Rethinking Artistic Copyright in the Era of Text-to-Image Generative Models

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Does this count as *copying* ?

How can we even decide?

I strongly feel that this is an insult to life itself.

Summary: A new framework to define artistic styles and detect copying

The advent of Gen. AI creates a new threat of potential copyright issues that **current law does not protect against:** style copying. This goes beyond duplicating exact works, requiring a new manner to demonstrate copying. Further, we need arguments to be *interpretable*, so that they're accessible to the range of interdisciplinary stakeholders (artists, lawyers, judges, juries).

Two Complementary
Artistic Style Recognition Methods

DeepMatch via *Neural signatures* — Highly accurate

TagMatch via *Tag signatures* — Highly interpretable

We frame art style copying as a **classification** problem over artworks, with this intuition:
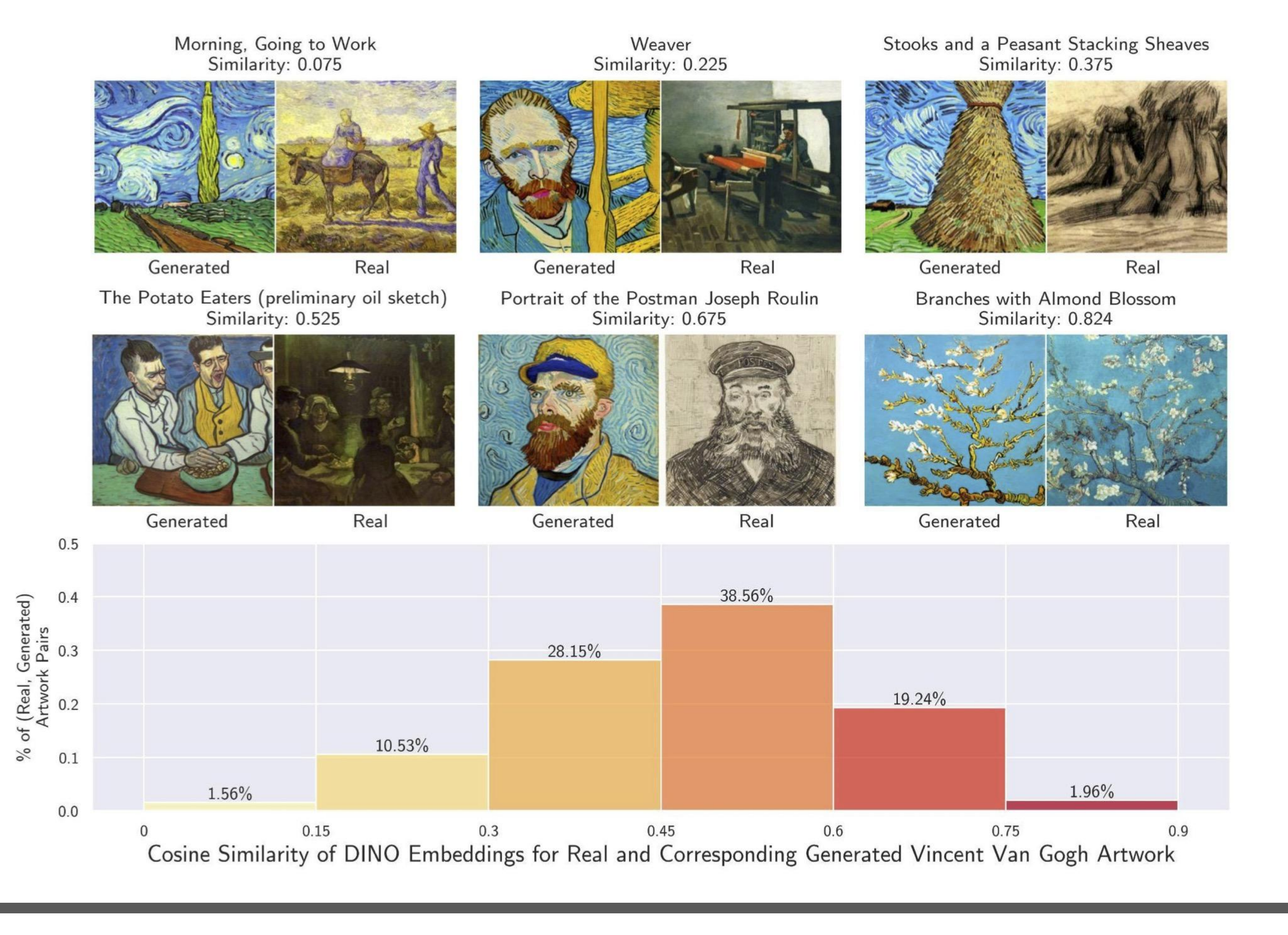
If an artist's work is consistently recognized as theirs, then they have a unique style.

We build two complementary classification systems that channel *holistic* and *analytic* angles from the copyright law community.

We package our methods into a tool: **ArtSavant**. Applying it on real art reveals that 89% of 372 prolific artists have unique styles. On gen. art (via simple prompts of current models), we find 20% of artists are at risk of style copying.

Empirical Study:
372 artists x 3 T2I models

No Match for Sally Gabori — Real / Generated — No Style Copying for 79.8% of Artists

Match for Pierre Auguste Renoir — Real / Generated — Potential Style Copying for 20.2% of Artists

Motivation: Image-wise similarity may not adequately capture style copying

Exact duplicates of individual works are rare, but style can reappear, even when image-wise similarity is low. To reliably catch and interpretably argue style copying, typical copy-detection methods may not suffice.

Morning, Going to Work — Similarity: 0.075
Weaver — Similarity: 0.225
Stooks and a Peasant Stacking Sheaves — Similarity: 0.375

Generated / Real

The Potato Eaters (preliminary oil sketch) — Similarity: 0.525
Portrait of the Postman Joseph Roulin — Similarity: 0.675
Branches with Almond Blossom — Similarity: 0.824

Generated / Real

Cosine Similarity of DINO Embeddings for Real and Corresponding Generated Vincent Van Gogh Artwork

1.56% — 10.53% — 28.15% — 38.56% — 19.24% — 1.96%

ArtSavant: A practical automatic tool built for artists and lawyers

ArtSavant Report for *Canaletto*

You have a unique and recognizable style!
We can identify your style (over the style of 372 other artists) in 88.37% of your works. This puts you in the top 83.6% percentile of artists in recognizability.

Your style is detected in works generated by Stable Diffusion.
When prompting a gen AI model to copy you, the resultant images exhibit your style more than 372 other artists 70.34% of the time.

EVIDENCE: **We find stylistic elements unique to you that reappear in generated images.**
We identify some tag signatures (set of stylistic elements that frequently co-occur only in your work) that also appear in generated images. Here's an example; click to see more.
Matched Tag for Canaletto: oil painting, broad brushwork, geographical symbolism
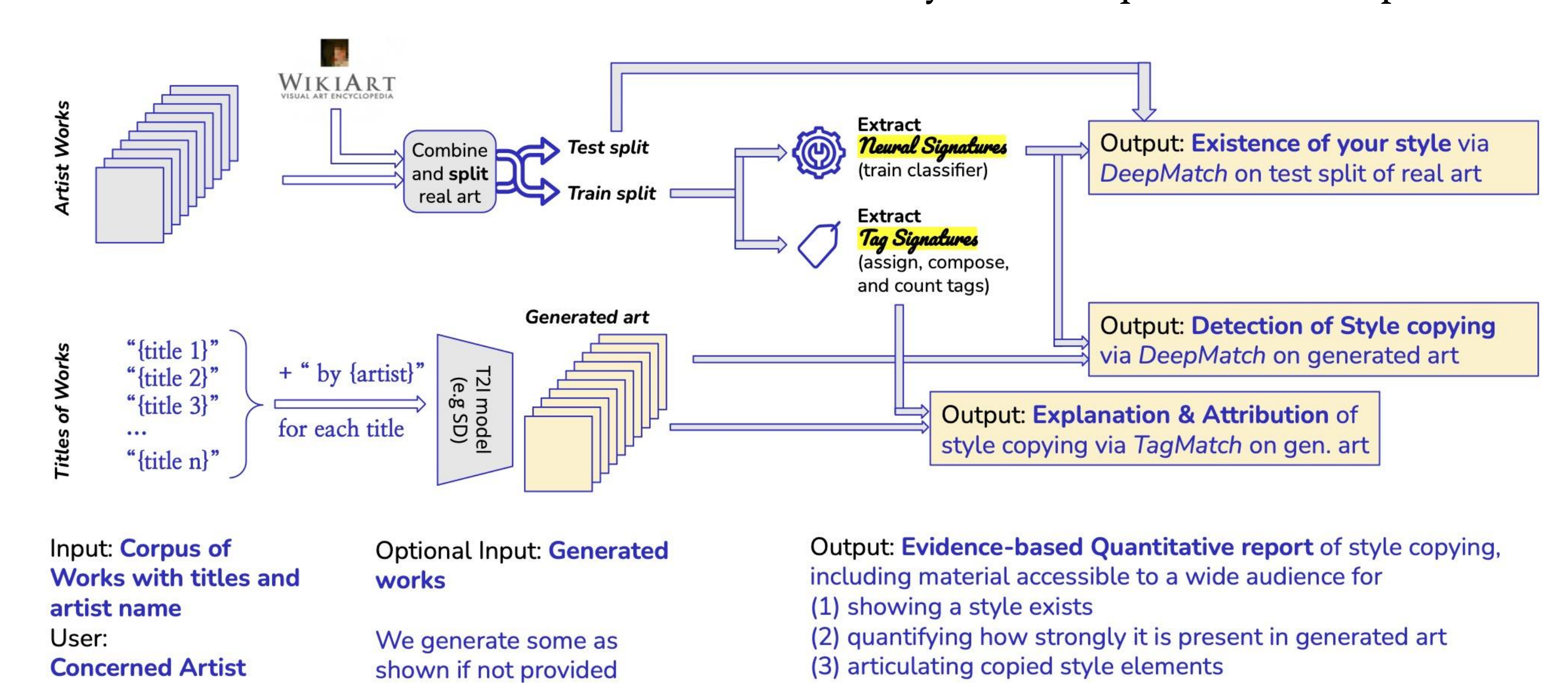0 other artists also have this signature
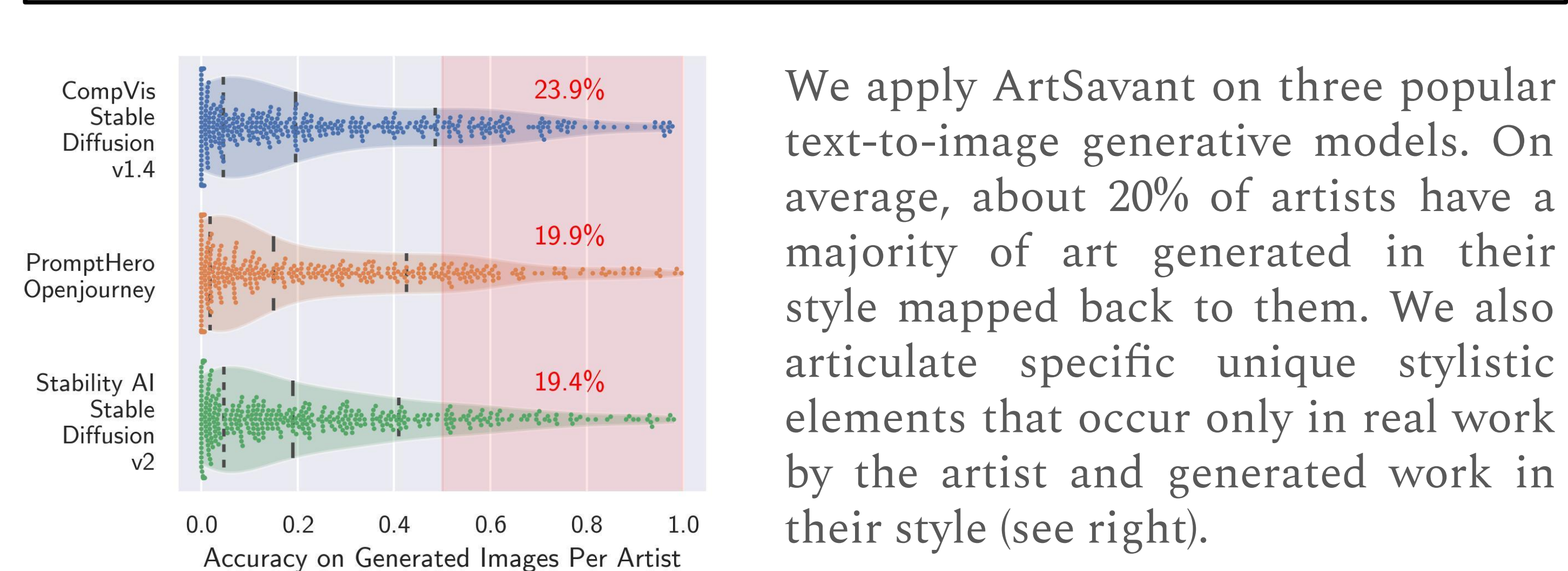
17 generated images with this signature — 8 real images with this signature

E.g. output report (above) and overall flow (below) of **ArtSavant**. In <u>minutes</u>, an artist or their lawyer can use ArtSavant to generate an accessible and evidence-based characterization of if their style is unique and/or copied.
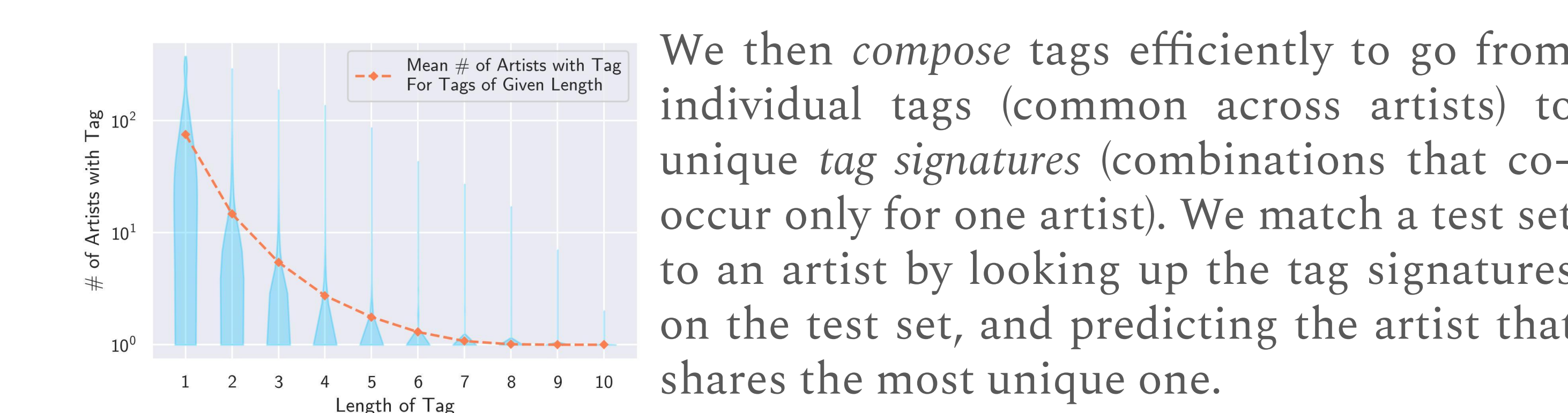
WikiArt

Artist Works → Combine and split real art → Test split / Train split

Extract *Neural Signatures* (train classifier) → Output: **Existence of your style** via *DeepMatch* on test split of real art

Extract *Tag Signatures* (assign, compose, and count tags) → Output: **Detection of Style copying** via *DeepMatch* on generated art

Titles of Works: "(title 1)", "(title 2)", "(title 3)" ... "(title n)" + "by (artist)" for each title → T2I model (e.g. SD) → *Generated art* → Output: **Explanation & Attribution** of style copying via *TagMatch* on gen. art

Input: Corpus of Works with titles and artist name — User: Concerned Artist

Optional Input: Generated works — We generate some as shown if not provided

Output: Evidence-based Quantitative report of style copying, including material accessible to a wide audience to (1) showing a style exists (2) quantifying how strongly it is present in generated art (3) articulating copied style elements

Empirical Study: ~20% of 372 prolific artists are at risk of style copying

CompVis Stable Diffusion v1.4 — 23.9%
PromptHero Openjourney — 19.9%
Stability AI Stable Diffusion v2 — 19.4%

Accuracy on Generated Images Per Artist

We apply ArtSavant on three popular text-to-image generative models. On average, about 20% of artists have a majority of art generated in their style mapped back to them. We also articulate specific unique stylistic elements that occur only in real work by the artist and generated work in their style (see right).

This number may change as prompting and models get more sophisticated. We hope our framework can enable quantifying style copying in a way that is accessible to all, especially the many non-techinal stakeholders at play.

Distilling and detecting unique artistic styles via *tag* and *neural signatures*

TagMatch is **interpretable** and **attributable**, utilizing *tag signatures.* We first tag individual works using a novel zero shot selective, multi label scheme with LLMs+VLMs. See example tags on the right.

"Leda Atomica" by Salvador Dali — Tags: magic realism style, heaven, Contemporary influences, surrealist, sharp angles

"Guitar, Sheet music and Wine glass" by Pablo Picasso — Tags: abstract expressionism style, collage, repetitive composition, musical instruments, simple colors, Contemporary influences, abstract subject matter

We then *compose* tags efficiently to go from individual tags (common across artists) to unique *tag signatures* (combinations that co-occur only for one artist). We match a test set to an artist by looking up the tag signatures on the test set, and predicting the artist that shares the most unique one.

Mean # of Artists with Tag For Tags of Given Length

TagMatch *articulates* the elements that constitute a unique style (interpretable), and returns exact images that present the unique tag signatures (attributable).

Matched Tag for Salomon Van Ruysdael: boats, Dutch influences, smooth texture/application
0 other artists also have this signature

21 generated images with this signature — 15 real images with this signature

Matched Tag for Antoine Blanchard: oil painting, simple colors, streets, Contemporary influences
0 other artists also have this signature

7 generated images with this signature — 5 real images with this signature

89.3% of artists have consistently recognizable styles

Palma II Giovane — Paolo Veronese

Number of Artists — 10.7% of Artists Not Recognized

Accuracy Per Artist

DeepMatch uses a lightweight classifier to assess how recognizable an artist's works are. If at least half of held-out works by the artist can be accurately attributed to them, we say an artist has a unique style. We find 89.3% of 372 prolific artists studied have unique styles; a key prerequisite to arguing style copying, and also a **nontrivial** one — indeed, 42 artists do not pass our test! E.g. two italian high renaissance painters may not have distinguishable styles, and thus, cannot each individually be infringed.