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Poster, Performed: Understanding Public Opinions of Authorship in Generative Artificial Intelligence Models via Analogy

Wylie Z. Kasai
*Dartmouth College*, wylie.z.kasai.gr@dartmouth.edu

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Poster, Performed: 
Understanding Public Opinions of Authorship in
Generative Artificial Intelligence Models via
Analogy

A Thesis
Submitted to the Faculty
in partial fulfillment of the requirements for the
degree of
Master of Science
in
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by Wylie Kasai

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Exposing Committee:

Lorie Loeb, Chair

Tricia Treacy

Tim Tregubov

F. Jon Kull, Ph.D.
Dean of the Guarini School of Graduate and Advanced Studies
Abstract

Over the last decade, generative artificial intelligence models have advanced significantly and provided the public with several tools to create new works of art. However, the true authorship of these works has been debated due to their training on web-scraped data. Serving as an analogy to these larger models, Poster, Performed is an interactive artificial intelligence exhibition project that uses image assets submitted by the public to create poster compositions with custom image processing algorithms. During the course of a four-day exhibition, visitors were asked to identify the exhibition’s primary artist from five options: (1) participants who submitted image assets, (2) the programmer, (3) the artificial intelligence software, (4) the exhibition’s design team, and (5) the printers that output the posters. Survey data revealed that the participants who submitted image assets and the exhibition’s project team were the project’s most salient artists, each tied for the most responses. Within the analogy to state-of-the-art models, this finding implies that artworks produced with these generative tools would be best credited to the users who prompted the works and the original authors of the content used for model training.
Acknowledgements

To the *Poster, Performed* team, Tricia, Arzu, Mark, Steve, Owen, and Maggie – thank you for our weekly Zoom calls and the opportunity to work on this project.

To my advising committee, Lorie, Tricia, and Tim – thank you for your guidance not only during this project but throughout my entire time at Dartmouth.

To my fellow Studio Art Interns and manager, Julian, Mikaila, Ekene, Billie, and Aaron – thank you for our time in the studio and helping me to do this degree alongside full-time work.

To my roommates, Simon, Macy, Gia, and Yomi – thank you for your presence and our termly dinners.

To Leah – thank you for reading this thesis.

To my friends and family – thank you for the constant support, regardless of whether you knew what my thesis was really about.
Collaboration

*Poster, Performed* is a collaborative project initiated by Tricia Treacy and Arzu Ozkal. The full team includes Steve Bowden, Mark Zurolo, and myself with additional support from Maggie Minor and Owen Ryan. As the primary technologist for this project, I designed and developed the project website, database server, and generative algorithms with guidance and feedback from the larger team. In pursuit of the Master’s degree, I also designed and conducted the research study for this thesis.
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1 Introduction

1.1 History of Generative Art

Decades prior to the invention of the technology and tools now available, artists had been making generative art in its simplest definition: art made using a fixed set of rules or guidelines often including an element of randomness.[1][2][3] Artists of the Dada movement, such as Jean Arp and Marcel Duchamp, embraced the use of chance in their artworks. In Untitled (Collage with Squares Arranged according to the Law of Chance) (1916-17), Arp allowed torn pieces of paper to fall to the floor where they were glued in place.[4] Duchamp dropped meter-long pieces of string onto canvas and used their contours to cut pieces of wood in 3 Standard Stoppages (1913-14).[5] Minimalist painter Ellsworth Kelly used numbered papers corresponding to different colors to make his Spectrum Colors Arranged by Chance series (1951), grid paintings that have a pixel-like, digital quality to them.[6] Other artists produced works with analog “algorithms” reminiscent of ones that would eventually be programmed. Conceptual artist Sol Lewitt wrote short instructions for wall drawings that dictated compositions carried out by teams of assistants.[7][8] Computer art pioneer Vera Molnár developed the Machine Imaginaire (1960s), an imaginary computer she devised to carry out generative artworks based on sets of established rules.[9][10] Avant-garde musician John Cage created generative scores that left compositional elements to chance.[11][12][13]

Following the invention of the computer, the possibilities for generative art grew tremendously as artists began to experiment with technology. Ben Lapoksy created some of the first computer graphics drawings using an oscilloscope with the aim of distinguishing his artistic forms, Oscillons (1969), from ordinary oscillograms used in scientific research.[14][15] Manfred Mohr implemented mathematical algorithms in the early coding language Fortran to make generative compositions that were transferred to paper with a flatbed pen plotter.[16][17] Research groups such as Bell Laboratories and artistic institutions produced exhibitions and performances that solidified the
role of technology not only in generative art but art in general, though this new medium was not immediately embraced. As technology advanced beyond early proofs of concept, so did artistic implementations. In the 1970s, artist and technologist Harold Cohen developed one of the first artistic artificial intelligence with his creation AARON, an autonomous drawing robot that followed an internal set of rules to create drawings (and later paintings) without human intervention. In writings about AARON, Cohen questioned what criteria determined image-making versus art-making and whether his artificial intelligence could be considered an artist altogether.

As computers became more readily available, the ability for artists to create with software grew alongside new languages and frameworks that made generative art more accessible. Still a popular tool today, Processing, created by Ben Fry and Casey Reas in 2001, is a Java framework with built in graphical functions and an emphasis on being beginner-friendly. Such tools democratized generative art, allowing the general public to create art of their own with relative ease. Generative art found another recent resurgence in 2021 culture with the cultural virality of non-fungible tokens, more commonly known as NFTs, a minting platform to buy and sell digital artworks on simultaneously popular blockchain currencies.

1.2 Generative Artificial Intelligence Models

In the last decade, artificial intelligence has expanded dramatically in both its capabilities and availability, advancing generative art in tandem. Using state-of-the-art applications, any ordinary user can create high-quality and life-like images with simple text prompts. With the development of Generative Adversarial Networks (GAN) and Contrastive Language-Image Pre-Training (CLIP) models, labs and companies such as Midjourney, OpenAI, and Stability have published such visual tools online for the general public to experiment with, in many cases for free. These technologies fit into two main categories, sequence-to-sequence
models and diffusion-based models[41]. Sequence-to-sequence models, such as OpenAI’s first version of DALL-E, use autoencoders[42][43] to learn relationships between image-text pairs with architectures such as Vector Quantized Generative Adversarial AutoEncoders (VQ-GAE)[44][45], a more advanced version of the General Adversarial Network[34]. Diffusion-based models begin with random noise and use denoising autoencoders with text descriptions until generating images that match the prompt, with an especial capability to create high-quality images[46][47][48][49]. Though these two types of models function differently, they both rely on large sets of images that serve as training data.

Figure 1.1: Three images created with DALL-E 2, OpenAI’s generative model that is free and open to the public. The following prompt inspired by the project was given to the model: Photo of an art exhibition with a metal scaffolding cube holding up four laser jet printers and one large plotter printer making posters on white and orange papers with previous posters scattered on the floors and pinned on the walls.

Unsupervised (2022) by Refik Anadol is one example of an artistic implementation of such models. Using images of over 200 years of artwork from the Museum of Modern Art in New York, Anadol uses a specific implementation of a General Adversarial Network, StyleGAN 2 ADA[50], to synthesize images that interpolate between different artworks in the dataset to create new ones.[51][52]
1.3 Authorship Concerns

With the growing prevalence of generative models, questions of authorship have risen to the forefront of discussions regarding creation with artificial intelligence. Beyond whether the output from these programs can be considered art\(^{53}\)\(^{54}\), it is undecided who can take credit for these works of art. Because these models are trained on data from by automated bots (web-scrapers) traversing the internet\(^{55}\)\(^{56}\)\(^{57}\), some argue that the creators of this original content should be compensated and credited, especially since collection of training data often occurs without consent\(^{58}\)\(^{59}\). In the case of more well-known artists, models can use previous works to generate new ones replicating their style without regulation\(^{60}\)\(^{61}\)\(^{62}\). Others argue that users who interface with these programs by fine tuning prompts and curating model outputs, called “prompt engineering”\(^{63}\), deserve the credit, with entire online communities of these users dedicated to discussing best practices\(^{64}\)\(^{65}\). However, in the absence of any legislation and regulation of these models\(^{66}\), there is no consensus on the authorship of works created by artificial intelligence.

1.4 Project Overview

*Poster, Performed* is a critical artistic project, initiated by artists and designers Tricia Treacy and Arzu Ozkal, that investigates the creation and use of computer algorithms to make generative art with the poster as its specified medium. The poster – a simple, yet popular medium amongst graphic designers and artists – offers an aesthetic platform to analyze outcomes of the project as well as the ways in which they may affect their viewers. The project welcomes randomness, inspired by the work of former Dadaist and Chance artists, and audience participation from the general public. Following the project’s ideation, artist and technologist Wylie Kasai was invited to the project alongside designers Steve Bowden and Mark Zurolo.

Although *Poster, Performed* ultimately outputs posters, a larger pipeline (Figure
1.2) constitutes its inner workings. The project begins with audience participation in the form of photos and accompanying text assets that are submitted by the public to its website and stored in the project’s database to be used in the creation of posters. The posters are designed using custom code written in Processing, where four image processing algorithms transform the photos to be placed alongside text. These generated compositions are printed live during exhibitions using a Raspberry Pi connected to various printers, and printed posters become part of the physical space where audience members are welcome to rearrange their placement on the exhibition walls and floor. The project debuted at Printed Matter’s Los Angeles Art Book Fair in August 2023 at the Geffen Contemporary at the Museum of Contemporary Art (MOCA).

![Figure 1.2: High-level pipeline of Poster, Performed.](image)

### 1.5 Analogy to Generative Models

This study is primarily concerned with understanding authorship and credit with regards to artmaking and asks participants to identify a single artist within the exhibition. The Poster, Performed project serves as an analogy to state-of-the-art generative models, designed to break down their complexity and ambiguity to give the layperson an opportunity to understand the black box of creation with artificial intelligence. Each step of Poster, Performed’s pipeline is mapped to one in the general pipeline of popular generative technologies as seen in Table 1.1. The analogy uses the assignment of the artist in this simpler model to extrapolate attitudes toward the authorship of content created by large-scale models.
Table 1.1: Analogy mapping between the Poster, Performed pipeline and large-scale generative models.

<table>
<thead>
<tr>
<th>Poster, Performed</th>
<th>Large-scale, generative models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programmer writes AI</td>
<td>Programmers write AI</td>
</tr>
<tr>
<td>Participants submit photos</td>
<td>Creators publish content that is web-scraped to train models</td>
</tr>
<tr>
<td>AI designs poster</td>
<td>AI designs composition</td>
</tr>
<tr>
<td>Installation team curates outputted content</td>
<td>User creates and curates prompts until desired response</td>
</tr>
</tbody>
</table>

2 Photo Submission

To create its compositions, Poster, Performed relies on photos from its collection populated by voluntary participants via the website: https://posterperformed.in.space. Its primary purpose is to facilitate this submission of photos with accompanying texts and additionally serves to provide further information about and documentation of the program.

2.1 Website Design

The website’s interface was designed simply using a grayscale color scheme that mimics the palette of the posters. The website’s core user experience was also designed in a minimal fashion to streamline submission with especial consideration that most participants would access the website on their phones, requiring that the site be responsive and mobile-friendly.
2.2 Website Pages

The website has eight pages:

1. *Home* – The home page contains information about the project, short biographies for each of the team members, and acknowledgements of grants and sponsors. Participants can navigate to other pages from this landing page using the navigation bar at the top.

2. *Upload* – The upload page is the first step of uploading content to the photo collection. The page’s instructions specify the types of files allowed and a disclaimer agreement for submitting. Users submit photos by clicking the “Upload a file…” button which opens a widget from Bytescale (formerly upload.io) that facilitates the uploading process. The upload page is only accessible via the navigation bar during exhibition periods.

3. *Tagging* – The tagging page directly follows the uploading page after successful submission and facilitates the optional tagging of the participant’s photo(s). Below a set of instructions, the submitted photos appear, each with its own pair of input fields: one for tagging, and one for extra context.

4. *Submitted* – The submitted page confirms that the participant’s submissions and tagging were successful with a simple message. This page typically redirects after a short time to the home page but was repurposed to advertise the study survey during the exhibition.

5. *Survey* – Only available during the exhibition, the survey page was an introduction to the data collection survey and contained a link to the Google Form.

6. *Book* – The book page is a photo gallery with images of the *not a multiple, /1* art book that was constructed using posters created during the testing phase. It serves as a preview for those interested in purchasing the book.
7. *Launch* – Created following the exhibition, the launch page is a photo gallery with images from the project launch at the 2023 Los Angeles Art Book Fair.

8. *Contact* – The contact page specifies an email that interested parties can use to contact the project members.

### 2.3 Photo Submission User Flow

The core user flow for photo submission (Figure 2.3) begins with the upload page, reached via website navigation (during exhibition periods only), direct URL, or using QR codes scattered throughout the exhibition. Once the participant submits their desired photos using the Bytescale widget, they are directed automatically to the tagging page. On the tagging page, instructions confirm submission and provide instructions on formatting and submitting optional image tags and context. Tags are short descriptors of the image itself, whereas the context describes information not visible in the image in response to the prompt *“What’s not in the image?”*. Below, the images appears with two input fields beneath each for tagging and adding further context for the image. Following successful tagging, the user is then directed to the submitted page, signifying the end of the submission process. Participants are free to upload multiple times by restarting the flow again at the upload page.

![User Flow Diagram](image)

*Figure 2.3: Core user flow for photo submission.*

### 2.4 Database Models and API

To handle and store photo submissions, the website interfaces with an API server hosted online via HTTP requests. The server supports the creation and updating of
“image” database models, outlined below, as well as delivers images when requested for the making of posters.

**ImageModel**

imageUrl (String): The URL for the image hosted on Bytescale.
imageType (String): Specifies whether the image is a PNG or a JPG/JPEG.
imageTags* (String Array): One or more user-provided tags that describe the image.
imageContext* (String): User-provided context for the image in response to the prompt.
timesUsed (Number): The number of times the image was used in a poster.
createdAt (Time): The date and time the image was submitted to the collection.

*These fields are optionally added by the user and may be empty in some instances.

### 2.5 Frameworks and Services

The website was written in JavaScript, HTML, and CSS using the React.js framework developed by Meta with open-source community contributions. Bytescale (formerly upload.io) was used for image hosting and provides a convenient web widget to facilitate the uploading process. A MongoDB database was used to store links to hosted photos and their accompanying data using Mongoose data models. The API was built using the Express framework for a Node.js server and hosted on Render.

### 3 Poster Design

#### 3.1 Initial Designs

The first iteration of the poster design (Figure 3.4) began with a simple algorithm to identify further directions for the design and understand the visual interaction
of unrelated images. In these posters, images were not processed beyond basic resizing, conversion to grayscale, and the assignment of a random opacity level. A small portion of one of the images was also sized up to be used as the background of the composition. Short, unrelated text snippets were later included to experiment with the appearance and role of typography.

Figure 3.4: Example compositions from the initial design algorithm without text (left) and with text (right).

3.2 Design Principles

Following these initial tests, various design principles were formed to direct further work on the algorithm.

1. Unique Posters – Specified at the project’s onset, each poster produced for the exhibition should be unique, and code should also be written efficiently to allow for subsequent posters to be generated as quickly as possible.
2. *Monochrome Palette* – Using a monochrome palette ensures color harmony for any group of randomly selected images. When selected, original images are converted to black and white, and the resulting poster is in grayscale.

3. *Legibility* – To add visual intrigue, photo assets should be altered in some fashion but still maintain a level of legibility. While an ordinary viewer may not recognize subjects in an image, a participant should be able to identify if their submission was used. Processing these images also helps to protect against inappropriate submissions by obfuscating the content.

4. *Role of Randomness* – Incorporating randomness not only aligned with the artistic inspiration for the project but also allowed for more visual variety in the posters when used to control variables like placement of images and text. Using randomness to select images from the collection also created the opportunity for unexpected meaning to arise from the combination of images that may not otherwise appear if selected intentionally.

5. *Role of Text* – Text, and its combinations, additionally contributed to unexpected meaning and sets the project apart from other generative artificial intelligence that do not have the ability to make images with text. Participants can optionally submit text to be used alongside their images.

6. *Spatiotemporal Snapshot* – Each poster should include a snapshot of the time and place at which it was produced to provide contextual meaning for its creation (e.g. incorporating local weather and trending news headlines). Alongside the project title and exhibition names, this information anchors each work spatiotemporally and serves as archival background.

### 3.3 Final Algorithm Design

In the final iteration of the poster (Figure 3.5), four images are randomly picked from the project’s collection alongside any text that may have been included with their
submission. Each image is turned to grayscale, resized appropriately for the canvas size, and undergoes one of four processing algorithms before it is placed randomly on the canvas. Following image placement, texts from the images, the news, and weather are then placed on the canvas. As a last step, a white space at the bottom is created to add the exhibition’s and a timestamp. The size of the overall composition is dependent on the final printing size and desired resolution.
Figure 3.5: Example of a final generated poster.
3.4 Handling of Images

Before each of the four images is placed on the canvas, it is converted to grayscale then undergoes one of four image processing algorithms. Each image is mapped to an algorithm depending on its order, with every algorithm present only once on each poster.

Figure 3.6: Outputs from each different processing algorithm on a picture of a face: horizontal strips (top left), vertical strips (top right), threshold (bottom left), and mosaic (bottom right).
Horizontal and Vertical Strips Algorithms

In the horizontal and vertical strips algorithms, the provided image is split into a number of equal sections as specified by the function parameters. These sections are randomly offset from one another randomly within a specified range as they are placed on the canvas. The two versions of this algorithm behave the same apart from the orientation of the rectangular sections.

Threshold Algorithm

In the threshold algorithm, the provided image is passed through a built-in threshold filter. This filter converts the grayscale image to a black and white one: pixels with a value lower than the threshold are changed to white, and pixels with a higher value are converted to black. After various tests, a threshold of 0.8 rendered the best-looking results on a scale of 0.0 (white) to 1.0 (black). Once converted, the result is inverted to produce an image of the lighter pixels; other pixels are discarded so that elements behind are visible. Three equal sections of a specified size are taken and placed randomly on the canvas, each with a variable opacity.

This algorithm is the most variable in its results, heavily depending on the values present in the original image. In some edge cases, this algorithm produces large chunks of a single color value, which is unlikely to be recognizable to the participant who submitted that image. However, these additions often add a welcome visual element to the poster despite their occasional illegibility.

Mosaic Algorithm

In the mosaic algorithm, parameters passed to the algorithm specify the size of the rectangle for the mosaic to occupy and the number of tiles per row and column, determining the size of each equally-sized tile. Two-thirds of the tiles – determined
by chance – are then filled using portions of the provided image selected at random, with the remaining third left empty.

3.5 Handling of Texts

After processed images are placed onto the canvas, two types of texts are placed on top: image contexts and spatiotemporal contexts. At the end, a final footer is created at the bottom where information about the project and exhibition are placed with a timestamp and geographic information. All texts are written in the typeface Rebond Grotesque by Roger Gaillard.

Image Contexts

Image contexts are texts that are optionally submitted alongside images by participants in response to the question “What’s not in the image?” If any of the four images used in the poster have associated text, they are drawn in a large font in a random location on the canvas. Photo tags, if included, were not used in this first iteration of the project.

Spatiotemporal Contexts

News and weather texts are gathered from two publicly available APIs. Provided by the National Weather Service, the weather text is the current forecast for the location of the poster creation. The news text is a randomly selected trending news headline from News API. These two texts are drawn in a small font in a random location on the canvas.
As the last step in poster creation, a white rectangle is placed at the bottom of the poster to clear space to put the project title, the name of the exhibition, the time the poster was created, and the coordinates of the exhibition. These fields are placed in the same location on each poster.

3.6 Codebase and Libraries

The poster design algorithm was written in Java using Processing 4, created by Ben Fry and Casey Reas. The HTTP Requests for Processing library by Rune Madsen and Daniel Shiffman was used for server requests within the Processing code.

4 Printing Mechanism

To print the posters, a Raspberry Pi is used to both run the poster design code and send them to a printer.

4.1 Scripting and Timing

Python scripts on the Raspberry Pi triggered the Processing sketch outside of the normal graphical editor via Java executable. Once the poster is created and saved, the script then uses the CUPS library to send the poster directly to the USB-connected printer with desired size and image settings. During an exhibition, the script runs on a loop and repeats this sequence at the desired interval.
Figure 4.7: Python scripting diagram for creating and printing posters live in the exhibition. This process is repeated at a specified interval.

5 Exhibition

*Poster, Performed* debuted at Printed Matter’s Los Angeles Art Book Fair on August 10–13, 2023 at the Geffen Contemporary at The Museum of Contemporary Art (MOCA). Over 15,000 people attended the fair over the course of four days to visit 300 small vendors, larger publishers, and exhibition spaces.

5.1 Exhibition Arrangement

In the center of the 25- by 16-foot exhibition space, a six-foot cube of aluminum scaffolding held up the five printers used throughout the exhibition: four letter-sized laser printers and a large inkjet plotter. Inside the cube, two Raspberry Pis sat on a smaller 3-foot wooden cube alongside other materials, and paper and ink cartridges sat on wooden shelves that ran across the width of the cube.

On two of the walls of the space, a grid of magnets was installed to display posters that were printed during the exhibition. When the printers were not running, visitors were invited to peruse and rearrange this display. On the third wall, shelves with t-shirts and book copies for sale were mounted, and a slideshow of test images was projected onto the fourth wall. QR codes with the link to upload images were interspersed throughout the room alongside explanatory vinyl lettering that invited visitors to
participate by submitting images.

Figure 5.8: Photos of the gallery space and collaborative magnet grid.

5.2 Printing Timing

The first Raspberry Pi was connected to the four letter-sized laser printers and ran a modified script that split up a larger poster into smaller tiles. These tiles were split amongst these four printers and were either left on the floor to collect or arranged as one on the magnet grid wall as they were printed. This script ran every 15 minutes during the exhibition.

The second Raspberry Pi was connected to the large inkjet plotter, which was fed by a continuous roll of paper, and printed posters in their entirety. The trim feature on the printer was disabled such that the posters were printed continuously on the roll and cascaded onto the floor out of the printer. When rolls were finished, these large scrolls of posters were later hung on ceiling pipes. In addition to the t-shirts and books, visitors could purchase these large posters which were trimmed upon selection. This script ran every 10 minutes during the exhibition.
6 Data Collection

To understand who visitors perceived as the artist of the exhibition, a Google Forms survey was distributed to collect data and linked on the project website, available via QR code. Anyone who entered the exhibition was allowed to participate, and free stickers upon completion were offered as an incentive to complete the survey.

6.1 Form Structure

The data collection survey features four sections:

1. Introduction – The survey’s introduction provides short background on the thesis study and ends with a data agreement.

2. Background Assessment – In the background assessment section, survey participants are assessed on their familiarity with 12 different artists and experience with 12 different technologies. These responses are later used to generate familiarity scores for comparison.

3. Who is the artist? – In this section, survey participants are provided with a brief summary of the project and then asked who they interpret as the artist.

4. Wrap Up – In the wrap up section, survey participants are asked questions about their general thoughts regarding artificial intelligence, generative art, and the exhibition. All questions in this section were optional.

6.2 Score Generation

Results from the background assessment questions were used to create scores that represented a participant’s familiarity with the following categories: general artists, generative artists, general technology, and generative technology/artificial intelligence.
If a participant marked that they were familiar with the artist or had used the technology before, they were granted one point for the answer’s respective category score. Each group had six possible choices, and each score had a maximum of six points.

<table>
<thead>
<tr>
<th>General Artists</th>
<th>Generative Artists</th>
<th>General Technology</th>
<th>Generative Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Georges Seurat</td>
<td>Sol LeWitt</td>
<td>Google search</td>
<td>ChatGPT</td>
</tr>
<tr>
<td>Frida Kahlo</td>
<td>Casey Reas</td>
<td>Smart home devices</td>
<td>Lensa App</td>
</tr>
<tr>
<td>Jean-Michel Basquiat</td>
<td>Vera Molnár</td>
<td>Augmented or Virtual Reality</td>
<td>ThisPersonDoesNotExist.com</td>
</tr>
<tr>
<td>Ruth Asawa</td>
<td>Harold Cohen</td>
<td>Python or other coding language</td>
<td>DALL-E/Craiyon</td>
</tr>
<tr>
<td>Kehinde Wiley</td>
<td>Refik Anadol</td>
<td>API servers</td>
<td>Stable Diffusion or Midjourney</td>
</tr>
<tr>
<td>Simone Leigh</td>
<td>Brian Eno</td>
<td>Machine Learning libraries</td>
<td>GAN or CLIP</td>
</tr>
</tbody>
</table>

Table 6.2: Selected artists and technologies on survey used to generate familiarity scores by category for each respondent.

6.3 Interpretations of the Artist

To assess who visitors observed as the primary artist of the project, survey participants were presented the following question and allowed to select only one answer.

“In Poster, Performed, who is the artist? Choose one.”

- Participants who submitted photos and text
- The programmer who wrote the artificial intelligence
- The artificial intelligence which made the posters
- The team who designed the installation
- The printers which output the posters
- None of the above
6.4 Additional Questions

At the end of the survey, participants were welcomed to respond to the following questions with responses of any length. These questions were not required to receive the completion reward.

1. What was your general impression of the work?

2. Can artificial intelligence create art?

3. Did this installation prompt any thoughts about artificial intelligence’s ability to create art? What thoughts?

4. Anything else you’d like to tell us?

7 Results

Over the course of the 4-day fair, 70 survey responses were collected from various visitors of the exhibition. Most respondents were approached by a team member to advertise the survey and were more likely to do the survey if they were additionally submitting an image to the collection.

7.1 Score Distributions

In the background assessment section, respondents were asked about their familiarity with different artists and experience with various technologies. These responses were used to generate scores that gauge a respondent’s background in four areas: General Art, Generative Art, General Technology, and Generative Technology.

For these four groups, the mean scores were 2.87, 1.23, 2.60, and 1.67, and the median scores were 2.5, 1, 2, and 1, respectively. Further distribution of the scores is shown
Figure 7.9: Overall distribution of background assessment scores.

### 7.2 Artist Perception Distribution

In the following section, respondents were asked to decide the primary artist of the exhibition as shown in Figure 7.10. The team who designed the installation and the participants who submitted photos and text were tied in responses, both picked by 21 respondents or 30% of the total pool. The remaining 40% were split amongst the programmer who wrote the artificial intelligence, the artificial intelligence which made the posters, and none of the above with 21.4% (15 respondents), 7.1% (5 respondents), and 11.4% (8 respondents), respectively. No respondents identified the printers as the primary artist.
7.3 Score Breakdowns of Artist Perceptions

After calculating familiarity scores and artist perception, each artist perception group- ing was examined against respondents’ familiarity scores to identify trends.

General Art Score and Artist Perception

Analysis of the General Art Score revealed means for each artist perception option as follows: the installation team (2.95), the programmer (3.07), the artificial intelligence (2.60), submission participants (2.38), and none of the above (3.75). The means and their standard deviations are visualized in Figure 7.11. The full breakdown of scores can be seen in Figure 7.12.
Figure 7.11: Mean general art scores by artist perception.
Figure 7.12: Distribution of general art scores by artist perception.

**Generative Art Score and Artist Perception**

Analysis of the Generative Art Score revealed means for each artist perception option as follows: the installation team (1.00), the programmer (1.33), the artificial intelligence (1.60), submission participants (1.00), and none of the above (2.00). The means and their standard deviations are visualized in Figure 7.13. The full breakdown of scores can be seen in Figure 7.14.
Figure 7.13: Mean generative art scores by artist perception.
General Technology Score and Artist Perception

Analysis of the General Technology Score revealed means for each artist perception option as follows: the installation team (2.90), the programmer (2.86), the artificial intelligence (3.00), submission participants (1.81), and none of the above (3.13). The means and their standard deviations are visualized in Figure 7.15. The full breakdown of scores can be seen in Figure 7.16.

Figure 7.14: Distribution of generative art scores by artist perception.
Figure 7.15: Mean general technology scores by artist perception.
Figure 7.16: Distribution of general technology scores by artist perception.

**Generative Technology Score and Artist Perception**

Analysis of the Generative Technology Score revealed means for each artist perception option as follows: the installation team (1.62), the programmer (2.13), the artificial intelligence (2.60), submission participants (1.19), and none of the above (1.63). The means and their standard deviations are visualized in Figure 7.17. The full breakdown of scores can be seen in Figure 7.18.
Figure 7.17: Mean generative technology scores by artist perception.
7.4 Text Responses

Of the four optional open-response questions, only one question lends itself to a numerical analysis: “Can artificial intelligence create art?” For this question, the 64 responses ranged from simple “yes” and “no” to longer explanations with caveats; they can be broken down into the generalized categories seen in Table XX. Responses to the other text questions will be addressed in the Discussion section.
"Can artificial intelligence create art?"

<table>
<thead>
<tr>
<th>Response</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>22</td>
</tr>
<tr>
<td>Yes, but</td>
<td>11</td>
</tr>
<tr>
<td>Maybe</td>
<td>13</td>
</tr>
<tr>
<td>No, but</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>15</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 7.3: Generalized categories of text responses to whether artificial intelligence can create art.

8 Discussion

8.1 Demographic and Scoring

When looking at the overall distribution of scores, it is important to consider the primary demographic in attendance at the fair. The nature of the art book fair and the materials sold – primarily zines, art prints, and books from independent publishers – attracts many bibliophiles and those interested in graphic design and illustration. And although some artists may touch on technology in their work, these mediums are not inherently technological. Therefore, despite a higher General Art score, it makes sense that the mean Generative Art score is less than half as large. Had the survey been conducted at an AI art exhibition or a digital media conference, the generative score might be expected to match or even surpass the general score.

In terms of the technology scores, attendants were primarily adults in the age range of 20 to 50 years old with likely average technological experience, and a relatively normal distribution of the General Technology scores reflects this. As discussed above, the book fair attendees were not expected to have thorough experience with either general or generative technology, whereas conducting this survey at a computer science conference would inflate the scores drastically. However, the virality of tools
like ChatGPT or DALL-E mini have prompted the public to engage with generative technologies more so than they might have engaged with generative artists; half the number of respondents indicated no prior experience with generative technologies than with generative artists.

8.2 Artist Interpretation Implications

In looking at the number of votes each artist option received on the survey, returning to the analogy between Poster, Performed and large generative models can help evaluate and extrapolate attitudes regarding creation with this technology. Each choice has its own implications for authorship and credit which become especially relevant as the public begins to use and experiment with these tools for both casual and artistic applications.

The team who designed the installation

Tied with participants who submitted photos and text, the team who designed the installation was the most selected artist on the survey. The team behind Poster, Performed can be best compared to the technologies’ users who feed prompts and curate outputs until a desired state. Through the analogy, selecting the team as the artist implies that those who use generative technologies to make artistic outputs should receive credit as the artists behind the work.

Participants who submitted photos and text

Tied with the team who designed the installation, participants who submitted photos and text also received the most votes on the survey. Participants who submitted photos and text can be compared to authors of images and text samples that are used to train machine learning models. Unlike this project, these resources are gathered
by web scrapers without consent from the creators of this content and used to inform the generative responses to prompts. Through the analogy, the original owners of the assets used to train generative models should be credited for their contributions to the output.

The programmer who wrote the artificial intelligence

The third most popular choice, the programmer who wrote the artificial intelligence, has a more direct counterpart in larger generative models in the teams that write and upkeep them. In selecting the programmer, the developers of these generative programs should be recognized for their responsibility in the development of the technology, though it may be ambiguous in practice with larger teams, corporate ownership, and employee turnover.

None of the above

As the fourth most selected option, none of the above functions as an umbrella term for both those who may have identified multiple artists in the project and those who may have identified none of the proffered options, in addition to other beliefs about authorship with artificial intelligence. In a post-survey conversation, one participant indicated that they chose none of the above due to the inability to select multiple artists of the exhibit. In this sense, the response may be interpreted as multiple parties deserving credit, rather than the entire exhibit being seen as devoid of art. Other participants who did ultimately choose an artist also expressed a similar struggle whilst taking the survey upon being allowed to select only one artist.
The artificial intelligence which made the posters

Receiving the second fewest votes, the artificial intelligence which made the posters also maintains a direct counterpart with large generative models. In selecting this option, programs that create art would be analogously considered artists in their own right despite human-generated inputs.

The printers which output the poster

Lastly, no participants identified the printers of the exhibition as the artist. Unless generative works by larger models are printed, this choice also does not have a counterpart in the larger model analogy and was added as an option for artistic inquiry. Although the role of printers in art may be more salient in other experimental forms of physical printmaking, this outcome seems appropriate in the consideration of a medium whose output and distribution is largely digital in practice.

8.3 Trends in Artist Interpretation

In tandem with looking at participants’ perception of the exhibit’s artist, considering the background assessment scores in addition to these choices can reveal additional trends or lack thereof.

General Art Score

Looking at the General Art score, the artist with the highest mean score was none of the above, leading the programmer by nearly three-quarters of a point (0.68), the installation team following in third with a much smaller margin of 0.12. As touched on in the previous section, this ambiguous choice could show that those with a more extensive general art background had a harder time singling out an artist or
identifying one to begin with.

**Generative Art Score**

Looking at the Generative Art score, none of the above again has the highest mean score, which incurs the same implications regarding artist identification for those with higher generative art scores. However, unlike the general art score, the second and third highest mean scores were the artificial intelligence and the programmer respectively, the two technology-related artist options. These choices could additionally indicate a trend that those with more knowledge of generative art are more likely to identify the artificial intelligence or programmer as the artist.

**General Technology Score**

Looking at the General Technology score, none of the above once more has the highest mean. However, the gap between none of the above and the second, third, and fourth highest scores is much smaller. Rather, the most dramatic difference is the gap between these four choices and the choice with the smallest mean score: the submission participants. Despite being tied for the most popular choice overall, those with greater experience with general technology were less likely to identify the submission participants as the artist.

**Generative Technology Score**

Looking at the Generative Technology score, artificial intelligence has the highest mean score with almost a half point difference above the programmer, the second highest mean score. Even more prominent than the Generative Art score, the two technology-related artist options have the highest scores. Despite having the highest mean score in the other three categories, none of the above only had the third highest
mean score with 0.01 points above the installation team.

At large, these trends are simple observations of the mean scores contrasted by artist perceptions to create an initial understanding of how prior knowledge may affect participants’ choices. However, they may vary widely in practice, as indicated by the large standard deviations, and require further study with a more diverse collection of participants outside of an event as specialized as a book fair.

8.4 Text Responses

There are fewer numerical observations to be made from the text responses. Open-ended questions about general thoughts primarily garnered short, positive responses about the exhibition and its reception, whereas more directed questions prompted participants to express more specific thoughts about generative art.

Regarding artificial intelligence’s ability to create art, there were over twice as many positive answers to the question as negative answers, which had a similar amount to those who were unsure. Beyond simple yes/no answers, some inserted qualifying caveats or other thoughts:

- “It can combine things in ways previously not combined, which is creation.”
- “Maybe, but it has to be based off of human artistic expression, aesthetics, and curatorial knowledge”
- “Possibly, but not without the help of real people. AI lacks in creativity with wholeheartedly meaning.”
- “I mean yeah, anything can make art it all depends on what the viewer thinks is art”
- “Art, by definition is human expression. What makes art art is someone creating something. That can be simple or complex but art is created by intention. Ai
can’t do that. If used as a tool it’s a slightly different conversation but that’s not necessarily related to the question of whether or not ai can create art.”

- “No. It all stems from human input and human creativity is essential to continue to create art. Artificial intelligence is a tool that feeds off of human ideas to make a product using its human-centered programming. That’s not to say that the product is art, for art requires human decision and choice and for the artist (human) to be an active participant”

In response to whether the installation prompted thoughts about artificial intelligence’s ability to create art, participants contributed similar ideas and offered insight into the questions they were considering themselves.

- “Yes! I don’t know much about AI but I think it is trying to understand the human experience so does that mean, by the definition I have held of what art is, AI is making art after all??? Thanks for the mind f**k! ;)

- “Not initially, but in thinking about this question, I found myself at awe in how AI may be bringing us closer to each other, showing us how we can be similar even if we see things differently.”

- “it’s still us making the work, isn’t it? wouldn’t ai just be the medium?”

- “To what extent should we determine how artificial intelligence should be used in creative mediums?”

Although less straightforward, these text responses not only offer insight into what participants thought whilst electing an artist but additionally provide questions for future research of public opinion regarding artificial intelligence’s role in artmaking and creation.
9 Conclusion

Poster, Performed is an interactive art exhibition that creates unique posters using submitted photos and custom image processing algorithms. The project serves as an analogy to large generative models to better understand public perception of authorship when creating with state-of-the-art artificial intelligence tools. By applying the analogy to survey results from exhibition visitors, artworks created with large-scale models would be best credited to those who prompt the works and the original creators of the content used to train them.

9.1 Limitations

There are various limitations that may have impacted the project and its results.

1. Participants from event context – Participants for the survey were sourced during the project’s exhibition at the 2023 Los Angeles Art Book Fair, which may have resulted in a lack of diversity amongst the group. Future data collection should aim to formally recruit participants and seek a wider array of artistic and technical backgrounds.

2. Improving the analogy – Poster, Performed serves as an analogy for larger generative systems that are more prevalent in the generative art space, though there are some shortcomings in the analogy that may affect analysis of participant response. In this project, collected images are only altered to a degree where they remain recognizable to the viewer, whereas assets used to train larger models are not used as directly in final products. While this helps emphasize the role of these assets in training models, it may also exaggerate the degree to which participants perceive public contribution — web scraping in the analogy — as deserving credit. Similarly, the artificial intelligence that creates the poster is much less complex than the state of the art, which may prevent more observers
from identifying its contributions.

3. *Intervention from installation team* — During the exhibition event, it was necessary for the installation team to intervene with visitors to encourage their participation. The nature of this interaction and exhibition’s overall authorship may bias participants to select the team in being responsible for the actions of other parties, such as the artificial intelligence or the programmer.

4. *Participation as a prerequisite for survey participation* — Visitors were most likely to take the survey once they had already interacted with the installation by submitting photos. In contributing their own content to the project, these participants who submit photos may be biased to identify themselves as the artist.

5. *Printer difficulties* — Due to Wi-Fi enabled printers and the large number of vendors on the fair’s network, only two or three of the four letter-sized letter printers were operational at a given moment. Though this unlikely affected the results of the survey, printers that operate more smoothly via USB-connection should be used in future exhibitions.

### 9.2 Future Work

There are various improvements to be made to *Poster, Performed* to address limitations and improve a viewer’s overall exhibition experience.

1. *Sophisticate generative algorithm* — The artificial intelligence algorithm can be advanced to add intrigue and match the capabilities of other prevalent generative systems, such as training a machine learning model to create entirely new compositions with further altered assets or using image recognition on the asset collection to allow intentional inclusion of images and their texts.

2. *User Interaction* — Most generative art models require some sort of intervention
from an initial user to produce an output. In the current state, the input was a mix of artistic decision by the installation team and randomness. Future versions of the project might consider opportunities for exhibition viewers to more directly affect or instruct the printed outcomes.

3. **Printing on command** – Users who submitted photos to the collection were often excited to see their submissions be incorporated into the photos, but random inclusion of assets did not guarantee that they would see their image used in a timely manner. Requiring recently submitted images be included in compositions may provide more engagement for participants.

4. **Incorporation of sound art component** – Beyond their intended function, printers make a variety of rich sounds that would make them convincing instruments and sources for a vibrant generative sound component to increase artistic intrigue.
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