The Digital U-Turn in Art History

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Humanities research over the past decade has become increasingly concerned with digitizing large corpuses of texts, images and objects, as well as using computational tools to study them. While the discipline of art history has embraced digitization of artworks and scholarly resources, it has been less inclined to adopt computational methods. One reason for this may be that the nature of our core material – images and artefacts rather than text – makes the use of computational methods more complex for art history compared to other fields. Despite these challenges, a number of tools have been developed to analyze art images and objects, and they are used to create visualizations, network analyses, topic modelling, discourse analysis, simulation, virtual modelling, pattern recognition and aggregation of materials from disparate geographical locations. Text mining, another key digital humanities method, is popular in other disciplines, but it has been less prevalent in our field.

In recent years, scholars have delineated a sub-field of art history and the digital humanities that they call ‘digital art history’ (DAH), which looks specifically at how computational tools might be used to study art (Fig. 1). This emerging area of art history is often described as something completely new for the discipline. In this article, we critically question the newness of this field and seek to position it in relation to the history of the discipline. The core audience we seek to address, therefore, is not limited to researchers already actively using digital methods. Instead, we aim to engage the broader community of art history scholars in this historiographic investigation of the methods and theory of DAH.

While surveying existing DAH literature, we have found that there is a strong focus on formal and iconographic issues in the study of art. In particular, we have frequently seen references to the theories and methods popular among early art historians like Heinrich Wölflin, Aby Warburg and Erwin Panofsky, which have fallen somewhat out of favour in recent art historical research. The question of whether DAH scholarship differs from other art historical research – and, if so, how – served as our point of departure. What attributes characterize the application of digital methods in art history, what they have been used for, and to what ends? Digital art history methods have not been widely assimilated into the field of art.

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This is not only due to lack of technical skills and resources among art historians but, as this study shows, there are fundamental differences in the frameworks and definitions of what constitutes art historical research in DAH versus the mainstream of the discipline.

In order to investigate these differences, we decided to use digital methods on DAH scholarship, namely text mining, to elucidate the historiographic and theoretical concerns in the uptake of computational methods in art history. This was an exercise in what might be termed meta-methodology. While we found text mining extremely useful for this study, it was only a starting point for the discussion that follows. Computational analysis itself tells us little unless we strive to understand why the output we obtained using a particular methodology is what it is and what it could mean, accounting for biases and possible errors in the data – and in our own mindset, by extension. Therefore we have combined quantitative digital methods with qualitative analogue methods in this study.

Defining Digital Art History

In 2013 the journal Visual Resources published a special issue on digital art history that gave scholars a space to propose definitions for DAH as an offshoot of the digital humanities. The editors of the issue, Murtha Baca and Anne Helmreich, identify five roughly chronological and overlapping phases of development. The first phase is the digitization and dissemination of archives, the second is building tools for the digital humanities, the third is visualization/reconstruction/virtual reality, the fourth is experiments in alternative forms of scholarly publishing, and the fifth is algorithmically-based computational methods including machine learning and natural-language processing. According to this definition, what constitutes digital methods has shifted over time. In 1989 computer technology was said to be used in art history in three principal ways, for databases, electronic storage of images, and electronic monitoring and adjustment of the museum environment. More recently, Paul Jaskot proposed four areas where digital tools may be useful for art historians: digital storytelling, text-based analysis, network analysis and spatial analysis.

The 2013 special issue also includes Johanna Drucker’s often-cited essay, ‘Is There a “Digital” Art History?’ which posits a definition of DAH that excludes Baca and Helmreich’s first phase entirely. Drucker writes
that ‘a clear distinction has to be made between the use of online repositories and images, which is digitized art history, and the use of analytic techniques enabled by computational technology that is the proper domain of digital art history’. While digitization projects are still often folded into DAH, Drucker’s essay shifted the meaning of the term to imply that DAH is the use of computational methods rather than use or creation of digitized archives. For the purposes of this study, however, we define the field in the wider sense, incorporating both what Drucker terms digitized and digital art history (Fig. 2).

The appearance of this special issue ushered in a consolidation period for DAH that saw a group of scholars argue and debate the definition of the field as well as engage with the larger field of art history. Following this, in 2015 Harald Klinke and Liska Surkemper launched the International Journal for Digital Art History (DAHJ). The articles published in DAHJ over the past five years include research that follows Drucker’s definition as well as articles that are more concerned with digital collecting practices. While most articles are enthusiastic about the potential uptake of computational methods, a few critical voices were published in its pages as well. For example, Claire Bishop’s essay ‘Against Digital Art History’ argues that quantitative approaches replicate neoliberal models and that such research is typically irrelevant to contemporary art historical questions.

In 2019 Baca and Helmreich published a follow-up special issue of Visual Resources to gauge the state of the field six years later. It continues in the same vein as the previous special issue, focusing on both digitized collections and archives for art history and the use of computational methods. These two
special issues of *Visual Resources* as well as the corpus of articles published in *DAHJ* between 2015 and 2019 formed the basis for this computational study of recent art historiography. In order to compare the citations and topics in DAH with other research in the field of art history, we created a corpus of all articles published in the journals *Art History* and *Art Journal* between 2010 and 2019. We are well aware that art history is a diverse, interdisciplinary field and this is especially true in digital humanities research. As such, art historical writing appears in many different scholarly journals, not only those strictly-defined as art history journals. In order to limit the noise that interdisciplinary journals may have created in this study, however, we chose two very broad yet diverse journals that are clearly devoted to the study of art history. They represent a cross-section of contemporary art historical scholarship, as both journals are published by major scholarly associations for art history that hold important annual conferences for the field: the Association of Art Historians (AAH) in the UK and the College Art Association (CAA) in the USA. We chose *Art History* because it covers a very broad span of art historical research from ancient to modern, using a diversity of methods and theories, and *Art Journal* because it is concerned with modern and contemporary art and often focuses on less canonical and/or western-centric perspectives. As this article aims to address a broad art history audience, reaching those without a technical background, we have chosen not to describe our text mining methods in technical detail here. However, a technical account of the computational methods used for extracting results from these corpuses can be found in two of our previous articles and the dataset is available online. In lieu of describing the computational portion of our methods, the following text will focus on exploring the results obtained using these previously-cited methods by adding an additional methodological layer to the analysis namely close reading.

Lev Manovich describes the concept of drawing unknown patterns from a given set of data as ‘exploratory data analysis’ or ‘unsupervised learning’, borrowing terminology from machine learning. He uses these terms to argue that computational methods can provide findings in the humanities that approach scientific objectivity. However, the application of computational methodologies in the humanities is not strictly quantitative nor is it devoid of subjective considerations with regard to data collection. The researcher must always define what constitutes a complete, comprehensive or representative sample, which means that bias is built in. Instead of thinking about our use of computational methods as a way to achieve objectivity, we chose to think of this methodological decision as simply one way to deal with and understand a large amount of text. Rather than searching the material for key concepts and names, we intentionally produced frequency lists that were not limited to what we could come up with. These lists indexed all existing names in the text corpus arranged according to their frequency. In short, we used this method to avoid ‘looking to confirm a theme or pattern’.

In the initial stage of this study, we performed a text mining analysis of the footnotes and bibliographies of articles in our corpus to determine which authors are frequently cited. Simply put, this text mining consisted of automatically collecting all the words in a text and analyzing them quantitatively for patterns. In
Fig. 3. Venn diagram showing the top 35 most commonly cited authors, extracted based on number of articles in each sample they were cited in (regardless of number of citations per article).
the case of our study, we chose to look at how frequently each individual author’s name appears. This could be done en masse, without consideration to the particular context the words appear in, or, as we have done in this study, bundles of text can be associated with particular sections of a text (body text versus bibliography) and different articles or groups of articles. Some articles cite a particular author twenty times and others cite the author just once. After trying several alternatives, we chose to count the number of articles an author has been cited in rather than the number of times the author has been cited total, as this seems to provide a better picture of distributed frequency. In other words, it does not matter whether an author is cited once or twenty time in one article – it will only be counted once. This means that one article with many citations of a certain author does not outweigh a corpus that does not contain any other articles that cite that author.

In effect, the results of our text mining in *Art History, Art Journal* and DAH literature produced an answer to the question: who appears most? Our next step was, therefore, to look for where these names are referenced in the body text of articles. In some cases, art historians or theorists are mentioned in the body of an article but not cited in the references and vice versa. The results of these first two steps gave us a sense of the rate at which authors or theorists are mentioned in a given article in a given dataset but they did not, however, give us any sense of why they appear so often or in what context. Even if the data had simply confirmed our suspicions without any unexpected results, we would still find ourselves in need of an argument as to why this is the case. This is where close reading comes into play. We could not have ascertained the results of the text mining through close reading but nor can the ‘distant reading’ of text mining answer any deeper questions about what the presence of certain authors or theorists means for the discipline of art history. As such, this article is a case study in how mixed methods such as these can complement each other for art historiography and art history research more broadly to delineate disciplinary discourses as expressed in theories, methods used and materials studied. Digital methods cannot be disallowed as such. The crucial issue is how and to what ends they are used.

**Resurrecting the Old Guard**

Through text mining, we were able to obtain a list of the top thirty-five scholars cited in *Art History, Art Journal* and our DAH sample from the last ten years. We found that the only author shared between the three groups of articles was Walter Benjamin. The frequent appearance of Benjamin’s name in all three categories is due primarily to the continual popularity of his 1936 essay ‘The Work of Art in the Age of its Technological
Reproducibility’, which is a classic in both media studies and art history, owing to its broad resonances with and applicability to (digital) image culture today. The overlap of Benjamin between all three sets of articles – and, therefore, his singular prominence in the field of art history as represented by our sample – deserves a longer treatment that is beyond the scope of this paper. However, broadly speaking, citations of Benjamin in DAH typically mention his famous essay without engaging in further analysis. The other two journals, on the contrary, often apply Benjamin’s methods and theory on a deeper level. As shown in the Venn diagram in Fig. 3, Art Journal had no overlap of authors with DAH apart from Benjamin. It could be reasonably assumed that articles dealing with contemporary digital practices (DAH) might have commonalities with articles that appear in a publication focused on modern and contemporary art (Art Journal), but that does not appear to be the case.

Overall, the list of authors frequently cited in Art Journal and DAH differed more than DAH and Art History, while Art Journal and Art History had far more in common with each other. Although DAH positions itself as a new and innovative avenue of scholarship for the field of art history, it borrow heavily from older art historians. We found only three overlapping authors between Art History and DAH besides Benjamin: Erwin Panofsky, Aby Warburg and Hans Belting. In the list of scholars frequently cited only in DAH literature, one art historian stands out: Heinrich Wölflin. Although Wölflin is considered one of the founding fathers of art history alongside Warburg and Panofsky, his methods and theory have largely disappeared in art historical scholarship. He is not frequently cited in either our Art History or Art Journal sample, but his name often appears in DAH literature (Fig. 4).

In the opening editorial of the first issue of the DAHJ, Wölflin is described as a pivotal figure for DAH:

Art history has never been afraid of new technology. Think of Heinrich Wölflin’s use of the slide projection 100 years ago. He changed the method of art history for good. [...] His scientific achievements were a game changer in perceiving, analyzing and presenting works of art in the scientific world and beyond.

Wölflin is not an arbitrary art-historical reference. On the contrary, proponents of quantitative analysis for large digital images collections have strong affinities with Wölfflin, whose concept of ‘Kunstgeschichte ohne Namen’ (art history without names) is a model and a precursor to contemporary formalist digital methodologies.

Analysis of an isolated work of art and its formal properties was not an adequate way for Wölflin to develop a systematic or evolutionary history of style akin to evolutionary models in the natural sciences; he needed to compare works with one another. Comparing two works was good, but the more works he could compare the better the system/taxonomy. Michael Ann Holly writes, “The formal attention given to one painting, for example, propelled him [Wölfflin] to take interest in another of the same generation, and in the end, his system of analysis makes sense only with reference to a large body of similar objects.” Just as a nineteenth-century naturalist could better determine the ‘ideal’ pattern or form of particular species by looking at as many examples as possible, Wölfflin’s method – like computational methods – works ‘best’ if the dataset is large.
Manovich, on the other hand, contends that Wölflin’s concept of art history without names ‘reflects the ambition of art history’s founders – Wölflin, Riegl, Panofsky – to analyze broad patterns of historical changes in visual representation and form, manifested in multitudes of artifacts that were produced across thousands of years, without limiting these investigations to small sets of important “art” objects’. He suggests that Wölflin did not (or could not) go far enough towards extracting positivist findings from his art objects, as he was limited in the number of images he could compare and by the predetermined categories they were grouped in.

It seems, then, that DAH has adopted the mindset of late nineteenth and early twentieth-century art history rather than that of more contemporary art-historical scholarship. While we do find reference to Panofsky and Warburg in Art History, the overlap between Art History and Art Journal includes theorists Roland Barthes, Gilles Deleuze, Michel Foucault, Theodor Adorno and Sigmund Freud as well as the art historians associated with them, such as Rosalind Krauss, Hal Foster and Benjamin Buchloh. Unlike these scholars of modern and contemporary art who appear frequently in Art History and Art Journal, the founding fathers of art history mentioned frequently in DAH – Panofsky, Warburg and Wölflin, as well as their successor Hans Belting – are all specialists in the study of Renaissance art. It is logical that a publication such as Art History, which publishes articles on this period, might contain references to these scholars due to their foundational work in a particular subject. It also follows that articles in a journal concerned with modern and contemporary art like Art Journal would not need to reference Renaissance specialists with any frequency.

This raises the question of why these scholars, their methodologies, and – by association – Renaissance art are so prominently featured in DAH. Reading DAH literature, there is no explicit suggestion that digital methodologies should only be applied to the study of Renaissance art. One simple explanation for this is that, as the nexus of art historical tradition, the Renaissance and its scholars confer legitimizing power, tying DAH back to some of the earliest roots of the academic discipline of art history and therefore asserting its place within disciplinary boundaries. Another way to explain the connection between DAH and Renaissance scholarship lies in the formalist bias behind the development and implementation of some digital methodologies, which follow in the footsteps of early art historians by taking the universality of iconographic methods as a given. This assumption has, of course, already been thoroughly critiqued by several generations of art historians in the last half century. It is due to this evident narrowness of early art-historical methods that art historians subsequently turned to other methods and critical frameworks. In many ways, DAH operates as if the ‘new’ art history had never come about.

One name that appears frequently in both Art History and DAH is Erwin Panofsky, but that does not mean that his work is viewed or used in the same way for both sets of articles. While the quantitative data tells us that this is a point of intersection, we need to look more closely at how Panofsky is cited. The two most appealing aspects of Panofsky’s argument to contemporary scholars in Art History seem to be his relativistic outlook as well as musings on phenomenology. This is often acknowledged, however, alongside criticism of his arguments. For example, Molly Brunson writes in 2018:
In theory, Panofsky’s task is a general one: arguing that perspective is a culturally relative symbolic form, he identifies Renaissance perspective as only one of many spatial possibilities, so that each culture and each historical moment advances its own particular way of viewing, and thus understanding, its relation to the world. And yet, by understanding the history of perspective as an evolution, Panofsky privileges Renaissance perspective as a culmination of sorts, the achievement of a modern – and Western – conception of objective space.

Articles in the Art History sample therefore acknowledge how the relativism present in Panofsky’s essay opens doors to discussion about artworks outside of Panofsky’s canon, which was limited to ancient Greek/Roman, medieval European and Italian/northern Renaissance art and architecture. For example, Brunson discusses his theories in relation to Russian art, while another article in our sample by Keith Broadfoot from 2019 draws from Panofsky in its analysis of colonialist Australian art.

Other articles that cite Panofsky marry his conception of time to more recent critical theory concerning time and space as well as our phenomenological experience of them, highlighting for example the relationship between Panofsky’s idea of perspective and that of French psychoanalytical theorist Jacques Lacan or phenomenologists Hubert Damisch and Maurice Merleau-Ponty. In cases where Panofsky’s theoretical writing is cited in Art History, the authors’ discussions of his ideas are readily mixed together and compared with those of later writers, particularly those by popular critical theorists like Lacan and Deleuze. Many of the articles from the Art History sample also cite Panofsky in ways that could be considered historiographic. Scholars tend to cite him for his importance in, and influence on, the development of the discipline rather than directly engaging with or implementing his theory.

This type of theoretical comparison is not present in DAH, where discussion of critical theory is almost non-existent. In the DAH article corpus, Panofsky citations have a different focus. Having coined a new term – ‘digital art history’ – alongside proposing new methodologies which define a new version of the discipline, the articles in our corpus naturally tend toward the historiographic when citing art historians. Very often they outline a disciplinary trajectory from forefathers of art history Giorgio Vasari and Johann Joachim Winckelmann to founders of the academic discipline such as Alois Riegl, Aby Warburg, Heinrich Wölfflin and Erwin Panofsky.

This trajectory, however, usually ends at Panofsky. While there are certainly examples in Art History where Panofsky’s iconology is cited, they typically place his work in a dialogue with other methodologies that have subsequently built on or diverged from his formulation. DAH literature, on the other hand, seems to suggest through its omission of other similar types of scholarship or critique of Panofsky that his work was the final word on the subject – until digitization came along. One example of this can be found in the writing of DAHJ editor Harald Klinke in 2016, which is framed around the methods of Panofsky and Wölfflin. Noting that digitized image databases provide ‘the opportunity to not only look at a single work of art – or the comparison of two – but that we are also able to compare more pictures than a human can look at in a lifetime’, Klinke writes that the ‘first systematic approach that comes to mind’ is that of Erwin Panofsky’s iconology. The next
scholar that Klinke’s mentions is Heinrich Wölflin. He writes, ‘Both [Panofsky’s and Wölflin’s] methods show that no other discipline looks at pictures as systematically as Art History. […] Would it not be great to go a step further and use computers …’

As Klinke points out, art-historical scholarship may begin from the cultivation of an encyclopaedic image database – whether in the mind or on a server, but this type of collecting does not produce a complete piece of art-historical scholarship. He writes that the computer ‘leaves cultural contextualization to the art-historical researcher, who can dive deeper into the individual images. Art is made by humans for humans and the computer can help us cut through the ever-expanding forest of mass visual data.’ In other words, it seems that digital tools are not suited to cultural contextualization – the ‘human’ work of the humanities. And so, here, we have a clue as to why DAH focuses primarily on scholars like Panofsky and the ‘systematic’ aspects of their thinking rather than on the ‘cultural contextualization’ step of their formalist research methods: computation is useful for archival practices that order and superficially analyse large amounts of data. This task can be accomplished on a small scale by an individual human but, in bulk, the data becomes too overwhelming for manual processing. While this might be an important step in art-historical research, the collecting or archiving process does not on its own produce insights. Collections and schemas – be they computationally or manually compiled – are resources for art historians to formulate deeper interpretation of artworks.

In ‘Is There a “Digital” Art History?’ Drucker asks the reader to ‘imagine’ a digital analysis of Jan van Eyck’s The Arnolfini Portrait (1434) which would:

track each of its material, physical, iconographic, compositional, stylistic, economic, ritual, and other features into their respective field of associations using an integrated array of computational techniques, image analysis, and close readings produced by combining digital technologies with network analysis and connoisseurship … crafting links to every known purported wedding portrait, or image of a married couple and the symbols and objects surrounding them, every painting with a mirrored reflection, other symbolic images of memento mori, other portraits of pets, scenes of domesticity and ritual, possibly of pregnancy foretold, of costume and interior decoration, of perspectival construction, point-of-view systems – the list could go on.

She offers these suggestions with the following caveat: ‘My comments on the iconography of the image may be taken as a leitmotif and suggestive reading after Panofsky, historiographic rather than authoritative in its claims and methods.’ The conclusions an art historian might draw from computational findings such as these, however, would be solidly grounded in the work’s formal, visual or material qualities (i.e. its appearance alone), which is more than merely suggestive of Panofsky. Indeed, it is very much a return to ‘old-fashioned’ iconographic methods like Panofsky’s.

Klinke’s arguments that computers will never replace the work of the art historian builds on those made by Drucker in this earlier article. She writes that computational methods are not a substitute for a ‘trained art historian’. While such techniques need not automatically lead the hypothetical trained art historian to remark or create arguments based on purely formal or material characteristics of the given artworks, Drucker’s and Klinke’s writing implies that this will be the direction the historian follows –
in the footsteps of Panofsky rather than any number of subsequent art historians, critical theorists or philosophers who have written about art and aesthetics. We contend, as our study clearly shows, that computational methods can be used to engage critically within the discipline of art history.

DAH scholarship has proposed that researchers delegate the first step (‘pre-iconographical analysis’) and second step (‘narrow iconographical analysis’) of Panofsky’s method to computers and leave the third and most complex step (‘iconographical interpretation’) to the art historian. Panofsky describes how practical experience is part of both pre-iconographic, i.e. formal, and iconographic interpretation but that each set of experiences does not ‘guarantee’ the interpretation’s ‘correctness’. In other words, the art historian not only determines the formal elements of an artwork or consults, for example, classical texts or biblical stories to discover what the artwork might depict but also needs to check these determinations against ‘controlling principles of interpretation’: the ‘history of style’ and ‘history of type’ of groups of artworks. This is where Panofsky’s method finds a corollary with computational methods of image identification/sorting. In theory, by cross-referencing a large corpus of images, a piece of software can pinpoint works that are stylistically and typologically similar so that the art historian does not need to do these steps manually.
However, the third step still involves interpretations that are dependent on superficial qualities identified in groups of artworks.

Panofsky’s iconology builds on that of Aby Warburg, who is best known for his thematically organized library and his incomplete final project, the Mnemosyne Atlas. While scholars disagree whether Warburg should be characterized as a ‘positivist’, he was certainly concerned with discovering new insights from the ‘data’ of images through visual analysis. It is his focus on formal comparison, rather than his more philosophical reflection on the tension between rationality and unreason in cultural history, that has drawn digital art history scholars toward his work. The premise that underlies automated digital image comparison/recognition, like other kinds of formalism, is that art-historical arguments should be drawn from the visual and/or material features of the artwork (or images of artwork) alone. As Hans Brandhorst writes in an article from our DAH sample, ‘... it is seductive to imagine Aby Warburg with access to the digital laboratory we have at our disposal today, no doubt feeling that his wildest dreams had come true (Fig. 5).’

Warburg’s library and image collection acted as a means by which to think through images, a tool to reconfigure and discover connections that hierarchical, mono-disciplinary or chronological systems preclude. For this reason, scholars have characterized Warburg’s *Kulturwissenschaftliche Bibliothek* as a ‘rhizomatic’ system, borrowing Gilles Deleuze and Félix Guattari’s metaphor. For those drawing a connection between Warburg and digital image collections, new digital tools offer the opportunity to avoid the inconveniences of the physical archive as well as expand the web of connections and associative possibilities through linked data and image recognition software.

In another article from 2016 in our DAH sample, Stefka Hristova ‘remaps’ panel 45 of Warburg’s atlas using Lev Manovich’s Cultural Analytics methodology. The aim in using this method is to plot colour images from the panel by their variations in hue and saturation, in an attempt to update Warburg’s theories on the use of *grisaille* by Florentine Renaissance painter Ghirlandaio. Inspired by Warburg’s formalism, Hristova treats the visual qualities of digital images as data, writing that digital humanities research projects ‘rarely analyze images per se. Instead they tend to focus on the metadata: historical and cultural information about the artifact’. Given this, Hristova maps digital images of the artworks based on greyscale, brightness, hue and saturation, labelling them according to whether the ‘title of the artwork signals associations with violence or civility and reconciliation’ and finds that similar techniques were used regardless of these themes. A critical factor left unremarked in this article, which is also a significant barrier in Manovich’s methodology as generally applied, is the assumption that digital images of artworks are ‘true’ to the brightness, hue and saturation of the artworks themselves. A Google search for any famous painting will show a variety of hues and saturations in digital image reproductions of the same work. To truly compare artworks, therefore, the digital reproductions would need to be cross-checked against one another as having been photographed under the same light conditions so that a comparison would be accurate to the actual deviation between colour composition of the works themselves.
Creating an ‘accurate’ database such as this would be a huge undertaking.

Maximiliane Schich, another DAH scholar, meanwhile questions why Warburg is not more well-known among those who deal with large image collections. In 2016 he writes:

Isn’t it ironic that a cited search for Warburg’s Bilderatlas returns a wealth of literature theorizing the approach, while the majority of practitioners that deal with large amounts of images have never heard about Warburg, even though his idea of Mnemosyne may be as important to our visual cognition and practice as the ideas of Planck are to quantum mechanics?

Looking instead at the segment of our Art History sample that cites Warburg – part of the ‘wealth of literature’ Schich describes – we found that these articles typically cite Warburg’s role in art historiography. His method is discussed primarily for its place in the history of the discipline rather than as a model for contemporary art-history scholarship. This then indirectly attests to the importance of not only searching for a specific term or author to understand a scholarly field but to combine ‘unsupervised’ searches with close reading, as done in this study. Where Warburg’s specific arguments are discussed, as was the case with Panofsky, the arguments are placed into dialogue with more recent art-historical scholarship. Part of the appeal of older art historians for DAH is that their methods derive from a historical moment where the primary objective in art history was understanding the evolution of art as well as organizing and ordering it.

**The New Old Art History**

As our distant and close reading of art-historical writing published in the last decade shows, the emerging field of digital art history seems to have several characteristics which differentiate it from mainstream art-historical writing. The higher prevalence of nineteenth- and early twentieth-century theory is especially intriguing as this area of research is often described as a ‘methodological innovation’ that provides ‘new ways of accessing its [art history’s] material and gaining unprecedented insights’. Simultaneously, DAH has been heavily criticized as having ‘theoretical problems [...] steamrollered flat by the weight of data’.

Common to both fans and critics of DAH, however, is the idea that it is a new thing. For the critics, it is something that has evolved as part of a new model of public management, in tandem with the contemporary urge to quantitatively evaluate every human activity. For supporters, on the contrary, it entails something different: for example, it has been said that it will enable researchers to substantially transform their methodologies and ask new types of research questions’ and that it will provide ‘entirely new types of information about art’.

What our meta-methodology, using mixed methods for a historiographical study of this emerging field shows, however, is that studies using computational methods are not qualitatively different from analogue art history. Rather, they are closely tied to very particular pre-digital methods and theories of art history – very traditional ones, in fact.

The main issue with the prevalence of these old-fashioned theories is that they were developed in tandem with methods for scientific distance or neutrality in humanistic study. As such, those who cite these traditional art-historical sources often obscure the fact that they are historically and ideologically biased. In other words, DAH appears to de-
historicize art historical theories and methods. By referencing art historians like Wölflin, Warburg and Panofsky and treating them as contemporaries, scholars ignore the ways in which historical methods reflect particular historical contexts. This downplays the vital role subsequent critiques have played in reshaping the discipline over the past sixty years. For example, DAH often fails to acknowledge the ways in which art-historical study has expanded beyond western art and how scholars continue to rethink the traditional canon of art history.

The current digital image analysis tools typically lend themselves to iconographic, pattern recognition and categorizations based on form or colour. Moreover, these tools favour analyses on a quite superficial level and are seldom adapted for a broader spectrum of art-historical research, since none of them were initially developed for this end, but are rather a spin-off of systems used for law enforcement, warfare and science. Both ideologically and technically, iconographic analysis and its focus on formal details and classification have the same historical roots as nineteenth-century scientific practices. The criticality which is so strongly visible in the reception of artificial intelligence systems in contemporary culture should therefore be equally applied in the development of systematic ordering of databases for artworks and for historical images in general.

While this article critiques the adherence of DAH research to the ‘old guard’ of art history, this does not mean that the use of computational tools is inherently incompatible with contemporary critical theory perspectives in the discipline. Rather than carriers of dangerous ideological baggage, computers can be viewed simply as a means to perform specific kinds of tasks. In a recent stock-taking of the field, Jaskot asks, ‘What are the critical questions in art history that demand and are best suited to specific digital methods?’ One answer to this call, which we believe the present study shows, is in the area of art-historiography. What can the way we talk about art, and how this has changed over the years, tell us about our field and the work we study? As evidenced by this study we need to continually remind ourselves that the tools we use to perform art-historical research, whether they are analogue or digital, are neither neutral nor have any inherent use. The question is not whether digital methods are inherently good or bad but rather how we choose to use them in tandem with existing humanities methods and theories to develop the discipline of art history.

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**Notes**

1. Anna Bentkowska-Kafel, “Debating Digital Art History”, *International Journal for Digital Art History*, No 1, 26 June 2015, p. 51; Michelle Millar Fisher and Anne Swartz, “Why Digital Art History?”, *Visual Resources* 30, No 2, 3 April 2014, pp. 125–137; Matthew P. Long and Roger C. Schonfeld, “Preparing for the Future of Research Services for Art History: Recommendations from the Ithaka S+R Report”, *Art Documentation: Journal of the Art Libraries Society of North America* 33, No 2, 2014, p. 202.

2. Amanda Wasielewski, “The Growing Pains of Digital Art History: Issues for the Study of Art Using Computational Methods,” in *Digital Human Sciences: New Objects – New
Approaches, ed. Uno Fors and Sonya Petersson, Stockholm, 2020.

3. Johanna Drucker, “Is There a 'Digital' Art History?”, Visual Resources 29, No 1–2, 1 June 2013, p. 7; Claire Bishop, “Against Digital Art History”, International Journal for Digital Art History, No 3, 27 July 2018, p. 123.

4. Paul B. Jaskot, “Digital Art History as the Social History of Art: Towards the Disciplinary Relevance of Digital Methods”, Visual Resources 35, No 1–2, 3 April 2019, p. 24; Anne Helmreich, Tim Hitchcock and William J. Turkel, “Rethinking Inventories in the Digital Age: The Case of the Old Bailey”, Journal of Art Historiography, No 11, 2014, pp. 1–25.

5. Murtha Baca and Anne Helmreich, eds, "Digital Art History", Special issue, Visual Resources 29, No 1–2, 2013.

6. Murtha Baca and Anne Helmreich, "Introduction", Visual Resources 29, No 1–2, 2013, p. 2.

7. Baca and Helmreich, 2013, pp. 2–3.

8. Jean Miles, "Introduction", Computers and the History of Art 1, No 1, 1989, p. 1.

9. Jaskot, 2019, p. 24.

10. Drucker, 2013, p. 7.

11. Conversations between those 'outside' DAH and 'inside' have been largely unfruitful in convincing non-DAH scholars of the virtues of computational methodologies. Bishop's ongoing debates with Drucker on the subject is most noteworthy: Bishop, "Against Digital Art History"; Johanna Drucker and Claire Bishop, "A Conversation on Digital Art History", in Debates in the Digital Humanities 2019, Minneapolis, 2019.

12. Bishop, 2018, pp. 122–131.

13. Murtha Baca and Anne Helmreich, eds, "Digital Art History", Special issue, Visual Resources 35, No 1–2, 2019.

14. The combined DAH corpus contained 61 articles in total.

15. The total number of articles from Art History was 373 and from Art Journal 215. We decided to include the first three years of decade (2010–2013) for these two journals to understand whether the digital turn in art history would carry across all journals from 2013 onward or not.

16. All texts in Art History were included except for abstracts, authors' biographies and reviews. Likewise, all texts in Art Journal were included except for information on editorial board, table of contents, funding information, reviews and art projects.

17. The major challenge for the quantitative portion of our methodology was converting the articles, which are available only in PDF format, to machine-readable text for text mining. In order to extract text and citations from PDFs, we used an open-source Java protocol called CERMINE (Content ExtRactor and MINEr). We used the resultant XML to extract plain text of either the body text or the citations. We chose to use a standard text mining method using the text mining (tm package) in R. We used two different techniques to determine the top 100 most frequently mentioned words in each datasets, minus stopwords. The first (Method A) analyzed all the text of each dataset combined together, and the second (Method B) produced a list of words that were mentioned in the highest number of articles in each dataset. In this study we have used methods B throughout. For further details on methods and the dataset see Amanda Wasielewski and Anna Dahlgren, "Mining Art History: Determining the Frequency of Citations and Key Terms from Humanities Articles in PDF", in Digital Human Sciences - New Objects - New Approaches, ed. Uno Fors and Sonya Petersson, Stockholm, 2021; Anna Nåslund Dahlgren and Amanda Wasielewski, "Cultures of Digitization: A Historiographic Perspective on Digital Art History," Visual Resources (2021) https://doi.org/10.1080/01973762.2021.1928864; Amanda Wasielewski, “Sharing the Visual Heritage. Metadata, reuse and interdisciplinary research. Text Mining Art History 2019–2020.” https://doi.org/10.7910/DVN/ORALM9

18. Lev Manovich, “Data Science and Digital Art History”, International Journal for Digital Art History, No 1, 26 June 2015, pp. 12–35; Lev Manovich, “Can We Think Without Categories?”, Digital Culture & Society 4, No 1, 2018, pp. 17–28.

19. Wasielewski and Dahlgren, 2021.

20. Bishop, 2018, p. 127.

21. Bishop, 2018, p. 127.

22. Franco Moretti, Distant Reading, London, 2013.

23. Due to the smaller size of the DAH sample (61 articles), the list of the top 35 cited bibliographic references encapsulates all authors who were cited in at least three of those articles. We considered those cited in only two of the 61 articles as too marginal to include as 'top cited'. For the larger sample sizes of Art History and Art Journal, on the other hand, we could create a longer list of top cited across the sample. So, the top 35 for Art History contains those cited in 21 (out of 373) or more articles and the top 35 for Art Journal contains those who were cited in 8 or more articles (out of 215). The actual numbers of authors for each of the top 35 lists contained approximately 35 names: Art Journal (35), Art History (36), and DAH (33). The disparity in the numbers is due to the fact that authors who were each cited in the same number of documents (tied with each other) needed to be included and so equal numbers could not be achieved. For DAH in particular the list of twice-cited authors is very long and not statistically relevant.

24. Walter Benjamin, “The Work of Art in the Age of Its Technological Reproducibility”, in The Work Of Art In The Age Of Its Technological Reproducibility, And Other Writings On Media, ed. Michael William Jennings, Brigid Doherty and Thomas Y. Levin, Cambridge, 2008, pp. 19–55.
25. Harald Klinke and Lisa Surkemper, “Editorial: What Is Digital Art History?”, International Journal for Digital Art History, No 1, 26 June 2015, p. 7.

26. Michael Ann Holly, Panofsky and the Foundations of Art History, Ithaca, 1984, p. 54.

27. This glosses over the fact that Panofsky formulated pointed critiques of both Wölflin and Riegl’s methodologies and developed his own iconology on the basis that context matters a great deal in study of art objects. Lev Manovich, “Museum Without Walls, Art History Without Names”, in The Oxford Handbook of Sound and Image in Digital Media, ed. Carol Vernallis, Amy Herzog and John Richardson, Oxford, 2013, p. 274; Holly, 1984.

28. Full list of ten authors shared between Art History and Art Journal: Roland Barthes, Hal Foster, Rosalind Krauss, Michael Fried, Gilles Deleuze, Michel Foucault, Benjamin Buchloh, Clement Greenberg, Theodor Adorno and Sigmund Freud.

29. For example, Panofsky published artist- and period-specific texts such as The Life and Art of Albrecht Dürer (1943) and Early Netherlandish Painting (1953) that are often cited in articles in Art History dealing with these topics.

30. These critiques are perhaps best represented by the term ‘the new art history’, coined in the 1980s as way to describe the turn toward critical methods in art history. These methods include by are not limited to the social history of art, Marxism, feminism, gender studies, race studies, identity politics, psychoanalysis, postcolonialism, semiotics, structuralism, and post-structuralism. Key art historians/critics who developed these perspectives from semiotics, structuralism, and post-structuralism. See for example Molina Barea and María del Carmen, The Training of Such a Programme is Another Question, p. 933.

31. In order to qualitatively understand the context of these citations, we looked manually at every instance in every article where these authors were cited.

32. Molly Brunson, “Vasily Surikov and the Russian Point of View”, Art History 41, No 5, 2018, p. 902.

33. Keith Broadfoot, “Augustus Earle’s Waterfall in Australia and the Logic of Fantasy”, Art History 42, No 5, 2019, p. 933.

34. Broadfoot, 2019, p. 933; Brunson, 2018, p. 920 note 42; Holly, 1984, p. 904–906.

35. Kamini Vellodi, “Tintoretto’s Time”, Art History 38, No 3, 2015, p. 419.

36. For example: Susie Protschky, “Dutch Still Lifes and Colonial Visual Culture in the Netherlands Indies, 1800–1949”, Art History 34, No 3, 2011, p. 512; Guillaume Cassegrain, “Mantegna the Grammarian”, Art History: Journal of the Association of Art Historians 37, No 2, 2014, pp. 280–281; Geraldine A. Johnson, “((Un)Richtige Aufnahme’: Renaissance Sculpture and the Visual Historiography of Art History”, Art History 36, No 1, 2013, pp. 41–43.

37. See for example, Alison Langmead et al., “A Role-Based Model for Successful Collaboration in Digital Art History”, International Journal for Digital Art History, No 3, 27 July 2018, pp. 152–180.

38. See for example, Protschky, 2011, p. 512.

39. Harald Klinke, “Big Image Data within the Big Picture of Art History”, International Journal for Digital Art History, No 2, 18 October 2016, p. 15.

40. Klinke, 2016, p.16.

41. Klinke, 2016, pp. 29–30.

42. Hans Brandhorst, “Aby Warburg’s Wildest Dreams Come True?”, Visual Resources 29, No 1–2, 1 June 2013, p. 82.

43. Drucker, 2013, p. 6.

44. Drucker, 2013, p. 13 note 3.

45. Erwin Panofsky, Studies in Iconology: Humanistic Themes in the Art of the Renaissance, New York, 1972, pp. 3–17.

46. Drucker, 2013, p. 6.

47. Klinke, 2016, pp. 14–37; Drucker, 2013, pp. 5–13.

48. Panofsky, 1972, p. 9, p. 12.

49. Panofsky, 1972, p. 15.

50. The training of such a programme is another question altogether. Image training in practice today is often checked against human interpretation, e.g. Google’s CAPTCHA technology. See, for example, Russell Brandom, “When AI Needs a Human Assistant”, The Verge, 12 June 2019, www.theverge.com.

51. Hans Christian Hönes, “Warburg’s Positivism: Confessions of a Truffle Pig”, Oxford Art Journal 41, No 3, 2018, pp. 361–379.

52. Brandhorst, 2013, pp. 73–74.

53. See for example Molina Barea and Maria del Carmen, “Rhizomatic Mnemosyne: Warburg, Serres, and the Atlas of Hermes”, Contemporary Aesthetics 16, 2018, www.contempaesthetics.org/newvolume/pages/article.php?articleID=812; Georges Didier-Huberman, Surviving Image: Phantoms of Time and Time of Phantoms: Aby Warburg’s History of Art, trans. Harvey Mendelsohn, University Park: Pennsylvania, 2018, p. 12.

54. Emanuela Patti and Francois Quiviger, “‘Linking Venus’: New Technologies of Memory and the Reconfiguration of Space at the Warburg Library”, Between 4, No 8, 17 December 2014, http://ojunica.cineca.it/index.php/between/article/view/1349; Naja le Fevre Grundmann, “Digitising Aby Warburg’s Mnemosyne Atlas”, Theory, Culture & Society, 6 April 2020.
Summary

Over the past decade humanities researchers have increasingly come to embrace digital methods. Art historians, however, have often resisted engaging with these developments. In this article, we explore the driving factors behind art history’s reticence toward the digital turn in the humanities. Reflecting on the historiographic trajectory of the emerging field of digital art history (DAH) versus art history more generally, we selected a sample of recent articles published between 2010–2019. We used a mixture of methods, both digital and non-digital, to uncover the prevalence for different art-historical theories in DAH versus mainstream art history. We began our study by performing a text mining analysis on the references and bibliography of articles published in DAH, Art Journal, and Art History. Once we had determined a list of frequently-cited authors, we dug deeper to see how they were discussed in the body of individual texts. In other words, we employed traditional humanities methods: close reading and interpretation. DAH is typically positioned as something completely new to the discipline. However, as this study shows, DAH is closely tied to particular pre-digital methods and theories of art history, namely formalist and iconographic methods prevalent during the late nineteenth and early twentieth-century, rather than critical theory methods commonly found in more recent art-

55. Stefka Hristova, “Images as Data: Cultural Analytics and Aby Warburg’s Mnemosyne”, International Journal for Digital Art History, No 2, 18 October 2016, pp. 116–133.
56. Hristova, 2016, p. 117.
57. Hristova, 2016, pp. 123–124, p. 126.
58. Maximilian Schich, “Figuring Out Art History”, International Journal for Digital Art History, No 2, 18 October 2016, p. 46.
59. See for example: Joost Keizer, "Portrait and Imprint in Fifteenth-Century Italy", Art History 38, No 1, 2015, p. 26; Shira Brisman, "Relay and Delay: Dürer’s Triumphant Chariots in the Era of the Post", Art History 39, No 3, 2016, p. 439; Dorothy Price and Camilla Smith, “Weimar’s Others: Art History, Alterity and Regionalism in Inter-War Germany”, Art History 42, No 4, 2019, pp. 632–634.
60. 'Mission Statement', International Journal for Digital Art History, accessed 16 March 2020, https://dahj.org/mission.
61. Bishop, 2018, p. 125.
62. Claire Bishop, a notable critique of DAH, characterizes the type of research found in DAH as ‘fatuous’ and argues that computational studies in art history demonstrate an ignorance of philosophical and theoretical histories within the discipline such as, for example, the complication in using a term like beauty. Bishop, 2018, p. 126. See also Mike Pepi, “Is a Museum a Database? Institutional Conditions in Net Utopia”, E-Flux Journal 60, December 2014, p. 11, www.e-flux.com/journal/60/61026/is-a-museum-a-database-institutional-conditions-in-net-utopia/.
63. Long and Schonfeld, 2014, p. 201.
64. See for example the Frankfurt school of the 1930s, the ‘new’ art history of the 1980s and the social history of art, which arose in the nineteenth century but completely supplanted formalism from the 1950s onwards. Jonathan Harris, The New Art History: A Critical Introduction, London, 2007; B. Aulinger, “Social History of Art”, in Grove Art Online, 2003, www.oxfordartonline.com:80/subscriber/article/grove/art/T079457.
65. See for example the software InceptionV3, initially developed within medicine, used in the art historical project “Coding Our Collection: The National Gallery of Art Datathon”, www.youtube.com/watch?v=ewm4Cl3vn6k.
66. See for example Allan Sekula, ”The Body and the Archive”, October, No 39, 1986, pp. 3–64; Peter Hamilton and Roger Hargreaves, The Beautiful and the Damned: The Creation of Identity in Nineteenth Century Photography, Aldershot, 2001; Jeremy Melius, “Connoisseurship, Painting, and Personhood”, Art History 34, No 2, 2011, p. 298.
67. Jaskot, 2019, p. 22.
historical scholarship. Based on our analysis, we argue that DAH methods have not been embraced by art historians more generally because of fundamental differences in the theoretical underpinnings of DAH versus the broader field of art history.

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