

Sketch to Photo Translation

Yuhang Li

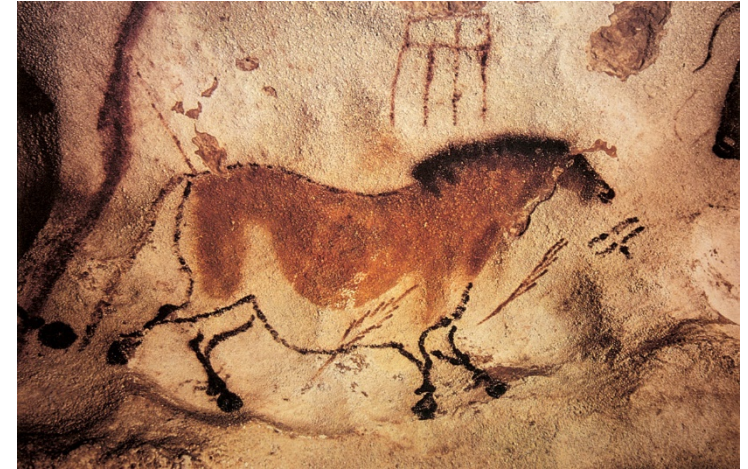
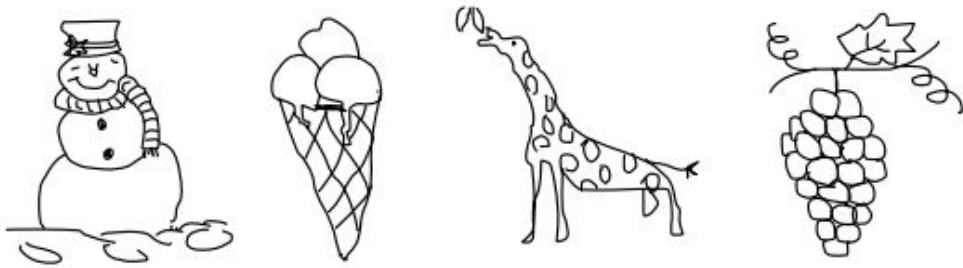
Sketch

Related works

Exploration

Sketch

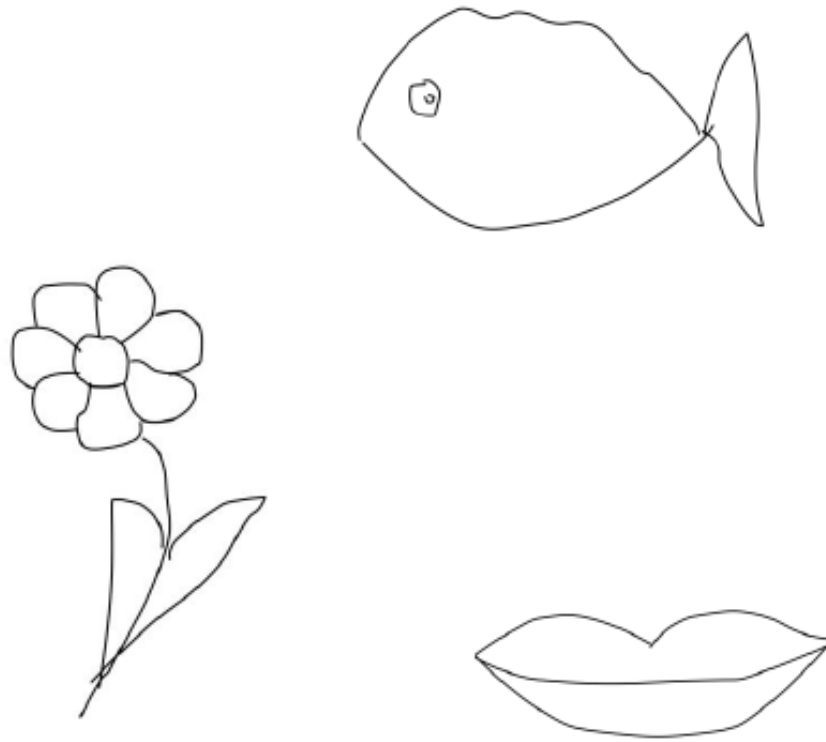
- A universal form of communication across nations and cultures
- Tracing back to prehistoric cave painting
- Conveying abstract concepts visually
- Becoming more important due to the popularity of touch devices



Characteristic of Sketch

- Iconic

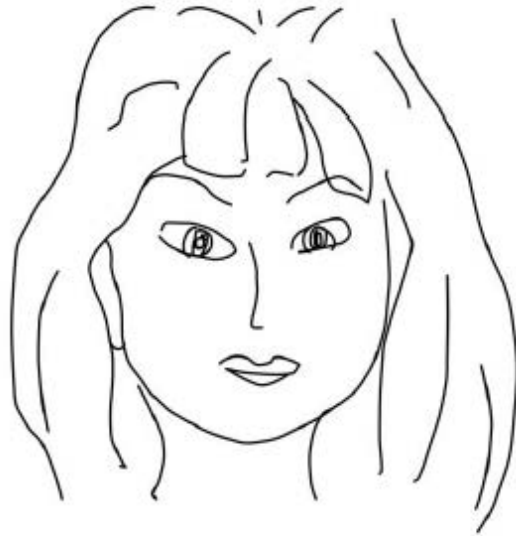
Sketches can be highly abstract.



Characteristic of Sketch

- High intra-class variations

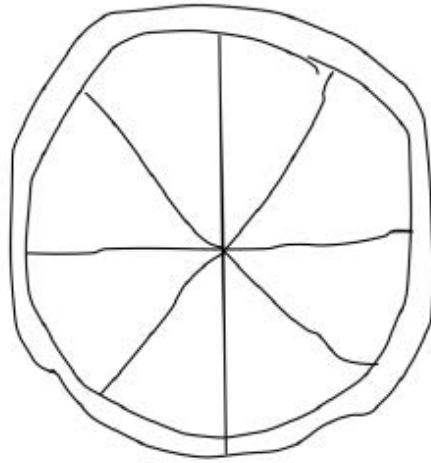
Sketches drawn by different people vary in the level of abstraction or deformation.



Characteristic of Sketch

- Lack of visual cues

Sketches are lack of colors and textures compared to photos.



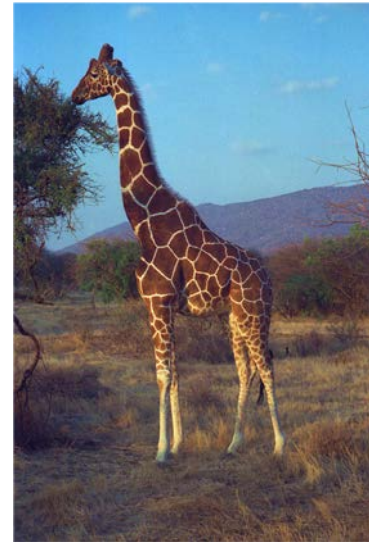
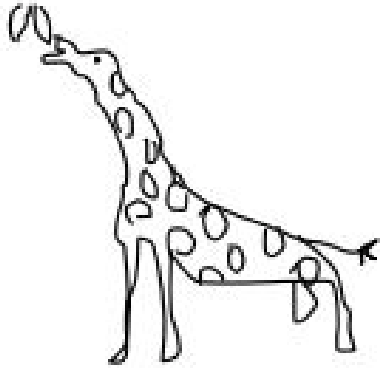
?



Problem definition

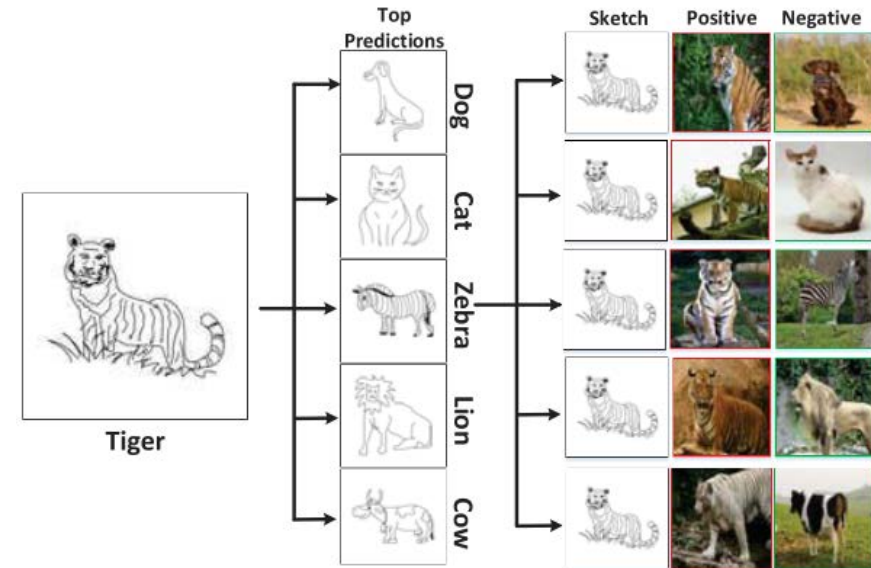
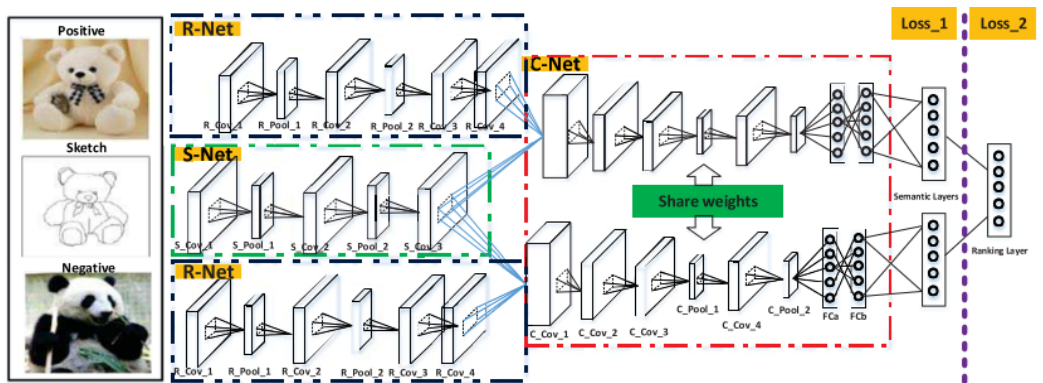
Sketch-based image generation

Given a sketch, we want to generate an image that preserves the scene in the sketch.



Sketch classification: SketchNet

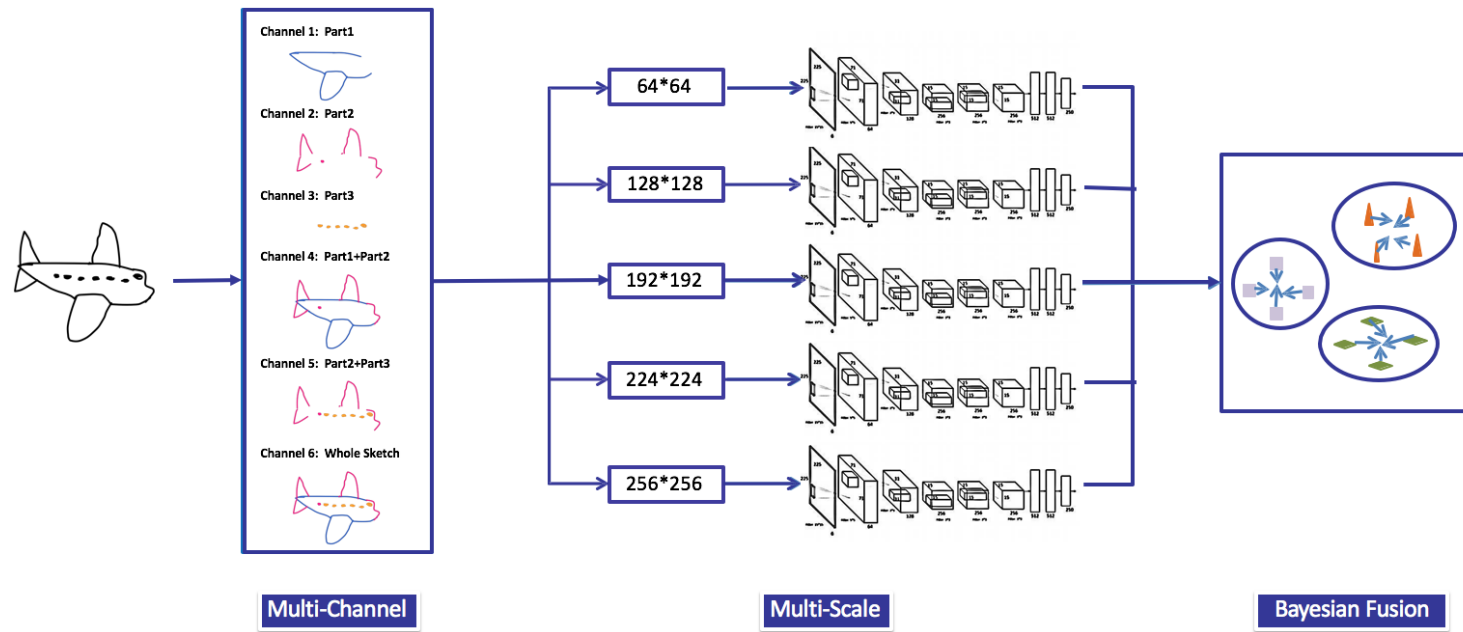
- Discover the discriminative structures of sketch images
- Triplet networks based on Siamese nets
- Weekly supervised



H. Zhang 2016

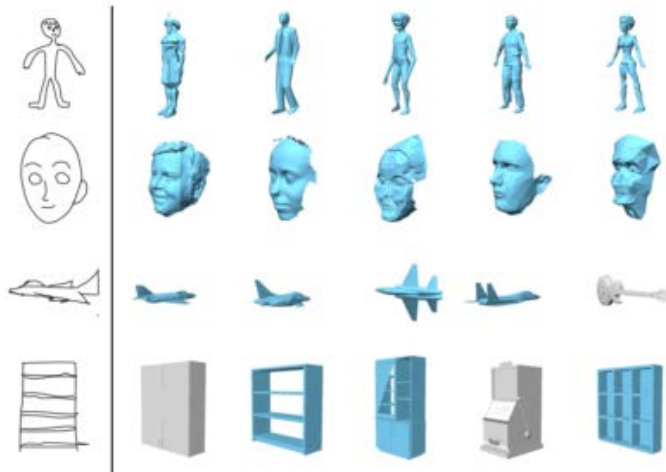
Sketch classification: Sketch-a-Net

- A novel method of data augmentation
- Bayesian fusion
- Multiple models of different scales
- Beats human in classification performance



Sketch-based retrieval

- Sketch-based 3D model retrieval
- Sketch-based image retrieval
- Sketch-based fine-grain image retrieval



3D model retrieval, F. Wang et al 2015

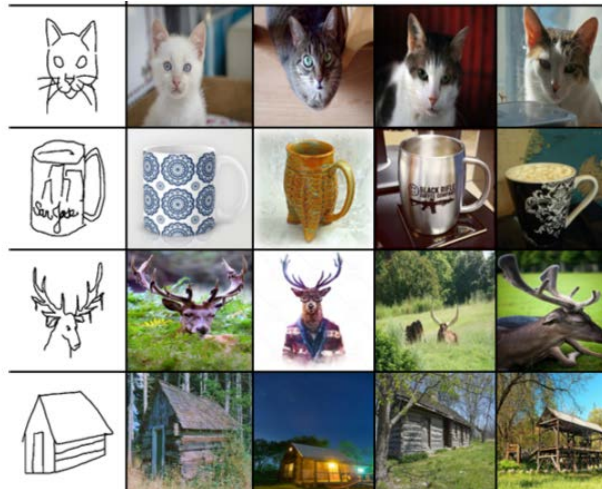


Image retrieval, P. Sangkloy et al 2016



Fine-grain image retrieval, Q. Yu et al 2016

Sketch-based image generation



Edge map to photo, P. Isola et al 2016

Generative Adversarial Nets (GANs)

- Generate images of a given dataset by adversarial training
- Discriminator
- Generator
- Minmax game

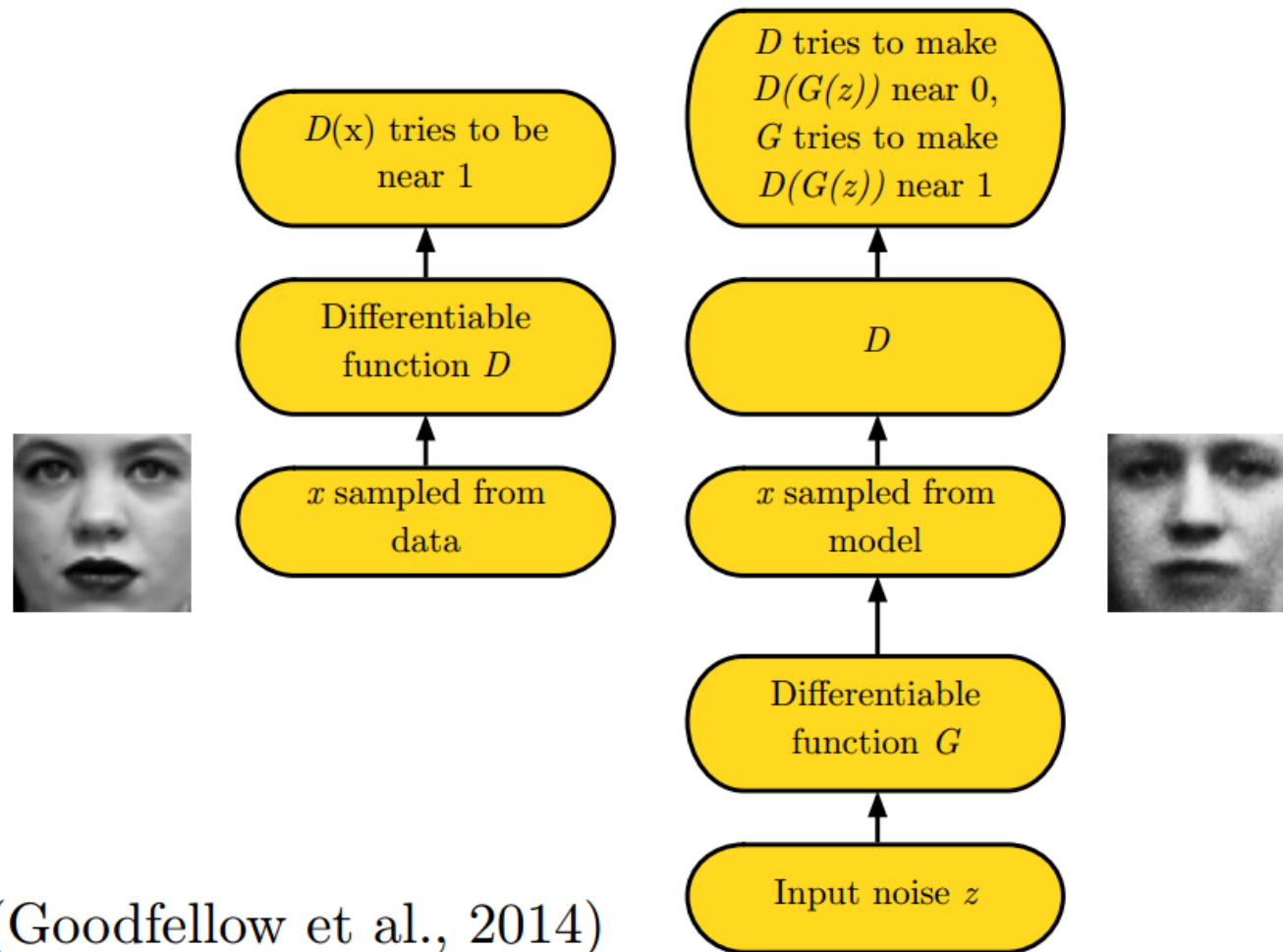


Image-to-image translation

- Based on conditional GANs
- Paired images for training
- A framework for multiple applications, only switching the training sets

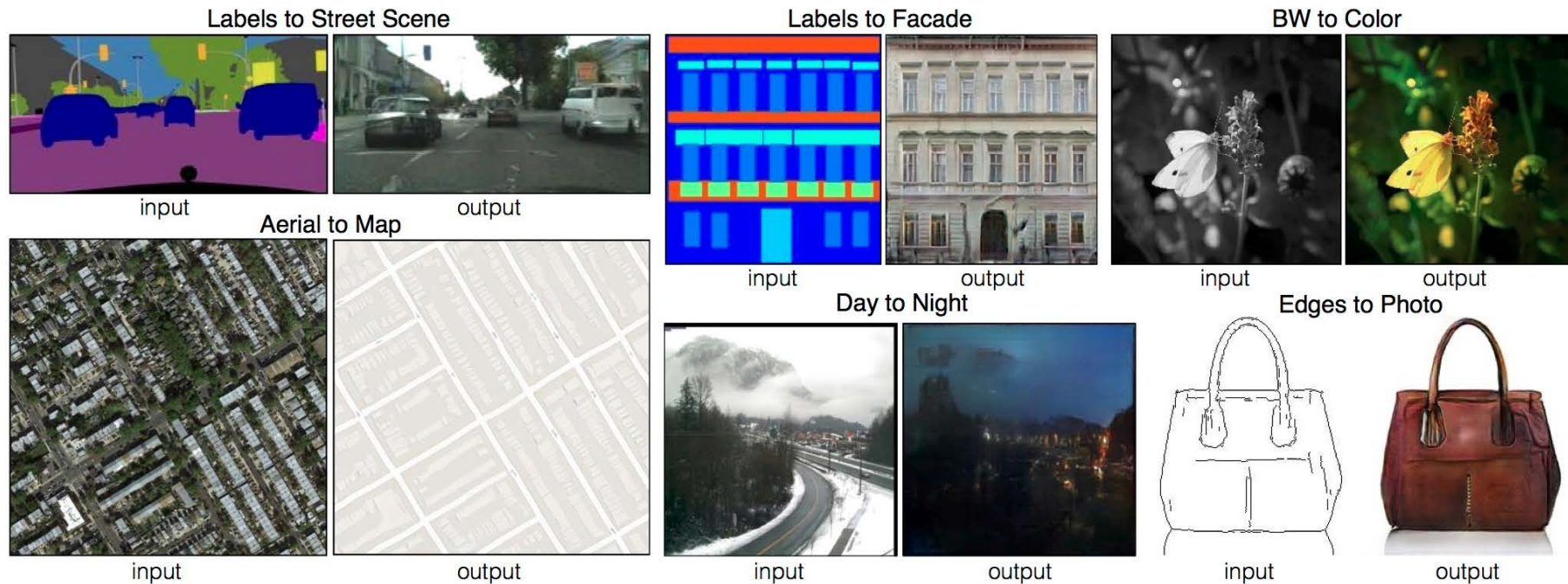
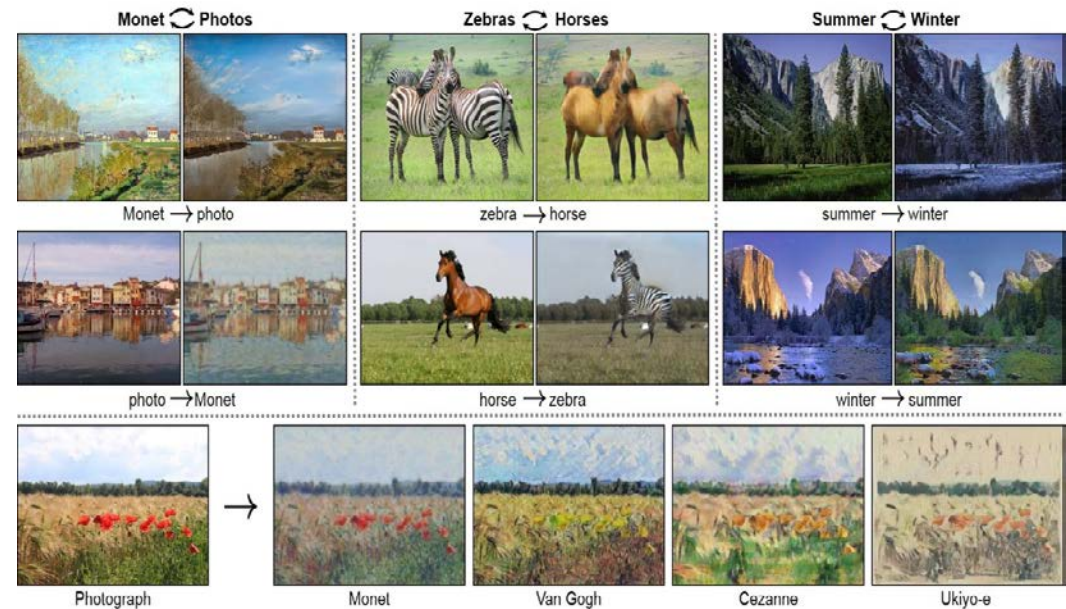
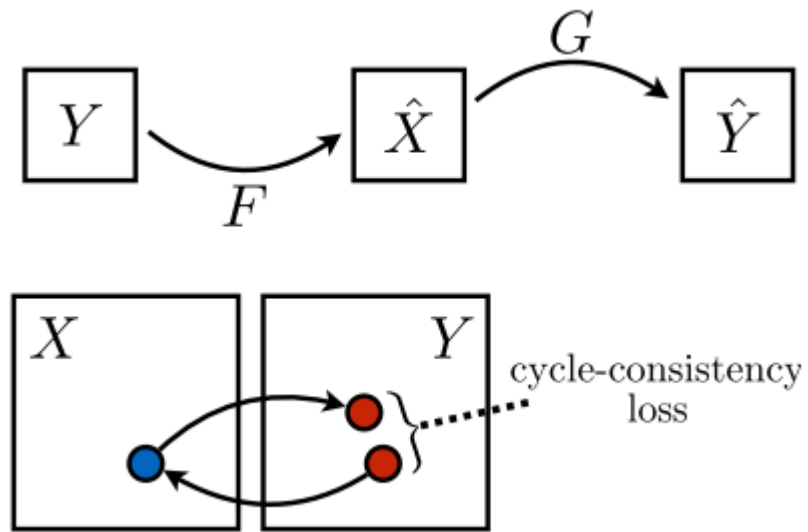


Image-to-image translation, P. Isola et al 2016

Unpaired image translation

- Image-to-image translation
- Unpaired images datasets
- Cycle consistency

Reconstruct the input image from generated image

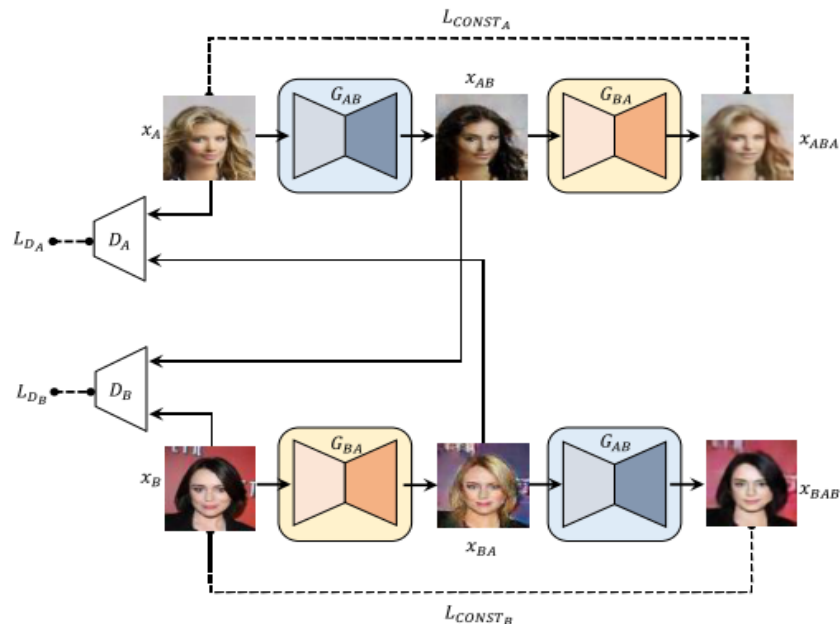


CycleGAN, J. Zhu et al 2017

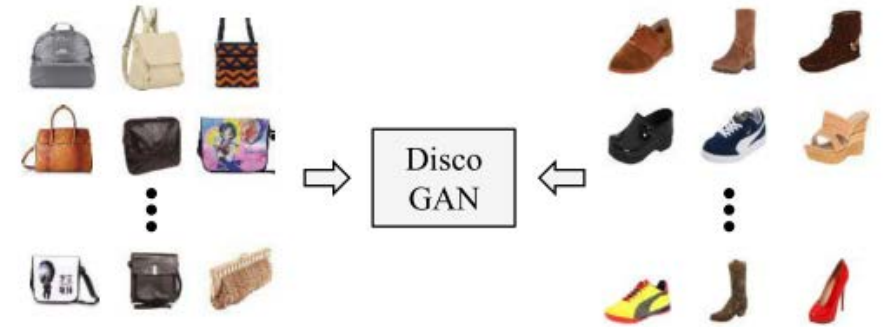
Unpaired image translation

- Image-to-image translation
- Unpaired images datasets
- Cycle consistency

Reconstruct the input image from generated image



DiscoGAN, T. Kim et al 2017



(a) Learning cross-domain relations **without any extra label**



(b) Handbag images (input) & **Generated** shoe images (output)

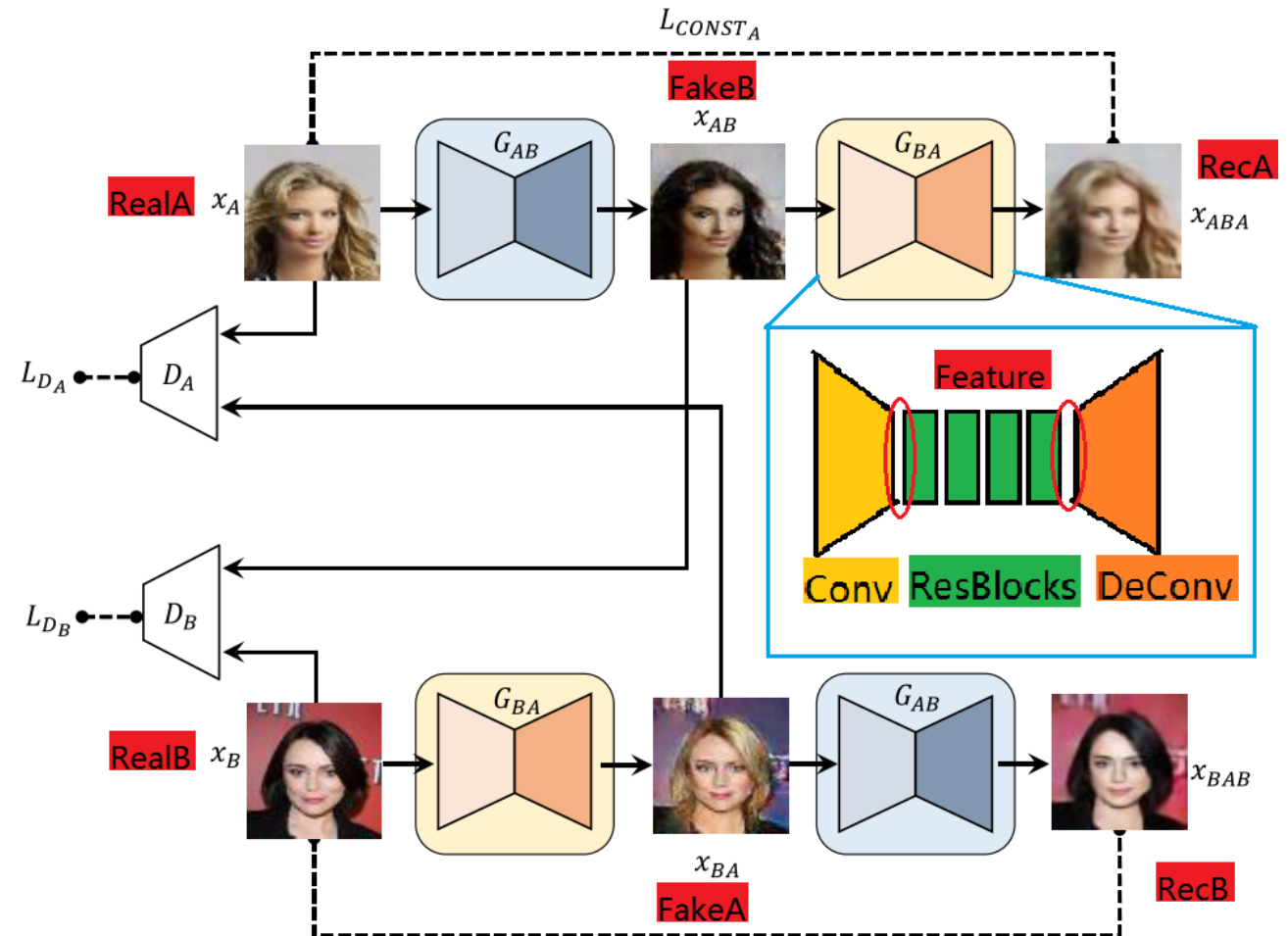
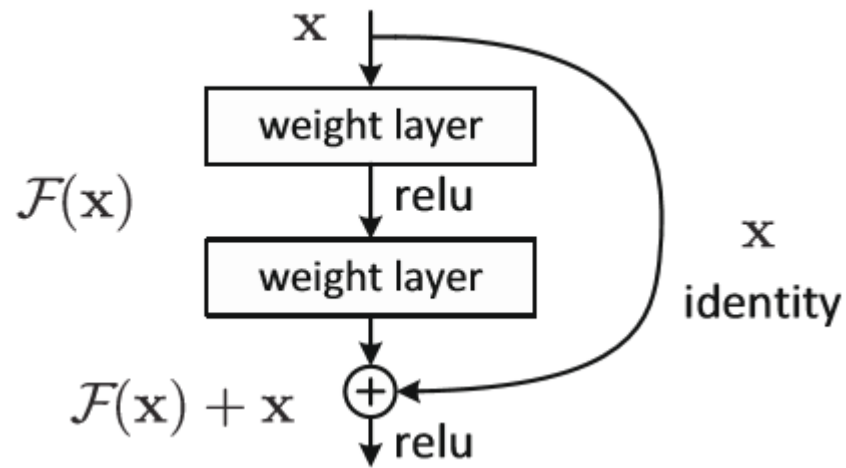


(c) Shoe images (input) & **Generated** handbag images (output)

Exploration: CycleGAN

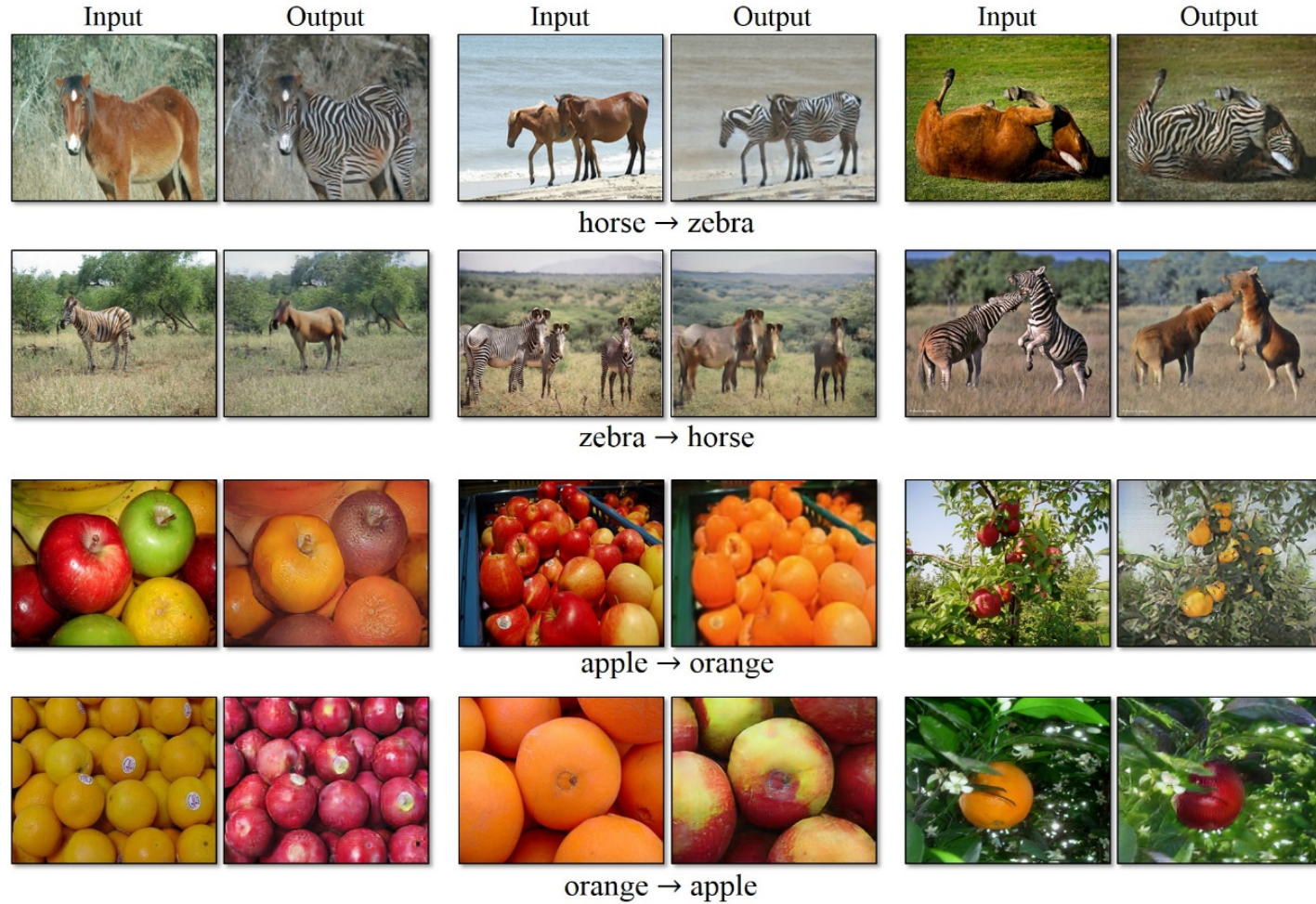
Architecture details

- Residual blocks
- Instance normalization
- Generated image pool



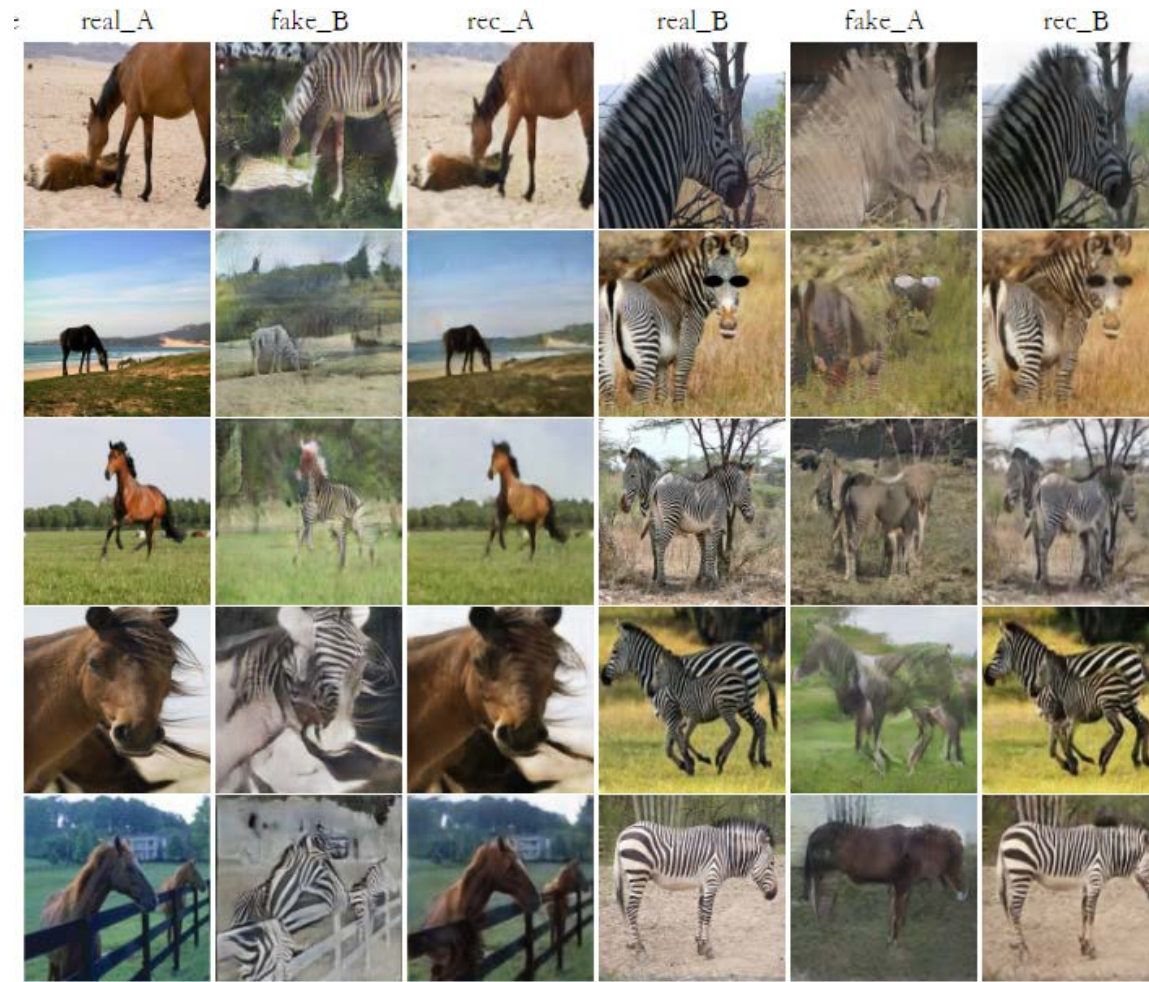
Exploration: CycleGAN

Reported results



Exploration: CycleGAN

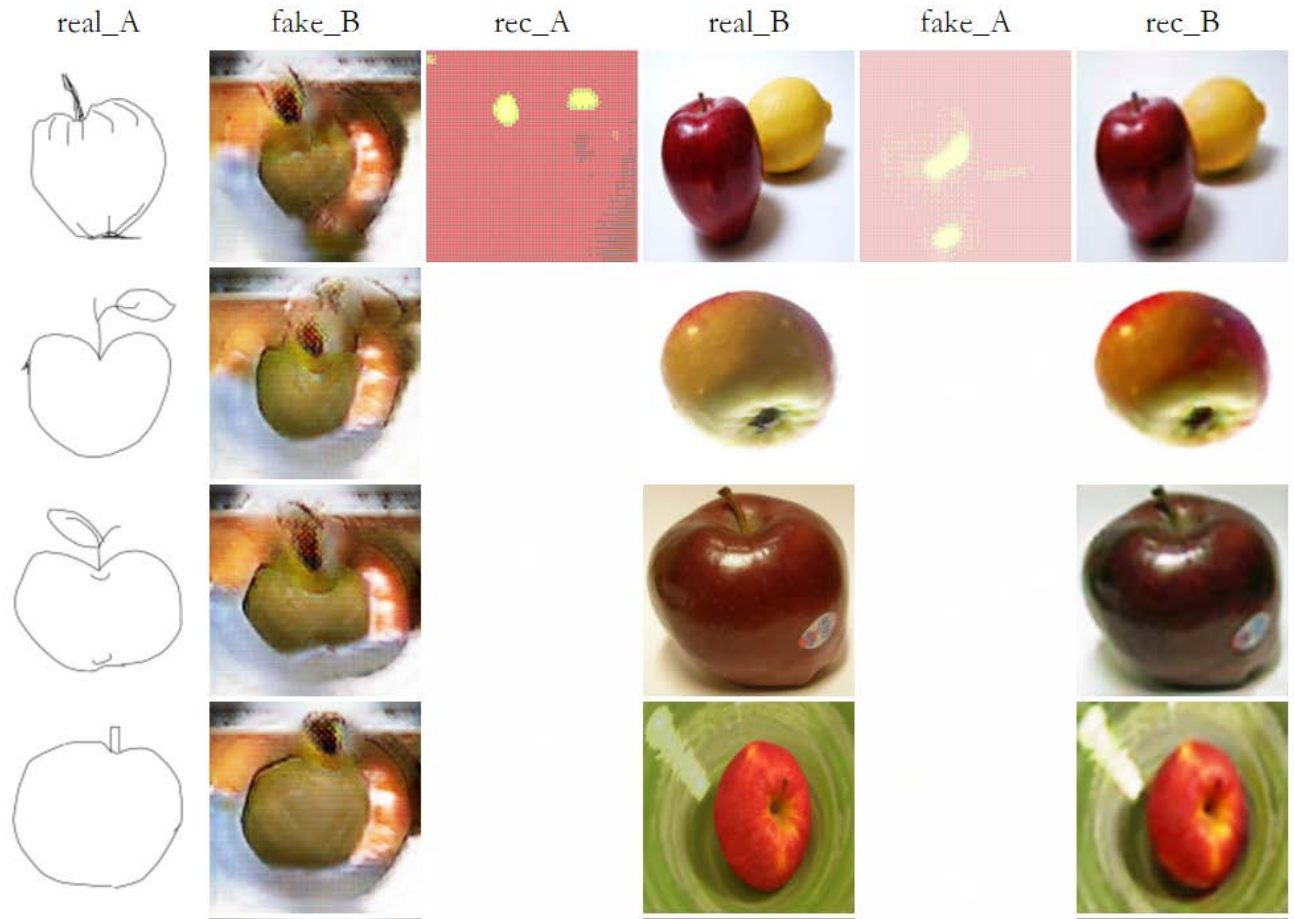
Results by training after 200 epochs with the official torch implementation. Horse to zebra dataset



Exploration: CycleGAN

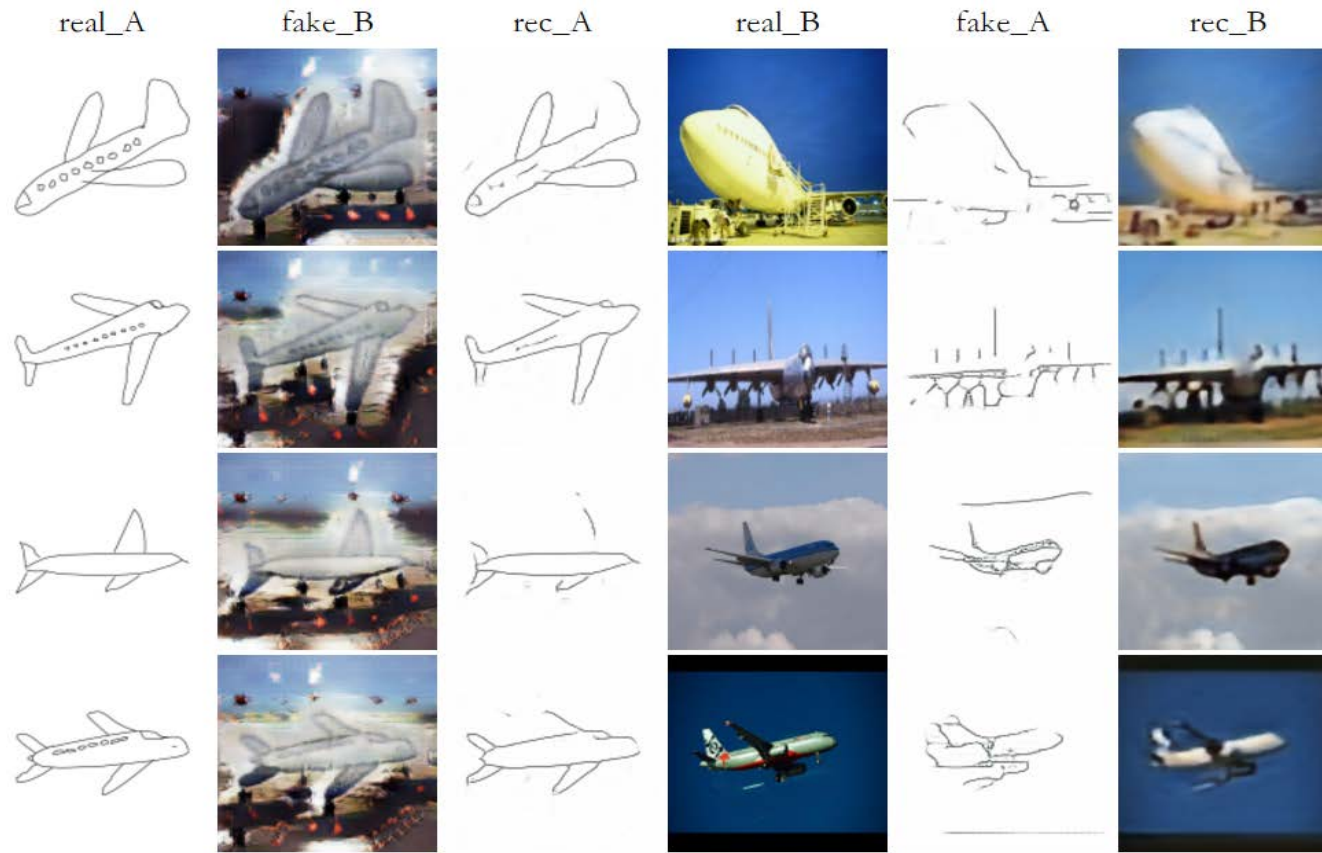
Results by training after 200 epochs with the official torch implementation. Sketch to photo (apple) dataset.

- Mode collapse (sketch to photo)
- All white (photo to sketch)



Exploration: CycleGAN

Results by training after 200 epochs with the official torch implementation. Sketch to photo (airplane) dataset.



Exploration: DiscoGAN