University of Tehran

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Machine Learning

Final Project – First report

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1 introduction

In recent years, there has been a significant rise in the use of artificial intelligence (AI) to create works of art. From computer-generated music and literature to visual art, AI is increasingly being used to produce pieces that can rival those made by human artists. While this development offers exciting opportunities for creative expression and innovation, it also raises important questions about how we define and differentiate AI art from traditional human-made art.

As AI-generated art becomes more prevalent, there is a growing need to develop methods for identifying and analyzing its unique characteristics. This includes understanding the techniques and algorithms used to create AI art, as well as its aesthetic qualities and emotional impact. Additionally, there are ethical and legal considerations surrounding the authorship and authenticity of AI art that must be addressed.

In this report, we will explore the intersection of art and technology and examine how machines can be used to identify and distinguish between AI art and human-made art. We will consider the techniques and characteristics of AI art, compare its aesthetics to those of human-made art, and discuss the ethical implications of this emerging art form. Through this analysis, we hope to shed light on the potential of AI-generated art and the challenges that come with its growing presence in the art world.

1.1 Definition of AI Art

AI art refers to images and works of art created using artificial intelligence. Using the vast data sets of information and art created over human history, AI analysis these compositions and reinterprets new works based on set rules and prompts given by a user. The processing capabilities, ability to generate variations, and complexity of image detail make AI art generation a compelling and powerful tool for anyone interested in visualizing their most fantastic ideas.

This area has been a growing topic of interest in recent years, attracting the attention of artists, art lovers, and the wider public. With the increasing capabilities of AI systems, this innovative approach to creating art has led to the generation of works that are sometimes indistinguishable from those created by human artists. Despite the excitement surrounding AI Art, it also raises complex ethical, legal, and artistic questions that have sparked debates about the definition of art, the role of the artist, and the future of art production.

Artificial intelligence Art is created using a range of techniques, including deep learning algorithms, neural networks, generative models, procedural rule-based generation of images using mathematical patterns, algorithms that simulate brush strokes and painted effects, as well as generative adversarial networks (GANs) and transformers. These techniques enable computers to analyze and generate art that mimics specific styles or genres, or produce completely new and unique artworks.

1.2 A brief history of AI-generated art

The history of AI-generated art can be traced back to the early days of computer graphics and the invention of the computer.[1]

In the 1950s and 1960s, computer graphics were used to generate simple patterns and shapes. These early examples of AI-generated art were created using basic algorithms to create patterns that were rendered on a computer screen.[1]

For example, a German mathematician and scientist Frieder Nake created a portfolio in 1967 named "Matrix Multiplications," consisting of twelve images, one of which you can see below.[1]

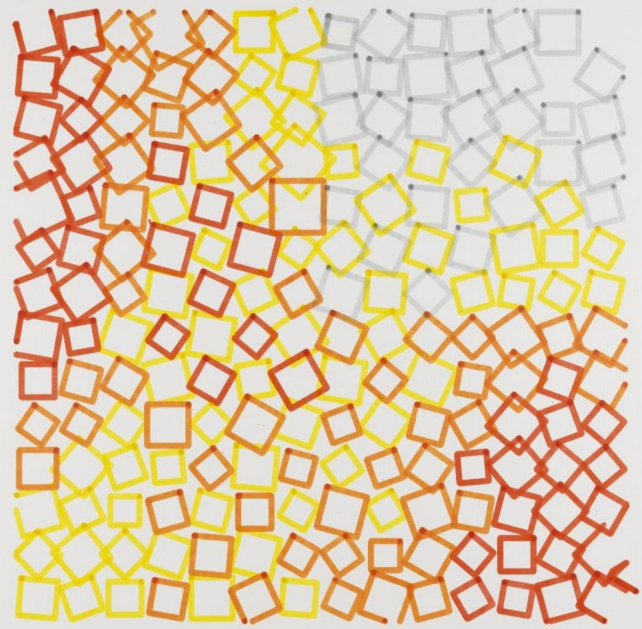

Figure 1: Untitled (1967), by Frieder Nake

Nake produced a square matrix and filled it with numbers, which were multiplied successively by itself, and the resulting new matrices were translated into images of predetermined intervals.[1]

Each number was assigned a visual sign with a particular form and color. These signs were then placed in a raster according to the values of the matrix. Nake commonly used random number generation in his work of this period, and, likely, his multiplication process was partly automated.[1]

In the 1970s and 1980s, AI-generated art began to be used more extensively in computer-aided design (CAD).[1]

CAD software allows designers to create and manipulate three-dimensional shapes on a computer. This allowed for more complex and realistic images to be created. For example, in 1973, artist Harold Cohen developed a set of algorithms, collectively known as AARON, that allowed a computer to draw with the irregularity of freehand drawing.[1]

AARON was programmed to paint specific objects, and Cohen found that some of his instructions generated forms he had not imagined before. He found that he had set up commands that allowed the machine to make something like artistic decisions.[1]

Initially, AARON created abstract paintings, which grew to be more complex art through the 1980s and 1990s, including (chronologically) drawings of rocks, plants, and humans. One such example is shown below.[1]

1.3 Tools and Software Used for AI Art Creation

Artists use various tools and software, such as Jasper Art, DALLE -2, Stable diffusion and many more to create AI Art. These programs offer endless possibilities for creative expression and allow artists to generate their own AI Art or manipulate existing works to produce new pieces. Additionally, there are numerous online communities and forums where artists can share and discuss their AI Art creations.[2]

2 Techniques for identifying AI art

Machine learning algorithms and image recognition software are like super smart computer programs that can analyze the characteristics of an artwork. They can look for specific patterns or features in the artwork that may suggest it was created by an AI system, rather than a human artist. For example, they can look for unusual repetitions or color palettes that are not typically found in human-made art. By analyzing these characteristics, the computer can help us tell the difference between AI-generated art and traditional human-made art.

Think of machine learning algorithms and image recognition software as "smart" computer programs that can study an artwork and look for specific

Figure 2: Painting made by AARON, developed by Harold Cohen

clues or patterns that are commonly found in AI-generated art. For example, when analyzing a piece of art, they may look for things like repeated patterns, unusual color choices, or other visual characteristics that may suggest it was created by an AI system rather than a human artist. By using these techniques, we can better understand and differentiate between AI art and human-made art.

for example in the image below you can look at the girl's parts of the face that are not realistic.

Machine learning algorithms and image recognition software can be used to detect certain characteristics of AI-generated art. AI-generated art is created by using AI as a creative tool and working with algorithms to set up specific rules through which machines analyze thousands of images1. Deep learning algorithms can generate original, realistic images and art2. AI art is created through a machine learning process where a machine has "learned" some information3. Technologies related to artificial intelligence have a strong impact on the changes of research and creative practices in visual arts4. Object detection in AI is based on the intuition that an object of interest has a distinct set of characteristics that can be identified by the local features of the image

Figure 3: in this picture, 3 output images of 3 different image generator compared

Figure 4: ai generated images

References

[1] Rohit Kundu. *AI-Generated Art: From Text to Images and Beyond.* (accessed: 03.02.2023).

[2] Raúl Lara Naranjo. *AI Art vs Human Art, A side by side analysis.*