How I use AI in my practice...

Catherine M. Weir

18th October 2023

About Me...

- I am an artist working with photography, data, code, and (most recently) machine learning.
- I am currently a Lecturer in Interaction Design and Design History and Theory at Glasgow School of Art.
- I graduated from Gray's in 2010 with a BA(Hons) in Photographic and Electronic Media.
- In 2011, I moved to London to study Computational Studio Arts at Goldsmiths.
- In 2014, I moved to Glasgow to do a practice-based PhD at Glasgow School of Art.

Image: My portrait labelled by Trevor Paglen and Kate Crawford's *ImageNet Roulette* (2018) >

About Me...

- I studied Photographic and Electronic Media here at Gray's between 2006 and 2010.
- A lot of my work was based in photography – both analogue and digital processes.

Image: *Camera Obscura* (2010) Digital photographic prints on MDF.

About Me...

- Around 3rd Year, I found myself increasingly interested in digital art.
- I was particularly interested in works that were interactive, or incorporated real-time data from the Internet.

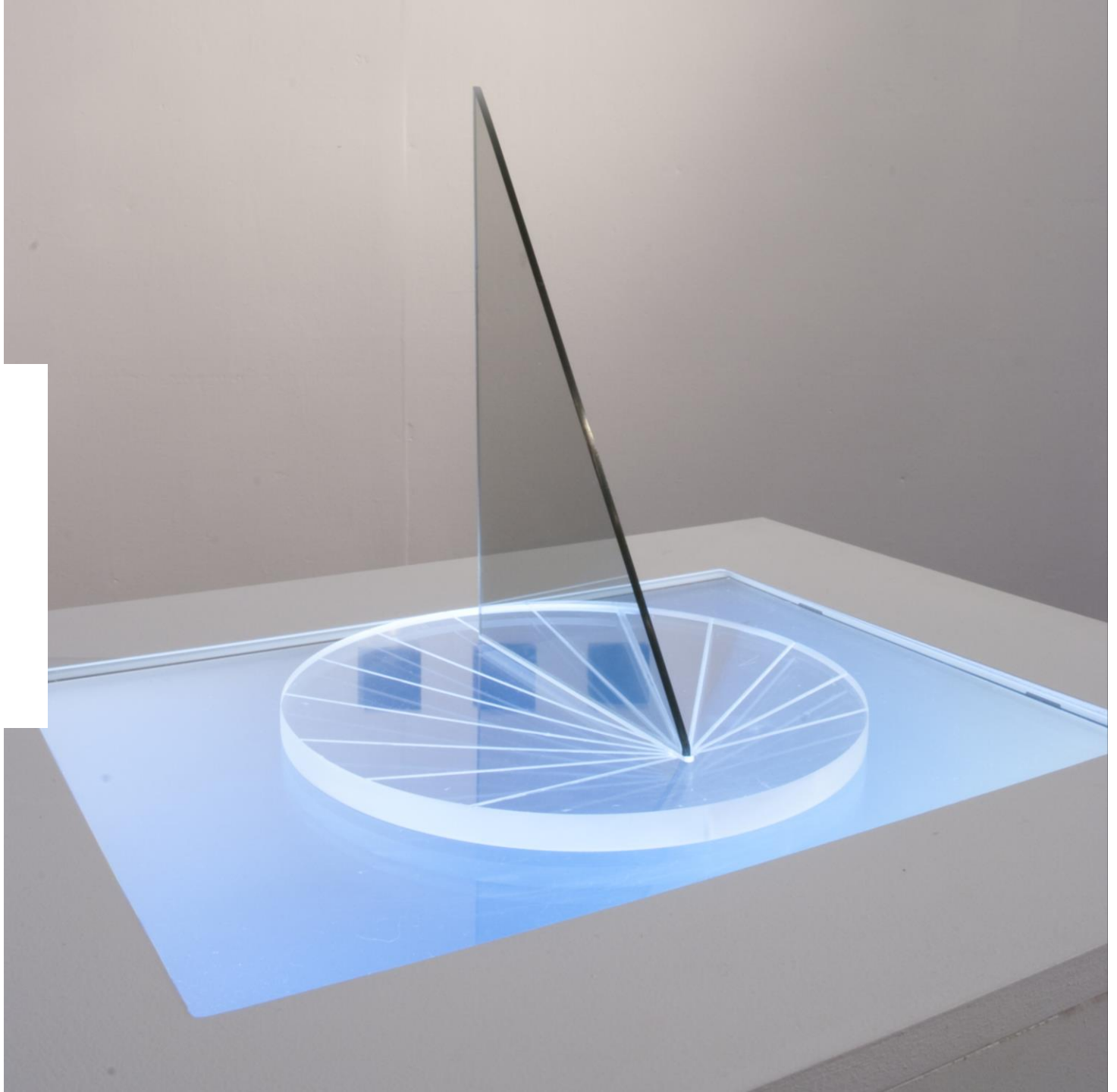


Image: *Digital Sundial* (2010) Custom software program, Perspex, and MDF.

About Me...

- In 2011, I started an MFA in Computational Studio Arts at Goldsmiths.
- Here, I learned to code; using mainly open-source software and hardware like Processing and Arduino.
- For my final project, I started to think about how the convergence of media and computing technologies was changing photography.

Image: *Composed Under Electric Stars* (2013)
Custom locative iPhone application.

Such images are indeed able to usurp reality because first of all a photograph is not only an image (as a painting is an image), an interpretation of the real; it is also a trace, something directly stencilled off the real, like a footprint, or a death mask. While a painting, even one that meets photographic standards of resemblance, is never more than the stating of an interpretation, a photograph is never less than the registering of an emanation [...] a material vestige of its subject in a way no painting can be.

Susan Sontag, 'The Image-World' in *On Photography* (London: Penguin, 2008), p.154.

About Me...

- For my PhD research, I focused on ways of combining my photographs with data visualisation in custom software programs.
- This was based on the idea that a digital photograph displayed on screen is not just a remediation of chemical-based photography, but the output of an active computational process.
- I proposed that working with data and creative coding to intervene in that computational process can be understood as a kind of 'performative gesture' on the part of the artist.

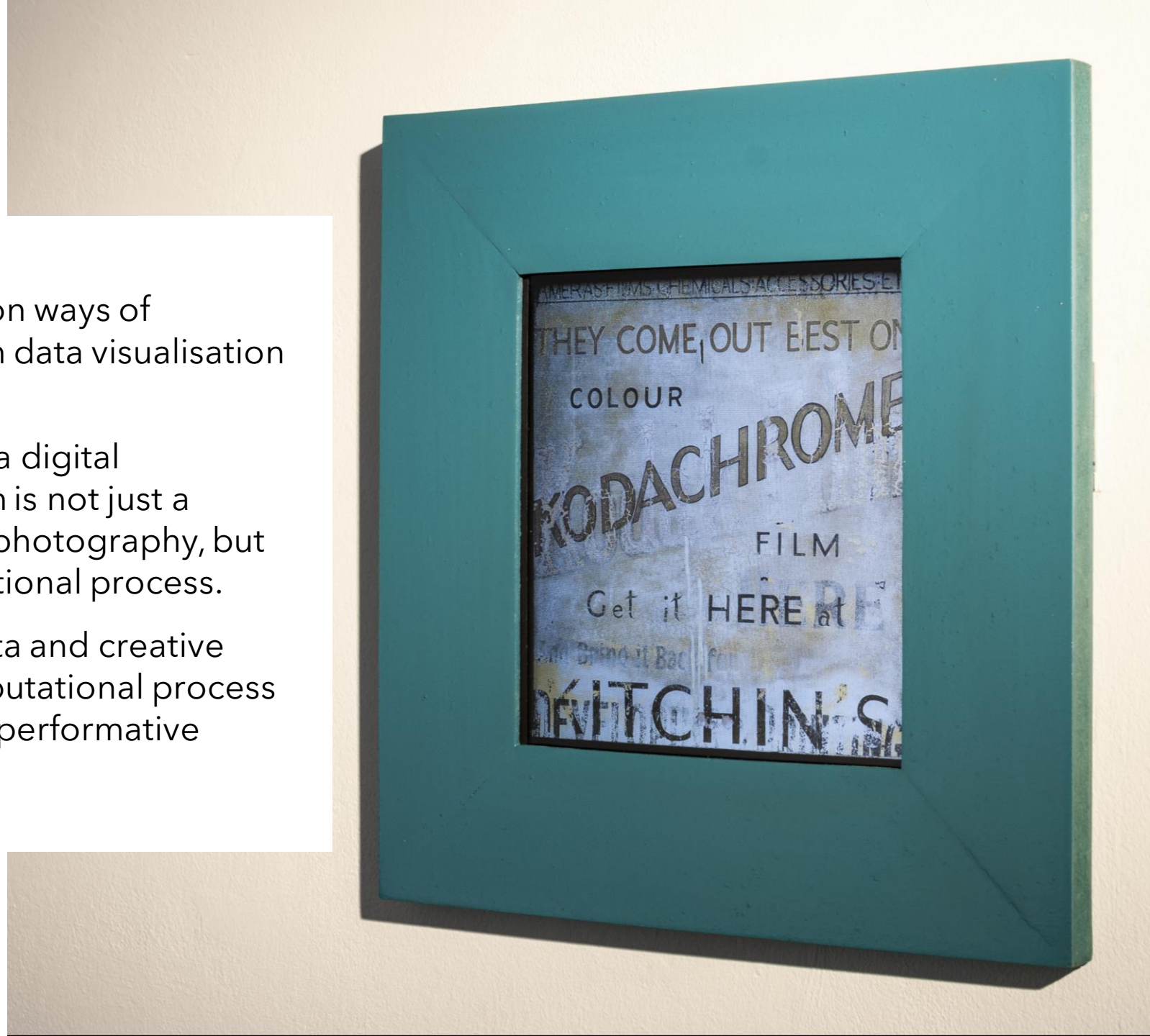


Image: *KODK* (2015) Digital photograph and custom software. Made with Processing.

Image: *Atlas* (2016) Digital photograph and custom software. Made with Processing.

First Forays...

- I finished my PhD in 2018, around the same time that photographic images generated by Generative Adversarial Networks (GANs) were starting to appear.
- GANs are trained to generate images by being fed thousands of labelled images of what you want to generate.
- GANs have improved a lot since 2018, but at the time a lot of the images they produced were very strange looking; almost uncanny.
- I was interested in what this new technology might mean for photography.

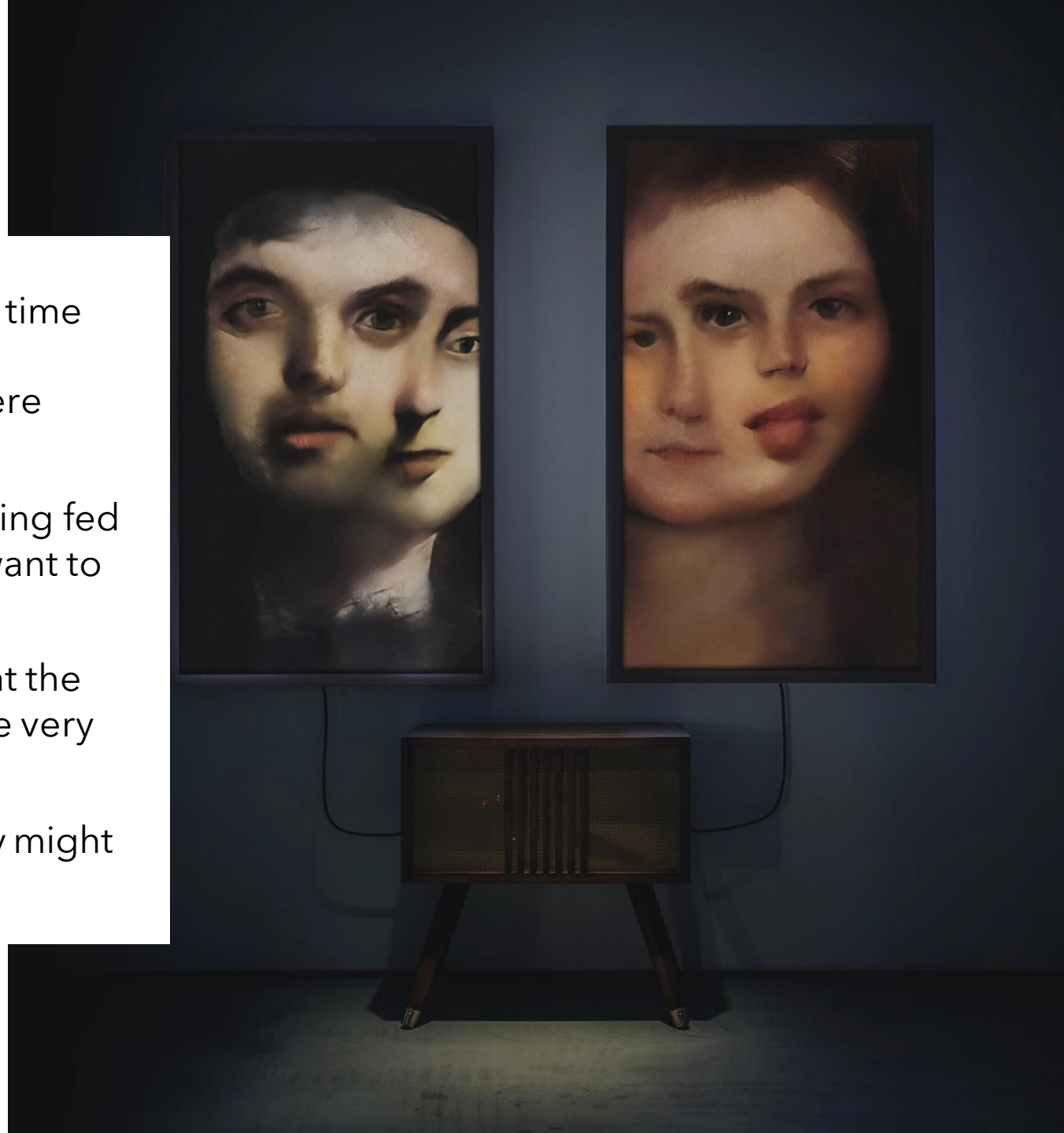


Image: Mario Klingemann, *Memories of Passersby 1* (2018)

Training sets [...] are the foundation on which contemporary machine-learning systems are built. They are central to how AI systems recognize and interpret the world. These datasets shape the epistemic boundaries governing how AI systems operate, and thus are an essential part of understanding socially significant questions about AI.

Kate Crawford and Trevor Paglen, 'Excavating AI: The Politics of Images in Machine Learning Sets' (2019) https://excavating.ai/.

First Forays...

- Machine Learning systems, in many respects, only as good as the data that they are trained on.
- A GAN that has, for instance, only been trained on images of cats can only ever produce images of cats.
- Similarly, an image recognition system that has only been trained on images of apples, will not be able to recognise an orange, or a banana.
- This becomes particularly complicated, and troubling, when we turn these systems on people.

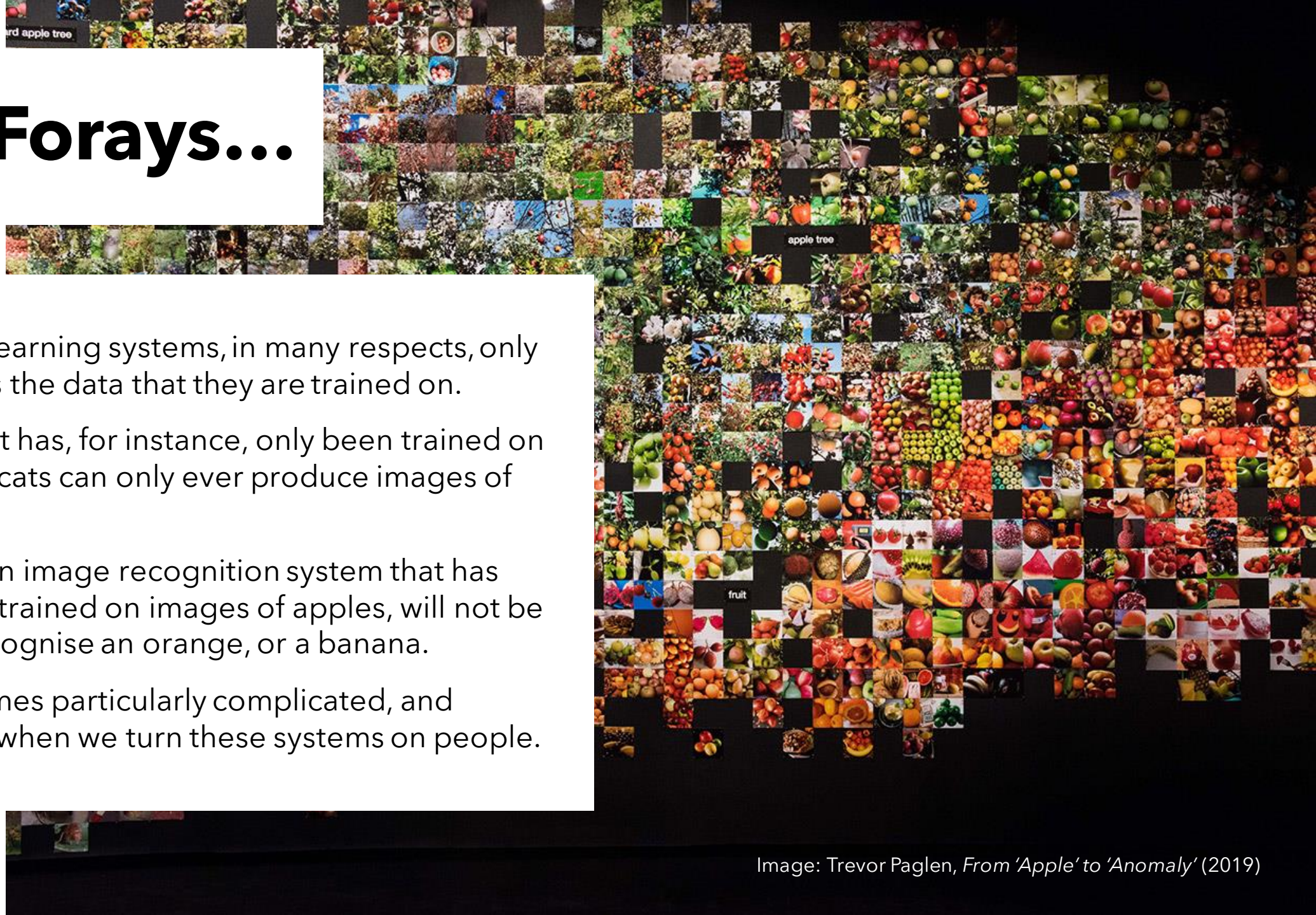


Image: Trevor Paglen, *From 'Apple' to 'Anomaly'* (2019)

First Forays...

- Too often, we see examples of machine learning systems that perform poorly on minoritized groups, such as people of colour and members of the LGBTQ+ community.
- MIT Media Lab researcher Joy Buolamwini has shown that facial recognition systems developed by some of the world's biggest tech companies perform very poorly on images of Black women.
- This poor performance is in large part due to the fact that images of Black women only make up a very small proportion of these systems' training data.

Image: MIT Researcher Joy Buolamwini, who is an advocate for Algorithmic Justice.

Datasets aren't simply raw materials to feed algorithms, but are political interventions. […] The whole endeavour of collecting images, categorizing them, and labelling them is itself a form of politics, filled with questions about who gets to decide what images mean and what kinds of social and political work those representations perform.

Kate Crawford and Trevor Paglen, 'Excavating AI: The Politics of Images in Machine Learning Sets' (2019) https://excavating.ai/.

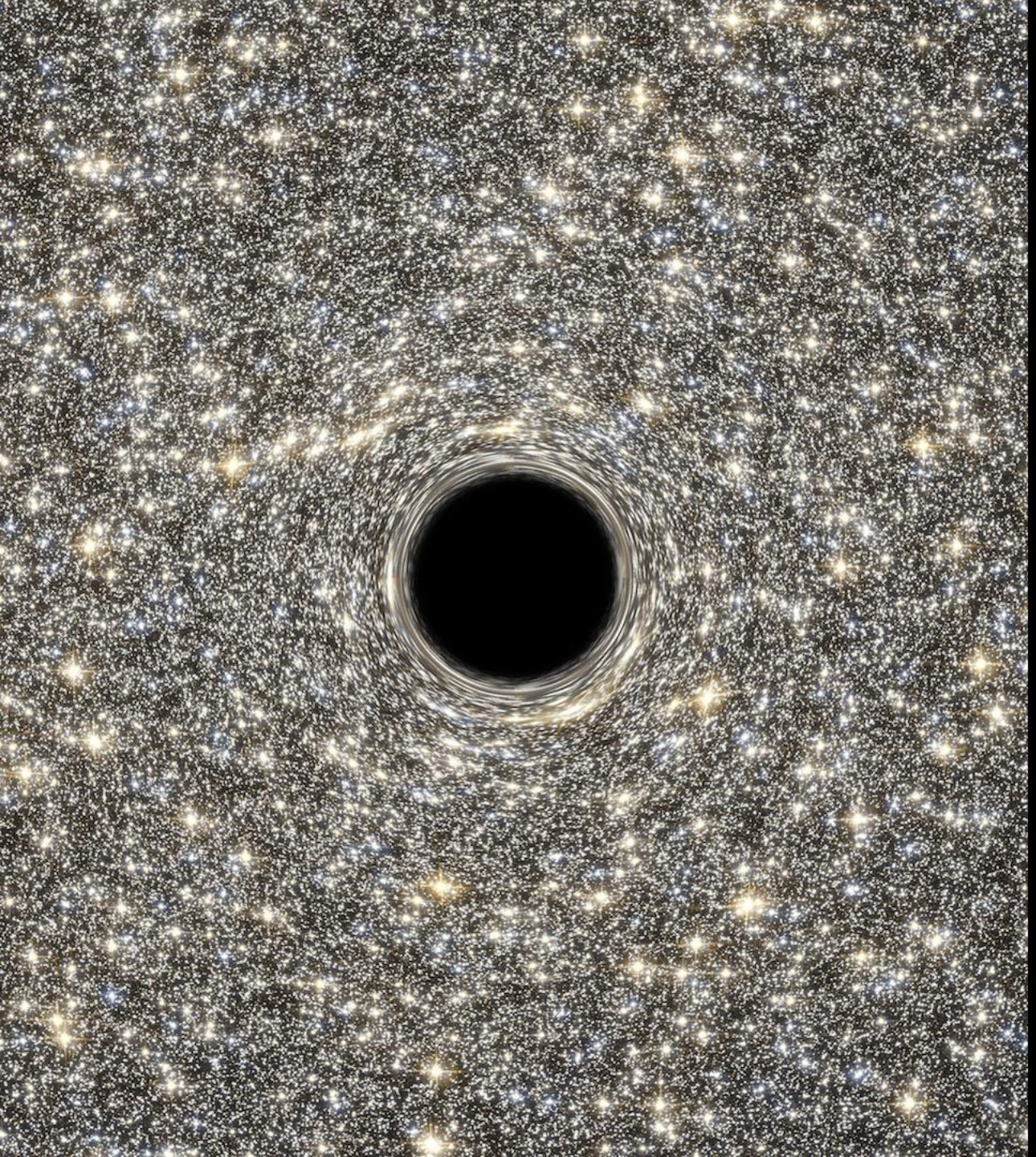
First Forays…

- Questions of the politics and biases of training sets were at the forefront of my mind when I first started to play around with machine learning.
- Some of my earliest experiments involved putting photographic images of stars and other stellar phenomena through different image recognition system to see what kinds of tags and descriptions they returned.
- I chose stars specifically because humans have always been good at seeing patterns in the night sky, in the form of constellations. I wanted to see how a machine might compare.

Image: NASA, *The Pillars of Creation* (1995)

flying
water
train
cake
traffic
top
driving
man
view
holding
rainy
star
sitting
dirt
fire
blurry red
pizza
seen
rain
pan
piece
riding
yellow

A blurry picture of a cake.



stone

A close up of a stone wall.

outdoor
lit
light
night
red
player
snow
wet
blurry
skiing
star
objects
stop
view
crowd
group
standing
playing
man
ball
water
bat
time
rain
air
game
dark
people
city
street
rainy
baseball
field
bar

A red light at night.

rainy

colorful

wet

water

object

rain

star

blurry

blue

yellow

A blurry picture.

A large polar bear swimming in the water.

Our best machines are made of sunshine…

- Training a single AI model can emit as much carbon as five petrol-driven cars in their entire lifetime.
- In December 2019, I took part in an event at CCA reflecting on the materiality of contemporary photographic culture.
- I decided to find out what an image-recognition system would make of satellite images of made-for-technology landscapes or affected by climate change.
- The title, *Our best machines are made of sunshine…* is taken from Donna Haraway's 'Cyborg Manifesto'.

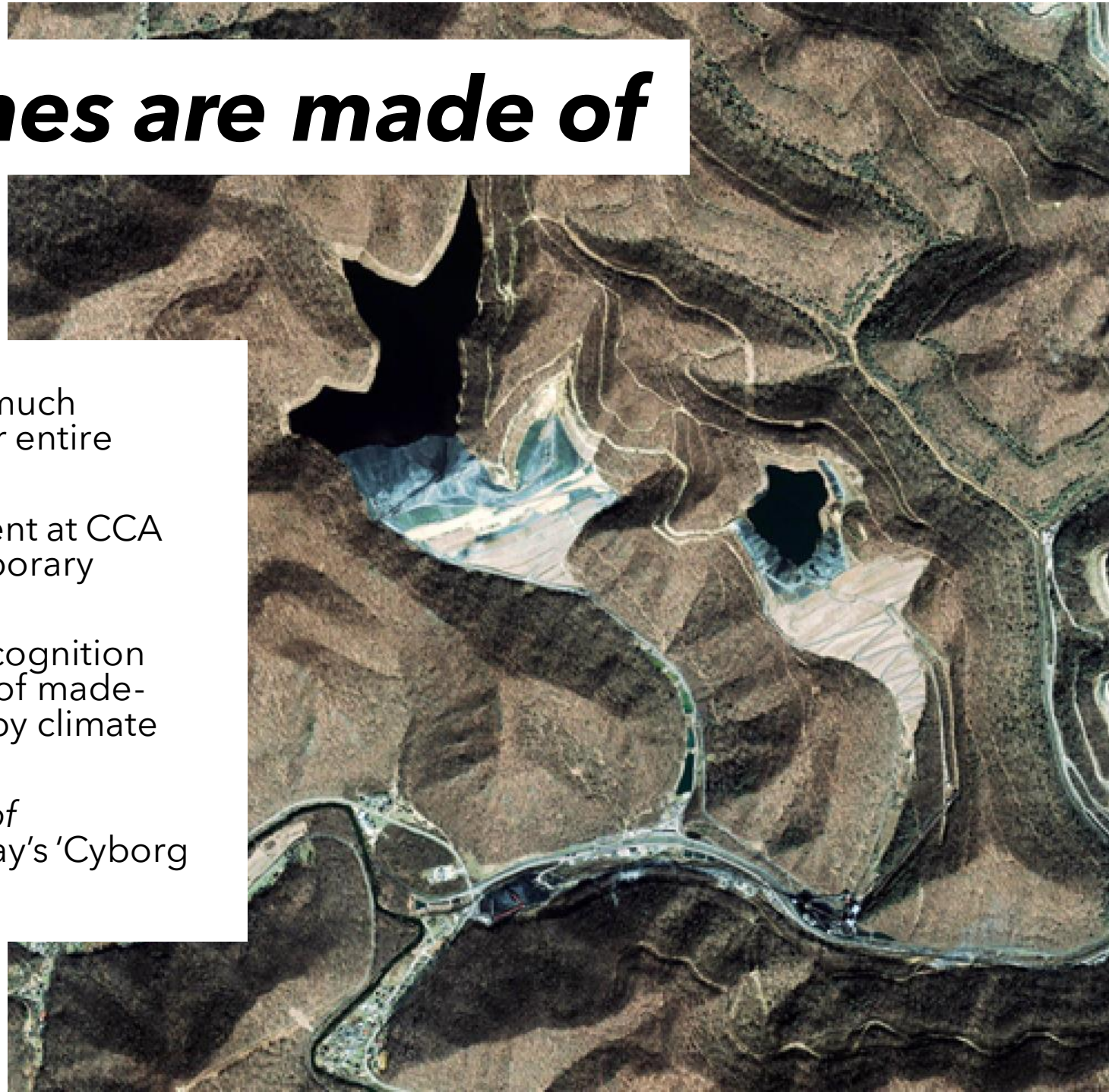


Image: A coal mine seen from space by NASA Landsat satellites.

Image: *Our best machines are made of sunshine…* (2019)
Custom software program. Made with P5.js, ML5.js, and Runway ML.

Image: *Our best machines are made of sunshine…* (2019)
Custom software program. Made with P5.js, ML5.js, and Runway ML.

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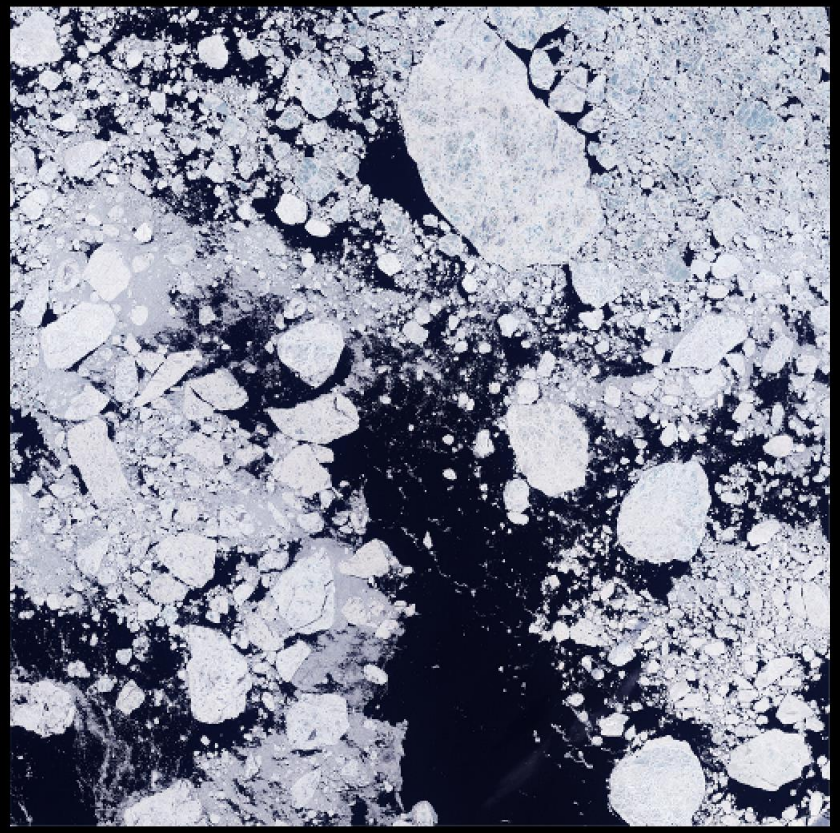


Image: *Our best machines are made of sunshine…* (2019)
Custom software program. Made with P5.js, ML5.js, and Runway ML.

Light Leaks

- *Light Leaks* started during lockdown, when I decided to have a go at training my own GAN.
- To do this I used a software program called Runway ML, which allows you to create your own models using transfer learning.
- One of the challenges of training a GAN is that you need a lot of images: ideally between 500 and 1000 as a minimum.
- I didn't want to scrape images from the Internet; it was important to me I used my own photographs.

Image: Still from *Unreported Sightings* (2020) generated in Runway ML using custom StyleGAN model.

Image: Stills from *Reported Sightings* (2016) Digital photographs and custom software. Made with Processing.

Image: Stills from *Unreported Sightings* (2020)
generated in Runway ML using custom StyleGAN model.

Light Leaks

- Photography's capacity for life-like reproduction has never been its biggest draw for me; some of the works I find most poetic are those that do not depict anything at all.
- Lyle Rexer suggests that abstract photographs can invite us to practice ways of 'looking with' photographs that do not privilege the subject of the photographs.
- I saw these 'light leaks' as a way to facilitate critical reflection on image recognition systems in operation; without recourse to iconic images.

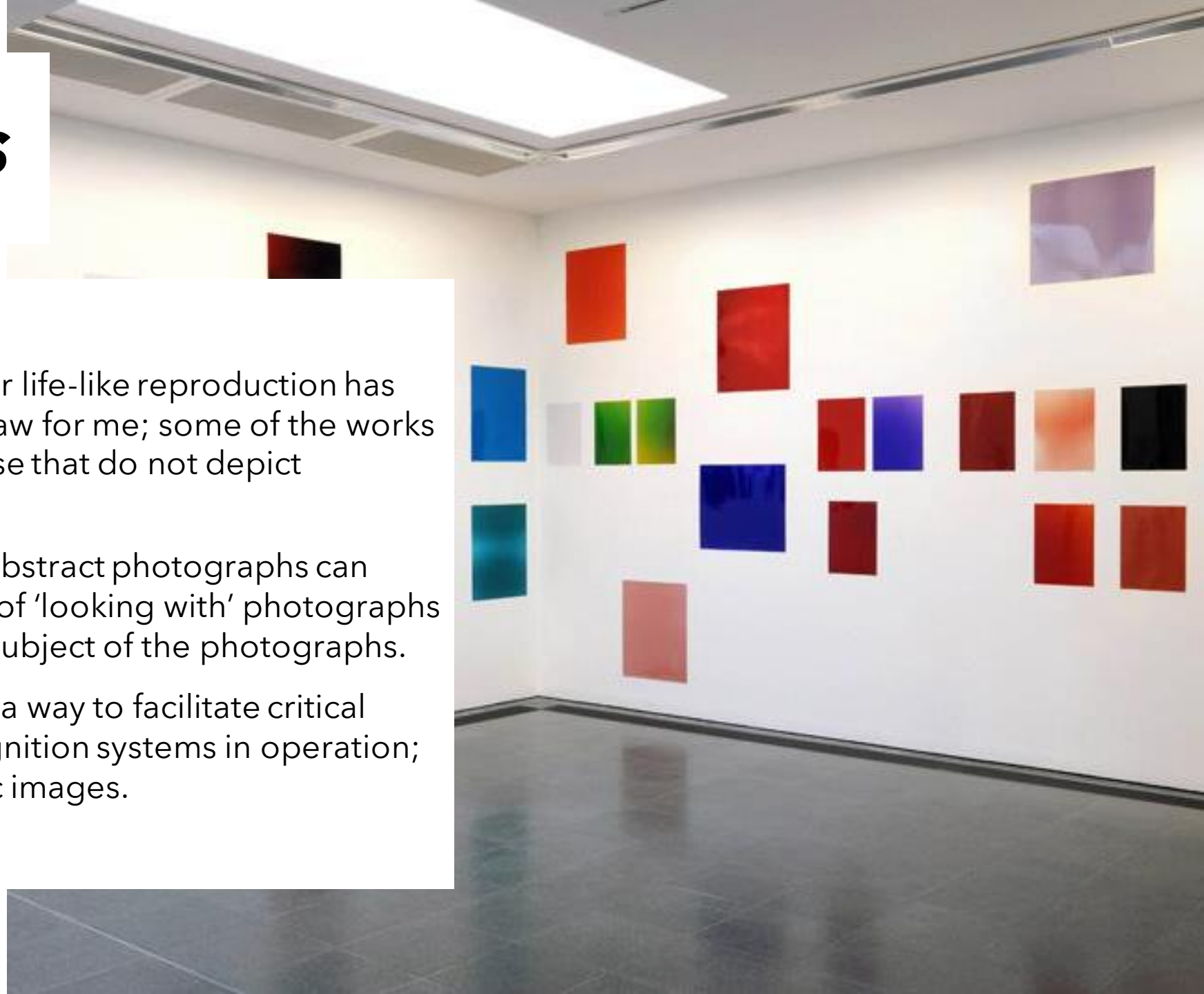


Image: Wolfgang Tillmans, *Silver Installation VII* (2009)

Light Leaks

- I began to isolate these ‘light leaks’ manually in Photoshop.
- For this work I used an image recognition system called im2txt, which is trained on the COCO dataset.
- COCO only has around eighty object categories, and is known to have a bias towards technological objects.
- *Light Leaks* was made in Processing, and uses HTTP requests to ‘speak’ to Runway, where the im2txt and AttnGAN models are running.

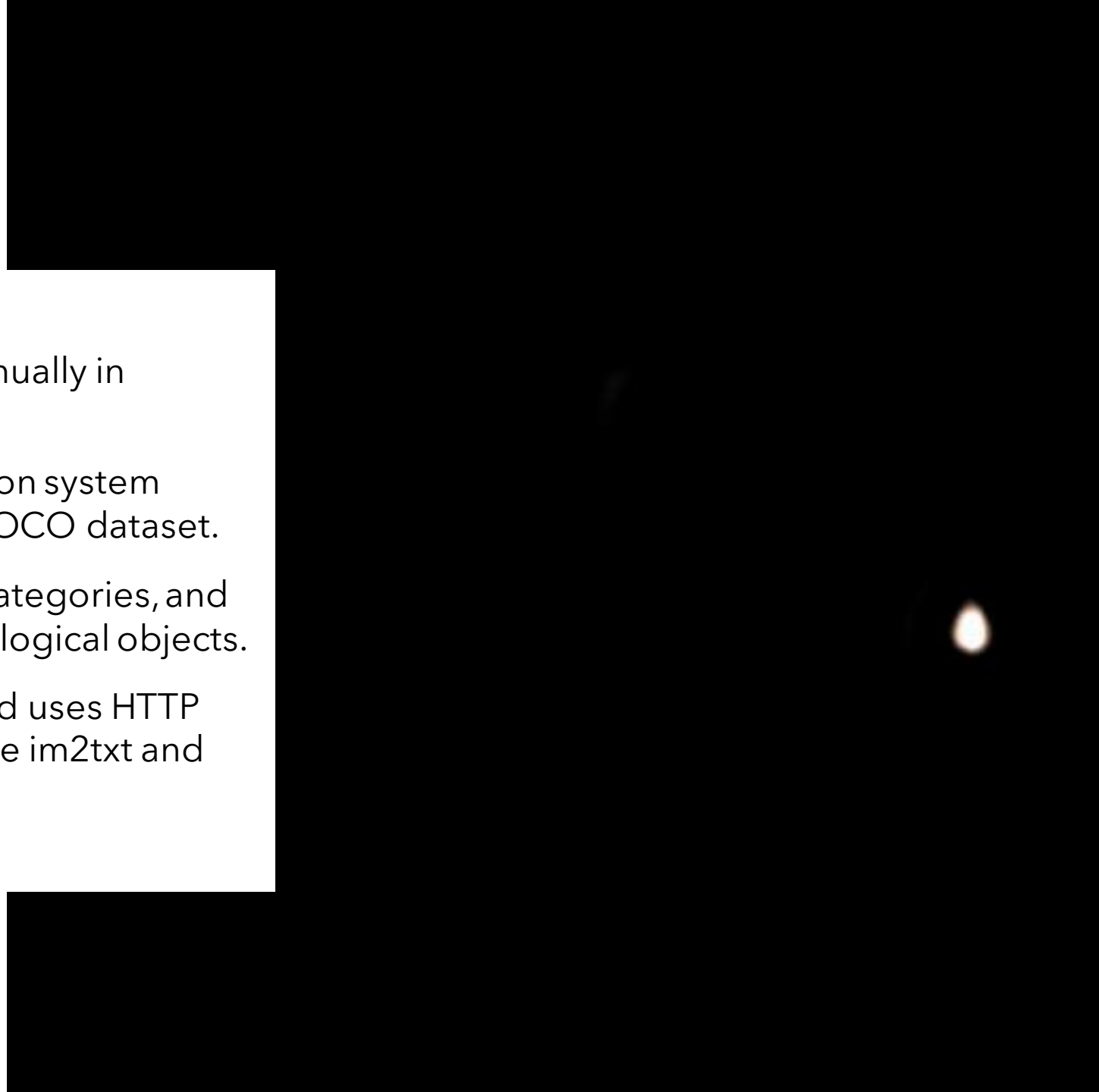


Image: *Light Leaks* (2021) Made with Processing and Runway ML.

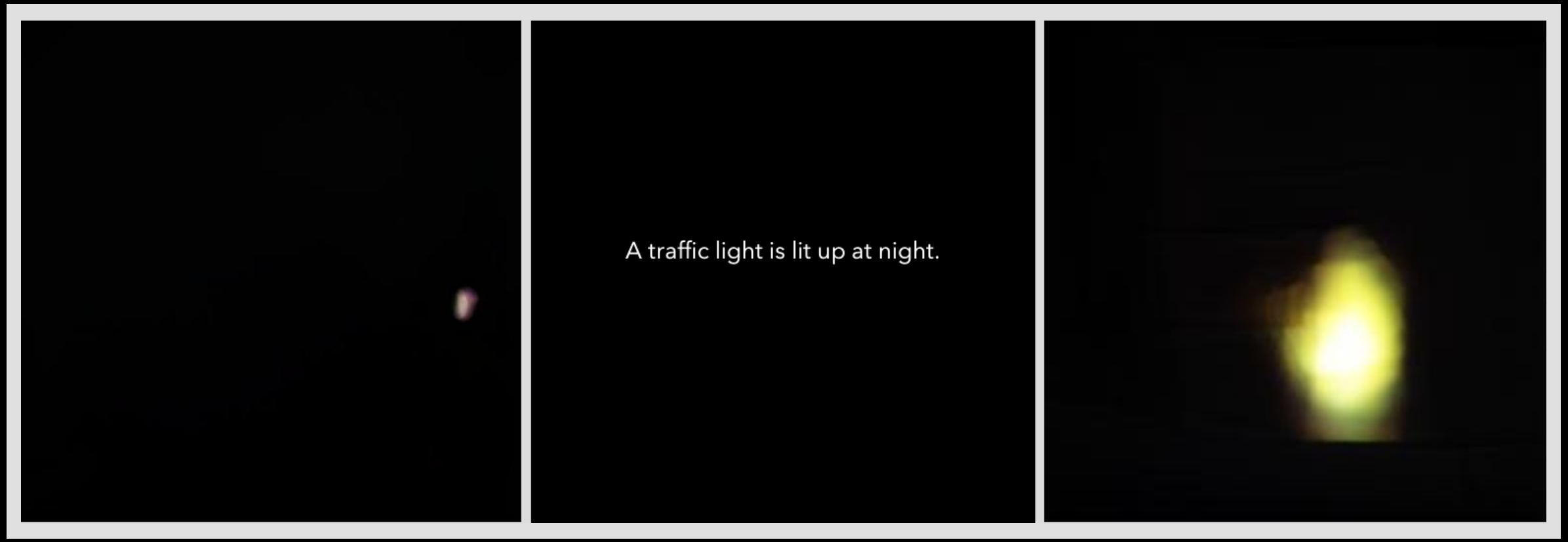
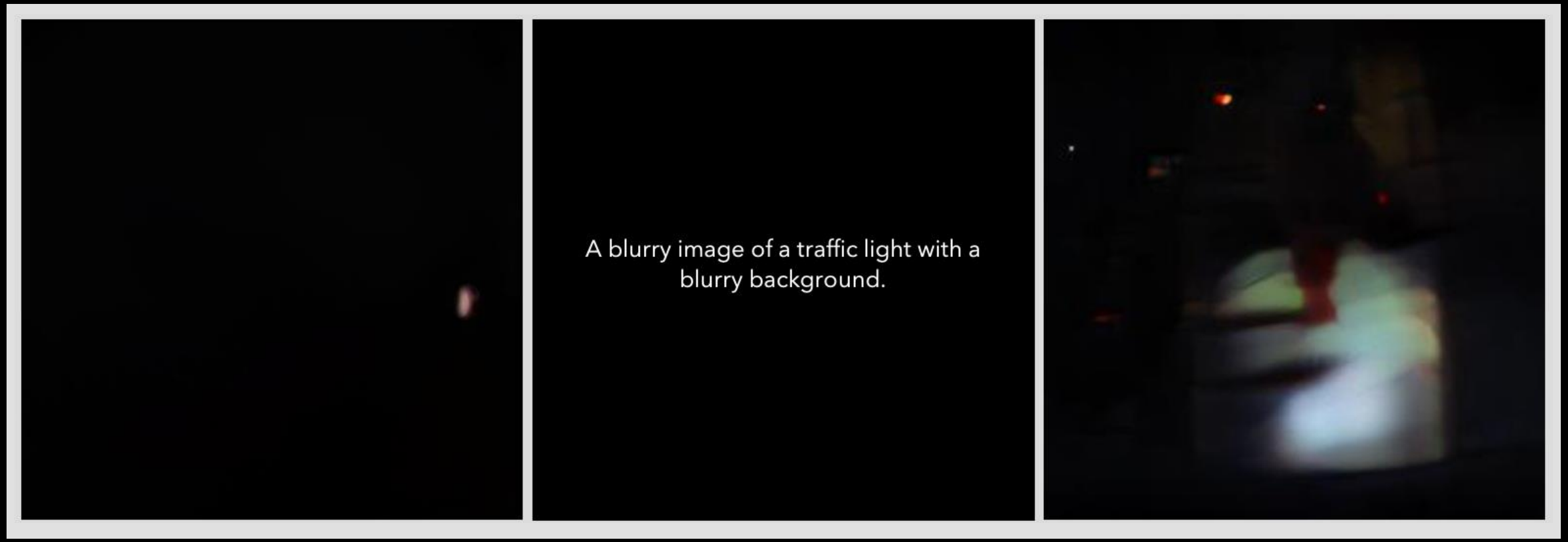


Image: *Light Leaks* (2021) Custom software program.
Made with Processing and Runway ML.



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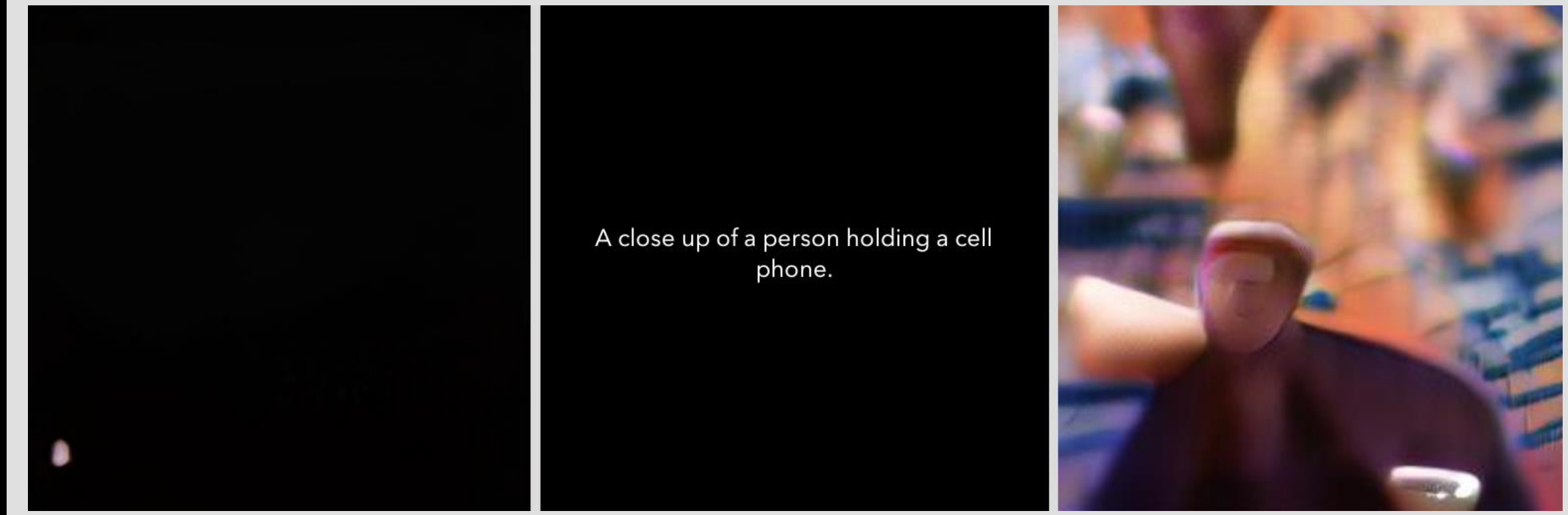

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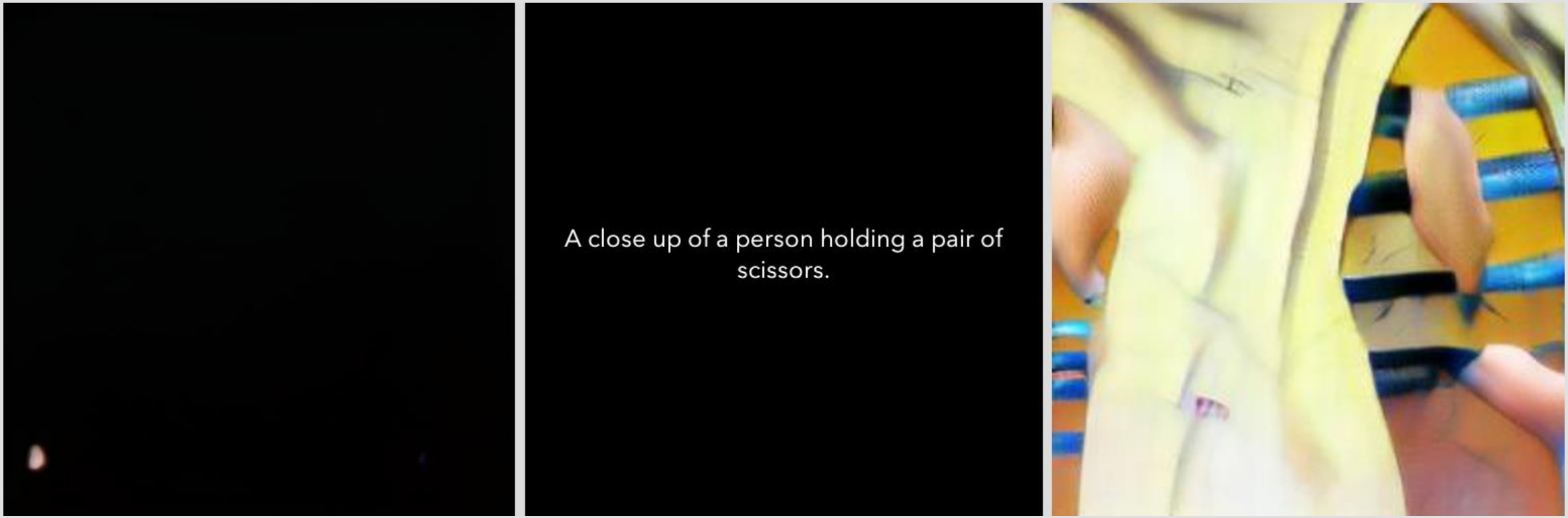

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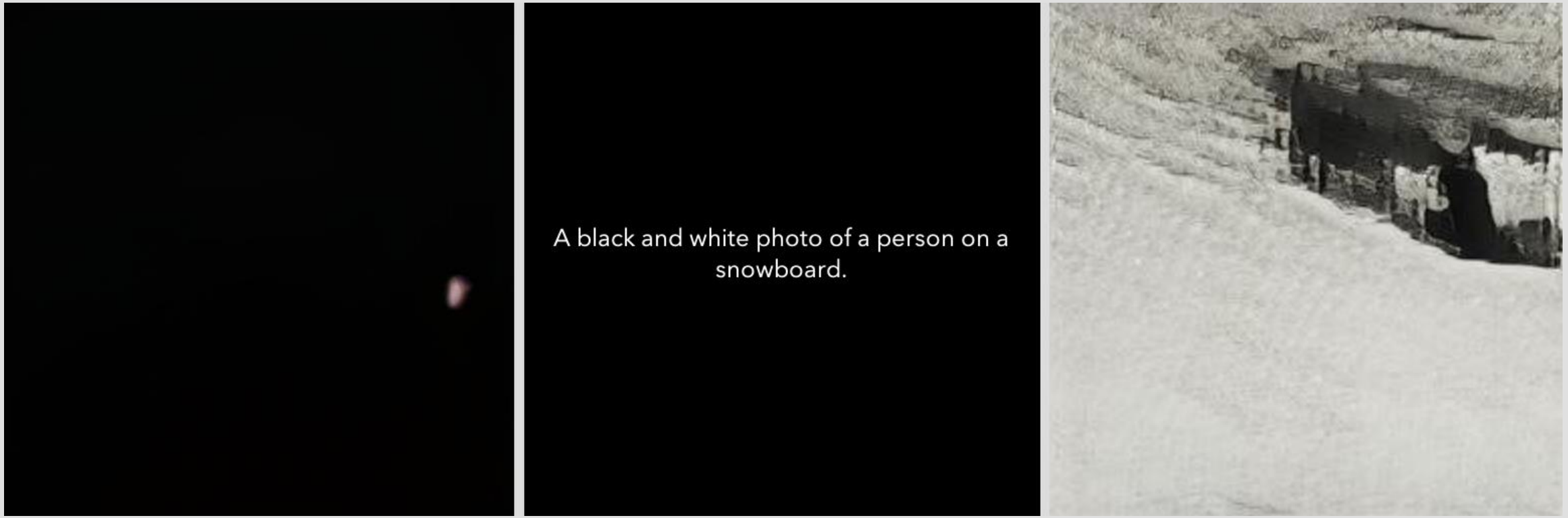

Image: *Light Leaks* (2021) Custom software program.
Made with Processing and Runway ML.

Light Leaks

- *Light Leaks* was an interesting experiment, and I feel is successful in bringing attention to some of the limitations of machine learning datasets in quite a poetic way.
- In some respects, I find strange and blurry GAN images more intriguing than those produced by more recent AI systems.
- They might even be considered an example of what Flusser terms 'informative images': an image that conveys new information.
- I personally felt, however, I had ceded too much control to the AI; and wanted to find ways to bring more of my own photography into my work with AI.

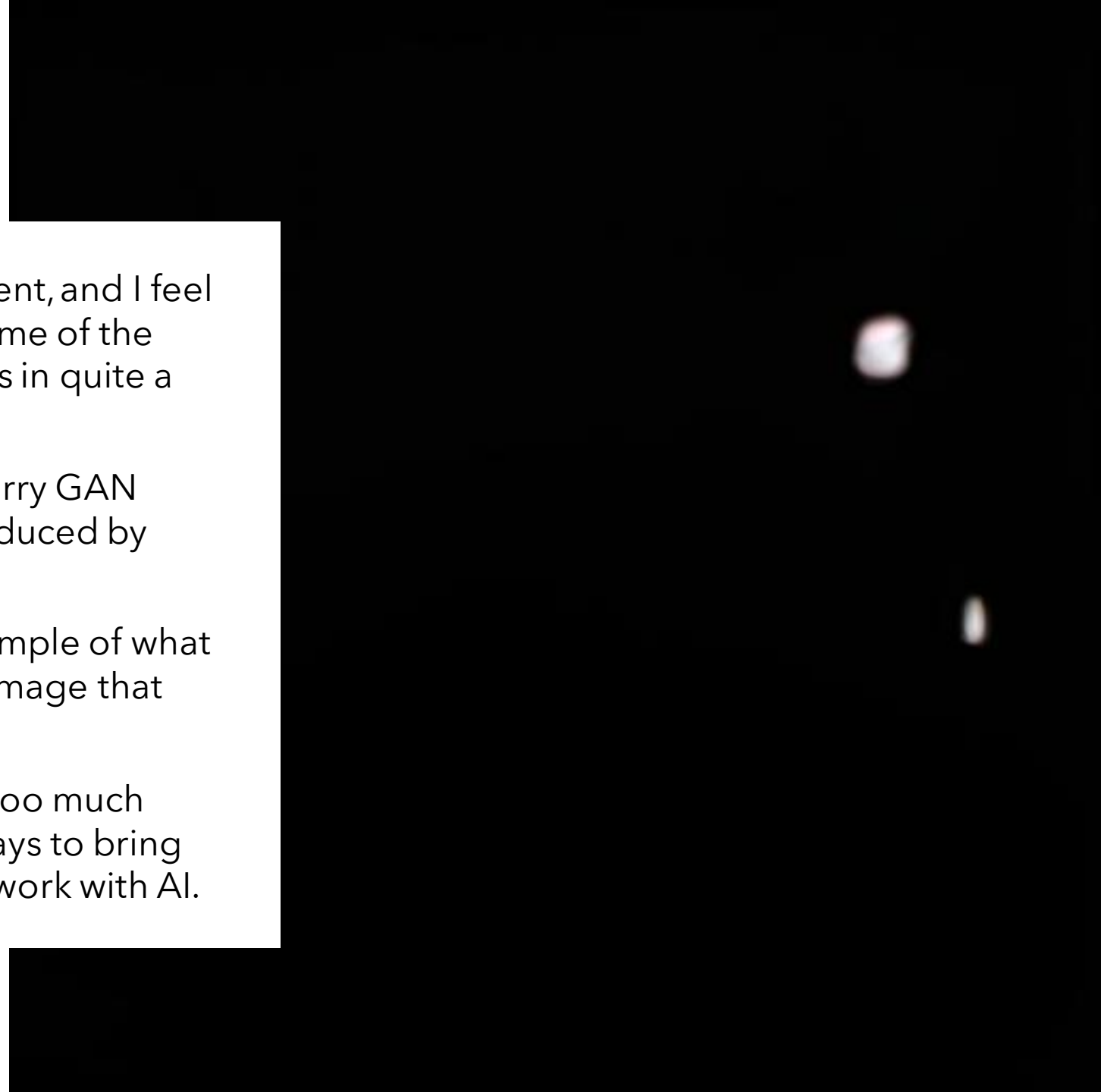

Image: *Light Leaks* (2021) Made with Processing and Runway ML.

Image: *Frankenstein's Camera* (In Progress) Made with Runway ML.

Frankenstein's Camera

- *Frankenstein* is very often regarded as the first true science-fiction novel; in the sense that Mary was very much inspired by the science of her time.
- The novel is also a cautionary tale of scientific hubris, in which Victor fails to take responsibility for the life he has created.
- After reading Jeanette Winterson's *Frankisstein*, I began to connect the story to contemporary developments in AI.

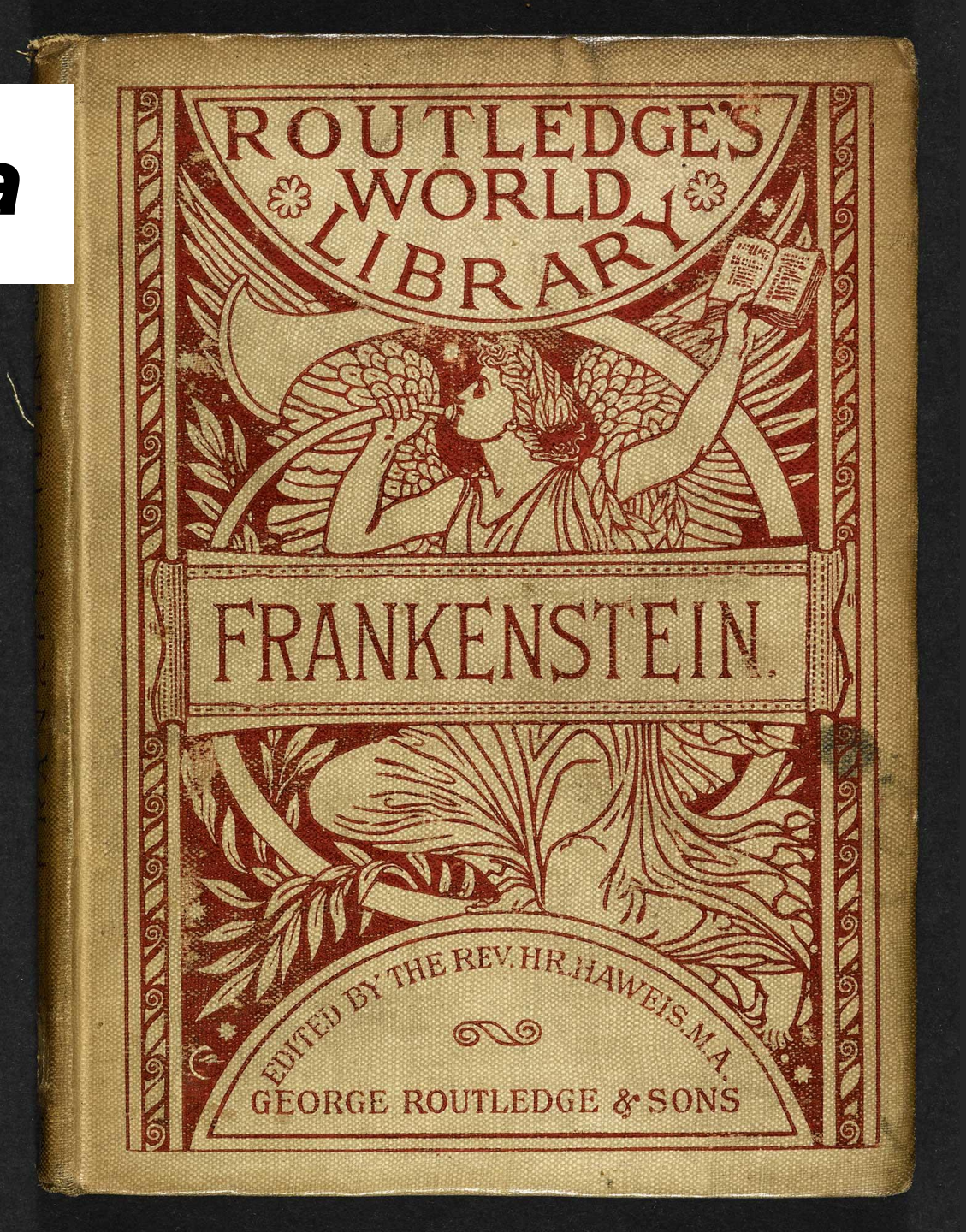

Image: First edition of *Frankenstein* by Mary Shelley (1818)

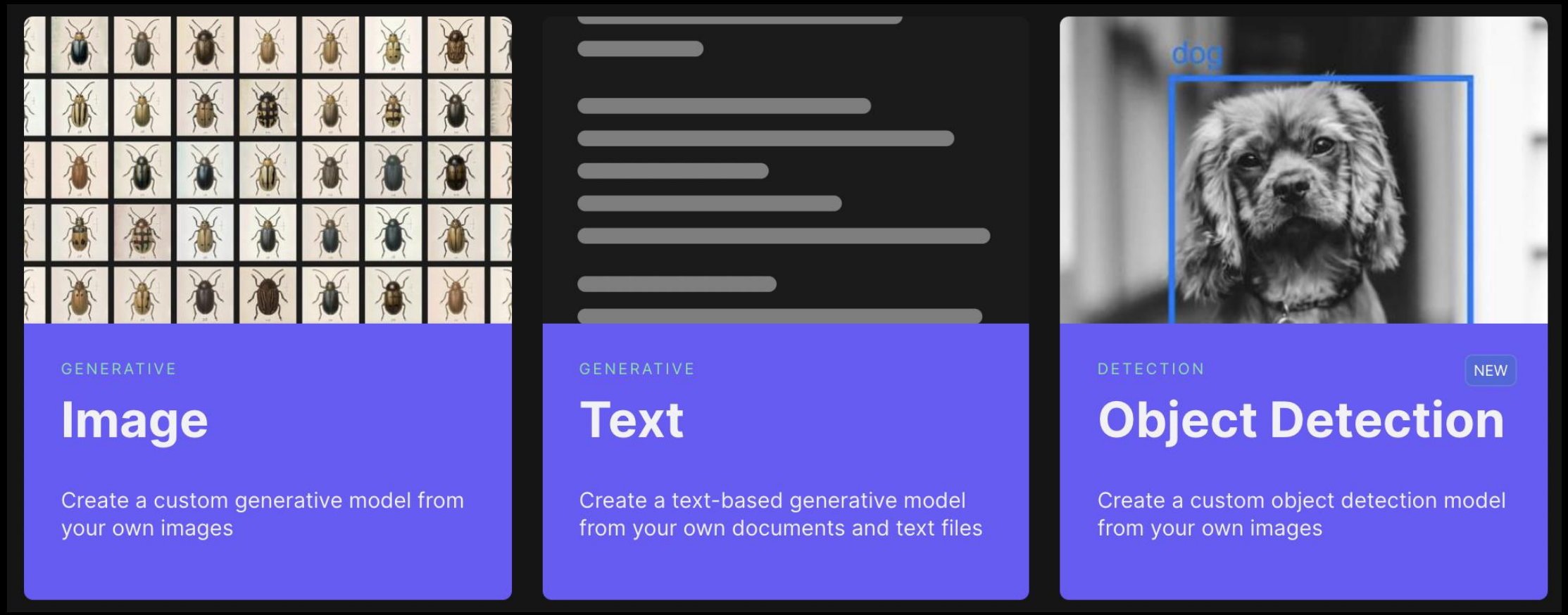

Image: Screenshot from Runway ML, showing the different training options available.

← Back to Models

Processing Examples
BigGAN
Mary Shelley
Mary-Shelley
GPU

Prompt: Text File Model Output

It was a dark and stormy night,

Use Output

Output: Preview Export 15.56s

It was a dark and stormy night, whose misty gloom covered the port, and, combined with the choking gray of the clouds, seemed to embitter the maze. I hurried to the dark, precipitous steps I had chosen to entrance the building, to descend them, if possible, before the strong winds swept over the country, and, if I could, rally the element; I brought my bag of provisions with me, and dashed forward till I found the passage. As I advanced, I heard sounds that frightened me; voices cried that the villains were present; I threw open the light, and the gloom choked me like water; my extremities trembled with the recollection. I saw a spectre, a man of fr

Randomize Seed

Options

Inference Network

Model Setup

Checkpoint Mary-Shelley Upload

Search Checkpoint ...

Mary-Shell...

Inference Options

Command Generate Batch

Max Characters 627

Top P 0.9

Seed 1000

Show Advanced Options

Run Remotely

I lived principally in the country as a girl, and passed a considerable time in Scotland. I made occasional visits to the more picturesque parts; but my habitual residence was on the blank and dreary northern shores of the Tay, near Dundee. Blank and dreary on retrospection I call them; they were not to me then. They were the aerie of freedom [...] It was beneath the trees of the grounds belonging to our house, or on the bleak sides of the woodless mountains near, that my true compositions, the airy flights of my imagination, were born and fostered.

Mary Shelley, 'Author's Introduction to the Standard Novels Edition [1831]' in *Frankenstein* (London: Penguin Popular Classics, 1994 [1818]).

Frankenstein's Camera

Image: Still from *Frankenstein* (1931), directed by James Whale.

- Descriptions of landscape play an important role in Shelley's novel: they are often foreboding; warnings of trouble to come; or reflect Victor's state of mind.
- I thought that an interesting use for the text generator I'd trained would be to generate new descriptions of landscape in her style; and in turn use these to create new images of landscapes.

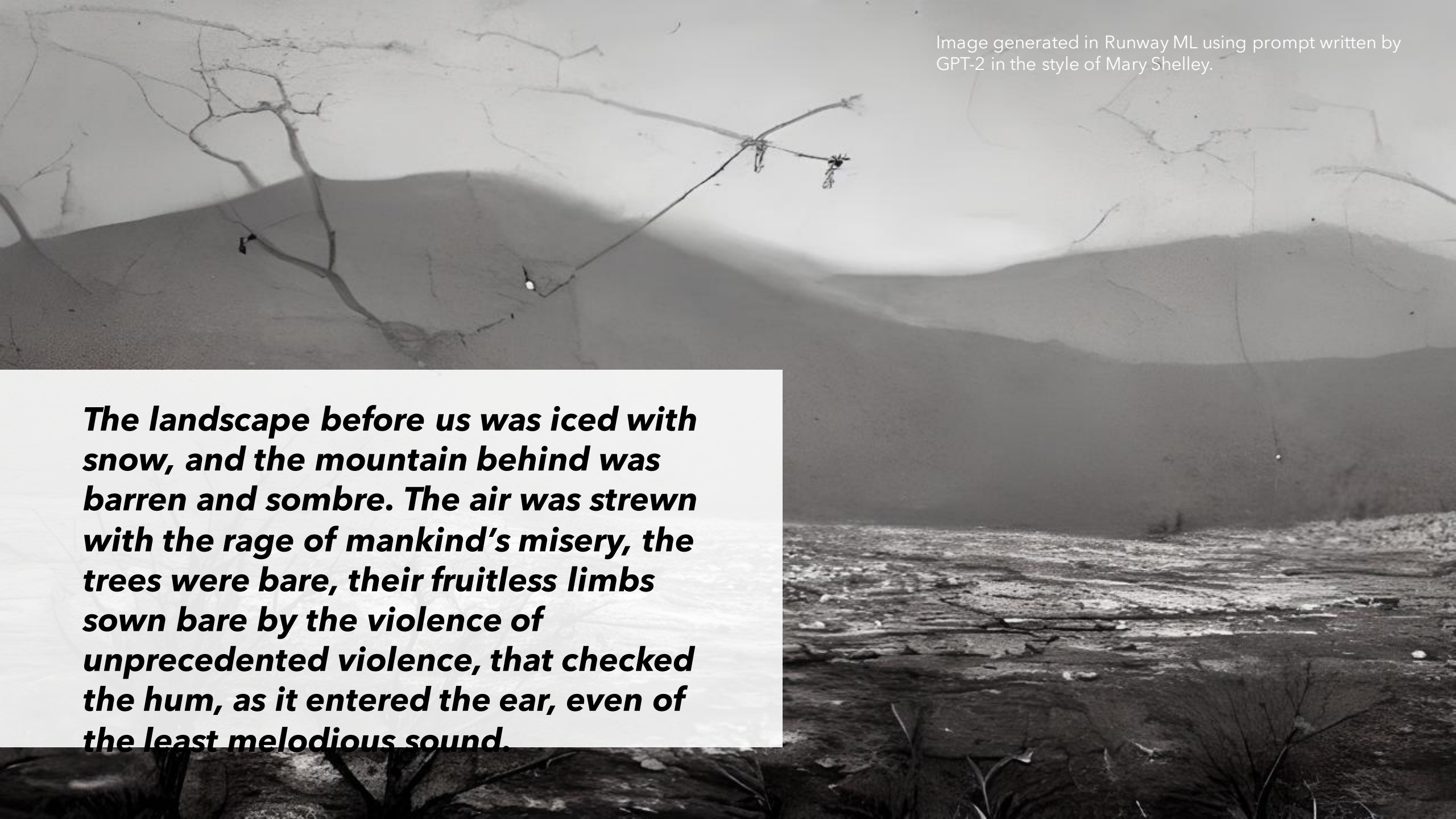

Image generated in Runway ML using prompt written by GPT-2 in the style of Mary Shelley.

The landscape before us was iced with snow, and the mountain behind was barren and sombre. The air was strewn with the rage of mankind's misery, the trees were bare, their fruitless limbs sown bare by the violence of unprecedented violence, that checked the hum, as it entered the ear, even of the least melodious sound.

Image generated in Runway ML using prompt written by GPT-2 in the style of Mary Shelley.

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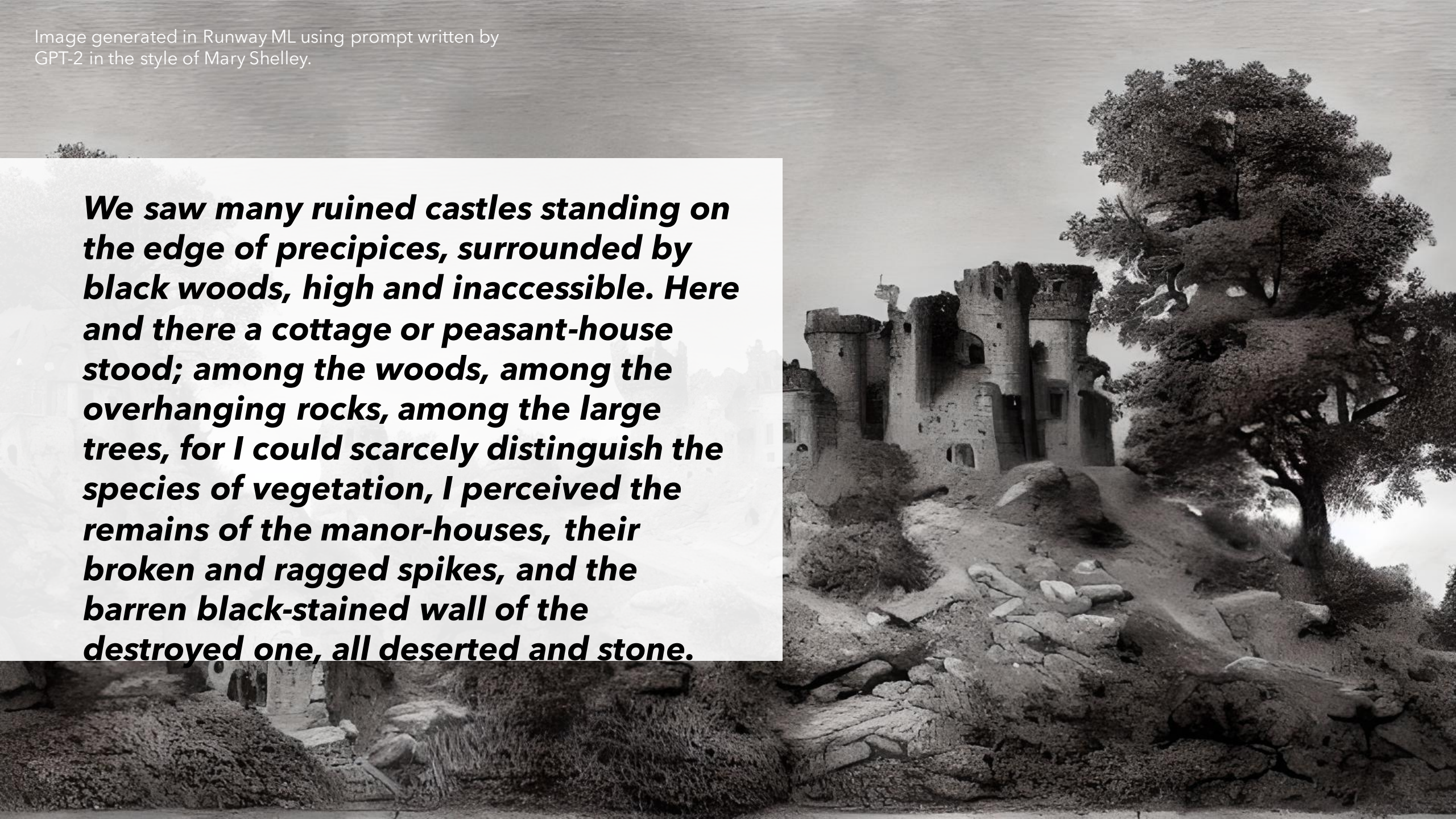

We saw many ruined castles standing on the edge of precipices, surrounded by black woods, high and inaccessible. Here and there a cottage or peasant-house stood; among the woods, among the overhanging rocks, among the large trees, for I could scarcely distinguish the species of vegetation, I perceived the remains of the manor-houses, their broken and ragged spikes, and the barren black-stained wall of the destroyed one, all deserted and stone.

Image generated in Runway ML using prompt written by GPT-2 in the style of Mary Shelley.


Image generated in Runway ML using prompt written by
GPT-2 in the style of Mary Shelley.

Image generated in Runway ML using prompt written by GPT-2 in the style of Mary Shelley.

Image generated in Runway ML using prompt written by GPT-2 in the style of Mary Shelley.

Image: *Invermark Castle* (2010)
Digital image from Medium Format Negative.

Frankenstein's Camera

- I am very conscious of the fact Generative AI can only produce images because the system has been trained on millions of other people's images.
- None of the creators gave permission for this, and none of them received any payment.
- There is also a concern that AI is going to take jobs away from artists and designers.
- It has always been important to me that I work with my own photographs; and while using 'off the shelf' systems is interesting to explore, it is not something I am sure I want to work with long-term.

Image: Still from the opening titles of Marvel's *Secret Invasion*, created using Generative AI.

Frankenstein's Camera

- When Runway introduced their 'AI Magic Tools', they introduced a new model called Image to Image.
- Image to Image allows you to take an image and modify it using text prompts.
- I thought this might be a good way of combining my own photographs with AI; by using my own photographs as a base I would have much more control over the subject, the framing, and so forth.
- I decided to try combining my own photographs with prompts produced by my Mary Shelley text generation model.

Image: *Frankenstein's Camera* (In Progress) Made with Runway ML.

Left Image: *Glen Esk* (2015) Digital Photograph.

Right image: Digital image made in Runway ML using prompt written by GPT-2 in the style of Mary Shelley.

Digital image made in Runway ML using prompt written by GPT-2 in the style of Mary Shelley.

We saw many ruined castles standing on the edge of precipices, surrounded by black woods, high and inaccessible. Here and there a cottage or peasant-house stood; among the woods, among the overhanging rocks, among the large trees, for I could scarcely distinguish the species of vegetation, I perceived the remains of the manor-houses, their broken and ragged spikes, and the barren black-stained wall of the destroyed one, all deserted and stone.


Digital image made in Runway ML using prompt written
by GPT-2 in the style of Mary Shelley.

Digital image made in Runway ML using prompt written by GPT-2 in the style of Mary Shelley.

Beyond the hills we could see ilexes and towns, and the light of the starry sky, which veiled the rugged and rugged scenery.


Digital image made in Runway ML using prompt written
by GPT-2 in the style of Mary Shelley.


Digital image made in Runway ML using prompt written
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by GPT-2 in the style of Mary Shelley.

Frankenstein's Camera

- As someone who works a lot with new media, I appreciate that systems change, code breaks with new updates: this is a huge challenge for the preservation of digital art.
- What I found so unsettling about this particular incident, however, was the speed with which the tool I was using just vanished.
- It made me very aware that working with Generative AI means that my work is much more vulnerable to commercial forces than it has been in the past.

Image: *Frankenstein's Camera* (In Progress) Made with Runway ML.

Image: Screenshot from Processing, combining my original photograph with AI-generated elements.

Image: Screenshot from Processing, combining my original photograph with AI-generated elements.

Frankenstein's Camera

- I have found that if I use Runway to train a custom Diffusion model based on my own photographs, I can use this with Image to Image.
- This gives me more control over the final image; offering some more possibilities for Generative AI to augment my photographic practice.
- However, it does require that I re-think how to approach the work.

Image: *Frankenstein's Camera* (In Progress) Made with Runway ML.

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Image: *Frankenstein's Camera* (In Progress) Made with Runway ML.

Frankenstein's Camera

- On a theoretical level, I am interested in thinking more about the 'visualising gesture' of these images, and to reflect on what these new kinds of images mean for photography and visual culture.
- I'd like to suggest that photographic images generated by AI are in a sense 'Frankenstein images': made from many parts and attempting to give the impression of 'life' by artificial means.

Image: *Frankenstein's Camera* (In Progress) Made with Runway ML.

Frankenstein's Camera

- Perhaps we can also use Shelley's metaphor to think about our responsibilities with respect to Generative AI.
- It is heavily implied in the novel that, had Victor taken responsibility for his creation, things would have turned out very differently.
- There are justifiable reasons why artists and designers may choose not to engage with AI, but if we choose not to engage with it, then we may also lose opportunities to inform its future development; and to think of ways we can make it work *for* us rather than against us.

Image: *Frankenstein's Camera* (In Progress) Made with Runway ML.

Thank you for listening!