

Machine Learning, Spring 2019

Generative Adversarial Networks (GAN)

Instructor: Prof. Yi Fang

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Python tutorial: <http://learnpython.org/>

TensorFlow tutorial: <https://www.tensorflow.org/tutorials/>

PyTorch tutorial: <https://pytorch.org/tutorials/>

Acknowledge: The slides are partially referred to the online materials by Taegyun Joen, <https://www.slideshare.net/TaegyunJeon1/pr12-you-only-look-once-yolo-unified-realtime-object-detection> and online YOLO paper and other materials (from ECS289g by Prof. Lee)

Magic of GANs

- Which one is Computer generated?



Src: Ledig, Christian, et al. "Photo-realistic single image super-resolution using a generative adversarial network." arXiv preprint arXiv:1609.04802 (2016).

ARTISTIC STYLE TRANSFER



Src: <https://neurohive.io/en/state-of-the-art/twin-gan-cross-domain-translation-of-human-portraits/>



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Academic Programs



"Games, Roadblocks, and Glitches": A Guide to Our New Tax Code
1040 Label



Courant's LeCun Wins Turing Award for Breakthroughs in AI

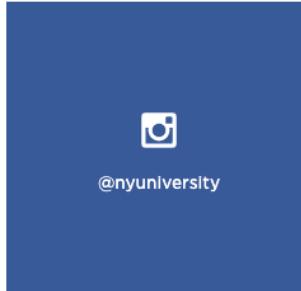
A photograph of Washington Square Park in New York City, featuring the Washington Square Arch and a large fountain in the foreground.



Graduate Admissions



Delivey Science
Feeling Self(ie)-Conscious



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Two students walking on a university campus.

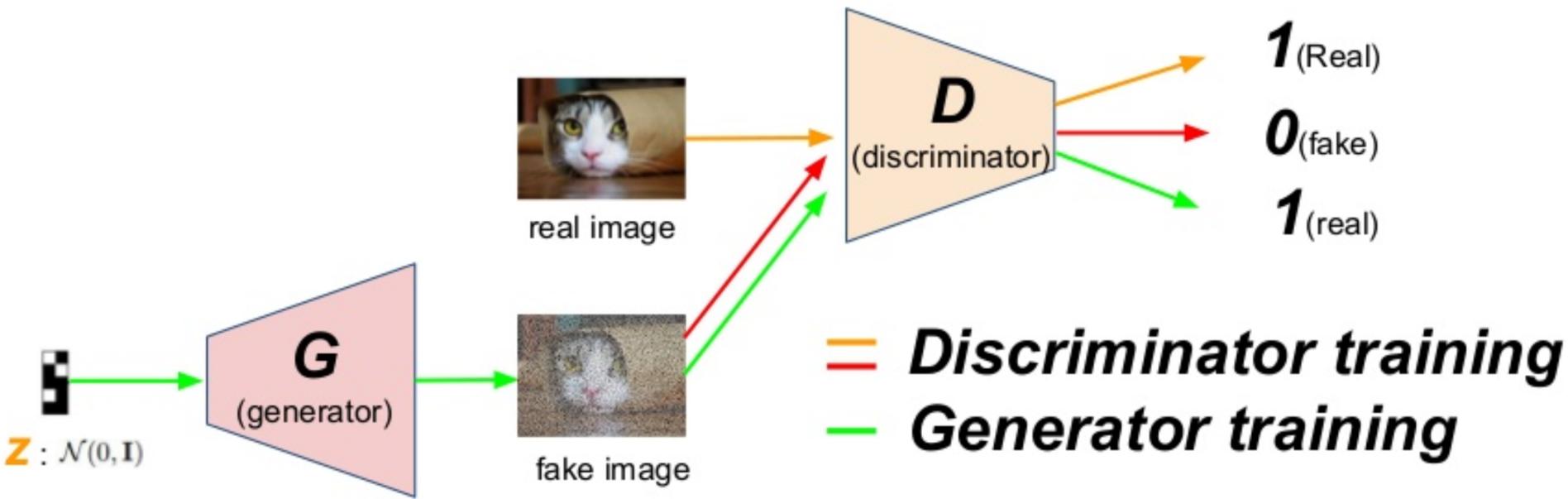
May 5, 2019

- Introduction of GAN
- GAN applications

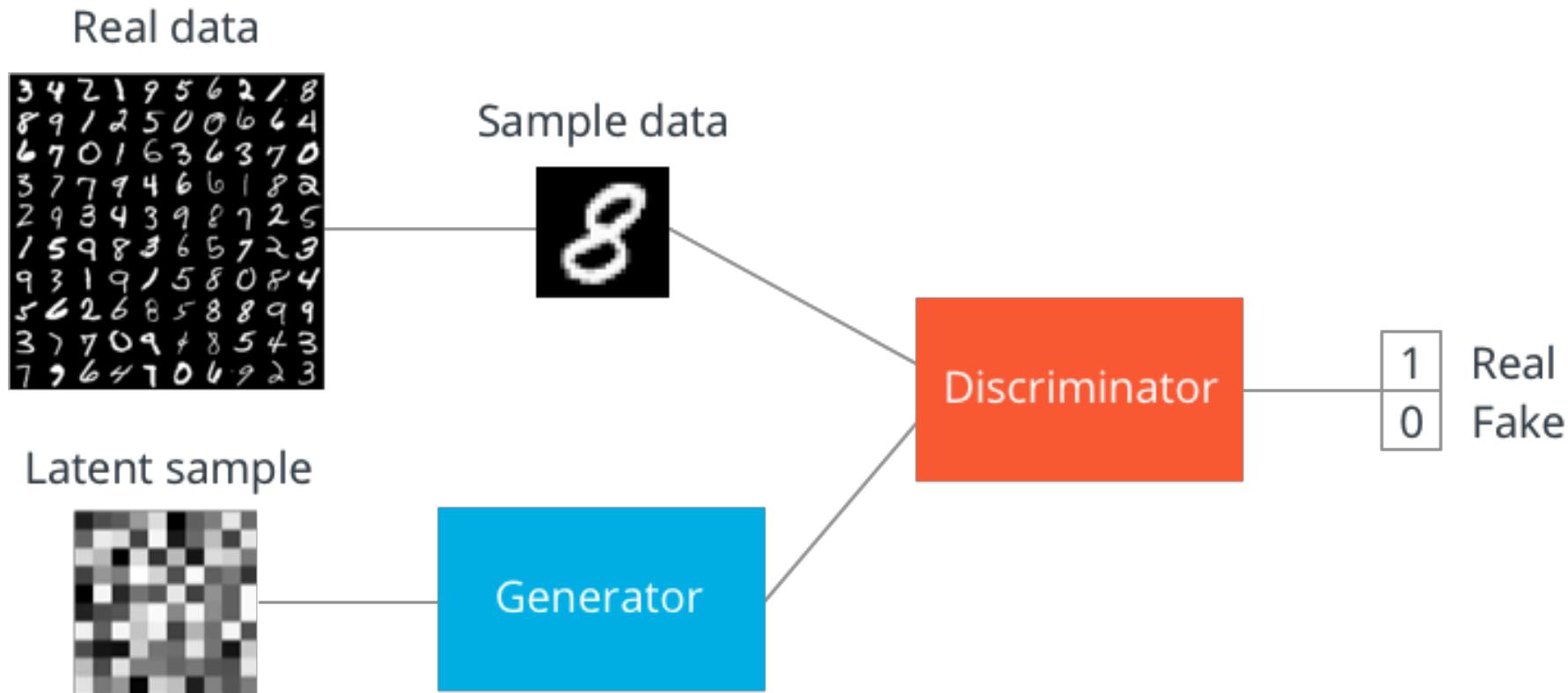
Applications of GAN

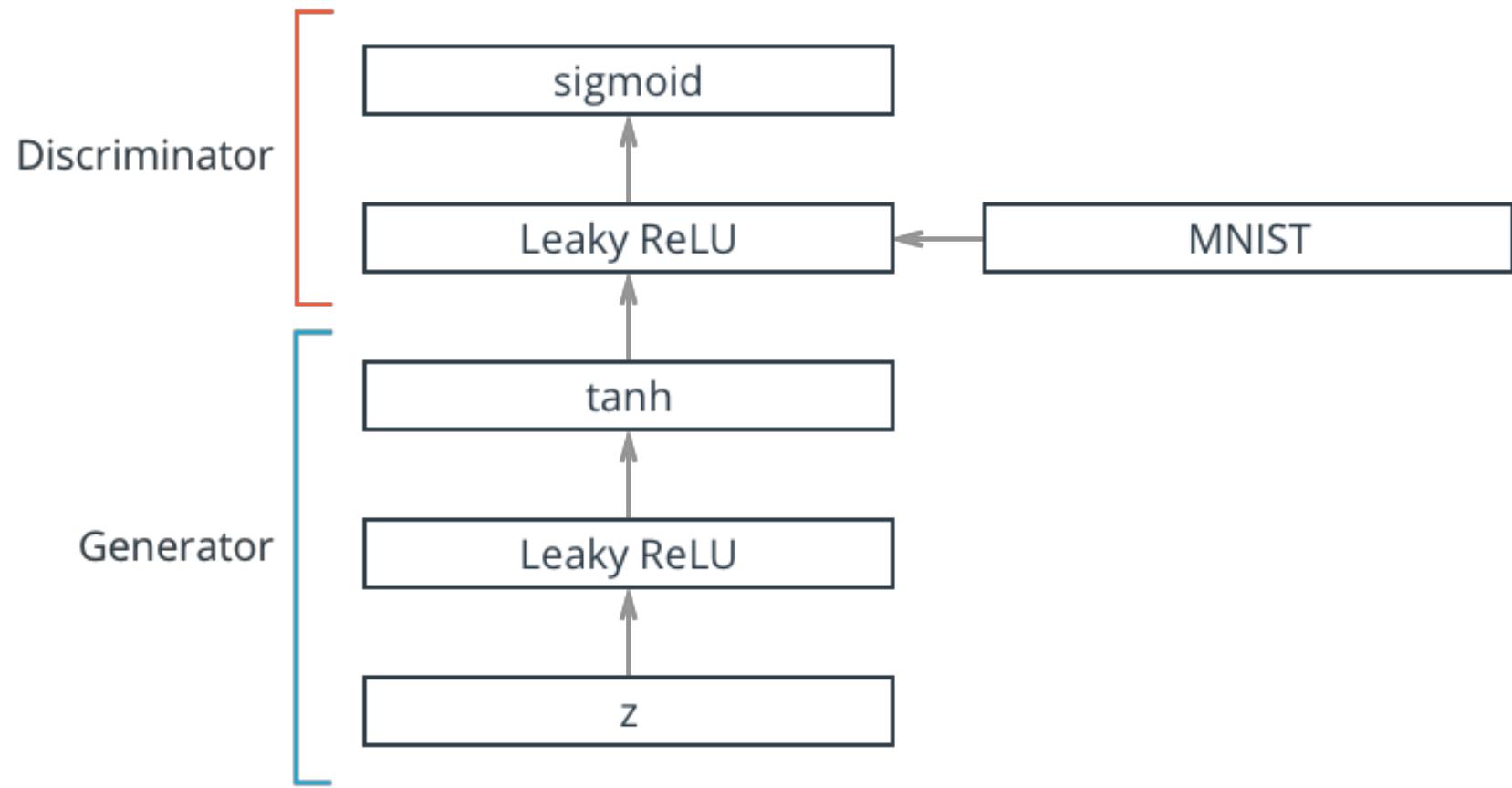
- Image Generation
- Domain Adaptation
- Image Editing

Image Generation

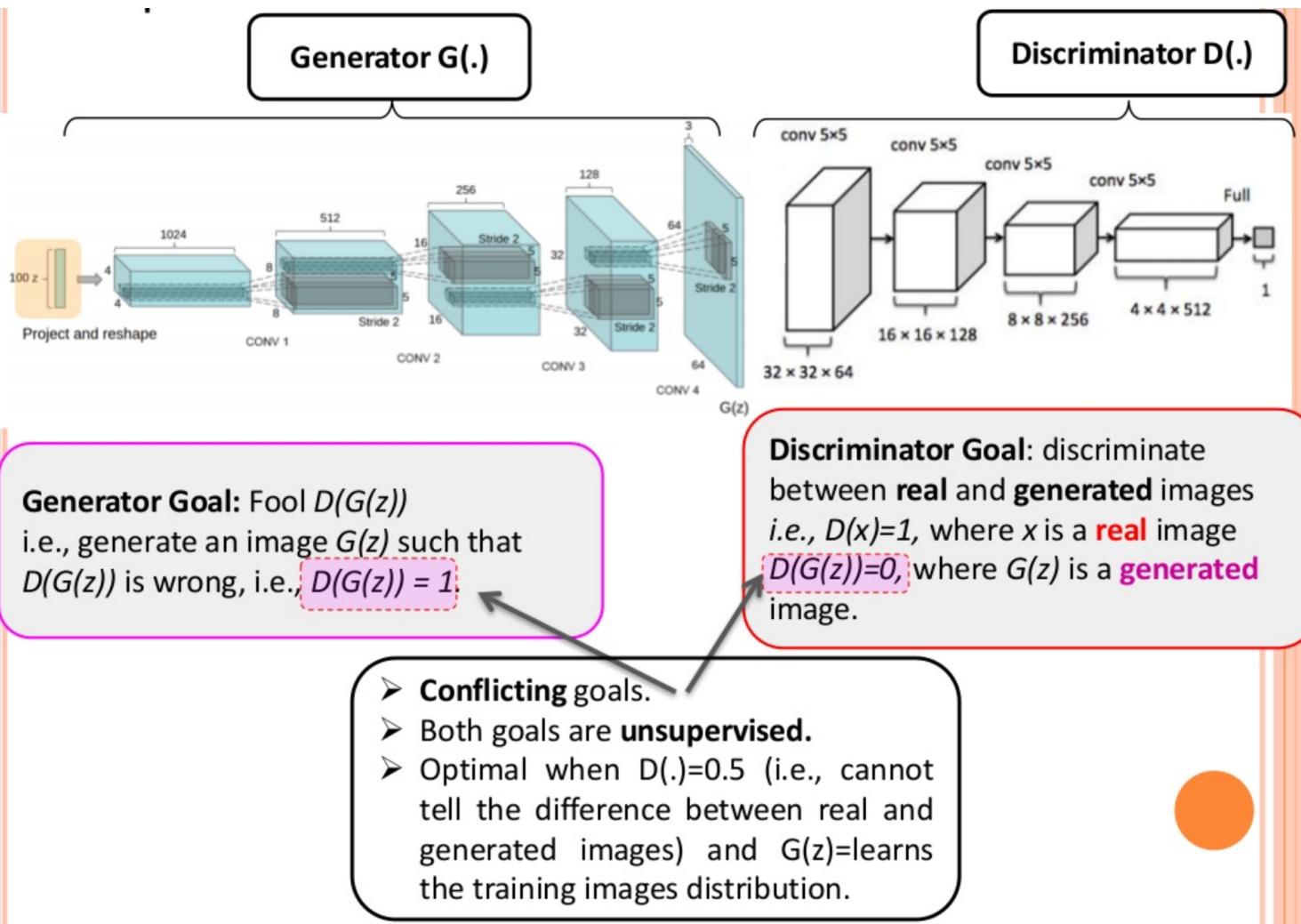


Example: Mnist Digits Generation

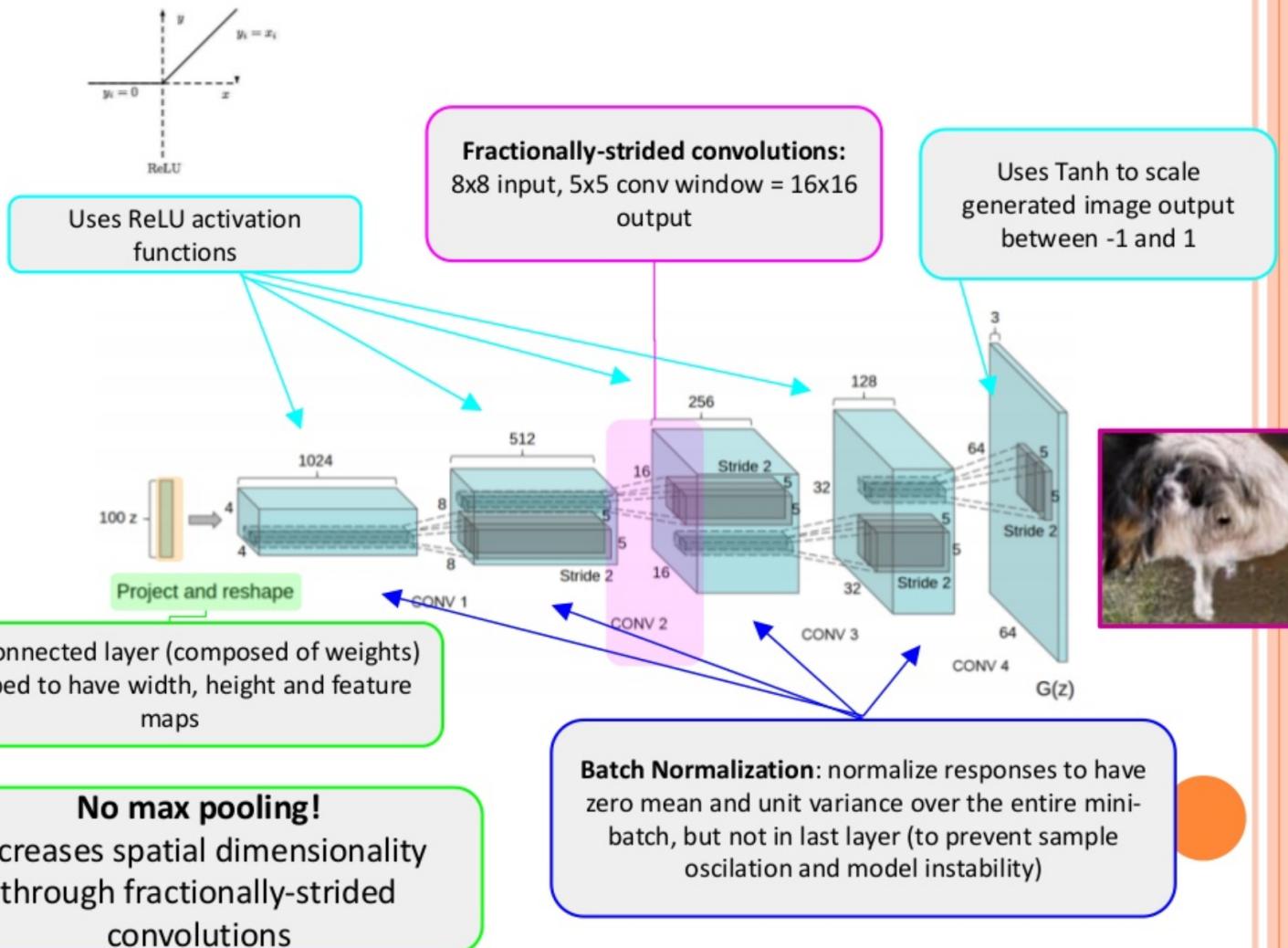




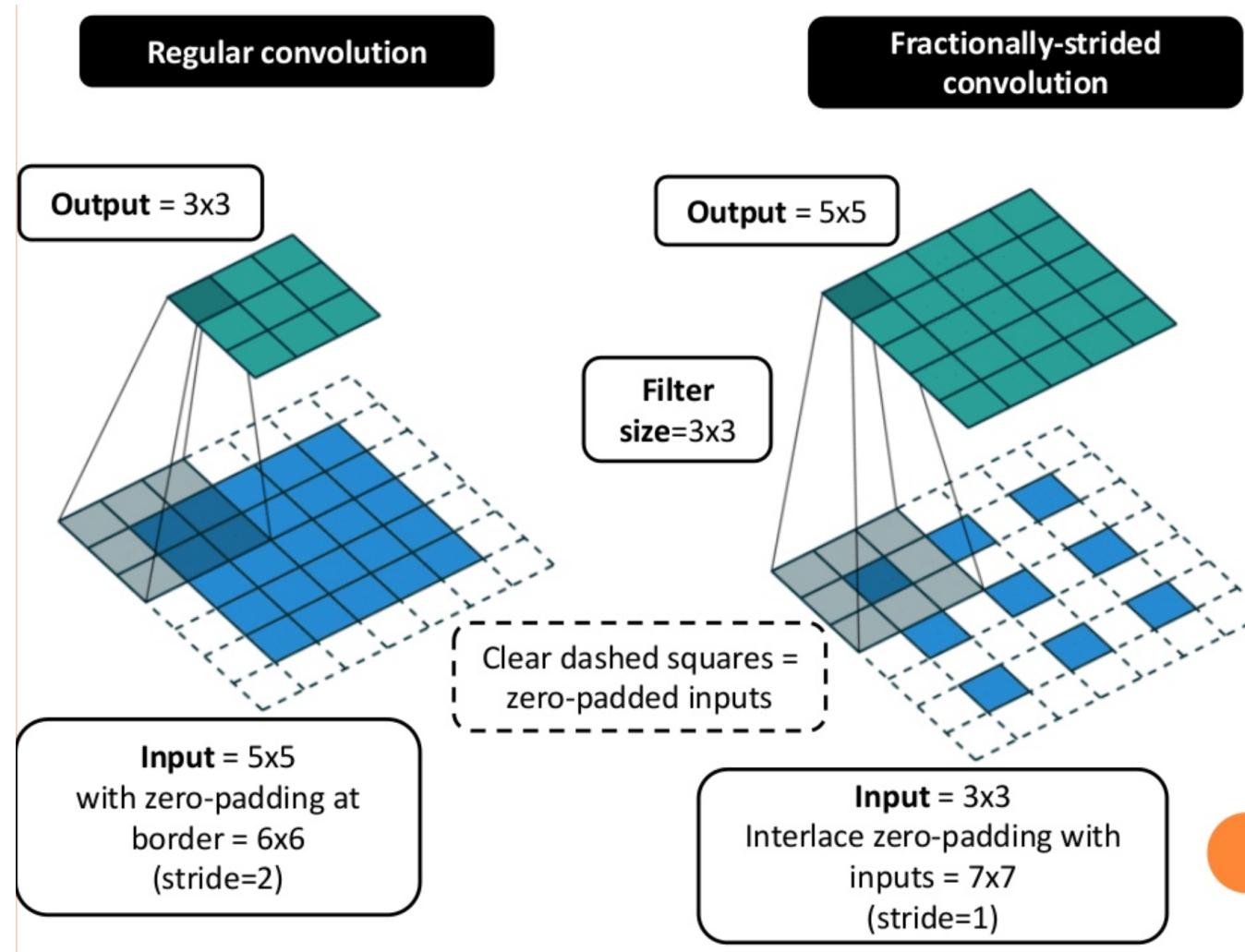
Example: Deep convolutional generative adversarial networks



DCGAN Generator:



Deconvolution Operator:



Cross-Domain

this flower is
white and pink in
color, with petals
that have veins.



- Text to Image

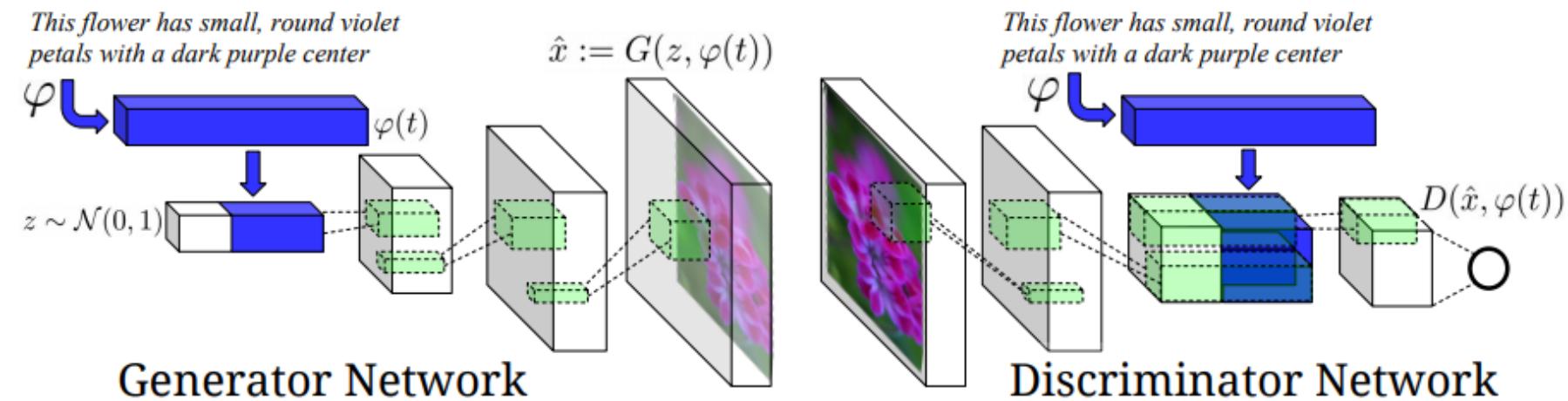
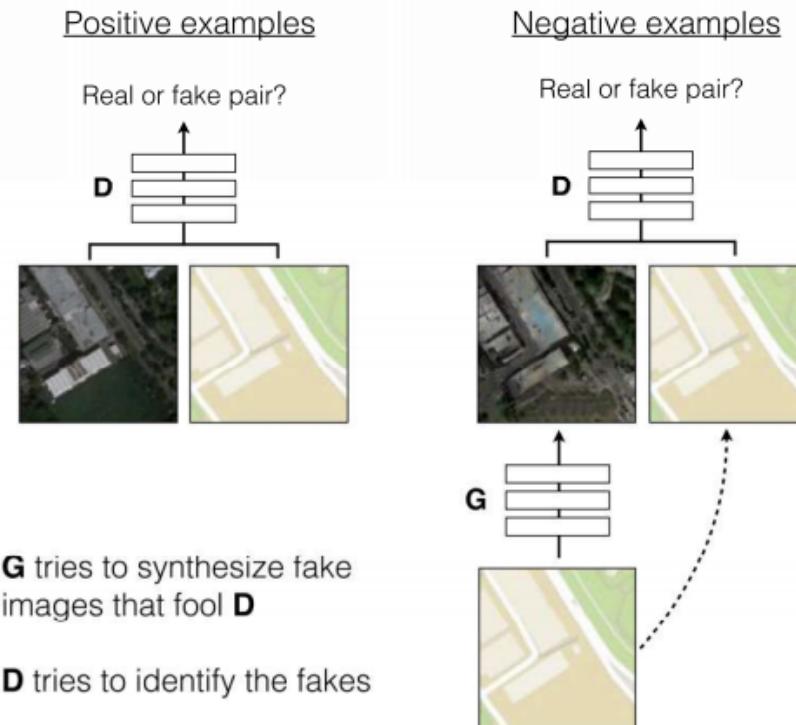


Figure 2. Our text-conditional convolutional GAN architecture. Text encoding $\varphi(t)$ is used by both generator and discriminator. It is projected to a lower-dimensions and depth concatenated with image feature maps for further stages of convolutional processing.

• Image Translation

Pix2pix: supervised image translation (Isola et al., CVPR 2017)

- Positive pair:
 - (Input, groundtruth)
- Negative pair:
 - (Input, synthesis)



Pairwise input?

From Image A to Image B:

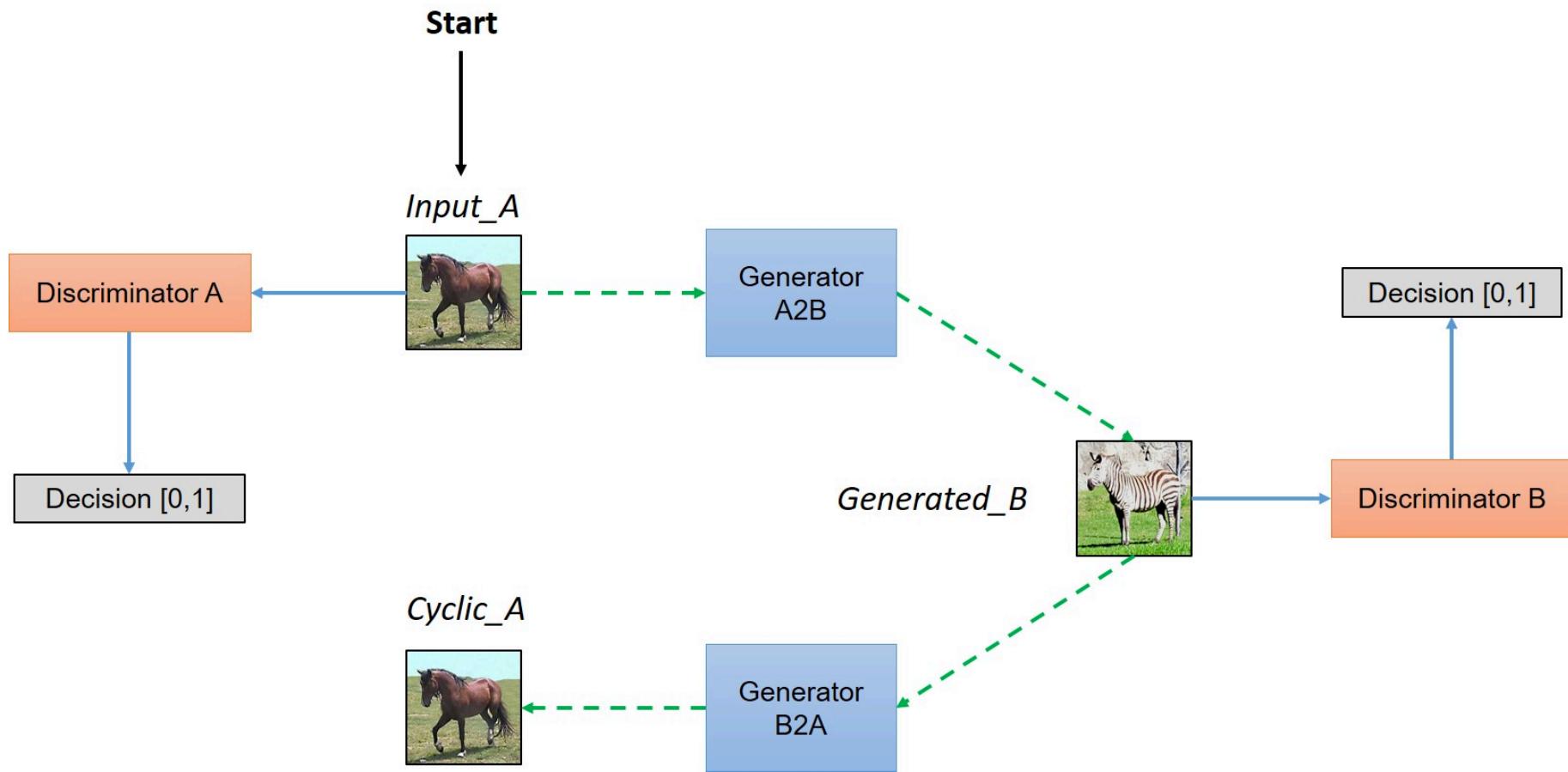
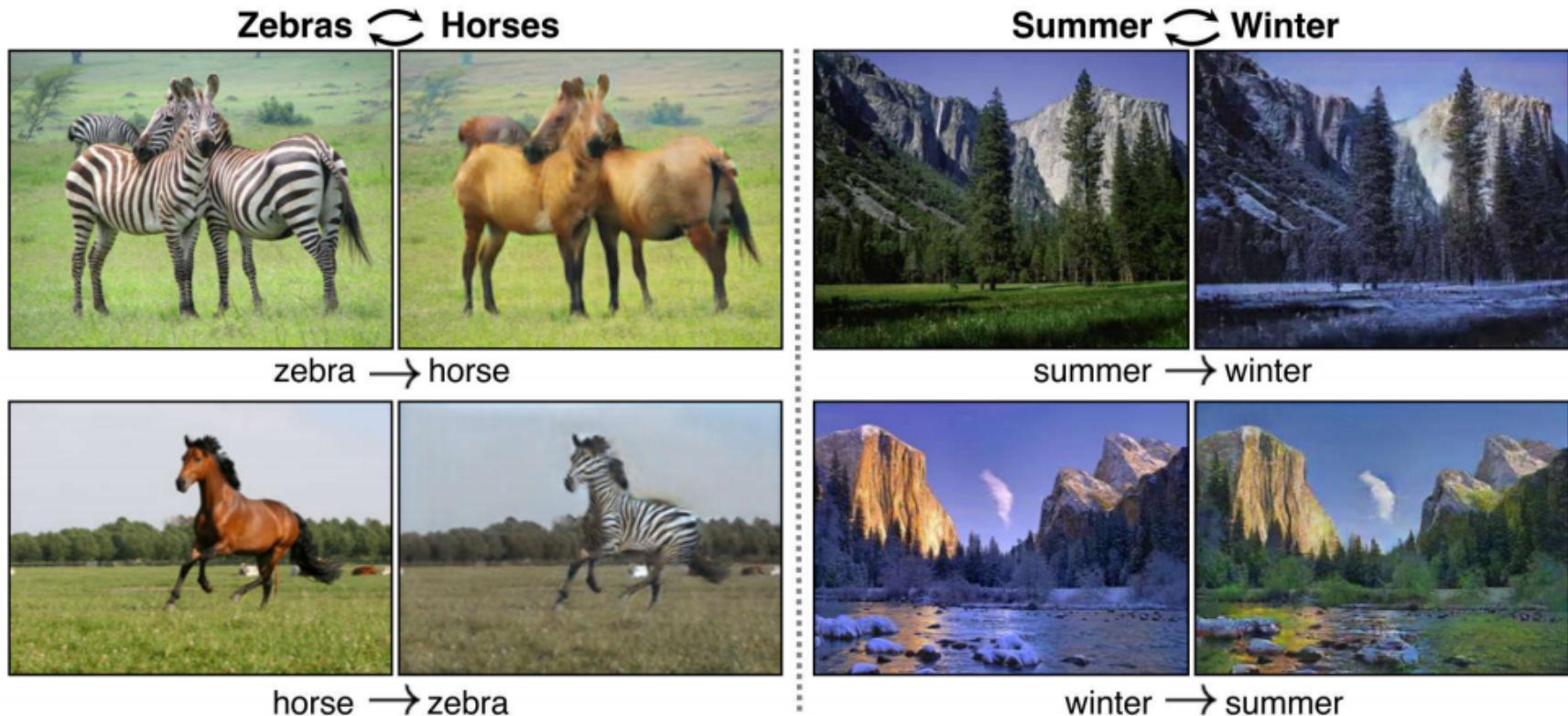


Image translation (Zhu et al., CVPR 2017)



Src: [Youtube](#)

From Image B to Image A:

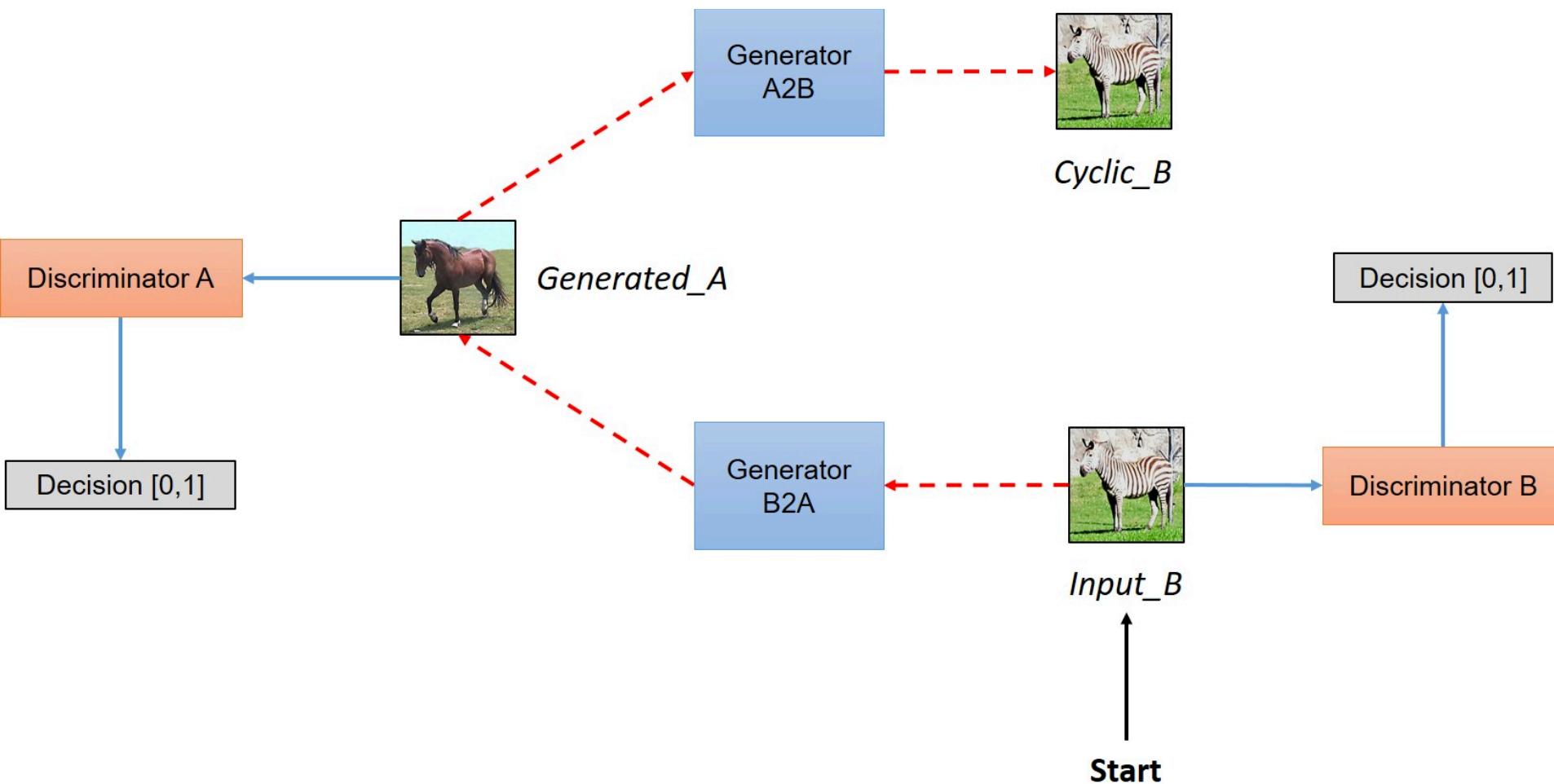


Image Editing

AttGAN: Facial Attribute Editing by Only Changing What You Want

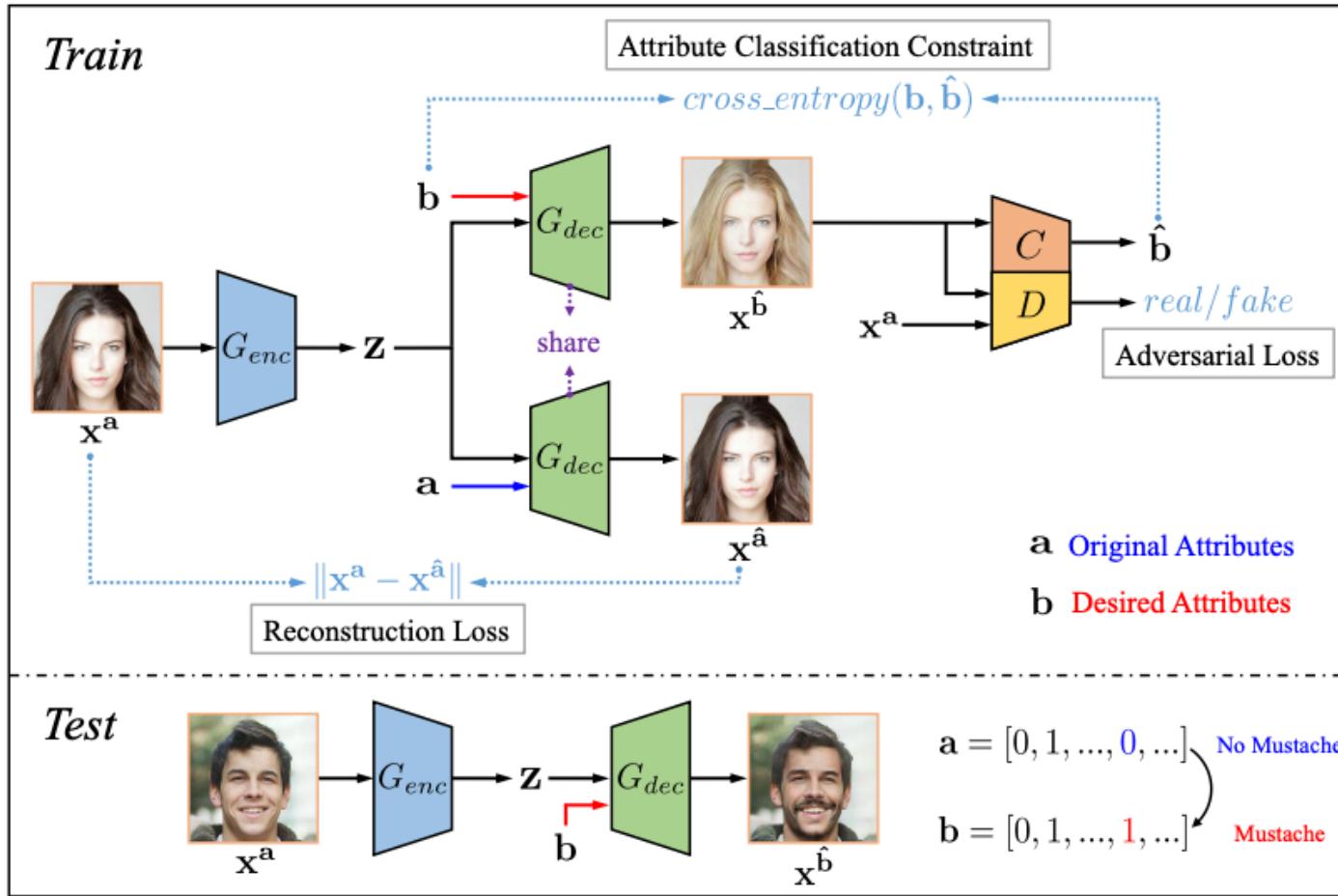
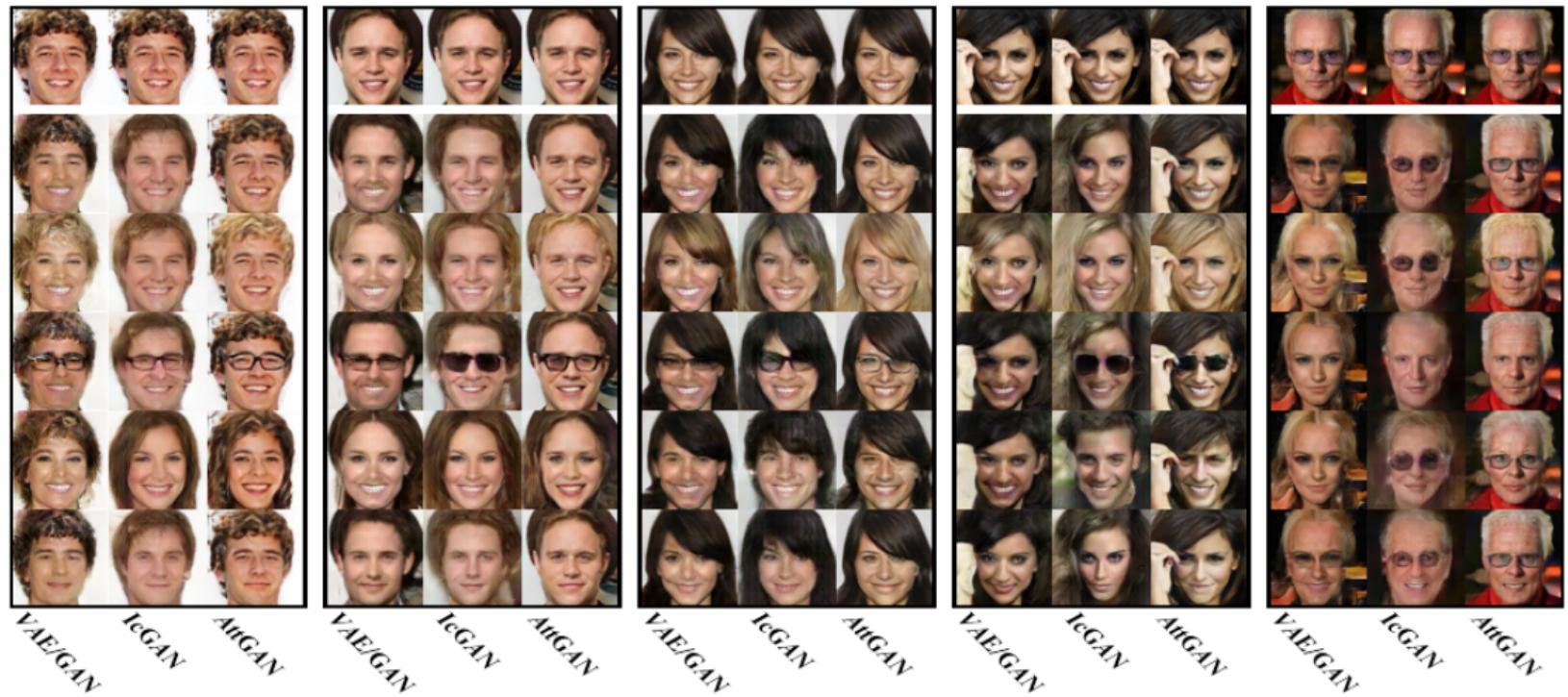
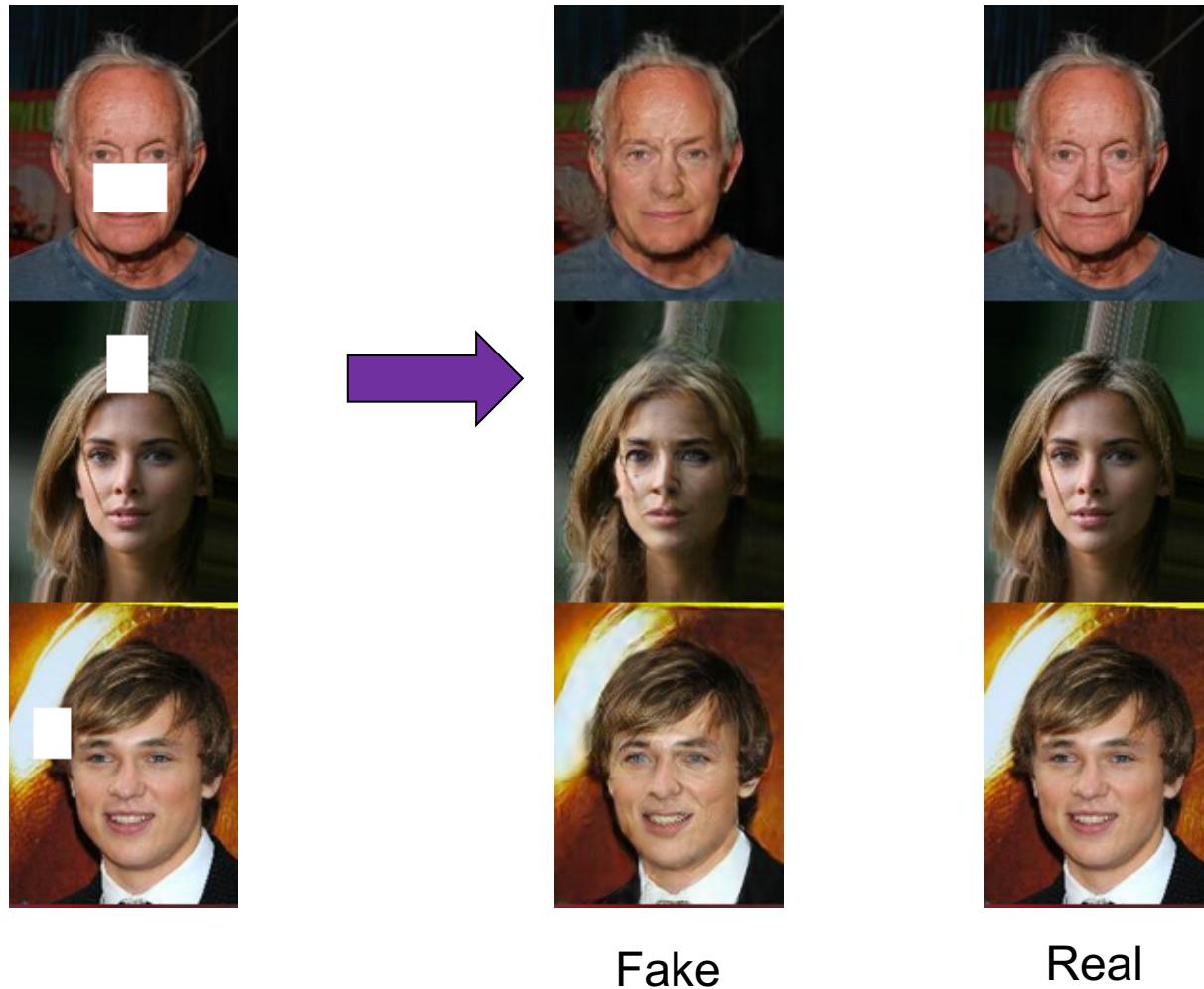


Fig. 2. Overview of our AttGAN, which contains three main components at training: the attribute classification constraint, the reconstruction learning and the adversarial learning. The attribute classification constraint guarantees the correct attribute manipulation on the generated image. The reconstruction learning aims at preserving the attribute-excluding details. The adversarial learning is employed for visually realistic generation.



(a) Comparisons with VAE/GAN [7] and IcGAN [8] on editing (inverting) specified attributes.

Quick Task



Src: https://www.cc.gatech.edu/~hays/7476/projects/Avery_Wenchen/

Thank you

- Enjoy AI music
- Remaining Class Schedule
- YOLO Project and Deep Learning Project
5 Discussion
- Good Luck on your finals

References

- <http://slazebni.cs.illinois.edu/spring17/>
- <https://cs.uwaterloo.ca/~mli/Deep-Learning-2017-Lecture7GAN.ppt>