

Toward visual definitions of cognitive impressions

Phillip Isola
GANocracy 2019

Work with Lore Goetschalckx, Alex Andonian, Aude Oliva

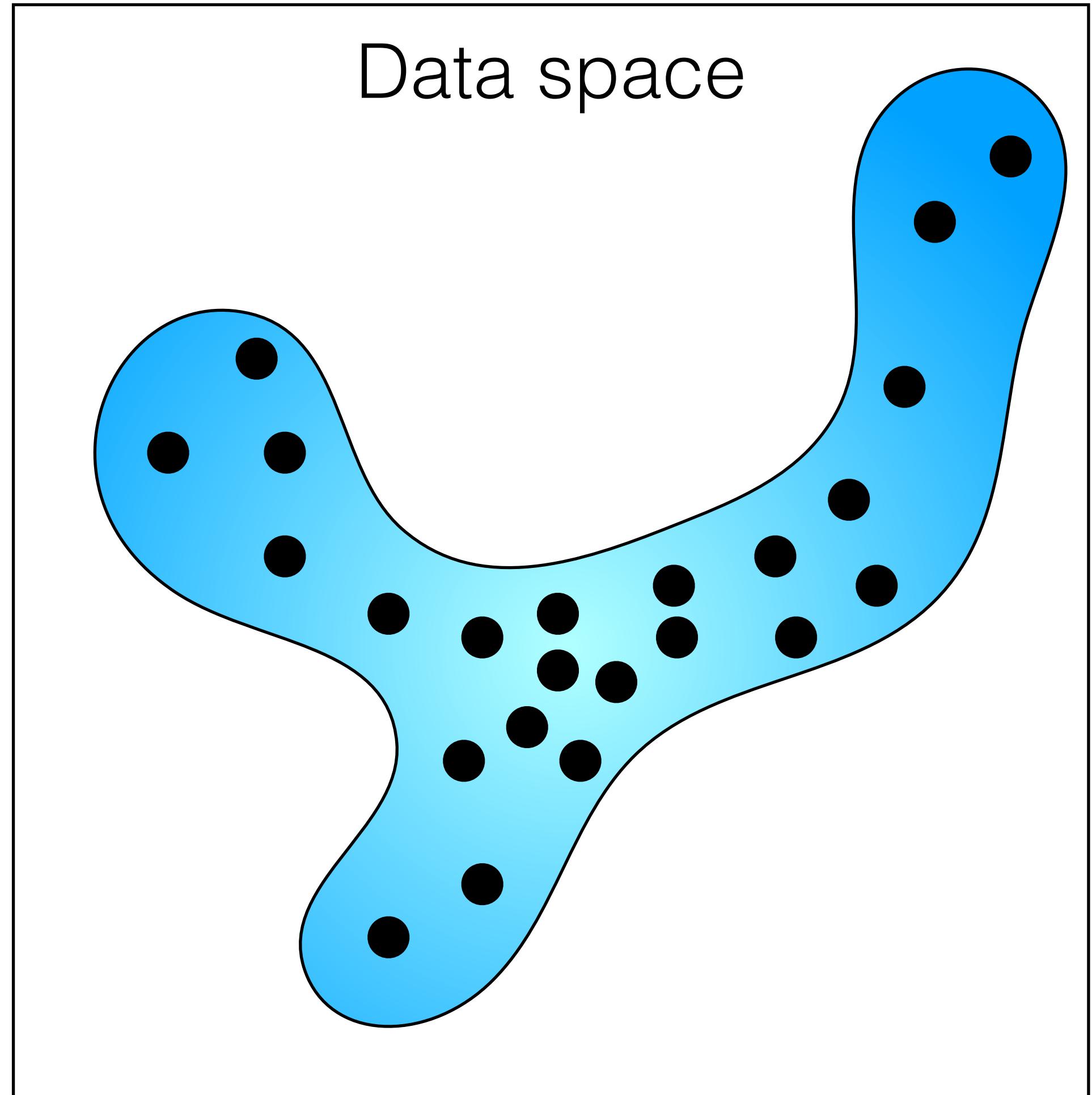


Generative models as data visualization

Data samples



Data space



Model interpolations

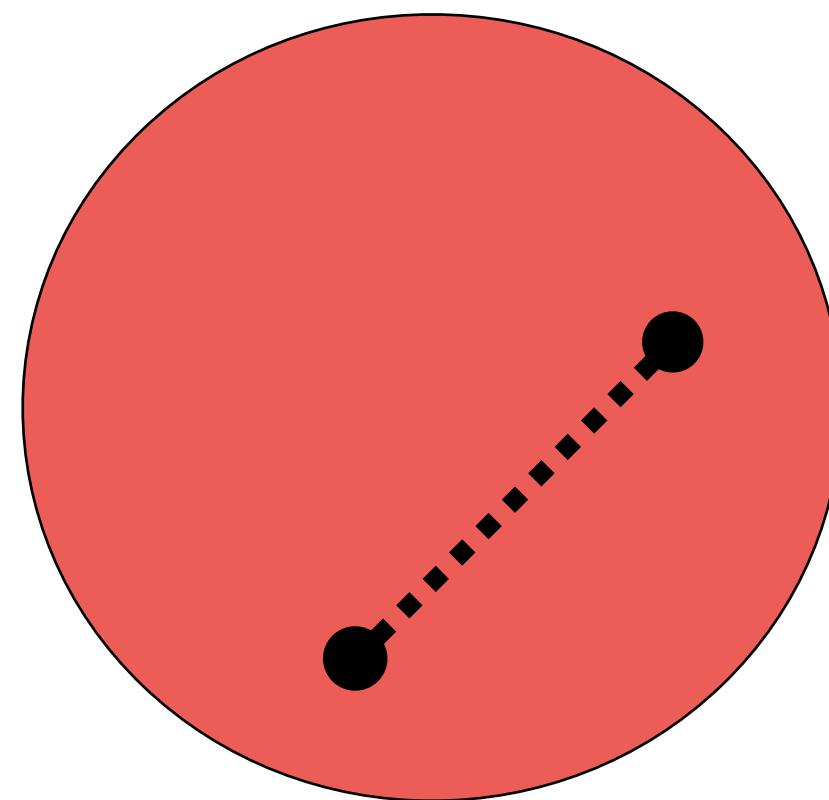


[FFHQ dataset, Karras et al. 2018]

[StyleGAN, Karras et al. 2018]

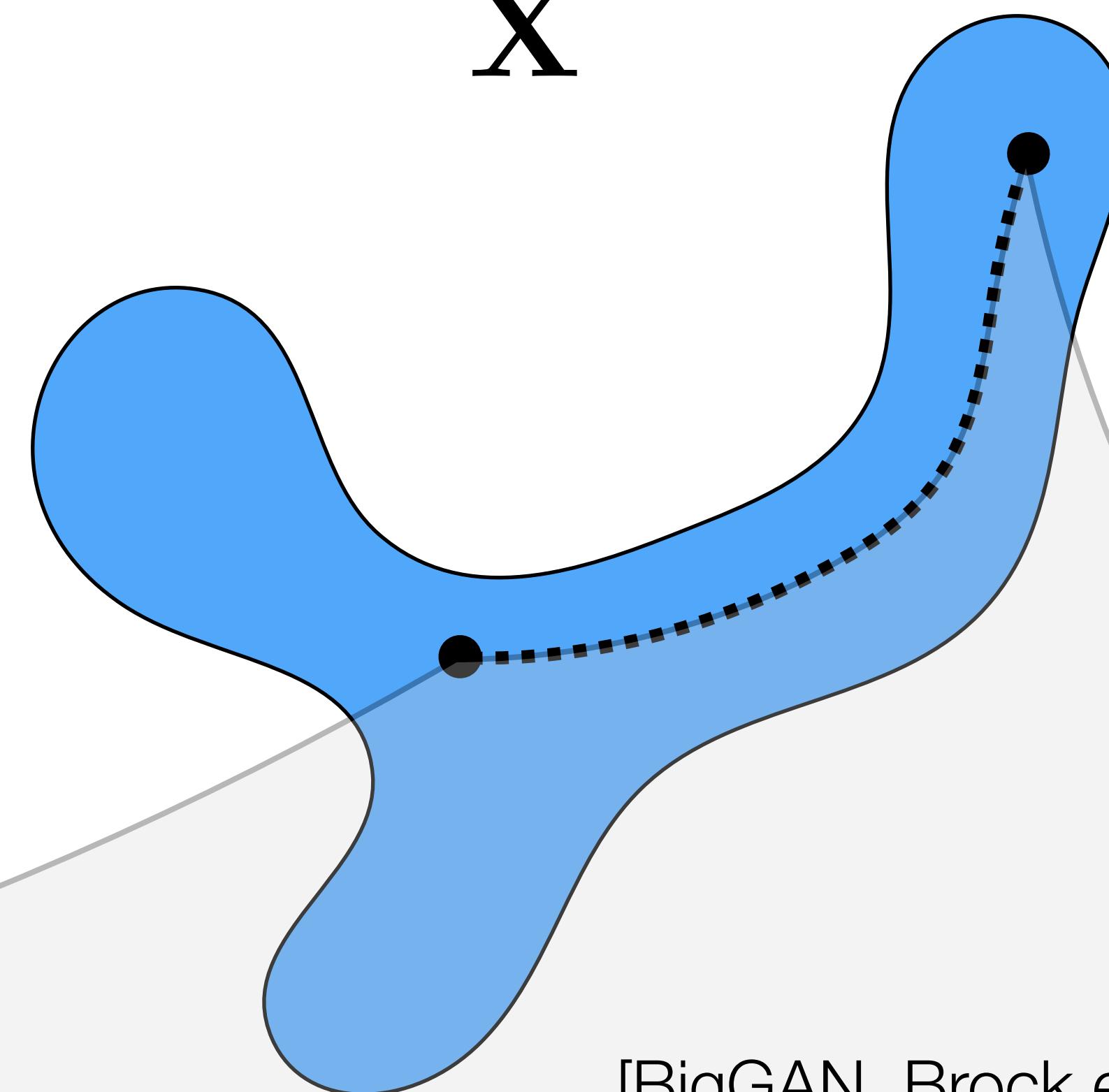
Latent space
(Gaussian)

z



Data space
(Natural image manifold)

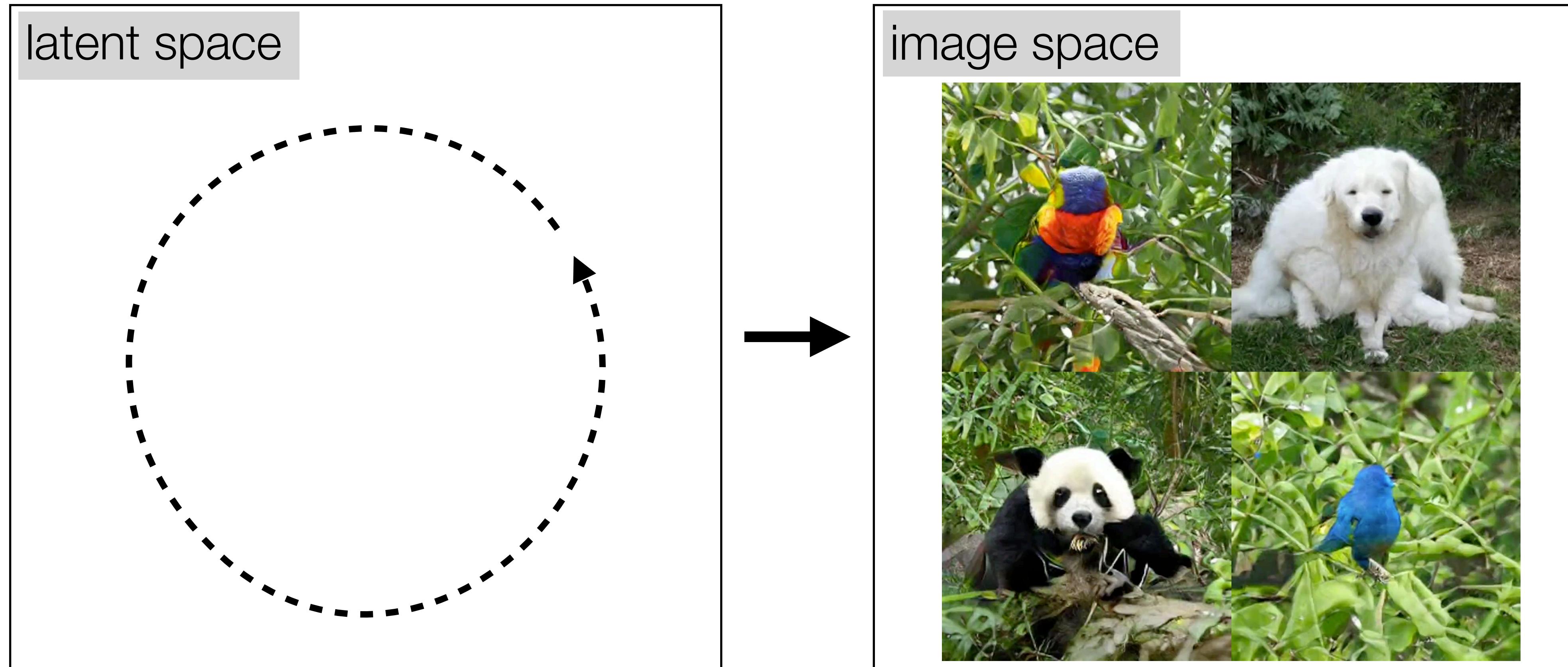
X



[BigGAN, Brock et al. 2018]

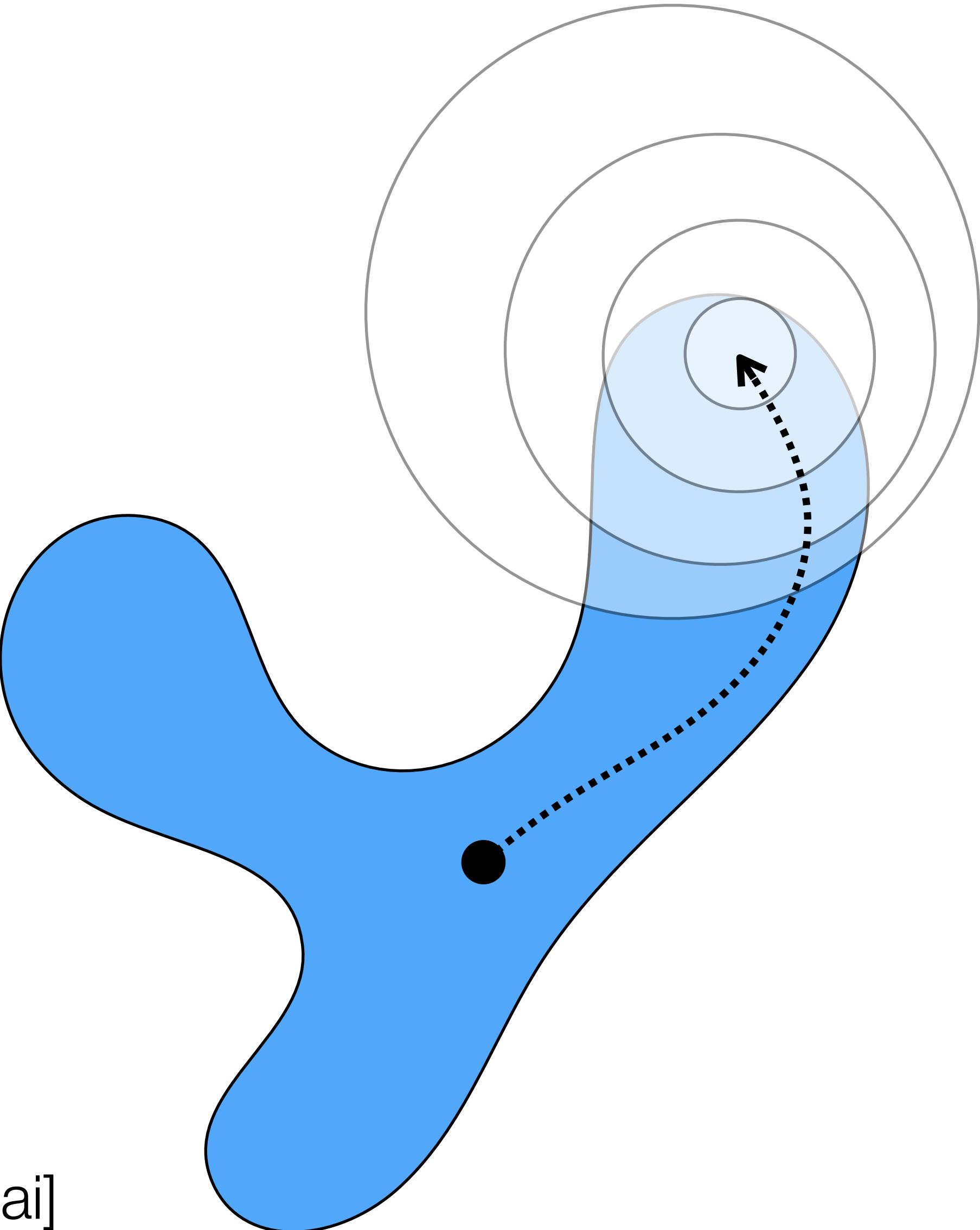


GANs let us explore the manifold of natural images



GANs let us explore the manifold of natural images

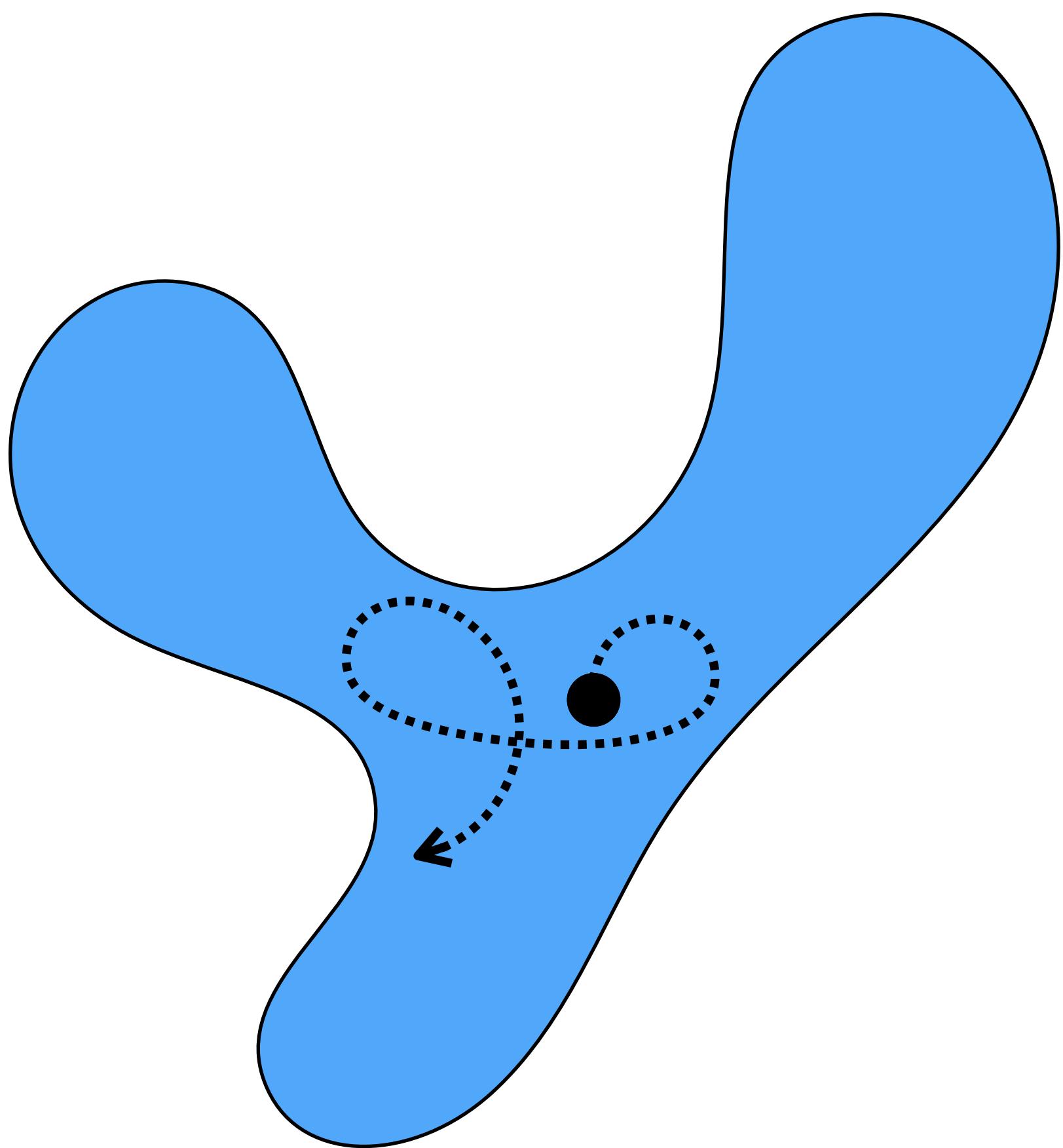
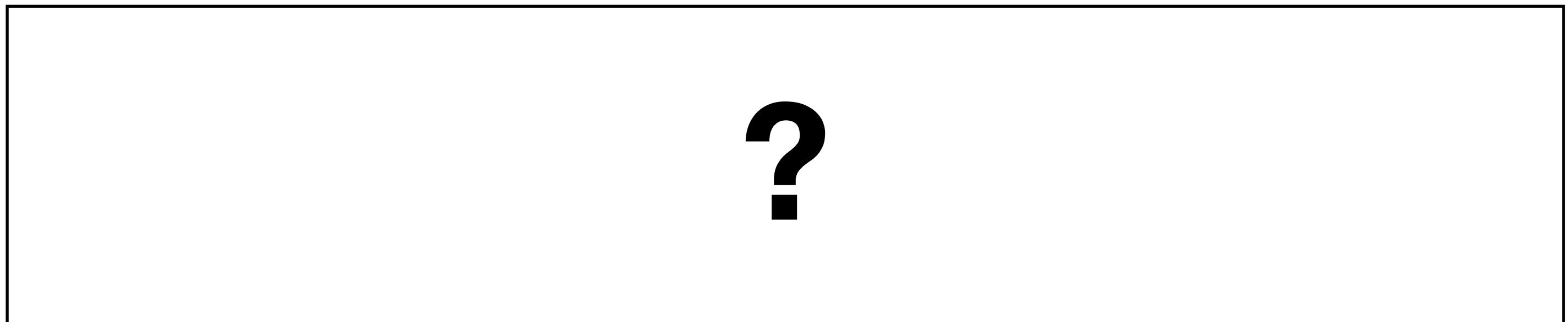
- What does it look like to make an image more white?

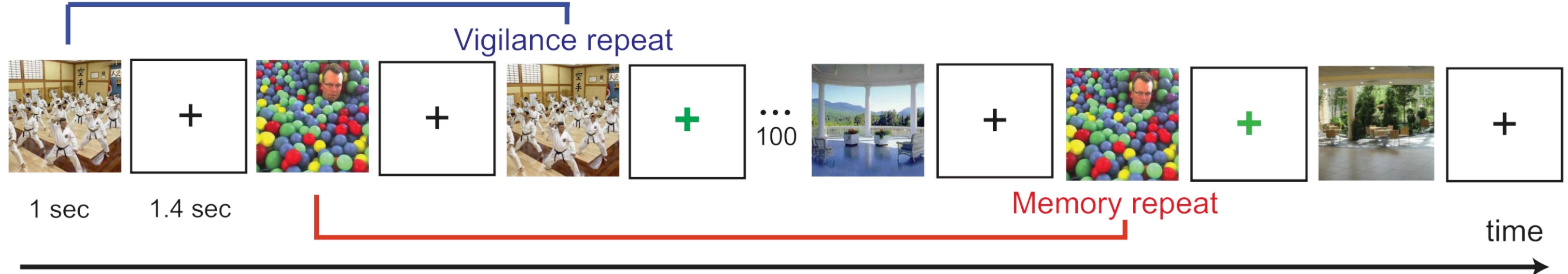


[see poster on “Steerability” of GANs by Ali Jahanian & Lucy Chai]

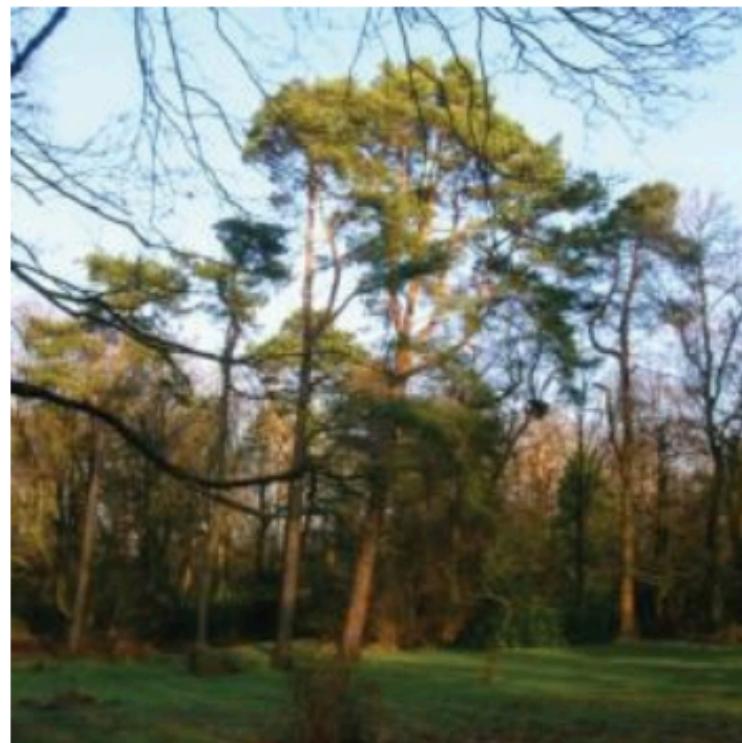
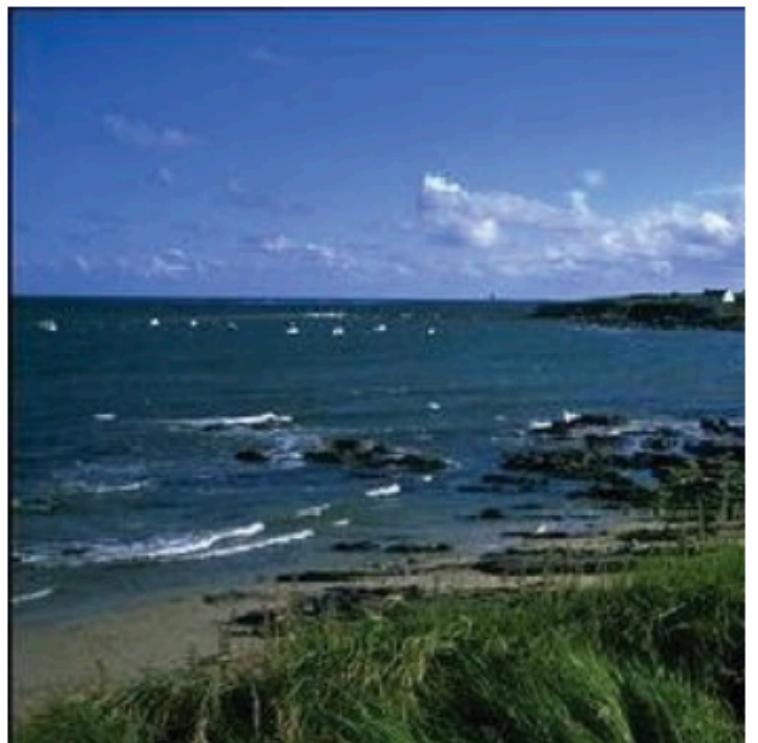
GANs let us explore the manifold of natural images

- What does it look like to make an image more memorable?





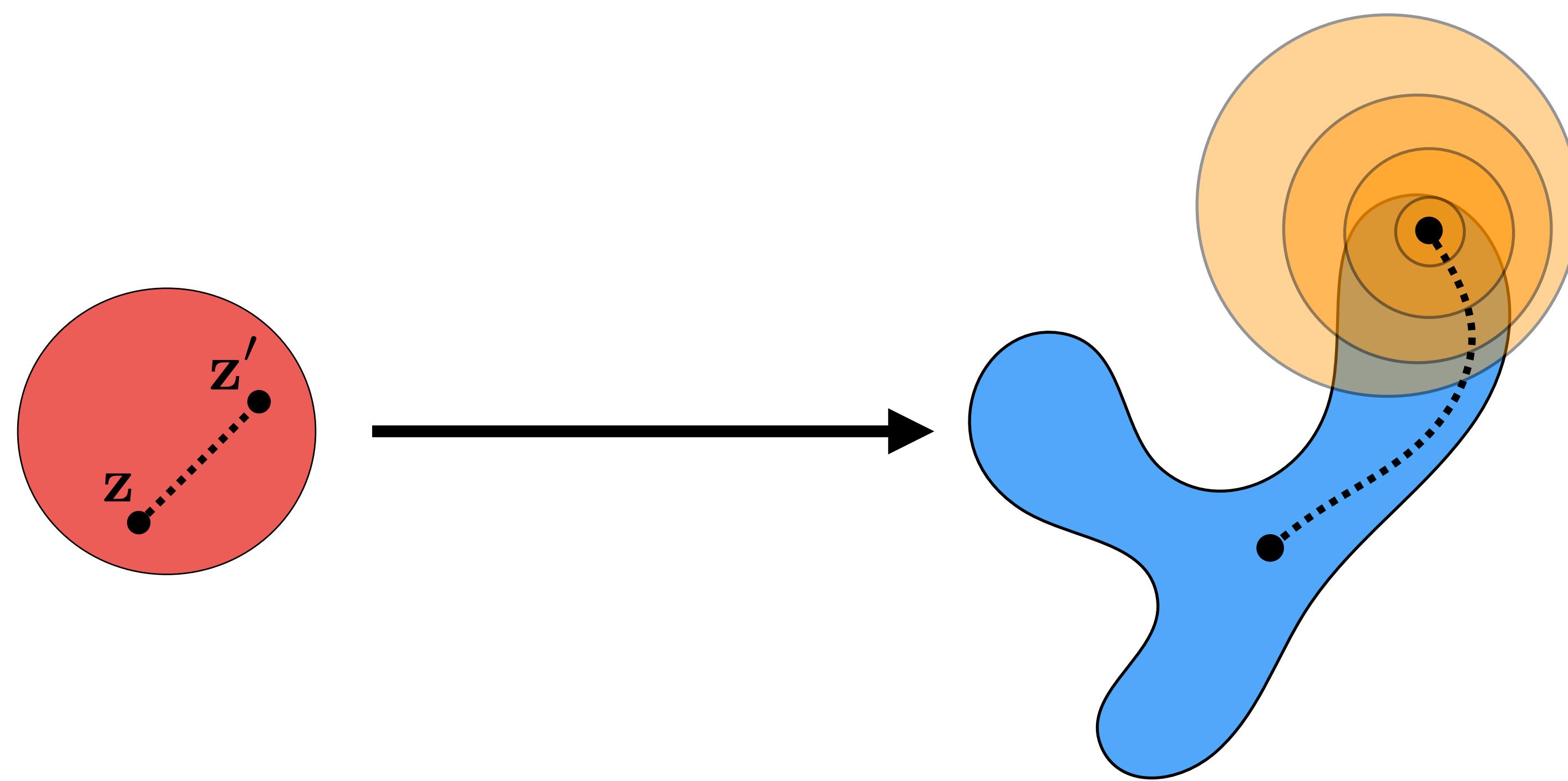
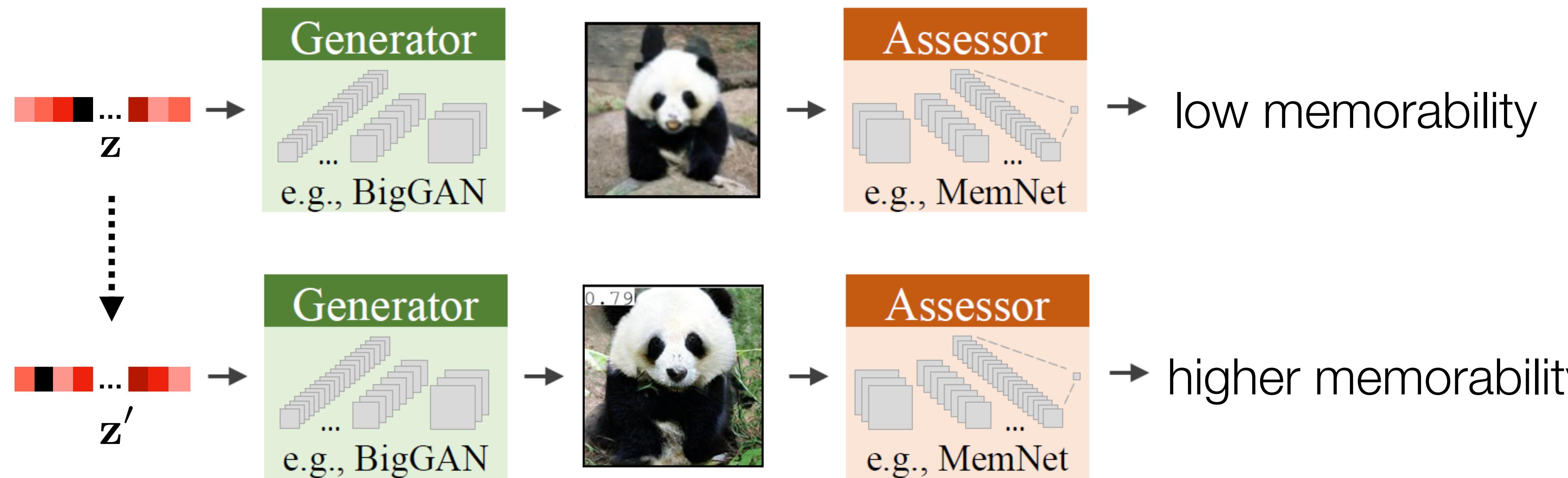
Forgettable

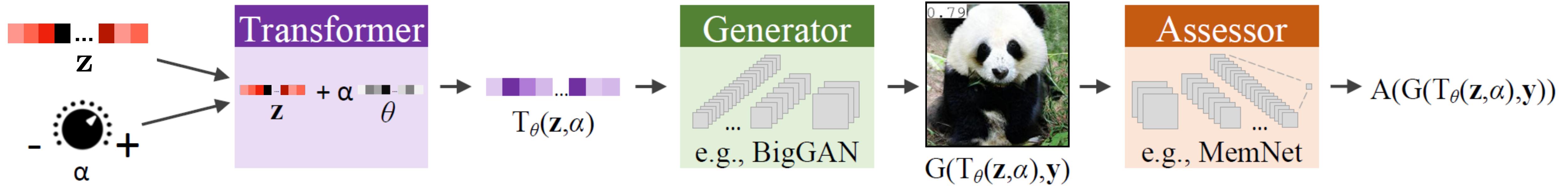


Memorable



[Isola et al. 2011, Khosla et al. 2015]



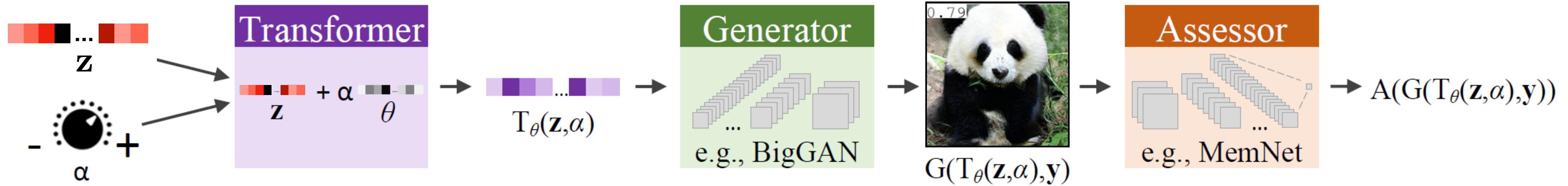


Assessor score of the modified image

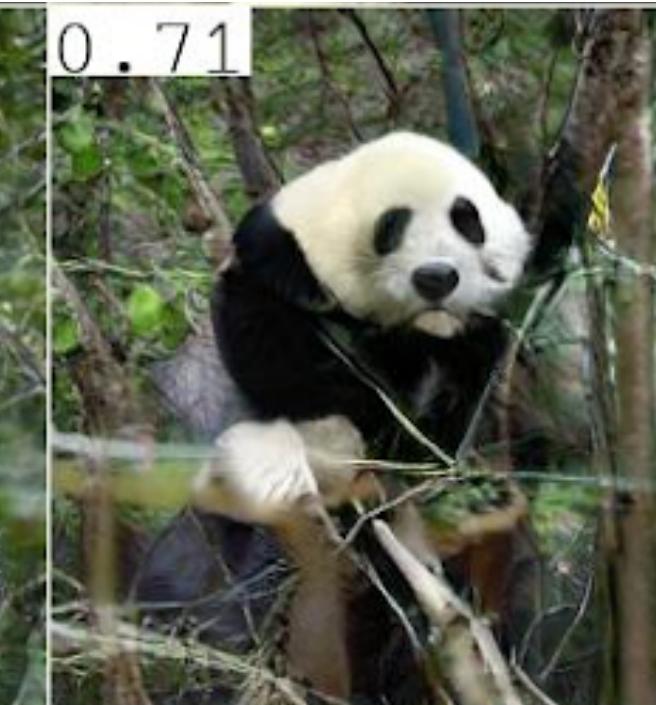
$$\mathcal{L}(\theta) = \mathbb{E}_{\mathbf{z}, \mathbf{y}, \alpha} [(A(G(T_\theta(\mathbf{z}, \alpha), \mathbf{y})) - (A(G(\mathbf{z}, \mathbf{y})) + \alpha))^2]$$

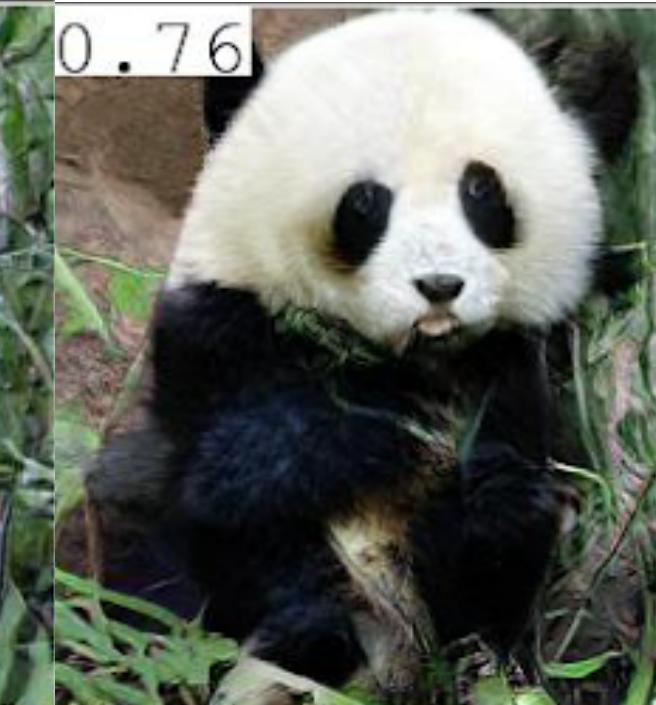
Assessor score of the seed image Incremented by α

$T(\mathbf{z}, \alpha) = \mathbf{z} + \alpha\theta$


 $\alpha = -0.3$

 $\alpha = -0.2$

 $\alpha = -0.1$

 $\alpha = 0$

 $\alpha = 0.1$

 $\alpha = 0.2$

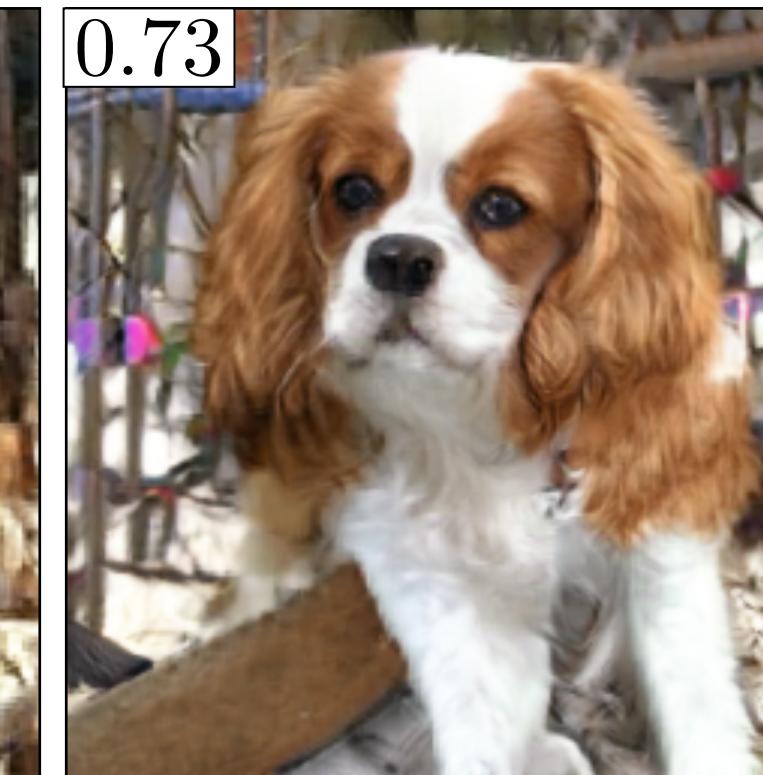
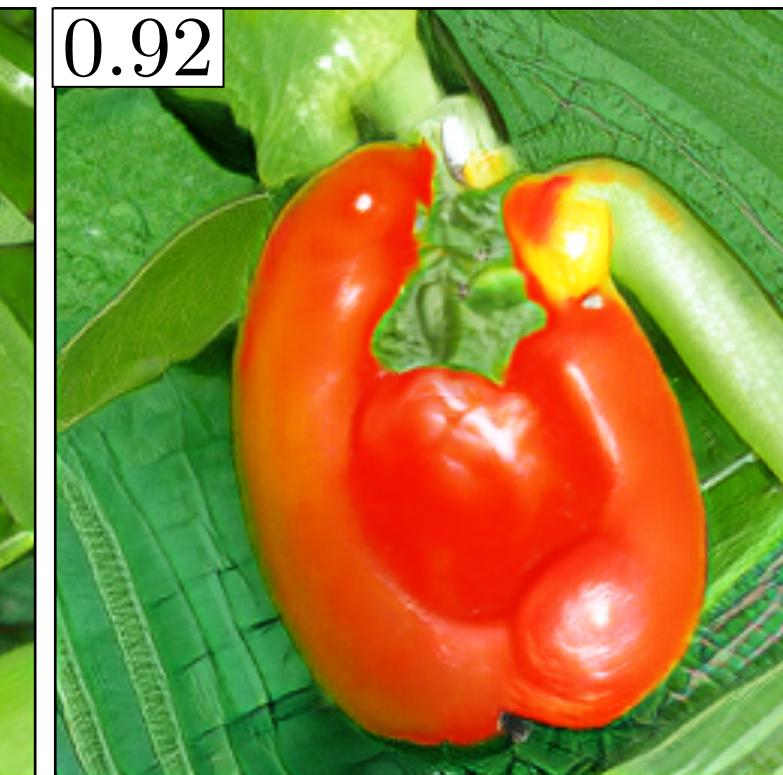
 $\alpha = 0.3$


modified images (memorability \downarrow)

seed image

modified images (memorability \uparrow)

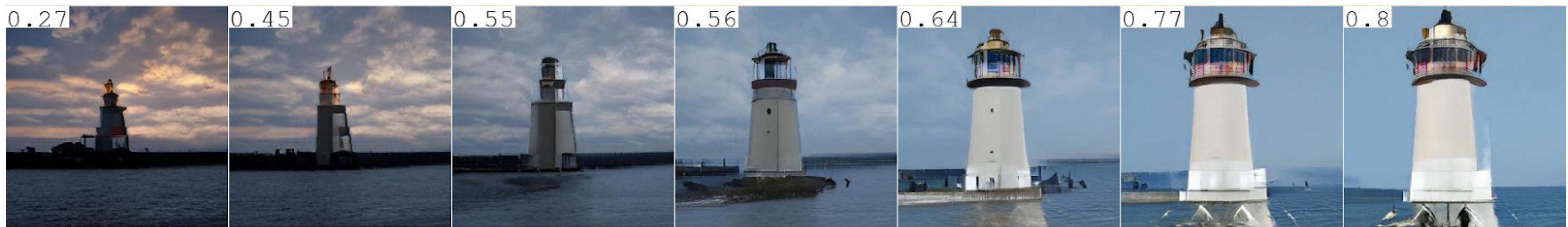
What does it look like to make an image more memorable?



← Less memorable ————— More memorable →

← Less memorable ————— More memorable →

Zoom



←

Less memorable



More memorable

→

Circularity



←

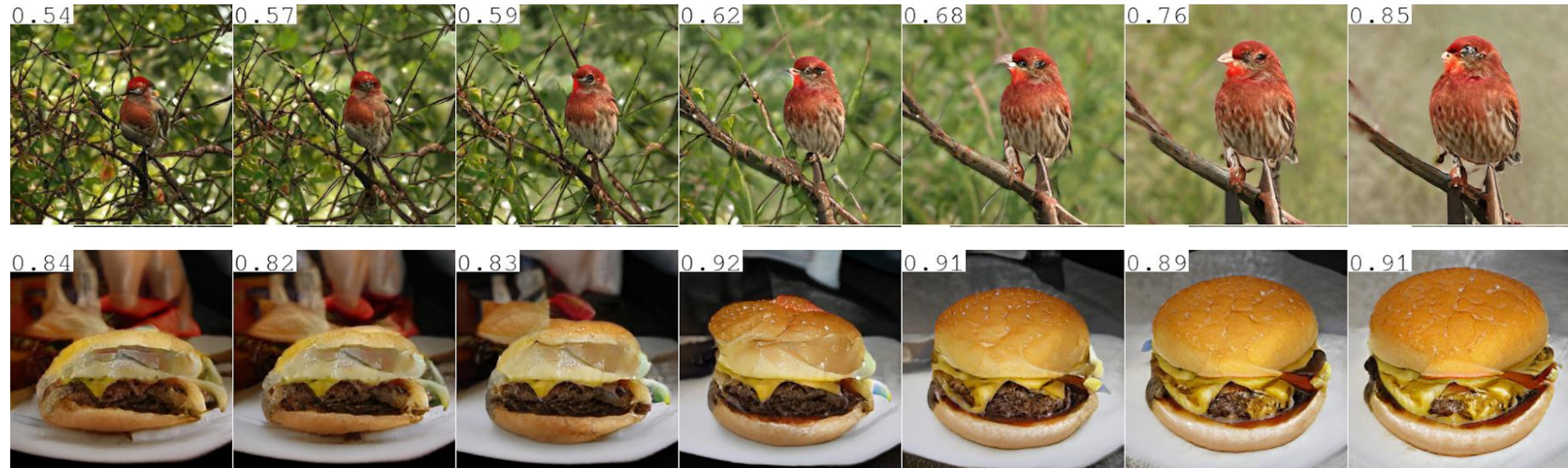
Less memorable

—————

More memorable

→

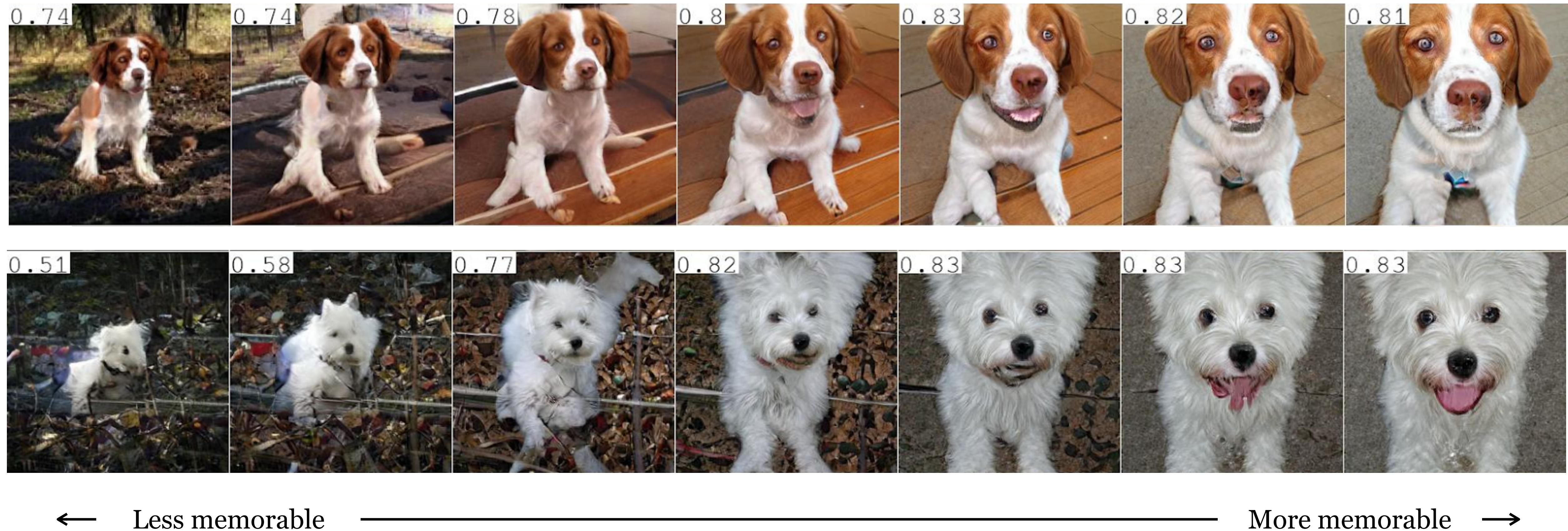
Simplicity



← Less memorable

More memorable →

Expressive face (“cuteness”?)



What does it look like to make an image more aesthetic?



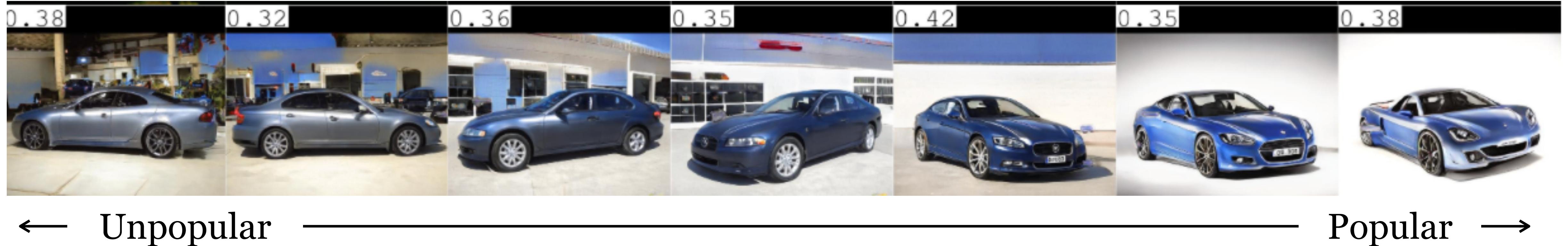
Less aesthetic



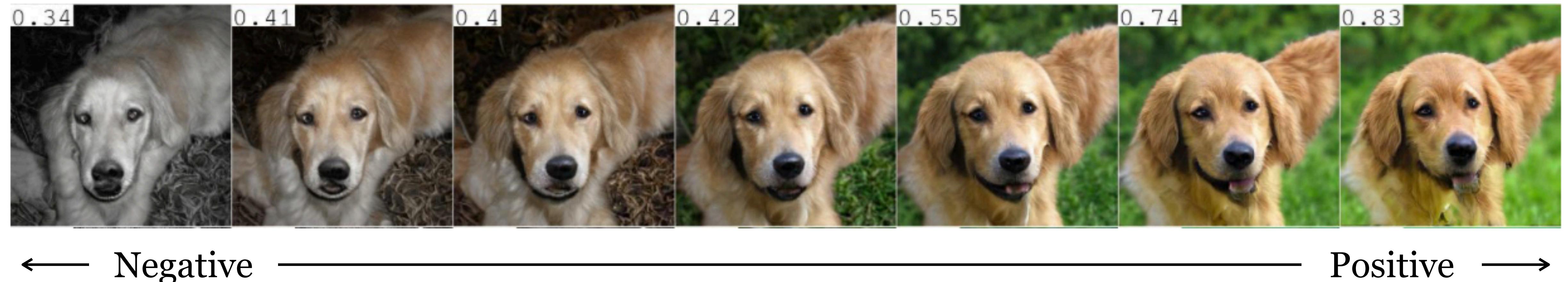
More aesthetic

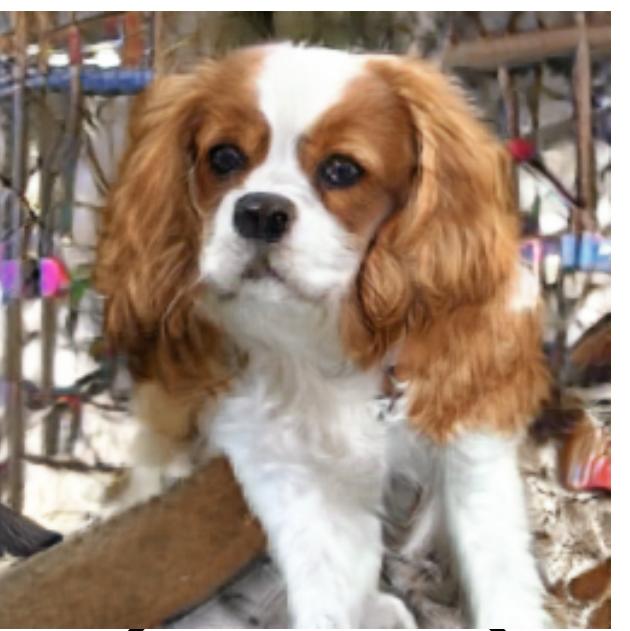


Instagram popularity



Emotional valence





$\alpha = -0.2$

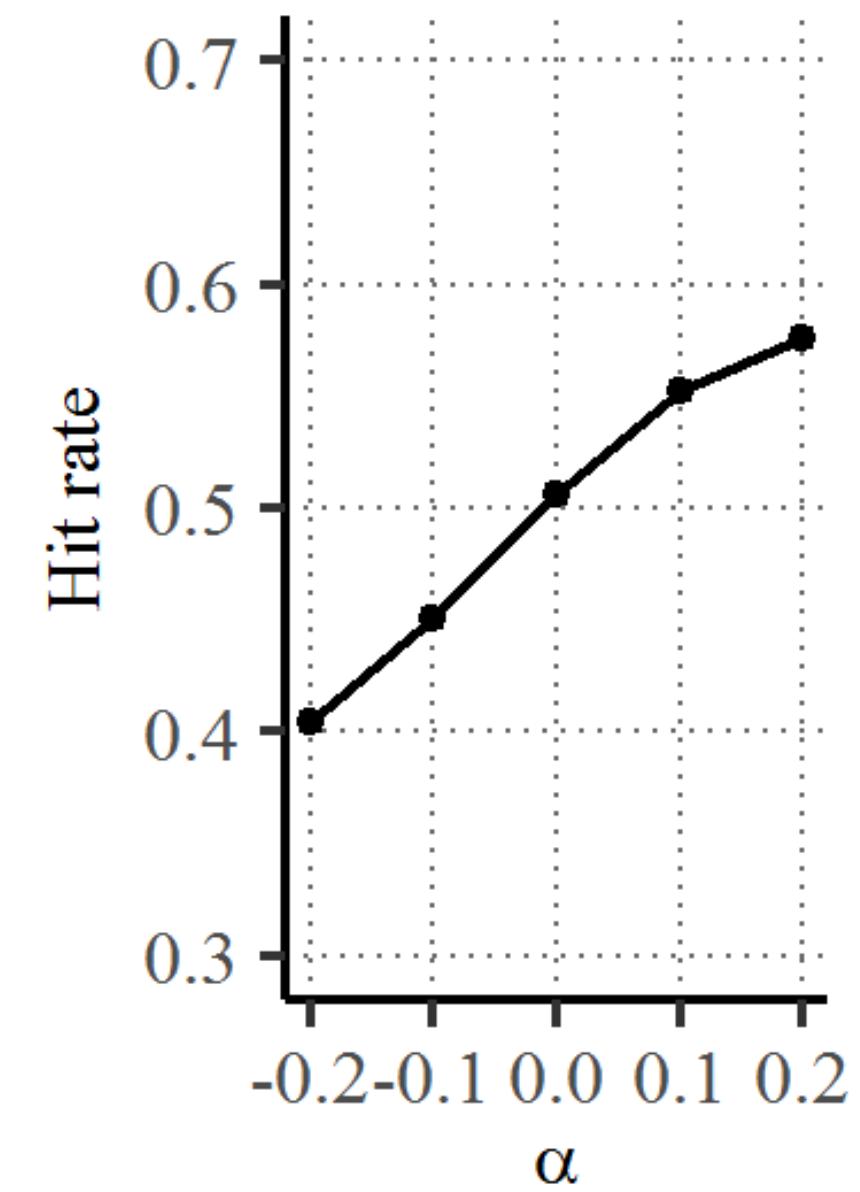


$\alpha = -0.2$

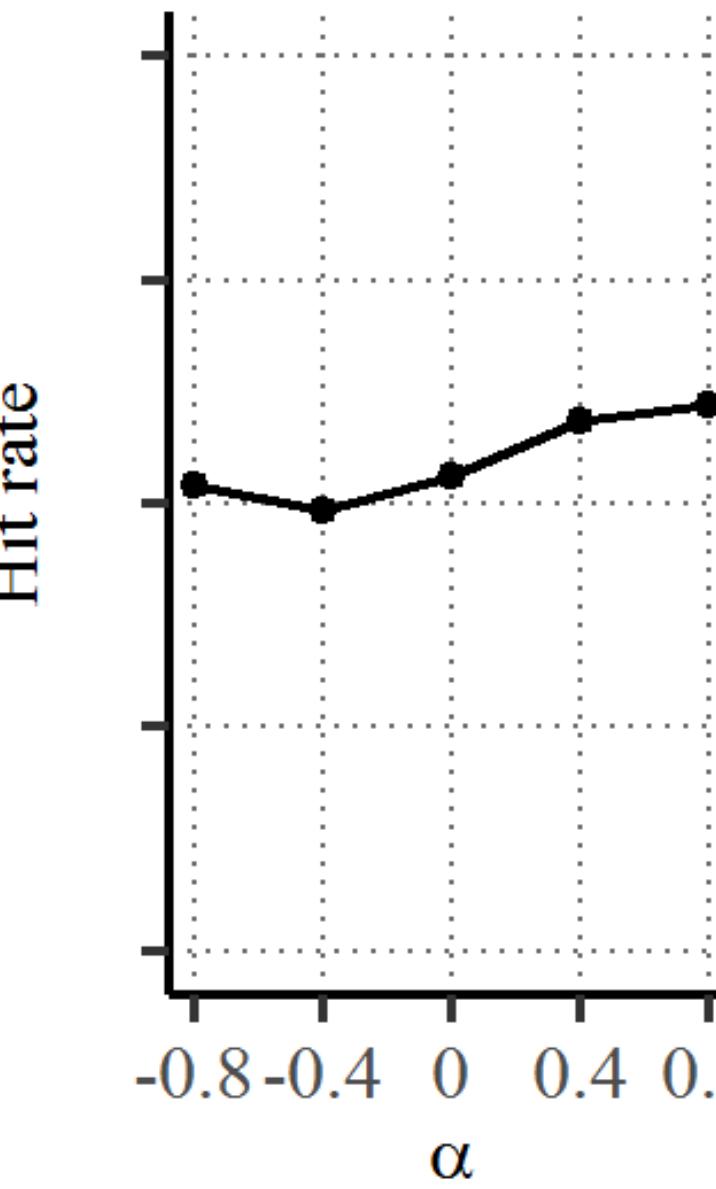


Causal?

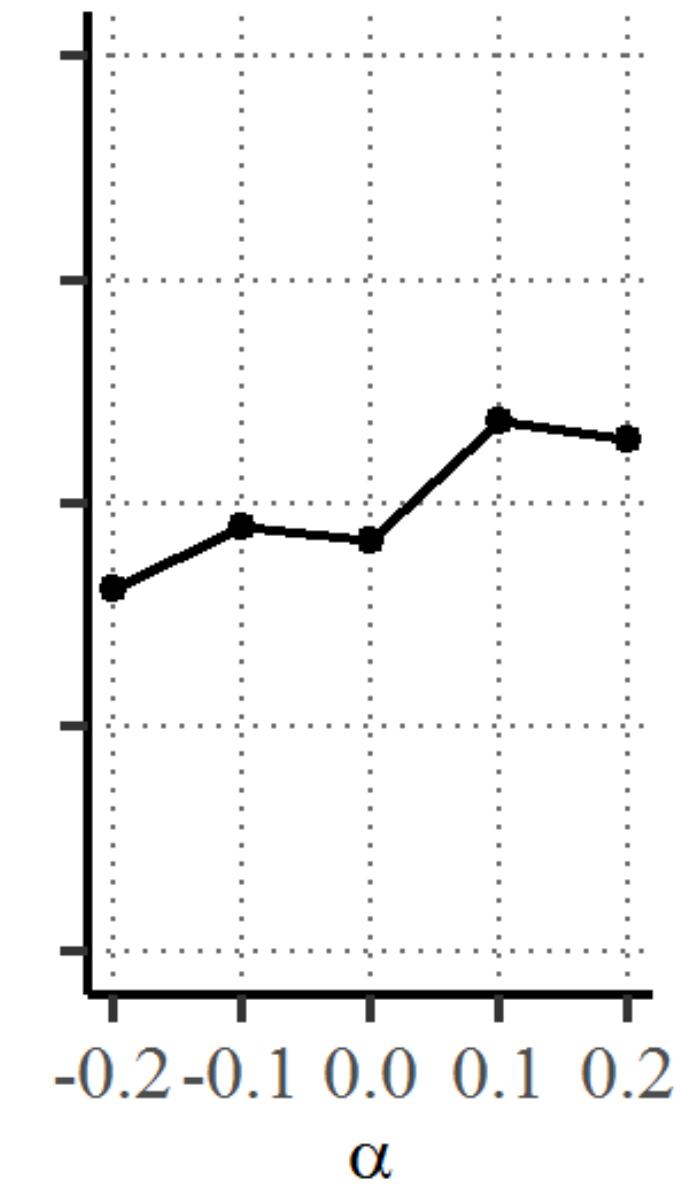
A. MemNet



B. Object size



C. Aesthetics-CNN



Memorability
Object Size
Aesthetics

“Visual definitions”



- Visually map out the full extent and continuum of a concept
 - + Visualize abstract concepts (memorability, beauty, emotional valence, etc)
 - + Scientific understanding
 - + Graphics applications

[c.f. “Activation Atlases”, Carter et al. 2019]

Browse examples

Lore Goetschalckx, Alex Andonian,
Aude Oliva, & Phillip Isola

Menu

Step 1: Choose assessor(s)

- MemNet
- Aesthetics-CNN
- Object Size

Step 2: Choose category

Select category Surprise me!

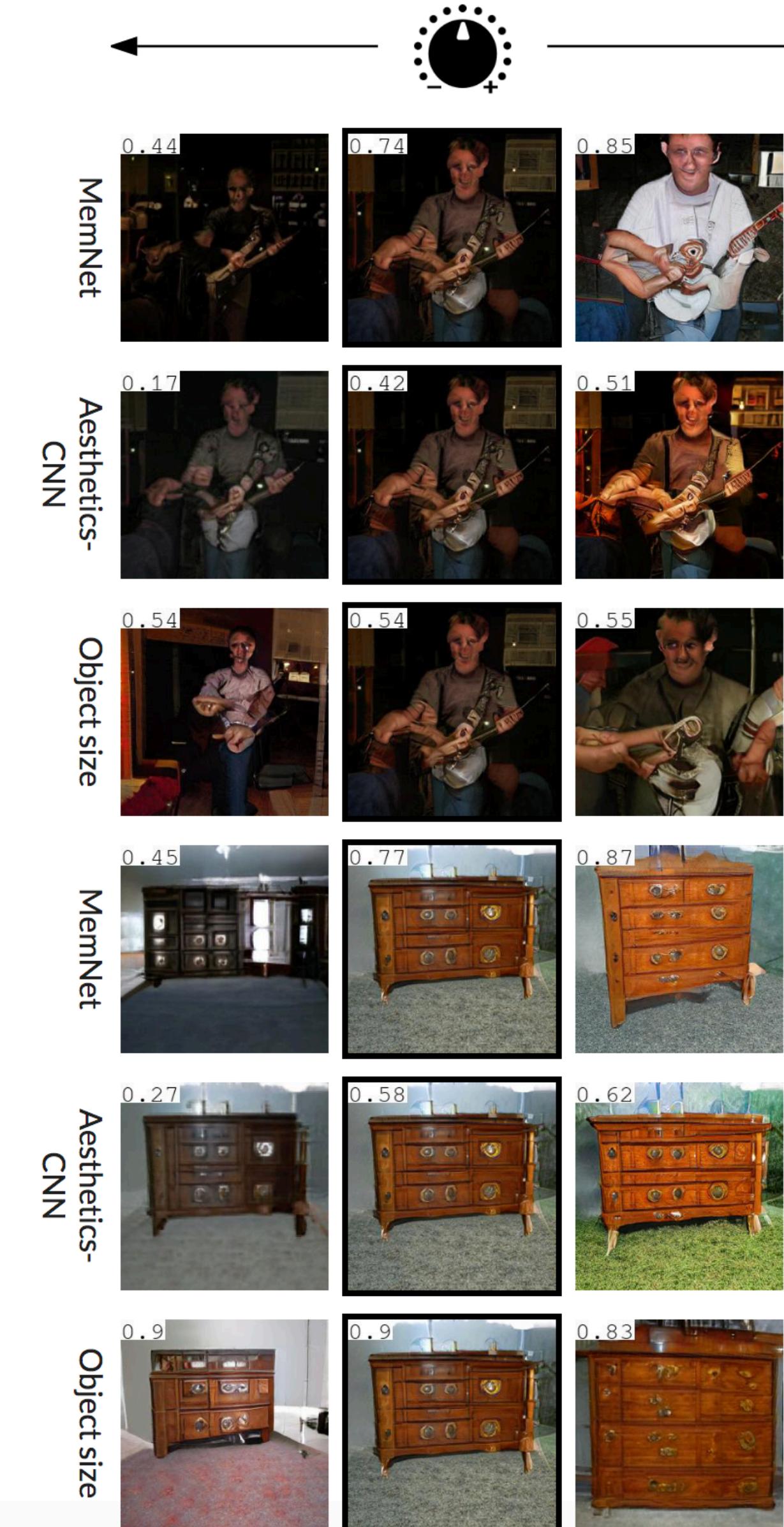
Step 3: Choose alphas

- 0.2
- 0.1
- 0
- 0.1
- 0.2

Image details

Click on an image to see its details.
Double click to open the image file.

TIP: the images scale with the window width. To see them in a smaller or larger size, adjust the width of the browser window.

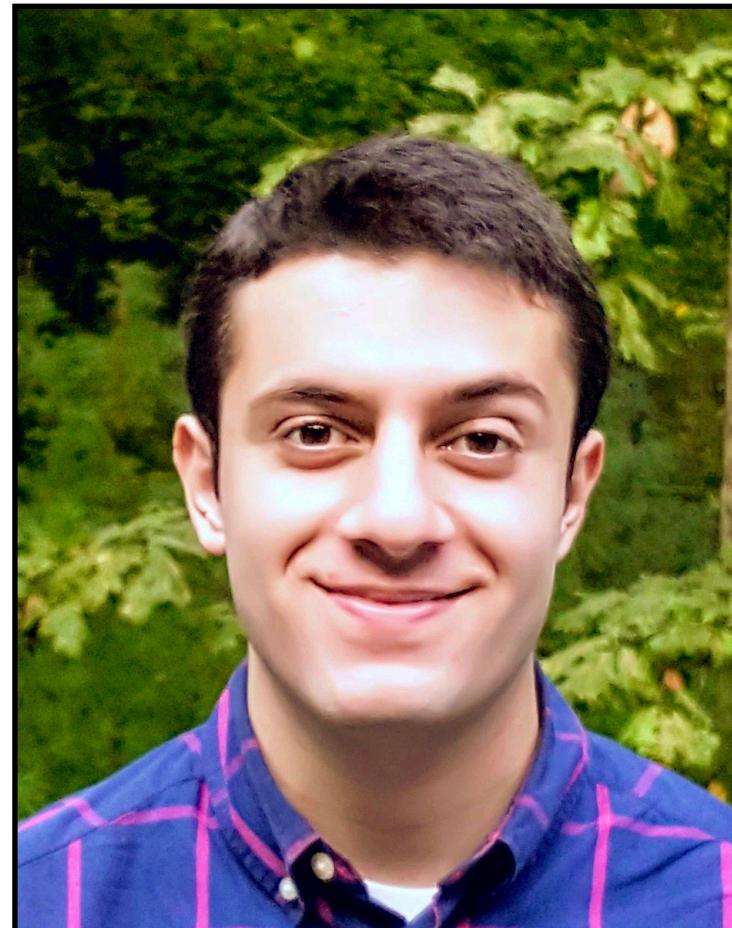


[http://memgame.csail.mit.edu/explorer/browse_examples.html]

Thanks!



Lore Goetschalckx



Alex Andonian



Aude Oliva