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ART HISTORY AND AI: TEN AXIOMS

SONJA DRIMMER AND CHRISTOPHER J. NYGREN

ABSTRACT | AI has become an increasingly prevalent tool for researchers working in Digital Art History. The promise of AI is great, but so are the ethical and intellectual issues it raises. Here we propose 10 axioms related to the use of AI in art historical research that scholars should consider when embarking on such projects, and we make some proposals for how these axioms might be integrated into disciplinary conversations.

KEYWORDS | Computer Vision; Machine Learning; Convolutional Neural Networks; Artificial Intelligence; Research Ethics

Computers are nothing new to art historical research¹ Since at least the 1960s, computer technology has been incorporated into collections management, at first implicitly informing and, within a decade, explicitly impacting art historical methods.² Whether digitized or digital,³ art history as a discipline is largely unthinkable today without at least some recourse to computing – from the most mundane tasks of word processing and PowerPoint creation to advanced research that makes use of GIS and multispectral imaging. Since the turn of the present century, the field has benefitted from the perspectives of art historians who are trained in the digital humanities, and their use of computational techniques has opened new paths of inquiry.

More recently, we have seen the rapid incorporation of a particular kind of computation into the study of historical artworks: namely, Artificial Intelligence (AI), a broad and variously defined term, but one which we take to refer generally to computer processes based on Machine Learning (ML) and

other techniques in which the computational process is not guided by step-by-step directives from a human collaborator, but rather is internally directed by algorithms. This kind of research is understandably attractive to art historians, for it promises to allow us to see the objects of our study in a new light (the symposium on this topic held at the Frick Collection in 2018 might be seen to represent the openness of art historians to this potential).⁴ There is, however, an important distinction between recent (and anticipated) applications of AI and earlier instantiations of art history's adoption of computation. Whereas earlier work largely used digital tools for the purposes of information management or to ask questions adjacent to the works of art (in other words, in generating and analyzing what could be considered a work's context), we are seeing the first efforts at aiming AI at the work itself, that is, the use of computer vision as an analytical lens placed on the object.⁵ This shift has been described by Alison Langmead and David Newbury as one from "pointers" to "proxies." While computerized indexes help point scholars toward real objects more effi-



Figure 1. Digital images created by Dall-e-2 using the following prompt: “the history of art as understood by artificial intelligence”

ciently, newer forms of computation do not retrieve information, but rather manipulate and analyze data “with an eye toward revealing potential statistical patterns in the information that might, when interpreted by the user, offer new understandings of the phenomenal world.”⁶ Collaborations between art historians and computer scientists have started developing projects in this vein, directing their analysis at works of art rather than their associated metadata.⁷ We are concerned, though, with the rapid propagation of studies that apply AI to art historical materials in an uncritical manner. If, to paraphrase a number of commentators on the subject, the AI horse is already out of the barn, then it seems at the very least we might put some roadblocks in its way to slow its gallop and allow ourselves time to think about what to do about it, rather than let it ride roughshod over the field of art history.

What follows are ten axioms that we hope will inform the future relationship between AI and art history. We formulate these axioms primarily in the hope that art historians interested in pursuing research that employs AI will consider them before embarking on a new project, but we also hope that these axioms will find their way to computer scientists interested in working with images.

Axiom 1: The history of art is not a problem to be solved

AI and Machine Learning have had many applications beneficial to humans, including the early recognition of medical maladies and the detection of patterns in enormous amounts of data related to global climate change (although the good it can do in these areas is by no means unconditional, whether in terms of the carbon footprint of AI itself or in algorithmic biases in healthcare).⁸ These are problems that humanity must confront, and AI can help in that endeavor. However, art historical inquiry is fundamentally different – artistic objects are not problems to be solved, but the residue of bygone moments of human creativity that merit our attention. Understanding art within its historical context requires us to engage with humanity from a position of humility – we are here neither to solve “the past” nor “art,” but to learn from them both. Whatever utility Artificial Intelligence might have in identifying or sorting works of art according to various criteria (date, color palette, size, etc.) will inevitably be limited by the fact that the archive of human knowledge has been produced by human beings, and is therefore fallible and incomplete.



Figure 2. Digital images created by Dall-e-2 using the following prompt: “the history of art as understood by artificial intelligence”

Axiom 2: Scale is not an unqualified good

A common justification for the application of AI to works of art is that it will allow the discipline “to scale.” This phrase, taken from the field of information technology and from the tech industry, refers to when a computer product (software or hardware) functions well handling exponentially higher volumes. Millions of objects remain obscure in museums, archives, and cultural institutions that lack the funding to catalog them in a rich and meticulous manner, and AI has been promoted as being able to plug the gaps where resources do not exist to support human labor. The hope is that Machine Learning can quickly produce a rudimentary index of these materials and make them available for further study. And yet, the problem with such applications is that, while they make visible objects that have not been made available for study, they are likely to further entrench norms and unexamined assumptions. This happens when they, for example, assign subject headings and designate the iconography of works of art.⁹ These systems use past patterns to create future predictions, and therefore necessarily carry those patterns into the future. This is especially lamentable at a time when critical archival studies

has been advancing powerful calls to scrutinize the legacies of inequity in archives and institutions and in cataloging metadata while issuing concrete steps towards redressing the harm such inequities have caused.¹⁰ Custodians of archival material will have difficult calculations to make: does the cost of (potentially harmful) error outweigh the benefit of making uncatalogued objects available to the public? What measures are in place to ensure that when – not if, but when – Artificial Intelligence assigns incorrect or derogatory labels to objects, the holding institution responds responsibly and with care? While the proponents of scale argue for the value of smoothness, optimization, and efficiency in art historical research, we counter that friction is often where productive thought happens.

Axiom 3: Artworks are not pixels, pixels are not artworks

In the last generation or so, more and more artists have made works that are born digital, and NFTs are now garnering serious attention from art markets. Moreover, in 2022 Dall-E, Lensa, and Midjourney have availed to millions of people the capacity



Figure 3. Digital images created by Dall-e-2 using the following prompt: “the history of art as understood by artificial intelligence”

to generate images using Artificial Intelligence. These sorts of image generation tools have raised important issues about intellectual property, creativity, and equity, which require a serious discussion, but one that veers away from our present focus. However, these image generators do highlight by contrast an important, if basic, point: when dealing with works of art that were *not* born digital, the transformation of these works of art into computational data requires a fundamentally transformational process of technological mediation. Old master paintings are not “just clever patterns of pixels,” as one researcher has suggested – they are material objects that record moments of human creativity in malleable materials that degrade over time.¹¹ Whether or not digital surrogates allow scholars to query computationally for something that is art historically meaningful is an open question, not a self-evident fact. While we accept that works of art can be transformed into data, when they are used as such the resulting argument is not about the art. At a maximum, the argument is about the digitized surrogate of the work.¹² There are currently projects afoot that use neural networks to quickly identify the pigments used in manuscript illuminations, but as the scholars themselves note, this is providing information to scholars, not directly answering questions.¹³

Axiom 4: Artificial Intelligence and Machine Learning will reinscribe existing hierarchies rather than challenge them

At the moment, art provides just another data set to computer scientists akin to MRI scans, consumer satisfaction surveys, or weather patterns. Unlike these other “data sets,” though, art provides an air of refinement. Working with names like Michelangelo, Picasso, and Kehinde Wiley offers easy access to cultural cache and a seeming point of entry into “popular culture.” However, AI relies on scale, and thereby necessarily privileges objects and data that are already categorized and available to be fed into the computer, and it relies on the assumption that any dataset is independent and representative without acknowledging the particular institutional history of that dataset’s formation as such. The allocation of resources within the fields of art history and museology have traditionally gone toward a narrow band of European centers and subjects, which now comprise the vast majority of publicly available data. Millions of hours of human labor provide com-



Figure 4. Digital images created by Dall-e-2 using the following prompt: “the history of art as understood by artificial intelligence”

puter scientists with “data” that seems readymade and representative of objective historical reality; this is not the case. As scholars, we both work in “traditional fields” (Western medieval and Italian Renaissance) and are by no means advocating for a cessation of funding in those fields. But we believe that digital projects are likely to reinscribe the importance of fields like ours, simply because they are “where the data are.” Indeed, a recent meta-analysis of articles in digital art history has demonstrated the prevalence of the Italian Renaissance in this emergent field. We worry that computers will calcify hierarchies that recent generations have worked diligently to counter.¹⁴

Axiom 5: It is important to know the difference between what humans do well and what computers do well

Computers are exceptional machines that can calculate faster and more accurately than humans. In this, they are extremely useful, but the utility of their calculations are not given in advance of a project. There are countless examples

of AI getting things “wrong” - i.e. misidentifying objects, giving nonsensical answers, or answers that reveal previously unobserved gaps in rule-based systems. But it is important to understand that here AI is not “wrong” in any meaningful sense – technologists asked the computer to provide a solution, and the computer did so. As Brian Cantwell Smith notes, because we have made them, computers represent the world in ways that matter to us, not to them. Importantly, computers imperfectly register humanity’s ethical and ontological commitments, if only because humanity is vast and what matters to human beings is widely variable. Ultimately, nothing matters to computers other than finding a solution. Therefore, it is essential that human judgment be explicitly deployed in any art historical research project that uses AI in order to ensure that our discipline’s ethical and moral commitments to other beings-in-the-world and their cultural heritage are given adequate deference.¹⁵ In sum, the “problem,” such as it is, resides not so much with computers themselves as with how human beings use them, often overlooking the remediations of real-world things into data that is computable. Unless an art historian understands the statistical probabilities underlying the “black box” of Machine Learning, they should be wary of drawing any strong conclusions.

Axiom 6: We need guidelines for the use of AI in art history

Currently, there are no universally accepted standards for what constitutes compelling or ethically-informed research at the intersection of historical images and AI. We believe it is essential to continually highlight a crucial fact: the historical data and *capta* that will be used to train any AI working on any art historical problem is imbued with all the prejudices of those who collected and cataloged the information.¹⁶ Racism, sexism, colonialist chauvinism, and many other forms of prejudice are baked into the catalogs bequeathed to us by previous generations, and undoubtedly contemporary prejudices will plague future generations, with or without computers. This calls to mind an axiom among computer scientists: garbage in, garbage out. If research is going to be undertaken into historical questions using machine learning, our scholarly community must establish some guidelines for researchers that will help navigate the potentially harmful research results that are likely to emerge from prejudiced data. Many disciplines rely on IRBs (Institutional Review Boards) to provide oversight of potentially harmful research practices.¹⁷ For understandable reasons, historical data and images are not granted the same status as human subjects. However, the ethical implications of historical research are very real. While we acknowledge that no single board of advisors can make binding decisions about what is or is not responsible research using AI and historical images, we implore our discipline's bodies (CAA, ICOM, the Mellon and Kress Foundations, etc.) to take this issue seriously and to proactively consider how to mitigate the abuse of art historical materials for harmful research purposes. We urge these organizations to develop some very basic guidelines that will impede ethically dubious research at the intersection of art history and AI. These guidelines would point toward some of the primary issues that make us skeptical of the use of AI. For instance, is a research sample size based primarily on the collections of major museums in Europe and North America? And, perhaps most importantly, what possible negative implications might this research have?

Axiom 7: Machine Learning can change how we see the historical record but it cannot complete the historical record

We are skeptical of projects that aim to use Machine Learning to “complete” works of art or inscriptions that have been

lost.¹⁸ For generations, art historians have proposed schematic reconstructions of lost or incomplete works of art. Such reconstructions are based on meticulous study of an incomplete historical record, and frequently experts in the field offer competing reconstructions, as in the case of Donatello's high altarpiece for the church of St. Anthony in Padua.¹⁹ Crucially, there is no “ground truth” against which such proposals can be audited—we cannot go back in time to check if one reconstruction is more correct than another. As Emily Spratt has noted, when images are examined independent from their contexts with the use of algorithms, “a worrying preference for completion, unity, categorization, and, above all, reliance on the use of formal properties as a means of interpretation over socio-historical consideration abounds.”²⁰ When used responsibly by trained specialists, computational techniques do offer the potential to “solve” certain problems with historical reconstructions.²¹ These reconstructions are convincing not because they were produced by a computer, but because they have helped the domain specialist see the documentary evidence in a new way. In such cases, computational techniques serve as a tool in the hands of scholars who have already gained the trust of their colleagues through the judicious display of scholarly discernment, a willingness to respond to well-founded critique, and a commitment to a responsible community of discourse. The “black box” of Machine Learning makes such auditing essentially impossible, and therefore we will remain *a priori* skeptical of the utility of AI/ML in the reconstruction of lost or damaged works of art.

Axiom 8: Collaboration between computer scientists and art historians will require mutual respect

Aligning research incentives is a wicked problem.²² Artworks are complex, and for this reason they pose engaging challenges to computer scientists — unlike words, images do not come in discrete packets, which makes them one of the next frontiers in computer science. However, AI-driven research that takes images and digital representations of three-dimensional objects as its central concern but which is not informed by serious art historical scholarship risks transforming art history into a playground for computational research. It is essential to be mindful of the fact that what constitutes a “research finding” in computer science is unlikely to be a “research finding” in art history. As

Claire Bishop has noted, research in computer-centered digital humanities increasingly “proceeds with a data set in advance of a research question.”²³ This kind of research seems more invested in discovering new computational techniques than with questions of historical interpretation, and that has implications that are crucial to understand. For a computer scientist, a valuable finding amplifies what computers are capable of; this is important work that has unforeseeable applications, but it means little to the field of art history. We encourage art historians to think deeply and critically about what *our discipline* stands to gain from collaborations with computer scientists. It is possible that the field stands to gain much. But unless art historians are able to drive the research agenda in a direction that is amenable to humanistic research, we risk simply automating tasks that have been so thoroughly metabolized by the field that they have become the water in which we swim.²⁴

Axiom 9: Being downstream of governmental power does not absolve researchers of moral agency

Our concerns are not limited to the discipline of art history, but rather extend to the broader cultural service into which such art historical research can be pressed. With predictability and regularity since the eighteenth century, efforts to align the study of art with the most cutting-edge science have implicitly and explicitly served racist and imperialist agendas, from Winckelmann’s hierarchy of the human races to stylistic taxonomies enrolled as empirical reference points for native, and national, characters. Art historians have labored to reckon with these legacies in our histories and methodologies. Yet as we write, scholars in “cultural evolution” are reclaiming these older, utterly discredited, and odious arguments by means of Artificial Intelligence. This is an atavistic backslide into our discipline’s primordial past, which, with similar irony, was obsessed with notions of “progress.”²⁵ We are increasingly concerned with a version of “art washing,” in which computer scientists use algorithmic analysis of artworks to lend cultural cache to aspects of a surveillance regime to which many citizens might otherwise object. Though the larger societal instrumentalization of AI – its use for facial recognition and government surveillance, in particular – are distant from the aims of art historical inquiry, art historians who partner with computer scientists should be aware that their research has the potential to further normalize and legitimize intrusive forms of surveillance.²⁶ The broad, non-direct-

ed application of AI, of course, means that research can also be turned to other injurious ends that cannot be foreseen.

Axiom 10: Can-do does not mean should-do

The outcome of curiosity does not need to be action. There is a deceptive banality to the expression that an experiment is worth conducting because of the unpredictable promise of its results, even when those results are null. But some experiments do insidious work purely by being posed as actionable. There is great potential to engaging conscientiously with computer technology as a means of finding new perspectives on objects of art historical interest. At the same time, we believe it is essential (as stated in axiom #6) that our discipline’s organizing bodies offer some guidance on how this research should be conducted so as not to inadvertently foster harmful outcomes. This includes concern for the fact that funded research that is beholden to stakeholders will be called upon to produce “outputs” even if those outputs prove a given experiment’s failure. These concrete proofs *against* concept nevertheless release into the world the promise that it may not be the concept or hypothesis itself that is wrong or questionable, but rather that the experiment itself needs refining or improvement. To make this point concrete using one of the articles cited above, we do not think that historical artworks can or should be used to investigate the correlation between physiognomy and trustworthiness, not only because there is no correlation between these two things, but also because undertaking such a study using historical works of art launders harmful stereotypes through the lens of history.²⁷ Is the premise for this kind of inquiry driven by genuine curiosity, or a rhetoric for maintaining perpetual funding? Researchers have a responsibility to think about the entailments that this kind of curiosity generates.

Though scholars working at the intersection of art history and digital techniques have confronted these issues for well over a decade, we have yet to encounter a concise statement of these concerns. We offer these axioms in the hope that they can become part of institutional and curricular conversations about the role of AI in art historical research. Pragmatically, these axioms might foster conversations in the classroom, where discussions of the digital are already an important part of art historical pedagogy; they might be tak-

en under advisement in producing guidelines for best practices by the relevant scholarly societies; and they should be integrated into the brainstorming process for researchers interested in pursuing projects that incorporate Machine Learning.

It is our conviction that people interested in operating in this space will benefit from discussing these axioms with their interdisciplinary teams *in advance* of committing to a particular application of AI to a body of art. We hope that scholars will enter these conversations with genuine curiosity and generosity,

rather than with a mindset of preemptively defending research projects already underway. Only in this way can scholars have a genuine conversation about what kinds of research questions can be asked productively, what can be asked ethically, and how to make these questions appealing to funding agencies without promising overblown or historically dubious results.

AI is simply too powerful and important to assimilate unthinkingly into what we do.

NOTES

1 The thoughts we share are the result of collaboration. The collaboration between us, though, has in turn been enriched by ongoing collaborations that we have both fostered at our home institutions. We wish to thank, especially, Alison Langmead and Yael Rice, who have been invaluable interlocutors for us. We also wish to acknowledge Alison Langmead, Steven Nelson, and Nancy Um for their engaged and thoughtful feedback on drafts of these axioms; they spurred us to think even more critically about our propositions. The views we express here, however, are our own.

2 Anna Näslund Dahlgren and Amanda Wasielewski, "Cultures of Digitization: A Historiographic Perspective on Digital Art History," *Visual Resources* 36:4 (2020): 339-359. <https://doi.org/10.1080/01973762.2021.1928864>

3 Johanna Drucker, "Is There a 'Digital' Art History?," *Visual Resources* 29:1-2 (2013): 5-13. <https://doi.org/10.1080/01973762.2013.761106>

4 "Searching Through Seeing: Optimizing Computer Vision Technology for the Arts." The Frick Collection. <https://www.frick.org/interact/miniseries/searching-seeing>.

5 Three recent examples include Elizabeth Mansfield, with Zhuomin Zhang, Jia Li, John Russell, George S. Young, Catherine Adams, and James Z. Wang, "Techniques of the Art Historical Observer," *Nineteenth-Century Art Worldwide* 21. 1 (Spring 2022), <https://doi.org/10.29411/ncaw.2022.21.1.5>; X. Shen, R. Champenois, S. Ginosar, et al. "Spatially-Consistent Feature Matching and Learning for Heritage Image Analysis." *International Journal of Computer Vision* 130 (2022), 1325–1339. <https://doi.org/10.1007/s11263-022-01576-x>; and F. Ji, M.S. McMaster, S. Schwab, et al., "Discerning the Painter's Hand: Machine Learning on Surface Topography," *Heritage Science* 9 (152): 2021. <https://doi.org/10.1186/s40494-021-00618-w>.

6 Alison Langmead and David Newbury, "Pointers and Proxies: Thoughts on the Computational Modeling of the Phenomenal World," in *The Routledge Companion to Digital Humanities and Art History*, edited by Kathryn Brown (New York, NY: Routledge, 2020), 360-61.

7 See above, note 5.

8 Annette Ekin, "AI can help us fight climate change. But it has an energy problem, too," *Horizon: The EU Research & Innovation Magazine*. Last modified 12 September 2019. <https://ec.europa.eu/research-and-innovation/en/horizon-magazine/ai-can-help-us-fight-climate-change-it-has-energy-problem-too>; and Katherin J. Igoe, "Algorithmic Bias in Health Care Exacerbates Social Inequities — How to Prevent It," last modified 12 March 2021. <https://www.hsph.harvard.edu/ecpe/how-to-prevent-algorithmic-bias-in-health-care/>

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15 On the question of modeling "the world," see Brian Cantwell Smith, *The Promise of Artificial Intelligence: Reckoning & Judgment* (Cambridge and London: MIT Press, 2019), esp. 97-103.

16 The distinction between data and *capta* appears to have originated in psychology in the middle of the twentieth century and is often attributed to R.D. Laing, in his *Politics of Experience and the Bird of Paradise* [Penguin, 1967], 53. It was made eloquently in relation to the history of art by Donald Preziosi in "That Obscure Object of Desire: The Art of Art History," *Rethinking Art History: Meditations on a Coy Science* (New Haven: Yale University Press, 1989), 36. The distinction was later applied to the digital humanities more narrowly by Johanna Drucker without reference to the term's origins and earlier uses. See Johanna Drucker, "Humanities Approaches to Graphical Display," *Digital Humanities Quarterly* 5.1 (2011). <<<http://www.digitalhumanities.org/dhq/vol/5/1/000091/000091.html>>>.

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26 Concerns about the ethical impact of algorithms on Artificial Intelligence and society more generally have now reached the highest levels of government, prompting the White House to issue a Blueprint for an AI Bill of Rights. <https://www.whitehouse.gov/ostp/ai-bill-of-rights/>. The scholarship on these issues has exploded in the last several years and is too vast to cite here. Most influential on our thinking have been Safiya Umoja Noble, *Algorithms of Oppression: How Search Engines Reinforce Racism* (New York: New York University Press, 2018) and Ruha Benjamin, *Race After Technology: Abolitionist Tools for the New Jim Code* (Polity, 2019).

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SONJA DRIMMER is Associate Professor of Medieval Art in the Department of the History of Art and Architecture at the University of Massachusetts Amherst. Her research is chiefly concerned with the book arts of the Middle Ages, addressing in particular issues of mediation, collaborative production, and replication. She is the author of *The Art of Allusion: Illuminators and the Making of English Literature, 1403–1476* (University of Pennsylvania, 2018), which received High Commendation for Exemplary Scholarship from the Historians of British Art.

Correspondence e-mail: sdrimmer@umass.edu

CHRISTOPHER J. NYGREN is associate professor of early modern art in the Department of the History of Art and Architecture at the University of Pittsburgh. In 2022, his book, *Titian's Icons: Charisma, Tradition, and Devotion in the Italian Renaissance* (Penn State, 2020), won the Phyllis Goodhart Gordan Prize for best book in Renaissance studies from the Renaissance Society of America. Prof. Nygren is also developing several collaborative research projects, including in the Digital Humanities. From 2017 to 2019 he served as Principal Investigator on “The Morelli Machine,” a project funded by the National Science Foundation that sought to examine whether computational methods might be used in the attribution of old master paintings.

correspondence e-mail: cnygren@pitt.edu