

NUS-ISS

Problem Solving Using Pattern Recognition



Deep learning: Create

by Nicholas Ho

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How deep learning is used to create: Use cases

A news report

The system prompt
(human-written)

In a shocking finding, scientist discovered a herd of unicorns living in a remote, previously unexplored valley, in the Andes Mountains. Even more surprising to the researchers was the fact that the unicorns spoke perfect English.

Source: <https://openai.com/blog/better-language-models/>

A news report

Model Completion

(Machine-written, after 10 tries)

The scientist named the population, after their distinctive horn, Ovid's Unicorn. These four-horned, silver-white unicorns were previously unknown to science.

Now, after almost two centuries, the mystery of what sparked this odd phenomenon is finally solved.

Dr. Jorge Pérez, an evolutionary biologist from the University of La Paz, and several companions, were exploring the Andes Mountains when they found a small valley, with no other animals or humans.

Pérez noticed that the valley had what appeared to be a natural fountain, surrounded by two peaks of rock and silver snow.

Pérez and the others then ventured further into the valley. "By the time we reached the top of one peak, the water looked blue, with some crystals on top," said Pérez.

Pérez and his friends were astonished to see the unicorn herd. These creatures could be seen from the air without having to move too much to see them – they were so close they could touch their horns.

A news report (Cont)

Model Completion

(Machine-written, after 10 tries)

While examining these bizarre creatures the scientists discovered that the creatures also spoke some fairly regular English. Pérez stated, “We can see, for example, that they have a common ‘language,’ something like a dialect or dialectic.”

Dr. Pérez believes that the unicorns may have originated in Argentina, where the animals were believed to be descendants of a lost race of people who lived there before the arrival of humans in those parts of South America.

While their origins are still unclear, some believe that perhaps the creatures were created when a human and a unicorn met each other in a time before human civilization. According to Pérez, “In South America, such incidents seem to be quite common.”

However, Pérez also pointed out that it is likely that the only way of knowing for sure if unicorns are indeed the descendants of a lost alien race is through DNA. “But they seem to be able to communicate in English quite well, which I believe is a sign of evolution, or at least a change in social organization,” said the scientist.

GPT-2 (Generative Pre-trained Transformer 2; a language model)

The good and the bad

- AI writing assistants
- More capable dialogue agents
- Unsupervised translation between languages
- Better speech recognition systems
- Generate misleading news articles
- Impersonate others online
- Automate the production of abusive or faked content to post on social media
- Automate the production of spam/phishing content

Source: <https://www.inkstonenews.com/tech/chinese-robot-copying-machine-causes-online-debate/article/3000875>

GPT-2

Grave concerns

- Due to concerns about large language models being used to generate deceptive, biased, or abusive language at scale, the researchers did not release the full dataset and code.
- They were not sure they were doing the right things, but they hoped the community should start to tackle this issue.

Source: <https://openai.com/blog/better-language-models/>

Facebook AI Systems

Creating own languages

FACEBOOK'S ARTIFICIAL INTELLIGENCE ROBOTS SHUT DOWN AFTER THEY START TALKING TO EACH OTHER IN THEIR OWN LANGUAGE

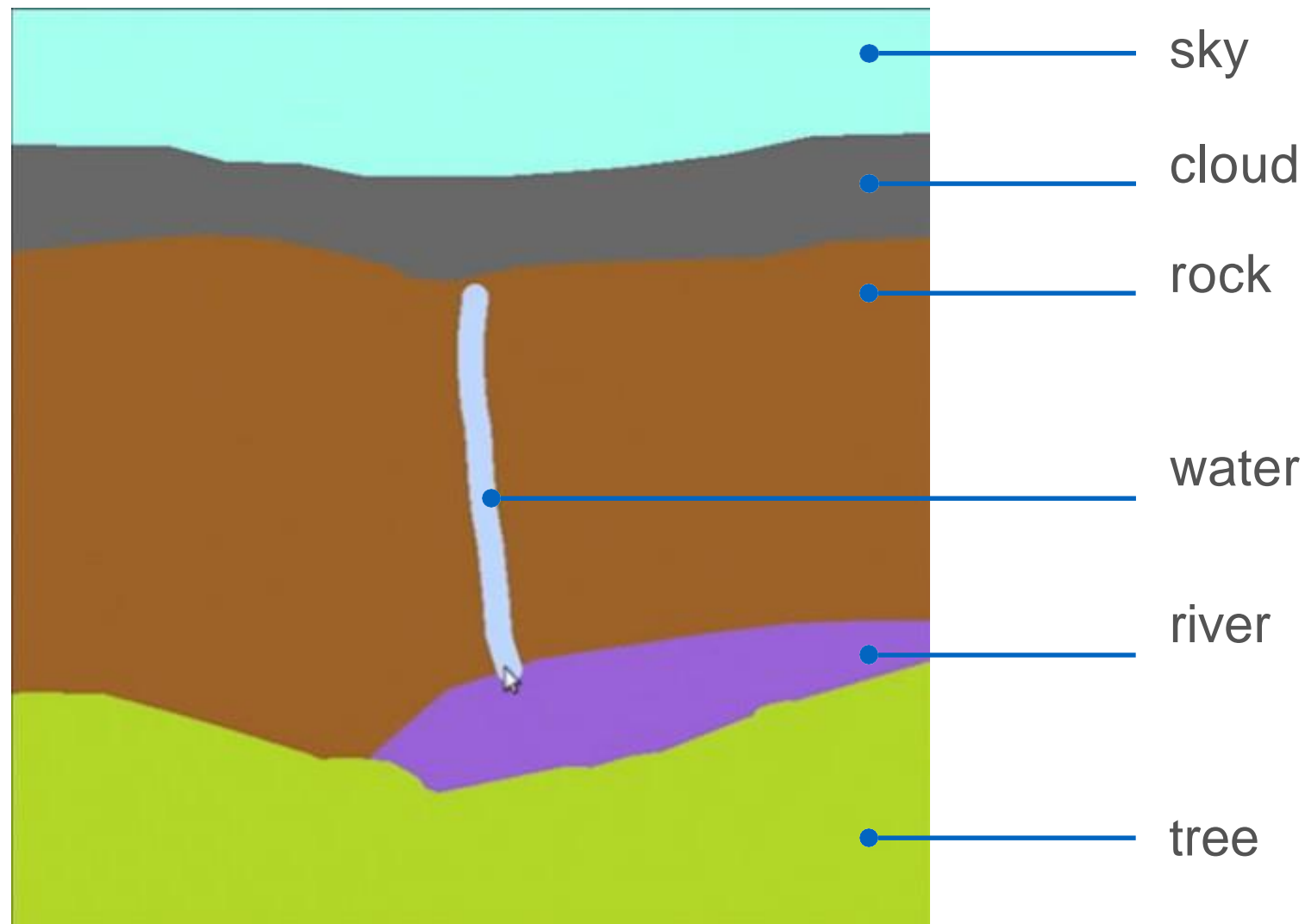
'you i i i everything else'

```
Alice : book=(count:3 value:1) hat=(count:2 value:1) ball=(count:1 value:5)
Bob   : book=(count:3 value:0) hat=(count:2 value:0) ball=(count:1 value:10)
-----
Bob   : i can i i everything else . . . . .
Alice : balls have zero to me to me to me to me to me to me to me to me to
Bob   : you i everything else . . . . .
Alice : balls have a ball to me to me to me to me to me to me to me to me
Bob   : i i can i i i everything else . . . . .
Alice : balls have a ball to me to me to me to me to me to me to me to me
Bob   : i . . . . .
Alice : balls have zero to me to me to me to me to me to me to me to me to
Bob   : you i i i i i everything else . . . . .
Alice : balls have 0 to me to me to me to me to me to me to me to me to
Bob   : you i i i everything else . . . . .
Alice : balls have zero to me to me to me to me to me to me to me to me to
```

Source: <https://www.independent.co.uk/life-style/facebook-artificial-intelligence-ai-chatbot-new-language-research-openai-google-a7869706.html/>

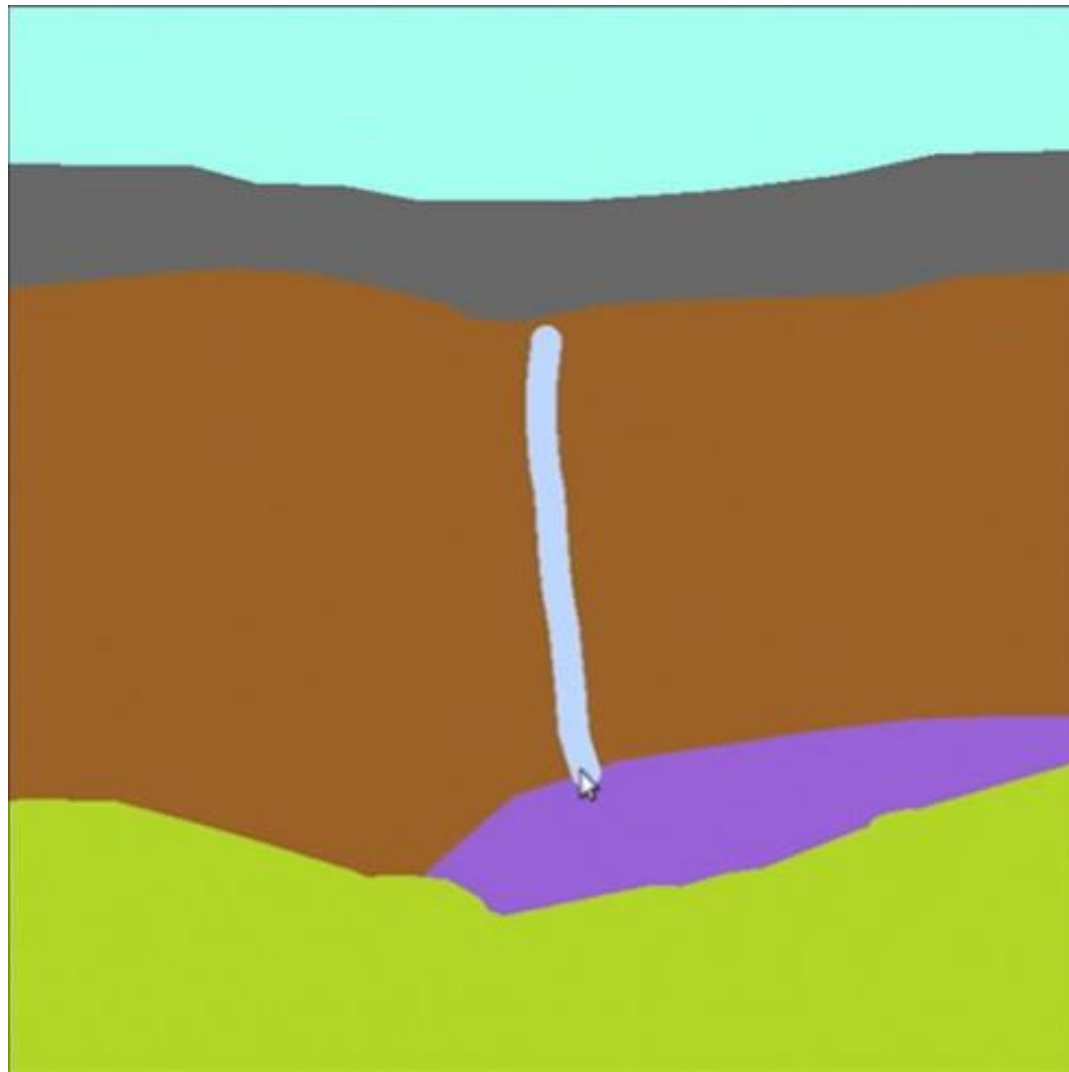
Drawing

A sketch



Drawing

A sketch



Source: <https://blogs.nvidia.com/blog/2019/03/18/gaugan-photorealistic-landscapes-nvidia-research/>

Drawing

GauGAN (inspired by Gauguin)



Source: <https://blogs.nvidia.com/blog/2019/03/18/gaugan-photorealistic-landscapes-nvidia-research/>
<https://www.youtube.com/watch?v=p5U4NgVGAwg>

Do you know...

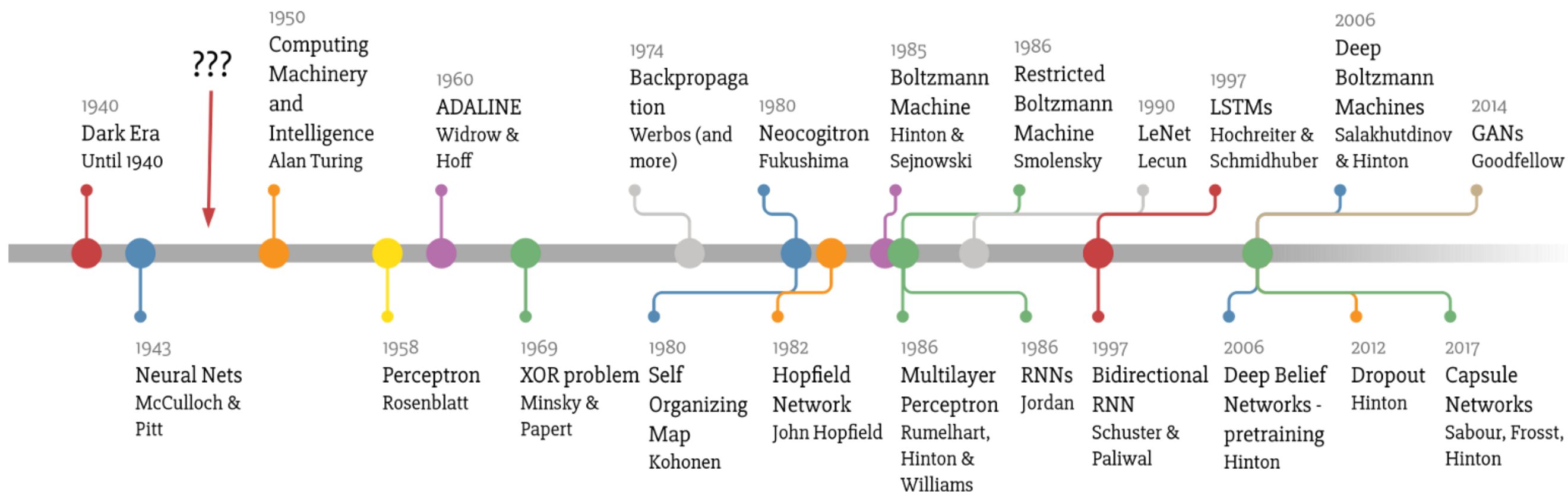
Who she or he is?



Source: <https://thispersondoesnotexist.com>

Time line

Generative adversarial networks

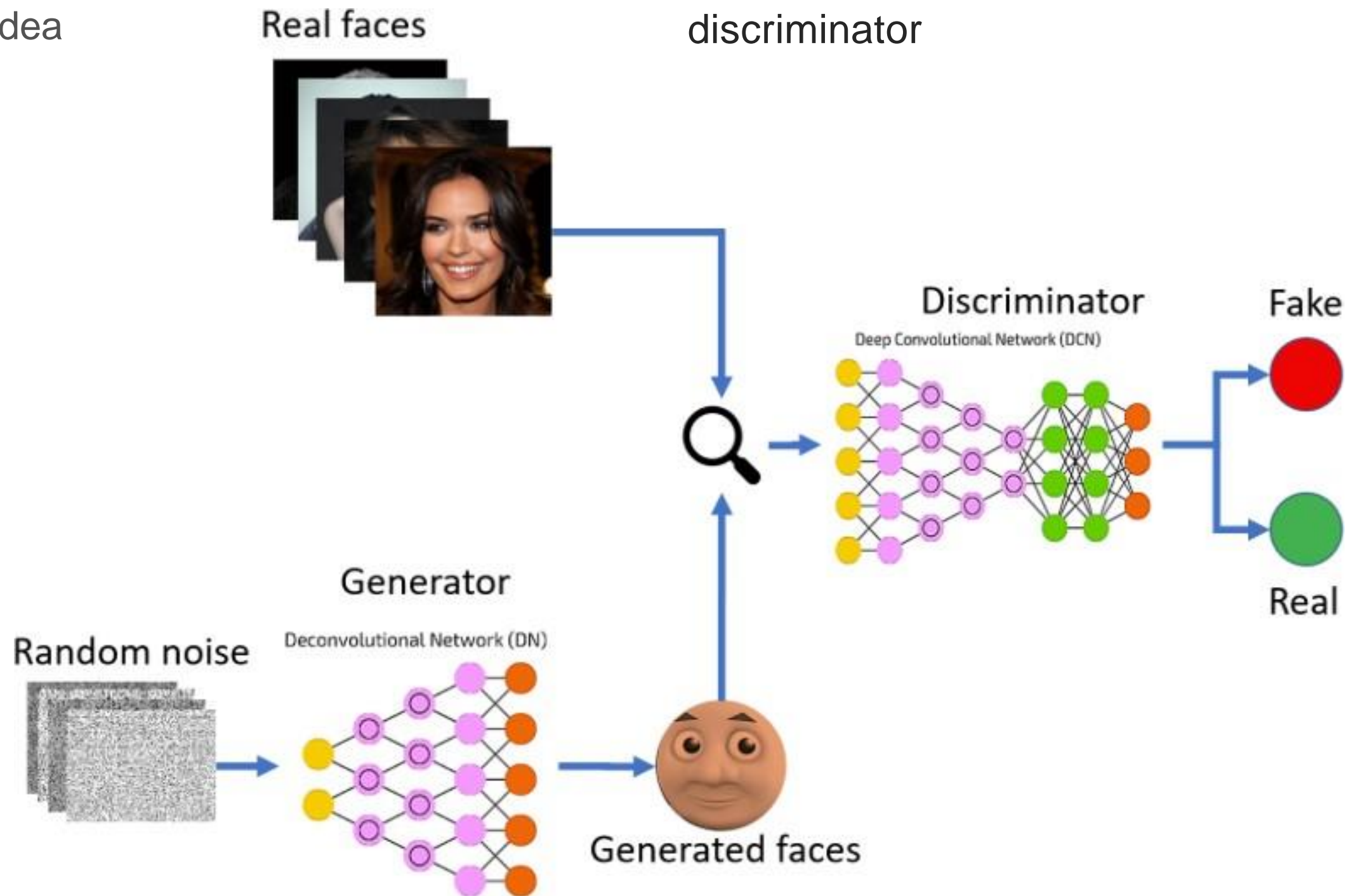


Source: <https://medium.com/@favio vazquez>

Generative Adversarial Networks

The idea

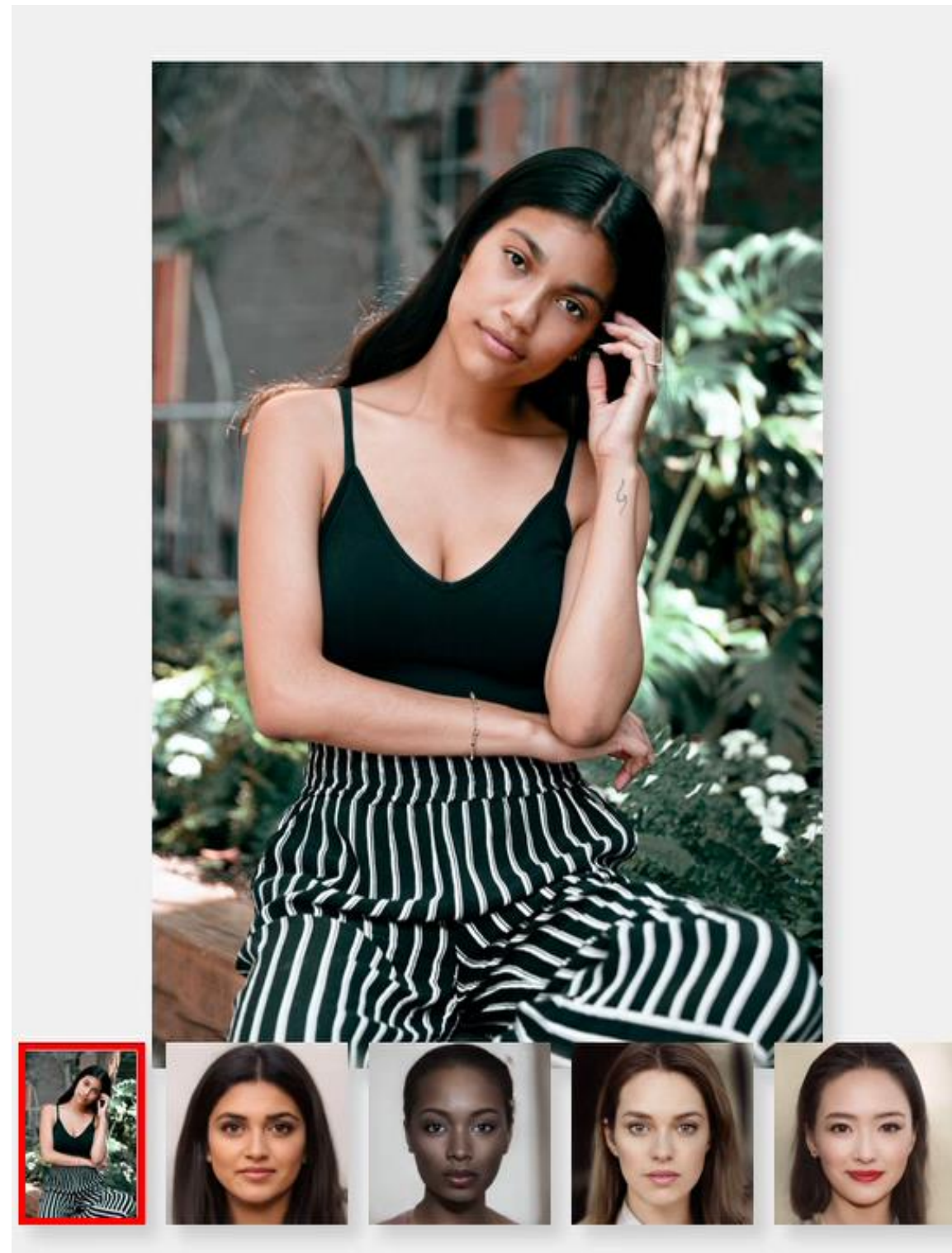
- The generated faces and the real faces take turn to be fed into the discriminator



Source: <https://www.spindox.it/en/blog/generative-adversarial-neural-networks/>

Change face

Unlimited possibilities



Source: <https://app.generative.photos>

Practical usage fashion



Source: <https://qz.com/1090267/artificial-intelligence-can-now-show-you-how-those-pants-will-fit/>

Generative Adversarial Networks

styleGAN



Source: <https://www.lyrn.ai/2018/12/26/a-style-based-generator-architecture-for-generative-adversarial-networks/>
<https://www.youtube.com/watch?v=q4U0VDrd60w>

Generative Adversarial Networks

Change face



Source: <https://www.youtube.com/watch?v=S1ba8etKGBY>

Generative Adversarial Networks

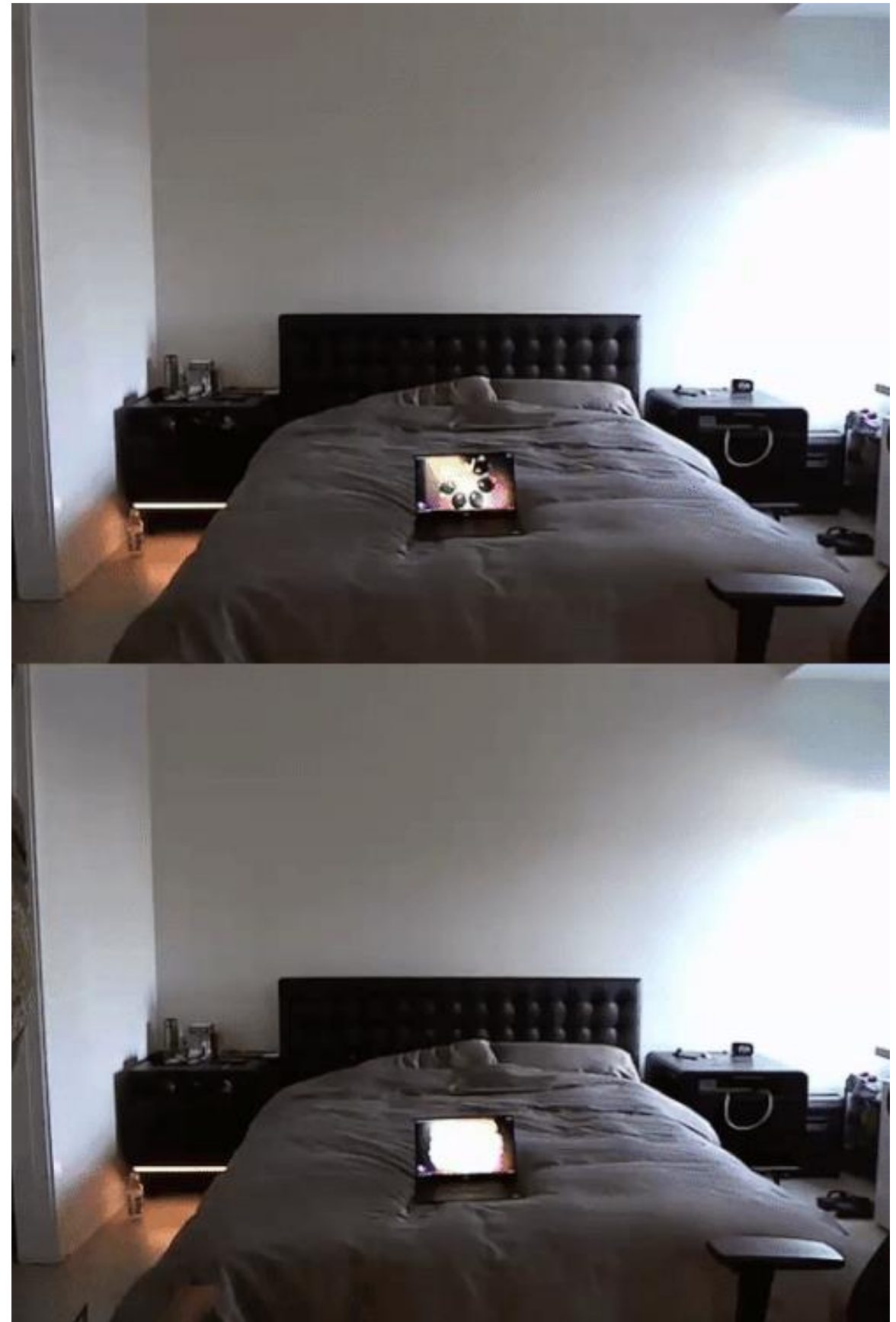
Change face



Source: <https://www.youtube.com/watch?v=xY85v7emCEs>

Disappearing people

The guy is missing



Source: <https://github.com/jasonmayes/Real-Time-Person-Removal>

Generative Adversarial Networks

How about ... anime?

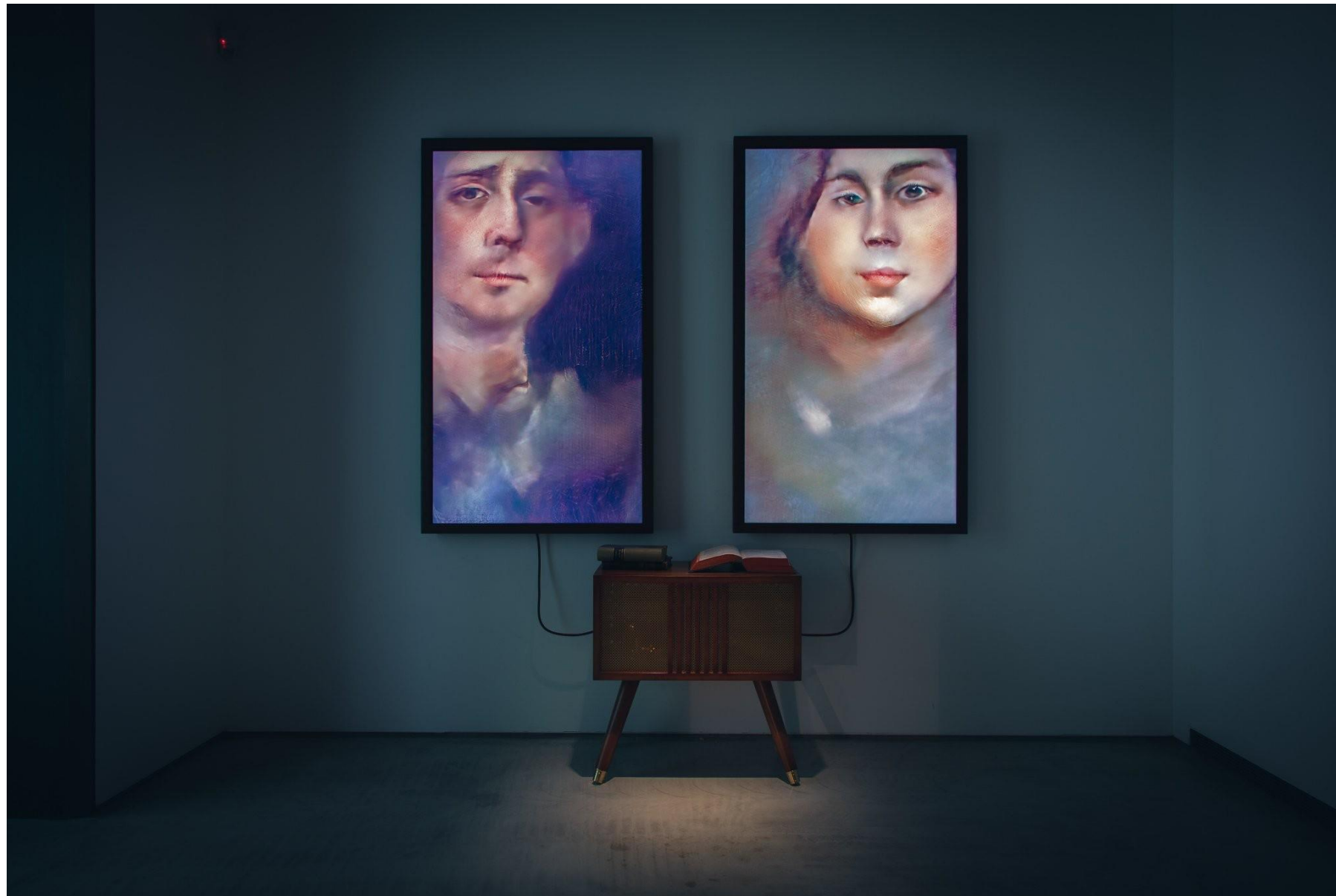


Source: <https://crypko.ai>

Generative Adversarial Networks

How about ... artpiece?

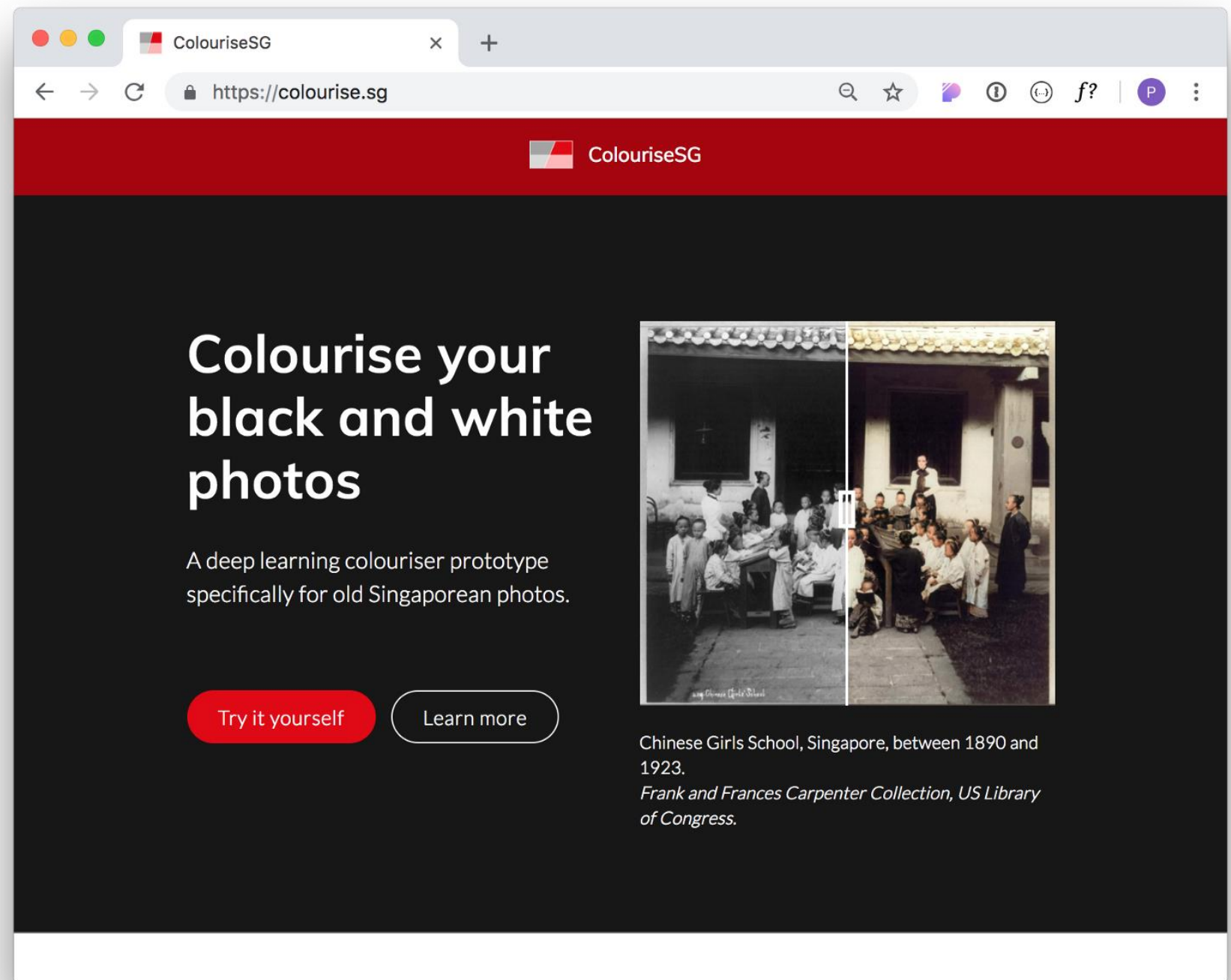
- Sold through auction at Sotheby



Source: Sothebys

Practical usage

By Singapore government



Source: <https://blog.data.gov.sg/bringing-black-and-white-photos-to-life-using-colourise-sg-435ae5cc5036>

Practical usage

By Singapore government



Source: <https://blog.data.gov.sg/bringing-black-and-white-photos-to-life-using-colourise-sg-435ae5cc5036>

Colourise SG

My attempt



Colourise SG

My attempt



Colourise SG

My attempt



Re-master (colorize) vintage film

A-Bomb blast effects (1952)

- 8 reference images were used to colour this video



Source: <http://iizuka.cs.tsukuba.ac.jp/projects/remastering/en/index.html>

How about 3D?

Face?



Source: <http://cvl-demos.cs.nott.ac.uk/vrn/index.php>

How about 3D in a scene?

Generates from a single image



Source: <https://github.com/facebookresearch/synsin>