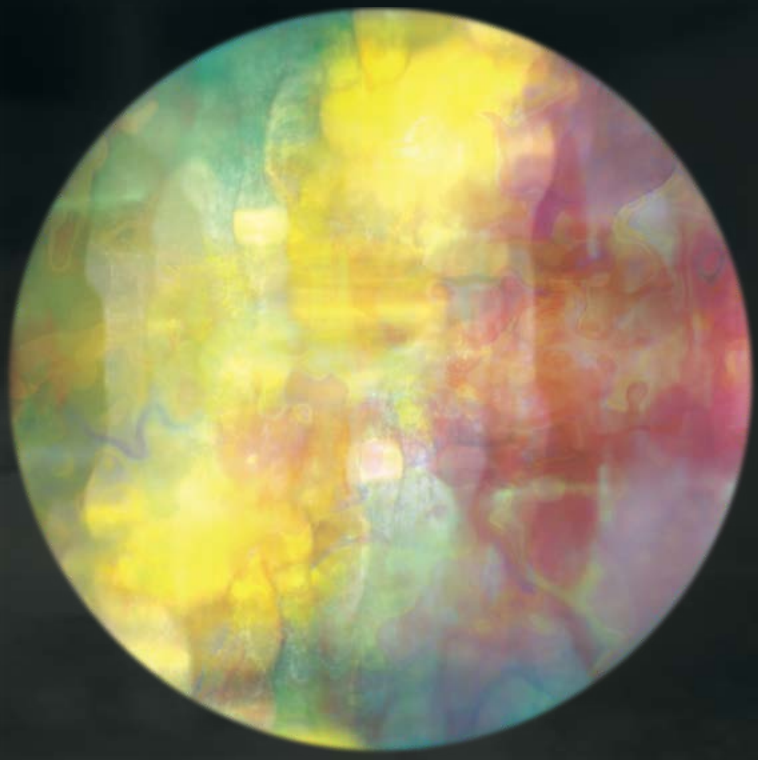

Artistic Data Abstraction in User-Data-Driven Interactive Media Art

Transforming Emotional Data into Color

Yuseung Lee

Master's Thesis

Artistic Data Abstraction in User-Data-Driven Interactive Media Art

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Date of Approval: 16 June, 2026

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Linz, 2026

Abstract

This paper proposes Artistic Data Abstraction (ADA) as a new conceptual framework for user-data-driven interactive media art — one that is developed and demonstrated via the author's own artistic practices — and examines how emotional data can be transformed into aesthetic color experience within this context.

Existing frameworks proved inadequate to describe this body of work. Data visualization prioritizes accurate information delivery, and artistic data visualization, while artistically intentioned, presupposes a structural mapping between data and image. ADA departs from both, finding its aesthetic roots in the tradition of pictorial abstraction. It is organized around three principles: embracing the algorithmic lens as a valid perspective of the contemporary moment; treating emotional data as formal raw material subject to the artist's compositional judgment, rather than as something to be faithfully reproduced; and enacting a circulation model in which color experience triggers new emotion in the user, completing the cycle.

Three of the author's interactive media artworks are analyzed to show how ADA is realized in practice: I am, We are (2024), which uses Natural Language Processing (NLP) to translate text-based sentiment into collective color fields; In Between (2025), which employs Facial Expression Recognition (FER) to render emotional states as color silhouettes that intersect across time; and Cycle of Emotions (2026), which combines NLP and FER across a multi-stage installation to accumulate emotional data into an immersive spatial color experience. Each work realizes the three principles of ADA along a different axis — space, time, and stage accumulation. User experience is analyzed through user logs, surveys, and field observation.

Comparative analysis with contemporary data-based practices engaging with emotional data clarifies where ADA converges with and diverges from existing work, and reveals that the direction of translating emotional data into color experience while positioning the viewer as co-creator of the cycle remains largely underexplored.

Future research directions include developing methodologies to verify the later stage of the cycle — whether color experience actually stirs new emotion in users — expanding ADA beyond color into other sensory media such as sound and movement, and diversifying the practice across different cultural contexts.

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Chapter 1. Introduction

1.1 Artistic Journey

My artistic journey began with painting, a traditional medium. The analog studio once filled with canvases and the smell of paint has since transformed into a digital space occupied by computers, screens, and complex code. I believed that in remaking myself as an “interactive media artist,” I had moved far from my earlier painterly habits. Yet sometimes, an outside perspective can cut straight to an essential continuity that we ourselves fail to see.

In 2023, meeting my longtime friend and independent curator Lee Juha at the Ars Electronica Festival in Austria became a defining moment that reshaped how I think about my work. She was one of the few people who had witnessed everything — from my earliest paintings to my current data-based practice. While she stood for a long while gazing at *Confiding*— part of the *Illusion of Communication* series by Team 2054, a duo I form with ceramic sculptor Kim Younggon — she turned to me with an amused look:
“The tools you use have completely changed, but there’s still something in your work that hasn’t. You’re still speaking through color.”

Her words came as a genuine surprise. I had thought of my past self as someone who drew and painted across various themes, and my present self as someone working with something entirely different — data expressed through algorithms and user interactions. But when I reopened my portfolio, I found a connection I couldn’t deny. *Confiding* (Figure 1, bottom) was strikingly similar to a 2016 piece (Figure 1, top) in which I had mapped the lights of a city onto coordinates using colored stickers. The subject and the medium had changed, but I was still treating data like paint — translating the world’s information into an abstract language of color and geometric form.

Figure 1 Light of City *(Top)* & Sharing *performance based on* Confiding *(Bottom)*

Note. (Top) *Light of City,* by the author, 2016. (Bottom) *Sharing,* by Team 2054, 2023, a performance work realized using the output of the work *Confiding* as its material. All photographs by the author.

Interestingly, this work also opened up a new research direction through audience reactions: emotional data and NLP technology. This new direction came not from a curator or fellow artist, but from misreadings by visitors at the exhibition. *Confiding* was originally designed to expose the imperfections of human communication by replacing text with color images during transmission. At the time, the system responded only to simple variables like the volume of words entered; no AI technology was involved at all. Yet some visitors were convinced the system was using AI to analyze the subtle nuances and emotions of their input, and displaying corresponding colors and circles in response. Rather than experiencing the "disconnection and misunderstanding" I had intended, certain visitors approached the work expecting emotional interpretation through AI or algorithms. This response sparked a question in me: what would it actually look like if AI performed sentiment analysis on text? This curiosity led to an exploration of Natural Language Processing (NLP), which in turn gave rise to *I am, We are* in 2024. That work then became the starting point for *In Between*, which uses facial expression recognition (FER), and subsequently *Cycle of Emotions*. The result was a body of work born from the combination of my growing interest in emotional data and the painterly identity with color that the curator had helped me rediscover.

1.2 Background of Research

When I tried to articulate these works, I ran into a problem: existing theoretical frameworks were not adequate to describe what I was doing. The methodologies of "data abstraction" and "data visualization" used in computer science and information design are oriented toward the clear transmission of information and efficient analysis. Emotional data, however, is inherently ambiguous and incomplete — quantifying human emotion can never be perfect. This incompleteness is not a flaw to be overcome. It is an intrinsic quality.

Moreover, my artistic goal is not to accurately "report" data, but to create emotional resonance in the viewer through it. In *I am, We are*, for instance, the aim was not to deliver the user's data as information, but to let the viewer directly sense — through color — both their own emotions and those of the collective. In other words, I was not visualizing the data. It was something else.

Therefore, this research argues for a new approach, distinct from existing functionalist data visualization: one that embraces the incompleteness of emotional data and transforms it not into strict information delivery but into a subjective, aesthetic experience of color. I call this "Artistic Data Abstraction (ADA)," and this thesis aims to clarify its methodology and value.

1.3 Research Questions and Thesis Structure

This research is guided by one main question and two sub-questions.

Main Research Question: **How can the transformation of emotional data into aesthetic experience be conceptualized within a theoretical and artistic framework, which I propose as Artistic Data Abstraction (ADA)**?

SRQ1: **How does ADA differentiate itself from conventional data visualization and artistic data visualization, particularly in its methodological handling of emotional data?**

SRQ2: **How does the translation of emotional data into color experience, within an interactive environment, shape audience engagement and sensory immersion — particularly when the viewer participates in both the input and reception of that experience?**

The thesis is structured as follows to address these questions.
Chapter 2 looks at the theoretical framework from which this research's methodology is derived. It covers existing approaches to data abstraction, data visualization, and artistic data visualization along with their aesthetics, and takes up abstraction in painting and the sublime. It then turns to the methodology of emotional data and color-emotion theory.

Chapter 3, building on Chapter 2, puts forward ADA as the central concept of this study, theorized through three principles: the embrace of the algorithmic lens, the transformation of data into raw material, and a circulatory model of the viewer's emotional data.

Chapter 4 traces how the proposed methodology is realized in practice through three case studies — *I am, We are*, *In Between*, and *Cycle of Emotions*.

Chapter 5 brings the preceding case studies into dialogue with the framework of ADA, and situates them in relation to contemporary works that also engage with emotional data.

Chapter 6 draws together the findings of the research, identifies its limitations, and points to directions for future inquiry.

1.4 Scope and Limitations

This thesis narrows its focus to "user-data-driven interactive media art" — a subset of the broader field of media art that relies on real-time user participation. This is because the "emotion" at the heart of this inquiry is not a fixed dataset, but something fluid: generated and transformed through real-time interaction between the artwork and its users. The subjects of study are limited to three actual works in Chapter 4 — *I am, We are*, *In Between*, and *Cycle of Emotions* — each utilizing text-based natural language processing (NLP) and facial expression recognition (FER).

Several disciplinary boundaries nonetheless apply, in order to keep the discussion within the domain of art. First, I do not aim to examine the philosophical or neuroscientific nature of emotion itself. Second, it does not seek to statistically or scientifically prove the correlations between specific emotions and colors. Third, it avoids engineering-oriented research into the internal structures of algorithms like NLP or FER, or improving the accuracy of machine emotion recognition. This starting point simply accepts the existence of the algorithmic lens that quantifies emotion, and explores an aesthetic approach that uses the resulting output as artistic material.

This study also includes, in Chapter 5, a comparative discussion that analyzes the works of other artists through the lens of ADA. It should be noted that such analysis applies ADA's preconditions and three principles as an analytical framework — it does not constitute a claim that those works fully satisfy ADA. By

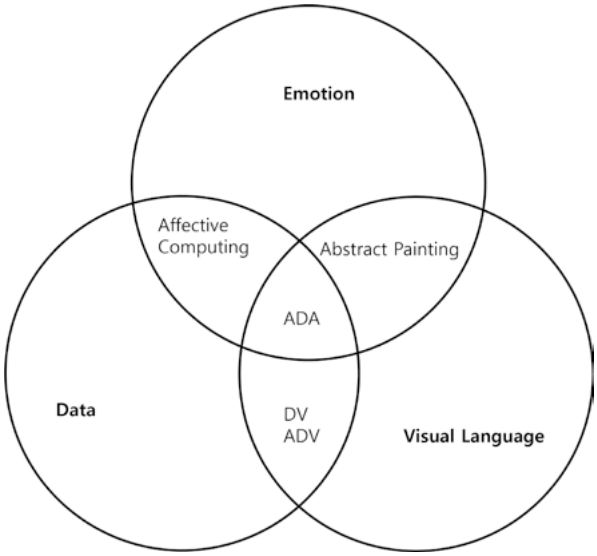
the same token, the disciplinary boundaries established above — the non-aim of philosophical investigation into emotion, the non-aim of statistical proof of color-emotion correlations, the non-aim of verifying algorithmic accuracy — apply equally to the analysis of other artists' works.

The focus of this research, therefore, lies in exploring the aesthetic methodology by which users' emotions — mediated through algorithmically produced emotional data — are translated into color experience, and generating new emotions in a circular process. While ADA is theoretically extensible to other formal languages such as sound, form, and movement, the case study analysis in this thesis is limited to color, as all three works use color as their primary visual medium. Expansion into other sensory dimensions is left as a task for future research.

Chapter 2. Theoretical Framework

This chapter theorizes the three intersections shown in the diagram below, in sequence.

Figure 2 *Three-circle diagram (Emotion / Data / Visual Language, ADA at center)*



Note. Produced by the author. ADA = Artistic Data Abstraction; DV = Data Visualization; ADV = Artistic Data Visualization.

As the diagram shows (Figure 2), ADA — the central concept of this research — sits at the point where all three circles overlap, and this is taken up in full in Chapter 3. Chapter 2 works through each of the surrounding areas on the way to that center. It begins with the aesthetics of abstraction in painting, which has long carried emotion through visual language (2.1). The chapter then traces the history of data visualization and its artistic extensions (2.2) and turns to affective computing — the moment emotion itself becomes data (2.3). Finally, as a preparation for entering ADA at the center of the three axes, it supplements this with a look at color-emotion association research (2.4): how color — the core material at the intersection of Emotion and Visual Language — connects to emotion at a cognitive level.

2.1 Abstraction in Painting and the Aesthetics of the Sublime

The term “abstraction” in “Artistic Data Abstraction” — the concept proposed in this research — is drawn from “Abstraction in Painting,” as it developed throughout the history of painting. Positioned in the diagram at the intersection of Emotion and Visual Language, abstraction in painting functions in this study not merely as a formal reference, but as the aesthetic root of ADA.

2.1.1 Reduction and Inner Necessity

The Latin root of abstraction, “abstrahere,” means “to draw away.” As art theorist Rudolf Arnheim pointed out, this refers to a process of reduction — of extracting only the essential structural properties from a complex subject (Arnheim, 1969, p. 153). Abstraction in painting was never merely a matter of reduction for easier understanding. It was a philosophical choice: to strip away the rational interference that comes with depicting the concrete appearance of things, and to reach more directly toward the essential nature and inner sensation of the subject. Despite their differing methodologies, the abstract painters of the early twentieth century shared a common direction.

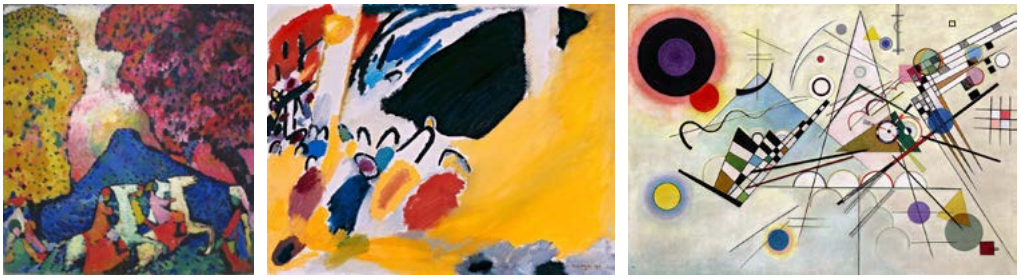
Mondrian’s *Red Tree* (1908), for instance, moves through *Grey Tree* (1911) to *Flowering Apple Tree* (1912). Surface details such as bark and leaves gradually disappear, leaving only the most essential structure — vertical and horizontal lines (Figure 3). This series moves further still, toward the pure grid structures of the De Stijl period after 1917, showing an attempt to reach the essence of the subject through the stepwise dismantling of form (Shaw, 2013).

Figure 3 *Mondrian*, Red Tree *(Left)*, Grey Tree *(Center)*, Flowering Apple Tree *(Right)*

Note. (Left) From *The Red Tree,* by P. Mondrian, 1908 (https://www.piet-mondrian.org/the-red-tree.jsp). (Center) From *The Gray Tree,* by P. Mondrian, 1911 (https://www.piet-mondrian.org/the-gray-tree.jsp). (Right) From *The Flowering Apple Tree,* by P. Mondrian, 1912 (https://www.piet-mondrian.org/the-flowering-apple-tree.jsp).

Kandinsky moved in the similar direction, but by a different path. In *Blue Mountain* (1908), the forms of mountain, trees, and figures are still present; by *Impression III* (1911), those forms begin to dissolve as intense masses of color take over the canvas. In *Composition VIII* (1923), any recognizable subject has vanished entirely — only points, lines, and color remain (Figure 4) . At the end of this transformation, he arrived at his theory of "Inner Necessity." According to Kandinsky, color and form are independent means of expression that stimulate human sensation in their own right. The immaterial "emotion" residing in the artist's soul is translated into color, line, and form on the canvas, and through these formal elements it awakens a corresponding emotion in the soul of the viewer. The destruction of the figure, then, was not an end in itself, but a necessary device for the direct transmission of emotion (Kandinsky, 1911/2019, p. 18).

Figure 4 *Kandinsky's Journey to Abstraction:* Blue Mountain *(Left),* Impression III *(Center),* Composition VIII *(Right)*



Note. (Left) From *Blue Mountain,* by W. Kandinsky, 1908 (https://www.wassilykandinsky.net/work-75.php). (Center) From *Impression III (Concert),* by W. Kandinsky, 1911 (https://www.wassilykandinsky.net/work-170.php). (Right) From *Composition 8,* by W. Kandinsky, 1923 (https://www.wassilykandinsky.net/work-50.php).

Where Mondrian tried to touch essence through the logical reduction of form, Kandinsky tried to touch the inner through the sensory resonance of color. Their methods differed, but read alongside one another, they suggest a shared direction — that concrete form stands between the viewer and essence, and that by

clearing away that interference, one can reach into the inner life of the viewer.

How does abstract painting — having abandoned concrete form — still manage to convey subjective experience to the viewer? The simulation theory of psychologists Johnson-Laird and Oatley gives an answer. When viewers encounter abstract art without recognizable subjects, rather than processing propositional information, they internally simulate emotional states through visual cues such as the movement of color and line. This process they call "mimesis," which is the viewer's perception constructs a model that imitates emotional actions or gestures from cues on the picture surface, and this in turn triggers real emotion (Johnson-Laird & Oatley, 2021, pp. 7-8). Abstract painting, in other words, does not explain information — it generates emotion directly within the viewer's mind. In support of this argument, they draw on empirical work by Melcher and Bacci (2013, as cited in Johnson-Laird & Oatley, 2021, p. 21), who found that geometric forms and primary colors produced positive emotions, while dark tones produced negative ones — color and form alone were enough to predict viewers' emotional responses in abstract painting. This implies that Kandinsky's 'Inner Necessity' transcends mere artistic rhetoric, acting as a channel of non-verbal sensory communication rooted in the human cognitive system.

2.1.2 The Abstract Sublime: From Form to Field

Early European abstraction established the foundation for a formal language of emotional transmission. Building on this, Abstract Expressionism, centered in America from the 1940s onward, drove that language into a domain of overwhelming sensation. Mark Rothko and Jackson Pollock completely dismantled the concrete form on the canvas, leaving only intense color fields and the traces of physical gesture. They turned the canvas from a window representing something into a vast "field" where the artist's inner world and the viewer's senses could meet immediately.

Art historian Robert Rosenblum read these large-scale abstract paintings as an "Abstract Sublime" (Rosenblum, 1961, p. 39) — a continuation of the awe before nature that nineteenth-century Romantic art had pursued. Where Caspar David Friedrich's *Monk by the Sea* (1808; Figure 5, left) conveyed the sublime indirectly through a mediating figure standing before nature, Rothko removed this mediator from the canvas entirely, leaving only an infinite depth of color (Figure 5, right).

Figure 5 *Friedrich,* Monk by the Sea *(Left) & Rothko,* No.14 *(Right)*

Note. (Left) From *Monk by the Sea,* by C. D. Friedrich, 1808 (https://stottilien.com/2016/02/03/the-monk-on-the-sea-infinity-and-mortality/). (Right) From *No. 14,* by M. Rothko, 1960 (https://www.mutualart.com/Artwork/No--14/A3D41C3BF7219D87).

The viewer, no longer a detached observer identifying with a figure in the painting, is drawn into direct confrontation with unfathomable infinity, the absence of form paradoxically enabling the most intense experience of the sublime (pp. 39-40).

Abstract painting arrived at this through practice: that the removal of form brings emotion closer. Cognitive science would later confirm that it was already there, embedded in the structure of human perception.

2.2 Data, Visualization, and Artistic Extension

At the intersection of Data and Visual Language in figure 2 sits a field that spans both analytical function and artistic ambition: data visualization (DV) and its artistic extension, artistic data visualization (ADV). This section looks at how the language of data takes on visual form, and how it crosses into the territory of art. For this, it opens with Data Abstraction, the process that precedes any translation of data into visual form (2.2.1), and then traces the path from functional visualization toward artistic extension (2.2.2, 2.2.3).

2.2.1 The Nature of Data and Engineering Abstraction

According to the Cambridge Dictionary, data refers to “information, especially facts or numbers, collected to be examined and considered and used to help decision-making” (Cambridge University Press, n.d.). It is thoroughly measurable and computable in character. Before data can be expressed visually, it passes through “Data Abstraction,” a process that converts it into a logical structure. In computer science, data abstraction is defined as “the principle of hiding the internal implementation of a data type and permitting access only through defined operations” (Oxford Dictionary of Computer Science, 2016). Visualization theorist Tamara Munzner extended this into the design domain, defining data abstraction as the removal of real-world context and reduction to quantitative attributes that can be visualized. Both computer science and visualization theory orient this approach entirely toward logical simplification and information structuring, with efficiency and information hiding as its guiding principles (Munzner, 2014, Chapter 2).

Data visualization expert Nathan Yau moves beyond this functional definition and turns to the deeper meaning of data itself. In Data Points, Yau describes data as “an abstraction of real life” (Yau, 2013, p. 4) — each data point carrying the people, actions, and contexts from which it was drawn. This perspective opens the possibility of reading data as an artistic medium, one that holds the intimate stories of human life rather than numerical information.

2.2.2 From Functional Tool to Artistic Medium

Structured into logical form, data becomes available for visualization. Statistician and data visualization researcher Antony Unwin distinguished between “exploratory graphics” for the analyst’s own use and “presentation graphics” for communicating information to others (Unwin, 2020, p. 3). He emphasized functional purpose above all else. He pointed out that even a beautifully crafted graphic is meaningless if “the content does not always match” (p. 5), and warned against aesthetics compromising the accuracy of information. Nathan Yau, by contrast, saw visualization as a borderless spectrum between function and art, arguing already in 2013 that it can expand toward data art, a medium that stimulates the audience’s senses (Yau, 2013, pp. 74-81). As an example, he referenced Viégas and Wattenberg’s *Wind Map* (2012). While the work (Figure 6)

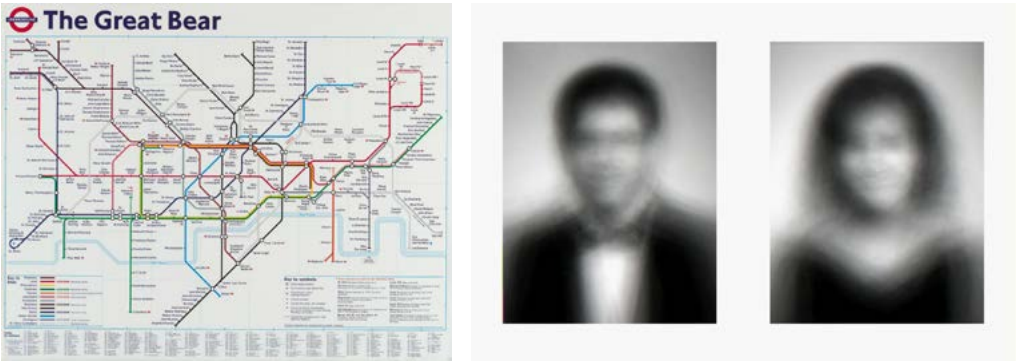
could serve as an analytical tool for meteorologists, it is important to recognize that this is an artwork and not a scientific publication. Yau described it as a beautiful experience that sees the environment as "a living, breathing entity" and noted that Viégas and Wattenberg themselves defined it as an art project (p. 81).

Figure 6 *Viégas & Wattenberg,* Wind Map *(2012)*

Note. From *Wind Map,* by F. Viégas and M. Wattenberg, 2012, Museum of Modern Art (https://www.moma.org/collection/works/163892).

Viégas and Wattenberg defined artistic data visualization as "visualizations of data done by artists with the intent of making art" (Viégas & Wattenberg, 2007, p. 183), and laid out two core conditions in their 2007 paper, *Artistic Data Visualization: Beyond Visual Analytics.* First, the work must be based on actual data. A work like Simon Patterson's *The Great Bear* (1992; Figure 7, left) borrows only the visual style without any real relationship to data, and cannot be considered data visualization in the strict sense. Second, the work must carry a clear artistic intent. A beautiful image discovered incidentally during scientific research, if lacking the artist's expressive intention, does not qualify as artistic data visualization (pp. 183-184).

Figure 7 *Patterson,* The Great Bear *(Left) & Salavon,* Class of 1988 *(Right)*



Note. (Left) From *The Great Bear,* by S. Patterson, 1992, Tate (https://www.tate.org.uk/art/artworks/patterson-the-great-bear-p77880). (Right) From *The Class of 1988,* by J. Salavon, 1998 (https://smartcollection.uchicago.edu/objects/24389/the-class-of-1988).

Viégas and Wattenberg further identified what sets artistic data visualization apart from analytical visualization: "committing various sins of visual analytics" (Viégas & Wattenberg, 2007, pp. 189-190). Where ambiguity or distortion of data was once considered taboo in traditional information design, artists deploy these deliberately as creative choices, transforming data into poetic form. Jason Salavon's *Homes for Sale* and *Class of 1988* series are good examples. By averaging hundreds of images pixel by pixel, he erased concrete forms and left only hazy masses of color (Figure 7, right). The pixel-averaging technique originally came from face recognition algorithms in computer science, but Salavon reversed its purpose. Individual images — each carrying meaning in its own right — dissolve into a field of color (p. 184). From an analytical standpoint this is a loss of information. From an artistic one, it becomes a poetic expression of the archetype beneath the surface.

2.2.3 The Emergence of "New Abstraction" and the Limits of the Anti-Sublime

Media theorist Lev Manovich described data visualization as a "New Abstraction" (Manovich, 2002, p. 7), a continuation of modernist abstract painting in the tradition of Mondrian or Paul Klee, in that it reduces a multifaceted world to geometric structures. Despite this formal resemblance, Manovich identified that

data visualization carries the character of an “Anti-Sublime,” the direct opposite of the Romantic sublime (pp.7-8). Nineteenth-century Romantic art expressed the sublime as awe and incomprehensibility in the face of overwhelming nature. Contemporary data visualization, by contrast, shrinks vast and incomprehensible phenomena into images that can be grasped at a glance, offering the viewer a rational sense of reassurance that the world can be understood and controlled. At the end of his writing, Manovich suggested that data art should move beyond remaining this rational sense of control and find new ways of expressing the subjective experience of living in a data society (p. 11).

Emotion, perhaps the most intimate dimension of that subjective experience, is precisely where this question becomes most pressing.

2.3 Quantifying Human Emotion: The Approach of Affective Computing

In the diagram (Figure 2), affective computing marks the overlap between Data and Emotion. Unlike abstraction in painting, which expanded the expressive range of emotion, this section considers how modern technology defines human emotion and converts it into quantitative data.

2.3.1 Affective Computing and the Datafication of Emotion

In traditional computer science and artificial intelligence, human emotion was long regarded as irrational and uncertain — something that interferes with rational judgment — and was excluded from the domain of scientific measurement and computation. However, Rosalind W. Picard of the MIT Media Lab proposed that emotion should be brought into the domain of computing, a shift she named “Affective Computing” and defined as “computing that relates to, arises from, or influences emotions” (Picard, 1997, p. 1).

Picard noted that emotion had long been dismissed in science as unscientific and irrational. Neurological findings from Antonio Damasio offered a counterpoint.

His studies of patients with brain damage showed that those lacking emotion lost the ability to make reasoned decisions. Drawing on this evidence, she argued that emotion is essential “information” for human decision-making and intelligent thought, and that any computer capable of interacting naturally with humans would need to recognize and process it (pp. 2-3).

The emergence of affective computing marked a significant shift: the hidden inner states of human beings, which had long belonged to the realm of art and philosophy, were brought into the domain of objective, computable data. Since machines cannot look into a person’s hidden emotional state, they began tracking physical expressions — facial expressions, voice, and biosignals. As Picard envisioned, Affective computing recast emotion from an ineffable, ambiguous notion into a digital variable, collectible and computable through sensors and algorithms. All contemporary emotion recognition technologies rest on this paradigm (pp. 4-9).

2.3.2 Physiological and Behavioral Signals

Machines convert human emotion into numerical data through two broad categories of measurement, distinguished by what is being collected (Shu et al., 2018, pp. 1–2).

The first is an approach based on physiological signals, which measures biological responses from inside the body. Data such as brainwaves (EEG), electrocardiograms (ECG), and galvanic skin response (GSR) track the responses of the autonomic and central nervous systems (pp. 1–2). These signals are involuntary and difficult for subjects to consciously hide or manipulate, making them highly regarded as objective emotional indicators (p. 2). However, they require an intrusive and controlled experimental environment in which multiple sensors must be attached to the body. Physiological signal-based studies reviewed by Shu et al. confine emotion to biological responses inside the body and rely primarily on self-assessment questionnaires, such as the Self-Assessment Manikin (SAM), to confirm emotional states (pp. 24–25). Such controlled environments and conscious questioning may capture simple biological arousal, but they carry inherent limitations in fully capturing the nuances of everyday human emotion.

The second is an approach based on what Shu et al. term “physical signals” (p. 1), which analyzes information expressed outward: facial expressions, speech, gesture, and posture. Building on this category, the present study extends the scope of outwardly expressed signals to include language (text), treating it alongside facial expression as a primary behavioral channel of emotional expression. Human emotion is not reducible to brainwaves or heart rate alone; it is realized and communicated through such outward expression.

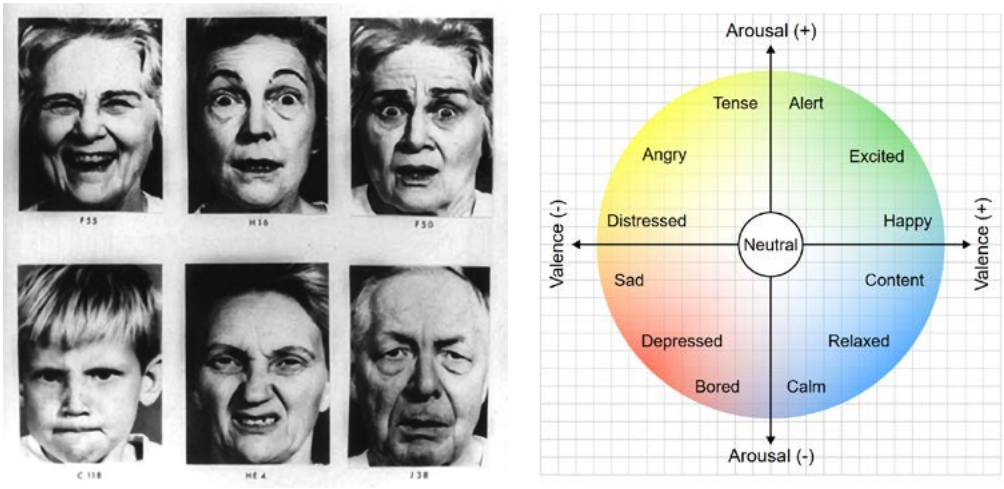
Natural language processing (NLP) and facial expression recognition (FER) are precisely the two technologies this research focuses on, both extracting emotional data through behavioral signals — the former through text, the latter through facial expression. Without conscious questionnaires or invasive biosensors, these two technologies extract emotional data through language and non-verbal visual expression: the two most fundamental expressive channels human beings use.

2.3.3 Categorical and Dimensional

NLP and FER also represent two contrasting mathematical paradigms in contemporary affective computing’s method of quantifying emotional states. The algorithms that translate collected behavioral signals into emotional values draw on two psychological models of emotion: Ekman’s categorical model and Russell’s dimensional model (Figure 8). FER has generally followed the former; NLP-based sentiment analysis, increasingly, the latter.

FER is grounded in Paul Ekman’s categorical model. Ekman, an American psychologist, established through cross-cultural research that a small set of basic emotions — happiness, sadness, anger, fear, surprise, and disgust — are universally recognized and accompanied by distinct facial configurations (Ekman, 2003, pp. 38–46; Figure 8, left). His Facial Action Coding System (FACS), which maps observable facial muscle movements to discrete emotional categories, became the foundational framework for computational facial expression recognition (Gunes & Schuller, 2013, p. 121). In practice, machines encode subtle facial muscle movements using FACS, or extract geometric facial landmarks mathematically (Gunes & Schuller, 2013, p. 127), and derive probability values for each predefined emotional category. Human expression, fluid and continuous by

Figure 8 *Ekman's Categorical Emotion Model (Left) & Russell's Circumplex Model of Affect (Right)*



Note. (Left) From "Emotion Families: Part 2," by P. Ekman, 2020 (https://www.paulekman.com/blog/emotion-families-part-2/). (Right) From "Circumplex model of emotion," by Wikimedia Commons, n.d. (https://commons.wikimedia.org/wiki/File:Circumplex_model_of_emotion.svg). Based on J. A. Russell (1980).

nature, is thereby reduced to discontinuous, discrete categories — a limitation that becomes especially apparent with complex or mixed emotional states (Gunes & Schuller, 2013, p. 121).

NLP-based sentiment analysis, by contrast, computationally implements the dimensional model proposed by James A. Russell, an American psychologist who, in his 1980 paper A Circumplex Model of Affect, argued that all affective states can be represented as combinations of two independent axes rather than as discrete categories (Russell, 1980; Figure 8, right). Research in this field long drew on Ekman's categorical model, but attempts to simultaneously predict valence and arousal from text have grown, and Russell's dimensional model has begun to be implemented computationally (Preoţiuc-Pietro et al., 2016, p. 9). NLP studies have shown that text can be used to simultaneously predict valence, the positive or negative direction of emotion, and arousal, the intensity of emotional energy (Preoţiuc-Pietro et al., 2016, pp. 9–10). The Google Natural Language API used in my artwork does not make its internal algorithm public, but outputs sentiment analysis results as two values: Score (ranging from −1.0 to +1.0), which captures

the direction of sentiment, and Magnitude, a measure of the intensity of emotional content (Google Cloud, n.d.). Taken together, these two values can be read as structurally corresponding to the two dimensions of Russell's model.

Algorithms reduce human emotion to probability values and coordinates, but numbers alone cannot be sensed. A medium is needed for that translation, and in this research, color serves that role. Section 2.4 looks at the reasoning behind that choice.

2.4 Color as Cognitive Medium

Color was chosen for reasons that are both personal and theoretical. The painterly identity described in Chapter 1 is one part of it; the other lies in the close relationship between color and emotional perception, supported by both artistic intuition and cognitive science research.

Stripped of form, color stands in abstract painting as one of the most powerful mediums for reaching the human interior without intermediary. Kandinsky, writing in Concerning the Spiritual in Art (1911), argued that each color carries its own vibration and stirs specific emotions in the soul. He wrote that yellow conveys an intense and aggressive energy; blue, a deep inward repose; red, a living vitality and force. For him, that connection between color and emotion amounted to an independent expressive language, one capable of generating emotion in the viewer without any concrete form (Kandinsky, 1911/2019, pp.50-59).

Kandinsky's argument that color alone could generate emotion finds empirical corroboration in cognitive psychology. An international team led by researchers at KU Leuven and the University of Toronto asked 40 artists and 41 non-artists to express six emotions (anger, disgust, fear, joy, sadness, and wonder) through abstract color drawings and line drawings, then measured how accurately 242 observers could identify them. The pattern of rendering anger in red, sadness in blue, and joy in yellow appeared consistently across both groups, with non-artists following such conventional mappings more reliably than artists. Psychology

calls this systematic linking color-emotion association (Damiano et al., 2023, pp. 3-7). The simulation theory outlined in section 2.1 offers an account of how such associations develop. Rather than being abstractly acquired, they take shape through mimesis of real-world perceptual experience, as when the face turns red in anger (p. 13). The study's findings on color versus line drawings support this view. Color drawings consistently yielded higher accuracy in emotion identification than line drawings, suggesting that color functions as a more immediate perceptual cue for emotion than form alone (pp. 7-8).

Color–emotion association, however, is not a fixed code that operates uniformly across all contexts. A study with French-speaking participants confirmed a generally high degree of pattern similarity in color–emotion associations, while acknowledging that the findings are limited to a single linguistic and cultural group (Jonauskaite et al., 2020, pp. 4, 22). The same methodology applied to Chinese participants found that red was associated with both positive and negative emotions when presented as a color patch, but only with positive emotions when presented as a color term; the difference was attributed to the cultural coding of red in Chinese culture—where it is linked to luck, success, and joy—which overrides perceptual association in linguistic contexts (Wang et al., 2014, as cited in Jonauskaite et al., 2020, pp. 3–4). A degree of universality is thus retained in the association, while variability across cultural contexts remains evident, suggesting that color resists reduction to a fixed sign of emotion, functioning instead as an open material.

The three theoretical threads examined so far each point in the same direction. Abstraction in painting dismantled form and drew the viewer into a field of color, building an aesthetic of the abstract sublime that reaches emotion without mediation (2.1). Data visualization developed a powerful language for structuring phenomena but did not move beyond the limits of the anti-sublime (2.2). Affective computing laid the technical groundwork for translating emotion into data (2.3). Color runs through all three as the material most closely bound to emotion — the substance, too, of the abstract sublime (2.4). Chapter 3 begins at this intersection.

Chapter 3. Artistic Data Abstraction (ADA)

3.1 Definition and Three Principles of ADA

Artistic Data Abstraction (ADA), the concept proposed in this thesis, occupies the center of the diagram (Figure 2) in Chapter 2 — the point where all three circles, Emotion, Data, and Visual Language, intersect.

Before proceeding, it is necessary to clarify the lineage from which the term “abstraction” is drawn in ADA. As examined in Chapter 2, two distinct concepts of abstraction appear in this thesis. The data abstraction of section 2.2.1 aims to conceal the internal implementation of data and to structure information efficiently; the pictorial abstraction of section 2.1, in contrast, is a paradoxical strategy — one that reaches more directly toward emotion precisely by stripping away concrete form. The “abstraction” in ADA follows the latter lineage.

ADA is an aesthetic approach that converts emotional data — produced through algorithms such as NLP and FER — into compositional raw material, and translates that material into color experience. It is organized around three principles. These three principles do not exist independently of one another; rather, they work together within a continuous process, each presupposing the others.

3.1.1 Principle 1: Embracing the Algorithmic Lens

Another’s emotion cannot be reached directly. ADA’s first principle accepts the algorithmic lens as the contemporary condition that makes that reach possible at all — not despite its partiality, but through it.

The first principle of ADA grows out of a question: why use emotional data at all? All my artworks in this study center on emotion and on user-data-driven interaction. The point of departure is each user's emotion, not my own. That distinction is the core premise. Only when the emotion of each viewer becomes the material can a work move beyond the one-directional transmission of the artist's interior, and instead make direct contact with the viewer's own emotional moment.

Individual emotions remain singular in every instance, and it is impossible for an artist to access them with any immediacy. As Ekman (2003) observed, emotions can begin so rapidly that the conscious self neither registers their onset nor identifies what sparked them. Algorithms such as NLP and FER serve as the conduit through which this otherwise inaccessible moment becomes reachable. When each user participates, each one encounters a different color experience, and that individuality carries equal weight. The algorithm does not erase it; the algorithm is the condition that renders the particularity of each user's emotion visible and makes the structure of that experience possible.

In this context, ADA embraces the algorithmic lens as a valid way of seeing. A machine's representation of emotion to numerical values may fall short of perfection, and that incompleteness is not a flaw to be overcome in ADA. It is a mode of seeing produced by the contemporary moment. This acceptance is premised on an essential property of emotion itself. Emotion cannot be fully captured by any algorithm, and to demand precision from its numerical output is to misread what this lens is. At the same time, this embrace does not mean that ADA can be constituted by any data whatsoever. The cycle of ADA rests on a causal connection that departs from the user's emotion and returns to emotion; random data lacking this connection cannot establish the starting point. The question, then, is not whether algorithms can perfectly capture emotion, but what kind of object the numerical output of that process should be understood as.

Data visualization theorist Offenhuber (2023) defines data, in Autographic Design, not as signs separated from the world, but as material traces through which the world inscribes itself. He draws on the ice core as one such example, observing that an ice core does not convert past atmospheres into a symbol, but lets the climate inscribe itself directly into layered material. Importantly, Offenhuber extends the notion of trace beyond permanent physical marks to include ephemeral impressions such as sound or smell, arguing that the difference is only

one of degree. In the same way, the numerical values an algorithm produces can be understood as traces left by an emotional moment passing through a specific lens. His argument was developed in an environmental and physical context, and some distance is required before applying it to emotional data; yet the underlying premise holds: every event inscribes itself in some form (Offenhuber, 2023, pp. 2-15). What such inscriptions reveal, however, depends on the vantage point from which they are read. Consider a human being viewed from the scale of the universe — a microscopic point in vast space. At the cellular and molecular scale, that same person resolves into an aggregate of innumerable biological processes. Neither perspective fully describes humans, but each reveals something that was invisible before it existed. The algorithmic representation of emotion to number is one such lens — a recent one, neither more nor less truthful than the others, but revealing what was previously unavailable to view.

3.1.2 Principle 2: Data as Formal Raw Material

In ADA, emotional data is not a record but formal material. It is taken up, broken, and reformed into the formal substance of color — handled as a painter handles pigment.

The numerical values produced by the algorithm are not transposed unchanged. Some values are selected; others are discarded; in some cases, the structure of the data itself is broken apart and reconstituted as the formal substance of color. Materiality takes precedence over precision. Such an orientation was not derived from theory at the outset; it emerged retrospectively, through the accumulation of work.

Pigment, in painting, is the artistic substance by which a painter senses and expresses the world; its function is expressive, not merely reproductive. Emotional data occupies an analogous position in ADA, as the expressive raw material from which color experience is generated. Just as the painter's relation to pigment is not adjudicated by the chemistry of pigments, nor the composer's relation to sound by acoustics, the artist's relation to emotional data in ADA is held within artistic practice, not within the scientific or computational frameworks from which the data is drawn.

The data's accuracy and representational claims are questions that belong to

other domains; ADA does not contest them. The data is taken up, instead, as the formal condition from which color experience is generated. Such a stance finds an adjacent recognition in Johanna Drucker (2011), a scholar working across digital humanities and data visualization theory. Drawing on etymology, she distinguishes between data ("the given") and capta ("the taken"), arguing that all data is the product of interpretation: something actively taken from a specific observational standpoint. Drucker's argument addresses how the humanities should display such data; ADA addresses how artistic practice may work it. The two questions are distinct, yet they share a single premise: data is never inert, having always been taken — and what has been taken can be taken up again.

3.1.3 Principle 3: The Circulation Model of Emotional Data

In ADA, emotion departs as data and returns as emotion. The user stands at both ends of this cycle, as origin and as recipient.

The individual's emotional data, captured through the algorithm, passes through the artist's formal intervention and transitions into color experience. That color experience, in turn, stirs the senses of the user and viewer, generating new emotion. The ADA cycle is established within this chain, and it operates within the medium-specific conditions of user-data-driven interactive media art. The user's real-time participation generates data, that data shifts into color experience, and the resulting experience again stirs the senses of the user and others; this sequence is possible only within the structure of living interaction.

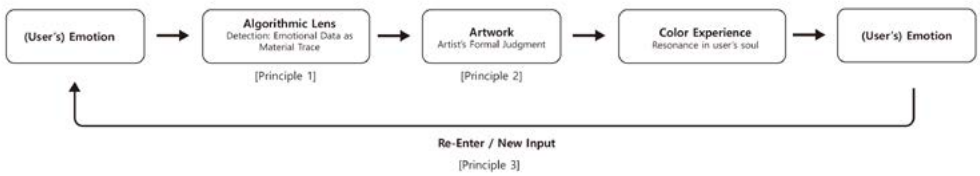
The ADA cycle connects to the chain Kandinsky described in section 2.1, where artistic communication is articulated as a process of transmission between artist, artwork, and viewer (Figure 9).

Figure 9 *Kandinsky's Emotional Transmission Chain*

Note. Produced by the author based on Kandinsky (1911/2019, p. 18). This diagram visualizes the linear process of artistic communication, where the artist's internal emotion is transmitted to the viewer through the medium of the artwork.

ADA's circulation model (Figure 10) inherits the structural logic of Kandinsky's chain (Figure 9), but with one significant difference: the starting point shifts from the artist's emotion to the user's emotion. The algorithmic lens takes the place once occupied by the first "sensation," the moment previously charged by the artist's interior. The artist is positioned, instead, as the transforming subject, working between the user's emotional data and the color experience it becomes.

Figure 10 *ADA's circulatory structure*



Note. Produced by the author. ADA = Artistic Data Abstraction.

Within this structure, the user is positioned as both sender and receiver of the cycle, participating in the process as a whole rather than functioning as a data input alone. What the algorithm has taken as numerical traces returns through color experience to be taken up again by the user's own senses. The circulation is thus a process of emotional re-creation, extending beyond a simple feedback loop.

The transition into color experience marks the point at which the work departs from the anti-sublime. As discussed in section 2.2.3, Manovich (2002) analyzed data visualization as carrying the character of the anti-sublime, reducing extensive phenomena to manageable images. But when the numerical values produced by the algorithm shift into color experience, the sense of systematic control dissolves, and the user is exposed directly to an uncontrollable sensory field of color.

The cognitive ground for this transition has already been laid in the simulation theory outlined in section 2.1. Confronted by a field of color stripped of form, the viewer is constituted as the first-person subject of sensation — a structure that maps precisely onto the mechanism by which color and form generate emotion in the brain. ADA, at this point, aligns with the abstract sublime as analyzed by Rosenblum (1961). Whereas the anti-sublime reassures viewers by reducing the

world to a comprehensible image, ADA's color experience moves in the opposite direction. Once the numerical language of data is rendered as a sensory field that resists decoding, sensory immersion displaces the impulse toward control.

The abstract sublime, however, presupposes a static painting. The artist's emotion is already inscribed on the canvas, fixed in place, and the viewer encounters it as a passive recipient. ADA operates otherwise. The field of color is generated and transformed in real time by the user's emotional data, elevating the viewer from passive recipient to active co-creator of the sublime. ADA consequently inherits the abstract sublime while expanding it into something altogether different, a form of dynamic, circulatory sublimity.

3.2 Why a New Concept Is Needed: Comparison with Existing Frameworks

Section 3.1 established the three principles of ADA. The three works at the center of this study (*I am, We are*, *In Between*, and *Cycle of Emotions*, discussed in detail in Chapter 4) resist easy classification within existing theoretical frameworks, as no available category proves adequate to contain them. ADA emerges precisely from this gap. The question, then, is what sets it apart from those frameworks.

From the perspective of functional data visualization (DV), my works neither attempt to accurately reproduce emotional data nor carry any purpose of delivering information. Emotional data is not mapped to color on a 1:1 basis within these works; it functions only as a point of departure toward color experience.

How, then, do my works relate to the category of artistic data visualization (ADV)? They satisfy the condition of artistic intent, but they operate distinctly from the "underlying mapping between data and image" that Viégas and Wattenberg (2007) proposed as the foundational premise of artistic data visualization. In ADV, the artist may distort or poetically transform the relationship between data and image, but the structural correspondence itself is preserved. Salavon's work, examined in section 2.2.2, is a case in point: even where pixels are averaged to dissolve concrete form, the structural basis of the data, hundreds of source images, remains intact within the result. Structural correspondence here refers

not to incidental correlations that may emerge between data and color, but to a systematic and traceable mapping in which the data's structure is preserved through the visual transformation. ADA departs from this principle. As outlined in section 3.1.2, emotional data is converted into visual raw material from which color experience is generated, a process that proceeds independently of structural mapping. This is why the decisive distinction lies in the legibility of the underlying mapping: in ADV, a viewer who knows the underlying data can recognize how it was used, because structural preservation is its foundational premise; in ADA, the bleeding, layering, and organic motion of color (examined in Chapter 4) render the data structurally illegible in the final visual result.

The comparison table next page shows at a glance how ADA differs from existing concepts:

Table 1 *Comparative Framework: Data Visualization, Artistic Data Visualization, and Artistic Data Abstraction*

	Data Visualization (DV)	Artistic Data Visualization (ADV)	Artistic Data Abstraction (ADA)
Attitude toward data	Data as object of accurate representation	Data as ground for artistic intent	Data as formal material — operating outside the logic of representation
Meaning of "transformation"	Data → 1:1 correspondence with sign	Data → visual expression (structural pattern preserved)	User's emotion → algorithmic lens → artist's formal judgment → color experience by user
Lineage[1] of abstraction	Engineering abstraction (information concealment, simplification)	Artistic extension of engineering abstraction	Pictorial abstraction (transmission of inner emotion)
Direction of the sublime	Not applicable (aesthetic experience not the aim)	Anti-sublime (Manovich)	Closer to the abstract sublime (Rosenblum); viewer constituted as first-person subject of sensation
Position of the artist	Designing subject	Interpretive Subject	Transforming Subject
Viewer's role	Reader, analyst	Passive spectator	Subject and receiver of the cycle
Function of color	Sign for decoding information	Element of visual expression	Open raw material that makes emotion sensible

1 Abstract painting is not among the concepts compared in this table; it is, rather, the aesthetic root of ADA. As examined in section 2.1, the principles of pictorial abstraction are absorbed into the "lineage of abstraction" row within the ADA column.

Note. Produced by the author. DV = Data Visualization; ADV = Artistic Data Visualization; ADA = Artistic Data Abstraction.

Two rows in the table demand particular attention: “meaning of transformation” and “Position of the artist.” Transformation in ADA does not denote a symbolic correspondence of data to color. Rather, it names the full process by which the user’s emotion is detected through the algorithmic lens, passes through the artist’s compositional judgment, and transitions into color experience. The positioning of the artist is equally specific. Far from being defined by functional tasks — such as the system designer in data visualization — or being the sole subject of expression as in artistic data visualization, the artist in ADA stands as a transforming subject working in resonance with the user’s emotional traces. Within this framework, the artist does not merely “render” data but commands it as aesthetic substance, channeling the user’s emotional traces into a sensory field through the deliberate exercise of thematic intent and formal judgment.

Ultimately, neither data visualization nor artistic data visualization can accommodate the works at the center of this study. Each framework presupposes a relationship to data — accurate reproduction in the former, structural mapping in the latter — that ADA sets aside altogether. What remains, once these obligations are released, is data as expressive substance and the artist as its transforming subject. The necessity of this concept becomes visible precisely where existing frameworks fall short.

3.3 Scope and Limitations of ADA

ADA proposes an aesthetic approach that transitions emotional data into color experience through three principles. The conditions under which the concept operates, and the domains it deliberately does not address, nonetheless require explicit clarification.

Preconditions

Two preconditions are required for ADA to function. The first is the existence of emotional data. ADA takes as its artistic substance emotional data that has been

quantified through the methods of affective computing. The data constitutes an interpretive result extracted by the algorithm from an emotional state at a specific moment; its significance lies in the fact of its existence, independent of accuracy. The second precondition is the use of color. As established in section 1.1, color emerged in this study as the through-line connecting the artist's painting practice to user-data-driven interactive media art. Within ADA, color acts as open raw material, shaped jointly by the artist's creative appraisal and the user's sensory experience. The specific relationship between colors and emotions varies from work to work and is not fixed by ADA itself.

These two preconditions — emotional data and color — also act as the reference points when comparing ADA to other works. In section 5.2, where the works of other artists are analyzed through the lens of ADA, the discussion proceeds by considering how these two preconditions and the three principles are met or not met in each case.

Scope

At present, ADA operates fully within the medium-specific conditions of interactive media art grounded in real-time user participation. As outlined in section 3.1.3, the core of ADA lies in a circulatory structure in which emotion is detected as data, transitions into color experience, and in turn triggers new emotion. This cycle cannot be established without real-time user participation; working with fixed datasets, or presenting finished results in a one-directional mode of exhibition, therefore falls outside the scope of ADA. The requirement for real-time participation marks another decisive condition distinguishing ADA from existing data art and artistic data visualization.

ADA is also, in principle, a concept extensible to formal languages beyond color: sound, form, movement, and others. Within the scope of this thesis, however, the discussion is confined to color, since all three case study works use color as their primary expressive medium.

Boundaries

ADA engages with emotional data, but does not presuppose any philosophical or neuroscientific account of the nature of emotion itself. As examined in section 3.1.1, the numerical values produced by the algorithm are not a complete reproduction of emotion; they are interpretive traces taken through a specific lens. The aesthetic value of ADA derives from the process of translating those values into

color experience, independent of their accuracy.

While color is widely recognized to act on emotion, ADA does not presuppose any fixed correspondence in which a specific color or shade designates a specific emotion. The connection is real but underdetermined: shaped by culture, subjective experience, and context, it cannot be reduced to a one-to-one mapping. Color in ADA therefore operates as an open material whose meaning is formed within the user's own sensory engagement and context.

Furthermore, the methodology for directly verifying whether color experience actually triggers new emotion within ADA's circulatory model is not adequately addressed within the conceptual scope of this study, and remains a task for future research.

The specific forms and possibilities that emerge in the practice of ADA are examined in greater detail through the work analyses of Chapter 4 and the comparative discussions of Chapter 5.

Chapter 4. Artistic Practices

This chapter examines how the three principles of ADA proposed in Chapter 3 are realized in actual works, through three case studies. The works under analysis are *I am, We are* (2024), *In Between* (2025), and *Cycle of Emotions* (2026). Each employs a different method of affective computing — NLP, FER, and a combination of the two — and realizes the principles of ADA within a distinct thematic context.

Before turning to the three works, three premises they share should be made explicit.

First, all three works are designed as experiences to be undergone individually. This is because extracting emotional data from each person's singular state requires that the experience be structured around the individual unit.

Second, all three works are designed with the intention that users encounter them with as little prior information as possible. If the structure of the work is known in advance, the responses collected as data may reflect anticipated reactions rather than genuine ones — a matter that bears directly on the authenticity of the data and the integrity of the user's experience.

Third, none of the three works relies on the simple principle of input yielding immediate output; all three are designed for immersion in two directions, achieved through a staged progression. One comes from the user's sense of actively intervening in the work at each stage. The other is sensory immersion produced by the color experience itself, which unfolds at the end of the process. These two directions of immersion connect directly to the way the circulation model — the third principle of ADA — operates within lived experience.

Each work is described according to the following three-part structure. First, the exhibition context and technical mechanism of the work are outlined. Next, the way in which the three principles of ADA proposed in Chapter 3 are realized

within that work is analyzed. Finally, how those principles were experienced in the actual exhibition space is examined through real user responses — observation, interview, or questionnaire[2]. Observations and visitor interviews were conducted informally by the author during the exhibitions and are presented as practitioner accounts rather than formally recorded data.

4.1 *I am, We are* (2024)

4.1.1 Work Overview and Technical Mechanism

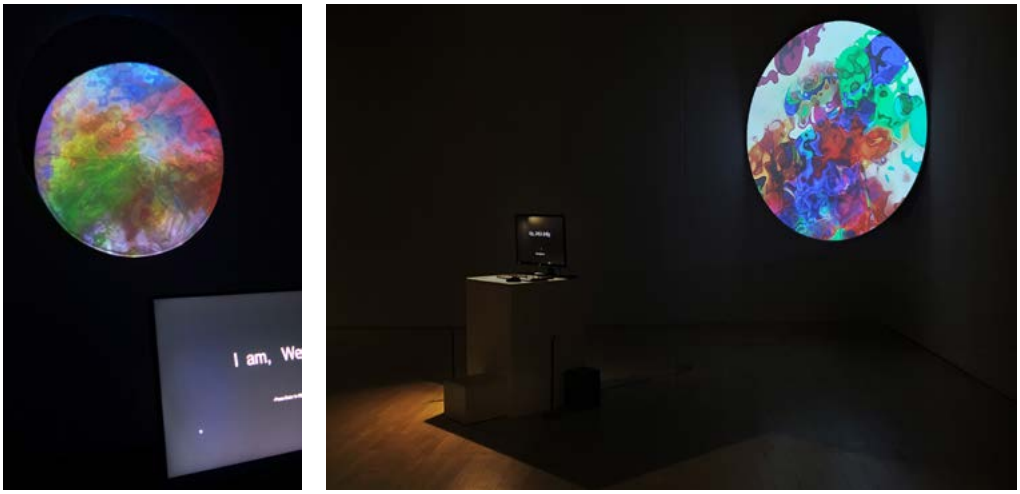
I am, We are was first presented in 2024 at the Ars Electronica Festival in Linz, Austria, as part of "NOUS", the Interface Cultures department exhibition. In 2025, it was reconstructed for the Goyang Aram Museum exhibition "엮어, 보아 (Yeokeo, Boa)" under the Korean title 나는, 그리고 우리는. In the Korean version, the Google Natural Language API used in the original was found to be inadequate for analyzing Korean-language text; accordingly, an OpenAI model was applied, using data from the English version as prompts. Both versions share the same underlying process of natural language processing, and the operating principle — converting sentiment scores into color — remains consistent across the two.

I am, We are is composed of two spaces (Figure 11, left): the *I am* space, consisting of a single computer station, and the *We are* space behind it, displayed through projection mapping. In the 2024 version, the *We are* space took the form of a circular projection approximately 1.8 meters in diameter; in the 2025 Korean exhibition (Figure 11, right), this was expanded to 2.4 meters.

The user begins by completing the sentence "I am..." following the prompt on screen. On the next screen, the user selects a hue that feels to them to correspond to the sentence they have written. During the loading screen that follows, the Google Natural Language API analyzes the sentiment score of the entered sentence, ranging from −1.0 to +1.0. Once the analysis is complete, the sentiment score calculated by the NLP is converted into saturation and brightness values and layered onto the hue the user has chosen; the resulting personal color circle appears on screen alongside the numerical sentiment score (Figure 12, left). The higher the sentiment score, the higher the saturation and brightness;

2 Supporting materials — user logs, questionnaire forms, and critical writings — are provided in the appendix.

Figure 11 *Exhibition view,* I am, We are *(Left) &* 나는, 그리고 우리는 *(Right)*



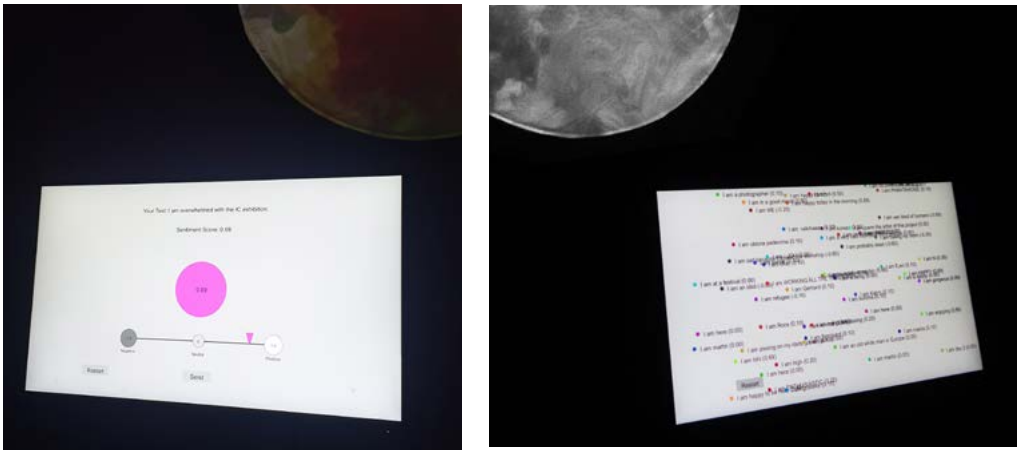
Note. Photographed by the author.

the lower the score, the lower both values. The color circle is transmitted to the *We are* space when the user presses the send button. Upon sending, the monitor displays the sentences submitted by previous users, moving alongside their sentiment scores and color tags (Figure 12, right); in the *We are* space, the color circles from all users move organically, forming a collective field of color.

The *We are* space is accompanied by a continuous flow of water sound. The moment a user submits a sentence, a sound resembling a stone dropping into water is produced. This auditory element is not a simple sound effect — it is a sensory rendering of the moment each user's input sends a ripple through the collective space, extending the color experience of the *We are* space viscerally.

This multi-stage progression generates two directions of immersion particular to this work. Each step — entering a sentence, selecting a color, waiting for the result — builds a sense of active intervention. The critical moment, however, lies in the instant when the hue chosen by the user and the sentiment score determined by the algorithm are brought together. Uncertainty about whether the result will align with one's expectation or depart from it entirely sustains the first direction of immersion. The second direction resides in the experience itself: the continuously moving color circles of different individuals in the *We are* space, forming a field of collective color.

Figure 12 *Result Screen Showing Personal Color and Sentiment Score (Left) and Collective Screen After Sending (Right)*



Note. Photographed by the author.

The Google Natural Language API used in this work is a black box — its internal algorithm is not disclosed. In actual use, certain inherent biases[3] have been observed: the same sentence may generate different sentiment scores depending on when it is entered, and sentences of similar structure may produce different results depending on variables such as gender. As indicated in section 3.3, however, the accuracy of the algorithm does not play a significant role in the work.

4.1.2 Analysis through the Three Principles of ADA

Principle 1: Embracing the Algorithmic Lens

Among the three works, this one exposes the algorithmic lens most directly. A result combining the user's chosen hue with the NLP-calculated sentiment score is presented on screen; the user then decides whether to transmit it to the *We are*

3 During testing, it was found that "I am woman (0.0)" and "I am man (0.1)" yielded different sentiment scores during testing conducted in August 2024. As the Google Natural Language API does not disclose its internal algorithm and updates its models without notice, this observation reflects a specific moment in the system's operation and cannot be generalized beyond that point. This bias is not understood as a flaw to be criticized, but as an instance that illustrates how a machine's way of reading language may differ from that of a human — the character of the algorithmic lens described in Principle 1.

space. The act of transmission is itself the moment of accepting the algorithm's judgment as one valid perspective. As Lee Mun-jung's review notes, the work leads the viewer to recognize that human and technological ways of judging information may differ, and that AI may not be perfect (Lee, 2026). Algorithmic imperfection is not a flaw this work seeks to resolve — it is what the work is about.

Principle 2: Data as Formal Raw Material
The relationship between data and color in this work is one of transformation, not reproduction. The artist's intervention operates at the level of structure, not output — the decision to connect sentiment scores to saturation and brightness, to move negative values toward dark and muted tones and positive values toward bright and vivid ones, is not a decision the data makes itself. The values the NLP produces function as raw material only within the formal framework the artist has designed, transforming the direction of color experience.

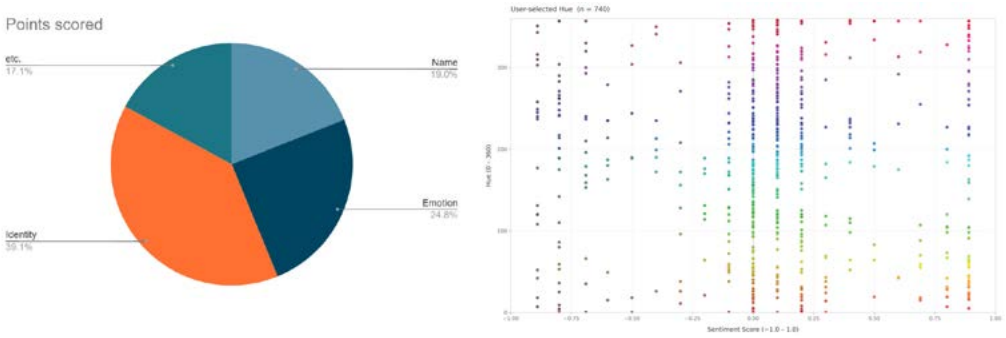
Principle 3: The Circulation Model of Emotional Data
The cycle of this work is structured along a spatial axis. *I am* becoming *We are* is not thematic labeling — it is the physical form of the circulation structure itself. The individual color circle moves into the *We are* space and mingles with those of others; the resulting collective field touches the senses of users and viewers alike, generating new emotion. The user begins as the sender of the cycle and becomes its receiver within the same experience.

4.1.3 User Experience

In *I am, We are*, user experience is analyzed through user log data, field observation, and external criticism. The user log records, anonymously and with a timestamp, each sentence entered, the hue selected, and the sentiment score produced by the algorithm, enabling tracking of whether individual users participated more than once.

Field Observations and Data Analysis
A total of 742 user logs were collected during the 2024 Ars Electronica Festival exhibition. When the entered sentences were classified by content, Identity (declarations of identity: "I am a student," "I am an artist," etc.) accounted for the largest share at 39.1%, followed by Emotion (emotional expression) at 24.8%, Name (name input) at 19%, and other inputs at 17.1% (Figure 13).

Figure 13 *Distribution pie chart by input category (Left) & User-Selected Hue (n = 740) (Right)*



Note. This figure was generated with the assistance of an AI-based data analysis tool. Raw data was collected from user logs during the exhibition period.

Table 2 *User Log Data: Entered Sentences, Sentiment Scores, and Selected Hue, Saturation, and Brightness Values,* I am, We are *(2024)*

Sentiment Score	Text	Hue	Saturation	Brightness
0	I am gon.	45	74	74
0.1	I am Martina.	271	52	60
-0.69	I am nobody.	0	50	50
0.1	I am rosi.	319	73	75
0.2	I am curious.	276	52	61
0.2	I am touched.	268	52	60
-0.8	I am outraged.	9	47	47
0.1	I am wendi.	216	67	70
-0.1	I am sleepy.	87	63	71
-0.6	I am blank.	279	54	54
-0.6	I am fat.	15	54	54
0.1	I am Jesus.	312	60	68
-0.3	I am weird.	26	63	63
-0.2	I am alone.	189	69	68
-0.1	I am cat..	112	58	70
0.89	I am happy.	350	88	92

Note. Compiled by the author from user log data of *I am, We are* (2024). See Appendix [A-1] for additional samples.

This distribution aligns with the design intent of the work. The “I am…” sentence was deliberately structured as an open form, so as not to elicit only emotional expression (Table 2). From the outset, it was anticipated that people would complete the sentence with emotions alongside declarations of name, occupation, role, and existence. The outcome therefore confirms that the open structure functioned as intended.

In field observation, the ways users engaged fell broadly into two patterns.
Users who participated only once tended to enter their name or a statement of identity and then conclude. For entries in the Name and Identity categories, the sentiment scores produced by the algorithm were largely concentrated at neutral (0.0-0.1). Each of these users, however, selected an entirely different hue and transmitted it to the *We are* space. An input that the algorithm read uniformly as neutral was translated, through the user’s own selection, into a completely different color. This reads as the act of placing oneself within a collective space through a color of one’s own choosing.

Among returning users, two distinct patterns emerged, sharing the same outward behavior of repeated participation but differing in what drives each. The first is repetition driven by internal curiosity, in which the user poses the question “What score would the algorithm give this sentence?” and tests sentences of divergent emotional nuance, probing the algorithm’s responses. Up to five repeated participations were recorded. The second is repetition prompted by external stimuli: seeing the sentences and color tags of previous participants moving across the screen, the user enters a new sentence in response. This chain, whereby the emotional expressions of others draw out new input from the viewer, demonstrates that the collective display functioned as an active stimulus for further engagement.

The user log data demonstrate the opening stage of this cycle, while also supporting the second precondition of ADA — the use of color. Users who entered the same sentence, “I am happy,” each chose an entirely different hue: 350, 31, 217, 62, 64, and so on. No consistent correspondence appeared between the sentiment score and the color selected. Each user’s color circle remained distinct, even when the same emotion was expressed. The data demonstrate that color is not a fixed sign of emotion but an open material formed within each user’s individual sensory context.

The closing stage of the cycle, where color elicits new emotion in turn, is validated in the responses of visitors who did not participate directly. The "엮어, 보아 (Yeokeo, Boa)" exhibition space (Figure 14), in which the Korean version 나는, 그리고 우리는 was presented in 2025, was arranged as a space for contemplation, with beanbag seating alongside the work. In front of this space, where color circles moved organically to the continuous sound of flowing water, visitors who had not themselves participated were observed to stay, watching the field of color.

Figure 14 *Two Visitors Engaging with the* We Are *Space,* 나는, 그리고 우리는 *(2025)*

Note. Photographed by the author.

External Criticism

Critic Lee Mun-jung described the *We are* space as "a place where the emotions of individual selves become entangled, coexisting and colliding — showing directly that there exists a diversity of selves: me, and you, each different" (Lee, 2026). She further wrote that "as one focuses on the sound of water flowing through the exhibition space, the *We are* space calls to mind a lake, or the sea" (Lee, 2026). Lee's reading, offered from outside the work itself, attests to the *We are* space being received by visitors as a sensory experience, with its origins in data aggregation receding entirely from perception (For the full translated text of this critique, see Appendix [A-2]).

4.2 *In Between* (2025)

4.2.1 Work Overview and Technical Mechanism

In Between was presented in 2025 at the Ars Electronica Festival in Linz, Austria, as part of "Post_human_resources," the Interface Cultures department exhibition. The work uses FER to capture emotion through facial expression, a non-verbal form, and explores the crossing of emotions between different people at different moments, across time. It was inspired by the Korean proverb rooted in Buddhist notions, "even a brush of sleeves is a predestined encounter," interpreted here in the following direction: we cannot meet the people who once occupied the same space, yet their emotions may remain in that space, across time.

The installation is simple in configuration: a Kinect sensor mounted above a vertically oriented screen, with a clock interface, designed and fabricated using Arduino and a rotary encoder, placed on a pedestal in front (Figure 15). On the opening screen, the user's silhouette appears through the Kinect as an aggregate of color particles, rendering one's own body strange to oneself.

Figure 15 *Exhibition view,* In Between *(2025)*

Note. Photographed by the author.

When the user presses the center button of the clock to begin, the FER (Facial Expression Recognition) system activates. The FER library used is Python's FER Library (OpenCV-based), selected with priority given to real-time processing speed. The algorithm analyzes the dominant emotion in the user's facial expression in real time, and the color particles of the silhouette change immediately in response. The mapping between emotion and color was designed as follows:

Table 3 *Emotion-to-Color Mapping and Corresponding RGB Codes Used in the Work*

Emotion	Color	Color Code (RGB)
Anger	Red	255,0,0
Disgust	Green	0,255,0
Fear	Purple	128,0,128
Joy/Happiness	Yellow	255,255,0
Surprise	Cyan	0,255,255
Sadness	Blue	0,0,255
Neutral	Gray	128,128,128

Note. Produced by the author.

Each emotion is also assigned a distinct natural sound: sadness, for instance, is paired with the sound of heavy rain; neutral by the ticking of a clock. The user can thus recognize their emotional state simultaneously through both visual and auditory channels. At this stage, the user's emotional color silhouette is recorded and stored for the next user.

In the second stage, the user turns the clock dial (Figure 16) to select a moment in the past. The screen displays time information down to the year, month, day, hour, minute, and second, allowing the user to select a specific moment at which a previous visitor experienced the work. Once a time is chosen, the emotional color silhouette of that previous visitor overlaps on screen with the current user's silhouette. At this moment, the color particles of the two silhouettes bleed and diffuse, the boundaries between them dissolving, and Johann Sebastian Bach's Keyboard Concerto No. 5 in F minor, BWV 1056, II. Largo begins to play. The total duration of the experience per person is approximately five to seven minutes.

Figure 16 *Work interface and clock device*

Note. Photographed by the author.

4.2.2 Analysis through the Three Principles of ADA

Principle 1: Embracing the Algorithmic Lens

In this work, embracing the algorithmic lens is less a matter of recognizing or understanding it than of sensing within it. Numerical values are displayed at the top of the screen, but most users did not notice them, and no explanation is provided as to which expression produces which color. Rather than reading the machine's judgment, the user makes facial expressions and explores that judgment through the shifting colors of the silhouette. The algorithm's operation is sensed first as color, before it is registered as data.

Principle 2: Data as Formal Raw Material

The artist's artistic judgment in this work takes shape across three layers: assigning a distinct color to each emotion, rendering the FER output as color particles across the entire silhouette, and designing the two silhouettes to bleed outward without simply overlapping when they meet. The third layer is the

decisive one. As bleeding occurs, the emotional values of two people meet and produce colors the artist had not designed in advance — as blue and yellow meet to become green. It is the moment when emotional data, as raw material, is processed through the formal framework and is translated into an unpredictable color experience.

Principle 3: The Circulation Model of Emotional Data
Past and present overlap within this work's circulatory structure. One user's emotion is captured and stored as a color silhouette, becoming material for a future visitor; the current user encounters that silhouette on screen alongside their own. Within this structure, the current user occupies a double position — a receiver who senses the emotion left by someone in the past as color, and simultaneously a sender whose own emotion remains as material for a future crossing. The sender and receiver of the cycle exist at different moments in time.

4.2.3 User Experience

The user experience of this work is analyzed through two complementary methods: an anonymous survey conducted with 66 participants over the five days of the exhibition, and field observation throughout the same period.

Survey
The survey consisted of seven items rated on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree), followed by an open-ended response (Table 4; see also Figure 17 for the original form). Participants completed the survey on paper immediately after their experience with the work, and submission was entirely voluntary. A representative form is shown in Figure 17; additional samples are provided in Appendix [B].

Question 5 received the highest mean score at 5.83, followed by Question 6 at 5.32 and Question 1-b at 5.29 (Figure 18). These results indicate that viewers responded with strong agreement to the core approach of the work itself, and suggest that the work prompted reflection on color-emotion assignment while also confirming that the assignment was, in large part, consistent with viewers' intuitions.

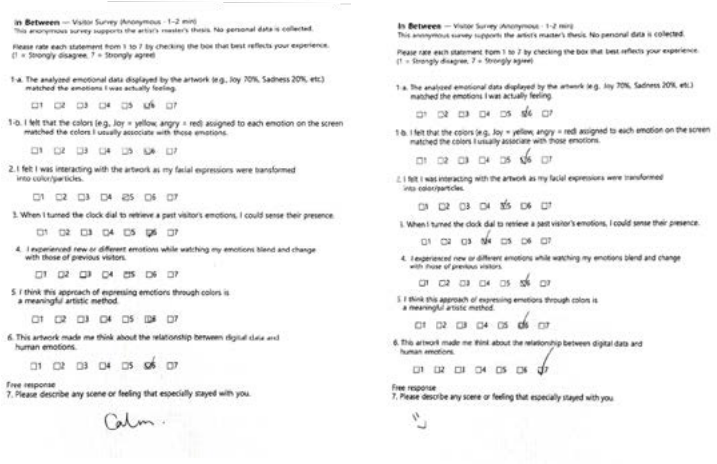
Particularly noteworthy is the gap between the mean score of 4.50 for Question 4

Table 4 *Survey Questions from* In Between *(2025)*

No.	Question
1-a	The emotional data displayed by the artwork (e.g., Joy 70%, Sadness 20%) matched the emotions I was actually feeling.
1-b	The colors assigned to each emotion on the screen (e.g., Joy = yellow, Anger = red) matched the colors I usually associate with those emotions.
2	I felt that I was interacting with the artwork as my facial expressions were transformed into colors and particles.
3	When I turned the clock dial to retrieve a past visitor's emotions, I could sense their presence.
4	I experienced new or different emotions while watching my emotions blend and change with those of previous visitors.
5	I find this approach of expressing emotions through color to be a meaningful artistic method.
6	This artwork made me reflect on the relationship between digital data and human emotions.
7	(Open-ended) Please describe any scene or feeling from the experience that particularly stayed with you.

Note. Items 1-a through 6 were rated on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree). Item 7 was an open-ended response.

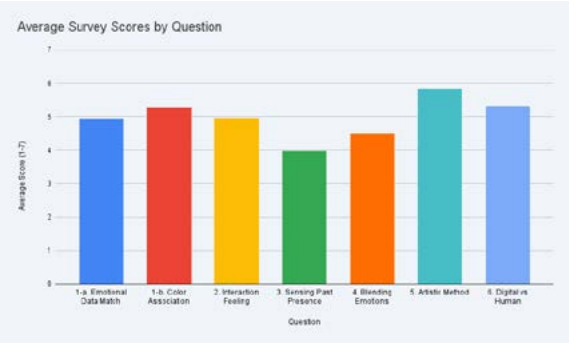
Figure 17 *Completed Survey Forms from* In Between *(2025)*



Note. Scanned copies of anonymously collected survey forms. See Appendix [B] for additional samples.

and the mean score of 3.98 for Question 3. Even without direct awareness of the previous visitor's presence, the scene of color intersection itself appears to have generated a new sensory experience. The medium of the cycle may have gone unnoticed, yet its effect was nonetheless felt.

Figure 18 *Average Survey Score by Question from* In Between *(2025)*



Note. Survey responses were collected during the exhibition period. Mean scores were computed and visualized with the assistance of an AI-based analysis tool.

In the free-response answers to Question 7, two layers of reaction emerged. The first focused on the sensory experience produced by the combination of color and music. Responses such as "the music drew me into the work" and "the harmony of sound and image was beautiful" appeared repeatedly, and reactions such as "calm" were noted across multiple respondents. The second concerned the experience of crossing time. Responses such as "it felt like traveling through time" and "when I turned the clock, I found myself wondering where I was at that moment, and what that stranger was feeling" indicate that the emotional crossing this work intended was actually transmitted to some viewers. The response "I was able to resonate with the previous visitor through the machine" describes an experience in which touching the emotion of another person was possible, even while remaining aware of the algorithm as the medium.

On the other hand, feedback such as "more explanation is needed" and "the emotion analysis felt random" was also found. This stands in tension with the work's design intention of having users encounter it without prior information, and this tension remains a structural challenge the work carries.

Field Observation

During the exhibition, most users maintained a static posture in front of the screen. As a result, the silhouettes of previous visitors were similarly motionless. With no difference in movement to distinguish the two figures, the experience of intersection was weakened. From the midpoint of the exhibition, guidance encouraging movement was added, but no fundamental resolution was achieved. Approximately 30% of users, however, actively moved or danced in front of the screen (Figure 19). This movement continued through the moment when the color particles of the two silhouettes bled and diffused. The moment when color experience elicits a bodily response can be found in that movement.

Figure 19 *Visitor Interactions with* In Between *(2025)*

Note. Photographed by the author.

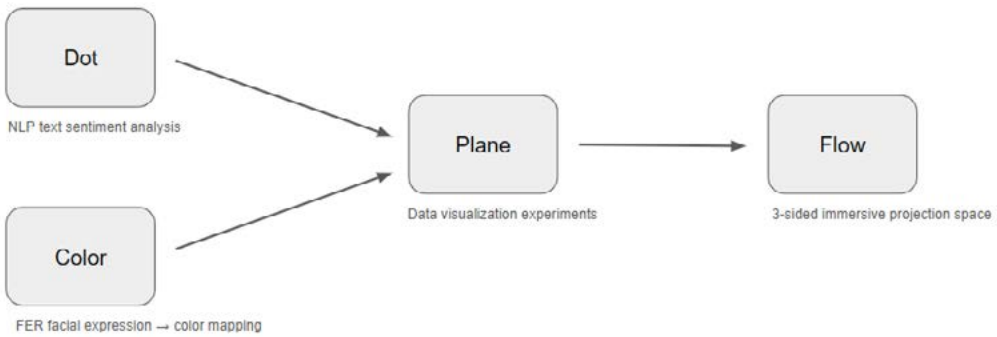
4.3 *Cycle of Emotions* (2026)

4.3.1 Work Overview and Technical Mechanism

Cycle of Emotions was presented in 2026 as the selected work of the first open call for "New Wave," the Youth Convergence Art Exhibition at the Gwangju Media Art Platform (G.MAP). NLP and FER together form the technical foundation of the work, which takes the circulation of emotion itself as its subject. Across the entirety of the installation space, and without any specific narrative or conceptual frame, the project enacts a cycle in which emotion is captured as data, rendered as color, and ultimately returned to the user as sensation.

The formal structure of the work was inspired by Kandinsky's concepts of point, line, and plane. It is organized into four stages — *Dot(점), Color(색), Plane(면),* and *Flow(결)* (Figure 20) — each standing as an independent space while simultaneously connected to the others through data. Line does not exist as an explicit stage. The invisible connection through which data passes between stages is itself the line of this work.

Figure 20 *Data Flow Diagram of* Cycle of Emotions

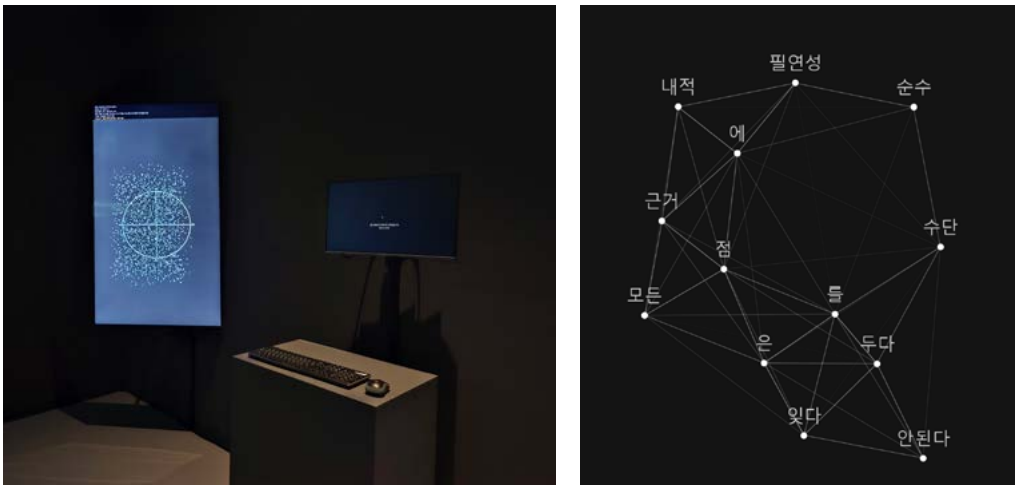


Note. Produced by the author.

In the *Dot* stage, the user writes a sentence freely. The entered text is analyzed through NLP across several dimensions (Figure 21): valence and arousal values, Ekman's seven emotion proportions, keyword extraction and mapping to spatial coordinates (x, y), and binary conversion. The results appear as a data

visualization on the adjacent screen. The display at this stage consists entirely of black, white, and gray.

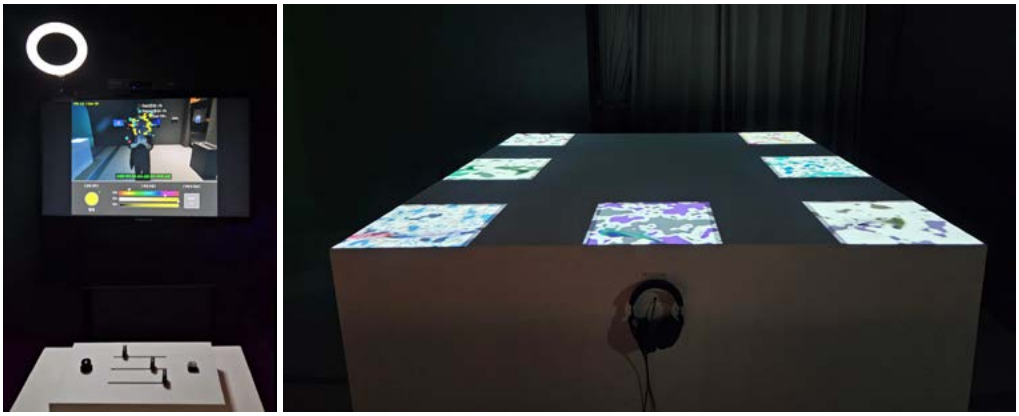
Figure 21 Dot *Stage: Text Input Interface (Left) & Keyword Coordinate Mapping (Right)*



Note. Photographed and produced by the author.

The *Color* stage is divided into two parts. First part, the user assigns colors to each of the seven emotions, using an interface box (Figure 22, left). The box is equipped with a rotary encoder and sliders for hue, saturation, brightness and a save button. A webcam mounted above the monitor runs FER in real time, and white particles are generated over the user's face on screen. Because of these particles, the user cannot easily see their own facial expression. The user observes the resulting changes in emotion values, which depend on how the FER reads their face, and calibrates the color assignment accordingly. When the save button is pressed, this color data is transmitted to the second part of the *Color* stage: a projection-mapped table measuring 2m × 2m at a height of 90cm (Figure 22, right). The table contains seven sections, one for each emotion, where the accumulated colors selected by all users gather. The sections carry no labels; headphones installed beneath each one allow users to infer the emotion through sound.

Figure 22 Color *Stage: Color Selection Interface (Left) and Accumulated Color Projection (Right)*



Note. Photographed by the author.

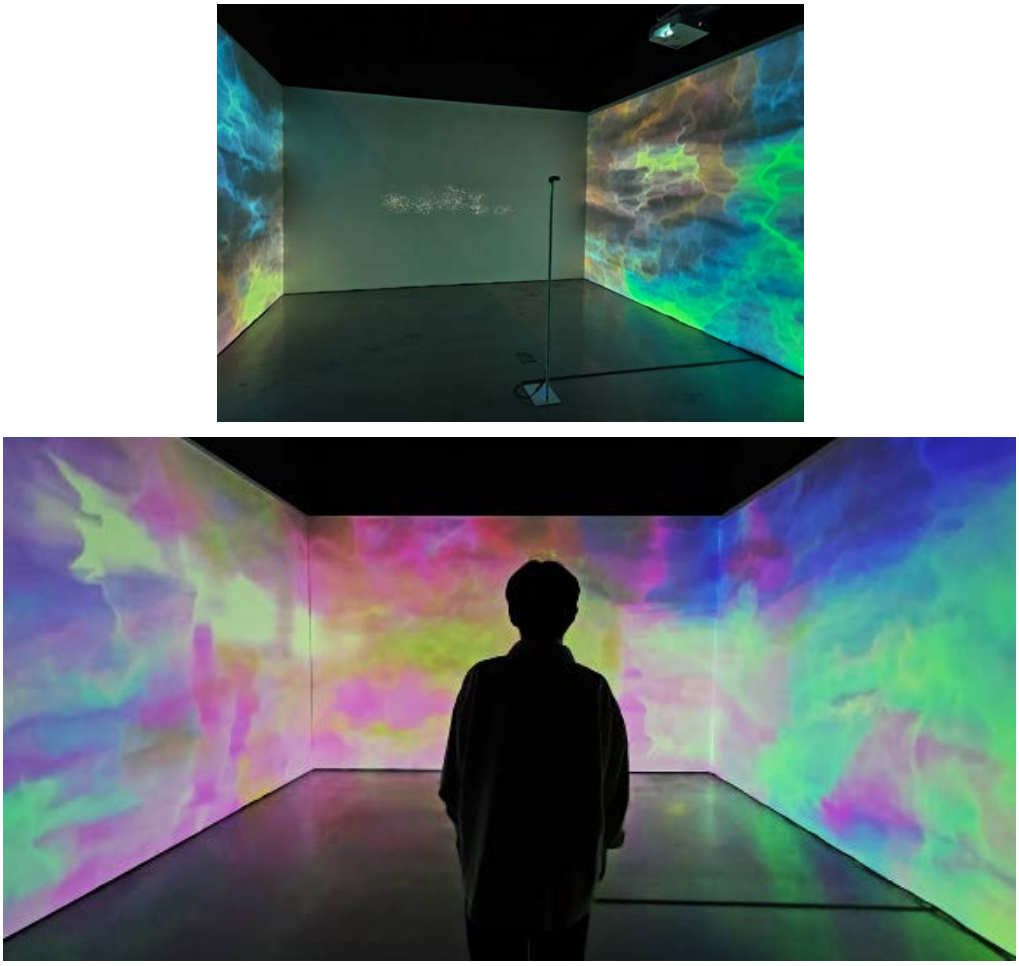
The *Plane* stage is a space of three screens, in which various visualizations are explored using the data collected in the *Dot* and *Color* stages. Lines connecting keyword coordinates, methods of applying emotional color, and other visual possibilities are tested here (Figure 23), and select data from this stage are passed to the final *Flow* stage.

Figure 23 Plane *Stage: Three-Screen Data Visualization Experiment*

Note. Photographed by the author.

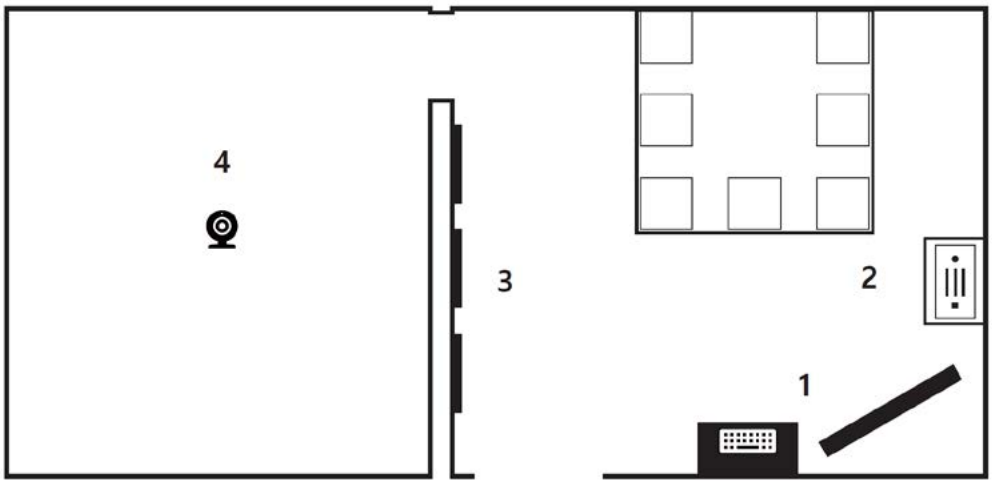
The *Flow* stage is a three-sided projection mapping space, each face measuring 4.5m × 3.5m (Figure 24). When the user enters, a centrally positioned webcam runs FER to detect the dominant emotion in real time. Color, texture, and sound across the entire space shift accordingly. The colors assigned to each emotion at this stage are drawn from a palette accumulated through the selections made by previous users in the *Color* stage. Light floating behind the texture moves along the keyword coordinates extracted in the *Dot* stage, generating a continuous sense of movement through the space. Sound resonates throughout the space and transitions naturally as the detected emotion changes.

Figure 24 Flow *Stage: Three-Sided Immersive Projection Space*



Note. Photographed by the author.

Figure 25 *Spatial Layout of* Cycle of Emotions *at G.MAP: (1)* Dot*, (2)* Color*, (3)* Plane*, (4)* Flow *(2026)*



Note. Produced by the author.

4.3.2 Analysis through the Three Principles of ADA

Principle 1: Embracing the Algorithmic Lens

In this work, the visibility of the algorithmic lens is gradually diluted as the work moves through its stages. NLP analysis results appear directly on screen as data visualization during the *Dot* stage. In the *Color* stage, FER values are displayed in real time, but the user's face is obscured by particles — the lens is sensed first as a shift in color rather than as numerical data. By the *Flow* stage, it becomes difficult for the user to immediately perceive that the color and texture of the entire space are responding to their own facial expression. The lens continues to operate, but its presence is dispersed throughout the space.

Principle 2: Data as Formal Raw Material

Raw material in this work draws from two layers: data extracted by NLP and FER, and the emotion-color assignments the user makes directly during the *Color* stage. Because the user's own selections constitute raw material, the artist's formal judgment intervenes in the very process by which that material is generated. These data do not transition in a single continuous stream; they accumulate in layers across each stage, pass through the visual experimentation

of the *Plane* stage, and converge into the spatial experience of the *Flow* stage. The x and y coordinates of NLP-extracted keywords follow the same logic, determining the trajectory of light drifting through the *Flow* space; the structure of language transitions into spatial movement.

Principle 3: The Circulation Model of Emotional Data
Stage accumulation provides the structural axis of this work's circulation. Data builds through *Dot*, *Color*, *Plane*, and *Flow*; the color surrounding the user in the *Flow* stage is a palette shaped by the emotional selections of all previous visitors, extending beyond the current user's own choices. Each user enters a color space shaped by their own choices and those of others, while their own selections remain as material for someone in the future. The cycle does not close; data continues to accumulate and the space continues to change until the exhibition ends.

4.3.3 User Experience

The user experience of *Cycle of Emotions* is analyzed through user logs[4] and field observation. Given the spatial configuration across four stages, the primary method was direct observation of behavior patterns and responses at each stage.

Data Analysis
In the *Dot* stage user log (Table 5), numerous instances were found of a single user entering sentences of varying emotional nuance multiple times. These patterns point to repeated attempts to test how their input is classified emotionally in the data visualization.

4 The user log data analyzed in this section was collected through the originally scheduled closing date of the exhibition (mid-March 2026). The exhibition period was subsequently extended to April 15, 2026; data from the extended period is not included in this analysis.

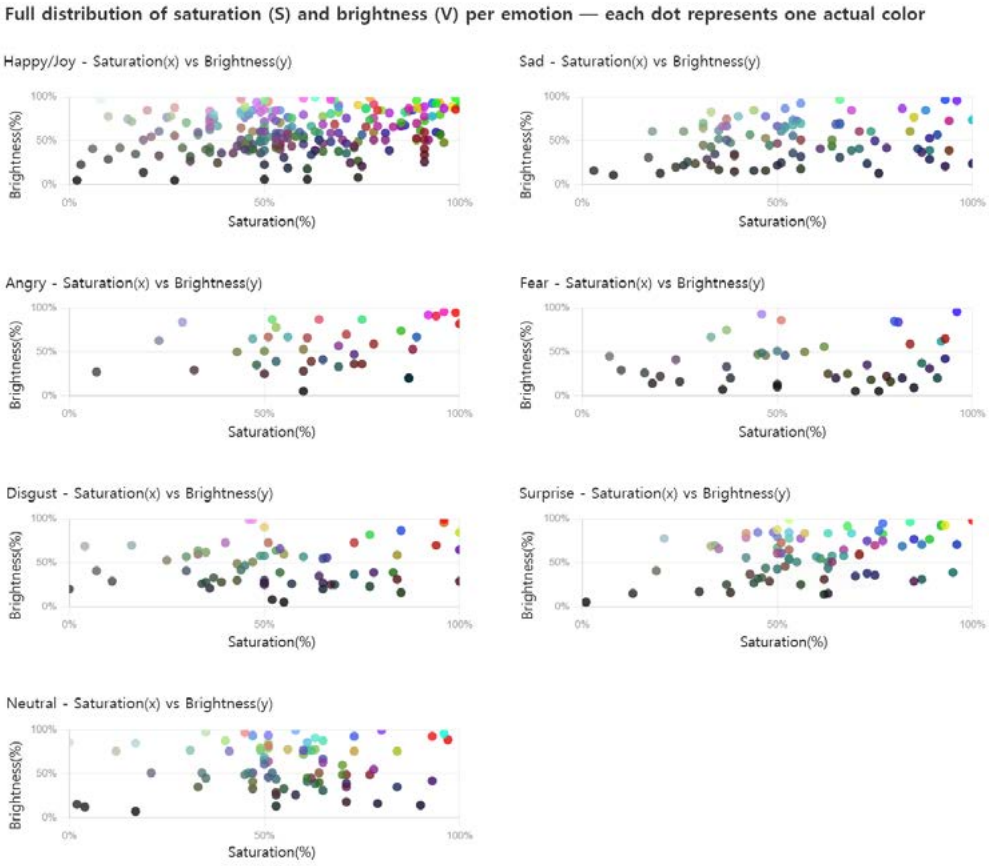
Table 5 *User Log Data: NLP Analysis Results from the* Dot *Stage*

Valence	Arousal	Text	Happy	Sad	Angry	Fear	Neutral	Disgust	Surprise
0.5	0.3	나는 산책중이다 (I am taking a walk)	0.4	0	0	0	0.6	0	0
0.5	0.3	나는 새다 (I am bird)	0.4	0	0	0	0.6	0	0
-0.6	0.5	나는 헤어질까요? (Should I break up?)	0	0.6	0	0.4	0	0	0
0.2	0.3	나는 행복할까? (Will I be happy?)	0.3	0.1	0	0.1	0.5	0	0
0.8	0.6	나는 항상 내가 사랑하는 사람과 오랫동안 행복하게 살고 싶다. (I always want to live happily for a long time with the people I love)	0.8	0	0	0	0.1	0	0.1
-0.8	0.3	기분이 우울해 (I feel depressed)	0	0.9	0	0	0.1	0	0
0.9	0.7	사랑해 (I love you)	0.9	0	0	0	0	0	0.1

Note. Produced by the author. NLP = Natural Language Processing.

The emotion-color assignment data collected in the *Color* stage (Figure 26) showed no clear pattern of concentration. With the exception of a relatively high frequency of red-range selections for anger, color choices across the remaining emotions were distributed broadly across the full spectrum. Each person assigned a different color to the same emotion, and the work takes that diversity itself as the palette for the *Flow* stage.

Figure 26 *User Log Analysis from the* Color *Stage: Saturation and Brightness Distribution by Emotion*



Note. This figure was generated with the assistance of an AI-based data analysis tool. Raw data was collected from user logs during the exhibition period. See Appendix [C] for raw data samples.

Field Observation

Several users came forward at the *Color* stage, expressing discomfort that their facial expressions were consistently classified as disgust or sadness. The question they raised — "Does this data actually represent me?" — I answered by noting that the algorithm could be wrong, and that it represented, in the end, simply one way of seeing: the machine's way.

User interest was generally lower at the *Plane* stage than elsewhere, likely

because the configuration offered no separate interaction. A notable exception was the moment when a keyword from a sentence entered at the *Dot* stage appeared on screen — at that point, noticeably attentive reactions were observed. More than 90% of users at the *Flow* stage remained standing before the webcam or in front of a particular screen. Few users moved freely through the space or experimented with different expressions; such exploration tended to emerge only in moments of solitude. Also, most users experienced the space without knowing that the color filling it was not theirs alone — that a palette accumulated from the selections of all previous visitors was spread across the entirety of the space.

Figure 27 *A Visitor Interacting with the* Flow *Stage*

Note. Photographed by the author.

Chapter 5. Discussion

The three works examined in Chapter 4 each realize the three principles of ADA within different medium-specific conditions and thematic contexts. This chapter approaches those realizations from two directions. Section 5.1 compares how the three works implemented the principles of ADA and considers the challenges that emerged in the process. Section 5.2 reviews major contemporary works that engage with emotional data through the frame of ADA. Through discussion with works that have approached color, algorithms, and circulation in their own ways, this section considers where ADA meets existing practices and where it diverges from them.

5.1 Comparative Analysis of the Three Works

The following traces each principle in turn, examining how its realization shifts across the three works.

5.1.1 How the Principles Are Implemented

Principle 1: Embracing the Algorithmic Lens
The three works each design the visibility of the algorithmic lens differently, and that difference determines the very way in which users come to accept it — whether through recognition, sensation, or immersion dispersed throughout space. Explicit confrontation defines *I am, We are*: the user's judgment and the algorithms are placed side by side, and the act of transmission becomes a conscious acceptance of that gap. In *In Between*, it is sensed first as color before it registers as data. *Cycle of Emotions* takes a more gradual approach, dissolving the lens across stages until, by the *Flow* stage, it can no longer be located in any single moment or screen.

Principle 2: Data as Formal Raw Material
Across all three works, the point and method of formal intervention differ, but one condition holds consistently: data does not determine color directly. It becomes

raw material only within the compositional framework the artist has constructed. For *I am, We are*, that framework is the decision to map sentiment scores onto saturation and brightness. The decisive move in *In Between* is a bleeding structure that generates colors no single emotional value could predict. *In Cycle of Emotions*, the raw material is itself multilayered — accumulated across stages, shaped as much by the user's own color choices as by algorithmic output.

Principle 3: The Circulation Model of Emotional Data

All three works share the same underlying circulatory structure, yet each realizes it along a different axis. *I am, We are* operates spatially: individual color circles move into a collective field that folds back onto its participants. *In Between* extends the cycle across time, separating sender and receiver into different moments entirely. Rather than space or time, *Cycle of Emotions* routes circulation through stage accumulation, so that each user enters a space already shaped by everyone who came before. Space, time, and stages — the structure of circulation remains constant; what changes is the dimension through which it moves. These axes belong to the artist's view from inside the design. Read from the outside — from where the work meets its audience — the same circulation can also be traced through who the emotional data moves between. *I am, We are* enacts a cycle between the individual and the group: what a participant sends out reaches both other contributors and viewers who never participated, binding strangers within a shared field. *In Between* draws the cycle closer in, holding it between one individual and another — a more intimate relation, for being one-to-one. *Cycle of Emotions* nests these patterns within itself: in the *Dot* stage, the text a user enters passes through the algorithm and returns to the individual as a visualization of what it has become as data; in *Color*, individual selections gather into subgroups on the projection table; in *Flow*, all prior inputs blend into a single shared space. Because users may re-enter any stage at any moment, the relational pattern of its cycle holds more layers than the first two works. These two readings — the structural axes I designed (space, time, stage) and the relational axes the works enact (individual–group, individual–individual, nested) — do not displace each other; they describe the same circulation seen from inside its design and from outside its operation.

5.1.2 Patterns of User Experience

Two common patterns run through the user experience of all three works. One is the behavior of repeatedly testing the algorithm's responses. *I am, We are* saw users entering sentences of varying emotional nuance multiple times and checked the results; the same tendency appeared in the *Dot* stage of *Cycle of Emotions.* For *In Between*, this pattern took the form of transforming one's expression and observing the corresponding shift in the silhouette's color. Across all three works, users did not passively accept the machine's output but varied their own inputs to probe the results repeatedly.

The other pattern is perceptual immersion in color. Visitors who did not participate directly in *I am, We are* nonetheless lingered in front of the *We are* space; the moment of color intersection in *In Between* repeatedly elicited the word "calm"; users in the *Flow* stage of *Cycle of Emotions* remained for a considerable time watching the shifting color of the space. Throughout all three, when emotional data transitioned into color experience, sensory absorption tended to precede rational analysis. Unlike the anti-sublime Manovich (2002) describes — the reduction of data to manageable images (see Section 2.2.3) — the color fields of these three works are generated and transformed in real time by emotional data, and the viewer becomes not a consumer of the sublime but its co-creator. Rosenblum's (1961) abstract sublime is inherited here, extended from the static color plane to the flow of living data.

Beyond these shared patterns, the cycle made itself felt to users differently in each of the three works. *I am, We are* produced the most visible transmission: users who observed the sentences and color tags of others moving across the screen entered new sentences of their own, and the cycle led to renewed engagement. *In Between* reached some viewers through the crossing of emotions over time, but as the survey results indicate (Question 3, mean 3.98), the medium of circulation itself was not directly recognized by the majority. Nonetheless, a new experiential encounter at the moment of color intersection was evident (Question 4, mean 4.50). *Cycle of Emotions* presented a different dynamic in its *Flow* stage: the structure made it difficult to immediately perceive that the color of the entire space was linked to one's own facial expression, and a passive, observational stance prevailed over open-ended exploration.

These three aspects offer clues about the conditions under which the ADA cycle is perceived and how. The more explicit the cycle's workings, the more it tends to lead toward direct participation; the more diluted the medium, the more the absorptive pull of color itself comes to the fore. Both directions constitute valid modes of experience within the ADA cycle — though the character of each is distinct.

5.1.3 Challenges of ADA Practice

Two challenges emerged in the process of realizing ADA across the three works in the previous chapter.

The first is a challenge of design. All three works were designed to be encountered without prior information — a condition intended to enable an immediate sensory response, but one that simultaneously produced cases in which the experience ended before the structure of the work was grasped. The insufficient recognition of the mediation of circulation in *In Between* and *Cycle of Emotions* is directly tied to this tension. Attempts were made to narrow the gap by adding guidance during the exhibition, but no fundamental solution was found. Repeat participants in *I am, We are* were observed probing algorithmic responses or entering new sentences prompted by others' inputs. Such behavior confirmed that prior awareness does not necessarily diminish the quality of experience; it can open participation in broader, more varied ways. The issue remains unresolved; it stays an open question in ADA practice.

The second is a methodological challenge. The earlier stage of the cycle, in which emotion becomes data and transitions into color, can be tracked to some degree through user logs, surveys, and observation. Whether the color experience actually elicited new emotion in the user, the later stage of the cycle, is theoretically supported by the simulation theory of Johnson-Laird and Oatley (2021; see Section 2.1.1), but the methodology for measuring this within individual works was lacking. Of the three works, the anonymous survey in *In Between* came closest to addressing this stage, yet it too carries the limitation of relying on self-report. Observation can capture externally identifiable reactions, but cannot measure inner emotional change with any precision. The development of a methodology capable of verifying this later stage with greater rigor marks the future step for ADA practice.

Table 6 *Analysis of Three Works According to the Three Principles of Artistic Data Abstraction*

		I am, We are	*In Between*	*Cycle of Emotions*
Data collection algorithm (affective computing)		NLP	FER	NLP+FER
Principle 1: Embracing the algorithmic lens		User's subjective judgment(hue) and algorithm's judgment(sentiment score) presented side by side	Values displayed but mostly unnoticed; lens sensed first as color	NLP as data visualization (*Dot*) / FER as live values (*Color*) / diluted in *Flow* stage
Principle 2:Data as formal raw material		Transformation structure connecting sentiment score to saturation and brightness	Emotion-color assignment + unpredicted color generation through bleeding	Multilayered raw material including user data, converted into spatial experience
Principle 3: Circulation model of emotional data	Structural axis	Space: individual emotions extend into a field of collective color	Time: the emotions of two people at different moments intersect within color	Stage: accumulated data converges into a single space
	Relational axis	Individual ↔ collective field	Individual ↔ another individual (across time)	Nested: data returns to individual (*Dot*) / individual → subgroup (*Color*) / all → whole (*Flow*), with re-entry across stages
Common experience		Repeated testing of machine responses / Sensory immersion in experience		
Cycle recognition		Most visible-leads to renewed engagement	Mediation recognition weak, but new sensory experience at color intersection confirmed	Mediation recognition difficult; immersion into the color space itself
Challenges of ADA practices		Immediacy vs. structural comprehension / Verifying the later stage of the cycle		

Note. Photographed by the author. ADA = Artistic Data Abstraction; NLP = Natural Language Processing; FER = Facial Expression Recognition.

5.2 The Boundaries of ADA: Comparative Analysis with Contemporary Practices

ADA is an aesthetic approach that translates emotional data into color experience, a concept proposed in this thesis. Section 5.2 examines where this framework meets contemporary media art and data-based practices, and where it diverges from them.

Comparison begins with the use of emotional data. Any work considered alongside ADA collects or measures emotional data, drawing on that data in some capacity as raw material. Color is the medium ADA set within this thesis, as the expression of emotional data has appeared most consistently through color in my own practice. Works that render emotional data through other perceptual media (sound, movement, or narrative) are nonetheless included. Whether ADA can extend beyond color to other media forms is addressed in Chapter 6.

Each work is mapped against ADA's five conditions: two preconditions — (a) the use of emotional data, and (b) the use of color as the primary medium — and three principles: Principle 1, embracing the algorithmic lens (P1); Principle 2, data as formal raw material (P2); and Principle 3, the circulation model of emotional data (P3). Through this review, I aim to identify what commonalities each work shares with ADA and at what points each diverges from it.

5.2.1 Practices that Engage with Emotional Data

Both works (Figure 28) in this section draw emotional signals from the collective language of the internet or social media; neither works with direct individual participation as its source. How each detects emotional data and channels it into experience is where the commonalities and differences with ADA become most visible.

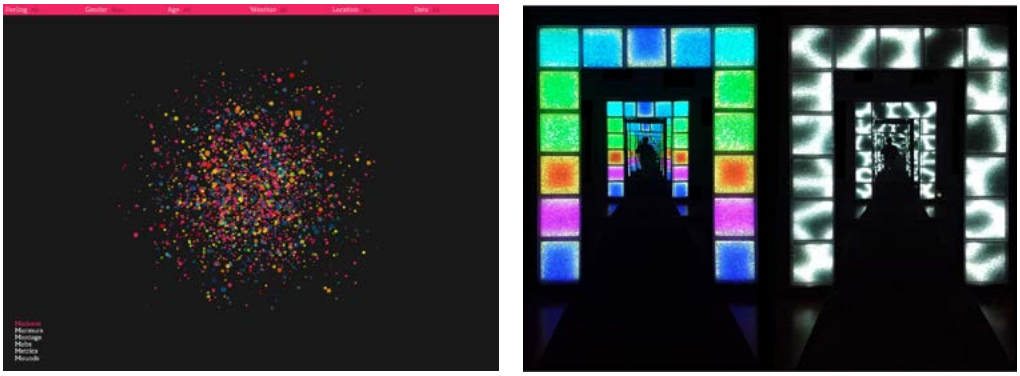
We Feel Fine — Harris & Kamvar (2006)
We Feel Fine is an online artwork (Figure 28, left) that gathers in real time sentences beginning with "I feel" and "I am feeling" from internet blogs, rendering them as color-bearing particles (Kamvar & Harris, 2009). Incoming affective

language data is processed without NLP-based quantification or classification; the work filters for sentences likely to contain emotional content and stops at that point of selection. Color appears throughout the work in various forms, its function remaining informational — a sign displaying affective states rather than a sensory medium operating in its own right. Visitors navigate the language of feeling left by others on blogs within an aesthetically organized interface.

The algorithm defines emotion categories in advance and maps each to a specific color. Within this symbolic logic, data determines color, and the artist's judgment is concentrated on the design of the overall system. The blogger who provides input and the visitor who encounters the color experience remain structurally separated; the work offers no circulatory structure through which personal emotion transitions into color and in turn stirs new feelings.

Among the practices covered in this section, *We Feel Fine* sits closest to artistic data visualization (ADV). The absence of an algorithm that quantifies emotion marks the decisive distance from ADA. Harris himself later broke from data-driven practice entirely. In a subsequent interview, he confessed to having become "obsessed with the potential of data to tell me everything I'd ever need to know about life" (Harris, 2014). Behind this shift was the recognition that vast quantities of data could not fully represent an individual's emotional life.

Figure 28 We Feel Fine *(Left)* & Mood of the Planet *(Right)*



Note. (Left) From *We Feel Fine*, by S. Kamvar and J. Harris, 2006 (https://jjh.org/we-feel-fine). (Right) From "Mood of the Planet: Challenging Visions of Big Data in the Arts" (p. 315, Fig. 13), by V. Sorensen et al., 2022, *Cognitive Computation*, 14(1) (https://doi.org/10.1007/s12559-020-09766-w). Copyright 2022 by Springer Nature. Reprinted with permission.

Mood of the Planet — Sorensen et al. (2022)
Mood of the Planet is an interactive installation that extracts emotion from social media texts using Sentic Computing (Cambria et al., 2010, as cited in Sorensen et al., 2022), a text emotion analysis methodology combining NLP with commonsense reasoning, and converts the results into the color and sound of a large arch sculpture (Figure 28, right). Unlike *We Feel Fine*, the algorithm here genuinely categorizes emotion, making it the raw material of the work, and the structure exposes viewers directly to color and sound as they pass through the arch. The twenty-four emotion-color correspondences are externally fixed by the Hourglass of Emotions model, but the artist's judgment enters in the design that distributes emotional proportions in one-minute intervals across the flow of time to compose the color experience. Some viewers recognized that their presence was influencing the work's emotional data (Sorensen et al., 2022), but the source of that material is aggregated social media data from around the world. Those who supply the emotional data and those who encounter the resulting experience occupy structurally distinct positions within the system, and no circulatory loop closes between them.

We Feel Fine and *Mood of the Planet* bring into view the vast emotional flow that moves through the internet and social media. The experience each offers, however, is oriented toward rendering an otherwise unfathomable aggregate of feeling navigable as image — a direction that does not depart from the anti-sublime character Manovich (2002) identified.

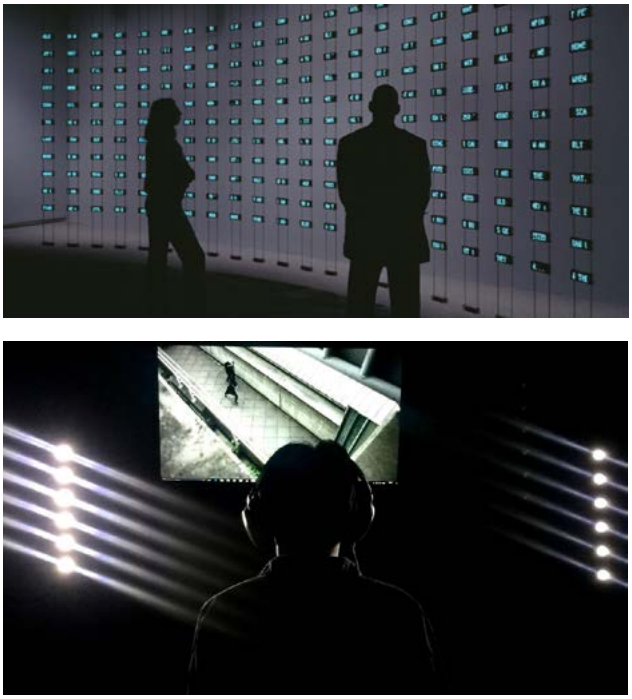
5.2.2 Practices that Translate Emotional Data through Different Media

Where emotional data was rendered as visual elements in section 5.2.1, the works (Figure 29) covered here carry it into different media: sound and text on one hand, cinematic narrative on the other. This section follows how the three principles of ADA apply differently, or no longer hold, as the medium shifts.

Listening Post — Hansen & Rubin (2002)
Listening Post by Mark Hansen and Ben Rubin is an installation that collects text in real time from internet chat rooms and bulletin boards and converts it into

231 small LCD screens arranged in a grid (Figure 29, top), paired with synthetic voices (Hansen & Rubin, 2002). The work is organized into several "scenes," each selecting and arranging text according to its own logic. Among them, the method of filtering for sentences beginning with "I am" or "I feel" — building a scene composed entirely of first-person emotional expressions — places the work at the boundary of the first precondition of ADA: it deliberately selects text that may have an emotional charge, but stops at that point. The primary medium is the combination of text fragments dispersed across hundreds of screens and the synthetic voices that read them; color holds no central place in the work.

Figure 29 Listening Post *(Top) &* RIOT *(Bottom)*



Note. (Top) From *Listening Post,* by M. Hansen and B. Rubin, n.d. (https://www.parallel.nyc/listening-post). (Bottom) From *RIOT*, by K. Palmer, 2015 (http://karenpalmer.uk/portfolio/riot/).

The algorithmic lens is absent from the work. The algorithm functions as a tool for collecting and arranging text, not one that detects or quantifies emotion — no lens is present to accept or push against. The artist's compositional judgment is directed elsewhere: toward which texts move across the screens, in what rhythm and arrangement, and alongside which synthetic voices. Data remains an object

of expression, a portrait of interior life conducted in the aggregate online, passing through no formal transformation. As in *We Feel Fine*, the originators of the text and the viewers of the installation are separated by design, and no circulatory structure takes hold.

RIOT — Palmer (2015)
RIOT, a collaboration between Karen Palmer and Professor Hongying Meng of Brunel University, is an interactive film installation (Figure 29, bottom) in which FER branches the cinematic narrative according to the viewer's facial expression, analyzed in real time by a webcam (Palmer, 2015; Vans, 2017). The viewer is placed in the middle of an unfolding riot; the system reads one of three emotional states — fear, anger, or calm — and responds accordingly (Vans, 2017). If the viewer maintains calm, the character in the film retreats; if fear or aggression registers, the story shifts course. The individual viewer's emotion is captured through FER and functions as genuine raw material for the work, meeting the first precondition. The medium into which that data is conveyed, however, is cinematic narrative, not color, and the effect on the viewer is immediate: their expression steers the story on screen.

FER's emotional judgment is taken as input for narrative generation without correction, placing the work in structural alignment with the first principle. That output then determines direction within the framework of narrative possibility the artist designed in advance, connecting partially with the second. A feedback loop emerges: the viewer's expression shapes the narrative, and it in turn induces further emotional response. Narrative, however, operates through direct meaning-transmission, producing an experience whose character differs from the sensory openness of color. The ADA cycle moves from emotional data, via color, into new emotion; *RIOT*'s loop runs through the logic of face–narrative–emotion, and its aesthetic orientation takes a divergent path.

Listening Post organizes collective language into a landscape of text and voice; *RIOT* channels emotional data through narrative branching. Both produce experiences that can be grasped and followed — a different mode from color's non-verbal openness, its capacity to evoke sensation without fixing meaning.

5.2.3 Critical Positions on the Algorithm

Whereas the works discussed in 5.2.1 and 5.2.2 accept emotional data and algorithms as artistic material, or carry them into other media, the two works (Figure 30) addressed here occupy a different stance: the emotion recognition algorithm itself is what each calls into question. Both move in the opposite direction from ADA's first principle, which embraces the algorithmic lens as a perspective of the contemporary moment, and that very opposition throws ADA's own position into sharper relief.

Training Humans — Crawford & Paglen (2019)
Training Humans by Kate Crawford and Trevor Paglen, presented at the Fondazione Prada Osservatorio in Milan, makes visible the history of image datasets used to train AI systems — (Figure 30, left) from early CIA-funded facial recognition research of the 1960s to large-scale contemporary datasets collected from social media without consent (Crawford & Paglen, 2019). Central to the work is an account of how emotion recognition datasets premised on Ekman's theory of six universal emotions narrowly categorize human emotional complexity, and how those categories migrate into moral judgment within systems of employment, surveillance, and law (Fondazione Prada, 2019). Emotional data enters the work, but as an object of critique rather than raw material; its trajectory is toward exposing the conditions under which such data is produced and exploited, with the physical arrangement of photographic prints as its primary medium.

The algorithmic lens is cast here as a structure of bias and concentrated power — its embedded assumptions are what the work sets out to expose. Viewers encounter the datasets in the exhibition space, yet the structure affords no personal emotional input and returns nothing as experience; the work's central gesture is the unmasking of the algorithm. ADA accepts the machine's gaze that reduces emotion to number as one acceptable perspective of the contemporary moment; Crawford and Paglen ask instead what economic and political forces produced that instrument in the first place.

Figure 30 Training Humans *(Left)* & Stealing Ur Feelings *(Right)*

Note. (Left) From *Training Humans*, by K. Crawford and T. Paglen, 2019 (https://www.fondazioneprada.org/project/training-humans/?lang=en). Copyright 2019 by Fondazione Prada. (Right) From "Introducing 'Stealing Ur Feelings,' an Interactive Documentary About Big Tech, AI, and You," by Mozilla Foundation, 2019 (https://www.mozillafoundation.org/en/blog/introducing-stealing-ur-feelings-an-interactive-documentary-about-big-tech-ai-and-you/). Copyright 2019 by Mozilla Foundation.

Stealing Ur Feelings — Levenson (2019)

Stealing Ur Feelings by Noah Levenson is an interactive AR documentary (Figure 30, right) that premiered at the 2019 Tribeca Film Festival and was exhibited at Tate Modern, receiving Mozilla's prize in AI arts and advocacy (Mozilla Foundation, 2019). While the viewer watches the video, a webcam analyzes their facial expression in real time and quantifies their emotional state; when the video ends, the work presents "inferred" results — the viewer's IQ, annual income, and political orientation — derived from those values. For its collection of emotional data, the work draws on the same FER technology found in patents filed by companies such as Snapchat and Facebook, though color carries no primary expressive role.

Levenson reframes the algorithmic lens as a surveillance instrument, directing the same FER technology found in corporate patents back onto the viewer to reveal how emotional data can become a tool of profiling and behavioral manipulation. A furrowed brow of concentration is read as "anger" and the user classified as aggressive; a moment of visible sadness is seized and redirected toward a targeted purchase recommendation (Levenson, 2019). Cast as satirical inference, the algorithm's output makes the data collection process itself the basis

for indictment — viewers contribute emotional data, but nothing is returned as experience, and the work terminates in critical awareness.

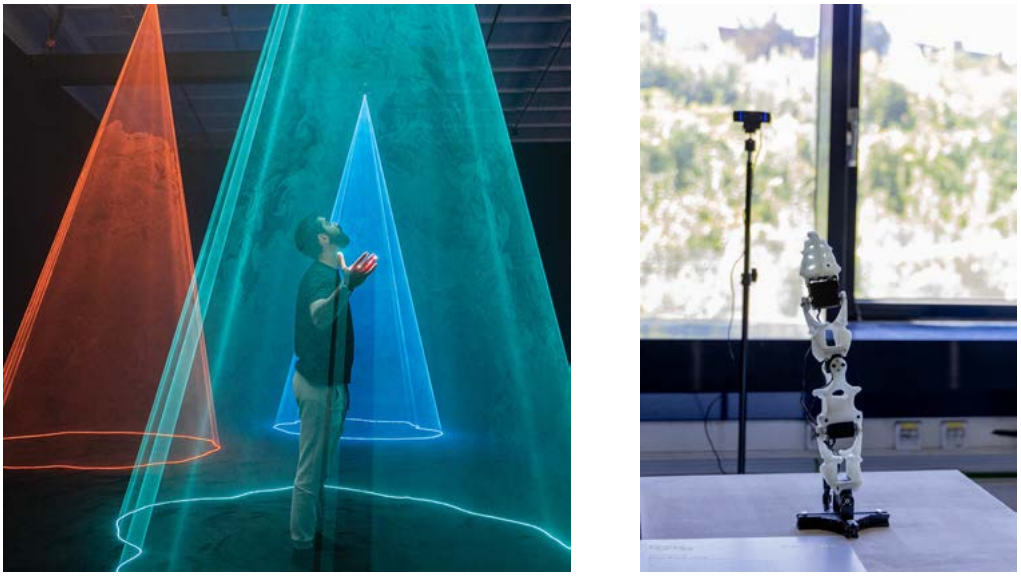
Training Humans traces the historical biases embedded in AI training data through archival means; *Stealing Ur Feelings* narrows its focus to contemporary surveillance, placing the viewer directly inside the data collection it critiques. Against ADA's acceptance of the algorithmic lens, both works attend, in different ways, to the power structures on which that operation depends.

5.2.4 Practices that Realize the Circulation of Emotional Data

A different configuration emerges in the two works that follow (Figure 31). Each of the preceding practices either met some of ADA's conditions or departed from it at identifiable points; here, both realize a cycle in which emotional data passes into sensory experience and that experience generates new emotion.

AURA — Verstand (2017)
Nick Verstand's *AURA* is an immersive audiovisual installation measuring 15 × 15 × 6 meters (Figure 31, left), presented at Dutch Design Week in Eindhoven in 2017, developed in collaboration with the Netherlands Organisation for Applied Scientific Research (TNO) (Verstand, 2017). Viewers enter the space wearing biosensors that track brainwaves, heart rate variability, and skin conductivity. A musical composition flowing through the space induces an emotional response, and the resulting biosignals are analyzed in real time, converted into organic forms of light rendered through RGB laser, and made to envelop the space entirely. Biosignal-based emotional data constitutes the raw material of the work, and the algorithm is accepted as the lens that translates those signals into a perceptible form. The artist's formal judgment enters in the design of the musical composition and in the method of translating data into the intensity, form, and hue of light. The circulatory structure runs accordingly: music stirs emotion, that emotion is captured as data and shifts into light filling the space, and that light feeds back into the viewer's affective state, what Verstand described as the materialization of inner metaphysical space into an external physical one (Verstand, 2017). Color appears as a component of the laser light, though in a capacity distinct from the role color holds within ADA.

Figure 31 AURA *(Left)* & Feel.Back.Loop *(Right)*



Note. (Left) From *AURA*, by N. Verstand, 2017 (https://riyadhart.rcrc.gov.sa/en/artworks/aura-2017/). (Right) From *Feel.Back.Loop*, by G. Hosseini, 2025. Courtesy of the artist. Reprinted with permission.

Feel.Back.Loop — Hosseini (2025)

Ghazal Hosseini's *Feel.Back.Loop* exhibited at the Interface Cultures exhibition of the Ars Electronica Festival, takes the form of a robotic tail (Figure 31, right) that reads the viewer's facial expression through FER in real time and uses the detected emotional state as feedback to drive motion via reinforcement learning (Hosseini, 2025). FER-derived emotional data enters the system as raw material, rendered outward through physical movement.

The algorithmic lens is already embedded within the architecture of the system. That reinforcement learning is built around it signals its acceptance from the outset: the lens is taken as the operative condition from which the work develops, not questioned. The artist's design is directed toward how accumulated feedback evolves the robot's mode of reaction, gradually shaping what Hosseini describes as a shared, evolving language of motion forged in dialogue with the audience (Hosseini, 2025). A loop takes shape: the viewer's expression elicits motion in the robot; that motion produces further emotional response; that response re-enters the robot's learning data. Because this accumulation occurs through reinforcement learning, the circulation deepens across time, extending well beyond simple real-time reaction.

AURA and *Feel.Back.Loop* place the viewer directly inside the experience of emotional data moving into space and physical form — sensing from within, rather than standing before a reduced image of collective feeling.

Table 7 *Evaluation of Existing Works Against the Preconditions and Principles of Artistic Data Abstraction*

	Precondition(a): Emotional Data	Precondition(b): Color as Primary Medium	P1: Algorithmic Lens	P2: Formal Raw Material	P3: Circulation of Emotion
We Feel Fine	△ Emotional text collection	△ Informational sign	◯ 1:1 color mapping	X Creation confined to structural design	X
Mood of the Planet	◯ Sentic Computing	◯ Color + Sound	◯ Ratio transformation	△ Artist's design / Hourglass model externally fixed	△ Some viewers mistakenly perceived a connection
Listening Post	△ Emotional Text Collection	X Sound + Text	X	X	X
RIOT	◯ FER	X Narrative	◯	△	△ Narrative-mediated loop
Training Humans	△ Training data exposure	X Photography	X Critical exposure	X	X
Stealing Ur Feelings	◯ FER	X Video	X Critical exposure	X	X
Aura	◯ Biosignal	△ Light/Laser	◯	◯	◯
Feel. Back. Loop	◯ FER	X Movement	◯	◯	◯

Note. Produced by the author.
P1 = Principle 1 (Algorithmic Lens); P2 = Principle 2 (Formal Raw Material); P3 = Principle 3 (Circulation of Emotion); FER = Facial Expression Recognition.
◯ = fully realized; △ = partially realized or ambiguous; X = absent.

5.3 Synthesis of the Comparative Analysis: The Position and Possibilities of ADA

Setting the findings of sections 5.1 and 5.2 alongside each other, two aspects stand out.

The first concerns the landscape of contemporary practice. The dominant approaches to emotional data divide into three directions: organizing collective data into viewable images (*We Feel Fine, Mood of the Planet*); subjecting the algorithm to critique (*Training Humans, Stealing Ur Feelings*); or transposing emotion into a different language entirely — narrative, voice, or movement (*RIOT, Listening Post*). Among these,few works take the translation of emotional data into color experience, and the prompting of new emotion through that experience as a structuring principle. No work outside my own three (*I am, We are*; *In Between*; *Cycle of Emotions*) satisfies all five conditions of ADA; and *AURA* and *Feel.Back.Loop*, which share the widest common ground, do not meet the second precondition, which requires color as the central medium.

The second, as confirmed through the three-work comparison in section 5.1, is that ADA's principles can be realized along different axes — space, time, and stage — which shows that the concept is not a fixed form. That works realizing the full circulatory structure through light or physical movement can meet its remaining principles also suggests that ADA is not bound to color alone; the cycle it proposes may be extendable to other sensory forms.

What the comparative analysis makes clear, however, is that color as the medium of that circulation remains a direction that remains largely uncharted. Even the works that come closest to ADA's structure — those that realize a genuine cycle between emotional data and sensory experience — do so through light or movement. As noted in section 1.2, this thesis began from the problem that existing theoretical frameworks could not account for this practice. That all five conditions of ADA are met only in my own works paradoxically supports this starting point: a new practice existed first, and a new concept was called for to explain it. Manovich (2002) proposed that data art should move beyond the rational sense of control of the anti-sublime and express the subjective experience of those living in a data society in a new way. More than twenty years after that proposal, the rarity of practices that translate emotional data into color

experience and position the viewer as co-creator of the cycle shows not the limitation of ADA, but that this direction remains an under-examined area.

Chapter 6. Conclusion

6.1 Research Summary

As stated in the introduction, this study began with practice. My works take emotional data as formal raw material, use color as the primary expressive medium, and adopt as their structuring principle a cycle in which color experience prompts new emotion in the user. That body of work surfaced the central problem of this research, one that existing theoretical frameworks fell short of capturing. Data visualization aims at the accurate reproduction of information; artistic data visualization satisfies the conditions of artistic intent and actual data grounding, but presupposes a structural mapping between data and image. Neither approach was adequate to accommodate the essential ambiguity of emotional data, nor to contain a practice organized around that cycle as its structuring principle. It was in abstraction in painting that I sought the answer to that insufficiency. Artistic Data Abstraction (ADA), proposed in this study, departs from precisely that point of convergence among the three domains of Emotion, Data, and Visual Language.

ADA rests on three interconnected principles. At its core, the algorithm's numerical output is received as the algorithmic lens, a valid perspective generated by the contemporary moment. Those values are then taken as raw material oriented toward color, transformed through the artist's compositional judgment. A third principle completes the process, as that color experience elicits new emotion in users and viewers, fulfilling the cycle. When these three principles operate together within a continuous process, emotional data ceases to be read as information and becomes an experience sensed through color.

The three works of Chapter 4 — *I am, We are*, *In Between*, and *Cycle of Emotions* — each realized these principles along different axes. From the design side, the cycle moved through space, time, and the progressive layering of stages; read from the audience side, the same circulation formed distinct relational patterns — between individual and group, between two individuals across time, and through nested configurations of the two. Across all three works, a consistent tendency emerged in which sensory immersion preceded rational analysis at the moment

of transition into color experience. The circulatory structure cast viewers as participants in the making of the experience, confirming within an actual exhibition environment that ADA's three principles constitute an aesthetic approach only when they presuppose one another and interplay.

Chapter 5 compared these three works through the principles of ADA while reviewing contemporary data-based practices in relation to its conditions. Comparative analysis clarified where ADA meets existing practices and where it diverges, and revealed that the direction of translating emotional data into color experience and positioning the viewer as co-creator of the cycle remains an area insufficiently explored.

6.2 Contributions of the Research

The theoretical contribution of this study lies in establishing a new conceptual language for describing the practice of emotional-data-driven interactive media art. ADA finds its aesthetic roots in the tradition of pictorial abstraction, draws on the methodology of affective computing as source material, and connects the two lineages through a single aesthetic approach of color and circulation. In doing so, it aligns with the direction of Manovich's proposal for data art — that data art should move beyond the anti-sublime to express human subjective experience in new ways. The comparison with contemporary practices made clear that this direction has yet to receive sustained critical attention. This suggests that the frame of ADA can function not only as a language for describing my own practice, but as a lens for analyzing a wider range of contemporary emotional-data-based practices.

The practical contribution is more straightforward. The three works show that ADA's principles can be realized in varied ways within actual exhibition environments; realized along different axes, they attest that ADA is not a fixed form. The user experience data collected through user logs, surveys, and field observation stands as the empirical basis for understanding how that realization speaks to the actual viewing experience.

6.3 Limitations and Future Research Directions

The process of proposing ADA and realizing its principles through three works surfaced two challenges. One concerns the tension between immediate sensory response and structural recognition of the cycle. My intention was that the most direct color experience becomes possible when the work is encountered without prior information, yet it simultaneously leaves the work's cyclical structure unrecognized. As repeated participation in *I am, We are* showed, however, the richer exploration that emerged suggests prior awareness and immediate response do not necessarily stand in opposition; how the two can coexist within ADA remains a question to be pursued through future practice. The other is that the methodology for measuring the later stage of the cycle — whether color experience actually stirred new emotion in the user — was limited. Surveys and observation rely on self-report and external reaction, and possess inherent constraints in verifying inner emotional change.

Future research can develop in three directions.
The search of methodologies for verifying the later stage of the cycle. The simulation theory outlined in section 2.1 provides theoretical grounding for the claim that color directly generates emotion. That theory presupposes static abstract painting, however, and its direct application to interactive media art environments has limits. Biosignal-based approaches using EEG measurement, or interdisciplinary collaboration with cognitive science, represent one possibility. Framed less as an urgent problem than as an open path of inquiry, this direction could further strengthen the empirical foundations of ADA's theoretical basis.

Expansion beyond color into other sensory media forms the second direction. *AURA* and *Feel.Back.Loop*, reviewed in section 5.2, each shared broad common ground with the principles of ADA through light and physical movement respectively. This finding suggests that ADA is not a concept confined to color, but one that can extend to a range of sensory media. How the mechanism by which color experience triggers emotion operates differently in sound or movement, and which principles hold across media, become the questions for subsequent research.

The third direction is the diversification of practice according to cultural context. As discussed in section 2.4, color-emotion associations carry a degree of

universality while remaining variable across cultural contexts. Given that my three works were realized primarily within exhibition contexts in Europe and South Korea, how ADA manifests in other cultural settings has gone largely unaddressed. To pursue this question, I plan to compare data collected across existing exhibitions with data to be gathered through future exhibitions in different cultural contexts.

Across all three directions, the exploration of ADA remains open. Color is not a medium for reproducing emotion, but for allowing emotion to be experienced. ADA will continue to move toward that threshold — where data ends and emotion begins.

Use of Artificial Intelligence

This thesis was written by the author. All conceptual development, theoretical framing, artistic analysis, and argumentation are the author's own. Artificial intelligence tools were used in a supporting capacity, in the following ways:

Drafting from author's notes. During the writing process, the author produced extensive notes and idea drafts in Korean in an unstructured form. AI tools (Claude Opus 4.7 and Sonnet 4.6, Anthropic) were used to help organize and articulate these notes into structured paragraphs. All ideas, arguments, and conceptual content originate from the author; AI assistance was applied to the formulation and organization of text rather than to the generation of ideas. The author reviewed, revised, and finalized all resulting passages.
Translation. The thesis was originally drafted in Korean and translated into English with the assistance of Claude (Opus 4.7 and Sonnet 4.6, Anthropic). All translated passages were reviewed and edited by the author for accuracy of meaning, terminological consistency, and academic tone.

Research support. AI tools were used to help identify potentially relevant academic sources during the early stages of research. Every source cited in this thesis was located, read, and assessed by the author directly; AI suggestions served only as initial pointers, and any source ultimately referenced reflects the author's own reading.

Data visualization. Figures involving the visualization of user log data (specifically Figure 13, 18, and 26) were produced with the assistance of Google Gemini (3.1 Pro) and Claude (Opus 4.7). The raw data analyzed in these figures was collected by the author from the works' user logs during the exhibition periods, and each such figure is also marked accordingly in its note.

Reference formatting. The formatting of references in APA style was carried out with the assistance of AI tools. Final accuracy was checked by the author.

Algorithmic systems within the artworks. The artistic works analyzed in this thesis incorporate algorithmic systems as part of their technical mechanism, including the Google Natural Language API, an OpenAI model, and Python's FER Library (OpenCV-based). These are described in detail in Chapter 4 and constitute the technical infrastructure of the works themselves, distinct from the author's use of AI in the writing of this thesis.

AI tools were not used to generate the artistic works themselves, the conceptual framework of Artistic Data Abstraction (ADA), or the analytical readings of the works. The author takes full responsibility for the content, claims, and arguments of this thesis.

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List of Figures and Tables

Figures

Tables

Appendix

[A-1] User Interaction Logs from *I am, We are* (2024)

Sentiment Score	Text (User Input)	Hue (H)	Saturation (S)	Brightness (B)
-0.89	I am an idiot.	351	44	43
-0.89	I am dead fucking tired.	18	43	44
-0.8	I am a clinically depressed ai algorithm.	357	44	45
-0.8	I am a point of sub-eternal confusion.	283	46	46
-0.69	I am losing my mind.	330	50	51
-0.6	I am amazed about how much crap there is in the world.	235	56	54
-0.5	I am Nobody.	0	57	57
-0.4	I am under the water, please help me.	199	63	61
-0.2	I am calling my mom.	114	58	68
0	I am tom.	0	74	75
0	I am an old white man in Europe.	104	61	73
0	I am an AI generating warcrimes.	357	76	76
0	I am a machine of meat.	355	75	75
0	I am nothing but a whisper in a cosmic wind.	251	52	60
0.1	I am waiting for an idea to pop up in my mind.	120	60	72
0.1	I am therefore i think.	235	56	61
0.2	I am 1098763789568.	117	61	72
0.2	I am WORKING NOW.	151	65	72
0.3	I am the artist.	227	61	63
0.4	I am natural intelligence.	227	62	63
0.4	I am verz happz to be in Liny to see ArsElectronica and Hope!!!.	358	83	85
0.5	I am making the world a better place.	83	68	78
0.6	I am very sentimental.	42	84	88
0.69	I am whatever I wanna be.	18	84	91
0.69	I am overwhelmed with the IC exhibition.	319	64	77
0.8	I am learning to play.	19	85	94
0.8	I am a very cool individual from georgia.	200	76	84
0.89	I am the ultimate superstar.	310	55	69
0.89	I am happily viewing the artworks.	254	50	63
0.89	I am love, peace and light.	57	88	93
0.89	I am happy about Ars Electronica!.	333	92	92

Note:
1) Data Source and Context: The data presented in this table are a representative subset of the interaction logs collected from the installation *I am, We are* during the 2024 Ars Electronica Festival.

2) Sample Size: Out of a total of 742 recorded entries, these 34 samples were purposively selected to represent the full spectrum of participant engagement, categorized into negative, neutral, and positive sentiment distributions.

3) Sorting: The logs are organized in ascending order based on their Sentiment Score, ranging from extreme negative (-0.89) to neutral (0) and extreme positive (0.89).

4) Data Integrity (Raw Input): To reflect the raw nature of the interactive installation, user inputs are presented exactly as recorded. This includes typographical errors (e.g., “happz”), numerical strings, and informal expressions.

[A-2] External Criticism

This appendix presents an excerpt from an external art critique by Lee Mun-jung, evaluating the interactive installation *I am, We are*. It is included to provide an objective perspective on the artwork’s philosophical dimensions, specifically the relationship between the individual (“I”) and the collective (“We”).

Note: The original Korean text was translated into English using Claude Opus 4.7. Portions discussing other artworks outside the scope of this thesis have been omitted, indicated by ellipses.

나와 너와 우리 그리고 세계 [I, You, We, and the World]

Lee Mun-jung (Art Critic, Director of Research Institute Leepoétique)

We must be careful not to regard the world as a fixed structure or a static one. Likewise, we should not treat the world as an enumerable set. (...) The world is a net, but this net is always dynamically changing through the interactions among the machines that constitute it. (...) Every world has its own regularities and tendencies, or vectors, but no world can be defined in a single stroke[1].

1 Levi R. Bryant, Onto-Cartography: An Ontology of Machines and Media, trans. Kim Hyo-jin (Seoul: Galmuri Publishing House, 2020), p. 190.

Interaction and resonance, the space between sameness and difference, refinement and clarity, retro machines in an age overpowered by technology, an unboastful technicity, emotions afloat in a computer-technical world. These are the words that surfaced before Yuseung Lee's works presented in the exhibition Yeokeo, Boa (2025) at Goyang Aram Nuri Goyang Cultural Foundation Aram Museum. The exhibited works, 나는, 그리고 우리는 (*I am, We are*) (2025, Korean ver. of *I am, We are* 2024) and Interlaced Persona (2023), unfold through the participation of the audience. Each reflects the thoughts and emotions of those who take part—their interior and their face, the inner and the outer. Since the interior is expressed through facial expression or voice, it constitutes the inside and the outside of an inseparable I and you—us. Within this, the I and you—us each leave their mark upon one another, and the vast world that surrounds us also leaves its traces. After choosing interactive media in her wish to depart from the one-directional transmission led by the creator, Yuseung Lee has come to focus increasingly on the human. The computer is often compared to the human brain and treated as something that takes the place of human intellectual operations, but a crucial difference lies in its user. A human being and the human brain are one. Separation is impossible. The computer, however, and everything entangled with it, is a tool for human beings[2]. At the very least, for now, the data accumulated within AI, the latest programs, and everything else still involve human intervention. And so the artist resolved to hold on to what is human. She came to use these things as if they were brushes and paint. She strove not to display complex and dazzling effects or technical prowess, but to pare down and simplify as much as possible. The more she pared down, the clearer her thinking felt[3].

I am, We are takes shape through a process: the audience completes the predicate "~이다 (am ~)" after the subject "나는 (I)," enters the color that comes to mind when thinking of what they have written, and AI analyzes the proportion of negativity and positivity within it; the visualized result is sent to a single vast world—a circle the artist has named the "*We are* space[4]." During the brief span in which the passage from I to we is visualized intuitively, the audience comes to sort through their own identity and current emotional state. They then check the judgment of others—not themselves—represented by AI. At this moment, the degree of positivity and negativity the individual audience member judges and the degree the AI judges may match, or may differ entirely; the greater the gap, the more clearly one recognizes that the thinking of the I—the individual—and that of us, or you-all, may differ. Furthermore, one comes to realize the fact that the human perspective of collecting and judging information differs from the perspective of technology, and that AI may not be perfect.

2 Gregory Berns, The Self Delusion, trans. Hong Woo-jin (Seoul: Heureum Publishing, 2024), p. 61.
3 Lee Mun-jung and Yuseung Lee, artist interview, July 26, 2025.
4 Yuseung Lee, artist's notes, 2025.

In fact, although it appears that AI is doing the evaluating, the criteria for its judgment have been obtained by collecting the contents and materials that circulate within society. The way in which the I-we, the individual and the community, evaluate their members is no different. Whether conscious of it or not, we are influenced by the tradition, stereotypes, and temporal background absorbed in the course of being educated and socialized. Therefore, just as it is ambiguous whether the perspective belongs to artificial intelligence or to us, it is also difficult to clearly distinguish whether the perspective is that of the I or that of we-they. In the process of experiencing the sameness or difference between I and we, one comes to feel how deeply we are bound together.

In connecting the interior with the world, the artist "thought of a feeling in which the various colors of the earth or of planets are all woven together." After adding the sound of water to the work, "I thought of living beings—bacteria—inside a schale." Above all, she imagined the situation in which a single stone is thrown into still water—the inner—and ripples spread out from it. As one focuses on the sound of water flowing through the exhibition space, the "*We are* space" calls to mind a lake or the sea, summoning into the head not only the infinite and vast digital world but also the actual nature that is thought to stand at its opposite pole. As a result, today, when the virtual world produced by science and technology has become familiar, one comes to reflect even upon the relationship between virtual nature and the nature that actually exists.

In the end, the "*We are* space" is a place where the emotions of individual selves become entangled, coexisting and colliding—showing directly that there exists a diversity of selves: me, and you, each different. At the same time, it makes us face the reality that we who are so different all live within a single world. Until the exhibition ends, the result—the color—that fills the "*We are* space" remains within an endless process. Colors resembling paint or ink dispersing in water, in motions that bloom and gather, move without end. Overlapping and combining, they form a single organic shape, and then break it apart. Because "color as expression is plainly subjective and bound to sensibility and thought," it clearly reveals the artist's intention to contain emotion. But *I am, We are* does not remain only within the realm of the individual. The colors, mingled with the interiors of others and holding no clear boundaries, carry the world outside individuals and act as a medium that connects me, us, and the world[5].

(...) In Yuseung Lee's work, perhaps a greater engagement occurs in the dimension of the interaction between the interior of the I—us—and the interior of the artist. Every I, every we, every being within the world, and the world made up of all of these, is always in motion. It is placed within becoming.

5 Gila Ballas, Modern Art and Color, trans. Han Taek-su (Seoul: Goongri Publishing, 2002), p. 35

[B] Anonymous Questionnaires from the *In Between* (2025)

The following pages reproduce anonymous survey forms collected from visitors to *In Between* during its 2025 exhibition. These documents serve as qualitative evidence of the audience's subjective experiences and their interpretations of the work's core themes.

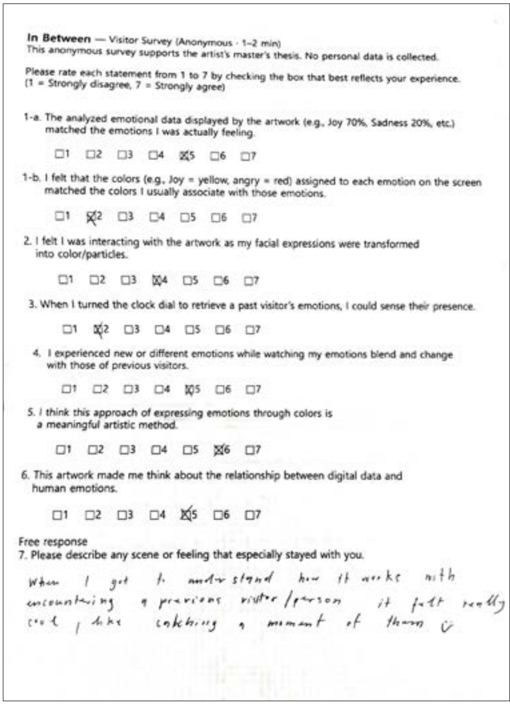
Note:

1) Data Source and Collection: A total of 66 survey responses (n=66) were collected from visitors during the 2025 Ars Electronica Festival.

2) Methodology: Participation in the survey was entirely voluntary and anonymous, with respondents providing their feedback spontaneously after experiencing the installation.

3) Selection for Appendix: While the total dataset consists of 66 entries, this appendix includes 8 representative samples to illustrate the variety of audience perspectives, handwriting, and linguistic diversity (including English and other languages).

4) Data Presentation: The samples are presented as original scans to preserve the authenticity of the audience's direct touch and expression.



In Between — Visitor Survey (Anonymous · 1–2 min)
This anonymous survey supports the artist's master's thesis. No personal data is collected.

Please rate each statement from 1 to 7 by checking the box that best reflects your experience.
(1 = Strongly disagree, 7 = Strongly agree)

1-a. The analyzed emotional data displayed by the artwork (e.g., Joy 70%, Sadness 20%, etc.) matched the emotions I was actually feeling.

☐1 ☐2 ☐3 ☐4 ☒5 ☐6 ☐7

1-b. I felt that the colors (e.g., Joy = yellow, angry = red) assigned to each emotion on the screen matched the colors I usually associate with those emotions.

☐1 ☒2 ☐3 ☐4 ☐5 ☐6 ☐7

2. I felt I was interacting with the artwork as my facial expressions were transformed into color/particles.

☐1 ☐2 ☐3 ☒4 ☐5 ☐6 ☐7

3. When I turned the clock dial to retrieve a past visitor's emotions, I could sense their presence.

☐1 ☒2 ☐3 ☐4 ☐5 ☐6 ☐7

4. I experienced new or different emotions while watching my emotions blend and change with those of previous visitors.

☐1 ☐2 ☐3 ☐4 ☒5 ☐6 ☐7

5. I think this approach of expressing emotions through colors is a meaningful artistic method.

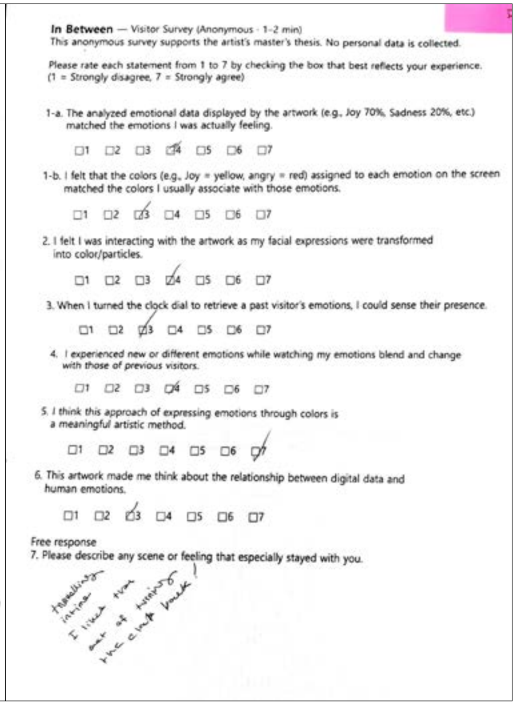
☐1 ☐2 ☐3 ☐4 ☐5 ☒6 ☐7

6. This artwork made me think about the relationship between digital data and human emotions.

☐1 ☐2 ☐3 ☐4 ☒5 ☐6 ☐7

Free response
7. Please describe any scene or feeling that especially stayed with you.

When I got to understand how it works with encountering a previous visitor/person it felt really cool, like catching a moment of them :)



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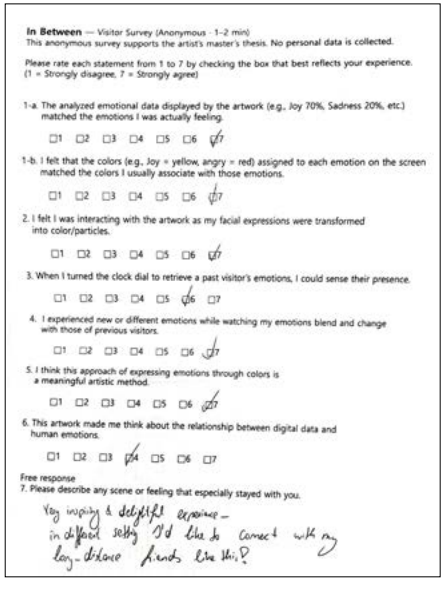
☐1 ☐2 ☒3 ☐4 ☐5 ☐6 ☐7

Free response
7. Please describe any scene or feeling that especially stayed with you.

travelling in time I liked that aspect of turning the clock back!



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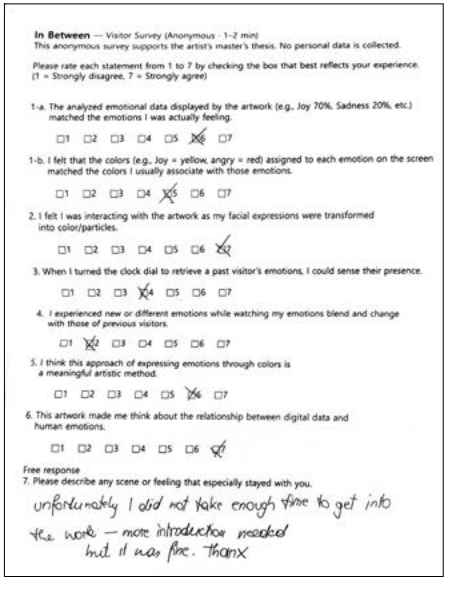
Free response
7. Please describe any scene or feeling that especially stayed with you.

Very inspiring & delightful experience — in different setting I'd like to connect with my long-distance friends like this!



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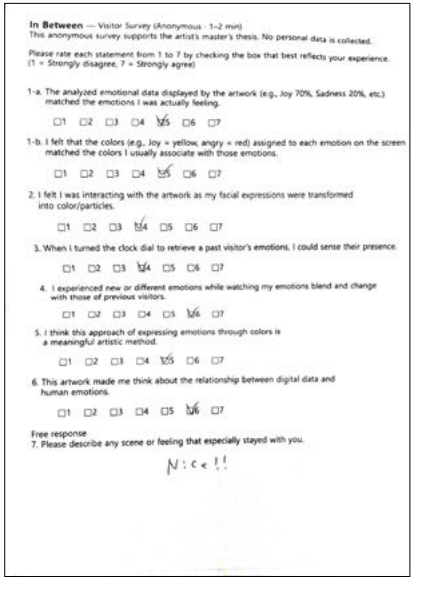
Free response
7. Please describe any scene or feeling that especially stayed with you.

unfortunately I did not take enough time to get into the work — more introduction needed but it was fine. thanx



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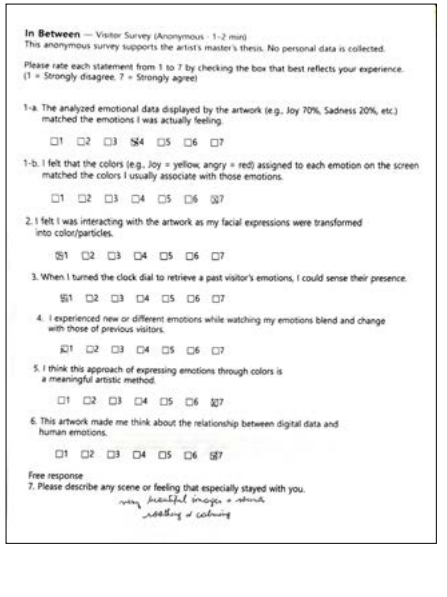
Free response
7. Please describe any scene or feeling that especially stayed with you.

Nice!!



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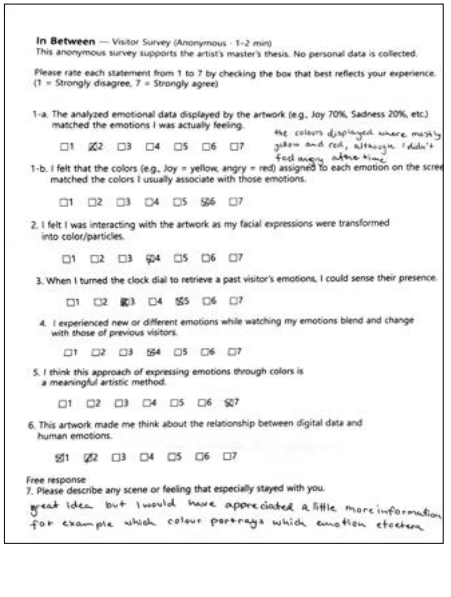
Free response
7. Please describe any scene or feeling that especially stayed with you.

very beautiful images + sounds
soothing + calming



In Between — Visitor Survey (Anonymous · 1–2 min)
This anonymous survey supports the artist's master's thesis. No personal data is collected.

Please rate each statement from 1 to 7 by checking the box that best reflects your experience.
(1 = Strongly disagree, 7 = Strongly agree)

1-a. The analyzed emotional data displayed by the artwork (e.g., Joy 70%, Sadness 20%, etc.) matched the emotions I was actually feeling.

☐1 ☒2 ☐3 ☐4 ☐5 ☐6 ☐7

the colours displayed where mostly yellow and red, although I didn't feel angry, attractive

1-b. I felt that the colors (e.g., Joy = yellow, angry = red) assigned to each emotion on the scre matched the colors I usually associate with those emotions.

☐1 ☐2 ☐3 ☐4 ☐5 ☒6 ☐7

2. I felt I was interacting with the artwork as my facial expressions were transformed into color/particles.

☐1 ☐2 ☐3 ☒4 ☐5 ☐6 ☐7

3. When I turned the clock dial to retrieve a past visitor's emotions, I could sense their presence.

☐1 ☐2 ☒3 ☐4 ☒5 ☐6 ☐7

4. I experienced new or different emotions while watching my emotions blend and change with those of previous visitors.

☐1 ☐2 ☐3 ☒4 ☐5 ☐6 ☐7

5. I think this approach of expressing emotions through colors is a meaningful artistic method.

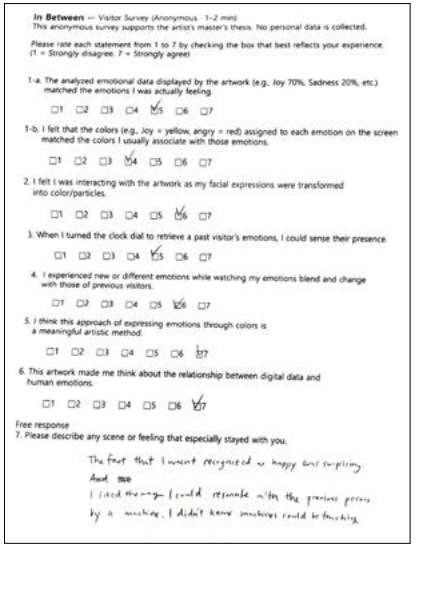
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☒7

6. This artwork made me think about the relationship between digital data and human emotions.

☒1 ☒2 ☐3 ☐4 ☐5 ☐6 ☐7

Free response
7. Please describe any scene or feeling that especially stayed with you.

great idea but I would have appreciated a little more information for example which colour portrays which emotion etcetera



In Between — Visitor Survey (Anonymous · 1–2 min)
This anonymous survey supports the artist's master's thesis. No personal data is collected.

Please rate each statement from 1 to 7 by checking the box that best reflects your experience.
(1 = Strongly disagree, 7 = Strongly agree)

1-a. The analyzed emotional data displayed by the artwork (e.g., Joy 70%, Sadness 20%, etc.) matched the emotions I was actually feeling.

☐1 ☐2 ☐3 ☐4 ☒5 ☐6 ☐7

1-b. I felt that the colors (e.g., Joy = yellow, angry = red) assigned to each emotion on the screen matched the colors I usually associate with those emotions.

☐1 ☐2 ☐3 ☒4 ☐5 ☐6 ☐7

2. I felt I was interacting with the artwork as my facial expressions were transformed into color/particles.

☐1 ☐2 ☐3 ☐4 ☐5 ☒6 ☐7

3. When I turned the clock dial to retrieve a past visitor's emotions, I could sense their presence.

☐1 ☐2 ☐3 ☐4 ☒5 ☐6 ☐7

4. I experienced new or different emotions while watching my emotions blend and change with those of previous visitors.

☐1 ☐2 ☐3 ☐4 ☐5 ☒6 ☐7

5. I think this approach of expressing emotions through colors is a meaningful artistic method.

☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☒7

6. This artwork made me think about the relationship between digital data and human emotions.

☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☒7

Free response
7. Please describe any scene or feeling that especially stayed with you.

The fact that I wasn't recognized as happy but surprising
And me
I liked the way I could resonate with the previous person by a machine. I didn't know machines could be touching

[C] User Color Selection Logs from *Cycle of Emotions* (2026) — *Color* Stage

The following samples document individual color choices recorded at the *Color* stage of *Cycle of Emotions* during its 2026 exhibition at Gwangju Media Art Platform (G.MAP). Figure 26 in Section 4.3.3 visualizes the aggregate saturation–brightness distribution across emotions; the samples below provide the underlying raw entries.

Note:
1) Data Source and Context: The data presented in this table are a representative subset of the color selection logs collected from the *Color* stage of *Cycle of Emotions* during its 2026 exhibition at G.MAP. As in Section 4.3.3, the dataset covers entries recorded through the originally scheduled closing date of the exhibition (mid-March 2026).

2) Sample Size: Out of approximately 1,400 valid color selection entries recorded in this period, these 35 samples were purposively selected — five per emotion category — to represent the distribution shown in Figure 26.

3) Sorting: The original logs are recorded in chronological order. For readability, the samples in this table have been reorganized by emotion category; within each category, entries are arranged in chronological order to reflect the breadth of the exhibition period.

4) HSV Range: Hue values range from 0 to 179, Saturation and Value from 0 to 255.

Emotion	Timestamp	Hue (H)	Saturation (S)	Value (V)
Happiness	2026-01-15 13:13:24	32	228	130
Happiness	2026-01-23 14:52:02	179	255	255
Happiness	2026-01-31 11:31:55	84	113	206
Happiness	2026-02-08 15:31:17	128	181	121
Happiness	2026-02-24 09:30:24	146	255	222
Sadness	2026-01-15 09:38:57	108	255	255
Sadness	2026-01-18 15:45:06	112	133	222
Sadness	2026-01-29 17:08:30	45	164	131
Sadness	2026-02-08 16:20:12	0	0	156
Sadness	2026-02-22 15:16:47	30	146	99
Anger	2026-01-15 13:13:24	0	198	151
Anger	2026-01-18 15:44:56	60	133	222
Anger	2026-01-29 10:55:32	173	240	232
Anger	2026-02-07 11:46:46	105	157	254
Anger	2026-02-22 13:17:21	107	75	106
Fear	2026-01-15 13:13:24	136	127	32
Fear	2026-01-18 16:59:27	91	233	52
Fear	2026-01-28 10:23:32	136	227	79
Fear	2026-02-07 11:36:25	98	117	126
Fear	2026-02-22 11:48:39	21	226	145
Disgust	2026-01-15 11:28:57	39	109	77
Disgust	2026-01-18 17:00:04	94	42	178
Disgust	2026-01-28 13:38:17	58	0	14
Disgust	2026-02-08 10:36:34	85	116	120
Disgust	2026-02-22 11:48:39	120	64	119
Surprise	2026-01-15 09:38:23	112	197	241
Surprise	2026-01-18 10:01:29	0	73	0
Surprise	2026-01-28 13:35:00	113	244	181
Surprise	2026-02-11 14:37:17	78	161	130
Surprise	2026-02-22 14:54:50	128	144	152
Neutral	2026-01-15 13:13:24	125	119	130
Neutral	2026-01-17 12:59:46	147	200	140
Neutral	2026-01-28 14:06:23	96	155	220
Neutral	2026-02-13 12:51:01	74	124	196
Neutral	2026-02-22 14:58:59	86	146	99