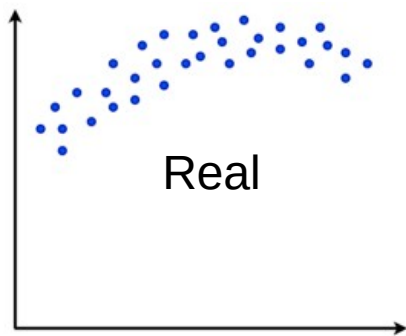
Generative Model

Real

Fake

Training set

Random noise

Generator

Fake image

Discriminator
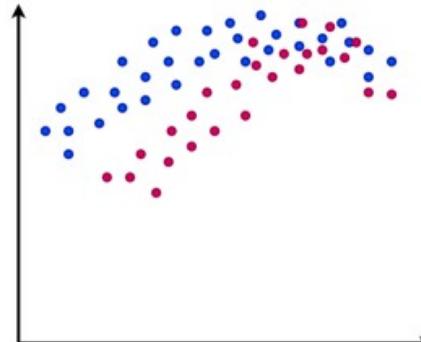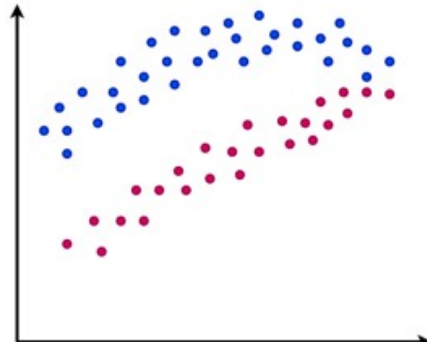
Real

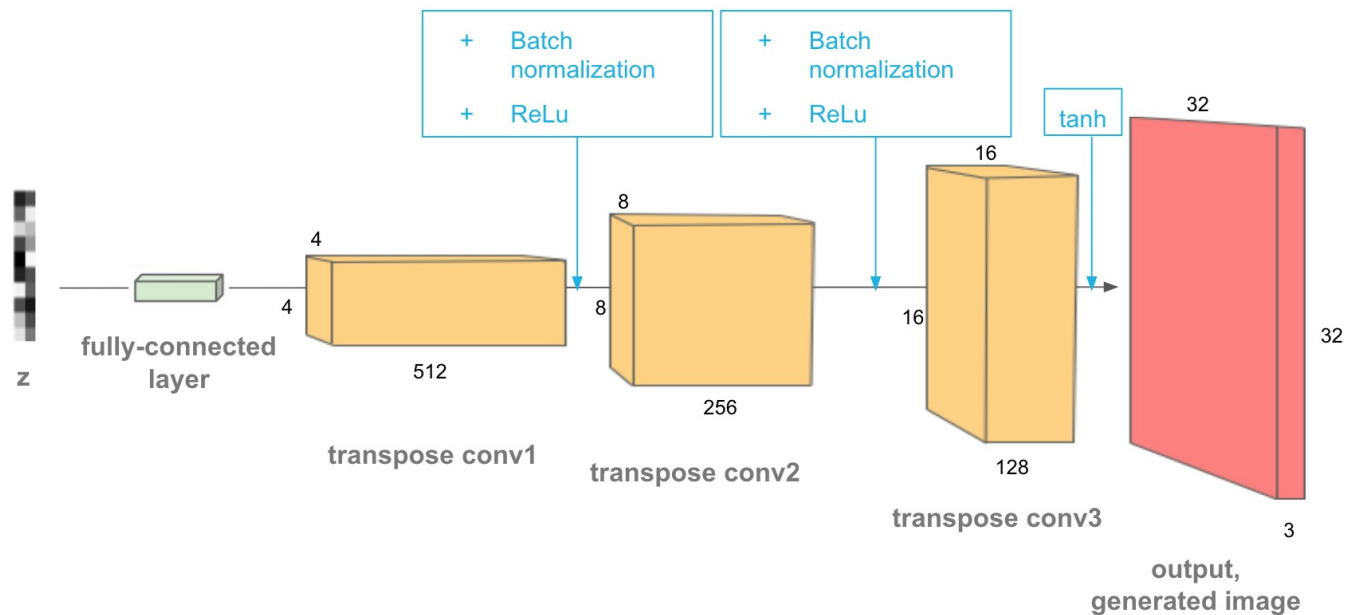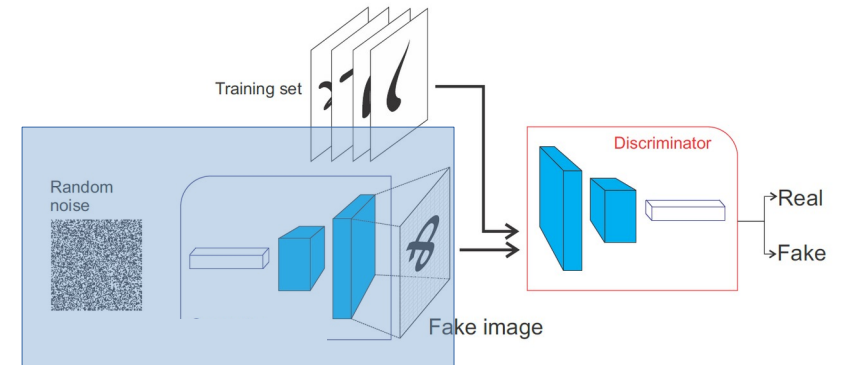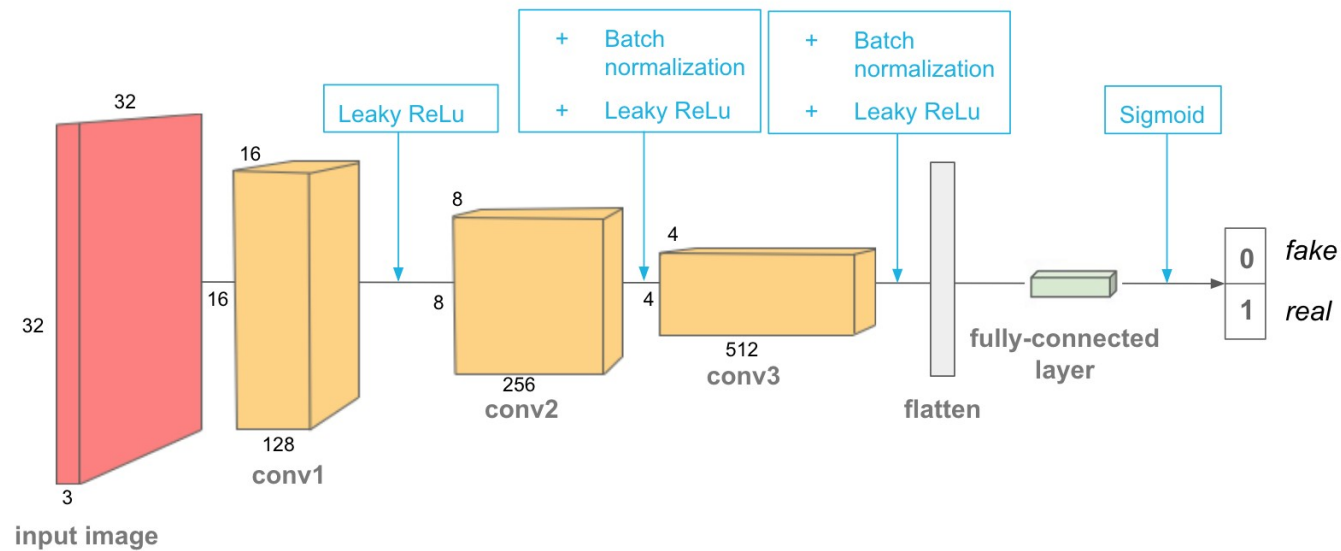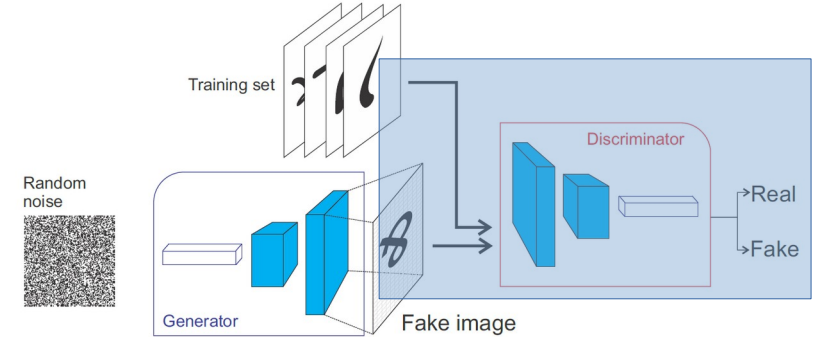Fake

Training

Deep Generative Model

- De-Convolutional Layers (upsampling)

  - Noise to Fake Image
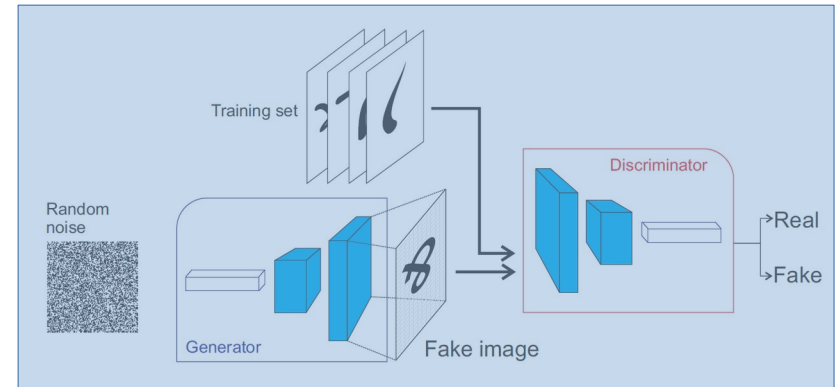
Discriminator Model

- Classification: Fake or Real

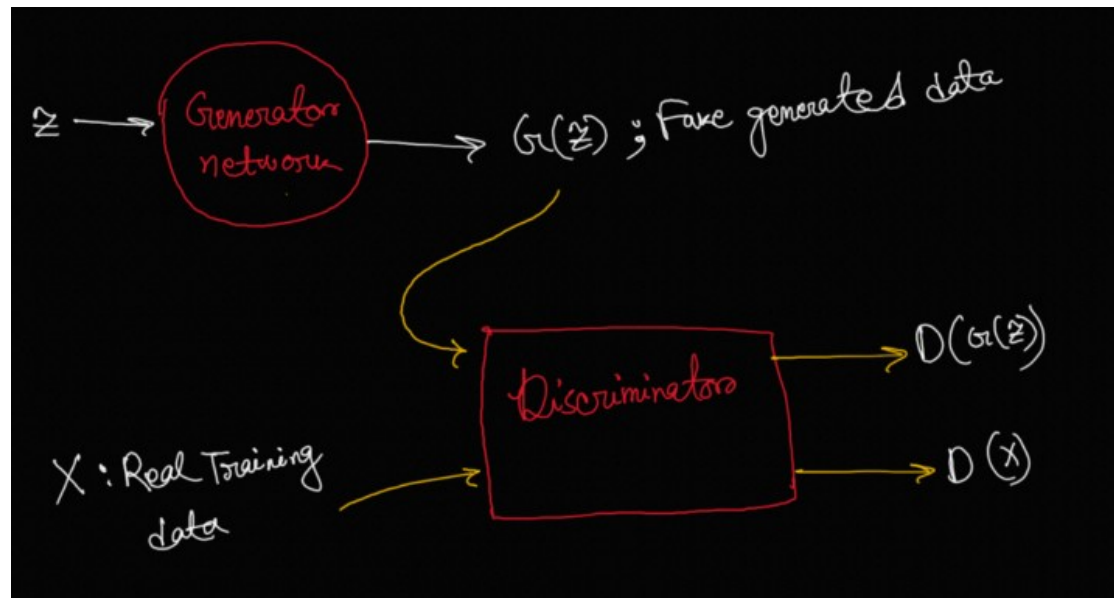 - CNN

Adversarial Training

- Adversarial Loss (Min-Max)

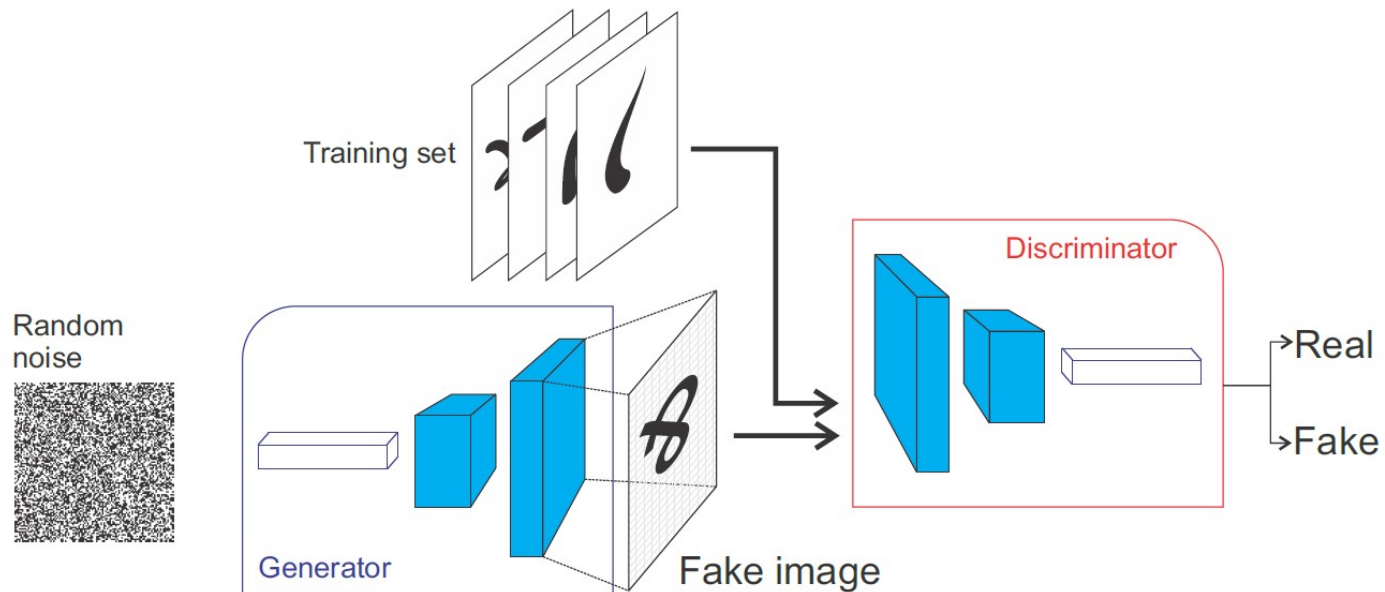 - Minimize Generator

  - Maximize Discriminator

$$\min_{G} \max_{D} V(D, G) = \mathbb{E}_{x \sim p_{data}}[\log D(x)] + \mathbb{E}_{z \sim p_z(z)}[\log(1 - D(G(z)))]$$
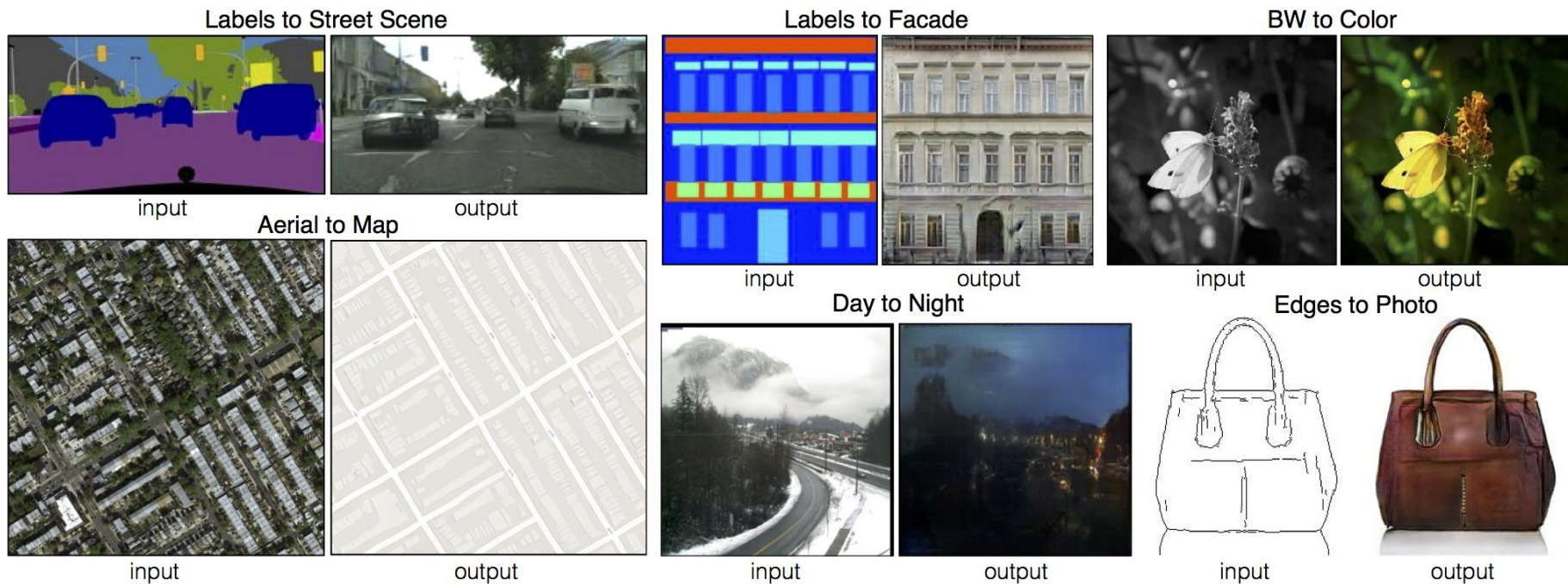
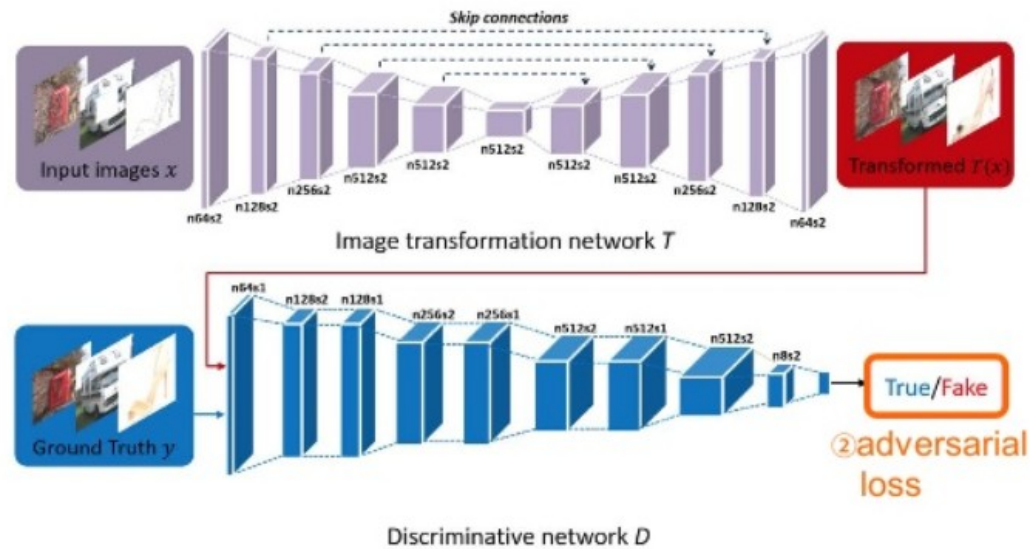# Let's Code

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

Pix2Pix

- Image-Translation

Pix2Pix

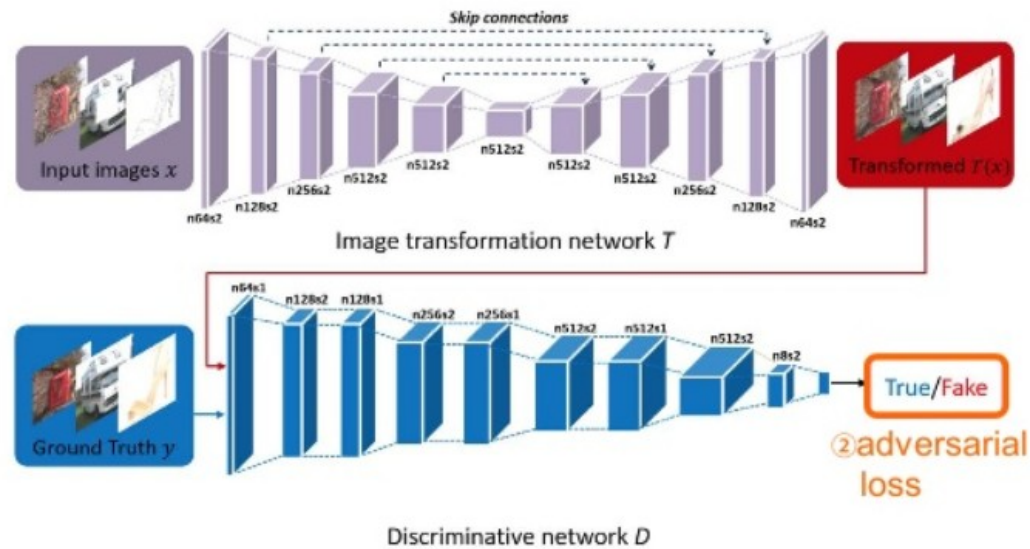- Generative Model: Encoder-Decoder Architecture (i.e U-Net)

- Paired Annotated Dataset

Let's Code

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

Course Final Remarks

- 12 Lectures / Topics
  - Image Processing
  - Image Segmentation
  - 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 Bart2Homer (GANs based)