Tristan Debeaune
Wendy Gervais

The outcome of our experiment with this “Discovering GANs” project was us realizing that the use of AIs in art was a thing, and is now a huge field to explore. Lev Manovich and Emanuele Arielli analyze this link and explain some of its keys in *Artificial Aesthetics,* and we totally agree that it is evolving fast and we witness it, especially on the Internet, for example with websites using GANs (Generative Adversarial Networks, ie machine learning producing images from datasets) such as *this-person-does-not-exist,* which generates hyper-realistic photo portraits of people… who do not exist, from a consequent dataset of photographs of real people. *GauGAN project*, from Nvidia, allows the user to generate a realistic landscape from a simple sketch drawn by the user, again thanks to a dataset of images and a GAN. Those surely impress us and people - artists, programmers or not, even the general public is amazed. This came so far that it can lead to paintings not painted by humans and which are sold in galleries - this was what *“Obvious”,* with its GAN algorithm, succeeded to do, in 2018.

Thus, more and more, digital creators from anywhere show an interest in deep learning for the unique experience it provides : generating images “by magic” - in fact, thanks to engineering. May it help all along the whole process? - considering creation is not only the realization, but also the search of ideas, of references, the tries, the changes after elaboration of the output…We can actually wonder: how deep learning can be part of a creative process? What may artists be able to reach thanks to it? At which steps could it help? Where does it play with art’s frontiers, and what are the limits of its use?

Whereas art is usually attached to the expression of *human* skills and imagination, and traduces one’s emotions and beauty in a sensitive form, deep learning refers to *machines,* and how “neuronal networks” - complex structure of data processing - allow it to, autonomously, draw links and establish recurrency within data. So basically, art and such informatic engineering could be opposed, but as it was said before, on the contrary, machine learning is often exploited in creation. Helping create visuals, manipulating huge amounts of images or, as in our project in class, be an end in itself, they can gather.

Observing how it works, experimenting with it, we could create new outputs, and we could consider as “artistic” the interpretation, the reflection and the ideation of the whole process. Indeed, the use of such technologies could *be* the creative process and make us invent new forms of art, like in the three examples we gave before. No other form of algorithm could provide an experiment like these, approaching interactive forms of art just like videogames or generative art, and in the end GANs *can* help to generate pieces of art - paintings, photographs, even music. All-in-all, it is relevant to use GANs to create art, even though some may think that if it is a computer who did it, it is not as genuine as if a human had done it, with their hands. But there still was a human behind the algorithm or behind its execution, and one before, who puts meaning on the result. Considering art is a large domain and its definition blurry, why not enroll the use of deep learning into the definition? The important thing to remember, of course, is that it would remain a tool, not so different from a music instrument, a pen or any creative software, helping ones to create things. Also, this seem-to-be question of AI's paternity (“who made the painting…”) of art is non relevant - to us, GANs are a tool, and nothing more.

Deep learning can help at different steps of a creative process. As we said, it can be used to generate new images, but it can help from the beginning to the end of the ideation and realization of a more classical project : it can help providing new references to an artist (for example, with our quadrangles, we could extend our set of images and even observe new aesthetics, like blurry and shaky shapes, introducing randomness, or create a unique animation with the inference step, and use it to do something else). Moreover, it can be a tool helping enhance visuals (like the Super Resolution part), for example, deep learning is used in CGI or in video games to improve graphics. All-in-all, deep learning can be a powerful helping tool.

The issue with the use of deep learning can be that, from the spectator's point of view, if they are not aware of the process of creation, they could think that the piece of art was made by a human, and could wrongly interpret it. Thus this technology could be exploited to fake art, to create forms without a real meaning. We can already see drifts, for example with deep fakes (videos where the faces of people are switched to another one) which could be dangerous because of the misinformation it can lead to.

Another issue, more technical, is the complexity of a GAN, it is very hard to understand how machine learning works and also the result is in itself unpredictable if it was not learnt before. In that way, it is a kind of black box which works "by magic" as we said previously. In itself, it is not a problem, any instrument at the beginning is a black box and with training, experiments and time an artist can master this instrument. But in the case of GAN, it is a black box over another black box which is the machine itself - this imbrication could be questioned, criticized because the complexity increases faster than our learning pace - even at IMAC or any engineering school. In the meantime, efforts are put into making computer science accessible and it is more and more present in education and creation, so we are confident that it could be overtaken.

The artist doesn't have a real control of the outputs so the creation could be less precise and rich. A more short term issue is the problem of ressources. A GAN needs -in order to be efficient- a huge amount of incoming data and big calculation power. So depending on the scope of the project, the use of a GAN could be greedier than useful. But seeing how the technology has evolved, it is clearly possible that it will continue to grow and ameliorate so these limits may be overtaken. The technological problem is also that it is based on existing images and is trained to reproduce it, so a GAN is not a very efficient tool to create original visions that apparently were never seen. In the idea of reproduction, where does the art is created? If I use a GAN based on photographs to recreate a fake photograph, do I really *create* it? Did I really make something original in the meaning, is it substantially enough? It is the case with our GAN project this year: where is the originality in the outputs we made? So, to what extent can we consider them as creation?

All-in-all, we can say that the most important idea is that deep learning is a tool, which is perfectible and not flawless at all. The potential is huge because it opens the door to new fields of art and it can accelerate parts of creation, even though it requires knowledge and a learning process to apprehend the technology.