AIcasso: an AI Art Generator

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Abstract - From the earliest cave drawings, art has always played a significant role in human society. It allows one to interact one another using interesting stories. A variety of industries, including the arts, are interested in the potential uses of recent developments in artificial intelligence (AI). However, it is generally accepted that only people can understand and appreciate the art in its true form. Advertising, architecture, fashion, and entertainment are just a few of the sectors that already employ AI-generated art. Realistic images and animations are made using AI algorithms. New literary and musical genres are also being created using AI-generated art. AI-generated art has several benefits, including the ability to produce realistic or hyper-realistic data, the potential to produce works of art that are impossible for humans to make, and its ongoing development. However, it also has difficulties of its own. The suggested stable diffusion art generator is more stable, flexible, and consistent than standard generating models. The method may create a wide range of creative styles, from abstract to realistic, and can be applied to several applications, including image synthesis, style transfer, and data augmentation. This project uses a machine learning method called "Stable Diffusion" to create artwork in the manner of Pablo Picasso. Modern algorithms like the Stable Diffusion approach may produce visuals that resemble hand-drawn drawings. The approach includes maintaining the structure and substance of the input picture while diffusing it over time. The output of the algorithm is then styled to resemble Picasso's distinctive artistic style. The initiative may offer fresh perspectives on the methods Picasso employed to make his works of art, and it may also inspire the creation of brand-new pieces in his aesthetic. The general public, as well as artists and art historians, may be quite interested in this.

Index Terms – Artificial Intelligence (AI), Generative Art (GA), Creative Algorithms (CA), Inspiring Art (IA), Image Synthesis (IS), Picasso, Fine-tuning (FT), Stable Diffusion (SD)

I. INTRODUCTION

The study of building intelligent computers that can carry out activities that ordinarily need human intelligence is known as artificial intelligence (AI), which is a subfield of computer science. The foundation of artificial intelligence (AI) is the notion of building intelligent machines that can mimic human thought, reasoning, and decision-making processes.

The expression of creativity via art spans a variety of mediums, methods, and styles. From performance art, installation art, and digital art to painting, sculpture, and photography, art reflects the human experience and offers a channel for communication and interpretation.

The subject of artificial intelligence has advanced significantly in several areas in recent years. The capacity to create very lifelike visuals is one of the most exciting developments in AI. It is sometimes impossible to determine if these photographs were produced by people or machines since they are so amazing. AI-generated art is a notion that is gaining popularity as more and more images are created automatically using AI algorithms. The most recent innovation that enables individuals to make their own digital art utilizing an internet application is the AI picture generator technology. With the possibility to improve originality by adding personalized seed photographs, the AI image generation tool comprehends user instructions and creates individual art styles.

Current models for AI based image generation can produce not only realistic-looking images, but also handling a wide variety of objects. In this paper, we use "Stable Diffusion," a model for image generation that creates an artificiallygenerated dataset for training image processing systems while training it to be specifically working for a special art style which, here, is Picasso's famous art style. Our results demonstrate that Stable Diffusion generates better faces than other systems, and we provide a dataset of face images for further study. Additionally, the paper introduces the stable library from Hugging face, providing a particular and specific dataset based on a specific art form to create art related to a particular style. This paper aims to contribute to the growing field of AI-generated art and stimulate further research in the field [7].

In the last several decades, artificial intelligence (AI) has considerably improved its potential as an artist, capable of authoring movies and producing hyper-realistic visuals. These tasks are frequently carried out using generative models, which, given enough training data, may produce unique data.

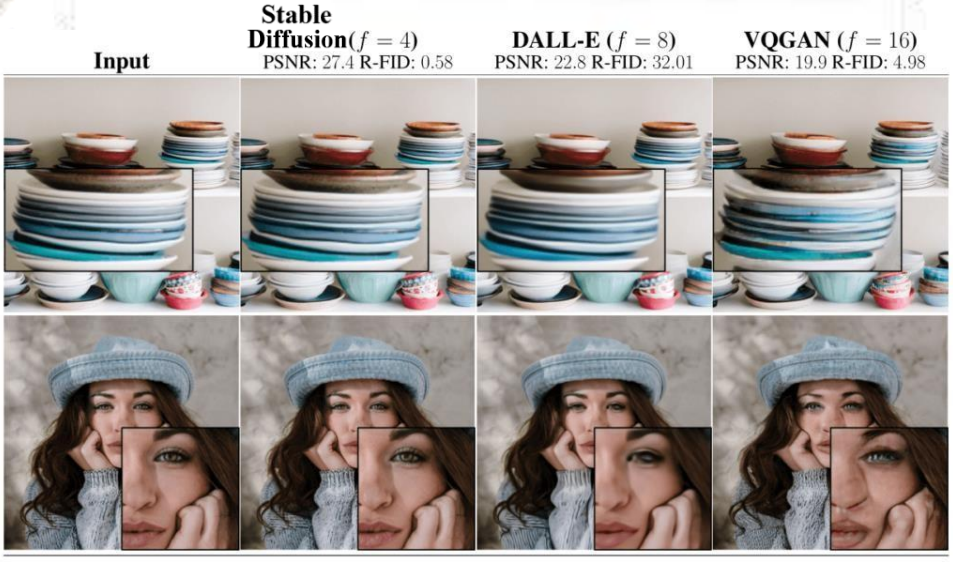
Besides from ethical issues, AI-generated art has other drawbacks, such as a lack of the personalization that is typically associated with artists and their work. So, even while AI-generated art commands high prices, there is some concern about the loss of conventional art produced by actual humans. The development of Electroencephalography (EEG) technology, on the other hand, allowed for the capture of an artist's ideas, allowing for the application of personality to AI-generated art (i.e., capturing the brain signals).

Although the future of AI-generated art is still uncertain, current AI technology can produce texts, movies, and images that can deceive us humans. The potential of AI art is thus both intriguing and unsettling.

II. LITERATURE SURVEY

Text to Image using Deep Learning [5]

A significant challenge for artificial intelligence is the interpretation of data between text and images. This study emphasized on many instances where automatic image synthesis is quite advantageous. One use for conditional generative models is the creation of images. GANs (Generative Adversarial Models) are used to create pictures. Using Generative Adversarial Networks, recent advancements have been made (GAN). A very good example of deep learning is the transformation of text into images. This combined study of papers resulted in a simple and effective model for picture creation after undertaking a combined analysis of the papers and project execution planning. Future work can be focused on refining the model to produce images with a high quality and applying it to more datasets.



AiArt: Towards Artificial Intelligence Art [10]

This report has shown the preliminary findings from the literature review, indicating the areas of current study. The fundamental and most significant aspects of AiArt, its nature and qualities, have been covered in detail. By defining this novel art genre and setting it apart from previous forms of expression, it may be called AI Art. We held that three factors—a diversified creative subject, an intelligent creative medium, and a contemporary representation of meaning—determine the nature of AI art. On the other hand, we also enumerated the fundamental traits of AI art going forward: experience with synesthesia, adaptability and fluidity, dialogue and connection, penetration, and integration. Anticipation is made to progress in the future by experimenting with ideas, models, and tools to examine the possibilities for creativity and innovation in the development of AiArt.

HuggingFace's Transformers: State-of-the-art Natural Language Processing [13]

HuggingFace's Transformers library has emerged as a powerful tool in the field of Natural Language Processing, providing state-of-the-art models for a range of tasks such as text classification, machine translation, and question answering. The library is built on top of PyTorch and TensorFlow, enabling users to train and deploy models with ease and flexibility. One of the major advantages of HuggingFace's Transformers is its ability to fine-tune pre-trained models on specific tasks, resulting in highly accurate and efficient models with minimal training data. Additionally, the library offers a wide range of pre-trained models that can be directly used for various NLP tasks, saving time and computational resources.

III. STABLE DIFFUSION FRAMEWORK

Hoffman et al. introduced Stable Diffusion in 2021 as a probabilistic generative model for continuous-time dynamics. It is a development of the diffusion process, a continuous-time stochastic method for producing samples from intricate distributions and denoising pictures.

By adding a "stabilizer" term that makes sure the diffusion process behaves properly and does not diverge, Stable Diffusion improves upon the diffusion process. This stabilizer term, which depends on the process's present state, was created to combat the diffusion process' propensity for creatingunstable or erroneous samples.

Many generative modelling tasks, such as producing text, images, and audio, may be accomplished using stable diffusion. It differs from other generative models in a few ways, including its capacity to produce high-quality samples, model complicated distributions, and deal with missing data.

For several benchmark datasets, including CIFAR-10, CelebA, and ImageNet, stable diffusion has been demonstrated to produce state-of-the-art results. It is a hotly debated topic in the machine learning community and is anticipated to progress generative modelling and other branches of the field [12].

Hugging Face created the open-source Transformers library, a collection of models and tools for use in natural language processing (NLP) activities. It is constructed on top of the well-known deep learning frameworks PyTorch and TensorFlow.

Providing pre-trained models for various NLP tasks, such as text categorization, named entity identification, machine translation, and question-answering, is the main goal of the Transformers library. These models are created to perform effectively on a variety of NLP tasks and are trained on massive volumes of text data.

The Transformers collection contains some of the most well-liked pre-trained models, including:

- BERT (Bidirectional Encoder Representations fromTransformers)
- GPT-2 (Generative Pre-trained Transformer
- RoBERTa (Robustly Optimized BERT Approach)
- T5 (Text-to-Text Transfer Transformer)
- DistilBERT (a smaller and speedier variant of BERT)
- XLNet (eXtreme MultiLingual Language Model)

These models are created to be improved on certain NLP tasks using data supplied by users, enabling programmers to customize them for particular use cases. It is simpler for developers to create and deploy NLP models and apps thanks to the Transformers library's features for preparing text data and assessing model performance [13].

Jalal Fadili and Jean-Luc Starck first introduced the Stable Diffusion method in their 2009 publication, "Stable signal recovery from partial and incorrect observations." The technique controls how the picture pixels move over time using a diffusion equation. Fadili and Starck analyse the stability and convergence characteristics of the methodtheoretically in their article.

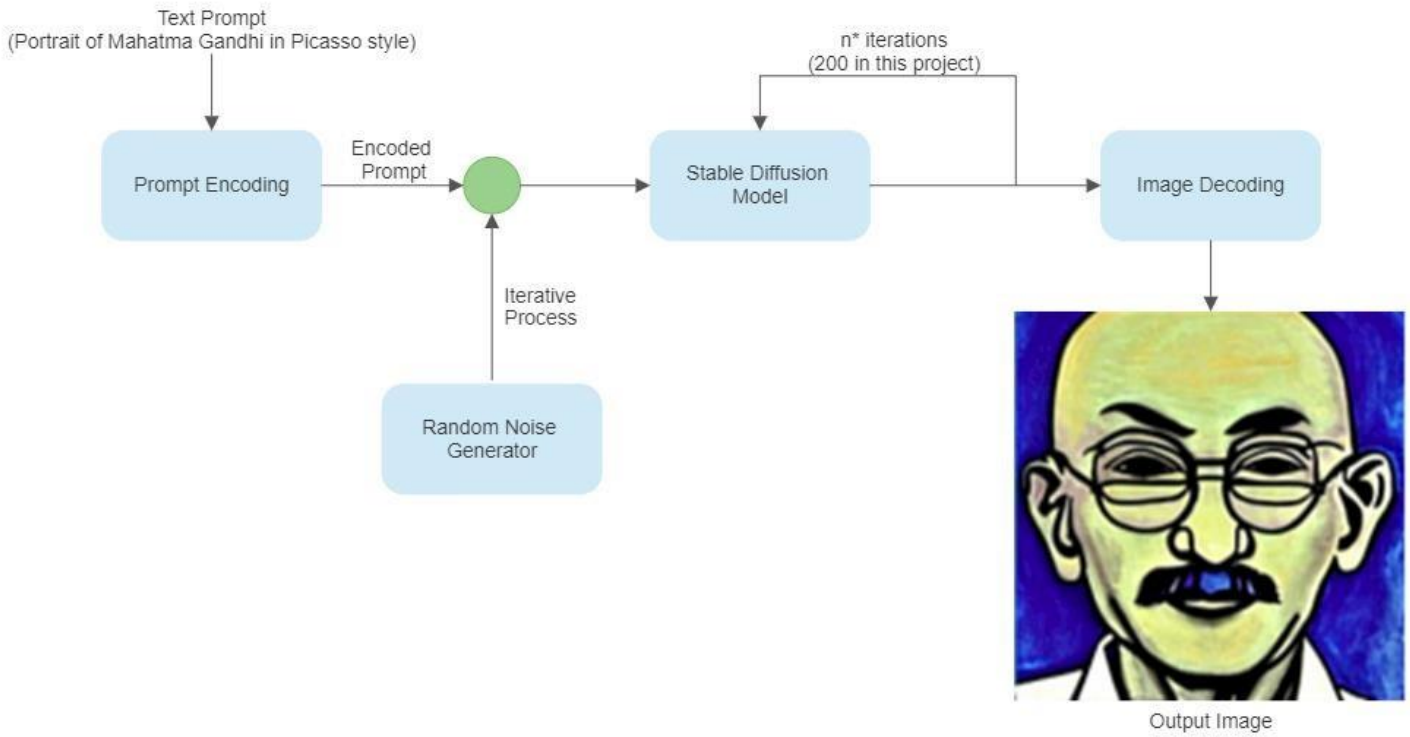
They demonstrate how the Stable Diffusion method may be used for a range of signal processing applications, such as picture denoising and deblurring, and how it can recover signals that are missing or erroneous. The diffusion equation used in the Stable

Diffusion algorithm can be written as:

$$\partial u(x,t)/\partial t = \mathrm{div}(c(x)\nabla u(x,t)) + \gamma(x,t)$$

where u(x,t) is the signal being processed at time t for a signal at location x, c(x) is the diffusion coefficient at location x, and $\gamma(x,t)$ is a stochastic process. The diffusion equation describes how the signal evolves over time as it is diffused.

The Stable Diffusion method uses a stochastic process $\gamma(x,t)$ to control how much diffusion occurs at each iteration. This helps to maintain the signal's structure and texture while also injecting aesthetic diversity. Depending on how the algorithm is specifically implemented, the stochastic process' precise formula may change [16].



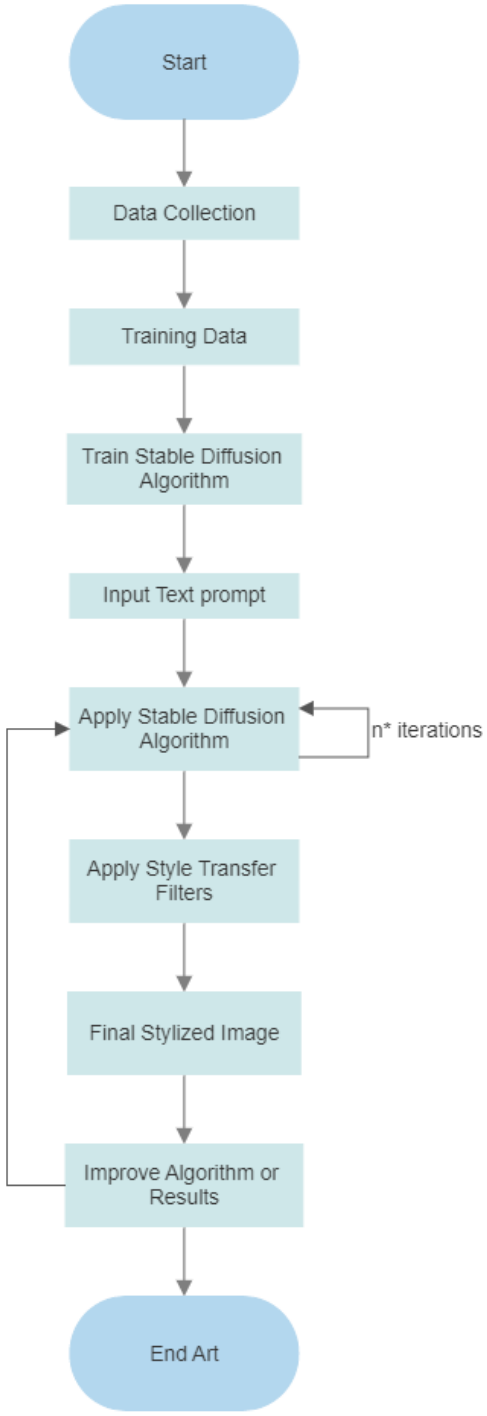
The Stable Diffusion technique gradually transforms an input image into an output image while preserving the structure and content of the original image via a diffusion process. The process is managed by a diffusion equation that directs the motion of the image pixels over time. Because it is based on a probabilistic framework that allows for the modification of picture textures and styles, the Stable Diffusion technique is particularly well suited for producing imaginative images in the Picasso style.

IV. METHODOLOGY

The project is progressed with the following actions to create art in the manner of Picasso using the Stable Diffusion method:

- Data Gathering: To provide the Stable Diffusion method with training data, a well compiled, sizable collection of Picasso's artworks, variety of media and styles, such as paintings, drawings, and prints, will be included in the dataset.
- Training: Using the gathered dataset of Picasso's artwork, the team will practice the Stable Diffusion method. The algorithm will need to be trained in order to understand the statistical structures and patterns of Picasso's style.
- Picture Creation: New images in the Picassoaesthetic will be produced using the trained algorithm. The group will choose a starting image and use the Stable Diffusion algorithm to progressively change it into a finished image in the manner of Picasso.
- Transfer of Style: The resulting picture will be styled to reflect Picasso's distinctive style. This can entail adding a series of filters or tweaks to the image to replicate Picasso's use of color, brushstrokes, and other visual elements.

At last, the process of using Stable Diffusion to create artwork with the interpretation of Pablo Picasso’s manners include gathering a dataset of training photos, teaching the algorithm, creating new images using the technique, and styling the created artwork in accordance with Picasso's distinct style.



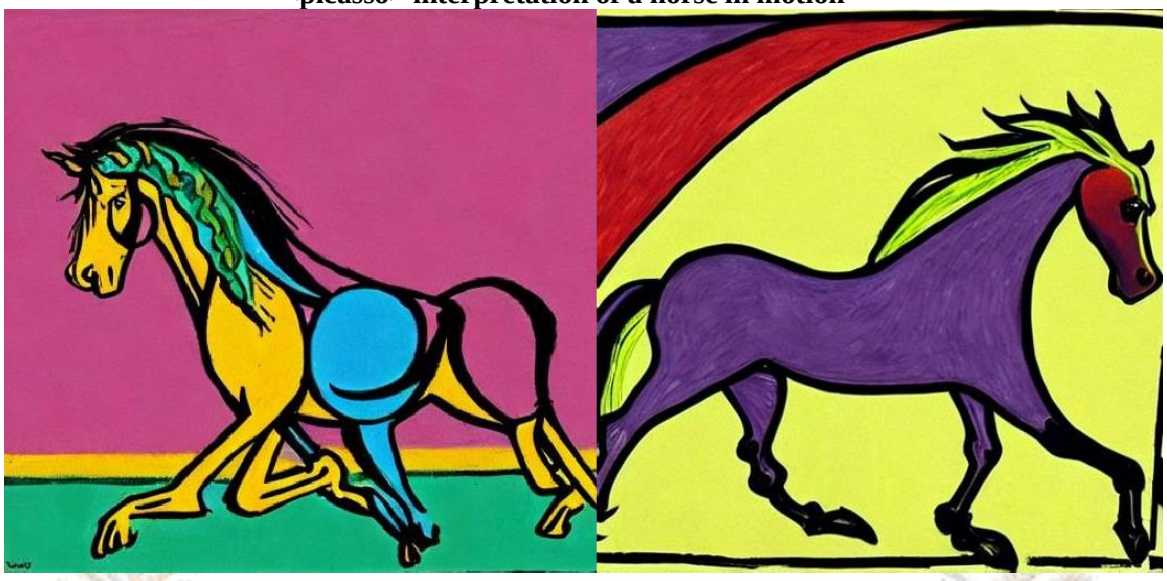
V. RESULTS

The goal of AIcasso was to establish an AI-based art generator that could independently produce works of art in Pablo Picasso's aesthetic. To capture the patterns and structures in Picasso's paintings and sketches, deep learning methods were used to train the system using a sizable dataset of his paintings and sketches. The resultant model demonstrated some degree of creative innovation and was able to produce new works with aesthetic similarities to Picasso's style.

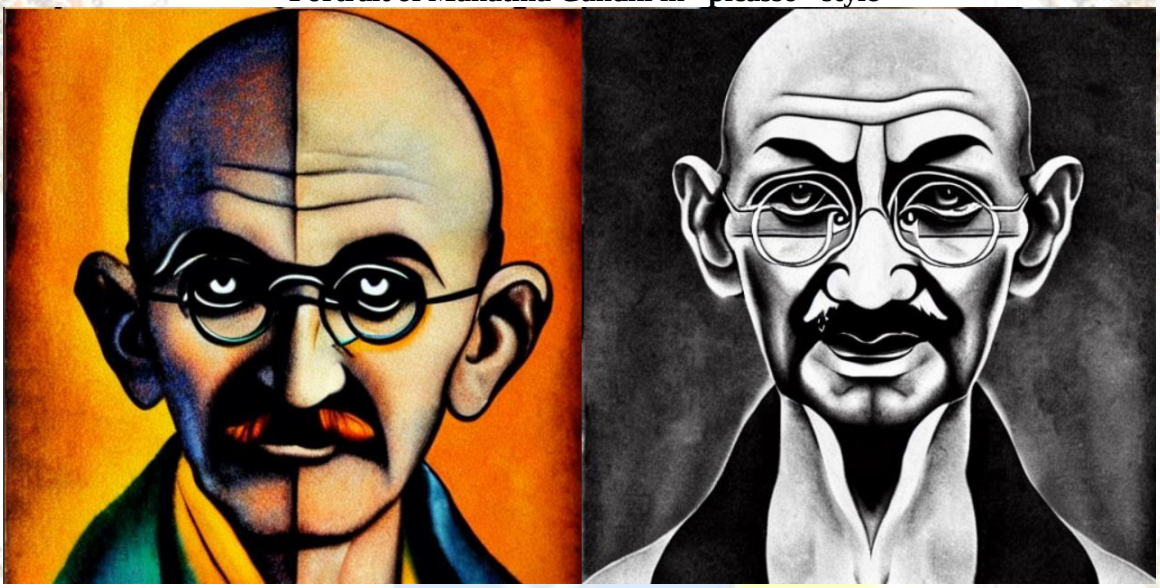
By requesting people to submit input prompts for the system to develop new artworks, more tests were carried out to investigate the system's creative potential. The resultant artwork displayed a variety of artistic interpretations, from accurate imitations of Picasso's style to original and unexpected variants.

Overall, AIcasso showed how artificial intelligence (AI) may be employed as a creative tool in the world of art and design, providing fresh avenues for experimenting and exploring different artistic forms and styles.

<picasso> interpretation of a horse in motion

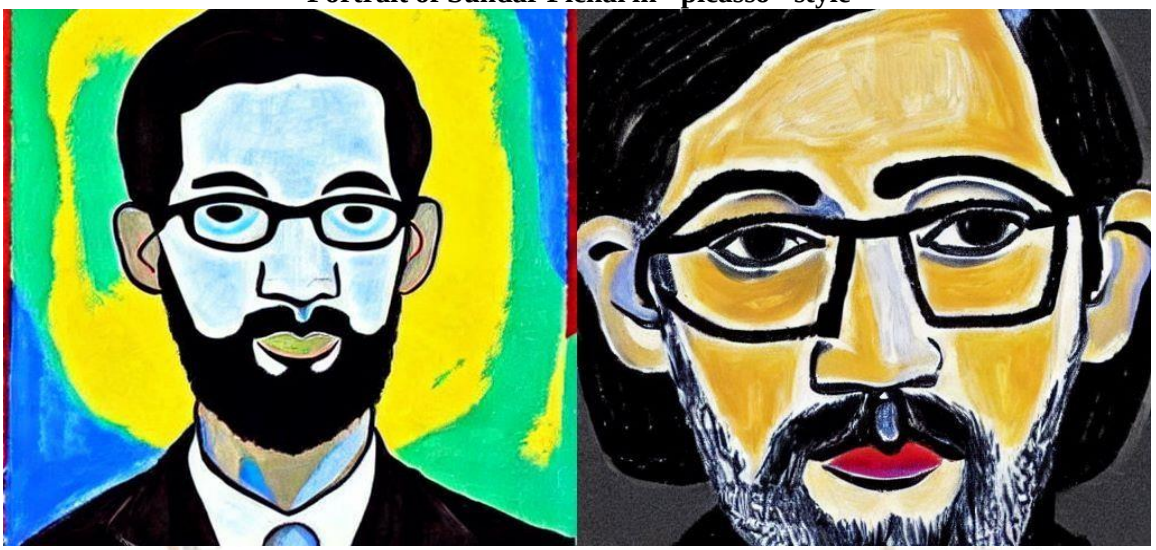


Portrait of Mahatma Gandhi in <picasso> style



Interpretation of starry nights in <picasso> style

Portrait of Sundar Pichai in <picasso> style



VI. CONCLUSIONS

In the upcoming years, the use of AIcasso: an AI Art Generator will become more widespread. An even more realistic and detailed output as an image with a text prompt as input was produced by using a steady diffusion technique to generate art using a library of embracing faces. The stable diffusion technique uses a stable numerical methodology that enhances the precision and stability of the art produced. It has been demonstrated that using this method will result in high-quality artworks that can be used in a range of fields, such as advertising and interior design. However, there are also issues to consider, such as the possible loss of creativity and uniqueness in created art. Overall, the steady diffusion approach is effective. Overall, the stable diffusion approach is a promising methodology that may be developed to enable the development of more realistic and distinctive AI-generated art.

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