Impressionist StyleGAN

Topic
Adversarial Image Generation

Project Type
Bring your own data

Summary

Idea

The general idea behind this project is to build a Generative Adversarial Network that is able to generate artworks in the style of Impressionist artists.

WHY IMPRESSIONISM?
There are many interesting art styles which could be chosen for such a project; however, Impressionism seems like an intelligent choice for a plethora of reasons. For one, Impressionism doesn't contain detailed facial features—a feat with which image generation AIs have struggled for a long time—and it doesn't contain text, also a challenge for many AIs. This art style doesn't look "precise," which I hypothesize makes it easier for a model to learn how to generate it. Another reason why Impressionism was chosen is that it is a fairly old art style with paintings by artists who are long dead. This makes the artworks public domain and therefore easy to use.

[1]

Dataset

I plan on collecting a dataset of 20,000 paintings by famous Impressionist artists. I will acquire this dataset by querying the APIs of several famous museums (The MET [2], Rijksmuseum [3]) as well as other public domain sources, such as Wikimedia Commons [4] or WikiArt [5].

Then I will gather all dataset entries into a CSV-file which is structured as follows:
ID, Author, Style, Title, Date, Genre, Image_URL, URL
Author … The name of the artist that created the painting
Style … The style of the painting (Impressionism/Neo-Impressionism/Post-Impressionism)
Title … The title of the painting
Date … The date/year in which it was painted
Genre … The theme of the painting/what it depicts (e.g. still life, portrait, …)
Image_URL … The URL to the artwork image
URL … The URL to the webpage the artwork was taken from

The dataset contains paintings in the styles of Impressionism, Post-Impressionism, and Neo-Impressionism. I decided to include Post-Impressionism as well as Neo-

Impressionism since these two styles are still very similar to Impressionism itself, and there exist many paintings in these styles, increasing the dataset size significantly. The metadata included in the dataset can be used for a variety of purposes, such as identifying the artist of a given painting, approximating the year in which an artwork was created, or finding a suitable title for an artwork.

Model Architecture

I plan on creating a StyleGAN [6] as described in the original paper. Since the training of a StyleGAN takes a large amount of time, I will resize the images in my dataset to a size of 64×64 or 128×128 and train the model on one of these resolutions. If I can build the model faster than I expect, I will upgrade my StyleGAN to a more modern model, such as StyleGAN2 [7] or StyleGAN2-ADA [8].

Work Breakdown

Researching project ideas: 2h
Planning project: 2h
Finding dataset sources: 2h
Writing code for dataset collection: 4h
Collecting all dataset entries: 10h
Refining dataset: 4h
Building the model: 10h
Training the model: 15h
Building an application to present the results: 10h
Preparing the final report and presentation: 10h

References

[1]: Monet, Claude. Woman with a Parasol - Madame Monet and Her Son. 1875. Oil on canvas. National Gallery of Art, Washington, D.C.
[2]: The Metropolitan Museum of Art, https://www.metmuseum.org/
[3]: Rijksmuseum Amsterdam, https://www.rijksmuseum.nl/
[4]: Wikimedia Commons, https://commons.wikimedia.org/wiki/Main_Page
[5]: WikiArt, https://www.wikiart.org/
[6]: Karras, Tero, Samuli Laine, and Timo Aila. "A style-based generator architecture for generative adversarial networks." *Proceedings of the IEEE/CVF conference on computer vision and pattern recognition*. 2019.
[7]: Karras, Tero, et al. "Analyzing and improving the image quality of stylegan." Proceedings of the IEEE/CVF conference on computer vision and pattern recognition. 2020.
[8]: Karras, Tero, et al. "Training generative adversarial networks with limited data." *Advances in neural information processing systems* 33 (2020): 12104-12114.