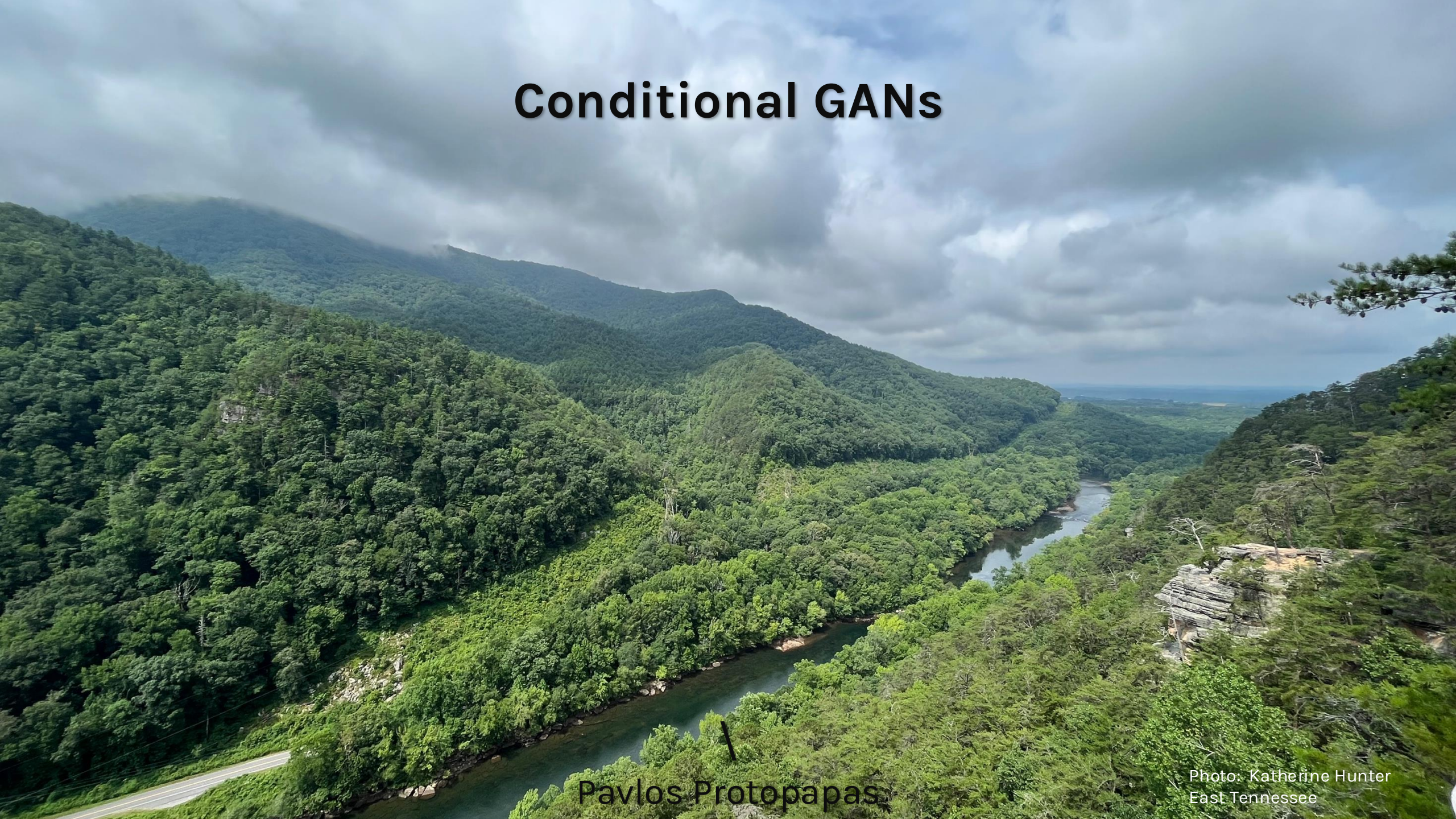
Conditional GANs



Pavlos Protopapas

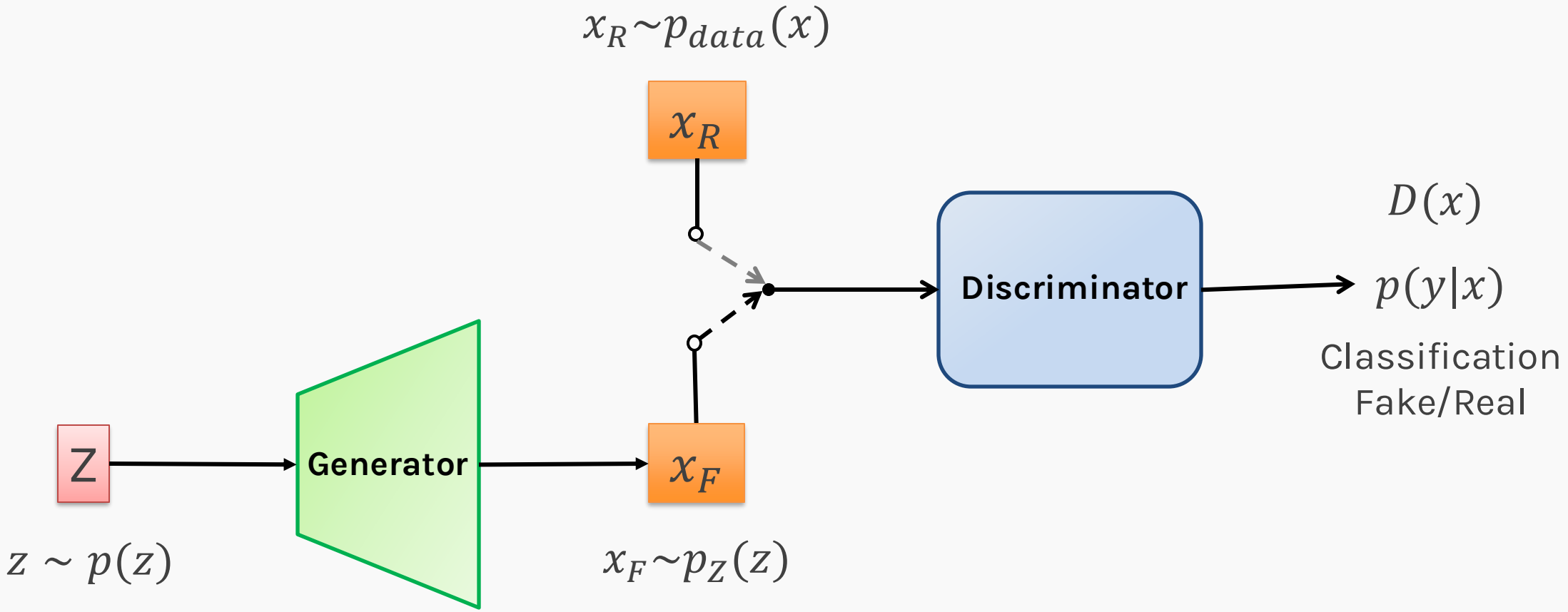
Photo: Katherine Hunter
East Tennessee

Outline

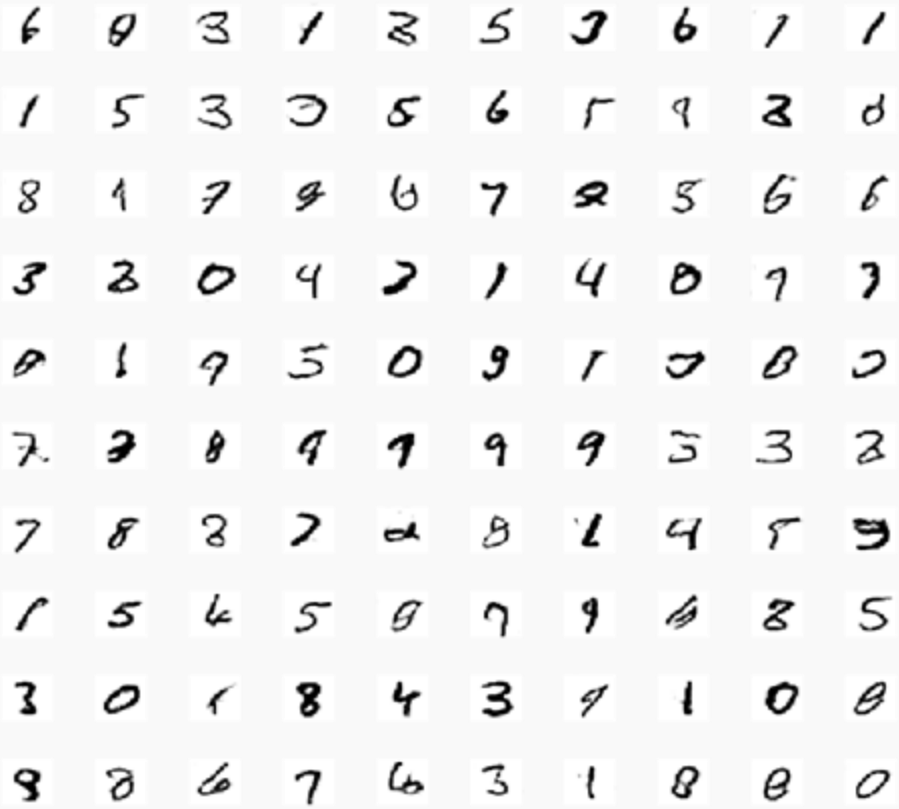
- Conditional GANs
- Auxiliary Classifier GANs

The GAN

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



Results of DCGAN

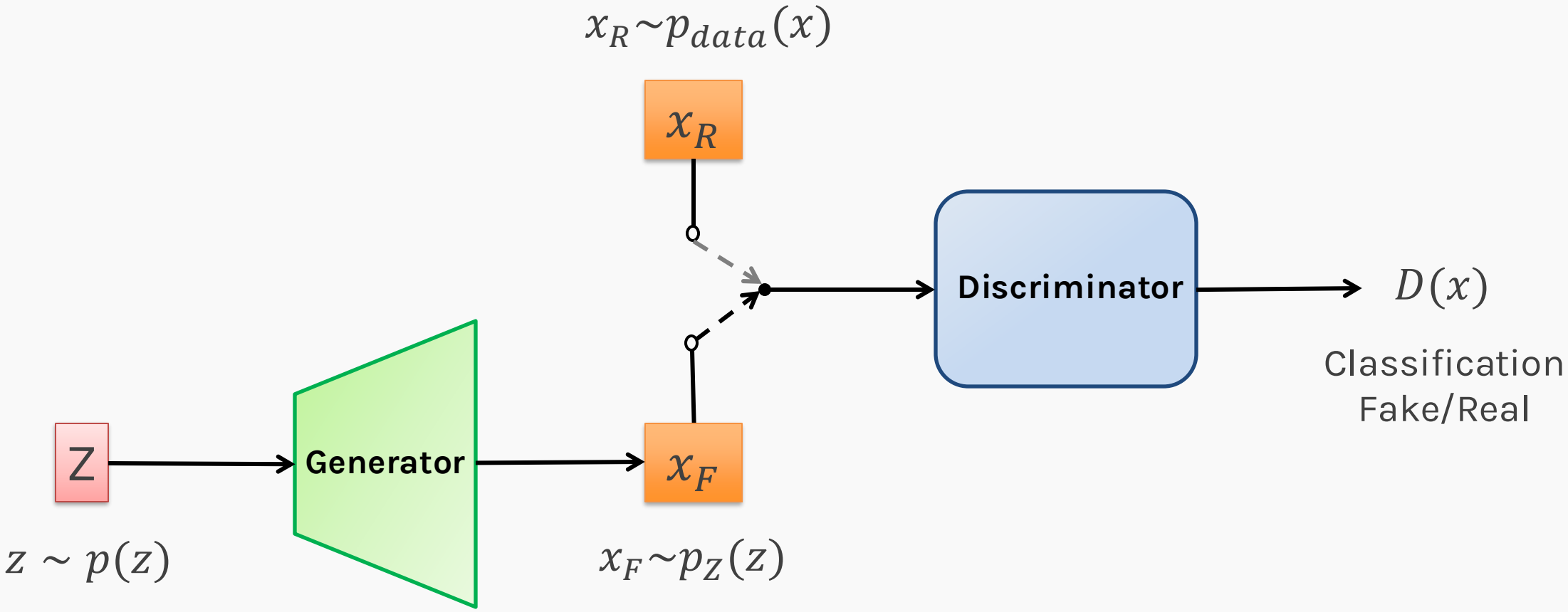


But what if I want a GAN that generates only the numbers 7 and 9?

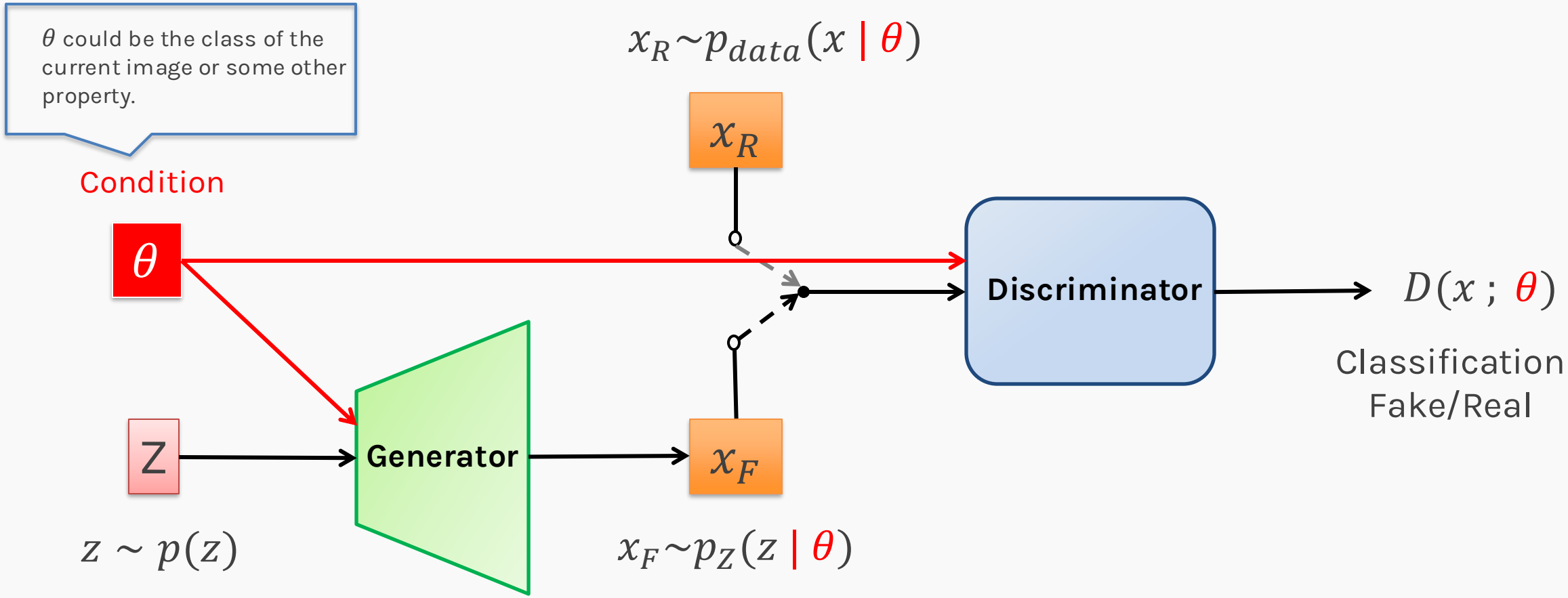
Outline

- **Conditional GANs**
- Auxiliary Classifier GANs

Conditional GANs



Conditional GANs



$$\min_G \max_D V(G,D) = \min_G \max_D \mathbb{E}_{x\sim p_{data}(x)} \log\big(D(x\,;\theta)\big) + \mathbb{E}_{z\sim p_Z(z)} \log\big(1 - D\big(G(z\,;\theta)\big)\big)$$

Conditional GANs

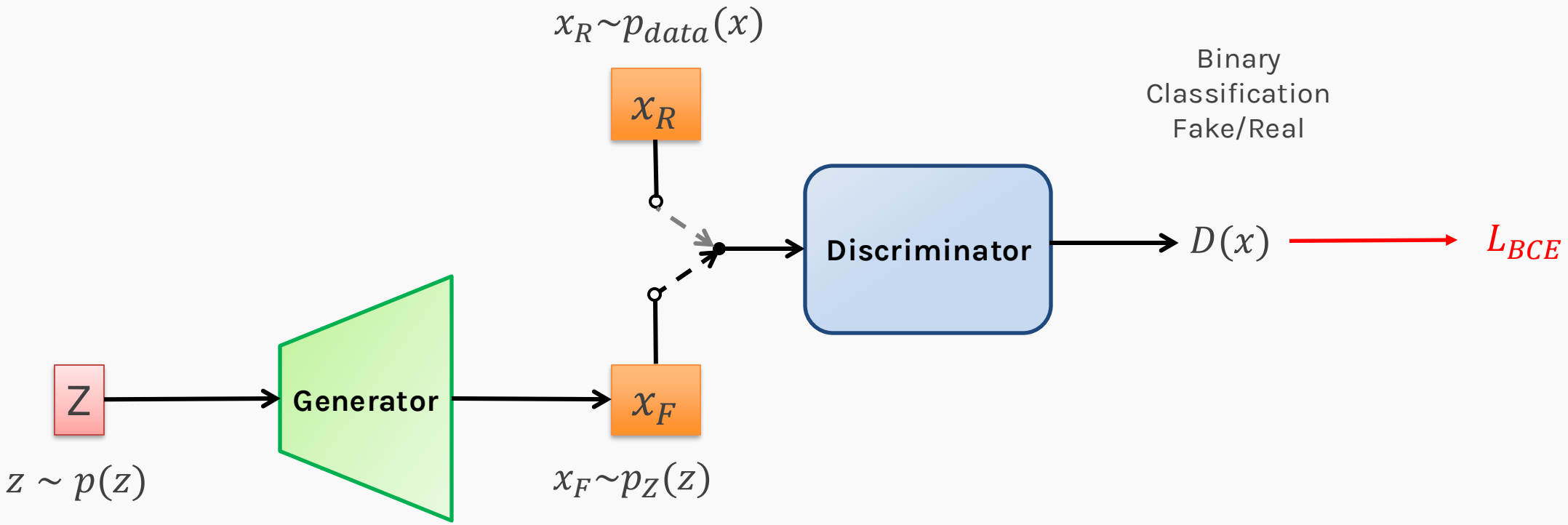
[Mirza et al. 2014]

In the above image, each row is conditioned on one label (i.e. one digit) and each column is a different generated sample.

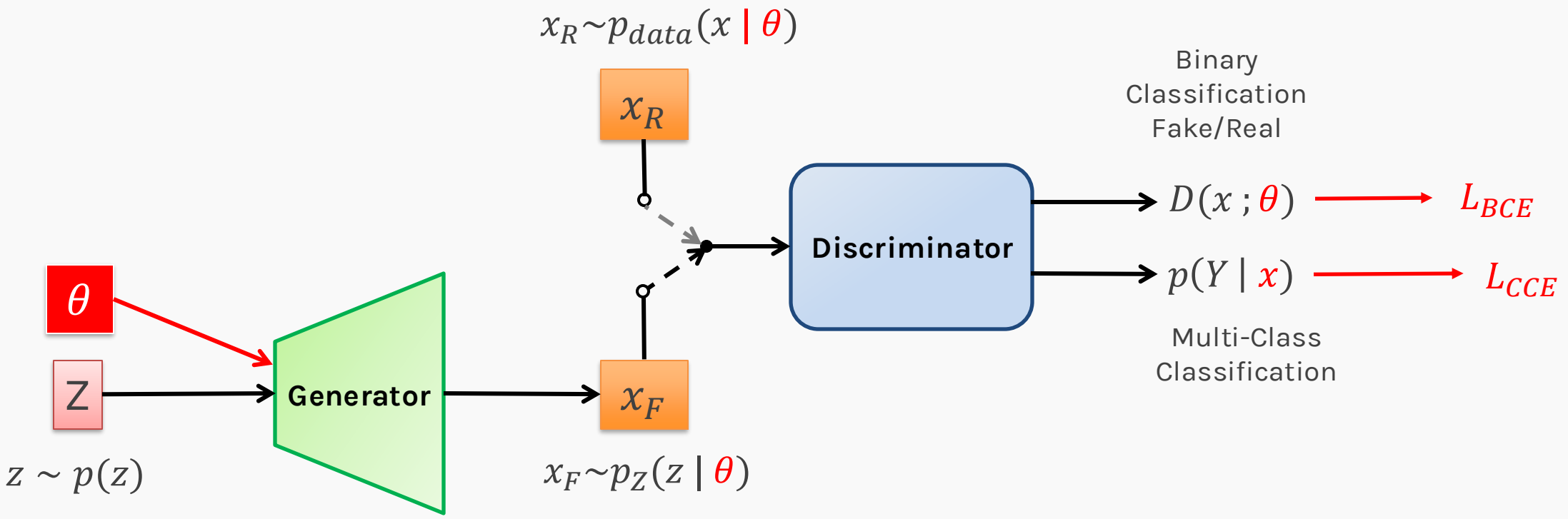
Outline

- Conditional GANs
- **Auxiliary Classifier GANs**

Auxiliary Classifier GANs



Auxiliary Classifier GANs

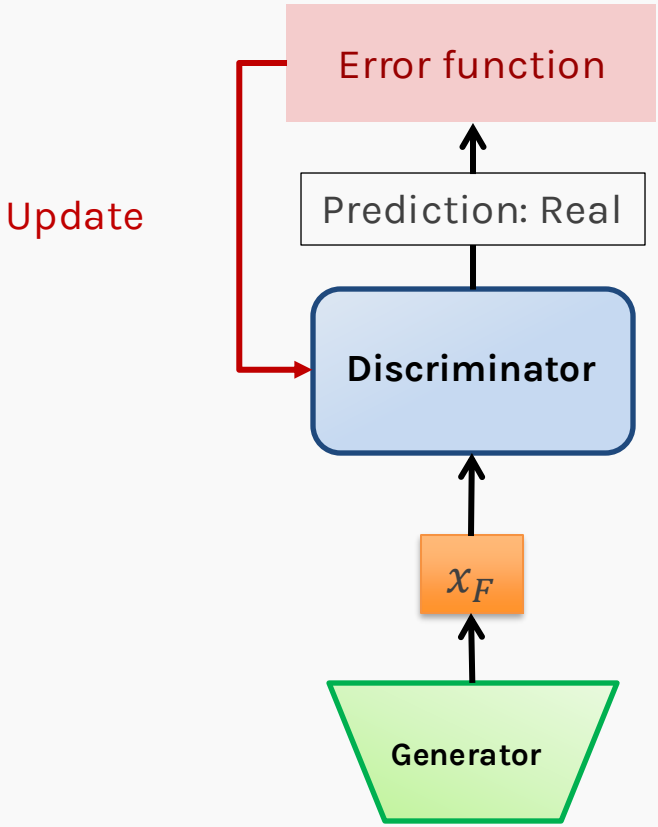


Hyperparameter

$$L = L_{BCE} + \lambda L_{CCE}$$

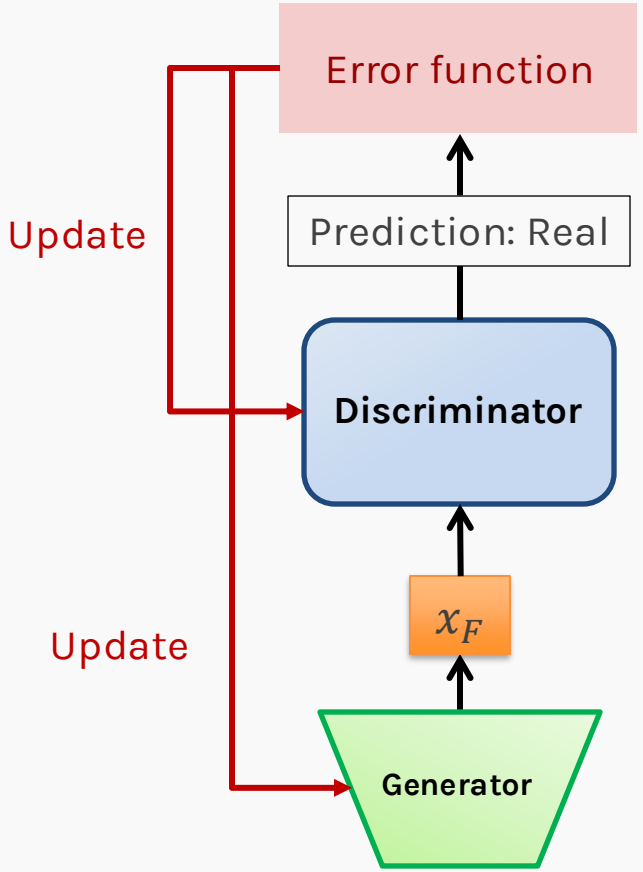
Auxiliary Classifier GANs

Input: Fake, D: Real



Vanilla GAN

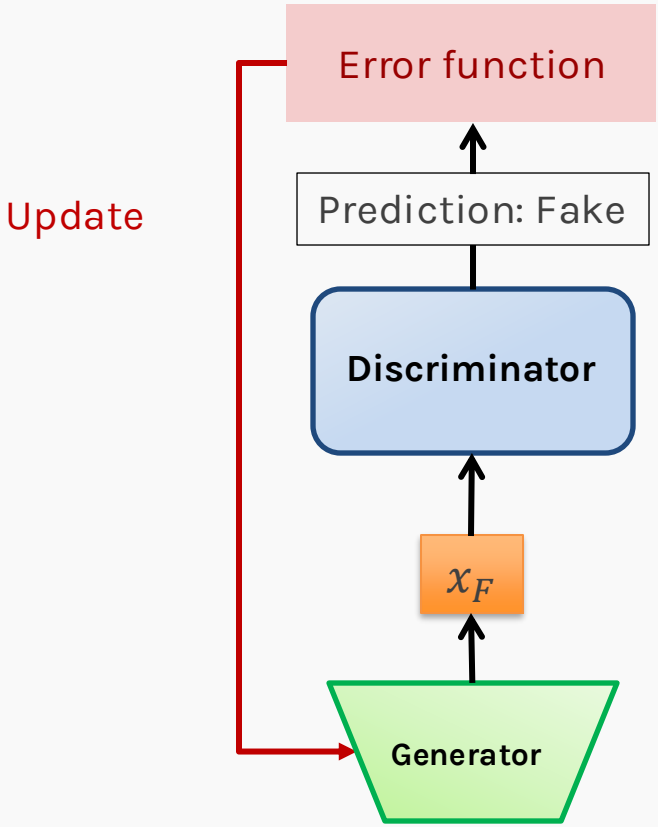
Input: Fake, D: Real but wrong class



AC GAN

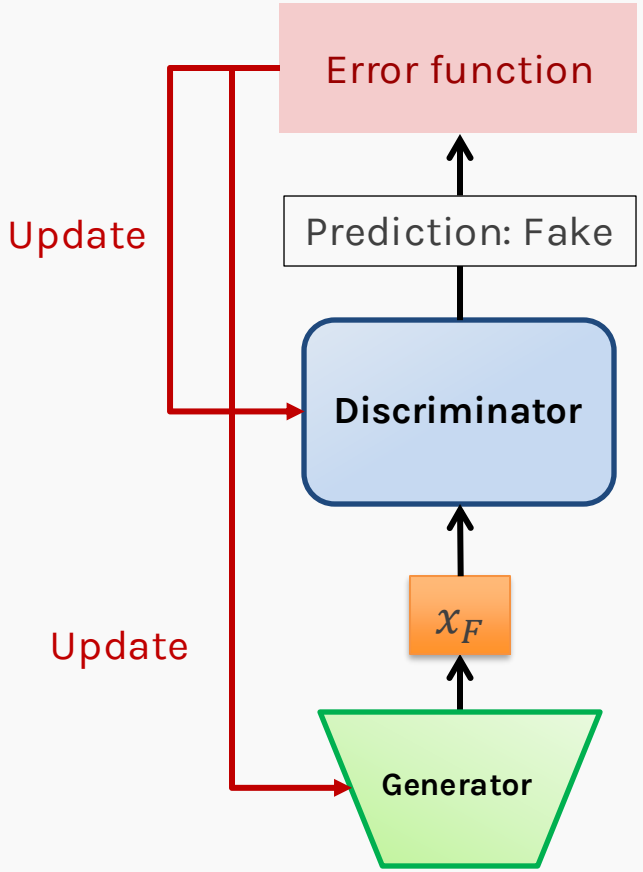
Auxiliary Classifier GANs

Input: Fake, D: Fake



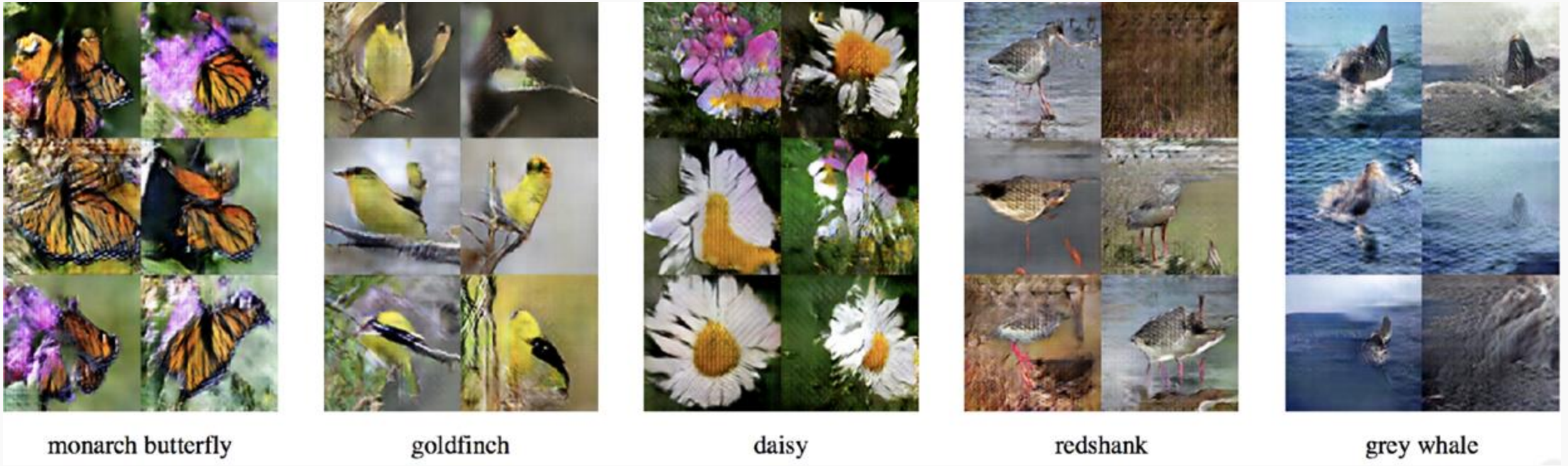
Vanilla GAN

Input: Fake, D: Fake but wrong class



AC GAN

Auxiliary Classifier GANs



[Odena et al. 2016]

Thank you

Photo: Pavlos
Saint. Lucia