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LETTER FROM THE EDITOR-IN-CHIEF

Dear Reader,

It is with great pride that I introduce the second volume of the *Harvard Art Law Review*. What we began last year as an ambitious effort to create a dedicated space for art law within Harvard has, in this short time, grown into a dynamic forum for exploring the legal structures that shape cultural production, preservation, and meaning. It has been a privilege to lead this publication, and I am delighted to share this volume with you.

The contributions in this issue reflect the breadth of the field of art law. From the transnational complexities of antiquities trafficking and restitution disputes to the human rights dimensions of cultural heritage, these pieces examine how law mediates our relationships with culture, our communities, and the past. At the same time, this volume looks toward the future. Several pieces grapple with the legal and artistic challenges posed by emerging technologies, particularly artificial intelligence, to the longstanding doctrines of authorship and originality.

This volume is a testament to international collaboration and intellectual curiosity that transcends borders and disciplines. I am honored to present a *Review* that brings together voices from across the world, across academic fields, and across stages of practice.

This issue would not have been possible without the passion and dedication of my editorial team, whose thoughtful engagement and hard work demonstrate the promising future of the *Review*. I am deeply grateful for their work, as well as for the authors who endeavored on this process with us.

Art remains a powerful and universal tool for expression, connection, and understanding. This *Review* seeks to contribute meaningfully to conversations about the vital role of art and the importance of its protection. As someone who believes that art is truly a fundamental part of the human experience, I hope that this issue inspires continued engagement with art and its many intersections with the law.

Sincerely,

Shira Fischer
Editor-in-Chief
Harvard Art Law Review

AUTHENTICATION EX MACHINA: ISSUES OF ADMITTING EVIDENCE OF AI ART AUTHENTICATION IN U.S. COURTS

Victoria Maatta *

I. INTRODUCTION

For better or worse, the use of AI is becoming increasingly common in daily life—the art market is no exception. AI technology has been created by several companies and academic institutions to aid in the authentication of artworks. Companies create these AI programs by feeding them datasets composed of known works by a given artist in order to teach the AI to detect the differences between authentic versus inauthentic works. Some of these datasets include works that are attributed to an artist by connoisseurs.

Using AI to prove a work's authentication can be advantageous because the tool is considered more "objective" than human authentication[1] and therefore, less prone to error. However, in one case, two different AI examinations of the same work purportedly by Raphael, the *De Brécy Tondo*, rendered differing results. This case study raised alarm, as the two programs theoretically should have reached the same conclusion, calling the accuracy and objectivity of these AI authentication systems into question.[2] This raises an important question: how unbiased can the AI be when they are developed based on subjective connoisseurship?

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[1] Giacomo Prideaux, *Artificial Intelligence and Art Authentication*, HEPHAESTUS ANALYTICAL (Aug. 2022), https://www.hephaestusanalytical.com/blog/artificial-intelligence-and-the-detection-of-forgery-in-art-authentication.

[2] Sharon Hecker, *Authenticity in Art: What if Artificial Intelligence is Not Objective? A Reflection After Raphael*, ART LAWYERS ASSOCIATION (Nov. 15, 2023), https://www.artlawyersassociation.com/post/authenticity-in-art-what-if-artificial-intelligence-is-not-objective-a-reflection-after-raphael?postId=0326cdf5-c1d4-4e30-b5f4-5938385bee2c&utm_campaign=cfd58eda-2b76-4ff5-b91a-34adea9cdd29&utm_source=so&utm_medium=mail&utm_content=a724bf3d-50ab-4438-880b-2e51674ed828&cid=fd509524-baed-43fa-be8e-3aeaafe0147e.

In addition to the issues of whether AI is a truly objective means of authentication, using the results as evidence in court may be complicated. AI authentication is a unique combination of two authentication processes—subjective connoisseurship and technical analysis.[3] Yet, courts have evaluated these two authentication regimes differently when deciding their admissibility and use as evidence.[4] The AI's process of combining the two methods thus leaves an open question as to how prospective courts will treat this new technology. Will AI blur the boundary between the two authentication regimes? Or will courts choose to categorize AI as a method of either technical analysis or connoisseurship?

This paper explores potential issues with admitting AI authentication results into evidence in United States Courts under the Federal Rules of Evidence ("FRE") on expert testimony and impeachment. First, it examines the history and jurisprudential treatment of authentication through connoisseurship. Then, it discusses the use of AI in art authentication, including the Raphael case study. Finally, the paper addresses the legal framework under the FRE for admitting expert evidence and impeaching witnesses and discusses how the courts might apply the FRE to AI authentication cases in the future.

II. THE ROLE OF THE CONNOISSEUR IN ART AUTHENTICATION

Connoisseurship has been defined as "the study of works of art, based on form, decoration, and other aesthetic criteria to determine their authenticity."[5] Throughout art history, artworks were typically authenticated by connoisseurs,[6] and for much of that history, connoisseurs were seen as imperative because of this role.[7] Connoisseurs are able to attribute a work to an artist, or their school/workshop, as well as to a specific place and time.[8] Art historian Gary Schwartz describes connoisseurship as a "close analysis and comparison as a means of judging the quality, authorship, and authenticity of works of art."[9] Brewer unpacks this

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[3] *OUR TECHNOLOGY*, https://art-recognition.com/our-technology/ (last visited Aug. 19, 2024); OUR AUTHENTICATION PROTOCOL, https://www.hephaestusanalytical.com/#authentication-section (last visited Aug. 19, 2024); HASSAN UGAIL ET AL., *Deep Facial Features for Analysing Artistic Depictions – A Case Study in Evaluating 16th and 17th Century Old Master Portraits*, IEEE, 4 (Feb. 6, 2022).

[4] *Hahn v. Duveen*, 234 N.Y.S. 185 (N.Y. Sup. Ct. 1929).

[5] Patty Gerstenblith, *Keynote 1: Getting Real: Cultural, Aesthetic and Legal Perspectives on the Meaning of Authenticity of Art Works*, COLUM. J.L. & ARTS, Vol. 35, No. 3, 338 (2012).

[6] David Ebitz, *Connoisseurship as Practice*, ARTIBUS ET HISTORIAE ,Vol. 9, No. 18, 207 (1988).

[7] *Id*.

[8] *Id.*

[9] John Brewer, *Evaluating Valuation: Connoisseurship, Technology, and Art Attribution in an American Court of Law*, OXFORD UNIV. PRESS, 90-93 (2015).

description: he explains that one portion of the role of the connoisseur is aesthetic—a judgment of quality—while the other is empirical—a judgment of whether an artist created the work.[10]

The connoisseur's expertise and practice in authentication have made them highly valuable throughout history.[11] This expertise includes a deep knowledge and understanding of an artist's processes, workshop practices, use of models, and labour division.[12] Connoisseurs have also been known to possess a unique skillset in recognizing quality, the ability to recreate an artist's creations, a strong visual memory,[13] and, of course, the "practiced eye."[14] The expert's eye was thought to effectively identify the genuine works of artists.[15] For example, in the case of the Old Masters, it is not uncommon for a painting's attribution to be rooted in the opinion based solely on the expert's eye.[16] As such, attributions are often predicated on an intuitive assessment as to the quality or feel of the work.[17]

While connoisseurship in the 19th century was sometimes accompanied by historical/empirical analysis through provenance research,[18] it does not de-emphasize the importance of the connoisseur's eye throughout history. Though the intuitive aspect of connoisseurship expertise is considered a cliché, art historian Max Friedlander noted that "the first impression is deeper than all subsequent ones, of different kind and of decisive importance," suggesting that the work's visual quality takes priority in an assessment.[19] Since connoisseurs relied on their intuition, it was commonly thought that some connoisseurs had a better *eye* than others[20] and different opinions could be reached by different connoisseurs.[21] However, there is a notable debate in the scholarship, with many maintaining that connoisseurship on its own is unreliable in determining authenticity.[22] This is because an attribution to a given work that was once accepted can become rejected

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[10] *Id*.

[11] Ebitz, *supra* note 6, at 207.

[12] *Id*. at 208.

[13] Ebitz describes "visual memory" as that which allows a connoisseur to be able to internalize, categorize, and perceive visual components of works to render judgment on others.

[14] Ebitz, *supra* note 6, at 208.

[15] Gerrit Verhoeven, *Mastering the Connoisseur's Eye: Paintings, Criticism, and the Canon in Dutch and Flemish Travel Culture, 1600-1750*, EIGHTEENTH-CENTURY STUD., Vol. 46, No.1, 36 (Fall 2021).

[16] MARTIN WILSON, ART LAW AND THE BUSINESS OF ART 148-149 (2nd ed., 2022).

[17] Ebitz, *supra* note 6, at 209-210.

[18] Brewer, *supra* note 9, at 95.

[19] *Id*.

[20] *Id*.

[21] Isabel Paintin, *The Art of Connoisseurship through Judicial Eyes: The Law of Negligence and Fine Art Attribution*, 20 ART ANTIQUITY & L. 101 (2015).

[22] Gerstenblith, *supra* note 5, at 338.

later, oftentimes as a result of new technical analyses such as infrared imaging,[23] X-ray analysis,[24] or chemical analysis.[25]

The connoisseur's role is most important in two areas of the art world: the market and the auction house. A work deemed authentic goes up in value exponentially compared to copies, fakes or forgeries.[26] To demonstrate,[27] a likely authentic *Salvator Mundi* by Leonardo da Vinci sold for $450.3 million,[28] while a copy of *Salvator Mundi* was sold for €1 million (a staggering amount).[29] Meanwhile, the ability to confirm a work's authorship is "at the heart of the role of the auctioneer."[30] In the United Kingdom, for example, international auction houses are entitled to rely on their internal experts and connoisseurs when attributing works rather than needing to employ a technical analysis.[31]

For context, connoisseurs were of the utmost importance in the late 19th and early 20th century in the U.S. market due to a boom in demand for collecting Old Masters by the ultra-rich.[32] Many of these wealthy collectors were uneducated on the arts, so they relied on connoisseurs to help them make smart purchases.[33] The increased demand for acquiring European art brought a similar demand for conclusive attributions.[34] As Friedländer noted, "[d]ealers and collectors are not

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[23] *Id*.

[24] Paintin, *supra* note 21, at 106.

[25] Dea Sula, *New Tools for Old Problems: Artificial Intelligence as a New Due Diligence and Authentication Tool for the Art Market?*, CENTER FOR ART LAW (Sept. 20, 2023) https://itsartlaw.org/2023/09/20/new-tools-for-old-problems-artificial-intelligence-as-a-new-due-diligence-and-authentication-tool-for-the-art-market/.

[26] Gerstenblith, *supra* note 5, at 325.

[27] Connoisseurship is not the only factor that identified *Salvator Mundi* as a potential sleeper. The author solely uses this example to demonstrate the effects authenticity have on the art market on a disputed painting. *See* Tim Brinkhof, *Was the mysterious, $450-million "Salvator Mundi" really painted by Leonardo da Vinci?*, BIG THINK (Sept. 30, 2022), https://bigthink.com/high-culture/salvator-mundi-leonardo-da-vinci/#:~:text=Looking%20at%20the%20Salvator%20Mundi,everybody%20had%20been%20looking%20for.

[28] Gareth Harris, Leonardo's $450m Salvator Mundi returns as an NFT, The Art Newspaper (Aug. 8, 2023), https://www.theartnewspaper.com/2023/08/08/leonardos-450m-salvator-mundi-returns-as-an-nft#.

[29] Bendor Grosvenor, *Badly preserved Salvator Mundi copy—which sold for staggering €1m—could be more valuable than once thought*, THE ART NEWSPAPER (Jan. 23, 2023). https://www.theartnewspaper.com/2023/01/23/does-paris-salvator-mundi-have-something-up-his-sleeve.

[30] Wilson, *supra* note 16, at 144.

[31] Thwaytes v. Sotheby's [2015] EWHC 36 (Ch).

[32] Brewer, *supra* note 9, at 90-93.

[33] *Id*.

[34] *Id*.

served by suppositions; they demand a positive choice."[35] Those acquiring cared for the artist's genius more than the technical or physical traits of their works; this attitude creates a landscape where attribution establishes the work's quality, as opposed to the quality establishing the attribution.[36]

III. THE ROLE OF AI IN ART AUTHENTICATION

Art authentication is one of many AI technologies being put to use in everyday life.[37] Several companies, including Hephaestus Analytical ("Hephaestus") and Art Recognition, as well as academics, like Professor Hassan Ugail, have developed AI programs to improve art authentication by creating "precise" and "objective" evaluations[38] intended to provide the art world with a "high[er] evidentiary standard."[39] This paper refers to three AI systems collectively as "the Programs."

Broadly, the Programs use neural networks[40] to create the algorithms that allow AI to sift through datasets and seek patterns to reach accurate and precise conclusions about a work in question.[41] Portions of the Programs' databases are derived from the existing records of authentic works by an artist. Ugail's data seems to be substantially based on connoisseur opinion.[42] However, it is less clear whether this is the case for Hephaestus and Art Recognition. While it is not public how much of the data is based on connoisseurship, much of art history relied on connoisseurship for authentication. As such, it is likely that a significant portion of the authentic work datasets are based on connoisseurship.[43]

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[35] *Id.*

[36] *Id.*

[37] Indeed, many works have become embroiled in science-based authenticity debates. *See e.g.* Noah Charney, *Is That Painting a Lost Masterpiece or a Fraud? Let's Ask AI*, WIRED (Mar. 20, 2025) https://www.wired.com/story/is-that-painting-a-lost-masterpiece-or-a-fraud-lets-ask-ai/.

[38] SHAPING TOMORROW'S ART AUTHENTICATION WITH AI, https://art-recognition.com (last visited Aug. 19, 2024).

[39] HEPHAESTUS ANALYTICAL, https://www.hephaestusanalytical.com (last visited Aug. 19, 2024).

[40] Oxford Dictionary defines neural networks as "a computer system which is designed to work in a similar way to the human brain and nervous system."

[41] Tim Schneider, *Why A.I. Art Authentication Isn't Necessarily the Game-Changer the Industry Wants It to Be (and Other Insights)*, ARTNET (Oct. 5, 2021) https://news.artnet.com/market/rubens-art-recognition-ai-authentication-2017274.

[42] UGAIL ET AL., *supra* note 3, at 19.

[43] This also may depend on the artist. As discussed in *Section II*, Old Masters were often authenticated as a result of connoisseurship. As such, perhaps a Rubens dataset in the Programs would be largely based on the connoisseur's eye.

Theoretically, each program should come to the same conclusion. However, in a case study of a potential Raphael, *de Brécy Tondo*, two programs yielded two different results after analysing the same work.[44] Ugail's program determined that the work was "undoubtedly" a Raphael, while Art Recognition determined that it was 85% likely to *not* be a genuine Raphael.[45]

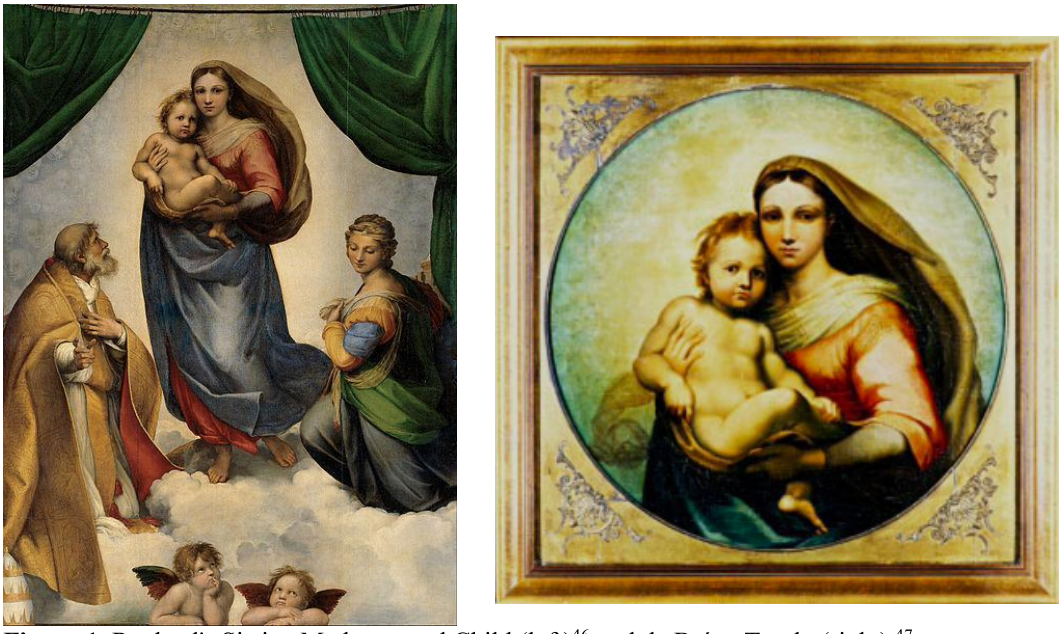

Figure 1. Raphael's Sistine Madonna and Child (left)[46] and de Brécy Tondo (right).[47]

This discrepancy may be due to the differing processes or designs in the technologies used.[48] Ugail's AI-assisted facial recognition found that the faces in *de Brécy Tondo* were "an exact match" and "identical" to the Madonna and Child in the Sistine Chapel, a conclusion which he reports could not be so surely made by the human eye.[49] Where there is a 75% similarity between faces, the faces are considered identical.[50] Here, there was a 97% similarity between the Madonnas of

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[44] Hecker, *supra* note 2.

[45] *Id*.

[46] 2012, CC 2.0 via Wikimedia Commons.

[47] Hassan Ugail, *Mystery portrait is "undoubtedly" Raphael masterpiece, according to new scientific analysis*, UNIV. OF BRADFORD (Jan. 16, 2023), https://www.bradford.ac.uk/news/archive/2023/raphael-discovered-by-facial-recognition-technology-.php.

[48] RAPHAEL: THE DE BRÉCY TONDO, https://art-recognition.com/case-studies/raphael-the-brecy-tondo/ [hereinafter "AR Raphael"].

[49] Ugail, *supra* note 48.

[50] *Id*.

the paintings and an 86% similarity between the two depictions of the Child.[51] With this information, he concluded that the model in both works was the same person and therefore the works were by the same artist, Raphael.[52] By comparison, Art Recognition creates datasets of high-quality images for a particular artist as well as a contrast set of works by known imitators and documented forgeries, which enables the AI to discern a real from a fake.[53] Additionally, Art Recognition's process examines the whole of the picture, not just the face.[54] The broader aspects of the work, such as the chromatics and brushstrokes, led the program to conclude that it was unlikely to be a Raphael.[55]

There is a tension between the opinion of AI and that of art experts, as many experts also disagree with Ugail's finding. [56] One expert is quoted saying, "[w]hile I am always open to the use of new technologies and approaches, I would not support an assessment of authenticity that relies on AI. True connoisseurship relates to the expert judgment of the trained eye and is so much more than mechanically matching brushstrokes and images."[57] Another has said "[t]his story is so perfectly AI; it can't tell what's real or not […]. One phone call to any half-decent Raphael scholar is all they needed."[58] Others believe that basing the authentication analysis on facial recognition misses the point: that the facial features were intended to match, because *de Brécy Tondo* was a copy.[59] These reactions reflect the view that connoisseurship is not only still relevant despite technical analysis options, but should not be cast aside in the wake of AI.

The technology is indistinguishable from a typical battle of the experts.[60] Since it is a technical analysis, though, it needs to be able to be repeated by a third-party neutral who can confirm the results independently.[61] In these early days of AI authentication, relying on independent testing raises a number of issues, as

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[51] *Id*.

[52] *Id*.

[53] OUR TECHNOLOGY, *supra* note 3.

[54] AR Raphael, *supra* note 49.

[55] Carina Popovici, *Two A.I. Models Produced Different Results When Authenticating a Raphael Painting. Here's Why That Doesn't Undermine the Tool's Potential*, ARTNET (Oct. 23, 2023), https://news.artnet.com/art-world-archives/ai-authentication-raphael-painting-op-ed-2373793.

[56] Gareth Harris, *'Clearly a copy from the 19th century'—Old Masters scholars reject AI-attributed Raphael*, THE ART NEWSPAPER (Jul. 26, 2023) https://www.theartnewspaper.com/2023/07/26/clearly-a-copy-from-the-19th-centuryold-masters-scholars-reject-ai-attributed-raphael.

[57] *Id*.

[58] *Id*.

[59] *Id*.

[60] Hecker, *supra* note 2.

[61] Hecker, *supra* note 2.

exhibited by the case study and as discussed in *Section V(A)(iv)*. Without this possibility, the results may be too subjective to be likened to traditional technical analysis. Indeed, falling into the "objectivity trap" with AI should be avoided because humans are the ones controlling the programs, how they are designed, what data is used, etc., ultimately imbuing some human subjectivity into the results.[62]

A. Case Law

Connoisseurs have made an indelible impact on art history, but their role in the courts is perhaps less widely known. Attributions premised on one's intuition can invariably lead to legal disputes.[63] When faced with an attribution dispute, a court is faced with the difficult task of attempting to objectively review a highly subjective attribution.[64]

The seminal case involving attribution by connoisseurship is *Hahn v. Duveen*.[65] In *Hahn*, the Hahn family sued art dealer Joseph Duveen for slander of title after Duveen told a reporter that the painting they owned, *La Belle Ferronnière,* was not a genuine Leonardo.[66] As a result, the Hahns claimed damages against Duveen for disrupting an ongoing negotiation for a museum's acquisition of the work.[67]

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[62] Schneider, *supra* note 42.
[63] Paintin, *supra* note 21, at 101.
[64] *Id*.
[65] 234 N.Y.S. at 185.
[66] *Id*.
[67] *Id*. at 186.

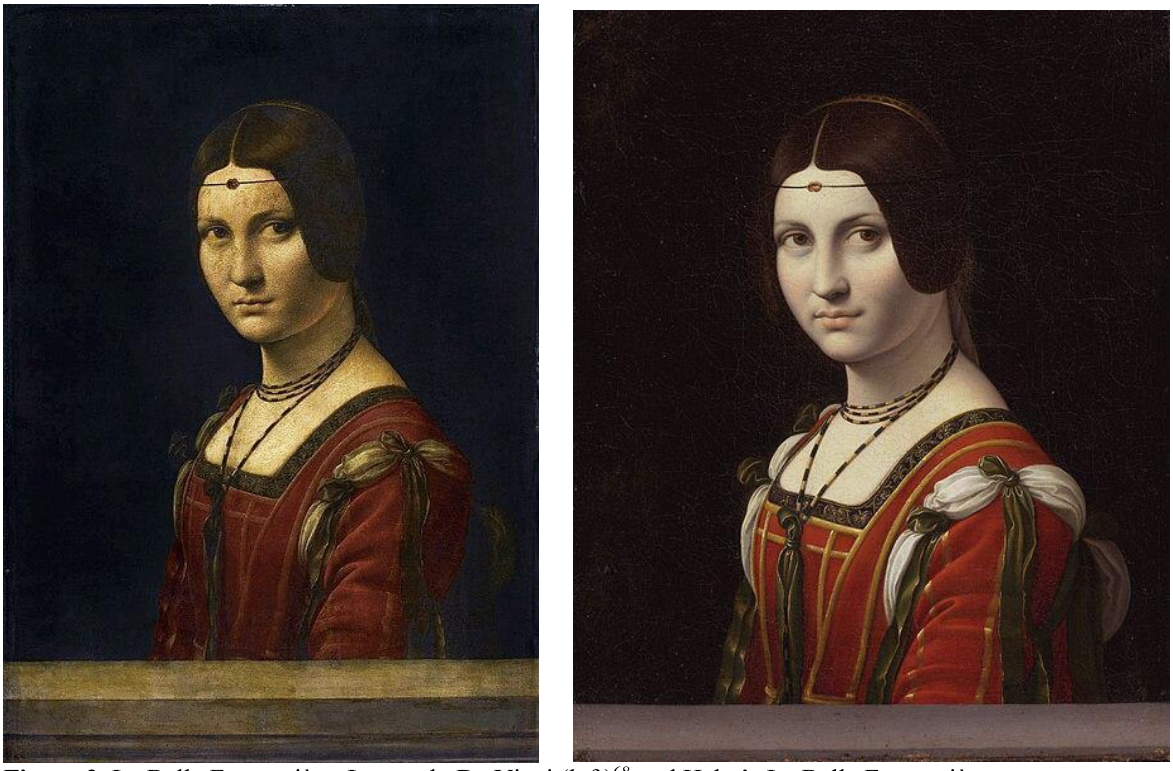

Figure 2. La Belle Ferronnière, Leonardo Da Vinci (left)[68] and Hahn's La Belle Ferronnière (right).[69]

Hahn focused on the dispute between different regimes and how they handle authentication,[70] ultimately turning the case into a battle of the experts.[71] The weight given to the differing expert opinions in this matter was pivotal because the accepted evaluation of the work would profoundly impact its subsequent market value.[72] The judge instructed the jury that there were two avenues through which to view the expert evidence: the authentication history of the painting offered by the expert and the methodology used by the expert.[73] This instruction highlights that documentary evidence and physical analysis are necessary to establish an attribution "founded on facts" over opinion.[74] Judge Black even cautioned that some experts will rely on speculation originating from a "psychological

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[68] 2022, CC 2.0 via Wikimedia Commons.

[69] 2011, CC 2.0 via Wikimedia Commons.

[70] In fact, Duveen wanted connoisseurs to gain legitimacy in the court system, so their opinion could weigh even more in the art market. Brewer, *supra* note 9, at 90, 98.

[71] 234 N.Y.S at 193.

[72] Brewer, *supra* note 9, at 89.

[73] 234 N.Y.S at 190.

[74] Brewer, *supra* note 9, at 101.

correlation."[75] This caveat exemplifies how this dispute occurred at a point in connoisseurship history, where the tradition of understanding driven by informed intuition clashed with the forensic techniques that were being used by courts.[76]

Duveen argued that scientific evidence should not be relied upon because it ignored the work's quality.[77] While Duveen's expert connoisseurs were reticent to even describe their qualifications to the court, Hahn's expert provided X-ray evidence of the two paintings.[78] Though the expert explaining the X-ray was not an art expert, the jury found their explanation more compelling than the following statements made by Duveen's experts. His first expert, Sir Martin Conway, explained his reasoning for rejecting the work's authenticity as: "I simply look at the Hahn picture and the impression produced on my mind is that it is not by Leonardo."[79] Similarly, Duveen's second expert, Maurice Brockwell, testified that, "[i]t is a question of psychology, not of the magnifying glass; it is the mind of the great master that we see, the spiritual content, the psychological correlations."[80] Lastly, Bernard Berenson described having a "sixth sense...dispirit acts almost unconsciously."[81] None of their testimonies were derived from any sort of technical analysis, instead, they were admittedly exercises in pure subjectivity and intuition.[82] Judge Black instructed the jury that this intuitive outlook "is not based upon enough objectiveness to convey definite meaning to a jury."[83] Reporting on the case, *Time Magazine* summarized the method: "Arguments on technique, expression, nuances of genius, only served to exhibit the latitude and variance of personal opinion."[84]

The decision ended with a hung jury, favoring Hahn.[85] When the question of a retrial was posed, Duveen's lawyers interestingly rejected a retrial, arguing that the law cannot reach a determination on a matter of opinion over fact.[86] With its instruction and decision, the court did not accord legal legitimacy to connoisseurship.[87] The case offers a glimpse into the opposing views that

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[75] 234 N.Y.S at 192.
[76] Brewer, *supra* note 9, at 95.
[77] *Id*.
[78] 234 N.Y.S at 193-195.
[79] Brewer, *supra* note 9, at 101.
[80] *Id*.
[81] *Id*.
[82] *Id*.
[83] 234 N.Y.S at 192.
[84] Brewer, *supra* note 9, at 103.
[85] *Id*. at 104.
[86] *Id*.
[87] *Id*.

connoisseurs and courts have as to the reliability of technical analysis. The court clearly prefers technical analysis.

The *Hahn* court's logic was shared in *Greenberg Gallery, Inc. v. Bauman*, a case pertaining to the authenticity of a Calder mobile, where one expert mostly formed his opinion based on a "feeling," whereas an expert for the opposing party based her opinion predominantly on the "flawless" provenance.[88] The court found that the work was authentic, relying more on the documentary evidence, like the provenance, than the feel of the mobile in making their decision.[89] From this case, the court demonstrates that expert testimony on art is given more weight where the opinion derives from empirical data over subjective feeling.

This is not to say that courts (1) never trust the testimony of an art expert or (2) that they are eager to make an affirmative ruling on a work's attribution. In *Thome v. Alexander & Louisa Calder Foundation*, the plaintiff sought positive authentication of their Calder work from the Calder Foundation, because the work the plaintiff owned was not included in the catalogue raisonné.[90] The issue was whether private foundations are legally obligated to authenticate works.[91] The plaintiff sought a judgment from the court declaring the work an authentic Calder.[92] The court denied the plaintiff's request for declaratory judgment on the basis that authentication involves an expert's informed and subjective expertise, holding that "[t]he law cannot give an art owner a clear legal right to a declaration of authenticity when such a declaration by definition will not be definitive."[93] This case is representative of the premise that authentication is made by the market and not by law.[94] However, *Thome* does not undermine the approach taken by the courts in *Hahn* or *Greenberg*. Instead, it simply holds that courts are not the venue by which to authenticate art.[95]

B. Applicability to AI Authentication

The fact that a connoisseur's opinion has been too subjective for courts in the past leads to the question of whether the datasets used by AI tools may also be considered too subjective. This is a timely issue, because if this technology becomes more popular, and more people rely on its use prior to art transactions, the results of the technology could ostensibly be used in attribution disputes. Consider

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[88] 817 F. Supp. 167 (D.D.C. 1993), aff'd, 36 F.3d 127 (D.C. Cir. 1994).
[89] 817 F. Supp. At 169, 174-5.
[90] 70 A.D.3d 88 (N.Y.A.D. 1 Dept., 2009).
[91] *Id*. at 94-96.
[92] *Id*. at 96.
[93] *Id*. at 99.
[94] *Id*. at 101.
[95] *Id*. at 99.

this hypothetical: Seller seeks an assurance as to a work's authenticity through an AI program before selling the work. Purchaser buys the work because of the AI's assurance as to the authenticity. Years later, Purchaser seeks to sell the work, but the authenticity is disputed, and the value of the work has decreased significantly since the time of purchase. She may seek a claim for misrepresentation and/or negligence and damages in court and try to introduce the AI's result into evidence. Under *Hahn* and *Thome*, her strategy presents the following issue: the AI is based on subjective connoisseurship but is also a form of technical analysis.

This case sets a precedent for the weight assigned to a connoisseur's opinion compared to technical analysis. Both judge and jury favoured the science over the connoisseur's eye because the eye can be too subjective of a standard. Yet, *Hahn's* and *Greenberg's* prioritization of technical and documentary analysis over connoisseurship might create an issue for the Programs. In a way, the Programs are a combination of both authentication regimes: they employ connoisseurship in their datasets, or otherwise engage in a degree of subjective analysis, but are simultaneously technical due to their scientific nature.

In the hypothetical posed, a party would seek to bring in evidence of the AI's report. At first blush, under *Hahn* and *Greenberg*, a court would likely favor the report's admissibility as it is based on a technical analysis, which theoretically limits subjectivity. This is because it would seem that the conclusion reached by the AI would be based on facts over opinion.[96] However, based on the hesitation to consider connoisseurs' opinions fully reliable (by scholars and courts), one may question if the datasets actually represent fact over opinion.

Though the Programs are technical, some of their makeup is psychological (which *Hahn* warns against). Who is to say that a work within an authentication set was not deemed an authentic Leonard because of a "sixth sense"? Without that work's attribution being bolstered by technical analysis and/or documentary evidence, the Programs' results would be seemingly no different than that of a connoisseur. In this vein, a court might not give the Programs the same weight that it gave other technical analysis in *Hahn*, blurring the boundary of how courts treat subjective connoisseurship and technical analysis.

IV. LEGAL FRAMEWORK AND ANALYSIS FOR ADMITTING EVIDENCE

Apart from the *Hahn* consideration, parties may have issues with admitting expert evidence based on the AI authentication results and may even be able to impeach such evidence. In any evidence analysis, one must first consider the thresholds to admissibility. To be admissible, evidence must be relevant to the

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[96] *Id*. at 191.

matter at hand. Under FRE 401, evidence is relevant if it has any tendency to make a consequential fact more or less probable than it would be without the evidence. Evidence that is irrelevant is not admissible.[97] In an attribution dispute, the information produced by the Programs will likely be deemed relevant under FRE 401 if the judge concludes that the Programs' authenticity assessment makes it more or less likely that the work is authentic.

Further, the court must consider FRE 403, which requires the exclusion of relevant evidence where the "probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury." FRE 403 does not disqualify conflicting evidence; for example, the varying determinations in the Raphael case study could be admitted into evidence if needed. Therefore, under normal circumstances, it is unlikely that the Programs' evidence would be found to risk unfair prejudice to one of the parties, mislead the jury, be needlessly cumulative, or cause undue delay.[98]

A. Expert Evidence

The admission of technical reports typically requires an expert to validate and explain them in order to be admissible.[99] Courts will need to look at whether the testimony will meet the requirements under *Frye* or *Daubert*. The expert in question would likely be a developer of the technology used by the program, who would be well-versed in the program's development and in interpreting the results.[100]

1. *Frye*

Courts initially relied on *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923) to determine the admissibility of expert evidence. Upon the defendant's conviction for second-degree murder, the case was before the court to determine whether

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[97] Fed. R. Evid. 402.

[98] Fed. R. Evid. 403.

[99] Melendez-Diaz v. Massachusetts, 557 U.S. 305, 308, 311, 329 (2009).

[100] To the author's knowledge, there are no present cases regarding the qualifications for an AI expert. *See e.g.,* Cahoo v. Fast Enterprises LLC, No. 17-10657, 2021 WL 1037727 (E.D. Mich. Mar. 18, 2021) (holding the defense was not permitted to admit expert testimony on whether the program in question was a form of AI because the opinion the examiners were not qualified to make such a conclusion). However, with the potential adoption of FRE 707, expert testimony may not be required. *See* Kristen Libonati, *Man vs. Machine: Proposed Federal Rule of Evidence 707 Aims to Combat Artificial Intelligence Usage in the Courtroom*, *Through Expert Testimony Standards*, Villanova Law Review (Sept. 22, 2025) https://www.villanovalawreview.com/post/3458-man-vs-machine-proposed-federal-rule-of-evidence-707-aims-to-combat-artificial-intelligence-usage-in-the-courtroom-through-expert-testimony-standard.

expert testimony regarding the results of a blood pressure test was admissible into evidence.[101] The defendant took this test to determine whether he was either lying or guilty (thought to be linked to blood pressure) and the defendant's counsel sought to enter expert testimony on the test into evidence.[102] To be admissible, "the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs."[103] Where the test in question had not been "generally accepted" among the appropriate scientific authorities, the information from such a test was inadmissible.[104]

2. *Frye* Analysis

Under *Frye*, expert testimony on some of the Programs will likely be admissible where the AI is developed using a generally accepted practice. Many AI programs are based on neural networks.[105] For example, Art Recognition utilizes two types of neural networks to analyse details "from brushstroke patterns to color palettes."[106] The process studies the elements of the work on a broad scale as well as minute details.[107] Smaller segments of the work are, in a way, zoomed into, and these minute details are extracted.[108] The tool also cross-validates the data to identify an efficient model, which "enhances the model's strength and consistency."[109] This type of coding and computer programming is in fact a generally accepted way to create AI programs throughout relevant scientific communities.[110]

On the other hand, Ugail's program uses "deep-learning," or convolutional neural networks, another generally accepted development method, which allows machines to "learn by example."[111]

Hephaestus, however, requires further analysis. The development of Hephaestus' machine learning is a proprietary system called "Pictology,"[112] which

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[101] 293 F. at 1013.
[102] *Id*. at 1014.
[103] *Id*.
[104] *Id*.
[105] Schneider, *supra* note 42.
[106] OUR TECHNOLOGY, *supra* note 3.
[107] *Id*.
[108] *Id*.
[109] *Id*.
[110] Stefano Bianchini, Mortz Müller, Pierre Pelletier, "Artificial intelligence in science: an emerging general method of invention," Elsevier, Vol. 51, 1 (Dec. 2022); *See also* Steven J. Frank, This AI Can Spot an Art Forgery, IEEE Spectrum (Aug. 23, 2021), https://spectrum.ieee.org/this-ai-can-spot-an-art-forgery.
[111] UGAIL ET AL., *supra* note 3, at 1.
[112] Prideaux, *supra* note 1.

is their stylometric algorithm.[113] Similar to the other Programs, the learning is trained on high-resolution images comprising homogeneous data and including fixed variables.[114] Where the information is proprietary, a court could potentially issue a Protective Order, which would allow the scientific method to be reviewed while also maintaining necessary confidentiality.[115] As such, while it is likely that Hephaestus utilized a similar approach as the other Programs for their Pictology technology, it would require more investigation to determine whether the method used is generally accepted under *Frye*.

The *Frye* standard sets a low threshold. Research indicates that the processes by which these programs were developed are generally accepted by the scientific community. As such, the expert witnesses could provide support for admitting the results of the Programs into evidence under the *Frye* standard.

3. *Daubert* and FRE 702

Frye was replaced by the FRE and its interpretation under *Daubert*.[116] However, the Supreme Court, before *Daubert*, did not formulate factors to determine expert testimony admissibility, so some circuit courts are conflicted as to the appropriate test."[117] Therefore, some jurisdictions often still analyse a question of expert evidence under *Frye*.[118]

In *Daubert*, Merrell Dow, a major pharmaceutical company, was sued by plaintiffs to recover for birth defects that were claimed to be caused by a drug ingested by the mothers.[119] The relevant issue was whether the admission of certain expert testimony by the District Court and the Court of Appeals was proper.[120] Both the District Court and the Ninth Circuit Court of Appeals reviewed the testimony under *Frye* and held that the petitioners' expert evidence did not meet the "general acceptance" standard.[121] The US Supreme Court granted certiorari and heard the case.[122]

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[113] Agata Becker, "Art Authentication: Interview with Denis Moiseev of Hephaestus Analytical," Institute of Art and Law (Jan. 29, 2024), https://ial.uk.com/hephaestus-analytical/.

[114] Prideaux, *supra* note 1.

[115] *See e.g.,* State v. Pickett, 466 N.J. Super. 270, 246 A.3d 279 (App. Div. 2021).

[116] 509 U.S. at 579.

[117] 1 Expert Witness Checklists § 1:301 (3d ed.).

[118] *See e.g.* State v. David D., 53 Misc. 3d 1041, 37 N.Y.S.3d 685 (N.Y. Sup. Ct. 2016). However, courts will balance the interests, as it will depend on the information available and whether disclosure is necessary. *See e.g.,* Congoo, LLC v. Revcontent LLC, No. CV 16-401 (MAS), 2017 WL 3584205, 4 (D.N.J. Aug. 10, 2017).

[119] 509 U.S. at 579.

[120] *Id*.

[121] *Id*. at 584.

[122] *Id*. at 579.

The Court looked to FRE 702, which does not provide "general acceptance" as a factor.[123] However, it places "appropriate limits" on an expert testimony's admissibility, as the judge must ensure that the testimony is reliable and relevant.[124] The Court elaborated that the testimony must be scientific (i.e., "ground[ed] in the methods and procedures of science") and connote knowledge that is "more than subjective belief" but "facts."[125] However, the Court said that for the testimony to be "scientific knowledge," it must be "derived by the scientific method," as it then "establishes a standard of evidentiary reliability."[126]

The *Daubert* Court also looked to other factors: (1) whether the method can be tested, (2) if the method were subject to peer review and/or publication,[127] (3) the methodology's rate of error, (4) any recognized standards, and (5) though not solely and not required, whether it is generally accepted.[128] The list is non-exhaustive, but each factor may bear weight on the admissibility.[129] In considering these factors, a court may look to the professional organization in question's standards[130] or perhaps current regulations in the field.[131] Inquiry into the testimony is flexible, and the focus should be on the methodology of how the expert reached the conclusion, not the conclusion itself.[132] This is important because, under the rules and in comparison to FRE 701,[133] experts are allowed to provide an opinion on the case, even if they lack the personal knowledge or observation.[134]

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[123] *Id*.

[124] 509 U.S. at 579.

[125] *Id.* at 590.

[126] *Id*.

[127] There could be an instance where a science is too particularized or new to have been published. Courts must take this into account, as "good science" depends on peer review to determine any methodological errors. 509 U.S. at 593, *citing* J. Ziman, Reliable Knowledge: *An Exploration *594 of the Grounds for Belief in Science 130–133 (1978); Relman & Angell, How Good Is Peer Review?*, 321 NEW ENG. J. MED. 827 (1989).

[128] 509 U.S. at 593-594.

[129] *Id*. at 597.

[130] *See* United States v. Williams, 583 F.2d 1194 (2d Cir. 1978).

[131] Gabrielle M. Haddad, *Confronting the Biased Algorithm: The Danger in Admitting Facial Recognition Technology Results in the Courtroom*, 23 VAND. J. ENT & TECH.L. 891.

[132] 509 U.S. at 595.

[133] Fed. R. Evid. 701 covers the admission of opinion testimony by a lay witness, provided it "is limited to one that is: (a) rationally based on the witness's perception; (b) helpful to clearly understanding the witness's testimony or to determining a fact in issue; and (c) not based on scientific, technical, or other specialized knowledge within the scope of Rule 702."

[134] 509 U.S. at 595. Indeed, the Judicial Committee on Rules of Practice and Procedure is working to adopt FRE 707 to directly address "machine-generated evidence absent accompanying expert testimony." With the rule, parties would be required to meet the FRE 702 analysis. *See* Libonati, *supra* note 101. The author does not consider this proposed rule in more depth, however, because it has not yet been adopted. However, it demonstrates the import of the subject matter.

4. *Daubert* and *FRE 702* analysis

The first question is relevance. Similar to the FRE 401 and 403 threshold, FRE 702(a) and (b) contemplate the relevance of the expert evidence.[135] In an authenticity dispute, expert testimony on a program's findings could help a jury determine a painting's authenticity. Further, expert testimony on the subject may aid a jury in understanding the process for AI authentication; the processes are complicated, and a layperson would need an explanation to reach a verdict. Under FRE 702(b), there will need to be "sufficient facts or data" for expert testimony to be admissible, which is to be evaluated on a case-by-case basis.

A court will then look to the *Daubert* elements. First, these Programs are testable and the tests can be repeated. This is evident by the various case studies that each Program has published.[136] However, it needs to be repeatable by a third party. This may raise two sub-issues. The first sub-issue is a question of effectiveness and efficiency. As demonstrated in the Raphael case study, the testing of the Programs may depend entirely on the exact process. Repeating the tests would require substantial transparency regarding how the Programs are taught as well as access to the datasets. To gather every known work of an artist by one company is already a daunting task, of which scholars are questioning the possibility.[137] To have another company repeat this without the first company's disclosure would be equally or more daunting and probably not cost-effective. The second sub-issue raised is one of public access. Developers test their products to refine them.[138] For example, Art Recognition tests the training by looking at the evaluation's precision and recall to see how well the AI determined authenticity from forgery within the data set.[139] Their peer-reviewed publication does offer insight into the testing process and results, that the public and courts could easily access.[140] However, these types of tests are not typically publicly available, which creates a need to compel disclosure.[141] Hephaestus and Ugail's programs do not have substantive information about testing available to the public. As such, this element weighs in favour of Art Recognition's admissibility. This is bolstered by

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[135] *Id*. at 580, 591.

[136] *See* Hecker, *supra* note 2; Prideaux, *supra* note 1; Sula, *supra* note 25.

[137] Hecker, *supra* note 2.

[138] Haddad, *supra* note 133, at 905.

[139] OUR TECHNOLOGY, *supra* note 3 (emphasis added).

[140] JOHANN OSTMEYER ET AL., *Synthetic images aid the recognition of human-made art forgeries*, ARXIV (Dec. 22, 2023 rev. Feb. 15, 2024), https://arxiv.org/abs/2312.14998.

[141] Haddad, *supra* note 133, at 905. The only dataset shared publicly relates to the Raphael case. *See* AR Raphael, *supra* note 49.

the decision in *Hahn*, because it favours the technical side of the program. The other two Programs may be less likely to admit evidence under this element.

Second, Art Recognition and Ugail's program have undergone a peer review, favoring admissibility under *Daubert*.[142] It is not apparent if Hephaestus' program has been peer-reviewed. While Hephaestus could provide evidence of a peer review, the court would note its absence if none were conducted, and it would weigh against admissibility. Additionally, the proprietary nature of these programs could raise an issue: where a private company will not allow academics to study the inner workings of their technology, there is a question of how meaningful that peer review would be.[143]

Third, the Programs each carry a favorable rate of error. Art Recognition has proven that a Van Gogh was authentic with a 97% accuracy rate,[144] Hephaestus has achieved a 98.2% accuracy rate in a study comparing a Canaletto to a Bellotto,[145] and Ugail says that facial recognition can reach up to 100% accuracy, depending on the data.[146] The Programs maintain higher accuracy than others that currently exist, which tend to yield 90% accuracy rates.[147] These are high levels of accuracy. However, the Raphael case study results undermine these rates. Further, an opposing party could raise the issue of subjectivity within the datasets, making the accuracy rate irrelevant under both *Daubert* and *Hahn*.

The fourth prong may consider two standards: art authentication standards and general AI standards. First, a court may note that there is not necessarily a singular recognized standard by which art is authenticated. In addition to technical analysis, art can be authenticated by a connoisseur, by a certificate of authenticity, by a work's inclusion in a catalogue raisonné, and via provenance research.[148] Again, technical analysis is preferred in the courts because it is more objective. For example, chemical analysis discovering an anachronistic paint pigment will prove that a work is inauthentic. Hephaestus and Ugail seem to use a holistic approach, including chemical analysis in their approaches.[149] Art Recognition's program uses brushstroke analysis,[150] a technical process that analyses surface topography.[151]

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[142] RESEARCH AND ACADEMIC PARTNERSHIPS, https://art-recognition.com/research-academic-partnerships/ (last visited Aug. 19, 2024); UGAIL ET AL., *supra* note 3.

[143] Haddad, *supra* note 133, at 906.

[144] Sula, *supra* note 25.

[145] Prideaux, *supra* note 1.

[146] UGAIL ET AL., *supra* note 3.

[147] Frank, *supra* note 111.

[148] Prideaux, *supra* note 1.

[149] OUR AUTHENTICATION PROTOCOL, *supra* note 3; UGAIL ET AL., *supra* note 3, at 19.

[150] OUR TECHNOLOGY, *supra* note 3.

[151] Benjamin Sutton, *Researchers train AI to attribute paintings based on detailed brushstroke analysis*, THE ART NEWSPAPER (Jan. 4, 2022),

Considering the historical legitimacy afforded to technical analysis and the support for this under *Hahn*, this element weighs towards admissibility.

The issue, however, will come from a secondary aspect of element four. AI is a relatively new technology, and law and policy are struggling to keep up. Regulatory standards on AI are presently quite limited; for example, there are no standards to ensure the accuracy of private companies' algorithms.[152] There are also no regulations on data collection to develop and train algorithms or regulate the use of AI; meanwhile, laws that do exist are limited in their application.[153] The Biden Administration issued what is known as the "AI Bill of Rights," which outlines principles for the safe development and use of AI.[154] Relevantly, the first principle calls for AI development by experts who will prevent extraneous or improper data from forming the algorithm to ensure safe and effective programs.[155] Though this executive order is not binding, a court could look to it for guidance in place of actual regulations. For example, in evaluating the Programs, a court could examine the process by which data is entered for machine learning and whether any of the data was improper. Since there are no binding standards yet, it weakens the probability that expert evidence would be admissible,[156] especially since the expert would be predominantly an expert in AI as opposed to an expert in AI art authentication programs specifically.

Finally, under *Daubert,* a court will again look at whether the method is "generally accepted." In addition to the above analysis under *Frye*, a court will consider FRE 702(c).[157] However, that standard alone "should not be applied in federal trials."[158] Again, it appears as though the Programs are likely to be considered generally accepted. However, the Raphael case study highlights an issue with reliability. The differing methodologies produced different results, which boils down to an opinion on the work rather than a testable scientific fact. Though the Programs are rooted in scientific methodology, the practice still seems to connote subjective belief and may be generally unreliable.

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https://www.theartnewspaper.com/2022/01/04/artificial-intelligence-attributes-paintings-brushstroke-analysis.

[152] Haddad, *supra* note 133, at 898.

[153] *Id*. at 899; HOPE ANDERSON ET AL., *AI Watch: Global regulatory tracker - United States*, WHITE CASE (May 13, 2024) https://www.whitecase.com/insight-our-thinking/ai-watch-global-regulatory-tracker-united-states#:~:text=Laws%2FRegulations%20directly%20regulating%20AI,AI%20albeit%20with%20limited%20application.

[154] BLUEPRINT FOR AN AI BILL OF RIGHTS, https://www.whitehouse.gov/ostp/ai-bill-of-rights/ (last visited Aug. 19, 2024).

[155] *Id*.

[156] Haddad, *supra* note 133, at 907.

[157] 509 U.S. at 584.

[158] *Id*. at 589.

While not discussed in *Daubert*, a court will also look to FRE 702(d). An expert on the Programs must demonstrate that the data was reliably applied. A court will not admit the expert testimony of a conclusion where the program was not properly used. For example, if a Program requiring a contrast set did not compare the work in question to a contrast set, it is likely that the court would find that the tool was not properly applied. In the Raphael case, a party could argue that Ugail's facial recognition technology is not holistic enough and is therefore unreliable for attribution. Alternatively, a party could claim that Art Recognition did not study the face reliably. As such, in that example, this factor may also weigh against admissibility.

The issues raised under *Daubert* may distinguish AI authentication from other forms of technical analysis that do not present these issues. For example, the Ninth Circuit found in favour of expert testimony as to the use of infrared imaging.[159] The court found that the methodology was reliable, met existing industry standards, and the methodology was capable of being explained.[160] Though the court in this case did not analyse every element, the methodology favoured toward admissibility[161] for reasons that an expert on AI authentication may be inadmissible, emphasizing the above-noted issues.

In summary, a court might not readily admit expert testimony about the Programs for the following reasons: the logistical issues in testing the methodology due to the nature of art authentication, the obstacles in obtaining proprietary information to evaluate, the lack of AI industry standards by which to base the methodology, general unreliability, and, in the case of Hephaestus, the lack of peer-reviewed publications.

Yet, a court would balance such factors against others that weigh toward admissibility, such as the high accuracy rates, the fact that neural networks are a generally accepted way to develop AI programs, and the fact that the Programs are indeed capable of repeat testing. While bringing in evidence of an AI's determination on a work may be extremely convincing to a jury in an art dispute, having the expert testimony to explain it and make it accessible to a jury may not be readily feasible under *Daubert*.

B. Impeaching a Biased Witness

1. Bias

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[159] Pyramid Techs., Inc. v. Hartford Cas. Ins. Co., 752 F.3d 807 (9th Cir. 2014).
[160] *Id.*
[161] *Id.*

A benefit of using AI authentication is that AI is, purportedly, without bias because it is "a mechanical process rather than an individual's personal opinion."[162] In fact, the Programs are marketed as *unbiased* authentication tools. Hephaestus published an article stating that "[w]hile human experts may rely on subjective judgments and personal biases, AI algorithms can provide consistent and evidence-based assessments, reducing the risk of human error and bias in the authentication process."[163] Art Recognition uses cross-validation in their technology,[164] which is said to have a lower level of bias than alternative ways of checking a program's efficiency.[165] Further, Art Recognition's website advertises that their product is "100% objective and unbiased" and that the "[r]esults are purely data-driven, with no human intervention."[166] In his paper, Ugail refers to the tool's potential due to the "unbiased scientific analysis" it offers.[167]

Nevertheless, many scholars question whether AI, generally, can be unbiased.[168] One study focuses on bias manifested through racial discrimination.[169] Emile Loza de Siles offers insight into the technological processes that can allow bias to arise in data, modelling, algorithm development, and use of AI programs.[170] To either eliminate bias, or make it apparent, it is essential to test for bias at each step in the process, such as in the data input stage.[171] Selecting the input data is a "multistep set of processes by which data are sourced, vetted, corrected, augmented and transformed" and then are presented by algorithmic processes.[172] Theoretically, it should be possible to eliminate any AI bias.[173] On the other hand, by eliminating or mitigating one bias, another may develop.[174] As such, there is a balance that AI program developers need to strike.

Bias in AI could look like "favouritism towards some things, people or groups over others."[175] The origin of the bias could be varied, but could come from "biases within human cognition and societies."[176] These subjectivities are then, in

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[162] Sula, *supra* note 25.
[163] Prideaux, *supra* note 1 (emphasis added).
[164] OUR TECHNOLOGY, *supra* note 3.
[165] *Id*.
[166] SHAPING TOMORROW'S ART AUTHENTICATION WITH AI, *supra* note 39.
[167] UGAIL ET AL., *supra* note 3, at 202.
[168] Emile Loza de Siles, *Artificial Intelligence Bias and Discrimination: Will We Pull the Arc of Moral Universe towards Justice?,* REVISTA FORUMUL JUDECATORILOR, 51 (2022).
[169] *Id*. at 42.
[170] *Id* at 46.
[171] *Id*. at 48.
[172] *Id*.
[173] *Id*.
[174] *Id*. at 51.
[175] *Id*.
[176] *Id*

a way, coded into AI.[177] Further, bias could arise at varying stages in the process, but especially during data sourcing and collection.[178]

The risk of bias in AI is widely acknowledged. For example, the Institute of Electrical and Electronics Engineers, a technical professional organization, has various working groups to create best practices around AI and bias.[179] However, regulations on bias in AI dataset collection are lacking. For example, President Biden's October 2023 Executive Order does provide some best practices for using AI responsibly and avoiding bias perpetuation and discrimination, but the order does not provide any guidance on dataset best practices to avoid bias in the first place.[180] Where best practices do exist, they are not always consistently followed and these companies often "pick and choose" what information to disclose in an enquiry.[181]

While the scholarship on AI does not contemplate bias in the sense of human subjectivity *per se* (focusing more on discriminatory effects) the notion that AI authentication is unbiased is questionable at best. Furthermore, the lack of objectivity is also raised by the Raphael case study.

2. *Abel*

The next means that could present an issue with AI authentication evidence is impeachment. The FRE covers a party's ability to impeach a witness by "attack[ing] the witness's credibility."[182] Under *United States v. Abel*, 469 U.S. 45, 50–51, 105 S. Ct. 465, 468, 83 L. Ed. 2d 450 (1984), bias can be a valid form in which to impeach a witness. In *Abel*, the court examined the admissibility of testimony from the defendant's fellow gang member.[183] The gang's tenets to "lie, cheat, steal [and] kill to protect each other" caused concern for allowing the testimony into evidence.[184] In this case, the District Court admitted the testimony that impeached the defendant's witness.[185] The Court of Appeals found that the

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[177] Schneider, *supra* note 42.

[178] Loza de Siles, *supra* note 171, at 51.

[179] *Id*

[180] Exec. Order No. 14110, 88 F.R. 75191 (2023).

[181] Arpit Gupta, *Industry AI "Standards" May Be a Good Band-Aid, But We Need Enforceable Standards in the Long Run*, TECHPOLICY. PRESS (Apr. 15, 2024) https://www.techpolicy.press/industry-ai-standards-may-be-a-good-bandaid-but-we-need-enforceable-standards-in-the-long-run/.

[182] Fed. R. Evid. 607.

[183] 469 U.S. at 45.

[184] *Id*. at 48.

[185] *Id.* at 46-47.

admission was improper.[186] The Supreme Court granted certiorari and ultimately held that the District Court did not err in admitting the evidence.[187]

Successful demonstrations of a witness's bias would make the facts to which they testified seem less probable to the jury than if that testimony were absent.[188] The court in *Abel* defines bias as:

> a term used in the 'common law of evidence to describe the relationship between a party and a witness which might lead the witness to slant, unconsciously or otherwise, his testimony in favours of or against a party. […] *Proof of bias is almost always relevant because the jury, as finder of fact and weigher of credibility, has historically been entitled to assess all evidence which might bear on the accuracy and truth of a witness's testimony.* The 'common law of evidence' allowed the showing of bias by extrinsic evidence [...].[189]

The gang's tenets demonstrated that the witness had a strong motive to bias his testimony in favour of the respondent, leading the court to find that the evidence of the bias was admissible and could be used to impeach the witness.[190]

In addition to cross-examination, parties may introduce extrinsic evidence to demonstrate bias.[191] This contrasts with FRE 608(b), which permits impeachment of a witness's character for truthfulness through cross-examination but prohibits the use of extrinsic evidence. Allowing extrinsic evidence to show bias highlights the significance of proving it in court.

3. *Abel* Analysis

A party seeking to impeach the Programs' results as biased could cite *Hahn's* note that expert opinions based on "psychological correlation" are "too introspective and subjective to be the basis of any opinion a jury can pin its faith upon."[192] Such a party may also consider citing *Daubert*'s standard of "knowledge" which favors facts over subjective belief.[193] While this type of bias is not exactly what the court in *Abel* contemplated, it is a risk to admit such evidence because the

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[186] *Id.*
[187] *Id.*
[188] *Id* at 51.
[189] *Id* at 52. (emphasis added)
[190] 469 U.S. at 46, 54- 56.
[191] *See e.g.,* Coates v. United States, 113 A.3d 570 (D.C. 2015).
[192] 234 N.Y.S at 192.
[193] 509 U.S. at 590.

core of the issue is the same: it allows a jury to review evidence that is skewed to one side rather than neutral information on which they could base their decision. This is because, again, the results can be likened to opinion over fact.

A component that poses problems in determining if an AI program is biased is the lack of transparency. AI programs are proprietary and their trade secrets are unlikely to be disclosed.[194] For example, some police departments use AI facial recognition but contract with private companies that will not disclose trade secrets if the information the technology yields is in dispute.[195] The issue goes deeper because there are currently no enforceable standards that will require companies that develop AI to disclose certain information about their engineering or programs.[196]

Furthermore, it is unclear whether the Programs are developed in a biased or unbiased manner. Although the Programs do provide some public information on their processes, these processes have the intention to eliminate bias. The following process summaries by each company may help demonstrate how the Programs try to remain objective.

Hephaestus' AI is trained on high-resolution images that have been determined to be authentic artworks in conjunction with fixed variables,[197] which "eliminates the need for very large data sets that can be difficult to acquire and curate."[198] The technology creates a "fingerprint," which captures aspects of the work's creation, such as "the pressure exerted by a paintbrush on a canvas."[199] The AI will take the artist's specific characteristics and assign each characteristic a value that "assesses its contribution to the artist's style."[200] Hephaestus then completes provenance research for the work in question, consults with a connoisseur, and conducts a chemical analysis to ensure the materials' ages align with the attribution.[201]

Art Recognition's process starts with a database on each artist.[202] For the system to identify fakes, the company integrates a contrast set of works.[203] The contrast set also includes forgeries in the style of the artist that is created by generative AI.[204] The company creates multiple versions of the image which vary

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[194] Haddad, *supra* note 133, at 903.
[195] *Id.*
[196] Gupta, *supra* note 184.
[197] OUR AUTHENTICATION PROTOCOL, *supra* note 3.
[198] *Id.*
[199] Prideaux, *supra* note 1.
[200] *Id.*
[201] OUR AUTHENTICATION PROTOCOL, *supra* note 3.
[202] OUR TECHNOLOGY, *supra* note 3.
[203] *Id.*
[204] *Id.*

in contrast, luminosity, and hue so that the AI can more consistently identify authentic works despite how the photo of the work was taken.[205]

The dataset for Ugail's program uses deep learning to differentiate painting styles in addition to facial recognition data.[206] The program is based on so-called "objective" expert determinations of authorship.[207] It also provides facial data that is qualified as either "perfect" or "imperfect" to improve the datasets for each part of the face.[208]

While the processes and prevention for bias are extensive, the issue is that a portion of the datasets are based on subjective connoisseurship. This is especially the case for Hephaestus' and Ugail's programs because their datasets are not comprehensive. Hephaestus uses a limited sample of authenticated works in their datasets, while Ugail's do not seem to corroborate expert determinations with other means of authentication. Of course, information to the contrary that is not currently available to the public could be disclosed in discovery.

A final question to explore is this: how should a court treat this combination of subjective connoisseurship and technical analysis? Would the fact that some of the Programs employ further technical analyses, like chemical analysis, trump the psychological nature of the connoisseurship included in the dataset? Would a court dismiss the notion that subjective data could create a biased AI attribution?

Abel was concerned with the witness's propensity to lie on the stand, thus creating a biased witness who is not necessarily trustworthy in their testimony. This is an inherently different type of bias than the bias that may occur in AI art authentication. However, a party contesting the admission of the Programs' determinations could still present a valid argument under *Abel*. This is because of the court's definition of bias. While it does say that bias is a descriptor of the *relationship* between the party and the witness, it also includes that "which might lead the witness to slant, unconsciously or otherwise, his testimony in favours of or against a party."[209] In theory, it is not the case that bias has to arise solely through the party's relationship to the matter.

Here, the results may be biased when the data includes degrees of subjectivity. Whether the data is fully or partially based on the determination of a connoisseur, that very subjectivity becomes part of the dataset. A connoisseur's determination of authenticity based on feeling only, without provenance research or technical analysis, may frankly result in an incorrect attribution. Basing an attribution on feeling could demonstrate a connoisseur's bias towards any number

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[205] *Id.*
[206] UGAIL ET AL., *supra* note 3, at 19.
[207] *Id*.
[208] *Id.*
[209] 469 U.S. at 52.

of things: a certain artist, period, subject matter, color use, style, and composition. For example, hypothetically, feelings of dislike toward a subject matter may subconsciously lead a connoisseur to deem a work inauthentic, in turn polluting the dataset. An incorrect attribution would then permeate the dataset and could create false positives when analysing another painting. Despite the various tests undertaken by the Programs, the final result is inherently biased as it favors one result over another. This may be impeachable because an undermined attribution could tarnish the evidence of the case and lead a jury to an incorrect result.

To prove bias, a party could present extrinsic documentary evidence. For instance, a party may show (1) the percentage of works in a "genuine works" dataset that were authenticated by a connoisseur and (2) the percentage of works in an 'inauthentic works" dataset that were deemed inauthentic by a connoisseur. This statistical data would illustrate the inherent subjectivity within the dataset. However, this information will not always be publicly available. For example, Art Recognition made their Raphael dataset publicly accessible only after the controversy.[210] The public information includes each high-resolution image of authentic and inauthentic works used to train the AI.[211] Additionally, they provided a spreadsheet with details about each work, such as its title, date, medium, and location.[212] What is missing from this public information, however, is how much of this data is based solely on connoisseurship as there is no explanation for how, or why, a work was deemed genuine. The burden of disclosing this information would be on the impeaching party, but again, a court could require it in discovery (with a Protective Order).[213] If an arguing party could obtain information on the amount of data that is based on connoisseurship, then that party should be allowed to admit that information into evidence to inform a jury of the likelihood of a subjective result.

A party opposing impeachment would argue that a court may ultimately decide that the AI is not a witness at all. The New York Court of Appeals heard a case where the defendant sought to question the developer of an AI source code, arguing that the source code was a witness and that he had the right to question that witness.[214] Indeed, a source code is essential to understanding the inner workings of an algorithm.[215] The court, however, denied this argument, advising that the source code was not a testimonial witness and that the argument raised more of a

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[210] ART RECOGNITION RAPHAEL TRAINING DATA SET, https://github.com/Art-Recognition/Raphael_Dataset (last visited Aug. 19, 2024).

[211] *Id.*

[212] *Id.*

[213] 466 N.J. Super. At 270.

[214] People v. Wakefield, 38 N.Y.3d 367, 195 N.E.3d 19, reargument denied, 38 N.Y.3d 1121, 192 N.E.3d 1152 (2022).

[215] Haddad, *supra* note 133, at 910.

discovery issue than an evidence issue.[216] This is essentially because the source code itself cannot be cross-examined.[217] This would also be the case with the Programs themselves. Of course, it would be impossible to call the AI itself to the stand (at least, with the current technology). However, technical reports, such as a lab report or an authentication report, are inadmissible unless a technician can validate the report.[218] It is necessary to have an agent to testify as to the report. The author argues that the information provided by the agent regarding the report may be impeachable due to bias. As such, the analysis concerning a party's ability to impeach the Programs' agents as witnesses stands.

The potential for bias in AI art authentication is a distinct reality. Parties should not immediately assume otherwise based on the preconceived notions of AI and should be able to impeach such information to ensure that a court's findings are based upon neutral information, not subjective opinions. While the Programs themselves are not the impeachable witness, the agents testifying on them would have to testify to the results reached from biased input, which could be impeachable.

V. CONCLUSION

While AI art authentication is likely the future of attribution—and may lead to the most accurate attribution results overall—using AI attribution as evidence in legal disputes may not be so straightforward. Due to the tradition of placing importance on a connoisseur's attribution, AI technology based on connoisseurs' opinions may create problems for admitting AI attributions as evidence.

Under *Hahn*, objective technical analysis is prioritized in evidence over subjective feelings or opinions. However, there are aspects to AI authentication technology that are subjective. Moreover, several implications must be considered when attempting to admit expert testimony on these Programs under *Daubert*. Finally, parties may have valid arguments for impeaching the AI reports due to bias under *Abel*.

These complications do not tend to shed light on which authentication regime would carry more weight in court, as AI authentication presents issues unique to both subjective and technical analysis. In fact, the analyses show that a party seeking to admit evidence of these reports could be blocked either on the technical methodology side under *Daubert* or by way of impeachment under *Abel*. Therefore, though AI authentication is a form of technical analysis, it may not be readily admitted.

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[216] 38 N.Y.3d 378.
[217] 38 N.Y.3d 385.
[218] 557 U.S. at 308.

Though AI authentication has the potential to be the leading technology to accurately authenticate artworks, there will be hurdles to admitting such evidence when a court hears an attribution dispute.