

This article should be illustrated with GAN generated images made out of Maurício Hora's photos. I'm working on this now, Maurício agreed to give me 1tb of his work. You can have a glimpse of Maurício's work on his Flickr: <https://www.flickr.com/photos/mauriciohora/>

Photography and Artificial Intelligence Art (GANs) - the challenges of intellectual property in the age of AI

*(Maurício's photo essays on Canudos, Maurício was the first person from Providência to ever visit Canudos... he made a photo essay and exhibition about it with support from Ford Foundation.)*

Maurício Hora was born and raised in a favela in the heart of Rio Janeiro, known as Providência Hill. He's internationally recognised by his work as a photographer and an activist for the rights of 'favelados', those who live in favelas. Altogether with the acclaimed French photographer JR, he created the Cultural Center Casa Amarela, the only one in Providência. Casa Amarela hosted people like Madonna, Pharrell Williams, among many other celebrities, politicians and entrepreneurs. However, up until 2020, Providencia Hill does not have daily running water all over the neighbourhood. In many favelas, it's hard to get services such as water and sewage, let alone good cable internet. Some parts of Providência can only be reached by climbing hundreds of stair steps. When water is out, which sometimes happens for up to 50 days in a row, people have to climb the stairs carrying water tanks on their backs. I've been collaborating with Maurício since 2011, when a street art project I developed around his neighbourhood brought me closer to activism and the fight to prevent illegal evictions in the favelas, evictions operated by our very government.

*(Maurício's photos from Canudos and Providência).*

Most inhabitants of Providência Hill used to work in the Port area of Rio de Janeiro. Nowadays, due to automation, very few of these jobs are left. Making costumes and props for the city's Samba Schools, who organise very luxurious parades every Carnival, used to be a relevant source of income for Providência, but this has also changed. Drug traffic is a strong part of the local economy. Confrontation between drug traffic and the police, are simply common. Maurício started his career working in a newspaper as a delivery boy. The newsroom inspired him to try photography and once he started taking photos of his community drug traffic members and daily life his photos became a sensation. He was one of the first photographers

to tell the stories of favelas from the inside. He developed his own artistic style and narrative, by showing the favela in its complexity: the beauty, the poverty, the friendships, the violence, all the intricate relationships that coexist in such a particular environment. However, as digital cameras become each day more accessible and powerful, offering effects that previously would need a much more skilled hand, it's becoming harder and harder to make a living as a photographer. But the issue of automation and photography has some newer challenges on the road.

Current technology such as GANs (Generative Adversarial Networks) are capable of creating extremely realistic or beautifully surrealistic images out of datasets, such as photos. A GAN is based on two competing artificial neural networks, algorithms inspired by our brain's nerve cells that can learn from a set of data by applying statistical processes. A GAN can recognise patterns from images by analysing it through thousands of layers: one sees only the edges between different colours, other tracks each colour separately, another is better at recognising lines ([see this video](#) to understand how neural networks see). By crossing all these layers and repeatedly trying to recreate something similar to what it's seeing, a GAN can make images that look authentic, just like the original photos. Worldwide researchers are constantly developing new GAN algorithms.

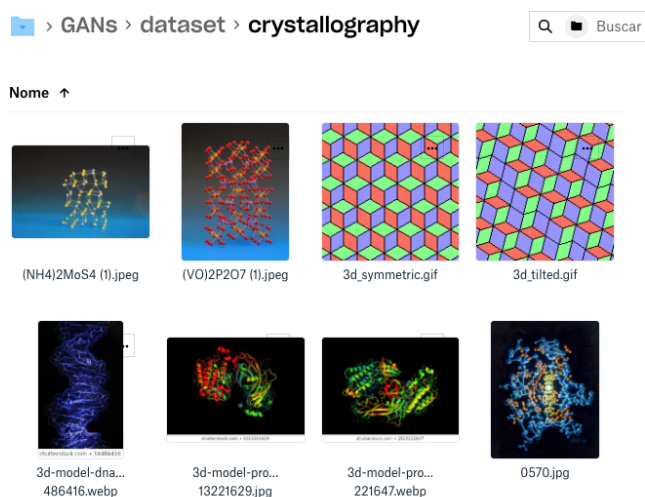
There are different applications of GANs, from the highly polemical deep fakes ([add link](#)), to improving astronomical images, helping with medical diagnosis and so many other. For the art world implications of Artificial Intelligence, one of the game changers was the introduction of the BigGAN model, which makes considerably high resolution images and videos. It can be trained with datasets as small as 500 images, though something like 10.000 would most likely give better results. Newer models are managing to achieve optimal results with less and less images. By creating a dataset and sending it to a GAN, one can get from 50 to a few hundreds new images generated automatically and a video animation called 'latent space' ([show example](#)). There are very few controls one can currently manipulate directly to a GAN, such as X.. and Y, the real human choice is the dataset itself.

Any image that is available online can be used for training AI models. It doesn't matter if the images have copyright or not, if the website tried to prevent people from downloading it. The images from most websites can either be massively downloaded by using some code, such as the image scrapers applications, or even by a bot screen printing whatever it needs. One can download all the images under one hashtag on Instagram in a glance. One does not need images in a very high resolution to train a GAN and there's also the possibility of improving an

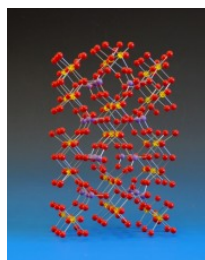
image resolution automatically with a neural network designed for that. GANs are designed to recognise patterns in images, therefore, if there are even less than a hundred images with a similar composition, similar colour palette, the GANs output will present images with the same structure as the original one. If the images have very diverse compositions and elements, the output will look more surrealistic, though it will still carry the aesthetics of the original data. Furthermore, the output images will be entirely new images, so it's a challenge to enforce copyright laws on such techniques.

Example: crystals structures.

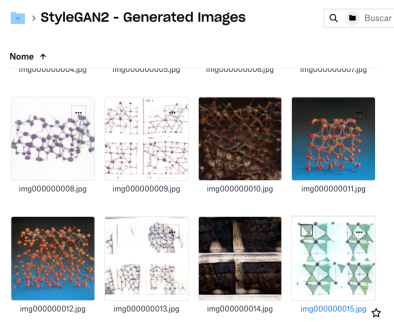
1026 images in the dataset total.



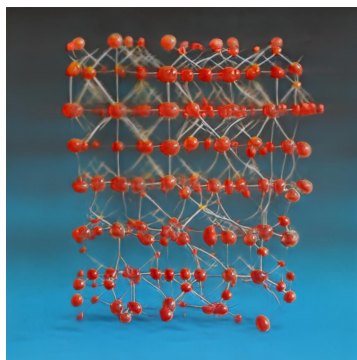
258 images with a very similar composition, all coming from this website: <https://www.miramodus.com/molecular-models/images/images-inorganic-crystal-structures.shtml>



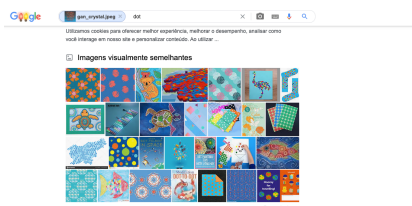
Images generated using BigGan out of the mentioned dataset



Out of 100 AI generated images 32 came out with the same structure as the before mentioned image:



However, when one tries image reverse search on google, the first image directs to the original website, the GAN generated image presents no results:



Many AI artists, also known as neural artists, only work with datasets made with images they created, Helena Sarin is a noteworthy example. But it's often necessary to have several thousands of images to achieve good results with not only GANs but many neural networks applications, therefore artists will gather much of their data from the internet. There are good examples of thought provoking art projects done out of data collected from social media posts, such as when Gene Kogan presented the first political deep fake on Trump, or Memo Atken's inquires on the average TikTok dancer. However, one of the easiest ways of creating beautiful outputs with GANs is to download thousands of images from Flickr groups or an Instagram

hashtag, then to manually select the best ones. Unless there are clear watermarks, one might not even know who the images belong to or how many within a dataset were made by the same person. The future of selling stock images looks pretty dim with AI techniques, but artistic works, specially photography, can also be harmed if we treat GANs as we treat any other image creation tool.

Maurício Hora only heard about GANs early in 2020, when I and neural artist and researcher Gene Kogan presented it to him. After understanding better how GANs work and how artists have been using online photos to create their datasets, Maurício became seriously concerned. He himself has some of his artwork presented on Flickr and Instagram. In his mind, massively collecting other people's photos, sending to a GAN and signing the resulting work as one's own artwork without any acknowledgement nor transparency of the process is a dangerous precedent for intellectual property theft. He pointed out how expensive and laborious it is to make high quality photos: a professional needs to purchase pricey equipment in general, even more so if one works with aerial or underwater photography, one needs to travel to capture specific things, one needs to wait for days to get the perfect lighting, or one needs several skills to create studio lightning. So many other efforts are requirements for the creation of images and the stories around them. He wondered how people could be responsible towards collectively created data. Shouldn't the art world make an effort to establish good and ethical practices around image usage and dataset creation?

During the 2020 pandemics, Maurício was dedicated to raising funds to install water tanks, pipes and sinks around his community, to prevent the virus spread. Getting 10 thousand dollars in donations, with the help of his friends he personally installed an unofficial and precarious water system to improve a disastrous situation. With another local activist, Alessandra Roque, they have been distributing soap since March. His cultural centre has been distributing food. However, even with the celebrity friends and some media attention, donations are never enough to solve some basic infra structure issues. If people don't even have daily running water, how can we expect them to compete in a world that asks for higher and higher skill sets and equipments? Covid 19 pandemics increased inequality worldwide. While communities like Mauricio's and professions such as photography have been terribly impacted, many tech industries have boomed.

All of us are contributing for AI development nowadays. Everything we do on the internet can be used as data for training some kind of AI model. We also use online platforms for our own needs, but there's a clear imbalance between the people who give their data and the ones who

not only give but can harvest massive data and profit from it. Such imbalance only tends to grow if we don't come up with different strategies around it. It's pointless to prevent people from using or knowing about image scrappers, on the contrary, it can be helpful if more people understand what are the principles behind creating datasets and training neural networks. But we are accountable for what we do with the data we collect.

If someone is going to propose and sell an artwork made out of data that was collectively created, it's essential to inform what does that mean and respect the data creators. For journalists, curators and gallerists, that also brings some extra protocols when dealing with artworks made with such techniques. Asking the provenance of data should be a necessary part of the work. Soon we'll have even newer techniques that will bring more questions into data usage and authorship. We can no longer afford to think and talk of technology as a black box. Transparency, education and accountability are key to prevent the worst outcomes of technological development in every field.