GANs for Creativity and Design

Ian Goodfellow, Staff Research Scientist, Google Brain

NIPS Workshop on ML for Creativity and Design

Long Beach, CA 2017-12-08
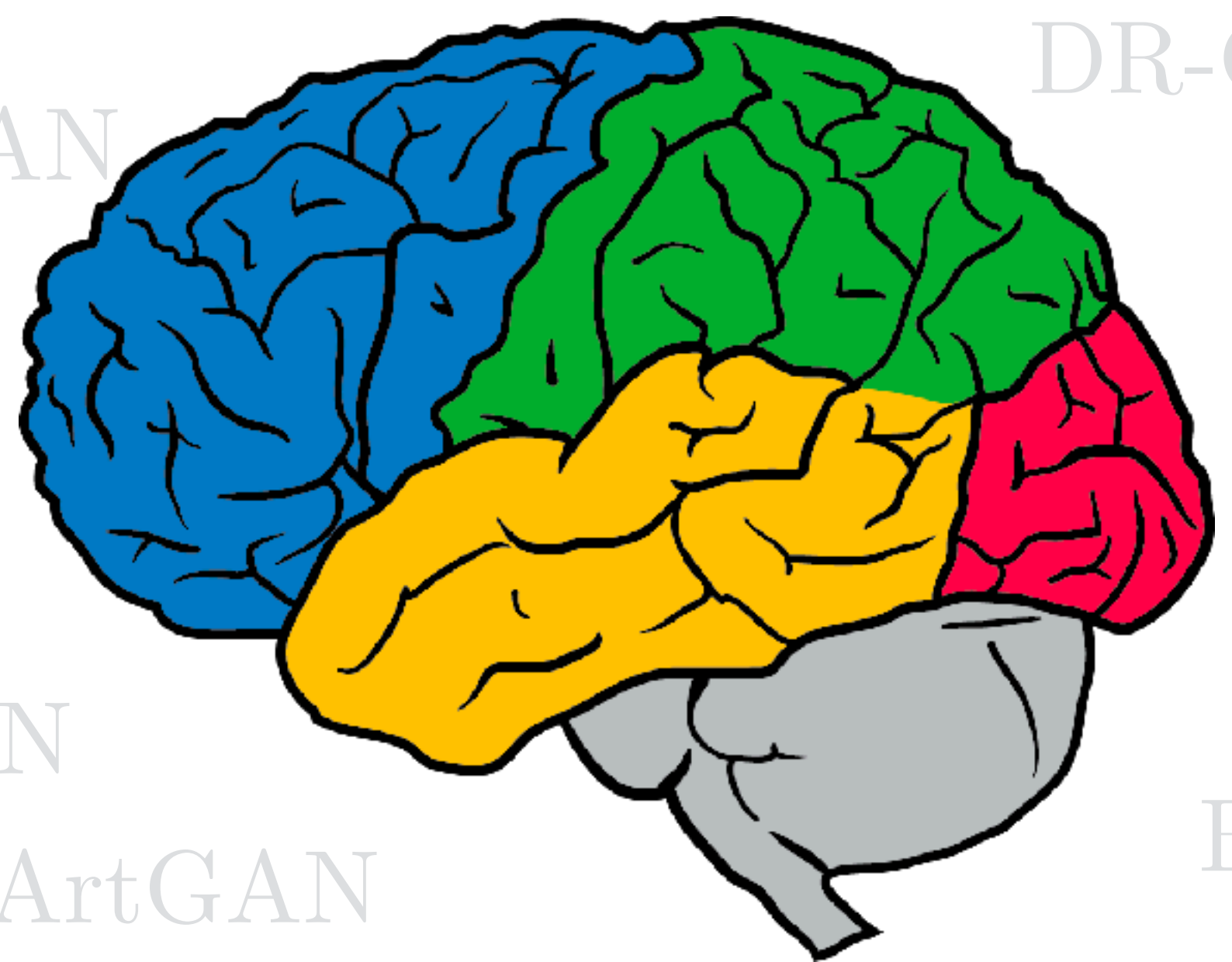
no mention of *realism*

Generative Modeling

- Density estimation
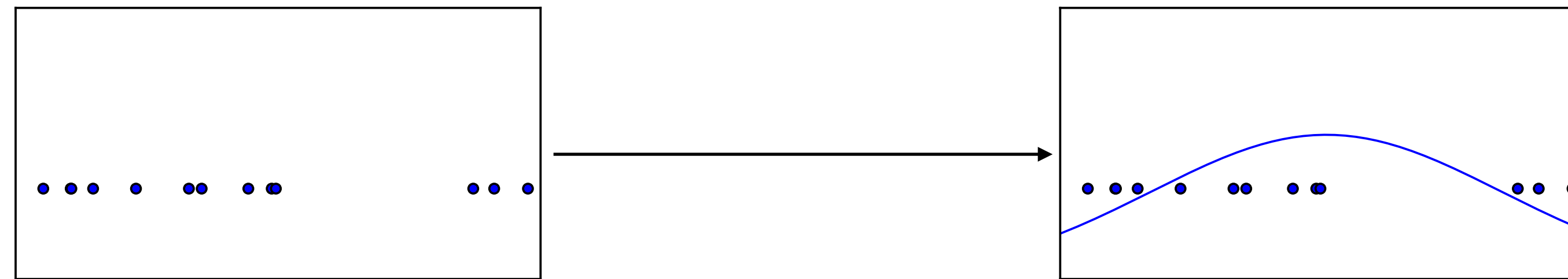
- Sample generation

Training examples   Model samples

Adversarial Nets Framework

D(x) tries to be near 1

D tries to make $D(G(z))$ near 0, G tries to make $D(G(z))$ near 1

Differentiable function D

D

x sampled from data

x sampled from model

Differentiable function G

Input noise z

(Goodfellow et al., 2014)
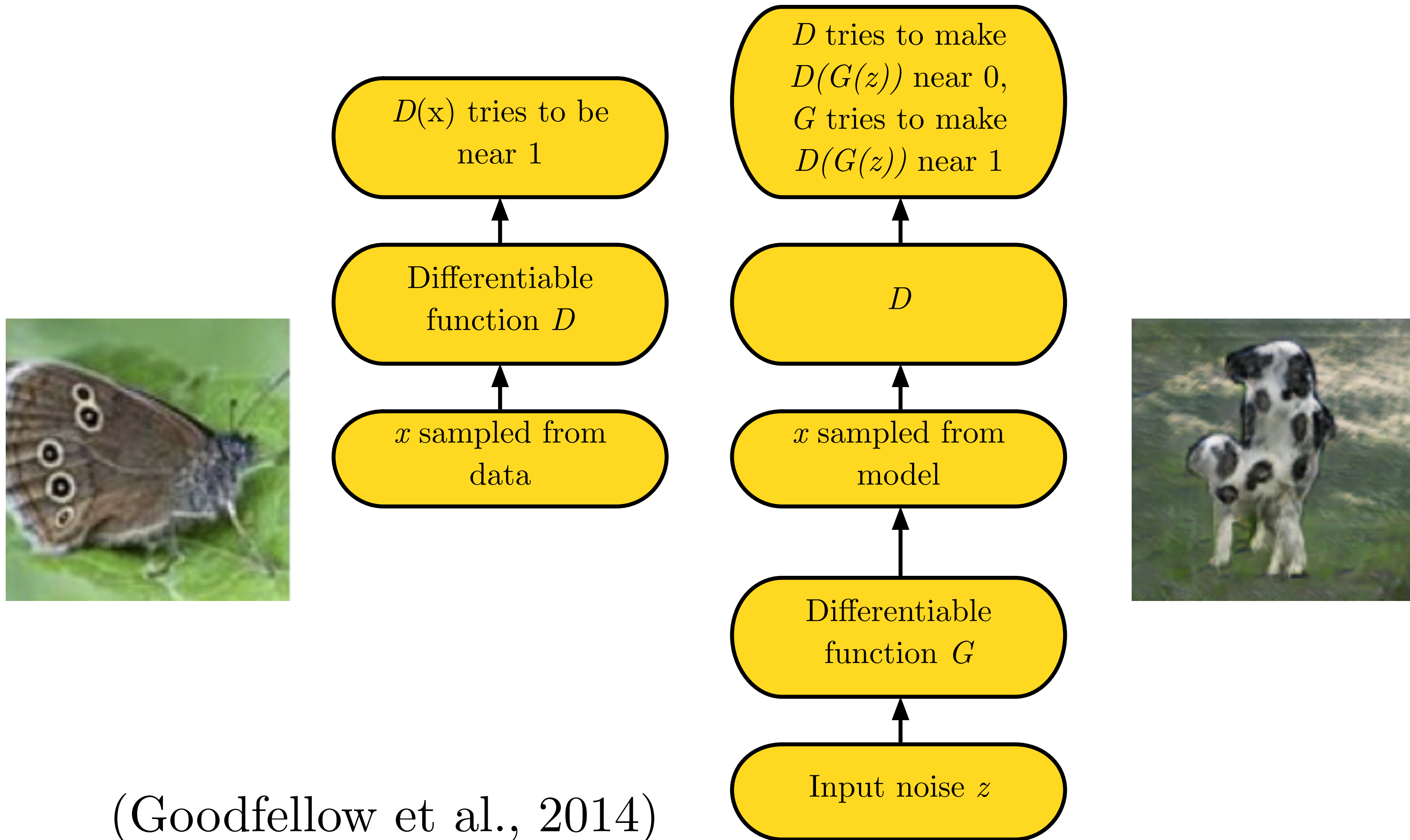
Imagination

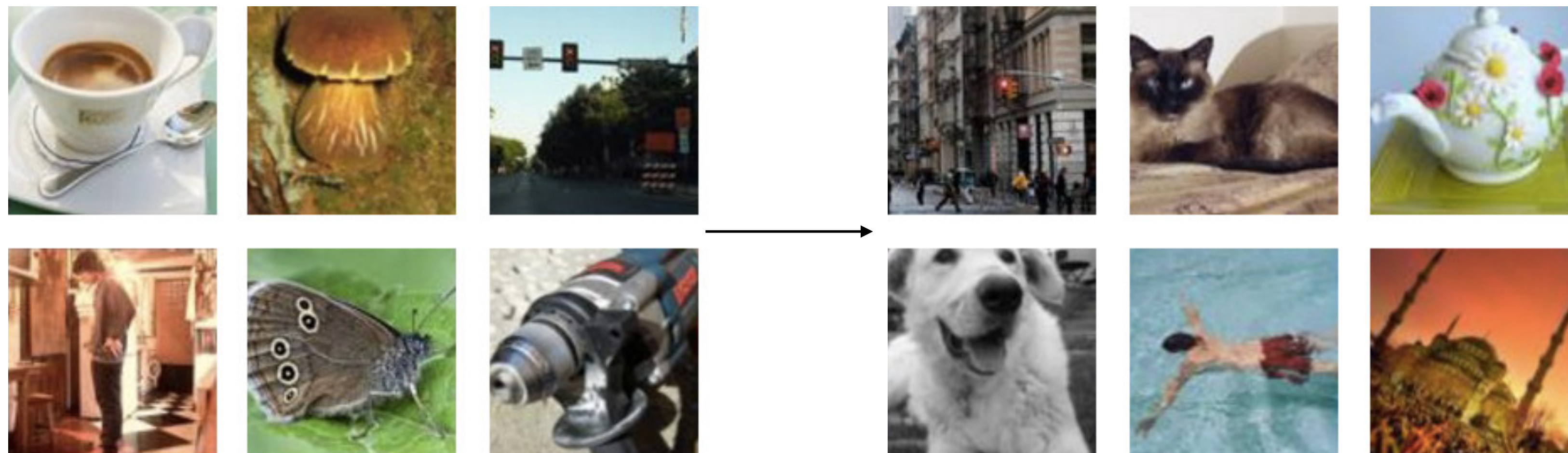**Definition of** IMAGINATION

1   : the act or power of forming a mental image of something not present to the senses or never before wholly perceived in reality

(Merriam Webster)

What is in this image?

"not present to the senses"

(Yeh et al., 2016)

Generative modeling reveals a face

"not present to the senses"

(Yeh et al., 2016)

Celebrities who have never existed

"never before wholly perceived in reality"

(Karras et al., 2017)

Is imperfect mimicry originality?

(Karras et al., 2017)
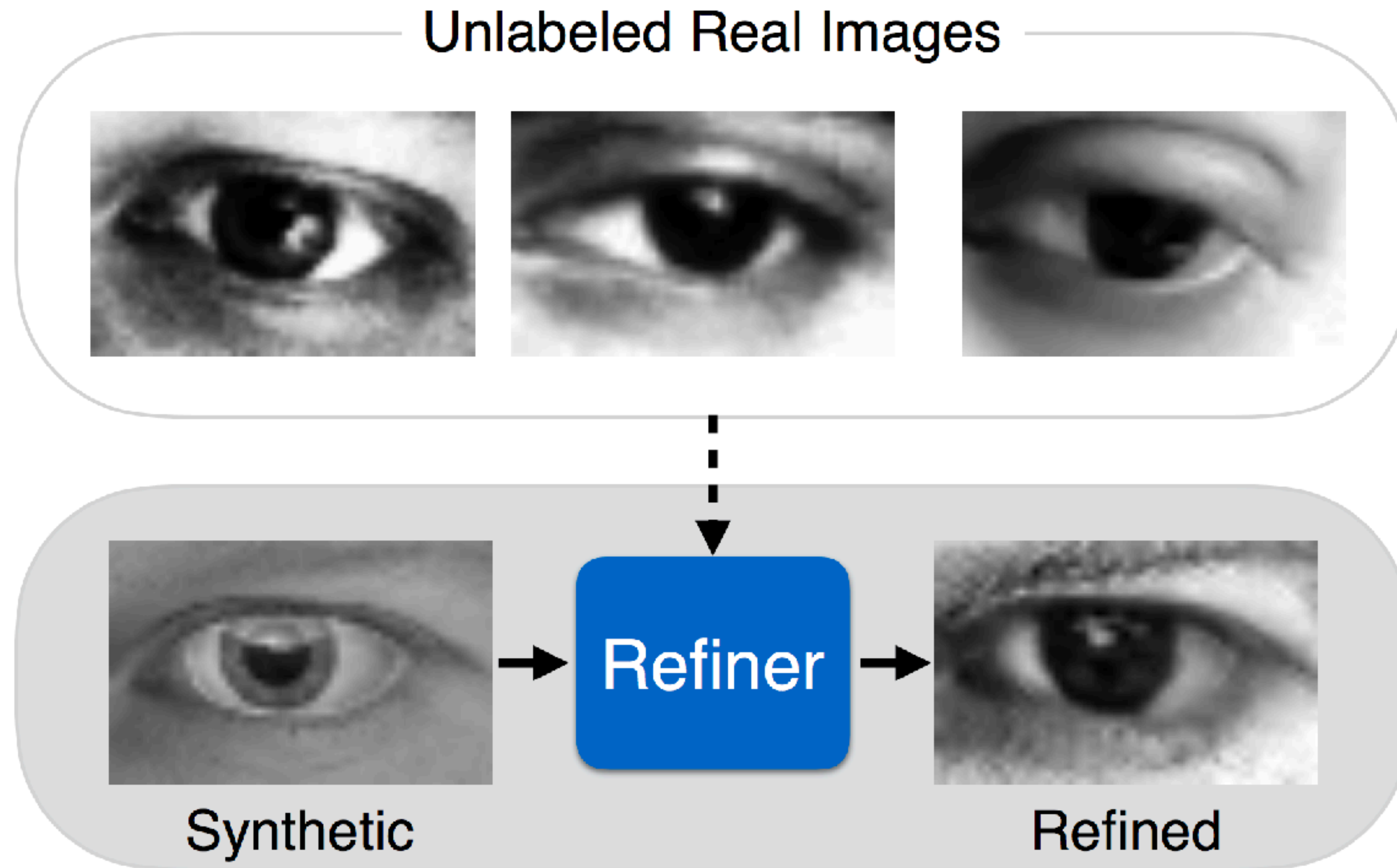
Creative Adversarial Networks

See this
afternoon's
keynote

(Elgammal et al., 2017)
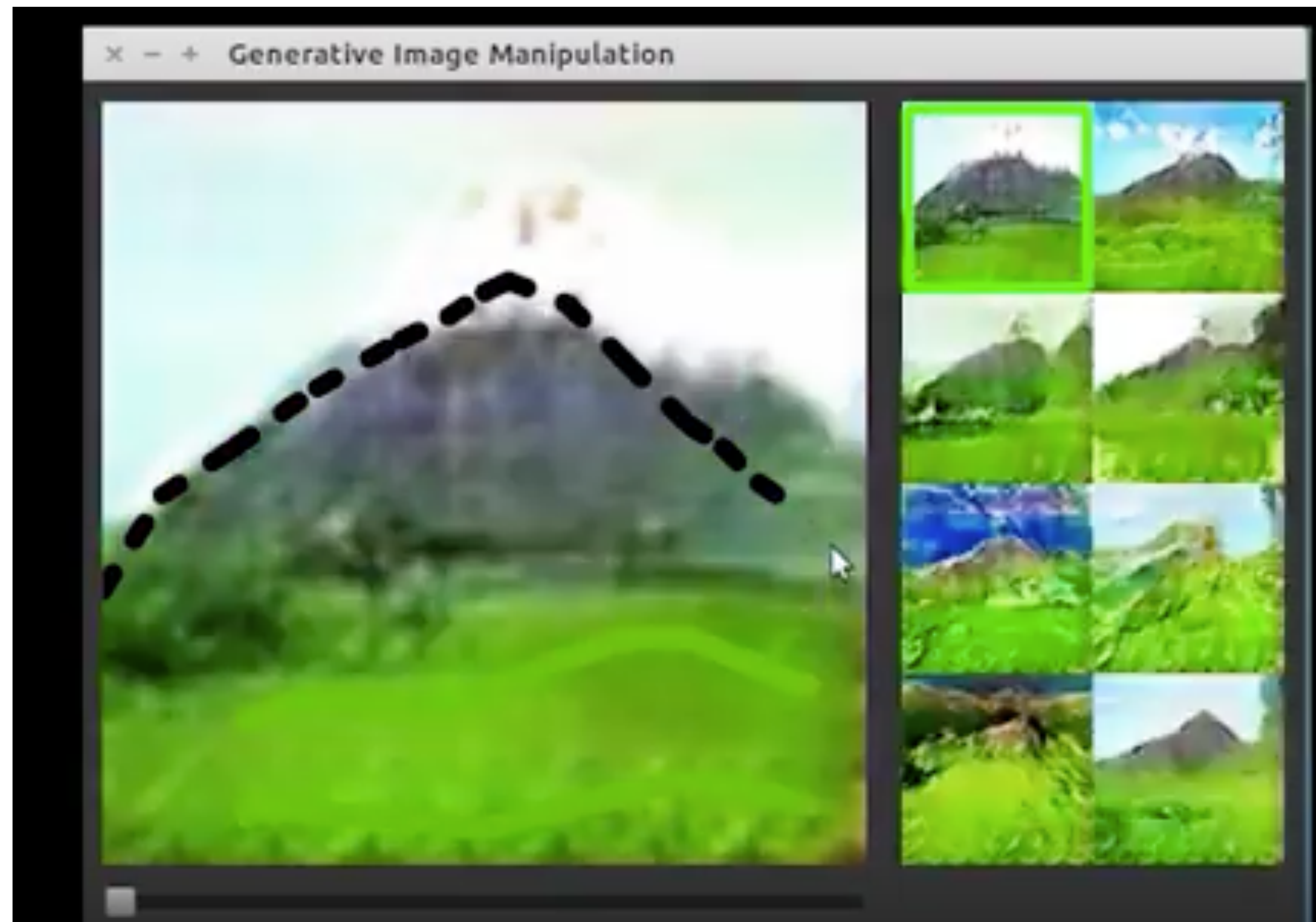
GANs for design

- A lower bar than "true creativity"

- A tool that assists a human designer

GANs for simulated training data
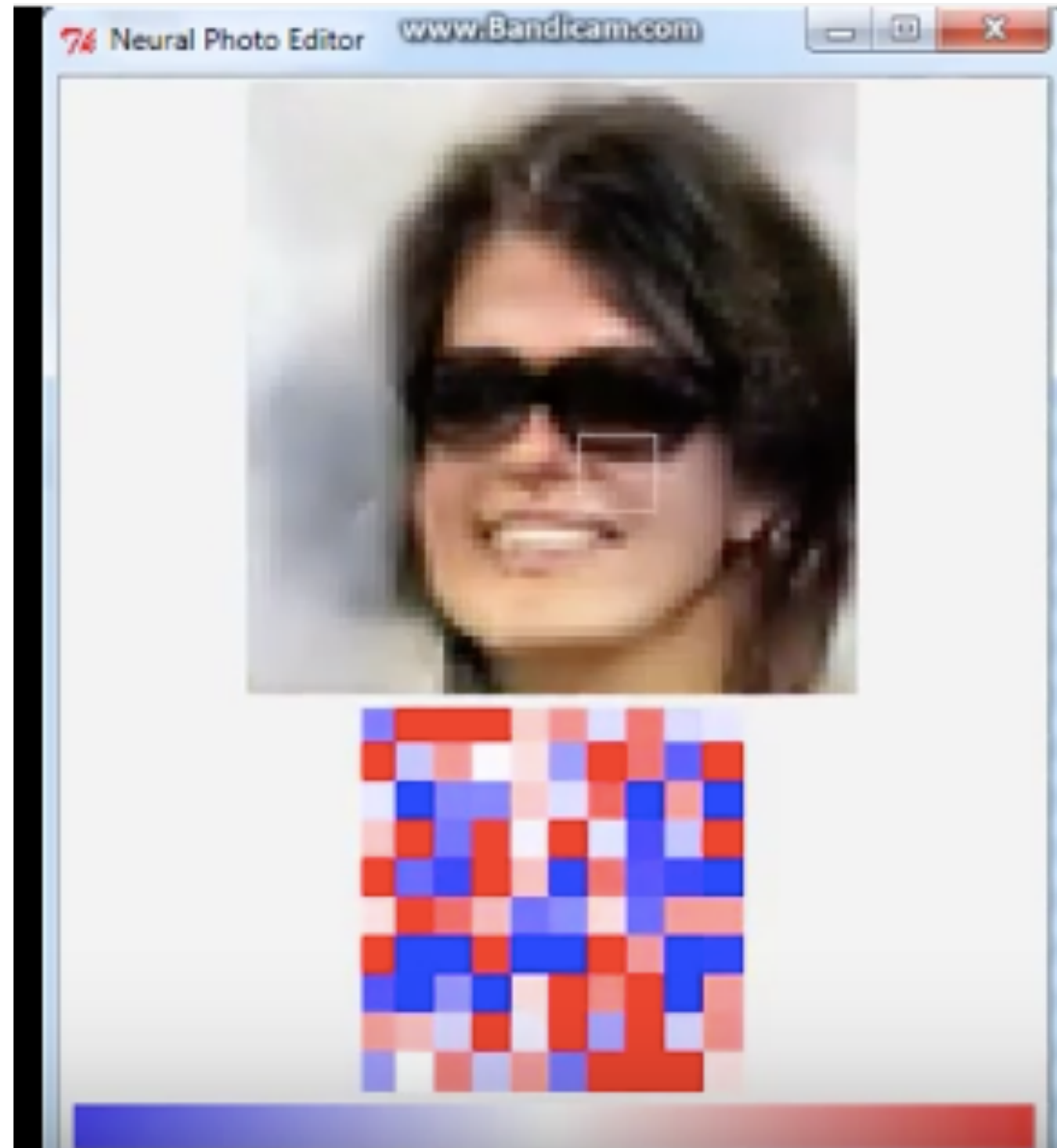

(Shrivastava et al., 2016)

iGAN

youtube

(Zhu et al., 2016)

Introspective Adversarial Networks

youtube

(Brock et al., 2016)

Image to Image Translation

(Isola et al., 2016)

Unsupervised Image-to-Image Translation

Day to night

(Liu et al., 2017)

CycleGAN

(Zhu et al., 2017)

vue.ai

vue.ai

Future directions

- Beyond realism: train the discriminator to estimate how appealing an artifact is, in addition to or instead of modeling whether the design is statistically similar to past designs

- Extreme personalization: highly automate design to generate artifacts to fit each customer or appeal to each customer's tastes

- GAN-based simulators to help test artifacts being designed (vue.ai is a first step in this direction)

Conclusion

- GANs are useful tools for design

- GANs have a form of imagination

- It is debatable whether GANs are "original" enough to count as truly creative. Though designed to perfectly *mimic* a pattern, they can be used to do more than that