

Expanding the generative space

Terence Broad

Creative AI meetup
March 2025

About me

AI artist (2015 - Present)

PhD in Generative AI, Goldsmiths (2018-2024)

Senior Lecturer, UAL Creative Computing Institute (2022 - Present)

*Expanding the Generative Space: Data-Free
Techniques for Active Divergence with Generative
Neural Networks*

Terence Broad

A dissertation submitted in partial satisfaction
of the requirements for the degree
Doctor of Philosophy

Department of Computing
Goldsmiths, University of London

2024

Autoencoding Blade Runner

Remaking Blade Runner with an artificial neural network

London Creative AI meetup #1, 2016

LOS ANGELES
NOVEMBER, 2019



Dear [vimeo.com](#):

I, the undersigned, CERTIFY UNDER PENALTY OF PERJURY that I am the owner or an agent authorized to act on behalf of the owner of certain intellectual property rights, said owner being named Warner Bros. Entertainment Inc. and/or our affiliated companies, Cartoon Network, Castle Rock Entertainment, DC Comics, Hanna-Barbera Productions, Inc., HBO Independent Productions, Inc., Home Box Office, Inc., New Line Productions, Inc., Turner Entertainment Co. and The CW Network, LLC ("IP Owner").

I have a good faith belief that the materials identified in the addendum attached hereto are not authorized by the above IP Owner, its agent, or the law and therefore infringe the IP Owner's rights. Please act expeditiously to remove or disable access to the material or items claimed to be infringing.

I swear, under penalty of perjury, that the information in the notification is accurate.

I may be contacted at:

David P. Kaplan
Senior Vice President & Intellectual Property Counsel
Worldwide Anti-Piracy Operations
4000 Warner Blvd.
Burbank, CA 91522
[818.954.6283](#) – phone
[818.954.2643](#) – fax

What was located as infringing content:

Blade Runner

<http://vimeo.com/167838700>

<http://vimeo.com/167792183>

Friends

<http://vimeo.com/164596865>

<http://vimeo.com/166772819>

<http://vimeo.com/166750512>

<http://vimeo.com/163885283>

<http://vimeo.com/167567391>

<http://vimeo.com/167570293>

<http://vimeo.com/166046378>

Lucifer

<http://vimeo.com/164910483>

<http://vimeo.com/165318559>

<http://vimeo.com/164667655>

<http://vimeo.com/164257403>

A guy trained a machine to “watch” Blade Runner. Then things got seriously sci-fi.

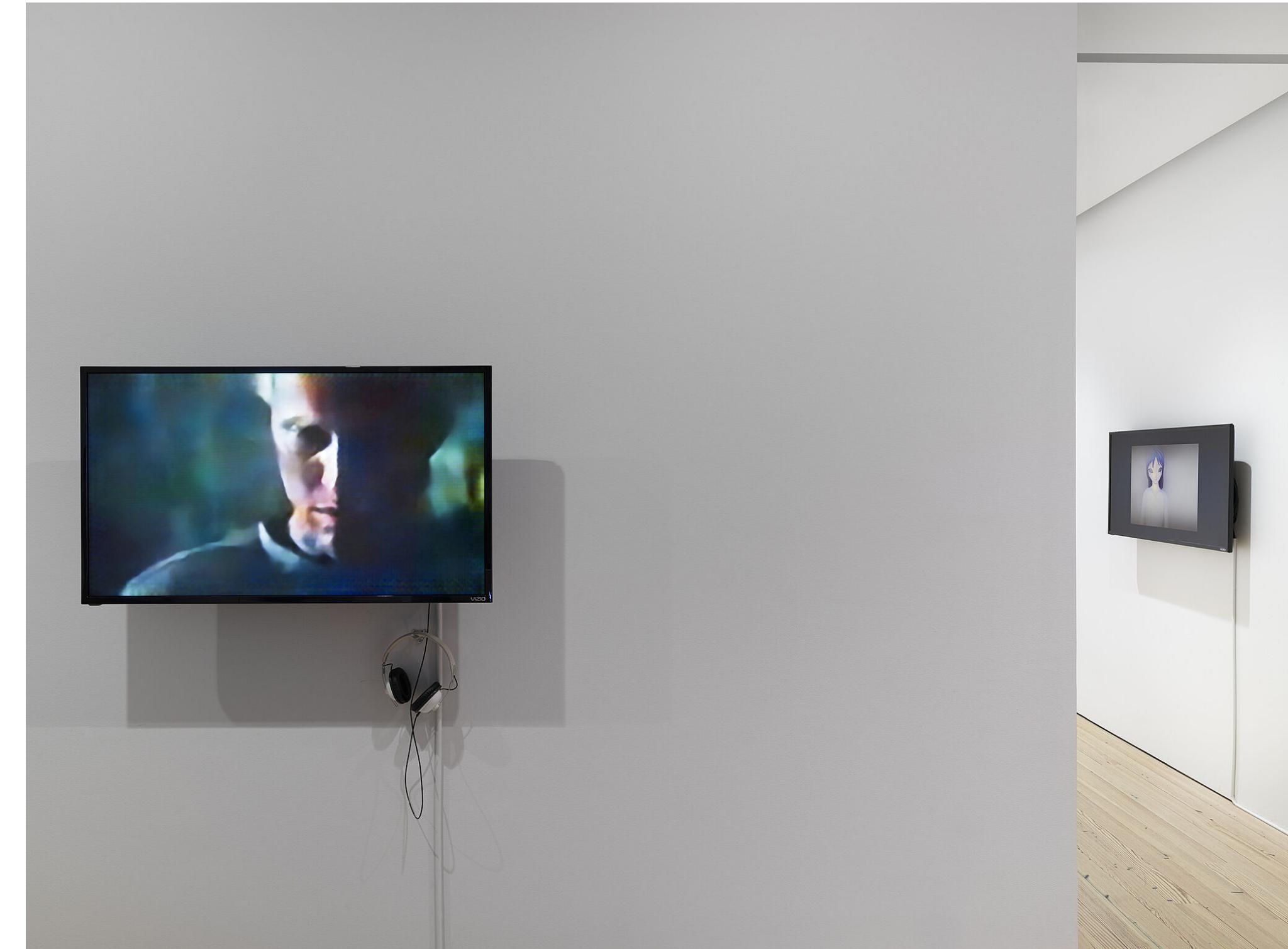
by [Aja Romano](#)

Jun 1, 2016, 5:00 PM GMT+1



Aja Romano writes about pop culture, media, and ethics. Before joining Vox in 2016, they were a staff reporter at the Daily Dot. A 2019 fellow of the National Critics Institute, they're considered an authority on fandom, the internet, and the culture wars.

DMCA takedown notice from Warner Brothers & resulting press coverage



Dreamlands: Immersive Cinema and Art, 1905–2016,
Whitney Museum of American Art, New York
2016-17

"The generated version of Blade Runner lacks [...] visual fidelity [such] that it appears only to be swirling, impressionistic blobs of color. [...] In a situation like this, when all the input data can be assimilated into a single "work" **for the purposes of copyright law**, it seems plausible to deem the model derived from these data **a derivative work**."

Sobel, Benjamin LW. "Artificial Intelligence's Fair Use Crisis." *Colum. JL & Arts* 41 (2017): 45.



Backlash against generative AI from creative industries

How to train a generative model without imitating data?

How to train a generative model without

imitating
pastiching
mimicking
parrotting
copying
stealing
modelling

data?

Three experiments from my PhD research:

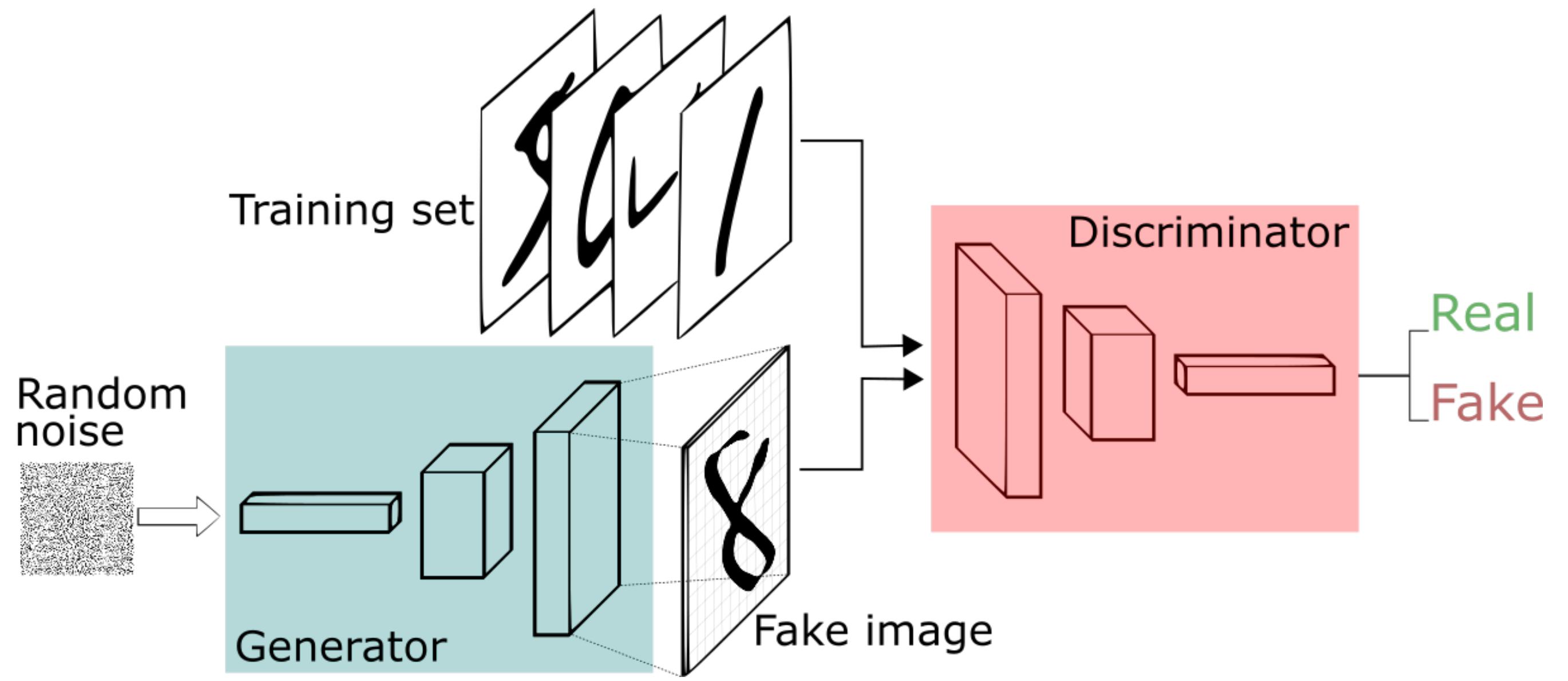
Training without data

Divergent fine-tuning

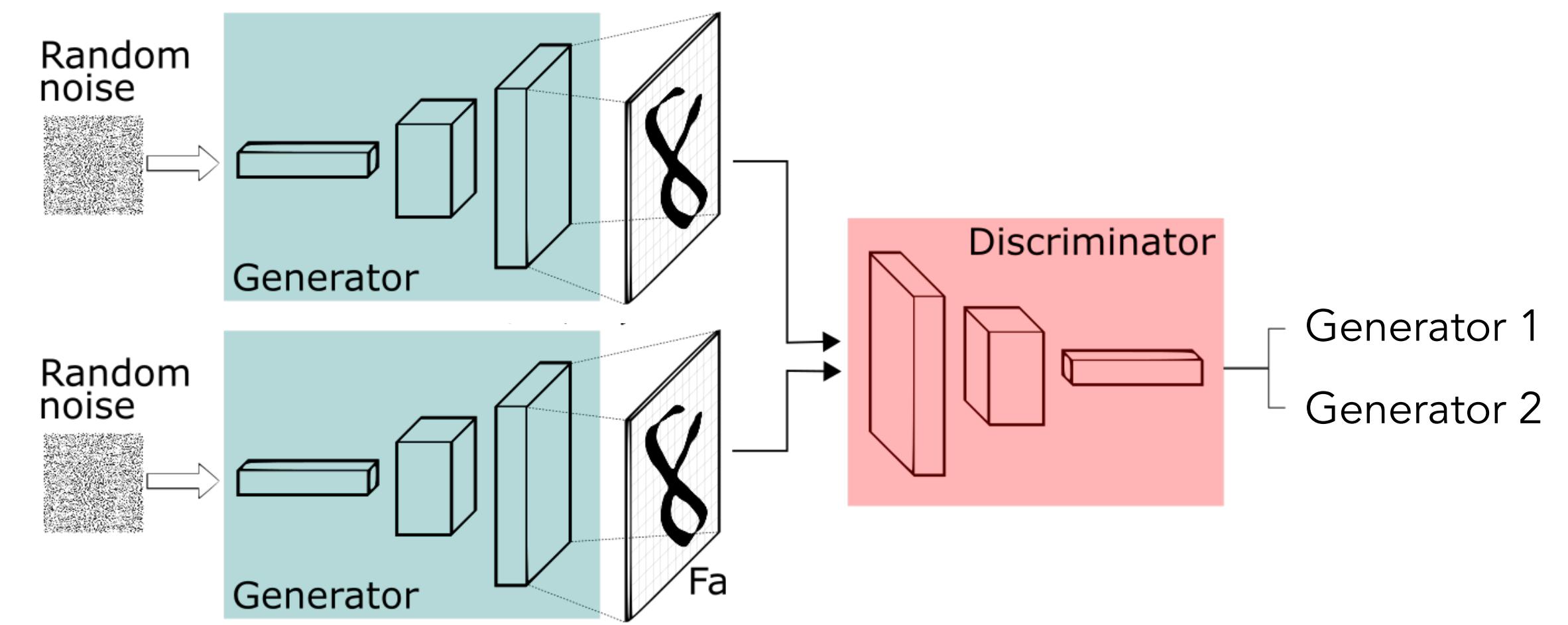
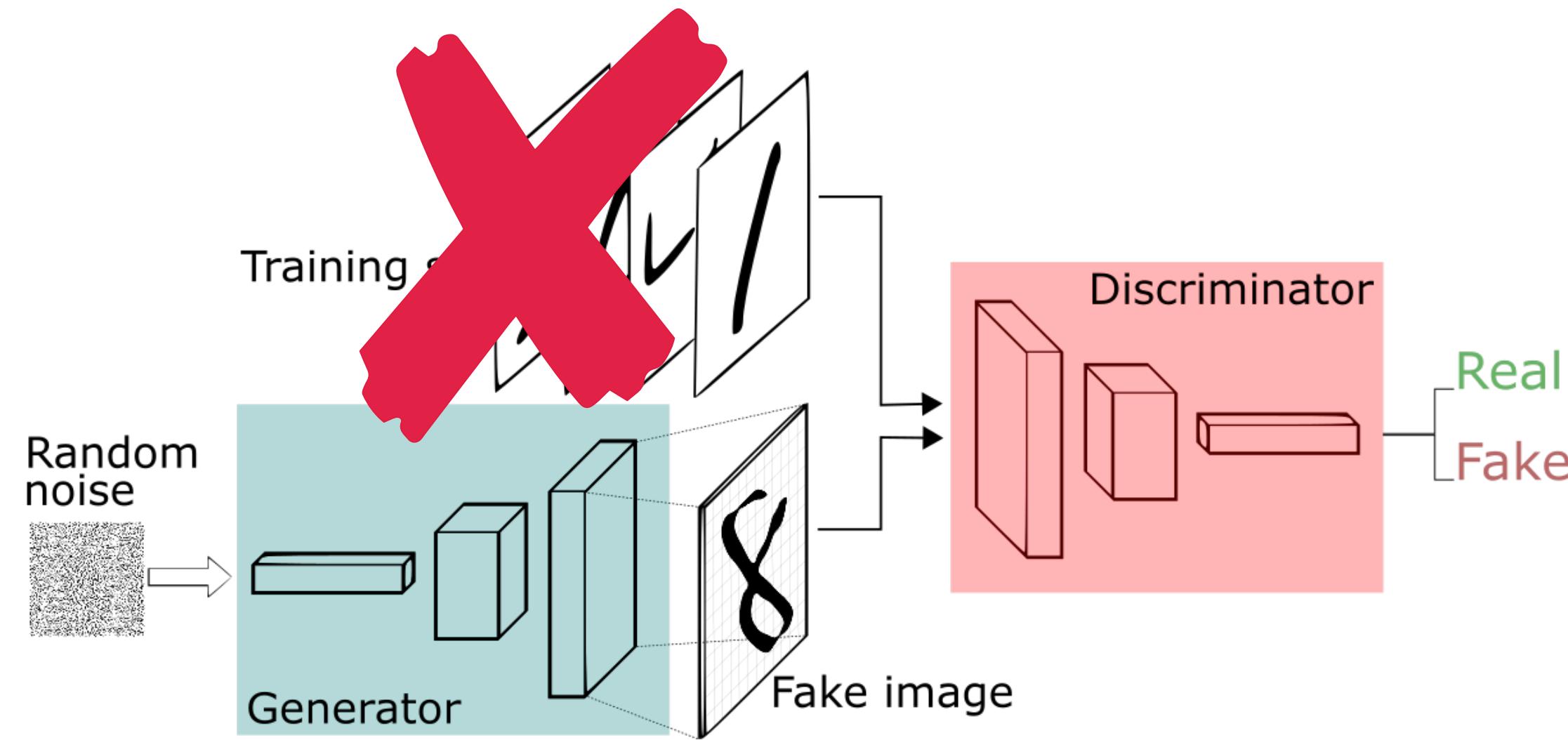
Network bending

Experiment 1:

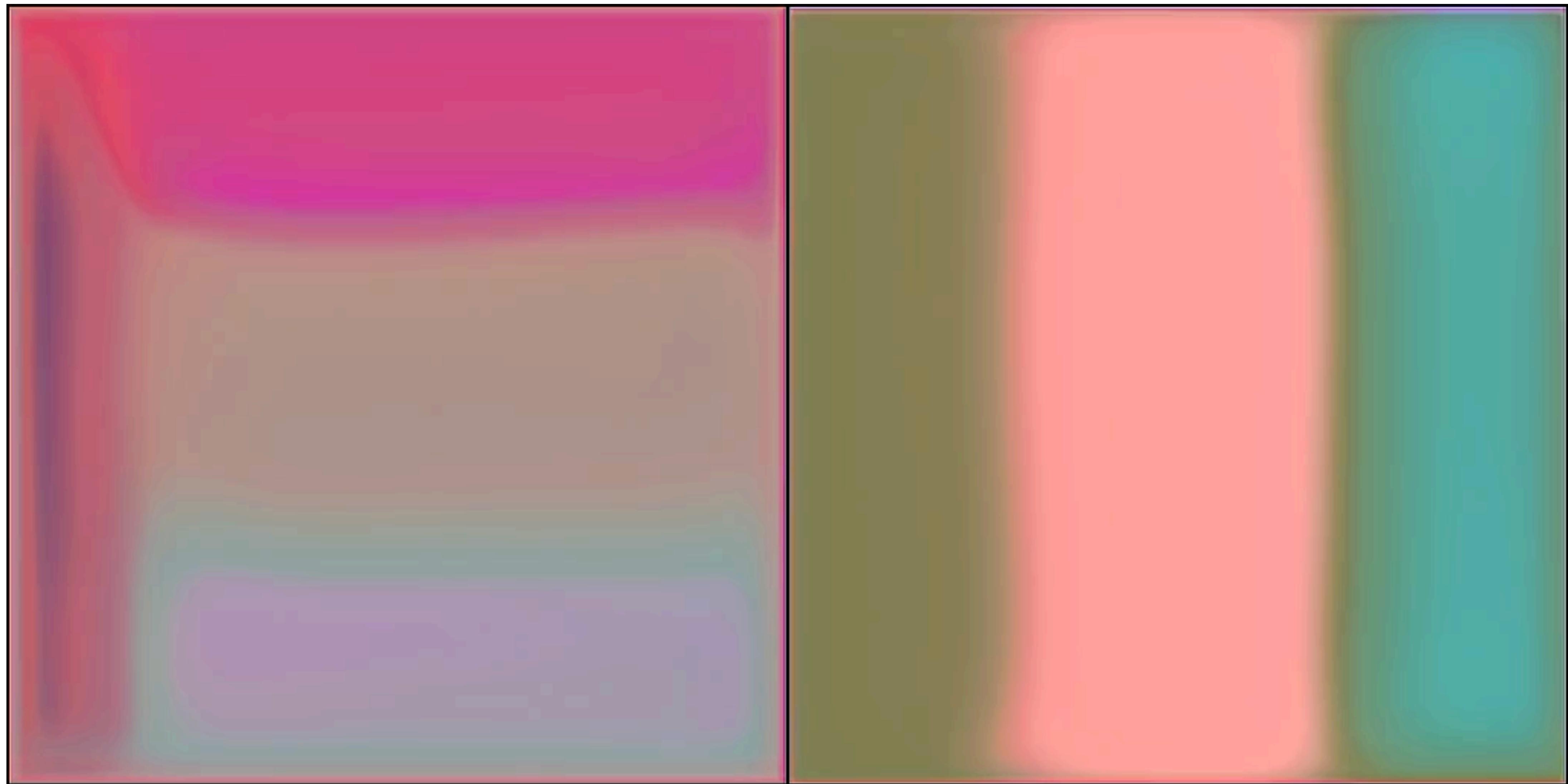
Can you train a generative neural network without data?



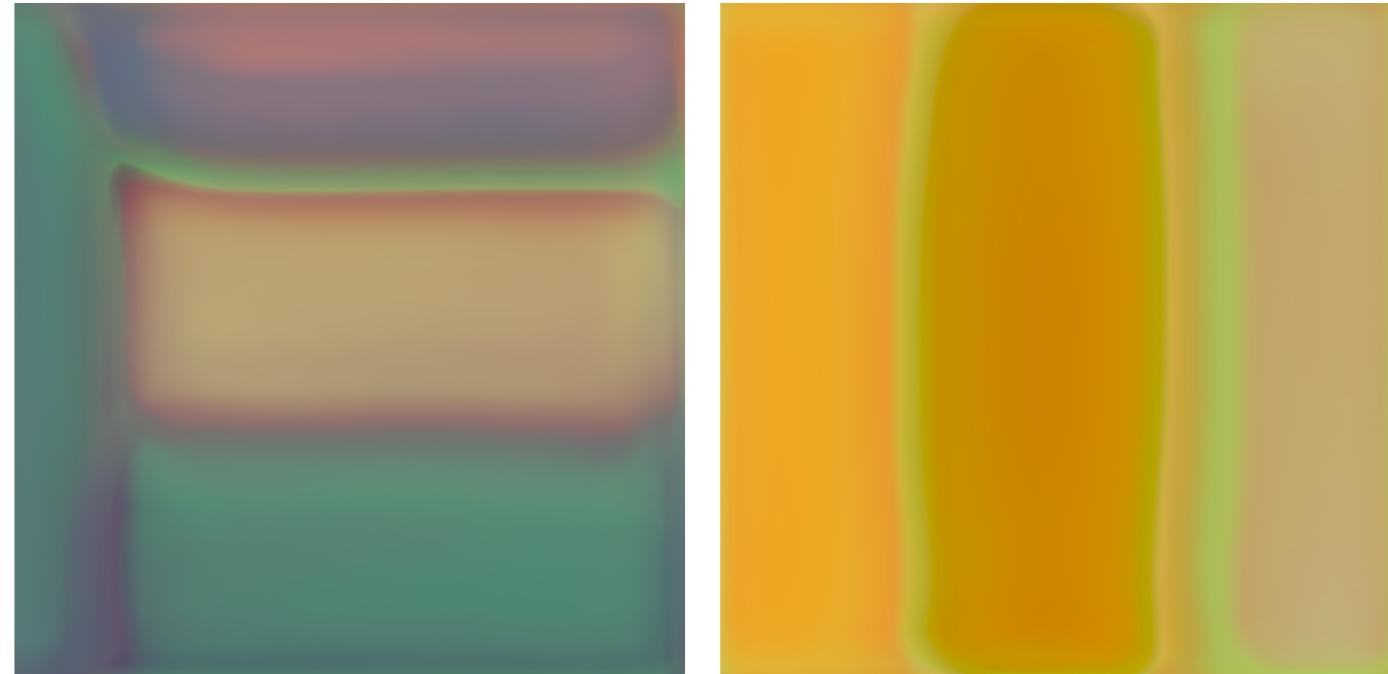
Generative Adversarial Networks (GAN)



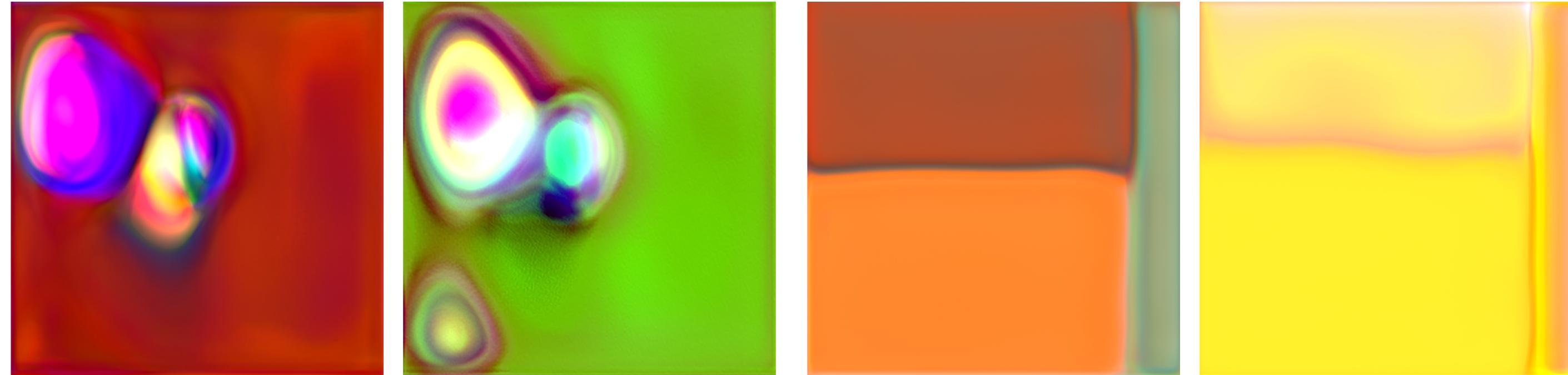
Replace the training data with another generator



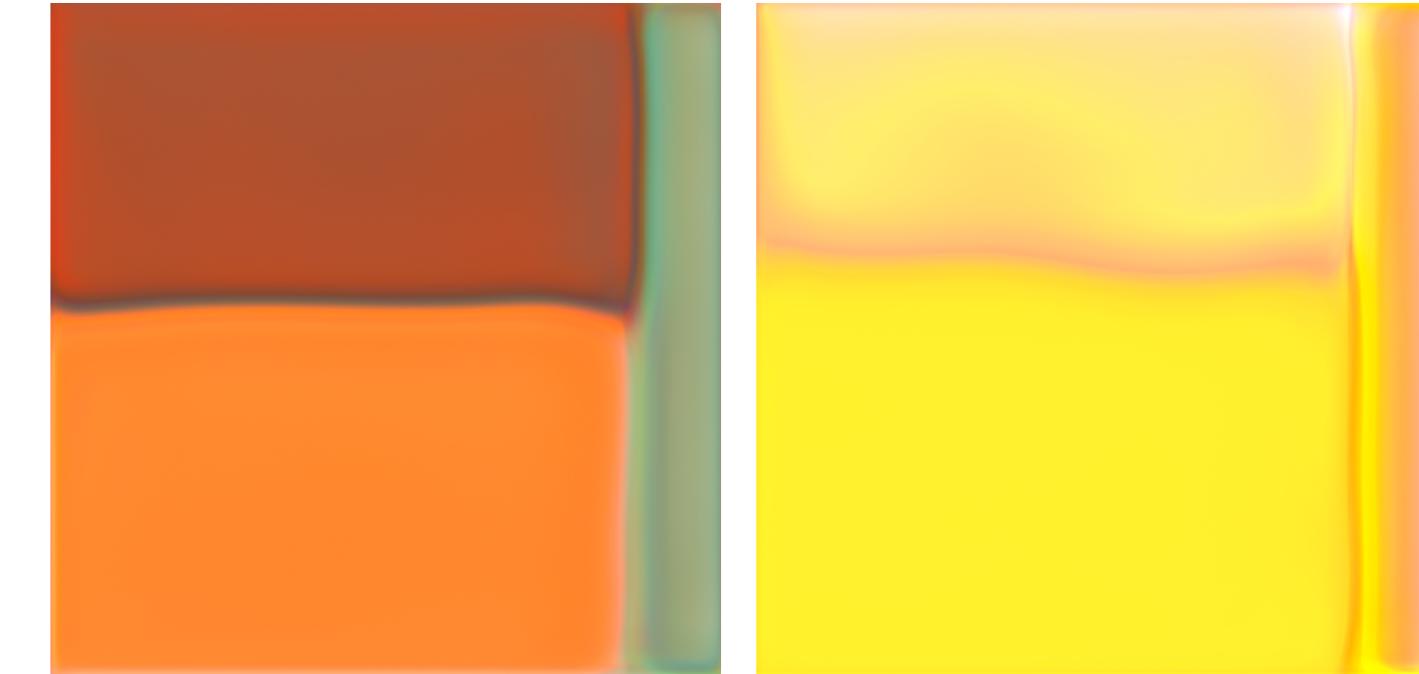
(Un)stable eqilibrium 1:1 (2019)



(un)stable equilibrium 1:1



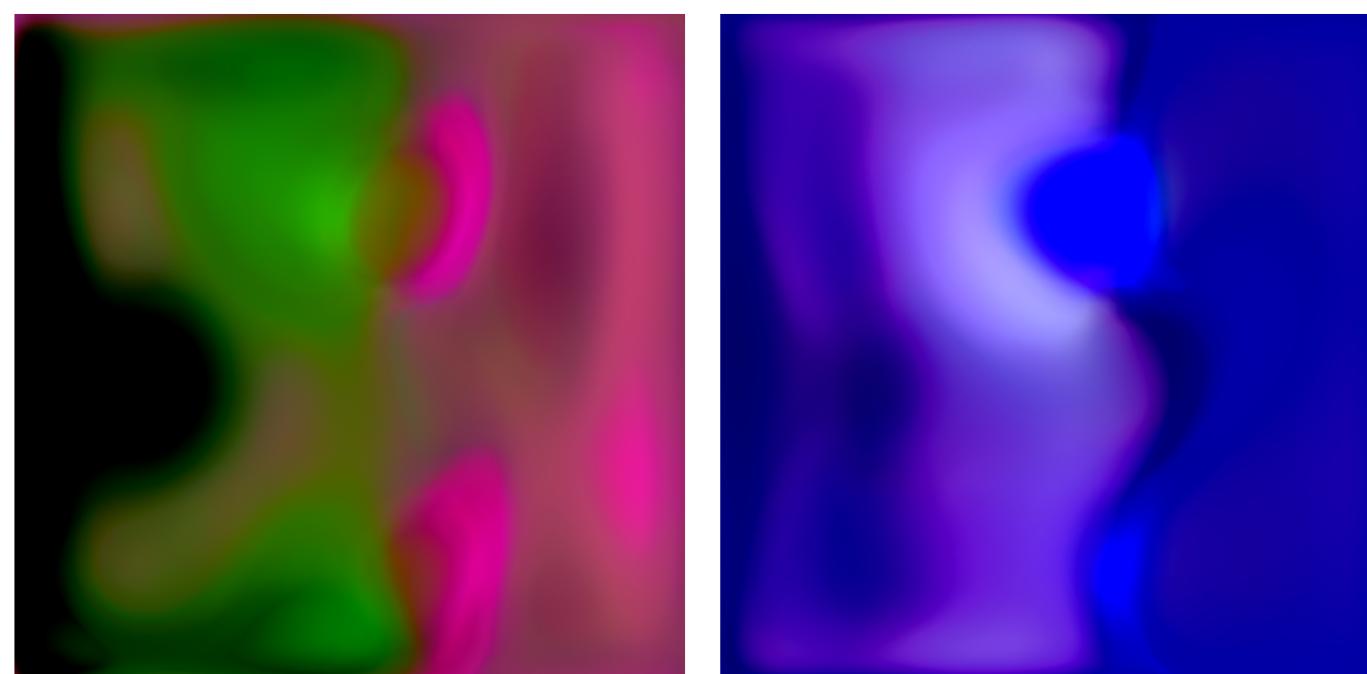
(un)stable equilibrium 1:3



(un)stable equilibrium 1:5



(un)stable equilibrium 1:2



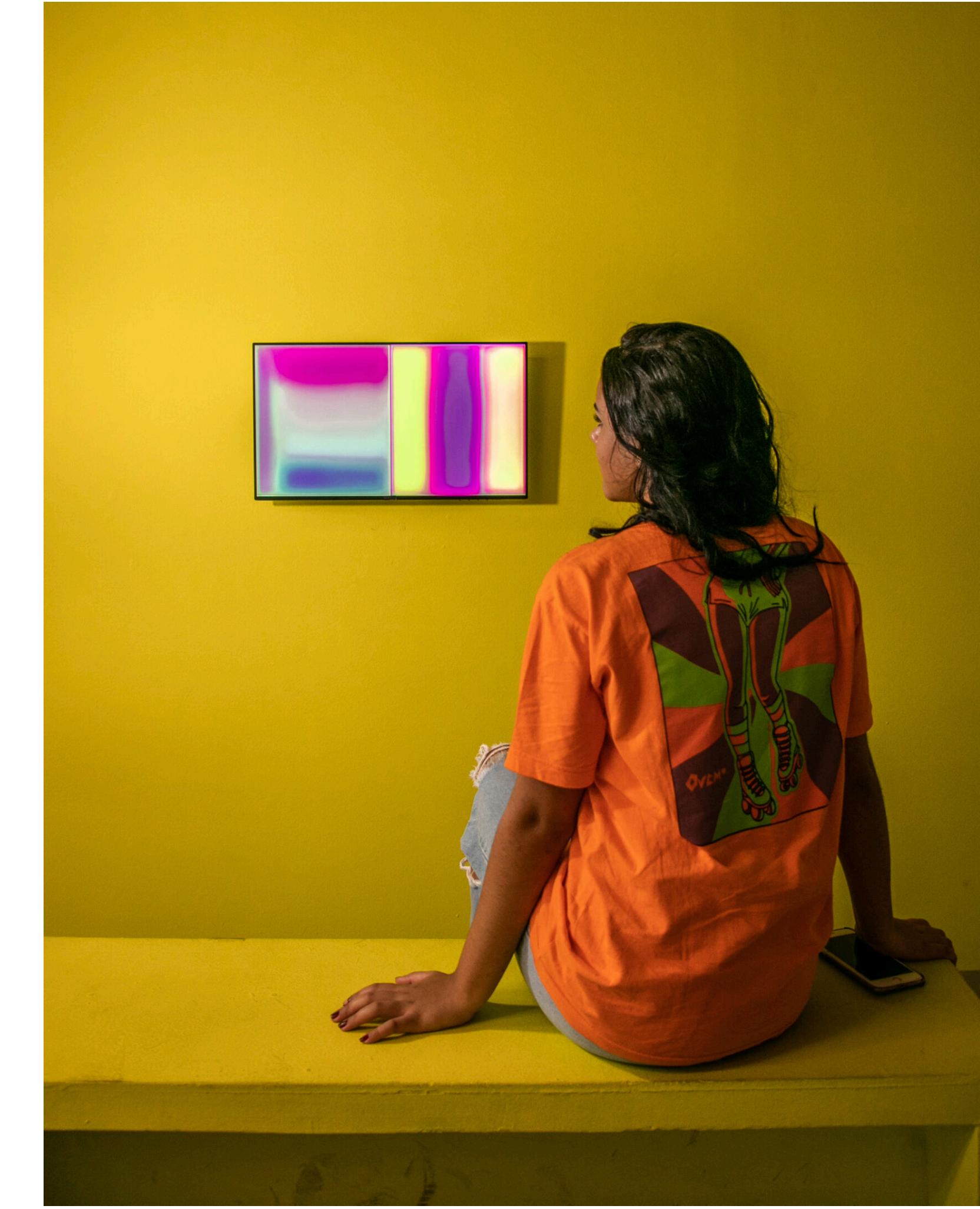
(un)stable equilibrium 1:4



(un)stable equilibrium 1:6



*the depot_digs,
London, 2021*



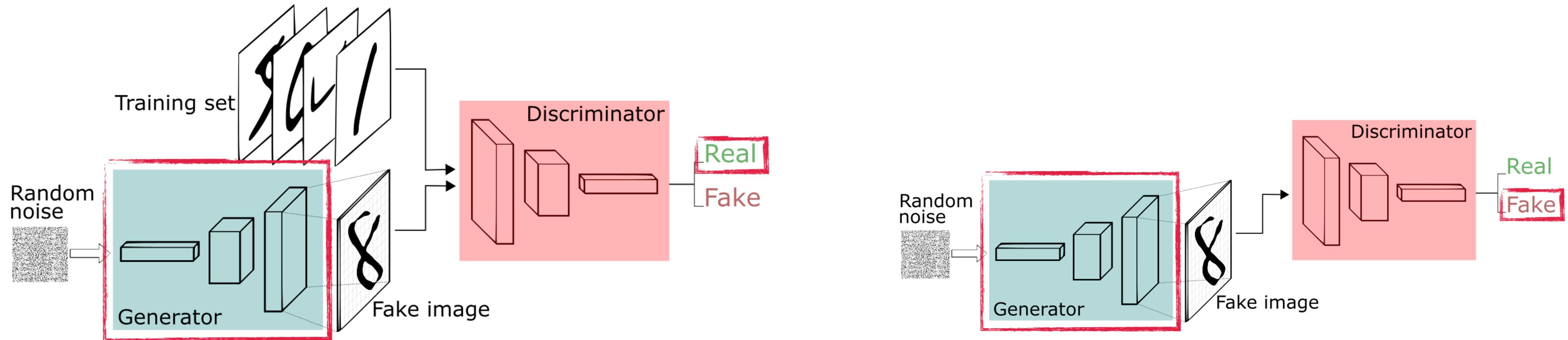
*FILE Festival,
Sao Paolo, 2022*

Experiment 2:

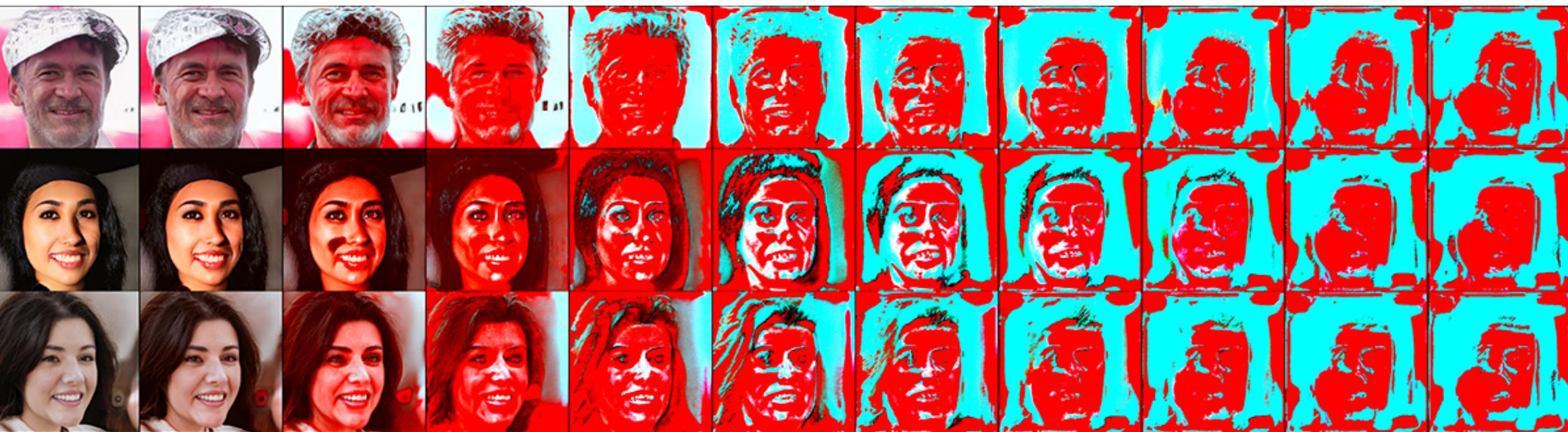
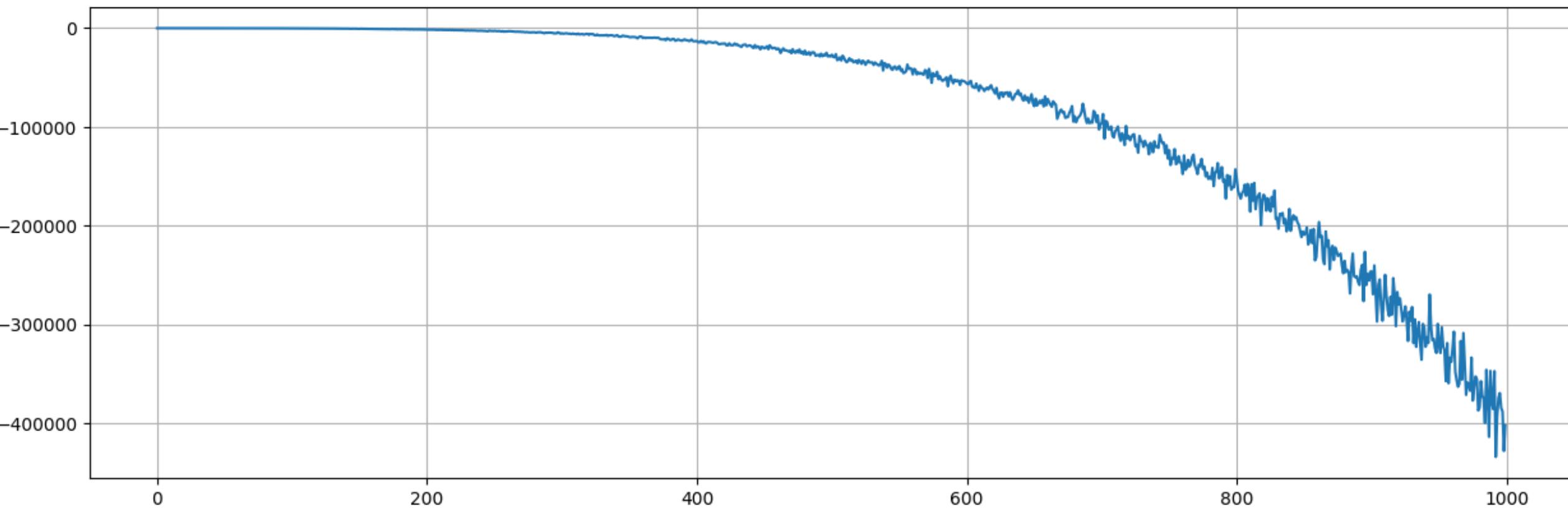
Can you fine-tune a generative neural network using other networks?



?



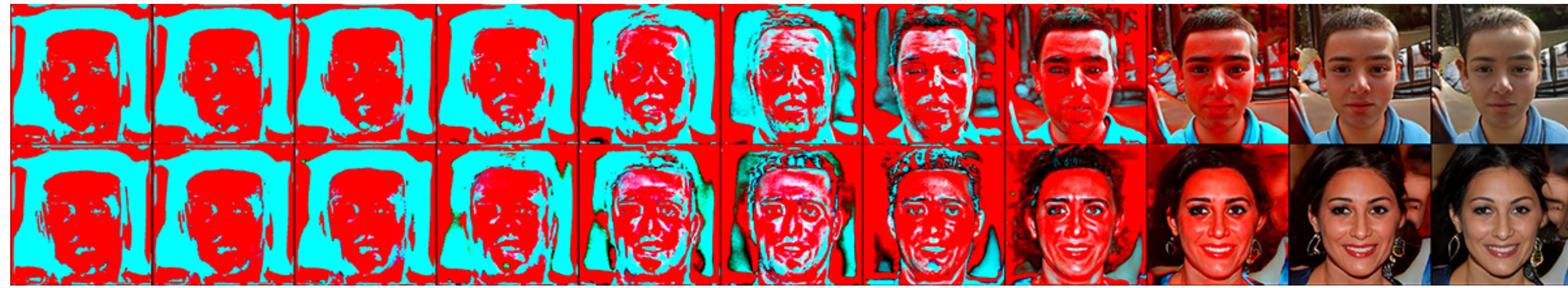
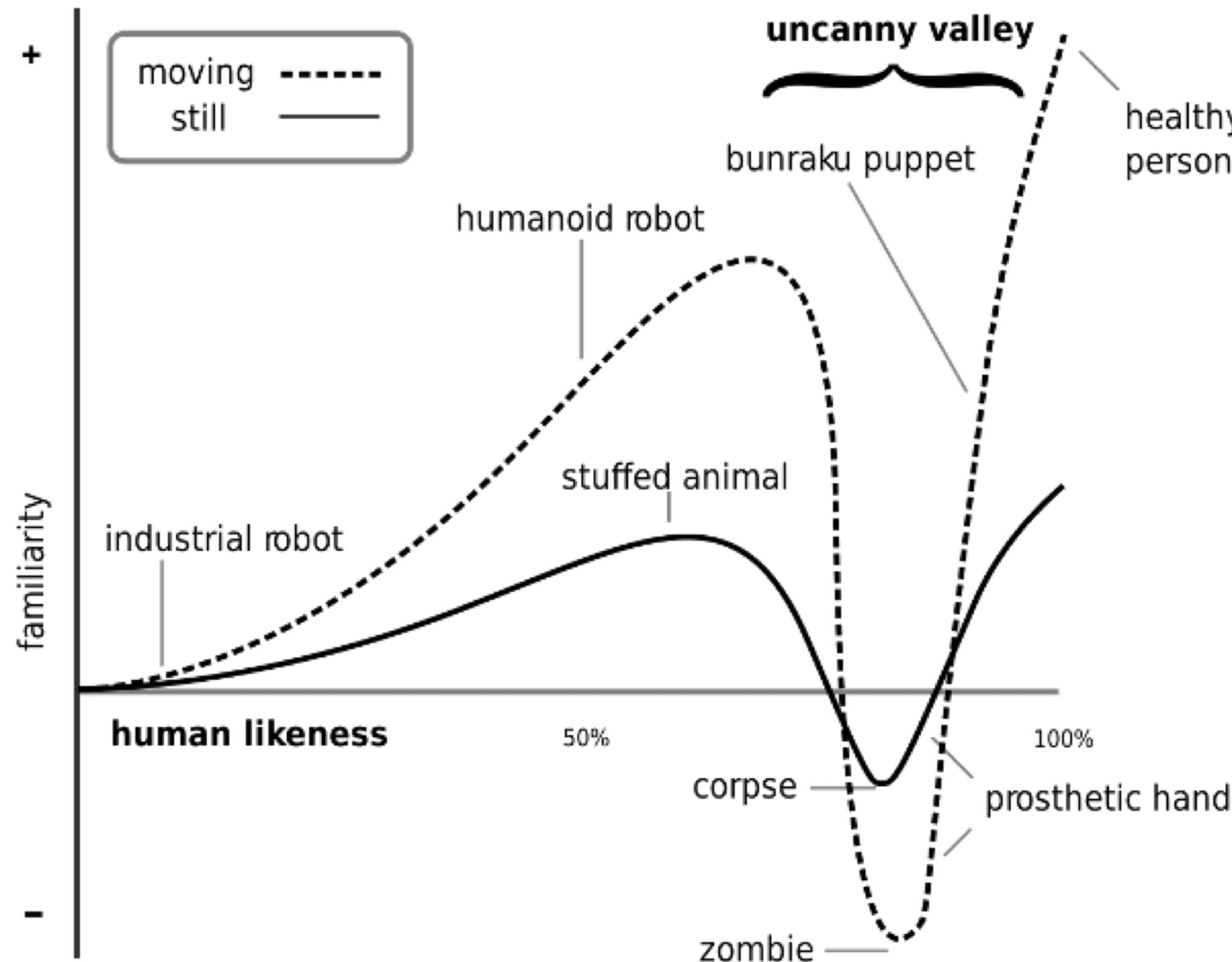
Optimise the generator towards generating 'fake' images instead of 'real' ones



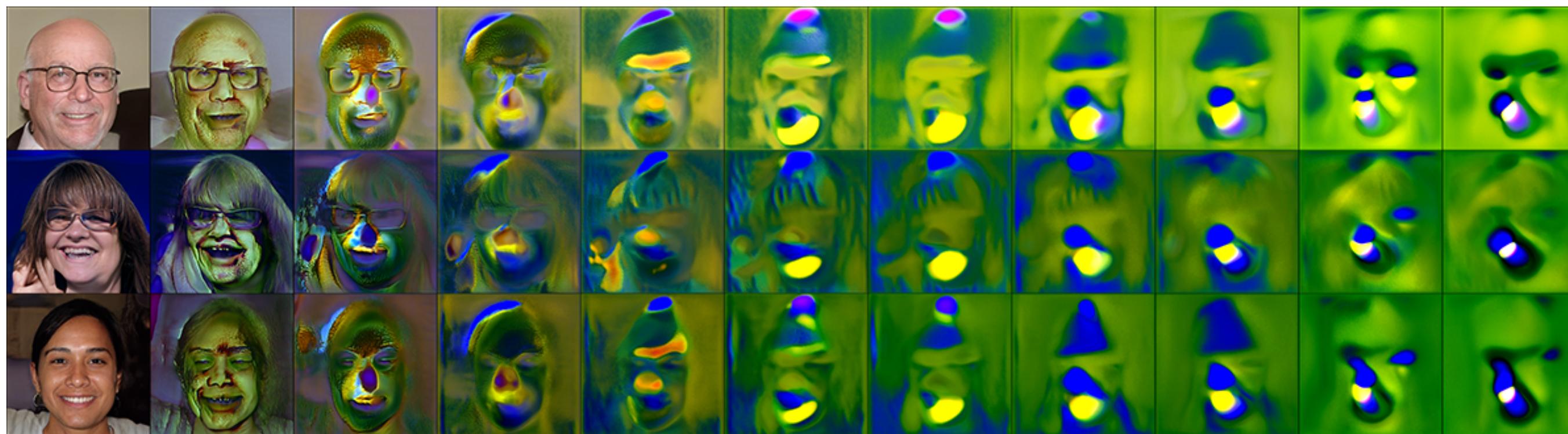
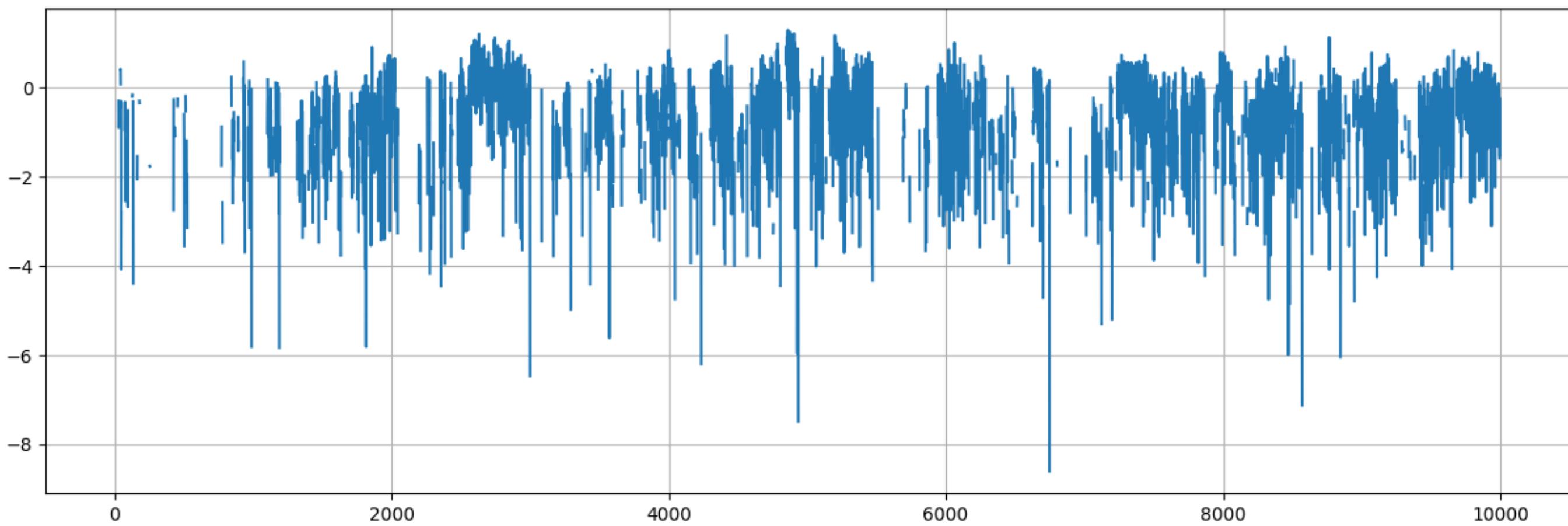
Fine tuning process over 1000 iterations with inverse loss



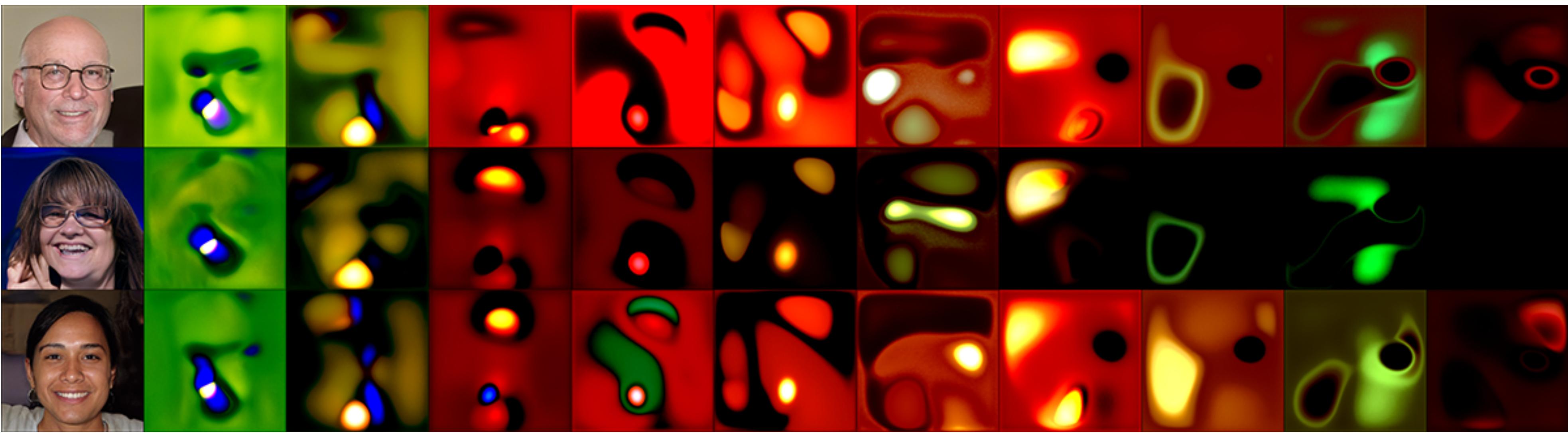
Being Foiled (2019)



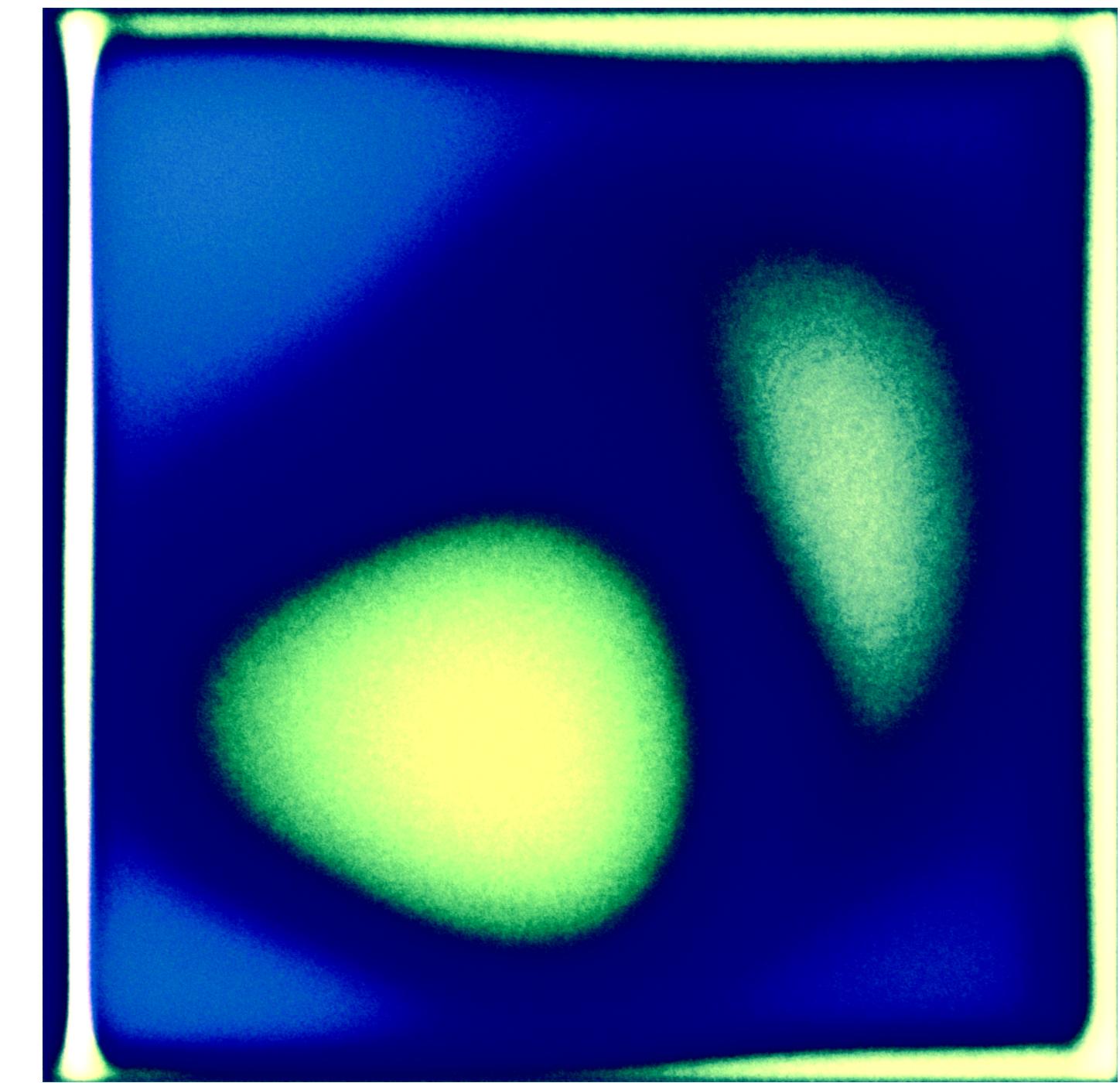
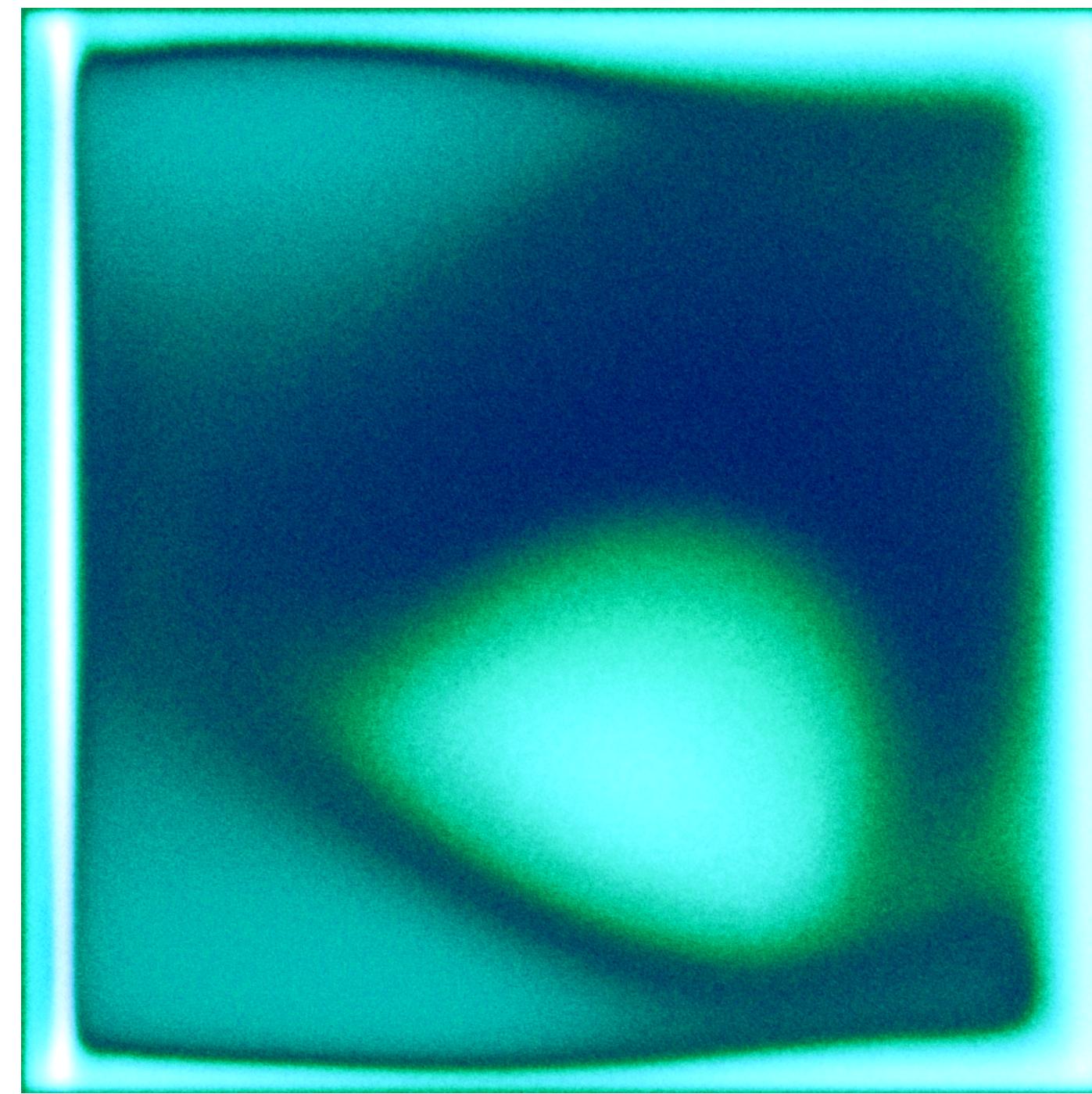
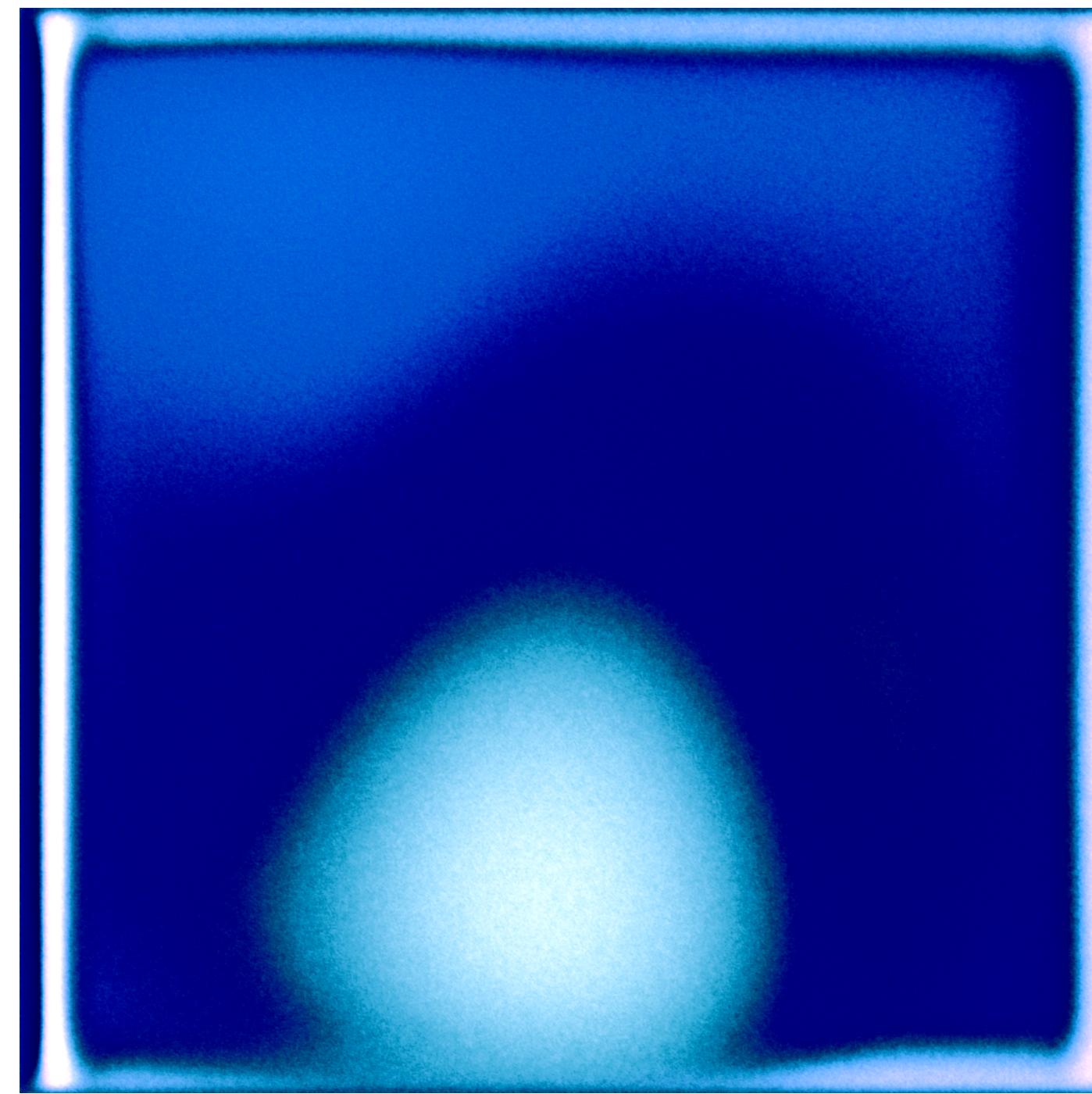
Traversing the uncanny valley in reverse



Fine tuning process over 10000 iterations with inverse log-loss



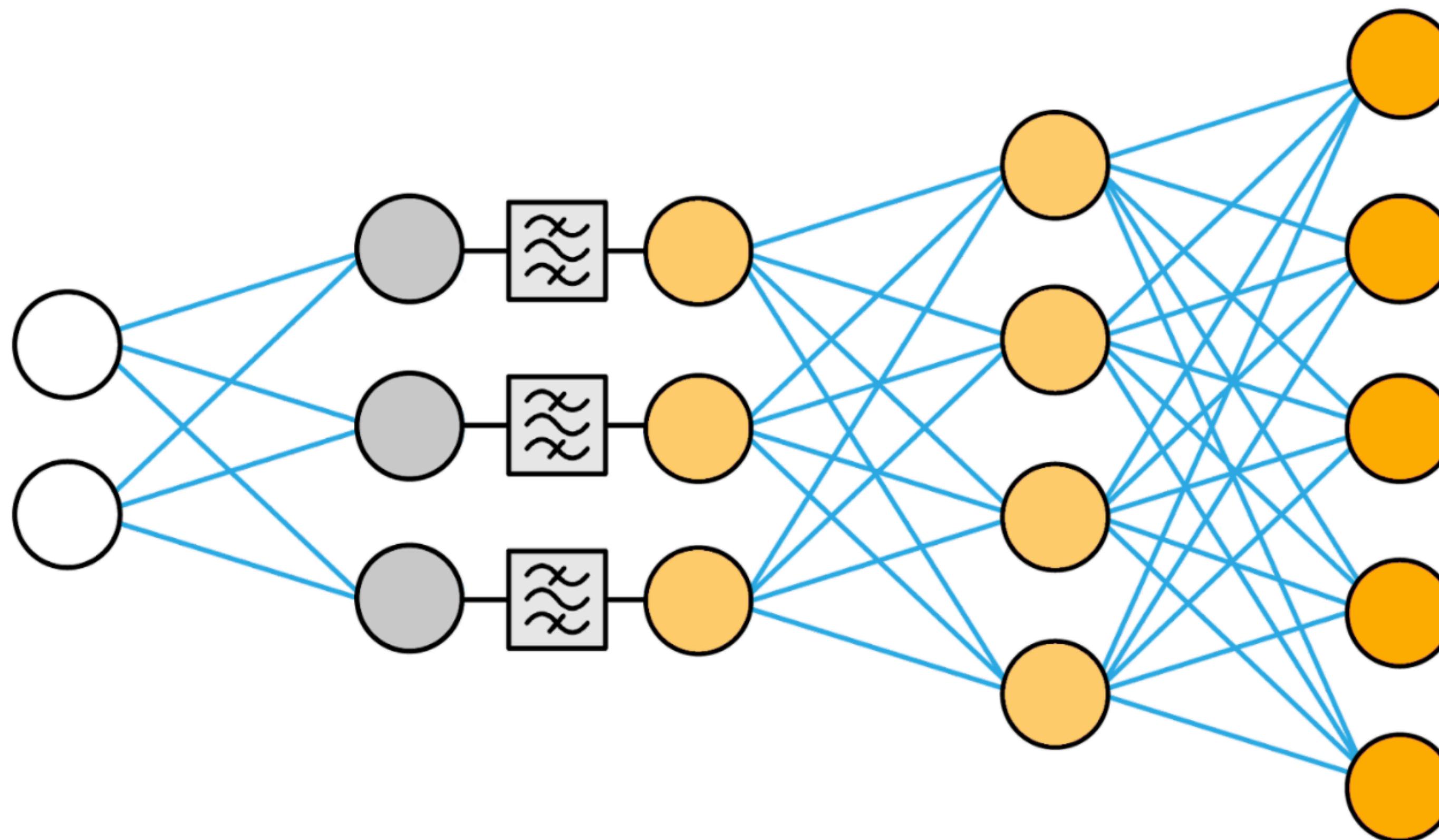
Fine tuning process over 100000 iterations with inverse log-loss



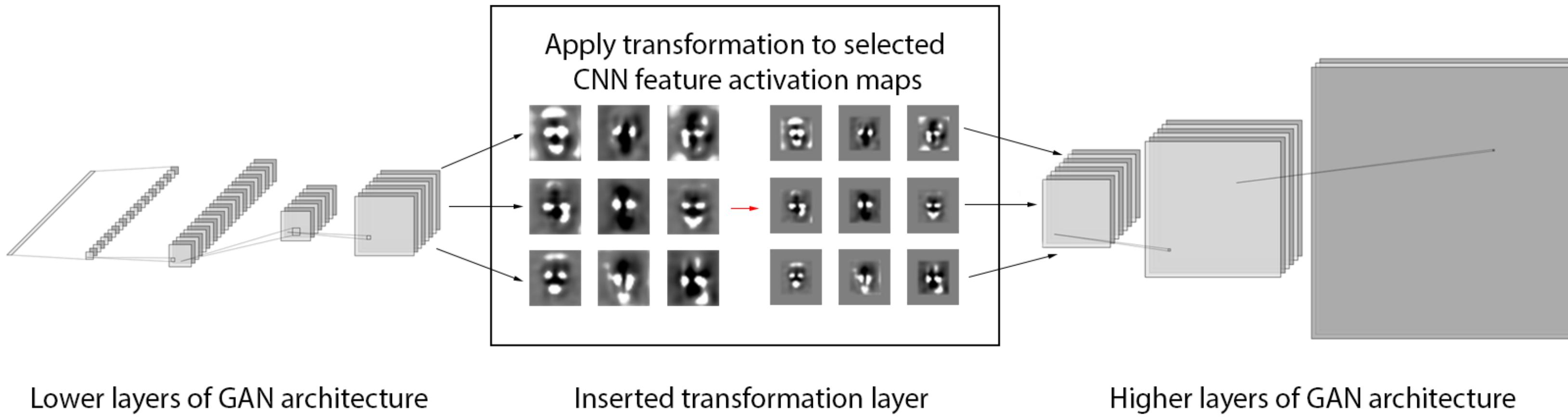
(un)stable equilibrium 2:1 (2025)

Experiment 3:

Can you manipulate neural networks after they have been trained?



Network bending — inserting controllable filters into pre-trained networks



Lower layers of GAN architecture

Inserted transformation layer

Higher layers of GAN architecture

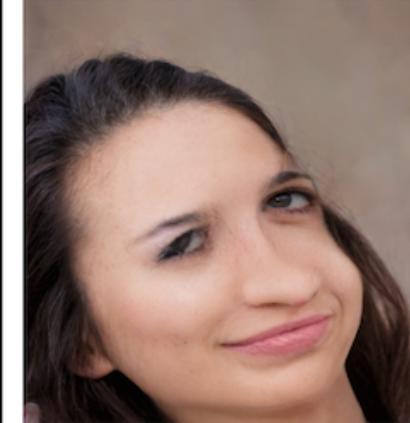
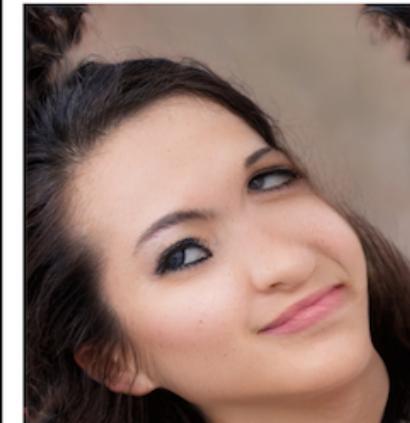
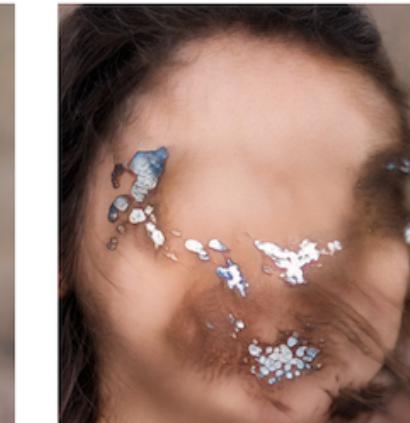
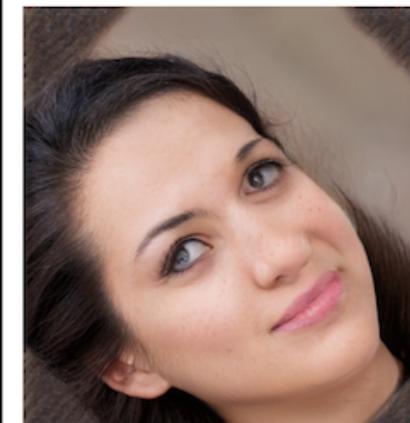
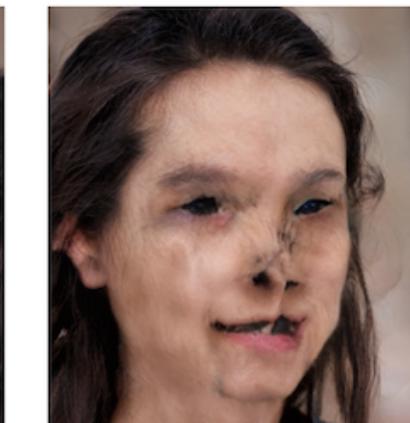
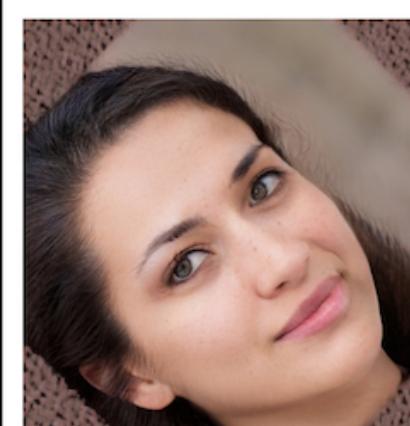
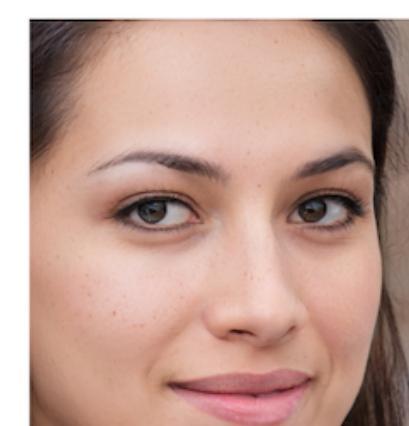
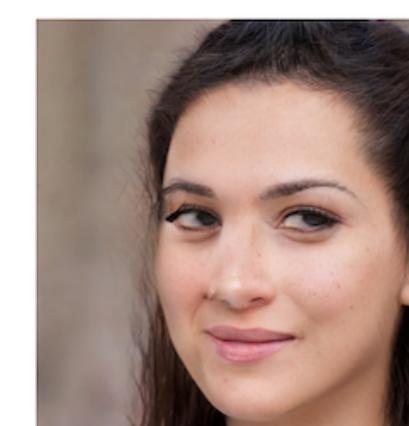
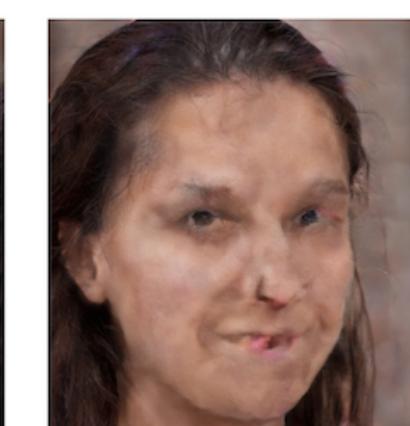
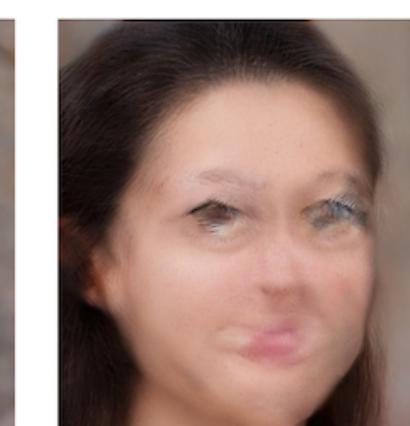
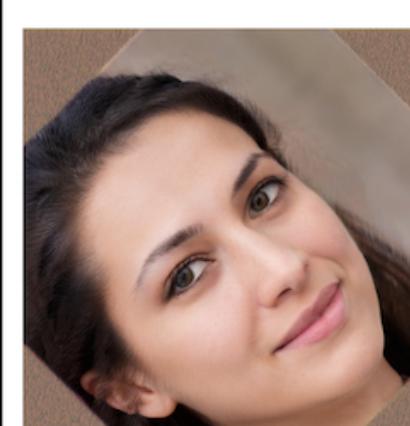
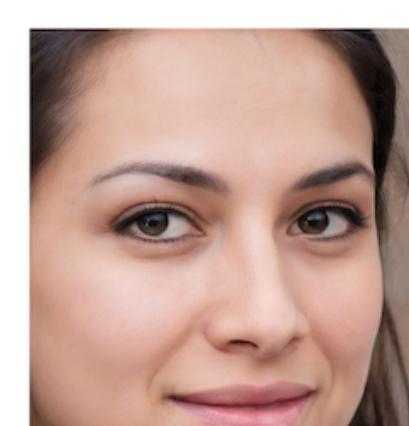
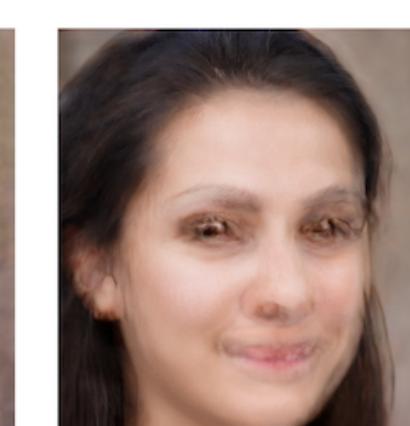
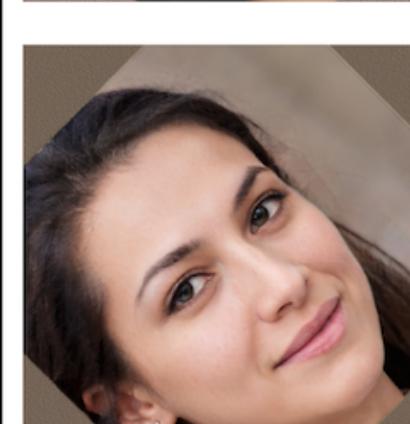
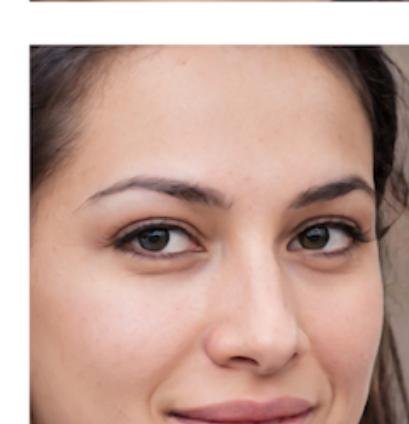
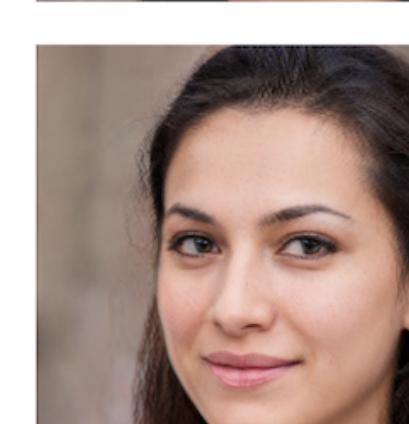
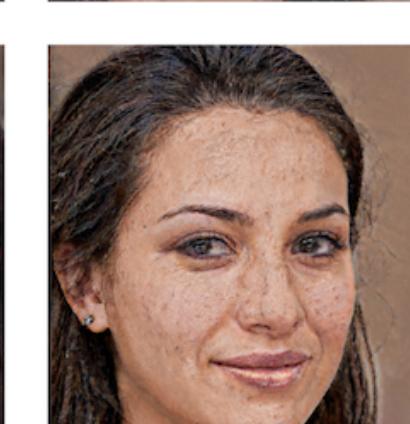
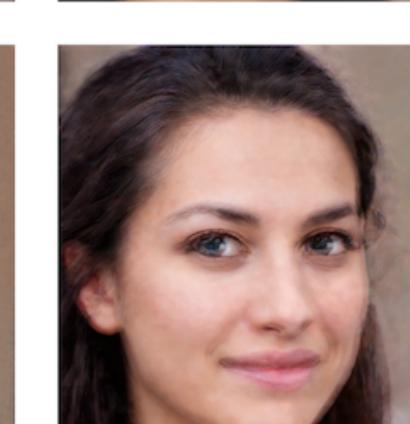


Unaltered Result



Manipulated Result

Network bending in styleGAN2

Layer	Rotate	Scale	Flip horizontal	Binary threshold	Dilate
2					
4					
6					
8					
10					
12					



Layer-wide



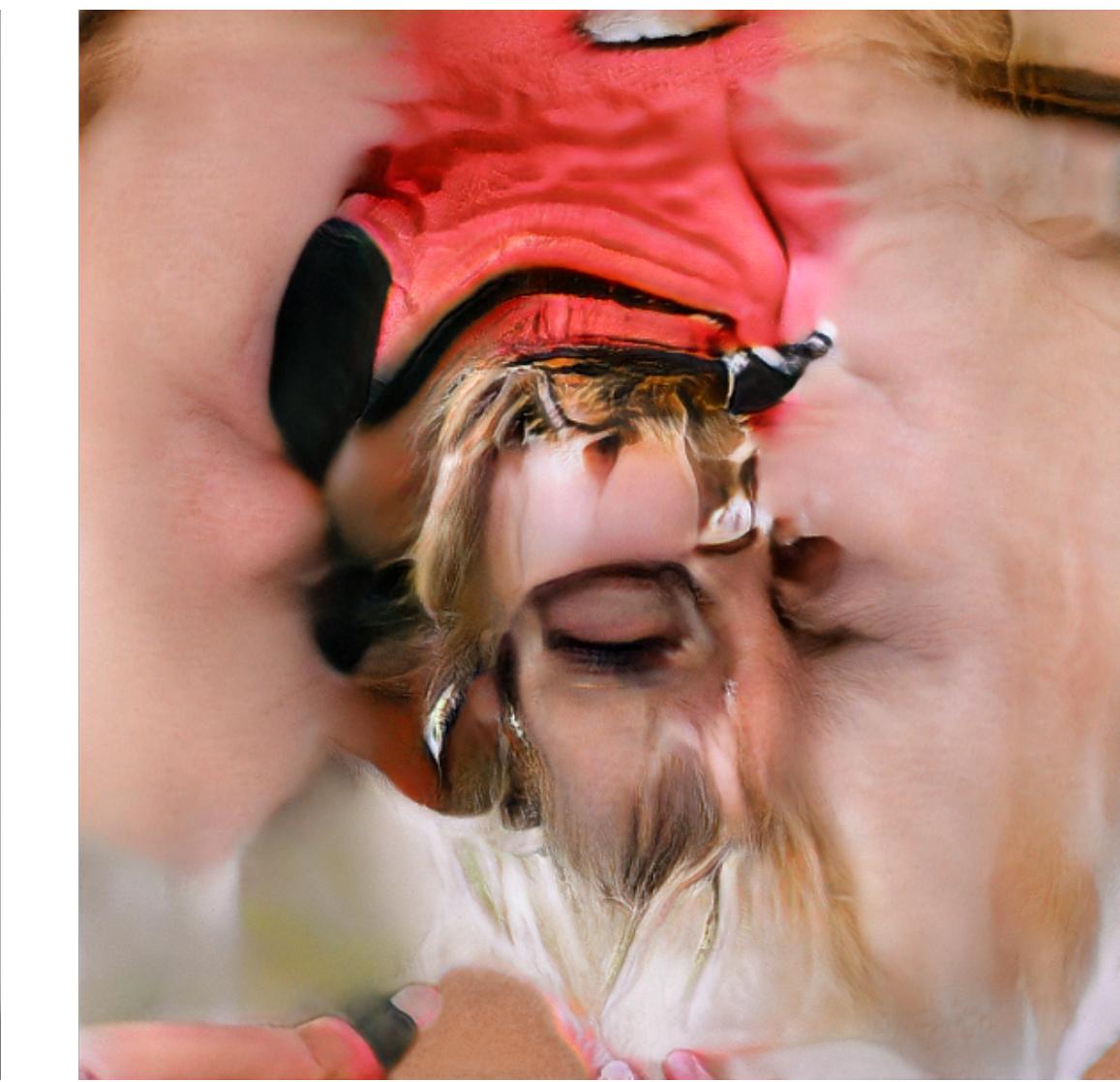
Random



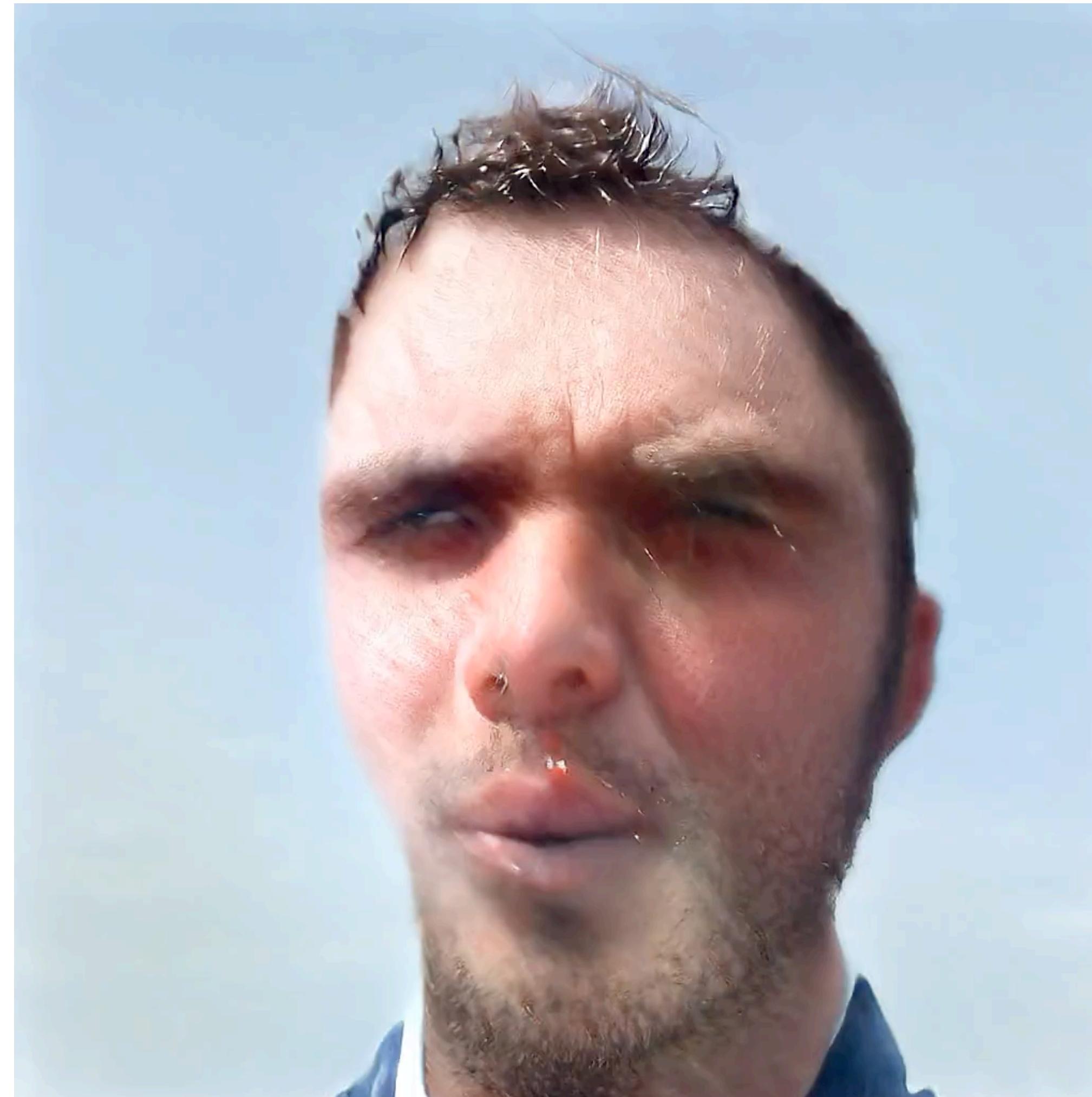
Cluster



**Combination of all
transform types**



Teratome (2020)



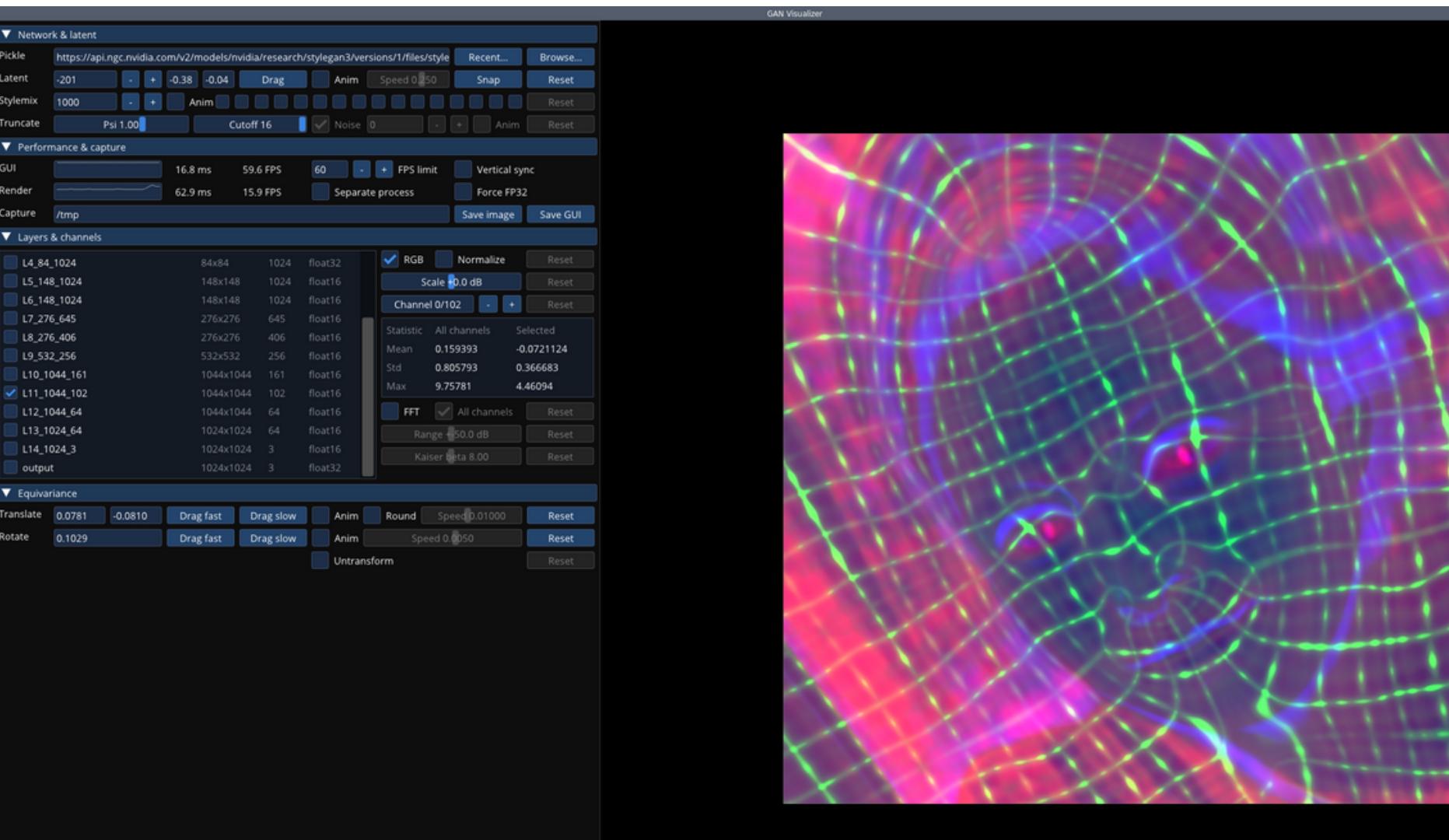
Selfie experiment (2020)

Working with AI art sometimes feels like gazing into a pond of water — we are not sure what we will get as a reflection. [...] Looking into a still pond, we see a clear, gently blurred version of ourselves staring back at us, while turbulent waters return mere rippled echoes of our shape [...] Working with AI has the potential to change too, as the technology becomes more predictable and controllable, rendering blurry reflections, distorted forms and uncertain outcomes a thing of the past.”

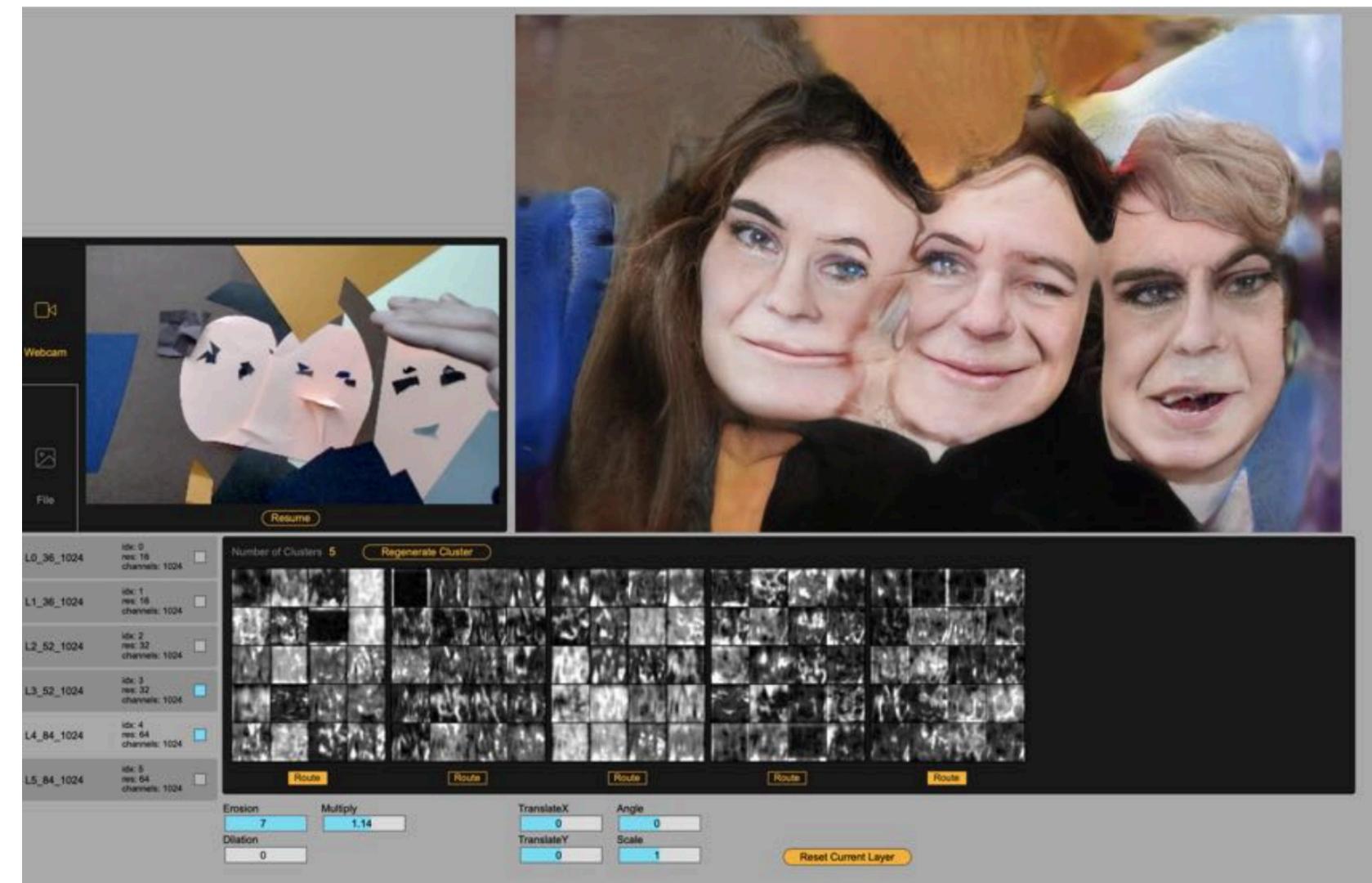
Reflections in the water — curators notes for Feral File,
Luba Elliott 2021



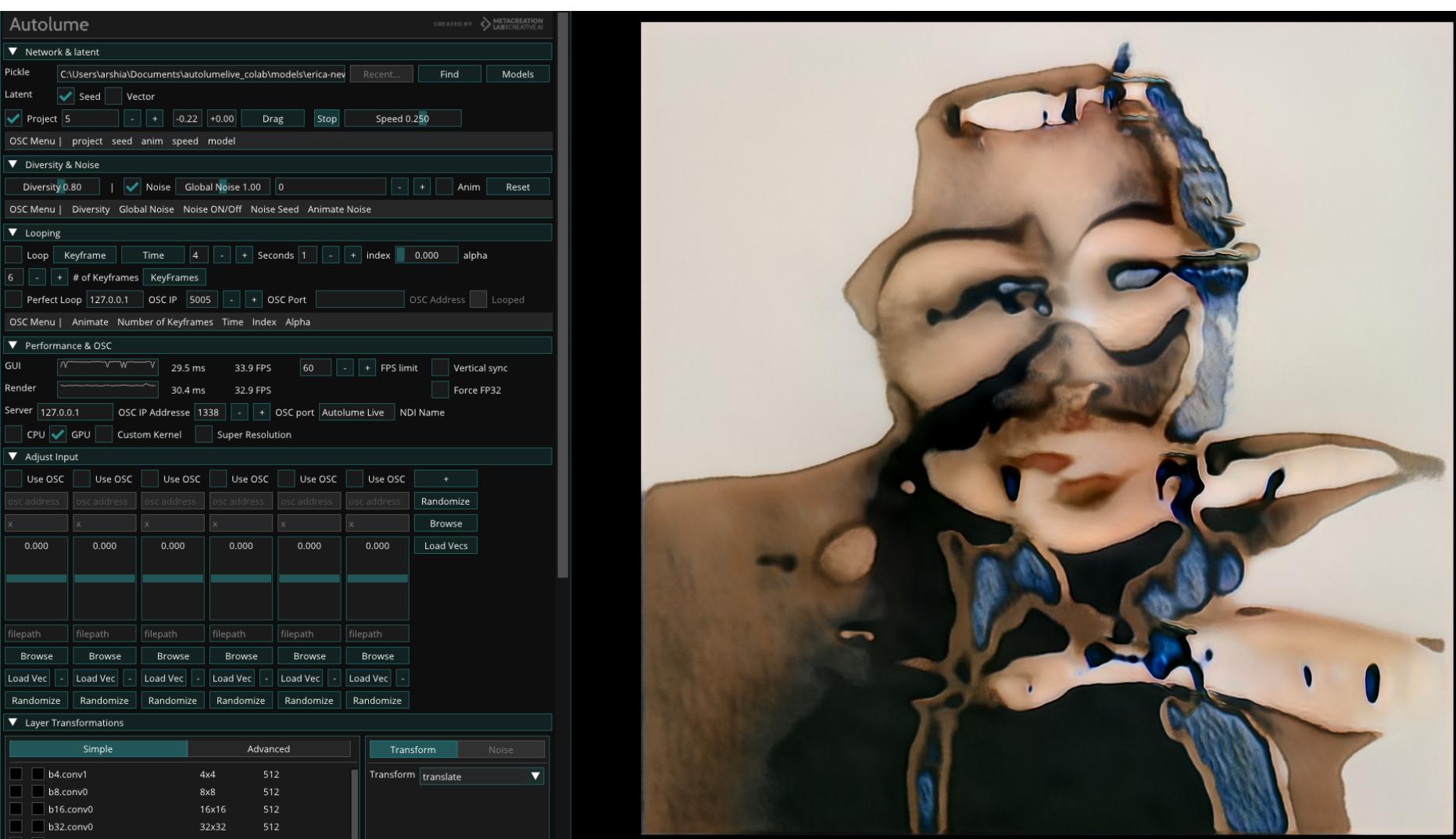
Fragments of self (2021)



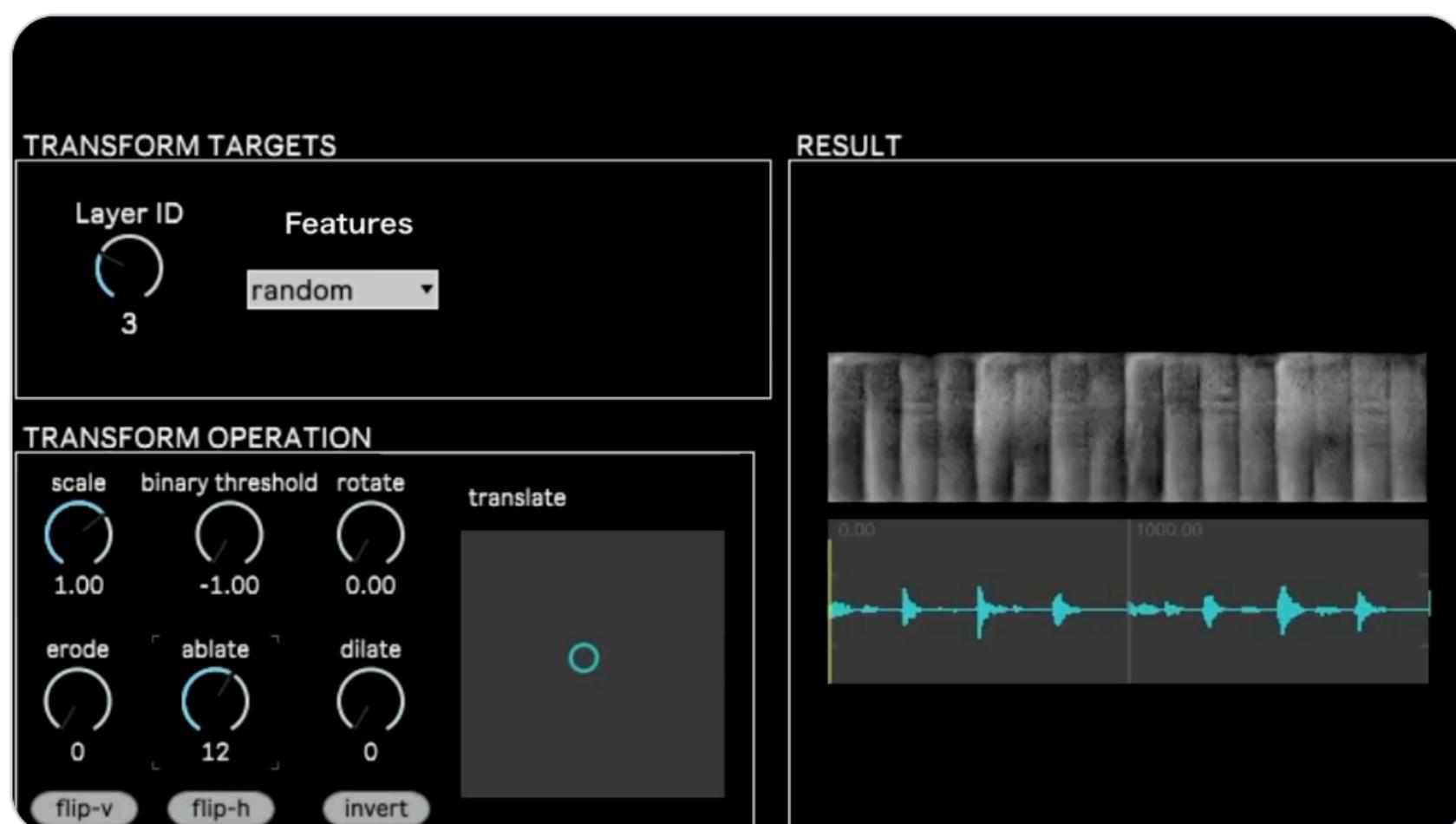
StyleGAN3 visualiser
NVIDIA



StyleGAN-Canvas
Shuoyang Zheng



Autolume
Simon Fasier University



LoopGAN interface
Nao Tokui



**Beyond prompts,
(Network bending stable diffusion)**
Garin Curtis



**Diffusertrack
(Network bending riffusion)**
Daniel Manz



**Brave,
(Network bending RAVE)**
Daniel Manz

 [acids-ircam / torchbend](#) Public

<> [Code](#) Issues Pull requests Actions Projects Security Insights

main 1 Branch 0 Tags Go to file <> Code

acids-ircam	Create README.md	26d9c07 · 3 months ago	3 Commits
LICENSE	Update LICENSE	5 months ago	
README.md	Create README.md	3 months ago	

README License ⋮

torchbend

`torchbend` is a library grounded on `torch.fx` focused on generative neural networks analysis and creative bending. This library allows you to:

- [✓] extend the tracing abilities of `torch.fx` with augmented parsers and proxies
 - dynamic parsing (wrapping un-traceable functions, shape propagation)
 - tracing torch distributions (currently implemented : `Bernoulli`, `Normal`, `Categorical`)
- [✓] easily parse and analyze model's graphs
- [✗] bend model's weights and activations
- [✗] adapt the library to specific generative models, and provide handy interfaces for python notebooks
 - [✗] handful classes for image, text, and sound
 - [✗] panel implementation for real-time bending

Torchbend library (coming 2025)

By taking data-free approaches we can ***expand the generative space*** of generative neural networks beyond what is possible with imitation based learning

By ***actively diverging*** from data we can open up new creative possibilities that are not derivative on the creative labour of others

Taking a ***hacking*** approach to generative AI, artists can create artworks that reveal unseen aspects of these models processes and give offer artistic approaches to explainability in AI

Link to slides:



Thanks for listening

<https://terencebroad.com/>

terry.m.broad@gmail.com