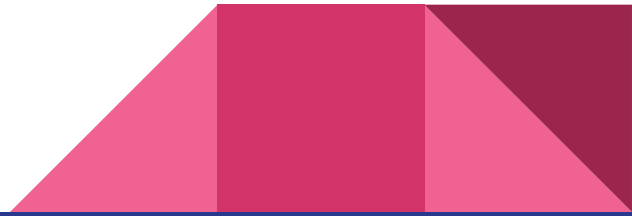
GAN-based Photo Video Synthesis

Summary of Generative Adversarial Nets

Lei Zhang

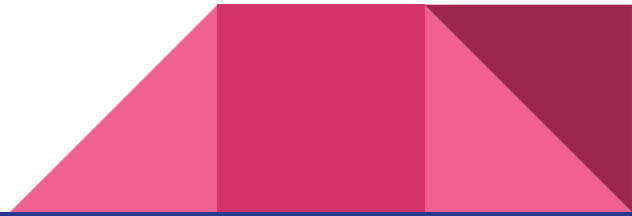
What is Generative Adversarial Networks (GAN)?

- Generative - creating new data that depends on the choice of the training set
- Adversarial - competitive between the two models: the Generator and the Discriminator
- Networks - neural networks



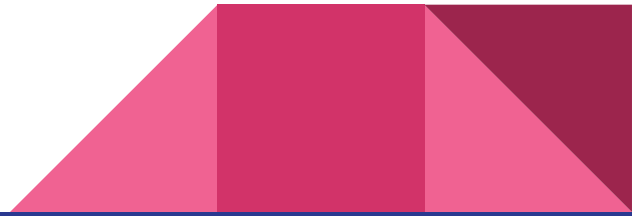
Two Networks

- GANs consist of two networks: the Generator (G) and the Discriminator (D)
- Generator - To produce examples that capture the characteristics of the training dataset
- Discriminator - To determine whether a particular example is real or fake



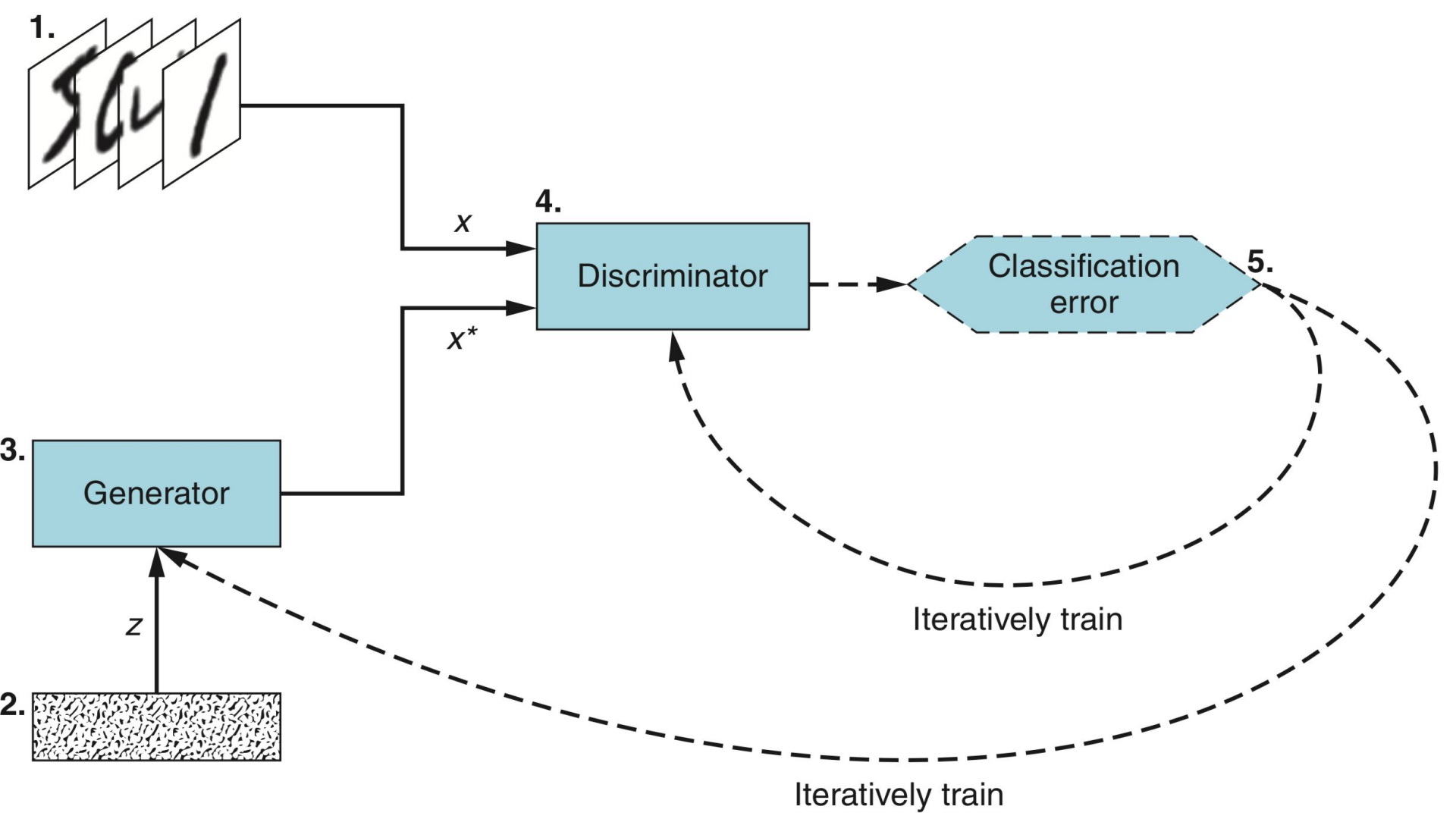
Two Networks

- The generative model can be thought of as analogous to a team of counterfeiters, trying to produce fake currency and use it without detection, while the discriminative model is analogous to the police, trying to detect the counterfeit currency.
- The generator learns through the feedback it receives from the discriminator’s classifications
- Create realistic-looking data from scratch
- Both networks continue to improve simultaneously



Generator and Discriminator subnetworks

	Generator	Discriminator
Input	A vector of random numbers	The Discriminator receives input from two sources: ▪ Real examples coming from the training dataset ▪ Fake examples coming from the Generator
Output	Fake examples that strive to be as convincing as possible	Predicted probability that the input example is real
Goal	Generate fake data that is indistinguishable from members of the training dataset	Distinguish between the fake examples coming from the Generator and the real examples coming from the training dataset


1.
x
4.
Discriminator
Classification error
5.
x*
3.
Generator
z
2.
Iteratively train
Iteratively train

Questions

- Will differentiable programming helps GAN?

REFERENCE

Goodfellow, I. J., Pouget-Abadie, J., Mirza, M., Xu, B., Warde-Farley, D., Ozair, S., Courville, A., and Bengio, Y. (2014). Generative adversarial nets. In NIPS'2014.

Langr, Jakub, and Vladimir Bok. GANs in Action. Manning Publications Co, 2019.