

Wolfgang Reuter, Gründer und Geschäftsführer der Art Intelligence GmbH,

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Artificial Intelligence in Art Authentication

As generative AI models increasingly shape our daily lives (or are used as a matter of course in all kinds of fields), the corresponding apps still struggle greatly when it comes to identifying the authors of artworks. For instance, if you upload a photo of a painting to Google Image Search, the AI will usually give you an answer naming an artist — but these answers are often incorrect. Forgeries are frequently identified as authentic, while questionable originals go unrecognized — especially when their motifs resemble those of genuine works. Here are two examples:



AI-Text:

The image shows a painting by Max Pechstein titled "By the River." It depicts a landscape with a river, buildings, and trees, with colors applied in a bold and expressive manner. The reflection of the red house in the blue water is a central element of the composition.

Actually sold as "attributed to" for \$300.



AI-Text:

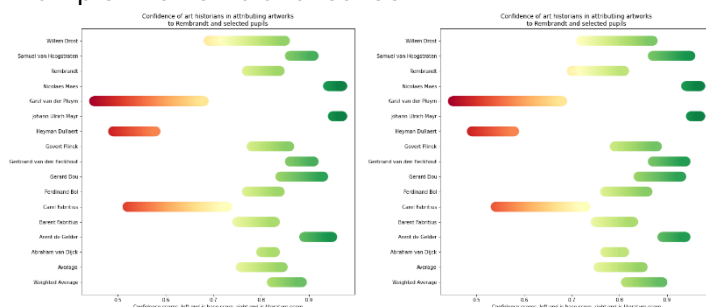
The image shows a painting by the German Expressionist Max Pechstein (1881–1955). It depicts a family with a dog in a landscape. Pechstein was a member of the artists' association "Brücke" and mainly created figure paintings, still lifes, and landscapes.

Actually sold as „Manner of Max Pechstein“.

The reason for this is fairly simple. AI doesn't just need a lot of data — which it now has access to (the associated copyright violations will not be discussed here). More importantly, it needs correct data.

But such data is hard to come by in the art world.

Example: the Rembrandt school:



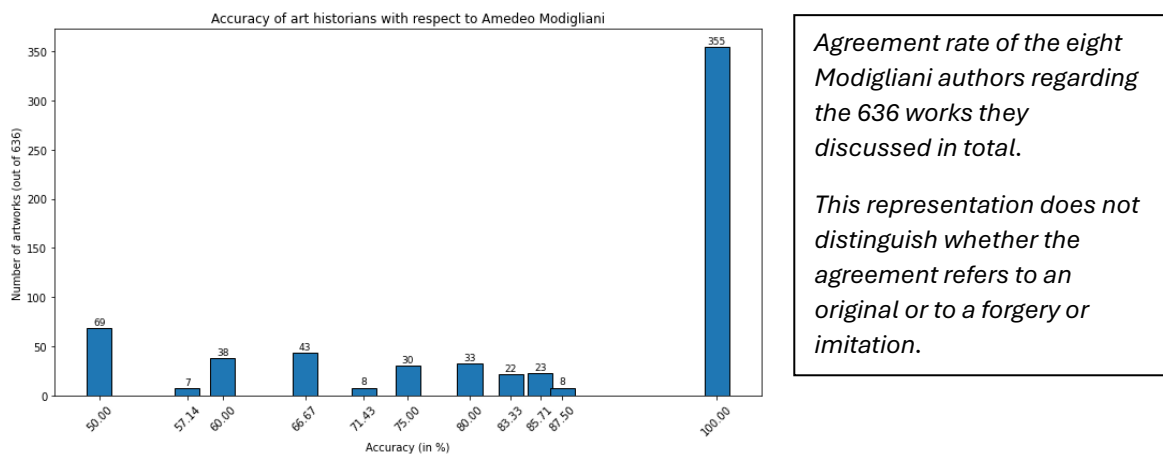
Accuracy of art historians (established upper and lower bounds) based on the RKD dataset. Left: all works; right: only oil paintings. The methodology of this study is explained in detail in:

<https://www.kunstgeschichte-ejournal.net/601/>

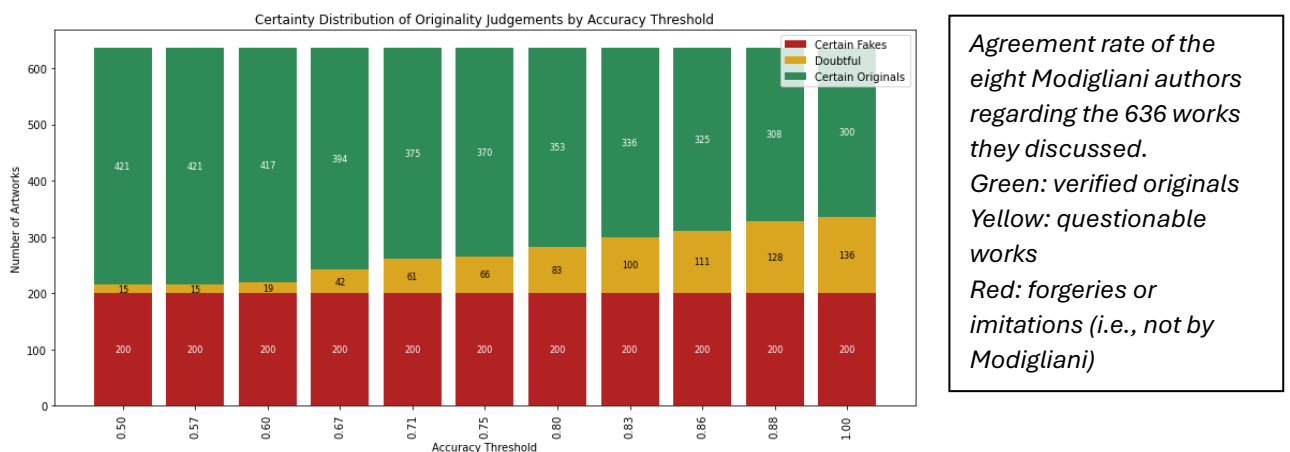
The agreement rate among the experts varies greatly between the individual pupils. For Rembrandt paintings, it ranges between 70 and 81 percent and is somewhat higher for all works.

Example Modigliani:

Here, the uncertainty among experts (eight catalogues raisonn ) is particularly high. The authors examined 636 works by the Italian Expressionist, and their judgments were painstakingly compiled by Francisco Garcia and published on the website. This dataset forms the basis for the following analysis.



All eight authors agree on only 355 works — but this also includes consistent rejections. However, AI for art authentication requires verified originals. Considering only these, the agreement rate drops to 300 paintings, i.e., significantly less than half.

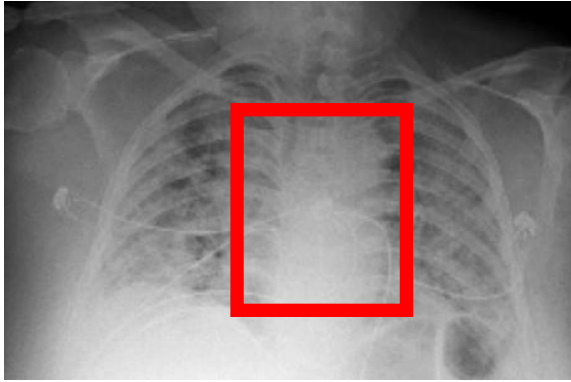


A systematic study of expert judgments for all relevant artists is not possible — however, Art Intelligence GmbH assumes that between 10 and 25 percent of expert attributions are incorrect. This is an estimate; the actual number could be higher.

Art historians are by no means as fallible as it may seem here — at least not compared to other experts. Even in medicine, top specialists often disagree in their diagnoses. Here are two examples:

Pathologies in chest X-rays:

The actual disagreement among top radiologists is estimated at around 3 to 5 percent, but the error rate rises to 10 percent due to mistakes in archiving.



Lungenröntgenbild mit Bounding Box:

Bis zu 10 Prozent der dokumentierten Diagnosen in diesen Datensätzen sind falsch

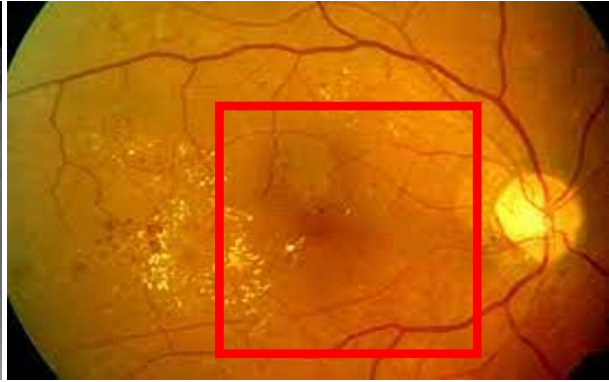


Foto eines Augapfels, mit Schatten:

Bis zu 30 Prozent der ärztlichen Einschätzungen in diesen Datensätzen widersprechen sich

For some diagnoses, the rate is significantly lower, as numerous publications show — one example being cited here.

Classification of Diabetic Retinopathy

Diagnosis accuracy is even worse for diabetic retinopathy (blindness) in publicly available datasets. 30 percent of sample images are classified differently by various experts.

But AI not only requires correct datasets — the phenomenon of so-called bias also plays a role.

Example Google:

MIT Technology Review

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ARTIFICIAL INTELLIGENCE

Google's medical AI was super accurate in a lab. Real life was a different story.

If AI is really going to make a difference to patients we need to know how it works when real humans get their hands on it, in real situations.

By Will Douglas Heaven April 27, 2020

The model publicly presented by Google Health was trained on high-quality images from the USA — in Thailand, it failed miserably.

See:

<https://www.technologyreview.com/2020/04/27/1000658/google-medical-ai-accurate-lab-real-life-clinic-covid-diabetes-retina-disease/>

The good news, however, is that AI is increasingly being used in medicine. Doctors and medical professionals have learned faster than art historians that this (not-so-new) technology can provide valuable guidance. Most importantly, they have overcome the fear that AI might replace them.

AI also works in art history — and in authentication. For example, works by Wolfgang Beltracchi are recognized by AI models with an accuracy of 70 to 80 percent — while the precision remains consistently above 80 percent. This means that if a work is identified by the AI as an “original” by Beltracchi, the probability that it actually comes from Beltracchi is greater than 80 percent.

Perhaps they would have wished for such a model 15 or more years ago, before the forger was exposed?

It is important to note, however, that AI is an additional tool for art historians — not a replacement for their expertise. Nothing more, nothing less. Specifically, this means: take the AI's results into account, but do not follow its judgments blindly. Take a closer look if the technology's answers or assessments do not align with your own evaluation.

AI offers some unique advantages: unlike some art historians, it is neither emotional nor biased, nor influenced by external interests. It is also transparent — the question is whether the AI experts themselves publish their methodology transparently.

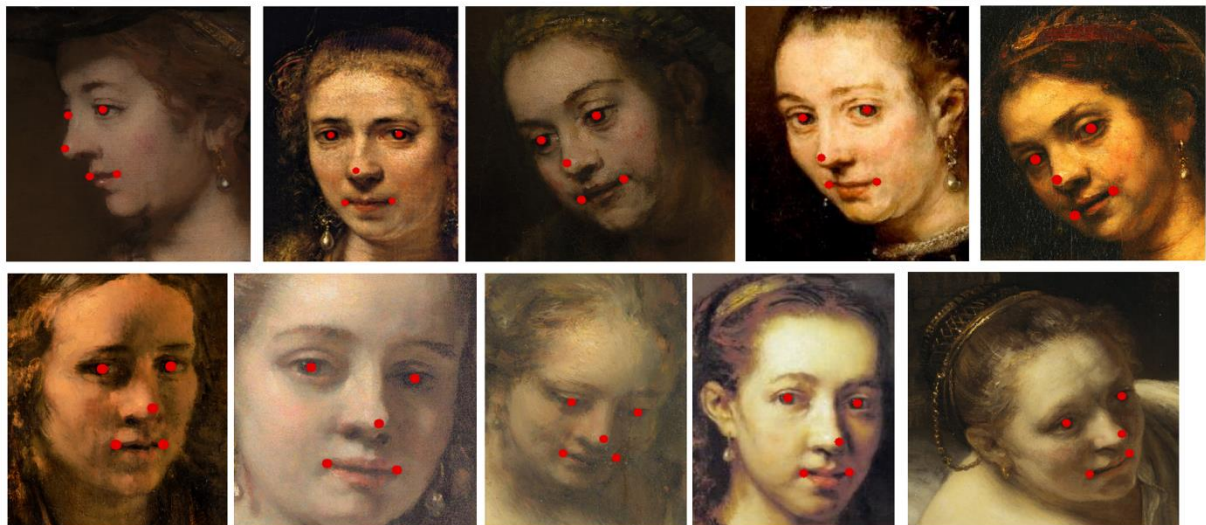
Here, too, art history can learn from medicine. For certain diagnoses, such as skin cancer, it has been shown that AI can outperform even the best experts, despite intrinsic uncertainties in the datasets.

BUT: the “lead” is usually very small — typically around 0.25 to 0.5 percentage points.

AND: numerous studies show that accuracy continues to improve when doctors know the AI's opinion but are not obliged to follow it.

Among art historians, these insights and the openness toward technology are not yet as advanced — but attitudes are slowly changing.

There are also many other potential applications for AI in art history. For example, AI can recognize faces, which can occasionally help with the authentication of artworks – or is of different art historic interest.



Take Hendrickje Stoffels, Rembrandt's partner and the mother of his daughter Cornelia. More than a dozen portraits are said to depict her, ten of which are shown here. Again, the uncertainty among experts is considerable — yet with the help of digital methods based on biometric features, it can be shown with high probability that these ten women represent at least three different individuals, as illustrated below.



AI offers numerous other possibilities for addressing questions posed by art historians — or at least providing indications to help answer them. This includes, for example, the systematic extraction of features from artworks, such as analyses of color gradients, brush strokes, contrasts, comparative studies of signatures, and much more.

Even generative models can be useful for art historians, though (for now) not in authentication. Using so-called RAG-based multi-agent systems, catalogues raisonné can be systematically searched — speeding up archival work by at least a factor of four. This aligns with examples from other fields, such as law.

The technology exists — and is ready to use.

Art historians would only need to be willing to use it.

For inquiries, please contact:



Art Intelligence GmbH
Taubensteinstraße 18
83727 Schliersee
Tel.: + 49-151-14659820
Web: www.art-intelligence.com