Divergent Responses to AI-Generated Art

An STS Research Paper
presented to the faculty of the
School of Engineering and Applied Science
University of Virginia

by

Rose Eluvathingal Muttikkal

May 12, 2023

On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

Rose Eluvathingal Muttikkal

STS Advisor: Peter Norton

AI in Art: What Is Art and Who Are Artists?

Innovations in computing power, artificial intelligence (AI), and robotics over the past two decades, and consequent employment displacement, promote automation anxiety (Autor, 2015). In a 2017 Pew Research Center survey, 72 percent of Americans reported feeling worried about automation (Smith & Anderson, 2020). While creative fields have resisted automation (Vinopal, 2018), recent text-to-image AI tools, such as DALL-E and Midjourney, have breached this barrier and can produce stunning imagery. Some argue such tools devalue human artists and their hard-earned skills (Klingermann, 2022). Artists are divided over the issue.

At least three classes of artists are engaged in the debate. Some view text-to-image tools as the future of art (Knight, 2022). Others oppose them as antithetical to art (Vincent, 2022). Some are ambivalent, favoring some applications over others (Gurney, 2022). Art venues such as galleries and auction houses are also engaged. While such venues seek income from artistic work, they also legitimize some artistic media relative to others. For example, when Jason Allen's piece Théâtre D'opéra Spatial won first prize in the digital art category at the Colorado State Fair and Allen then revealed that he used Midjourney to create it, the judges stood by their judgment (Roose, 2022). Finally, participants include developers of text-to-image AI tools, many of whom have championed their technology as a transformative tool for all (Alan Turing Institute, n.d.).

Literature Review

The cultural history of AI is far older than the technical capacity to develop it. The oldest known story of AI can be traced to Homer's Iliad, dating back to the eighth century BCE (Cave

et al, 2018). In the Iliad, Hephaestus, the god of smithing, made machines, “attendants made of gold, which seemed like living maidens. In their hearts there is intelligence, and they have voice and vigor” (Cave et al, 2018). The greatest density of fictional narratives exploring AI, such as the “heartless” tin man from *The Wizard of Oz* and the humanoid robot Maria in *Metropolis*, is found in the first half of the 20th century, before the coinage of the term in 1955 (Cave et al, 2018; Anyoha, 2017).

The technical capacity to develop AI begins with Alan Turing’s paper "Computing Machinery and Intelligence," introducing the logical framework for building and testing intelligent machines (Turing, 1950). Soon after, in 1956, Allen Newell, Cliff Shaw, and Herbert Simon developed the Logic Theorist, considered to be one of the earliest AI programs. The 1980s witnessed the emergence of deep learning techniques, developed by John Hopfield and David Rumelhart, and expert systems, introduced by Edward Feigenbaum. Thereafter, computers could learn from experience and mimic the decision-making of human experts (Anyoha, 2017). The field of AI achieved a significant milestone in 1997 when IBM's Deep Blue used AI to defeat the world chess champion and grandmaster Gary Kasparov.

Today AI has diverse applications, such as high-frequency stock trading, healthcare systems, surveillance systems, and automated vehicles (West & Allen, 2018). PriceWaterhouseCoopers estimates “artificial intelligence technologies could increase global GDP by $15.7 trillion, a full 14%, by 2030” (West & Allen, 2018). Yet experts in technology, business, and policy caution that AI systems can lead to degradation of human agency, promote data abuse, displace jobs, and foster dependence on automated networks (Anderson & Rainie, 2018). Thus, recognizing and re-evaluating AI technologies within the context of such concerns is necessary to resolve the ethical dilemmas presented by them.

The field of aesthetics, which explores the nature of art, beauty, and taste, is particularly relevant in the context of AI-generated art. The definition of art has long been a topic of philosophical debate and has implications for assessing the artistic value of AI-generated works (Adajian, 2022). Some philosophers argue that art is indefinable, they contend that it is too diverse to be adequately defined, as inspired by the work of Ludwig Wittgenstein and the concept of the language game (Biletzki, 2021). For instance, Morris Weitz's Open Concept Argument suggests that art lacks closely defined properties, making it impossible to arrive at a closed definition (Bresnahan, 2014). Art-competent agents must instead make decisions about whether new or emerging works qualify as art. In addition, the work of historian of philosophy Paul Kristeller indicates the five major arts of modern aesthetics - painting, sculpture, architecture, poetry, and music - did not take shape until the eighteenth century (Kristeller, 1951). Our understanding of art has evolved since then, and new art forms have emerged alongside technological innovation, suggesting that there is no stable definition of art.

As the definition of art continues to evolve, researchers are exploring the implications of integrating AI tools into artistic creation. Elgammal (2019) compares 21st-century responses to new AI tools in art to 19th-century responses to the camera. Elgammal and Ploin et al. (2019) argue AI will become a tool for artists rather than replace artists. Meanwhile, Ghosh and Fossas (2022) consider ways in which AI tools can exacerbate the exploitation of artists. They suggest responsible integration of AI could result in a new artistic medium, but stress this requires decision-making that goes beyond the domain of tech developers.

Early AI Art

A prototype of one of the first significant AI art systems, AARON, was presented at the Fall Joint Computer Conference in 1973 by Harold Cohen (Lawnson-Tancred, 2022). AARON is a series of computer programs created by British-born artist Harold Cohen. Using a symbolic, rule-based approach, the program reformats the knowledge of a human expert into a complex set of rules. A robot engineered by Cohen then produces the "drawings" based on instructions from AARON. In the 1990s, Cohen could even code the program to apply colors to the canvas independently of him. Cohen's work earned exhibitions at major institutions like the San Francisco Museum of Modern Art (1979), Tate in London (1983), and the Buhl Science Center in Pittsburgh (1984). During an AARON exhibition at the Computer History Museum in California, Oliver Strimpel, the museum's executive director, told the Washington Post the program "debunks the concept of creativity" as solely human (Schwartz, 1995). In contrast, in his 1973 essay *Parallel to Perception*, Cohen declared, "the real power, the real magic … rests not in the making of images, but in the conjuring of meaning" (Cohen, 2000).

AARON is developed by an artist, not computer scientists or engineers who are the current developers of AI art systems. Cohen was motivated to test if a machine is capable of "human art-making behavior" (Cohen, 2000). His work was an exploration of the nature of creativity and not focused on the commercialization of AARON. It was not seen as a threat to artists. In addition, the critical art community viewed his work with skepticism. According to Cohen, their skepticism was so intense "art writers run like hell" from his work (Schwartz, 1995).

Evolution of AI-generated art

In contrast to AARON, current text-to-image tools involve algorithms learning from a vast dataset using neural networks. Current tools are the results of innovations from the past decade, beginning with the development of the generative adversarial network (GAN; Goodfellow et al., 2014). GANs are composed of two neural networks, a generator creating new images superficially similar to the input data and a discriminator evaluating the generated images to determine whether the images are synthesized or part of the input data. The generative network aims to "fool" the discriminator into evaluating the generated images as not synthesized. The following year, Google engineer Alexander Mordvintsev created DeepDream a program that uses a convolutional neural network to find and enhance patterns in images, resulting in overprocessed psychedelic images (Mordvintsev et al., 2015). After DeepDream was released, various mobile apps started using neural networks to transform photos into paintings mimicking the style of famous artists like Picasso, Munch, and Salvador Dali (Biersdorfer, 2019). Artbreeder, a website allowing users to generate and modify images using neural networks StyleGAN and BigGAN, was launched in 2018.

Bas Uterwijk, a Dutch artist with a background in special effects, 3D animation, videogames, and photography, gained media attention for his use of Artbreeder to generate hyper-realistic portraits of historical figures (Gamp, 2020). To create the portraits, Uterwijk used the deep learning program in Artbreeder to form a multi-layered composite image, based on historical documentation, portraits, and available resources, and then he filled in features such as hairstyles, clothes, and eye color. Uterwijk, describes the creative process "is not all just graphics but some artistry involved too" (Gamp, 2020). In the recounting of his process, Uterwijk equates artistry to the adjustments he made after an image was derived from Artbreeder. Interestingly,

Giacomo Lee in his review of Artbreeder, published in Digital Arts — a UK-based creative tech magazine — described the website as having the potential to be a “very creepy 'rival' for digital artists indeed” (Lee, 2020). Lee's perspective signals a shift from considering algorithmically generated art as an innovative approach to viewing it as a threat to artists.

Text-to-image AI tools generate images based on text prompts, which may include keywords or keyphrases such as "in the style of [name of an artist]". DALL-E, a text-to-image tool, developed by OpenAI was released in early 2021. Competitors followed suit with the unveiling of similar technologies, such as Imagen and Parti by Google Brain, NUWA-infinity by Microsoft, and Dream by Wombo. In August 2022, Stable Diffusion was released making text-to-image AI models more accessible, free to use on personal hardware, and extendable by third parties for new software projects. The development of plugins built for graphics editing software, such as Krita, Photoshop, Blender, and GIMP, soon followed. Midjourney was released on November 2022, offering a simplified version of Stable Diffusion technology to consumers.

Responses to AI-generated Art

As seen by AARON, computationally derived artworks existed before the introduction of text-to-image tools and gained enough interest to be exhibited at various art institutions. "Thinking Machines: Art and Design in the Computer Age, 1959–1989" was an exhibition displaying artworks “produced using computers and computation thinking” at the Museum of Modern Art, running from November 2017 to April 2018. Co-curators Sean Anderson and Giampaolo Bainconi selected nearly 100 objects related to computers, computational thinking, and designs for commercial products (Kurchanova, 2018). Some of the work on display include Charles Csuri’s early computer animation *Hummingbird* (1968), John Cage and LeJaren Hiller’s

computer-aided composition, *HPSCHD*, and notes from Cedric Price's unfinished *Generator Project* (1978-1980), depicting a vision for AI-controlled architectural structures (Chilson & Szabó 2018). The exhibition is a broad examination of the evolving relationship between computer technology and art.

Likewise, artwork produced using technical innovations preceding text-to-image tools, such as GANs and DeepDream, has earned publicity and exhibitions. Helena Sarin is an "engineering artist" who primarily uses GANs as her medium. Her work has been exhibited in several cities globally, including Zürich, Dubai, Oxford, Shanghai, and Miami. Her artwork has also been featured in "Art In America" magazine, a monthly international publication that covers contemporary art in the United States. Sarin set herself apart from other AI artists exploring GANs by training her model on hand-crafted datasets (Bailey, 2018). Similar to Uterwijk, Sarin's use of hand-crafted datasets highlights her perspective on the value of human input in enhancing the AI-generated art process.

Artwork created using GANs and DeepDream algorithms has also generated significant profits. At a 2016 Google-sponsored benefit at the Gray Area Foundation, art created by ten artists and engineers experimenting with DeepDream raised nearly $98,000 (Campbell-Dollaghan, 2016). In 2018, "Edmond de Belamy, from La Famille de Belamy," by the French art collective Obvious was sold at Christie's New York for $432,500, over 40 times the initial estimate for the work (Cohn, 2018). The increased financial value of AI-generated art may indicate an increased perception of legitimacy for the medium. In response to the sale, Obvious thanked the AI community especially "those who have been pioneering the use of this new technology, including Ian Goodfellow, the creator of the GAN algorithm" (Cohn, 2018). While

the AI-generated art sold well at auction, some AI artists criticized it as "unoriginal," pointing to the critical evaluation of artistic merit of the work by AI artists (Cohn, 2018).

Recently, art produced using text-to-image tools has earned exhibitions. One such exhibition was "Artificial Imagination," held in 2022 at the bitforms gallery in San Francisco, which featured the work of eight artists who used AI image generators to create their pieces DALL-E 2 was a popular tool for the feature artists featured. Ellie Pritts, an artist on display, described the exhibition as necessary to the new medium. She claims, “there are serious artists; this is legitimate work,” bringing to light concerns over the recognition of her work (Fried, 2022). The exhibition may work to lend artistic credence to pieces constructed using text-to-image tools. In addition, the involvement of Day One Ventures, an early-stage venture capital firm, and OpenAI as the exhibition organizers highlights efforts in legitimizing the medium by participants with an interest in commercializing text-to-image tools.

Some artists at the exhibition were transparent about prompts used to generate their work, while others were not. Alexander Reben, who has two sculptures and a digital painting in the show, refused to share his prompts, calling it his “secret sauce” (Enking, 2022). August Kamp, on the other hand, who has two works in the show, was willing to share hers. Kamp explained that her eagerness to share her prompts stems from her infatuation with the concept of not owning her art. She advocates for others to build off her ideas, stating “the idea that if somebody sees my piece and thinks, I would love that style, but for this idea of mine—take it” (Enking, 2022). These artists differ in their views on the value of their work; one prioritizes prompt secrecy, while the other advocates for collaboration and sees it as a unique feature of the medium.

The progression of algorithmically produced artwork has sparked debate over ownership, prompting legal experts to consider AI art authorship and copyright law. Pamela Samuelson, an intellectual property (IP) law professor, examined ownership allocation in AI-generated works prior to the development of text-to-image tools, arguing for the rights to be assigned to the user of the generator program (Samuelson, 1985). More recently, Victor Palace, another IP lawyer, presented three options for AI copyright ownership. These include AI as the copyright owner, the user programmer or AI company as the owner under "Work for Hire" doctrine, or the lack of a copyright owner due to the absence of a single creator (Palace, 2019). As AI technology advances, it is important to continue examining intellectual property laws in relation to these new creative processes.

In 2022 as various consumer-facing text-to-image tools were released, the use of copyrighted art within the AI-model training datasets became controversial. Reema Selhi, head of policy for the Design and Artists Copyright Society (DACS), is advocating for fair compensation and control for artists whose work is used by AI image systems. It is worth noting that DACS is a private British organization that manages artist rights and collects and distributes royalties to visual artists. Therefore, protecting artists' copyrights financially benefits the organization. Selhi says, “there are no safeguards for artists [..] to be able to identify works in databases that are being used and opt-out,” highlighting a key issue of text-to-image tools (Vallance, 2022). In the midst of this dialogue, users of a popular portfolio platform, ArtStation, staged an online protest against the nonconsensual use of their artwork in the Stability AI dataset by placing “No AI Art" images in their portfolios. The protest began with a tweet from Bulgarian artist Alexander Nanitchkov, expressing his disdain for the algorithms underlying the text-to-image tools, he writes “current AI 'art' is created on the backs of hundreds of thousands of

artists and photographers who made billions of images and spend time, love and dedication to have their work soullessly stolen and used by selfish people for profit without the slightest concept of ethics" (Edwards, 2022). As a result of protests, Stability AI and Spawning, an artist advocacy group, will allow artists to opt out of Stable Diffusion 3.0 training by registering on the "Have I Been Trained?" website.

In contrast, developers of text-to-image tools have described their algorithms as radical new tools as they contend with various criticism of their development and use. Sam Altman, the CEO of OpenAI, discussed the societal impact of DALL-E with MIT Technology Review, claiming it as a "huge societal benefit," granting everyone a new "superpower" (Heaven, 2022). Altman acknowledged the technology could lead to new job opportunities while simultaneously causing transitional pains for some artists. The press release covering the public release of Stability Diffusion urges users to use the technology in an "ethical, moral and legal manner and contribute both to the community and discourse around it," leaving the obligation of fair use on users of the technology (Mostaque, 2023). However, the press release also mentions the launch of additional tools "to help maximize the impact and reduce potential adverse outcomes" of the technology. Similar to Altman, David Holz, founder of Midjourney, describes Midjourney's mission as one that fosters the expansion of "the imaginative powers of the human species" (Salkowitz, 2022). Ultimately, even though text-to-image tools have sparked criticisms around their impact on the job market and potential misuse, proponents like Sam Altman and David Holz have cast them as revolutionary tools expanding human creativity.

Conclusion

Early AI art systems initiated a critical examination of creativity as a distinctively human trait. Despite the capabilities of AARON, it was not perceived as a threat to artists, nor was it recognized as real art by the critical art community. Cohen himself viewed art as the "conjuring of meaning" not necessarily the production of images. Following AARON, various technological innovations in the use of neural networks enabled the creation of current text-to-image tools.

As these innovations were introduced, artists experimented with them and began establishing a new art medium. Their work gained media attention and recognition at exhibitions and auction houses. However, despite using the algorithmic tools, artist distinguished artistry based on the "human effort" and influence they could apply to the models, such as Uterwijk filling in the blank features of his historical portraits and Sarin's training of GAN models using handpicked, original datasets. Likewise, there was ongoing dialogue among AI artists about the originality of their works.

The introduction of text-to-image tools brought further automation to AI-generated artworks, whereby the "human effort" was reduced to text prompts. Increased automation gave way to questions over the legitimacy of work created by text-to-image tools, concerns over displacing professional illustrators, and controversy fueled by the development of models on copyrighted works. Developers have to contend with and respond to the criticisms of the tools they make, though currently, the initiatives that have been taken are mainly the result of the collective action of artists, as seen by the results of online protests in ArtStation. Ultimately, the dialogue surrounding the text-to-image tool is akin to Weitz's Open Concept Argument, where the ongoing debate is focused on whether the contemporary definition of art should be expanded to include AI-generated artworks or to reject it.

References

Alan Turing Institute (n.d.). AI & Arts: How can AI augment and be enriched by the arts and how far can data science and the arts help to answer each other's questions? www.turing.ac.uk/research/interest-groups/ai-arts

Anderson, J., & Rainie, L. (2018, Dec. 10). Artificial Intelligence and the future of humans. Pew Research Center: Internet, Science & Tech. www.pewresearch.org/internet/2018/12/10/artificial-intelligence-and-the-future-of-humans

Adajian, Thomas. "The Definition of Art", *The Stanford Encyclopedia of Philosophy*, (Spring 2022 Edition) Edward N. Zalta (ed.). plato.stanford.edu/archives/spr2022/entries/art-definition/

Anyoha, R. (2017, Aug. 28). The History of Artificial Intelligence: Can Machines Think? Science in the News, Harvard University. sitn.hms.harvard.edu/flash/2017/history-artificial-intelligence

Autor, David H (2015). Why Are There Still So Many Jobs? The History and Future of Workplace Automation. *Journal of Economic Perspectives*, 29 (3): 3-30. DOI: 10.1257/jep.29.3.3

Bailey, J. (2018, November 27). Helena Sarin: Why bigger isn't always better with Gans and AI Art. *Artnome*. www.artnome.com/news/2018/11/14/helena-sarin-why-bigger-isnt-always-better-with-gans-and-ai-art

Biersdorfer, J. D. (2019, December 4). From camera roll to canvas: Make art from your photos. *New York Times*. www.nytimes.com/2019/12/04/technology/personaltech/turn-photos-into-paintings.html

Biletzki, Anat and Anat Matar, "Ludwig Wittgenstein", *The Stanford Encyclopedia of Philosophy* (Winter 2021 Edition) Edward N. Zalta (ed.). plato.stanford.edu/archives/win2021/entries/wittgenstein/

Bresnahan, Aili W., "Morris Weitz" (2014). *Philosophy Faculty Publications 4*. ecommons.udayton.edu/phl_fac_pub/4

Campbell-Dollaghan, K. (2016, May 5). Inside Gray Area & Google's First DeepDream Art Show. Gray Area. grayarea.org/press/inside-googles-first-deepdream-art-show/

Cave, S., Craig, C., Dihal, K., Dillon, S., Montgomery, J., Singler, B., & Taylor, L. (2018). Portrayals and perceptions of AI and why they matter. (DES5612) doi.org/10.17863/CAM.34502

Chilson, K., & Szabó, M. (2018). Review of "Thinking machines: art and design in the computer age, 1959-1989". *Journal of Science and Technology of the Arts*, 10(1), 3-5. doi.org/10.7559/citarj.v10i1.497

Cohen, H. (2000). Parallel to Perception: Some Notes on the Problem of Machine-Generated Art.

Cohn, G. (2018, October 25). AI Art at Christie's sells for $432,500. *New York Times*. www.nytimes.com/2018/10/25/arts/design/ai-art-sold-christies.html

Edwards, B. (2022, December 15). Artists stage mass protest against ai-generated artwork on artstation. *Ars Technica*. arstechnica.com/information-technology/2022/12/artstation-artists-stage-mass-protest-against-ai-generated-artwork/

Elgammal (2019). AI Is Blurring the Definition of Artist. American Scientist, 107(1), 18–21. doi.org/10.1511/2019.107.1.18

Enking, M. (2022, November 7). These A.I.-Generated Images Hang in a Gallery-but Are They Art?. *Smithsonian Magazine*. www.smithsonianmag.com/smart-news/a-new-exhibition-seeks-to-answer-the-question-will-ai-generated-art-help-or-hurt-creatives-180981081/

Fried, I. (2022, October 31). Exhibit aims to present AI images as real art. *Axios*. www.axios.com/2022/10/31/exhibit-ai-images-art-dall-e-2-gpt-3

Gamp, J. (2020, July 3). Artist recreates lifelike AI renderings of famous historical figures and monuments. *Yahoo! News*. news.yahoo.com/artist-ai-technology-historical-figures-121041999.html?guccounter=1

Ganbrood. Kate Vass Galerie. (n.d.). www.katevassgalerie.com/ganbrood

Ghosh, A., & Fossas, G. (2022). Can There be Art Without an Artist? arXiv preprint arXiv:2209.07667.

Goodfellow, I. J., Pouget-Abadie, J., Mirza, M., Xu, B., Warde-Farley, D., Ozair, S., Courville, A., & Bengio, Y. (2014, June 10). Generative Adversarial Networks. arXiv.org. arxiv.org/abs/1406.2661

Gurney, James (2022, June 1), 10:47. The AI that creates any picture you want, explained [Video file]. *Vox*. www.youtube.com/watch?v=SVcsDDABEkM&t=138s&ab_channel=Vox

Heaven, W. D. (2022, December 16). Sam Altman: This is what I learned from DALL-E 2. *MIT Technology Review*. www.technologyreview.com/2022/12/16/1065255/sam-altman-openai-lessons-from-dall-e-2/

Helena Sarin. Kate Vass Galerie. (n.d.). www.katevassgalerie.com/helena-sarin

Klingemann, Mario (2022, May 31), 9:30. What AI art means for human artists [Video file]. *Vox*. www.youtube.com/watch?v=sFBfs-N3G4&ab_channel=Vox

Knight, W. (2022, July 13). When AI Makes Art, Humans Supply the Creative Spark. *WIRED*. www.wired.com/story/when-ai-makes-art

Kristeller, P. O. (1951). The Modern System of the Arts: A Study in the History of Aesthetics Part I. *Journal of the History of Ideas*, 12(4), 496–527. doi.org/10.2307/2707484

Kurchanova, N. (2018, February 3). Thinking Machines: Art and Design in the Computer Age, 1959-1989. Studio International: Visual Arts, Design and Architecture. www.studiointernational.com/thinking-machines-art-and-design-in-the-computer-age-review-moma

Lawnson-Tancred, J. (2022, November 4). The prophecies of Aaron. *Outland*. outland.art/harold-cohen-aaron/

Lee, G. (2020, July 21). Will this creepy AI platform put artists out of a job? *Digital Arts*. web.archive.org/web/20201222214934/https://www.digitalartsonline.co.uk/news/creative-software/will-this-creepy-ai-platform-put-artists-out-of-job/

Mordvintsev, A., Tyka, M., & Olah, C. (2015, July 1). Deepdream - a code example for visualizing neural networks. *Google Research Blog*. web.archive.org/web/20150708233542/http://googleresearch.blogspot.co.uk/2015/07/deepdream-code-example-for-visualizing.html

Mostaque, E. (2022, August 22). Stable diffusion public release. Stability AI. stability.ai/blog/stable-diffusion-public-release

Palace, V. M. (2019, April 1). What if Artificial Intelligence wrote this? Artificial Intelligence and Copyright Law. *Florida Law Review*. www.floridalawreview.com/2019/artificial-intelligence-wrote-artificial-intelligence-copyright-law/

Ploin, A., Eynon, R., Hjorth I. & Osborne, M.A. (2022). AI and the Arts: How Machine Learning is Changing Artistic Work. Report from the Creative Algorithmic Intelligence Research Project. Oxford Internet Institute, University of Oxford, UK.

Salkowitz, R. (2022, October 12). Midjourney Founder David Holz on the Impact of AI on Art, Imagination and the Creative Economy. *Forbes*. www.forbes.com/sites/robsalkowitz/2022/09/16/midjourney-founder-david-holz-on-the-impact-of-ai-on-art-imagination-and-the-creative-economy/?sh=423e985a2d2b

Samuelson, P. (1985, January 1). Allocating Ownership Rights in Computer-Generated Works.

Berkeley Law. lawcat.berkeley.edu/record/1112407?ln=en

Schwartz, J. (1995, April 10). Is Aaron's work creative art or just high-tech doodling? *Washington Post*. www.washingtonpost.com/archive/politics/1995/04/10/is-aarons-work-creative-art-or-just-high-tech-doodling/366dc211-2aec-4d99-8d55-27f7acd5e27d/

Smith, A., & Anderson, M (2020, Aug. 6). Automation in Everyday Life. Pew Research Center: Internet, Science & Tech. www.pewresearch.org/internet/2017/10/04/automation-in-everyday-life

Thinking machines: Art and design in the computer age, 1959–1989: Moma. The Museum of Modern Art. (n.d.). www.moma.org/calendar/exhibitions/3863

Turing, A. M. (1950). I.—Computing Machinery and intelligence. Mind, LIX(236), 433–460. doi.org/10.1093/mind/lix.236.433

Roose, K. (2022, Sep. 2). An A.I.-Generated Picture Won an Art Prize. Artists Aren't Happy. *New York Times*. www.nytimes.com/2022/09/02/technology/ai-artificial-intelligence-artists.html

West, D. M., & Allen, J. R. (2018, April 24). How artificial intelligence is transforming the world. *Brookings*. hwww.brookings.edu/research/how-artificial-intelligence-is-transforming-the-world

Vallance, C. (2022, September 13). "Art is dead dude" - the rise of the AI artists Stirs Debate. *BBC News*. https://www.bbc.com/news/technology-62788725

Vincent, J. (2022, Sep. 15). Anyone can use this AI art generator — that's the risk. *Verge*. www.theverge.com/2022/9/15/23340673/ai-image-generation-stable-diffusion-explained-ethics-copyright-data

Vinopal, Courtney (2018). Why automation won't put artists out of work just yet. (2018, December 14). *PBS NewsHour*. www.pbs.org/newshour/arts/why-automation-wont-put-artists-out-of-work-just-yet