The Art of AI: How Artificial Intelligence is Changing the Way We Experience and Create Art

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2023

Abstract

The increasingly fast revolution of AI (Artificial Intelligence) technology is upon us. Monthly new articles regarding AI breakthroughs headline consistently. This research paper is an in depth look of how these evolving technologies are affecting the world of art. Exploring specifically how the application of machine learning and computer vision have led to breakthroughs in accessibility of art and art history. This paper discusses several examples of tools being produced and used by artists, museums, and other arts organizations. Giving a better understanding of these technologies, their implications, and what to expect in terms of the future. Understanding how these tools can be used and accessed by anyone, is meant to provide an avenue of understanding encouraging the public and creatives to further investigate and utilize these tools. As well as understanding potential concerns and issues of these algorithms and their implications.

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1   Introduction

Artificial Intelligence (AI) has become increasingly engrained in today's society. With all the complex issues artificial intelligence is tackling it is no surprise art has also begun to be touched by it. Understanding how this technology is affecting the art world will help artists and experts utilize the tools AI is making accessible to everyone. This includes informing them of the issues of ethics and bias that exist in these programs, allowing people to make educated decisions on how they may choose to personally approach AI tools. Artificial Intelligence is trained to do different tasks using machine learning. According to an article published by several scientists of the American Physical Society, describe Machine Learning as "Machine learning (ML) encompasses a broad range of algorithms and modeling tools used for a vast array of data processing tasks".[i] This process combined with a more recent field "Computer Vision" has led to many of the breakthrough uses covered in this paper.[ii] AI's ability to understand and interpret visual images using machine learning and computer vision is allowing non-specialists expansive accessibility to art and art history.

For example, the AI's ability suggests search terms that are making art data bases more searchable to the general public. Artists themselves have begun to deeply explore this new complex field, creating novel contemporary works that help introduce this technology to more and more people. Similarly, many issues revolving around artificial intelligence are also highlighted by the works of artists confronting AI. By building sets of code AI can be programed to complete tasks or even come up with solutions to complex problems.   Many projects develop new unique codes but often still borrow from or improve on open-source existing code available online. Even with the availability of this information easily searchable online, understanding AI can be a rough arduous task. Questions like, "How is it doing this?", "What potential applications does this technology have?", "Are there concerns to be aware of?" can lead down long rabbit holes of research that sometimes create more questions than answers.

Wanting to understand the answers to these questions has prompted my pursuit of Artificial Intelligence concerning Fine Art for this project. Upon conducting this research, it is surprising how widely applied AI already is online and in person concerning art and art information. Although this dive into artificial intelligence could include a lot more aspects and applications, this narrowed look into AI and fine art is intended to highlight some similar technologies (machine learning, and Computer Vision) utilized to make a wide range of useful applications. In my own experience understanding this research and how AI is being used has helped change my perception of AI and my expectation for the future. This feeling of further accepting this technology has opened many doors of potential uses in my own art studies and creative practice. These potential uses, such as utilizing an art databases for similar works, or the ability to generate a visual example of an idea using prompt engineering inspired the direction taken exploring AI in this paper.

With this basis in mind, we will investigate several projects revolving around AI and Fine Art. Including an in-depth look into Rutgers Universities 2016 exploration of AIs potential to study art. Along with museum such as the Met and MoMA exploring uses of AI to make the accessibility of their collection more widespread.[iii] The first part of the paper will explore artists who use AI as a tool to create or as the subject of their art works. These artists are at the forefront of a new tool that is still not excepted by many, including some artists who discount the validity of its creative potential. Then the analysis will focus on how different Museums and art organizations are approaching these contemporary artworks. Also concerning these organizations utilizing AI we'll review museums initiating AI projects themselves. This ranges from suggesting a work of art based on your day to developing tools that help manage and improve art collections.[iv] Finally, looking at how these breakthroughs and applications are making a difference, and what to expect in future.

This is the purpose of writing my paper and the opportunity I hope to give to others who wish to be more informed on the subject of AI related to art. It is my hope that providing this opportunity to others will allow their own creative or historic explorations of art some clarity creating a better basis for understanding how AI can potentially be used.

2 Immerging AI Art

The First AI art to go to auction was sold by Christie's in 2018 for $432,500, after only being estimated to sell for $10,000.[v] This piece known as the *Portrait of Edmond Belamy* was created by a French artist collective Obvious. This group is comprised of three college students, who created this portrait by developing an art generating AI trained on historic artworks of AI trained to use the GAN algorithm. GAN, developed by Ian Goodfellow, stands for Generative Adversarial Network.

   To summarize a GAN network utilzes two separate AI neural networks. A neural network is a problem-solving model that trains an AI to process data in a format similar to the human brain. Using two networks in tandem in the GAN algorithm allows one network to attempt to make judgments separate from the other network.[vi] One network is trained on what a realistic image looks like based on a prompted subject and tries to replicate and create new versions of these images. The second network is trained to tell whether an image is real, or AI generated based on real life images. If this network spots a fake generated image when the system is prompted to create art, it sends back the image. This process allows both networks in the algorithm to continue to make progress and get better at their jobs. Resulting in more and more realistic and accurate generated images. This was a revolutionary concept in its development and has led to many more AI breakthroughs. Building and tweaking the code based around this algorithm is one of the key differences in the many AI art generators available online. Many of this code can be made from scratch or can be found on open-source resources online.

   Obvious initially presented the code for the *Portrait of Edmond Belamy* as their own labored creation. Before it sold at auction it was found out that part of this code had been sourced from online from the work of another AI artist Robbie Barrat. A 19-year-old who generated AI art using his developed code and decided to make it available online for others to use and experiment with. In an interview with online new source *The Verge*, Barrat states the artist group Obvious approached him and even asked to use his code. Shortly after he noticed the collective producing what he described as AI artworks very similar to his own already produced work. Obvious did not deny the use of this code but stated they had

only used a small portion in their project. This left many wary of the artist group. Leaving unanswered questions involving ethics, ownership, and art. Does Barrat deserve more credit or even financial compensation for his code's involvement? Does ownership partly belong to the person who made the code? Or not at all sense the AI itself made the work? Many of these questions call for the need of regulation surrounding AI. As well as highlighting the ease in which this new landscape can potentially be exploited.

Art collective Obvious's "Portrait of Edward Bellamy", (2018)[vii]
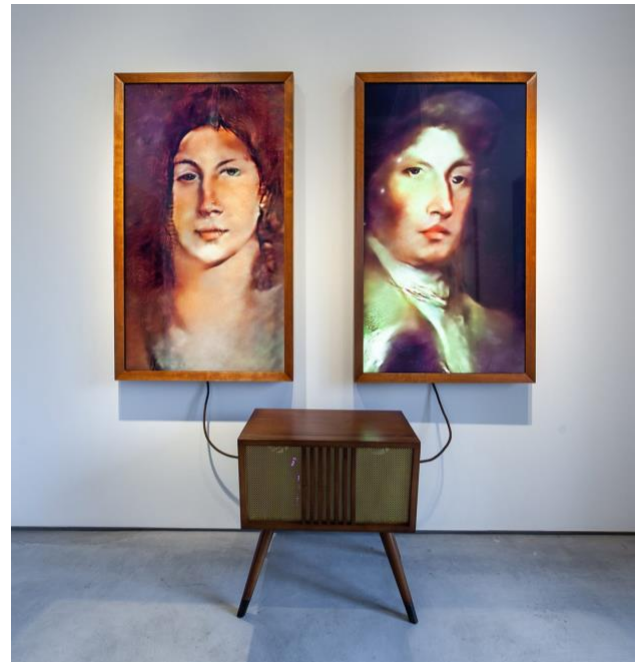
Mario Klingmann's "Memories of a Passerby", (2018)[viii]

This controversy over the code may have partly led to the inflated final sale price. Along with the Christies boasting the work as the first AI artwork to go to auction. In comparison to the canvas print framed in gold, the following year another work was sold at Sotheby's auction for only $50,000.[ix] This work by Mario Klingmann is called "*Memories of a Passerby*", made the same year as *Portrait of Edward Bellamy*. The work features an old-style cabinet that houses a computer, and two large screens attached by wires above it. These screens feature the AI's continuing production of AI generated portraits. It does not save any image and only continues to create new faces. Klingmann himself states for this reason the art is more about the code of the AI than the fading images. Despite this artwork being far more complex with its ever-evolving images of portraits, it went for far less at auction. Setting a precedence for what we are likely to see this type of contemporary art go for at auction in the future.

3   Artists and AI

Artists are adept at taking something and using it in new and unconventional ways to create exciting new works such "*Memories of a Passerby*". Artificial intelligence has been no exception with artists creating all sorts of AI related artworks aside from the ones mentioned previously. As AI artist Refik Anadol is quoted in referring to AI "Right now we are in a renaissance".[x] This section is dedicated to exploring some prime examples artists have already made. By either developing code for their own projects (Usually with a team) or generating art using publicly available AI art prompting platforms such as Deep Dream Generator and DALL-E 2.

These are two type of the most common current AI art generating platforms. Deep Dream Generator is an Image Generation AI that runs off prompts and settings. These prompts do not exactly follow normal English. Many find that generating art with this sort of AI platform is more like collaborating with the AI and it often does not work out exactly as the human participant may have specifically intended.[xi] DALL-E 2 on the other hand is a popular example of a Large Language Model generator. These art generators can understand regular English prompts and can be talked to like a normal person. These artworks tend to be much more accurate to the user's intent and more user

friendly in nature. These types of AI art models while shunned by many traditional artists, open a new pathway for an average person to explore their creative ideas.[xii] Removing the need to learn to paint, draw or even use a software such as photoshop to create a work of art. This allows anyone including artists to use these AI platforms to explore and test ideas.

Other artists who have been exploring the world of AI have been producing different types of work based on the subject. Trevor Paglen for example created a work in 2017 called "*Behold these glorious times!*". This work is a video featuring images used to train AI as well as examples of what the AI is seeing when it is shown these images.[xiii] This work is important because it forces the viewer to confront the controversies surrounding image training sets for AI systems. These sets are created by a collection process known as "scraping".

"Scraping" is an algorithmic process for pulling thousands of images from multiple online sources at once to use the data to train an AI. Artificial intelligence use machine learning to study these sets of images in order to learn what words represent, categorization, and many more useful tasks. Websites are often "scraped" unethically, pulling personal and owned images from social media platforms, and various image data bases often despite copyright law. This is currently the center of several lawsuits concerning a few different AI art generating platforms such as DALL-E 2.[xiv] Some of this unethically sourced imagery is even regenerated by the AI as an original work, effectively stealing it from the original artist. Several artificial intelligence platforms such as Midjourney and DeviantArt are currently being sued for this very problem.[xv] Several artists and even Getty images are fighting back, suing on claims if copy right infringement. This includes stealing these images as well as evidence of AI art generators producing copyrighted imagery as original work. The outcome of these trials will have a large impact on these types of platforms and will certainly be a step towards regulation concerning AI.

Another controversy pointed out by *Behold these glorious times!* regarding these training sets are the inherent biases that are absorbed into the AI data through these training sets. Because these training sets are often massed sourced images and not carefully selected examples of reality, many of the inherent biases documented on the internet are absorbed into these AI systems. Examples include

generating a flight attendant consistently as female or a boss figure as male. AI often have trouble identifying people of color in comparison to light skinned individuals. An Asian woman was even recently turned white to "make the picture look more professional". All these biases exist already online where these data sets are sourced from. They cannot be removed while training the AI and would require specific and carefully created data sets to be used. Which many companies do not take the time or expense to do. Paglen's work displays these images, often consisting of uncomfortably intimate and personal images of people the viewer may not expect. He hopes his work will help people consider the images they put online especially on social media.

Another unique example of an AI artwork is from 2018 by artists Kate Crawford, and Vladan Joler. This work called "*Anatomy of an AI System*" features a white blueprint mapping out the Amazon Echo artificial intelligence system on a black background. This diagram represents the painstaking task of collecting a vast amount of data in an organized diagram representing visualization of the metaphorical birth, life, and death of an Amazon Echo smart speaker system.[xvi] This artwork calls attention to the complexity of the AI system that are already functioning daily all around us. In our home devices, in our apps, in factories, and already countless businesses, AI is making a big impact all around us in our daily lives.
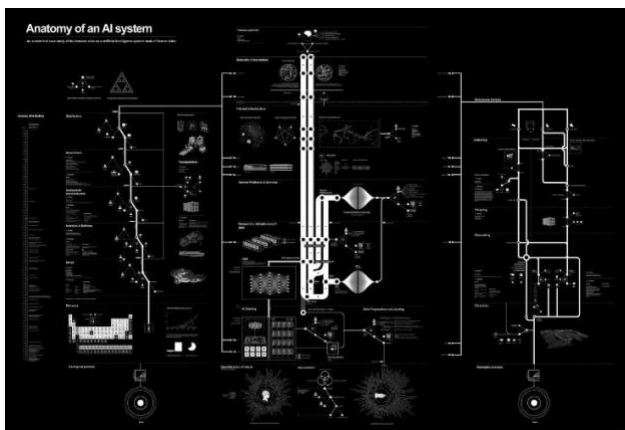

Kate Crawford and Vladan Joler's "Anatomy of an AI." (2018),[xvii]

4   Understanding Millennia of Art

To get a better understanding of AI and how it can be programmed to study and understand art, I have chosen to investigate the Machine Learning project of Rutgers University published in 2016. Despite the age of this project, it's break down and evolution are an amazing example of how small changes can make huge leaps in AI learning. This project was developed using MATLAB Statistics and Machine Learning Toolbox, and a database of thousands of paintings spanning six centuries. The goal of this project was to train an AI using computer vision to be able to identify, categorize, and study these paintings.[xviii] Computer Vision is a field in in artificial intelligence that allows a computer to create information from a visual image. Translating the visual data into a particular format such as text, and numerical code. It is important to note that AI do not see images but instead view them as numerical codes representing each pixel. Making this conversion of data even more difficult. Other examples of Computer Vision use include Object tracking, detection, and facial recognition. Luckily, many of the basis for these algorithms have already been developed and are available using programs such as Statistics and Machine Learning Toolbox, making them easier to implement and adjust.

The more challenging issue mentioned in training this particular AI to study art was deciding what method to use to actually train the AI. After testing several algorithm training methods, the Rutgers team was able to get their AI to correctly classify paintings with 60% accuracy. The AI was able to do this by recognizing elements such as color, texture, composition, subject, and more. By grouping these features together, the AI can decide what likely categorization would be most appropriate. This process was repeated and adjusted until the algorithm was considered reliable. This level was already considered more accurate than a non-expert human. The next step of this process was to use those same visual elements to try and train the AI to identify artistic influences in artworks. To compare this to a normal historian, facts like location, known acquaintances, and travel of the artist in their life. The AI only has the images, artist name, and the date of its creation. The computer was put up against art historians to study 1700 paintings from 66 different artists. The AI readily identified 60% of the

influences recognized by humans. Along with a few connections that had not yet been made by any experts. An example below shows how the AI found connections between two paintings that were created nearly 80 years apart. In comparing the two paintings the blue rectangles highlight similar structural elements, yellow circles similar objects, and the red lines compare similar compositional structures.
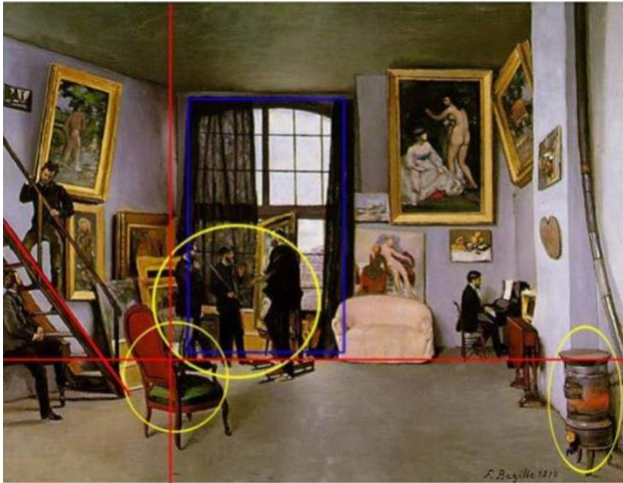
Norman Rockwell's "Shuffleton's Barbershop." (1950)
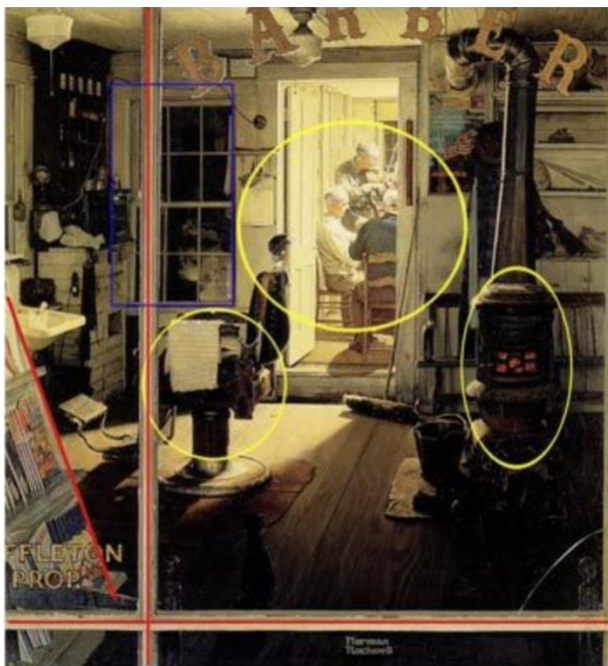
Frederic Bazille's "Bazille's Studio; 9 rue de la Condamine." (1870)

To take this process a step further, the team decided to try and measure the creativity of an artwork. They did this by continuing to build off the same pattern identifying algorithm they had developed. This time adding a definition of creativity, "an object is creative if it is both novel and influential. In these terms, a creative painting will be unlike the paintings that came before it (novel), but similar to those that came after it (influential)." This algorithm was tested against two data sets of art with over 62,000 paintings. The results of artworks creative scores were compared to scores developed by art historians using the same creative definition. This process was also deemed a success as the AI readily identified works from artists such as Lichtenstein and Leonardo as highly creative for their time. This process was also tested by changing the dates two artworks where created. Setting a contemporary work as created long ago and making an antique Baroque painting a recently made painting. As expected the old styled Baroque painting received low scores, while the contemporary work scored incredibly high in creativity, giving much credit to the accuracy of the AI system. This process of evolving AI, testing training systems and new algorithms is how artificial intelligence has snowballed in growth in recent years. Often these breakthroughs can be applied to a very large variety of topics. For example, Dr. Ahmed Elgammal of Rutgers University who helped with this research, predicts this model could easily be applied to other creative mediums such as writing and music, it would just take some tweaking of the algorithm.

5   Museums and AI Art

As Artificial intelligence slowly makes an entry into artists works, how are museums, the keepers of art and art knowledge, confronting AI themselves? A recent example produced by artists Refik Anadol has garnered much media attention sense it's been on display in the MoMA starting in 2022 and currently still on display now in 2023. This artwork features a continuously changing display on a large screen created by an AI's "daydream". Utilizing a GAN network and the images of the MoMA's collection. The AI creates a virtual space, the AI can navigate through this space, while simultaneously generating

dreamlike images based on the art it is near in this virtual system. It combines the styles, structures, and elements of nearby artworks into a new unique image. As it moves the image changes and evolves creating A new visual experience for the viewer.

Refik Anadol's "*Unsupervised*", (2022)[xix]

This AI system has been trained exclusively with the open-source data of the MoMA's art collection and its images. The AI then categorizes this collection spanning over 200 years of art using computer vision as described in the Rutgers project. The image produced is a mesmerizing, ever changing abstract works that continually varies in content and style. This artwork represents an intermingling of the history of art and the technology of the future. Anadol's artwork utilizes similar systems used to categorize and sort through museum art collections. Bringing a visual element that allows the public a glimpse into the thought process of an AI in relation to art. Highlighting the key point that AI do not think like humans, AI logic is very different and often unpredictable in comparison to human logic. This work offers a chance to sit and meditate on not only the image but what the image also represents. Much of the trouble and controversy behind AI is the lack of knowledge and understanding behind the subject. Many peoples only experience with AI are the controversial headlines of AI breakthroughs that often provoke fear of job loss or loss of safety or perhaps privacy. This can lead to AI being a potentially touchy subject being often accompanied by discomfort for some. Opportunities like Refik's work allow viewers to confront the technology in a way that is welcoming and meditative on the usefulness and potential of the subject.

This may cloud their ability to view AI as a tool for various situation. Because of this touchy background surrounding the subject of AI, as well as the severe un-regulation surrounding AI causing continued concern, AI art has been slow to immerge in museum galleries. In Colorado, the Denver art museum only just recently in 2023 displayed its first ever AI artwork. This artwork called "*Us*" is a collaboration of a poet and an artist. This work was in response to the other paintings in the gallery that featured while colonial artists, painting the subject of native people.[xx] *Us* features a poem with an animation accompanied by sound. It's important to note that using AI was only an aspect of creating a part of this work and was not completed AI created. After this artwork debut in the museum, it reportedly received a complaint internally from its own staff concerning the piece. This anonyms letter stated concerns of transparency pointing out that to know the work had AI involved, you had to open a pamphlet nearby or look online. The letter also cited the concerns of ethics in using an AI. As it is unknown if creating the artwork violated the rights of any other artists online whose images may have been stolen through scraping in order to train the AI. Despite the concerns from the employee the museum states they plan to continue to include AI related artworks. Though they will continue to approach the subject carefully.

Many art organizations including museums are still venturing towards utilizing artificial intelligence. In Science museums AI was shown by Carnegie Mellon University to increase engagement in exhibits for kids and adults. This includes notably extending the amount of time a person interacts with that specific exhibit. This is especially useful in kids' museums where creating engagement is important to ensure learning takes place. This can similarly be applied to art by adding a relatable element for younger viewers who are more familiar with new technology, and less interested in classical art. In an interview curator Michelle Kuo of the MoMA recalls how viewers have been seen spending half hours watching *Unsupervised*, when the average span of time for engaging an artwork is only a few seconds.[xxi] AI can also be used to help inform viewers to understand the time period in which the artwork was made along

with the perspective of a person from that time. Allowing the guest to better understand and relate to the artwork in a new way that cultivates learning.

5.1 Museum AI projects

As AI makes artworks more relatable it's also making them more accessible. The MoMA itself first used AI in 2018 to sort through thousands of old exhibition photos. This involved partnering with google to develop an AI that can identify artworks of a specific artist and style and match it with works in the museum's collection. This is a task that would take a person potentially years to accomplish but AI has already identified over 20,000 artworks.[xxii] These identified works are then added to the archived data of each artwork available online for the public. The MoMA allows the public to help report wrongfully identified artworks. This helps train the AI and creates a human checking system for the AI's work. This has been revolutionary for the MoMA's collection and backlog of unsorted images. This project has been a great help to the open-source initiative regarding the museum's collection. This includes releasing their art collection data on git-hub for people to use.[xxiii] Including building AI projects. This data however does not include the images which must be granted special permission.[xxiv]

Another example of a museum using AI is the Harvard Art Museum integrating AI into their online collection explorer. This project has been taken on sense 2016 by the schools Digital Infrastructure and Emerging Technologies Department. Their approach to this however has been slightly different. To integrate AI into the collection database the Harvard Museum connected five different AI computer vision services. They include Google Vision, Imagga, Microsoft Cognitive Services, Clarifai, and Amazon Rekogrnition. These five systems work in tandem interpreting and annotating each artwork, creating tags, captions, and descriptions to be used in the database. They also implement face, object, and text recognition for each artwork. It then creates a percentage for each annotation created. Originally the Harvard Museum's art collection was categorized and sorted using experts and terms of art historians. The implementation of these fie systems not only break down and categorize further, but a person who is not particularly art savvy can now search the collection

using simple terms such as "sad" or "car". The AI will pull up related art based on the percentage of categorization in comparison to what the person has searched. Making the entire collection user friendly and easier to navigate over 300,000 images of artworks.
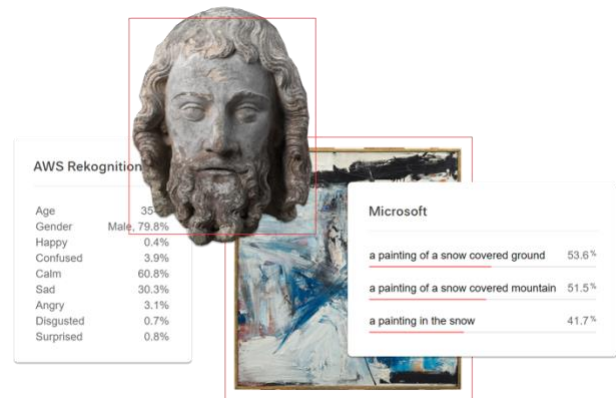
An example of artworks AI categorizations from ai.harvardartmuseums.org/about. (2023)

5.2 The Mets Hackathon

Museums, Like artists have been looking for and experimenting with various new ways to utilize AI technology. In terms of art museums, the Metropolitan museum in Ney York is a prime example of discovering these possibilities. In 2019 the Met partnered with Microsoft and MIT to host a two-day hackathon focused on artificial intelligence and connecting people to art. This hackathon comprised experts, artists, and students from each organization separating into several small teams that each worked on different projects. The goal of the hackathon was to utilize the Mets art collection to come up with ways AI can help reach global audiences to learn, create, and discover art through artificial intelligence.

Out of the hackathon five were chosen to move forward as prototypes. On the second anniversary of the Mets open access program these prototypes where presented. Each project provides a unique experience and useful tool that could be applied to the real world. I will touch on each of these projects and their main differences briefly. To start, *Tag, That's it!* Is similar to some of the function of the Harvard's AI systems in that this project is used to create usable search tags

for each artwork. This version takes the process a step further by adding an element of crowed sourcing edits and fine tuning of these tags. The AI used to create these tags makes notes of these human sourced adjustments and uses them to create more useful and accurate tags. This gives increased scalability to the program which is aimed at being adaptable and able to be applied to any collection.

My life, My Met takes images posted to social media and compares them to the Mets 400,000 images in the Mets open access program. It then replaces your image with a work of art on the same topic. For example, an image of your cat may be replaced by Nathaniel Currier's "*The Favorite Cat*". *Storyteller* is a project also suggesting relevant artworks but uses Microsoft AI to select an artwork that matches the tone and topic of a story or discussion. The AI selects an artwork from the Mets collection that best matches by using voice recognition software. This tool can help add visual elements to writing, enrich a bedtime story, and even includes options to create a book or a social media post based on your story and its suggested artworks. Continuing in utilizing an AI's ability to read the tone set by a group of data, Artwork of the Day chooses an artwork personalized to the circumstances of each user. This algorithm looks at information such as region, weather, current events, and past events. This specific and unique data ensures that no two people would receive the same artwork on the same day. This is more likely to create a personal connection to each selected artwork for a person to resonate with.

Lastly, and perhaps the most complex is *Gen Studio*. This project utilizes a GAN network and applies a similar navigation structure to the Mets collection as described in Refik Anadol's artwork "Unsupervised". This project is likely the precursor to Refik's project. Creating a virtual space, the user can navigate through, while simultaneously generating dreamlike images that combined the styles, structures, and elements of nearby artworks. As you move the image changes and evolves creating A new visual experience to accompany your journey. To reiterate *Unsupervised* is based off this process but removes the human driver, allowing the AI to navigate and create the dreamlike images with its own course of exploration. Beyond exploring the collection *Gen Studio* features other tools for navigating like *Generative Exploration*. This tool for example allows the user to select an artwork found in the collections virtual space, and the AI will locate

similar artworks elsewhere in the system. Allowing connections to lead to whole new areas within the collection to be explored. This takes the Mets immense collection and creates a whole new immersive exploratory experience.[xxv]

6 Conclusion

As these AI projects from art to categorization tools demonstrate. AI's ability to understand and interpret visual images using machine learning and computer vision is allowing non-specialists accessibility to art and art history. I've provided an in-depth analysis of these tools To aid in the accessibility as a basis for understanding and informing the reader of their applications and uses. Of these AI projects using machine learning and computer vision we evaluated several projects by the MoMA and Met museums who are utilizing this technology to spread the accessibility of their art databases. These projects such as sorting and categorizing thousands of years of artworks, with the added benefit of being able to add tags for searchability using terms majority of people would use. Suggesting artwork from your story, provided picture, or even *artwork of the day* suggesting specialized artworks based on the user's current unique situation. We even went in depth in the beginning of the paper into Rutgers Universities AI investigation in identifying art gaining a deeper understanding of how AI uses machine learning and computer vision to begin making these advancements. What we find from these complex and technologically advanced projects is that the outcome not only benefits experts but simplifies these tools to a usability and understanding anyone could utilize.

6.1 Key Takeaways

Whether it's for the purpose of learning about a particular work of art or investigating what a particular car painted in the style of Lichtenstein would look like, AI provides an avenue for each. AI is not a replacement for artists or art historians, in fact it is a tool to aid these endeavors. Speeding up studies and processes that could take months even years to complete by hand. This allows for an exponential amount of time to be saved, for example organizing

entire museum collections in a digestible, searchable format. Even with the abilities highlighted by the Mets AI projects with the ability to make suggestions of similar works, potential inspirations of works, and measuring of creativity, AI is still better used as a collaborator of research and not a replacement. This same premise can be applied even to art generating systems who may be able to produce art but are not necessarily replacements of artists. Artists are already using AI generative programs to create their own works of art. Although this process opens accessibility of creative practice to more people. This statement alone also calls into question the unanswered dilemma of, if the AI produces the art than who is the artist? This being only one of the problems of Artificial intelligence and its unregulated landscape.

Similarly, we investigated artists already using AI in their work and we realize as AI studies art, artists study AI. Not only discovering new uses and possibilities but simultaneously bringing to the forefront the issues of ethics and inherent bias within AI algorithms. Works such as Trevor Paglen's "*Behold these Glorious Times*" is a prime example of artwork covering these important issues of inherited bias and ethical collection. With these issues currently unregulated and still being unraveled by the court system, currently users of these AI programs are left to make their own decisions and research on which platforms they ethically feel they can use. It's up to us collectively to keep track of these programs as complex as they can be, to assure they're being developed ethically, in the interest of society. Aside from this AI will most certainly be behind many of the advancements we will likely see in understanding art history. Along with the equally groundbreaking applications that will continue to be utilized and demonstrated or brought to our attention by artists in their work.

6.2   Limitations

Due to lack of time and lack of responses this research paper did not meet all its intended research. This includes interviewing an artist utilizing AI such as Refik Anadol, or Trevor Paglen. I also intended to Interview a museum representative such as Michele Kuo from the MoMA to discuss the implications of AI in museums. But was unable to make contact for

this. A third interview discussing the matter with an AI expert would have also been extremely beneficial, but I was unable to garner any responses at this time. Lastly, with investigating further into how an AI works I intended to include how an AI tool could be made. Although I did find resources that would have enabled these tasks including a website called *The Forge* which uses simplified tools to create AI projects, including ones revolving around art. [30] These ideas for the research project did not make it into this first portion of the research due to time constraints and the length of the process even with simplified tools.

6.3   Further Directions

Along with utilizing *The Forge* to investigate how an AI system could be made would provide further evidence of the accessibility created by AI. Even with such intricate parts the nature of AI still allows these parts to be simplified and made easily accessible. [30] It is likely we will see more and more complex issues being easily compacted and presented as easily understandable tools thanks to AI. Along with this the next step in the process would be to further delve into these topics with more direct feedback from an expert on AI. I have done extensive research on the subject using many various resources from notable sources, it's hard to assure all terms being referenced in this study are being used completely to their applications and definitions. Reviewing these resources, along with their inevitable continued evolution is ideal to realizing their potential for the future of this projects study.

Acknowledgments

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