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Investigating Kandinsky's Inspiration from Michelangelo Buonarroti

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INVESTIGATING KANDINSKY'S INSPIRATION FROM MICHELANGELO

BUONARROTI

by

Asal F.Morvari

A Thesis Submitted to the Faculty of the Art and Design Department
in Partial Fulfillment of the Requirements for the
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ABSTRACT

INVESTIGATING KANDINSKY'S INSPIRATION FROM MICHELANGELO BUONARROTI

Asal F.Morvari, Master of Art History, 2022

Thesis directed by: Prof. Kelly Scheffer. MA

This study aims to analyze Kandinsky's *The Last Judgment* painting and compare it with Michelangelo's *The Last Judgment* to show that Michelangelo's work influenced Kandinsky's painting. For this study, the mixed-methods methodology is applied, which refers to an emergent methodology of research that advances the systematic integration or combining of quantitative and qualitative analysis within a single investigation. Mathematical analysis and a review of Kandinsky's books and manuscripts are considered. Image processing analysis is applied using biorthogonal Wavelet analysis and Canny Edge detection, in conjunction with Kandinsky's writings on color theory, to determine whether Kandinsky was inspired by Michelangelo's *The Last Judgment* when he was working on his own painting of the same name. This study introduces a new perspective on the source of inspiration for Kandinsky's *The Last Judgment* painting and demonstrates that Kandinsky, as a member of the Modernist avant-garde, was, in fact, looking back to the Renaissance master for inspiration. These findings and methods of analysis can be used by artists and art historians to study other artworks.

Acknowledgments

I would like to thank my family for their unconditional support, encouragement, and patience as I pursued my passion for undertaking this research and course of study.

I would also like to thank my thesis committee chair, Prof. Kelly Scheffer, for encouraging my enthusiasm for research, reassuring me that I was on the right track, and for her willingness to help shape my research and challenge my conclusions over the last two years through insightful discussion and commentary.

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Introduction/Background

Wassily Kandinsky was a prominent Russian painter and theorist who was considered

one of the twentieth century's most influential artists and one of the most important pioneers of

abstract art. This study aims to analyze Kandinsky's *The Last Judgment (1912)* painting (Fig.1)[1]

and compare it with Michelangelo's *The Last Judgment (1535–1541)* painting (Fig.*2)* [2] to show

that Michelangelo's *The Last Judgment* painting influenced Kandinsky's painting of the same

name. There has been relatively minor and limited literature published that addresses

Kandinsky's direct connections to Medieval or Renaissance practices. This study investigates not

only the books, manuscripts, and articles written by and about Kandinsky, but also uses various

mathematical methods to determine his influences. Kandinsky's philosophy of colors is also

considered to find evidence as to whether or not Kandinsky, as a modernist avant-garde artist,

was inspired by Michelangelo's *The Last Judgment* when he was working on his own *The Last*

Judgment painting in an abstract style.

Michelangelo's *The Last Judgment* depicts the second coming of Christ and God's final

and eternal judgment on all humankind. Muscular figures fill the walls to the brim in endless

dynamic poses. *The Last Judgment* is not bound by painted boundaries, the composition is

clearly organized in levels and quadrants, using subgroups and meaningful pairings that facilitate

the legibility of the frescoes. Overall, the left is rising, and the right is falling, reminiscent of the

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[1]   *The Last Judgment*, 1912, by Wassily Kandinsky (ca 1866-1944), unknown dimension, Private
collection
[2]   *The Last Judgment*, 1535-1541, by Michelangelo Buonarroti (ca 1475-1564), Fresco, 13.7 m. x
12 m., Sistine Chapel, Vatican City

scales used to weigh souls in many depictions of the Last Judgment. Kandinsky in his *The Last Judgment,* uses formative shades of black that paint only self-illuminating and mostly set color areas. His palette was consistent, with reds, yellows, and blues frequently appearing. In his painting, a frenzy of activity, almost chaos, can be found that perhaps perfectly sums up the image of the Last Judgement.

Wassily Kandinsky was born on December 4, 1866, in Moscow, where the cathedrals, palaces, and colors of the city there would stay with him throughout his life. [3] In 1869, when he was not yet three, he traveled to Rome, thousands of miles from Moscow, accompanying his parents on an Italian tour. He later traveled to Italy repeatedly and even lived there from 1905 to 1906. [4] He visited his mother there in later years.[5]

Kandinsky began his studies at the Classical Secondary School in Odessa until 1885, where he received his first lessons in music and painting. After that, He enrolled at the University of Moscow, studying law and economics. On a field trip to Vologda(Russia) in the 1890s, he was struck by the power of Russian popular art. After first discovering Impressionist painting in 1896, he decided to dedicate himself to painting and left Russia to study in Munich at the age of 30. In Munich, he first entered a private art school and then joined the Munich Academy of Arts. As Kandinsky expresses, he learned painting as a child, studied different fields of study (including law, music, and painting), and experienced living in different countries such as Russia, Germany, Italy, and France. [6]

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[3]   Annette Vezin, Luc Vezin, and Judith Hayward, *Kandinsky and the Blue Rider* (Paris: Pierre Terrail, 1992), 21.
[4]   Hilla Rebay, *Kandinsky* (New York, NY: The Solomon R. Guggenheim Museum, 1982), 115.
[5]   Rebay, 115.
[6]   Wassily Kandinsky, *Point and Line to Plane* (Baden, GE: Lars Müller Publishers, 2021), 7.

Kandinsky mustered the courage to found the Phalanx group in 1901, which was a new artists' organization in Munich, while still not a professional. [7] Phalanx was an association of artists, including Wassily Kandinsky, Rolf Niczky, Waldemar Hecker, and Wilhelm Hüsgen, as the Founding members who were opposed to old-fashioned and conservative viewpoints in art. Kandinsky desired to learn more from European art, and between 1906 and 1907, he traveled to Sèvres (France), then to Paris (France), where he first saw paintings by the Fauves. [8]

The Russian Avant-garde movement, born in pre-revolutionary Russia, was an opportunity for many European-influenced artists to liberate themselves from Russia's social and aesthetic constraints at the time; Kandinsky was one of the most important of these European-influenced artists. In 1908, having spent a great deal of time traveling across Europe, Kandinsky and Gabriele Münter, who studied and lived with Kandinsky, moved to Murnau, near Munich(Germany).

In 1909, Kandinsky created NKVM (Munich New Artist's Association) as the first modernist secession which is regarded as a forerunner for Modern art in 20th-century Germany. He met Franz Marc, who became his friend and part of the group. Kandinsky published his first theoretical text in 1911, called *Concerning the Spiritual in Art,* in which he provided a guide to understanding the abstract art that he produced, including the meanings of shapes and colors based on his philosophy. Then, he founded the Blaue Reiter (Blue Rider) group with other artists, including Franz Marc, August Macke, and Alexei von Jawlensky, in 1911 in Murnau (Germany),

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[7]   Mikhail Guerman, *Wassili Kandinsky 1866-1944* (Terzo, TR: Gribaudo, 2007), 22.
[8]   Evgueny Kovtun, *Russian Avant-Garde: Art of Century* (New York, NY: Confidential Concepts, 2014), 170.

and soon after he published the *Blaue Reiter Almanac*. Kandinsky's first solo show was held at Der Sturm Gallery in Berlin in 1912.[9]

The Blaue Reiter rediscovered "reverse glass painting[10]" in the early twentieth century. Kandinsky was one of Blaue Reiter's artists who painted more than seventy paintings in this style; he also presented many reverse glass paintings in various exhibitions, together with his paintings on canvas and cardboard.[11] In his reverse glass painting, Kandinsky was interested in painting religious motifs, like saints or apocalyptic scenarios, which are in close relation to his early works, such as *Crucified Christ (1911)* (Fig. IV- Appendix).[12] During this time, Kandinsky also painted his *The Last Judgment* in 1912.

At the outbreak of the First World War in 1914, Kandinsky had to return to Russia. When Kandinsky was there, he experienced a high level of creative activity during the years of the Russian Revolution.[13] Kandinsky had professional stability and the chance to teach others as a master; these features gave him confidence that his theory was being heard by those Kandinsky was making masters. At the Bauhaus, he succeeded in pursuing the theory of monumental art and realizing his own massive designs with the help of his students: "a situation reminiscent of Renaissance guild brotherhoods and one that naturally gave Kandinsky the particular sense of a total and profound interaction with the universe."[14] In one of his notes, Kandinsky states that "the

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[9]   Evgueny Kovtun, *Russian Avant-Garde: Art of Century*, 171.

[10]   Reverse glass painting is a type of art in which paint is applied to glass and then viewing the image by turning the glass over and looking through the glass at the image. This type of art has existed for many years. It has been widely used in sacred paintings since the Middle Ages. Stained glass later spread to Italy and influenced Renaissance art in Venice.

[11]   Simon Steger et al., "Kandinsky's Fragile Art: A Multidisciplinary Investigation of Four Early Reverse Glass Paintings (1911–1914) by Wassily Kandinsky," *Heritage Science* 7, no. 1 (July 2019), 1.

[12]   Steger et al., 3

[13]   Kovtun, *Russian Avant-Garde: Art of Century*, 22.

[14]   Guerman, 70.

contact of a sharp angle of a triangle with a circle has no less effect than God's finger touching

Adam's in Michelangelo,"[15] which shows Kandinsky was trying to compare himself to some of

the Renaissance masters, such as Michelangelo.

Regarding Kandinsky's attention to Renaissance and religious art, it is worth noting that

he has some artworks with the same name as those of Renaissance artists, such as *The Last*

Judgment for his artwork after Michelangelo's artwork *The Last Judgement*, or other names like

All Saints Day I(1911)(Fig. I- Appendix), *All Saints Day II(1911)* (Fig. II- Appendix), which

both paintings refer to All Saints' Day that is the religious Feast of All Saints and is a Christian

solemnity celebrated in honor of all the known and unknown saints of the church. Two of the

most famous paintings with the same name are by Fra Angelico and William-Adolphe

Bouguereau.

Moreover, the traditional Christian images can be seen in the early Kandinsky works,

such as *Crucified Christ (1911)* (Fig. IV- Appendix), and *Madonna and Christ (1917*) (Fig.V-

Appendix), which both refer to a religious themes and topic. This period represents the artist's

final phase of figuration before his already loose and colored forms freed themselves almost

entirely from representational reality and his works gradually became more abstract.

Kandinsky also painted *The Last Supper(1909 – 1910)* (Fig. III- Appendix), another

work with a religious theme and name, which refers to the last supper of Christ with his apostles,

a prevalent subject matter for Italian artists. It's the most famous supper in art history, depicting

when Jesus announces that one of the twelve apostles gathered for his final meal will betray him.

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[15]   Wessel Stoker, *Where Heaven and Earth Meet: The Spiritual in the Art of Kandinsky, Rothko,*
Warhol, and Kiefer (Amsterdam: Rodopi, 2012), 74.

Italy has the world's most significant number of *Last Supper* paintings; three of the most famous ones were painted by Giotto, Fra Angelico, and Leonardo da Vinci.

Kandinsky lived in Russia before and after the Russian Revolution (which dates from March 8, 1917 to June 16, 1923). However, he traveled to different European countries(and residency in France until his death in 1944), familiarizing him with multicultural arts, the history of European arts, and folklore arts from around the continent.

Literature Review

To date, the most comprehensive publications on Kandinsky's art are two of his own books, *Concerning the Spiritual in Art (1911)* and *Point and Line to Plane (1926).* In his remarkable *Concerning the Spiritual in Art* book, Kandinsky reflects his philosophy of color and the compositional relation of shapes and forms.

Also, in this book, Kandinsky directly expresses his views on the spiritual and visual meaning of the colors; for example, he mentions, "Orange is like a man, convinced of his own powers,"[16] as he painted Christ, a man convinced of his own powers, at the center of his *The Last Judgment* painting, or he notes that when red seek to deepen by an admixture of black, they make brown, "unemotional, disinclined for [forward] movement,"[17] as Kandinsky shows the Gate of Hell and the damned people who are unwilling to move forward and enter Hell in his *The Last Judgment* painting. This book has an important role in interpreting his *The Last Judgment* painting as an abstract painting.

His second important work, *Point and Line to Plane* (1926), came out when he was working at the Bauhaus and presented analyses of the point, line, and plane, and also investigated the effect of colors in connection with those analyses. In this book, Kandinsky digs deeper into the meaning of the points, lines, and planes in the paintings, specifically abstract paintings from his point of view. According to him, the point is the primary element, and the line is the result of the point in the movement, whereas the plane is the result of the line. Kandinsky believes that each

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[16]   Wassily Kandinsky and Sadler M T H., *Concerning the Spiritual in Art* (New York, NY: Dover Publications, 1977), 77
[17]   Kandinsky, *Concerning the Spiritual in Art,* 74

element has its own sound, and linguistically, the point has become an external sign for a "period" through which its inner sound has become lost.[18] Kandinsky believed that the tension adhering to the point is its concentric power by which it refuses to take up space and movement into itself.

Unlike the point, the line expresses movement. That is why life, with its movement and power, can be expressed well in a line. Straight, curved, horizontal, and vertical lines always express a certain feeling. Kandinsky thus considers the straight line lyrical and clashing/conflicting lines as tragic. A plane can assume all kinds of forms, such as a square or a triangle. Here as well, Kandinsky points to the human existential side. Each living being stands in a necessary relationship to "above"/"heaven" and "below"/"earth," which can be applied on the canvas of the painting that is itself a living being. "Above" stands for a feeling of lightness, liberation, and freedom, and "below" for the opposite, i.e. gravity and bondage.[19] This book is useful in interpreting some of the lines in Kandinsky's *The Last Judgment* painting. For example, in Michelangelo's painting, the arch above Christ indicates circular composition, which Kandinsky also painted his *The Last Judgment* painting in a circular format.

Mikhail Guerman's book *Wassily Kandinsky 1866-1944*, in which he describes important events and aspects of Kandinsky's art from his early ages until the height of his career. This book is a good resource regarding Kandinsky's biography and chronological life events. In addition, the book *Russian Avant-Garde: Art of Century,* by Evgueny Kovtun explores Kandinsky's life in the early twentieth century as a Russian avant-garde artist, including his intellectual and cultural turmoil. Kovtun discusses that for many Russian artists influenced by European art, the

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18   Stoker, 69.
19   Stoker, 69.

movement represented a way of liberating themselves from the social and aesthetic constraints of the past. It was these avant-garde artists who, through their immense creativity, gave birth to abstract art, thereby elevating Russian culture to a modern level. He cites such painters as Wassily Kandinsky, Kazimir Malevich, Natalia Goncharova, Mikhail Larionov, and Vladimir Tatlin had a definitive impact on twentieth-century art, even outside of Russia.

Kandinsky's role as an avant-garde artist has been well established in the literature, but his reverse glass painting has been less researched. Simon Steger et al., in their article, "Kandinsky's Fragile Art: a Multidisciplinary Investigation of Four Early Reverse Glass Paintings (1911–1914) by Wassily Kandinsky," describe one of the most common arts of the Renaissance and the rediscovery of "reverse glass painting" by Blaue Reiter in the early twentieth century. Kandinsky was one of Blaue Reiter's artists who painted more than seventy paintings in this style. The article results show the great importance of this technique in Kandinsky's oeuvre, as he used it in Murnau between 1909 and 1914 and continued with it later in Moscow and Paris. Kandinsky presented several of his reverse glass paintings in exhibitions together with paintings on canvas and cardboard (e.g. "Der Blaue Reiter" exhibition, 1911), implying the coequal importance of these techniques. He found inspiration in folkloristic Bavarian reverse glass paintings from the 19th- century and adapted his paintings with their characteristic features. So, Kandinsky's interest in reverse glass painting shows that he was inspired by folk art and Renaissance cathedral art of glass painting.[20]

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[20]   Simon Steger et al., "Kandinsky's Fragile Art: A Multidisciplinary Investigation of Four Early Reverse Glass Paintings (1911–1914) by Wassily Kandinsky," *Heritage Science* 7, no. 1 (July 2019), 14.

While many Modern artists embraced the concept of the avant-garde, there is reason to suspect that many were influenced by Renaissance-era visual languages, Roger Ferrer-Ventosa, in the article "Thinking in Hieroglyphic Images: from the Renaissance Hermetic tradition through the Avant-garde to Contemporary Art," also investigates the roots of the avant-gardes and contemporary art.[21]

Also, the aesthetic feature had several reappearances, especially during the twentieth century, that merges Hermetism, Neoplatonism, Kabbalah, and Western esotericism. It drifts into a style that takes hieroglyphic writing as a mythical model in both the Renaissance era and now. This article is important because it suggests art historians should investigate the roots of Avant-garde movements in the previous eras, such as the ancient, medieval, and Renaissance eras. Thus, it can be a good guide to investigate the recent artistic movement's roots and possible inspirations, using analyzing logic and iconography, mainly to find out how Avant-Garde movements could be linked to the previous eras.

Moreover, Wessel Stoker, in his book *Where Heaven and Earth Meet: the Spiritual in the Art of Kandinsky, Rothko, Warhol, and Kiefer*, demonstrates that these artists communicate religious insights through images and shows how they depict the relationship between Heaven and earth, between this world and transcendent reality, thus clearly drawing the contours of the spirituality these works evince.[22] The author includes information and quotes from these artists, including Kandisnky's notes and manuscripts. He discusses the broad concept of religion or spirituality as a concern with a reality that is experienced as holy or sacred. According to the

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[21]   Roger Ferrer-Ventosa, "Pensando En Imágenes Jeroglíficas: De La Tradición Hermética En El Renacimiento a Las Vanguardias Hasta El Arte Contemporáneo," *Arte, Individuo y Sociedad* 30, no. 2 (March 2018), 311.
[22]   Stoker,193.

16

author, from 1910 to 1913, Kandinsky did use Christian themes in figurative and non-figurative

ways, such as the apocalypse with the motif of four horses, men, and angels with trumpets in

paintings like *All Saints Day I* (1911))(Fig. I- Appendix). As the author mentions, Kandinsky

attempts to depict the mystical worldview he writes about in his works on the theory of art.

Stoker mentions that Kandinsky's work has an undeniably apocalyptic undertone and

dramatically depicts the struggle between good and evil.[23]

Kandinsky tries to place his spiritual view of art in the context of a philosophy of history.

According to Stoker, Kandinsky notes that "the seekers of God also get no further than the

external form of a work of art by Giotto or Raphael. The spectator of today is, however, rarely

capable of perceiving such vibrations." [24]

In the years leading up to World War I, Kandinsky saw the clash between good and evil,

between spirituality and materialism, and between spirit and matter. Also, some of his paintings

were discussed in this book, such as *Composition 6* (Fig.VI- Appendix), which the author notes

is a visionary apocalyptic painting that evokes the destruction and rebirth of the world. The

painting, which is primarily black on the left, has a light color on the right, which points to a

view of the new world.[25] The author also refers to *Composition 8* (Fig.VII- Appendix), depicting

the struggle between good and evil and the desire for an inner, spiritual world. In the brown-blue

triangle that converges somewhat with the off-with circle is a white circle with three arrows

directed at a black point. [26]

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[23]   Stoker, 49.
[24]   Stoker, 55
[25]   Stoker, 64.
[26]   Stoker, 74.

As Stoker notes, for Kandinsky, the circle is the synthesis of the greatest tensions. It combines the concentric and the eccentric, which keep each other in balance. When the unity of the opposition is completed, the circle becomes a point; the point of indifference. The point is the unity of silence and speech, which even, *Composition 8* is an example of this, and the forms should not be considered as merely geometric means but as pictorial means that have human existential qualities and evoke an inner life. Kandinsky states that "the contact of a sharp angle of a triangle with a circle has no less effect than God's finger touching Adam's in Michelangelo."[27]

Moreover, as the author mentions for Kandinsky , the study of art history leads in the end ti the "union" of the "human" and the "divine".[28]

It is worth mentioning that there are not many sources, neither in the field of art nor in science, that directly discuss Kandinsky's art and painting and its relation to Renaissance or Medieval art.

This study employs mathematical programming to analyze Kandinsky's *The Last Judgment* painting to extract more information regarding this artwork. Mathematical analysis and image processing methods are useful and powerful methods to find hidden information in an image. These methods are used in some fields of science, including Medical sciences and Earth sciences. Recently, by expanding the science areas, art historians are becoming interested in emerging sciences and mathematical methods because these methods can be used to reveal more information about a structure of an image or the specific elements of paintings than might be distinguishable to the eye.

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[27]   Stoker, 74.
[28]   Stoker, 68.

The articles and books discussed below are really helpful in getting more familiar and having a broader view regarding the usage of mathematical analysis and image processing and help to write the mathematical model for analyzing Kandinsky's artwork.

Yunzhong Wang et al., in their article, "Intelligent Painting Identification Based on Image Perception in Multimedia Enterprise, "explain how mathematical image processing methods can be used to analyze paintings. The authors analyze some artworks using Neural Networks, which is a mathematical method to find some hidden information in the artworks. Their results show that mathematical analysis has the ability to classify dynamic structures. As a result, the extracted maps passed through the mathematical analysis can measure the similarity between images. According to them, mathematical analysis is effective for the similarity measurement between images. It can classify images into specific categories by providing maps containing the contrast between two images' implicit information.[29]

In 2008, Johnson et al., in the article "Image Processing for Artist Identification," analyzed van Gogh's paintings and extracted their features using Wavelet transform. Additionally, they conducted art historical brushstroke analysis and provided very good definitions for the extracted features of van Gogh's brush works in his paintings. According to them, the problem of artist identification seems ripe for the use of image processing tools. In making an attribution, experts often use not only current knowledge of the artist's common practices in combination with meticulous comparisons of a variety of technical data (acquired, e.g., through ultraviolet fluorescence, infrared reflectography, x-radiography, paint sampling, and/or canvas weave count), but they also include a visual assessment of the presence of the

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[29]   Yunzhong Wang et al., "Intelligent Painting Identification Based on Image Perception in Multimedia Enterprise," *Enterprise Information Systems*, June 2020, 13.

artist's "handwriting" in the brushwork. This suggests that mathematical analysis of a painting's

digital representation could assist the art expert in the attribution process. According to the

authors, using the mathematical methods on the complete data set, four non–van Gogh paintings

were detected, at the cost of wrongly classifying two van Goh paintings. Their research results

suggest that the Mathematical method can detect dissimilarities in the brushstroke texture of

paintings and could therefore support art experts in their assessment of the authenticity of

paintings. Also, they have begun to apply its techniques to color reproductions of van Goh's

paintings, the automatic determination and validation of brushstroke orientation, and are

developing and testing advanced approaches that analyze configurations of brushstrokes. [30] This

article is a good resource on how other scholars use image processing to analyze artwork.

Another resource about image processing methods that will be used conceptually in this

research project is a book by Gimel′farb, *Image processing, and analysis: a primer book*,

published in 2019. This book provides comprehensive information about image decomposition

methods. Specifically, chapter seven of the book introduces the Canny Edge method[31] . It

provides some details about this method, such as the mathematical process of this method, its

application in analysis, and its ability to detect the main edges in an image. The Canny Edge

algorithm is one of the most important mathematical methods used in the research image

analysis, as this is a powerful edge detection method.

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[30]   C. Johnson et al., "Image Processing for Artist Identification," *IEEE Signal Processing Magazine* 25, no. 4 (2008): pp. 37-48, https://doi.org/10.1109/msp.2008.923513, 47.

[31]   The Canny edge detector is an edge detection operator that uses a multi-stage algorithm to detect a wide range of edges in images for a better interpretation.

In addition, *Data-Driven Modeling & Scientific Computation: Methods for Complex Systems & Big Data* is a comprehensive book for image analysis and image decomposition [32]that was written by Jose Nathan Kutz. This book provides vast information about image decomposition and processing concepts and methods. This book is used to improve understanding of some details about the image processing methods in this research and is a great help for this study to write the codes. In chapters thirteen, fourteen, fifteen, and sixteen of this book, there is much information about Wavelet analysis for image processing. This study uses this information in its Analysis chapter. In this book, the author mentions that, given the broad appeal of imaging sciences and its applicability in a wide variety of fields, it is not surprising that an equally diverse set of mathematical models has been brought to bear on image processing.[33]

Van Fleet provided comprehensive information and explanations about the Wavelet image processing methods in the book titled *Discrete Wavelet Transformations*, which was published in 2019. This book provides the abstract concepts of wavelet theory using a practical, application-based approach, reflecting how mathematics can be used for other fields of study, such as image processing (including, but not limited to, data compression, edge detection in images, and denoising[34]). This book introduces different types of Wavelets and their

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[32]   Image decomposition is the process of decompositing or sepereating an image components.

[33]   Jose Nathan Kutz, *Data-Driven Modeling & Scientific Computation: Methods for Complex Systems & Big Data* (Oxford, OX: OUP Oxford, 2013). 25

[34]   In this research, noise means colors, thin and short lines, small color spots, unsaturated small stains, and anything that distracts the eye from the main lines or main brush strokes and prevents the important spots and main lines from appearing. Denoising method is a mathematical process in which the noises of an image are removed to restore the true image Indeed, denoising methods remove the elements that don't contain important information and keep the most important elements that could contain very important information. In this research, the denoising method is used to keep the most prominent brush strokes, lines, and shapes of Kandinsky's painting. This importance will be selected by the artificial

applications, such as the Haar, orthogonal, and biorthogonal filters, and connects these concepts directly to real-world applications. This study uses this book to define the Wavelet method and write its codes in Matlab software to analyze Kandinsky's *The Last Judgment* painting.

In 2017, Vasamsetti et al. provided details about the Wavelet method and Canny Edge detection algorithm for image decomposition in their article, "Feature extraction through Haar Wavelet decomposition for automatic detection of landmarks on Cephalogram Images[35]." They explained in detail how these methods could be useful for image analysis. To this aim, they used these methods to analyze cephalogram images, which are a type of medical image. According to the authors, combining Canny Edge and Haar Wavelet analysis would reduce inter-subject variability during landmarks detection and reduce time and resources without affecting the treatment planning. In their article, they have developed a feature extraction algorithm through Wavelet which is capable of landmark detection on digital Cephalogram Images.[36]

The resources, including books and articles, are used to analyze Kandinsky's *The Last Judgment* artwork to find his inspirations from Michelangelo, based on the mixed-methods methodology discussed in detail in the following chapters.

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intelligence and algorithms that compare all the information and elements of a picture based on various mathematical values and decide to keep some of the elements and remove the rest of them. Noises in images can be removed through different denoising techniques.

[35] According to sciencedirect website, the lateral cephalogram is a standardized lateral view radiograph of the head and neck that can permit evaluation of bony and soft tissue structures.

[36] Srikanth Vasamsetti et al., "Feature Extraction through Wavelet Decomposition for Automatic Detection of Landmarks on Cephalogram Images," July 2017, pp. 2-6, 4.

Research Methodology

In this study, a mixed-methods methodology is applied to investigate the thesis question. This research uses both qualitative and quantitative techniques to integrate findings and draw inferences from both the qualitative and quantitative components. Researchers have been conducting mixed methods research for decades, yet it has recently become more prominent as a form of inquiry.

Mixed-methods research has had its roots over the last thirty years (since the 1990s) in several disciplines and fields of study.[37] In this method, the researcher collects and analyzes evidence from both qualitative and quantitative methods (based on research questions); or mixes (or integrates or links) the two forms of methodologies concurrently by combining them (or merging them) sequentially by having one build on the other; or embedding one within the other. Alternatively, the researcher gives priority to one or to both methods (in terms of what the research emphasizes). Mixed methods help the research procedures within philosophical world views and theoretical lenses and could combine the procedures into specific research designs that direct the plan for conducting the study.[38]

This study investigates Kandinsky's inspiration from Michelangelo Buonarroti's *The Last Judgment* when he was working on his own *The Last Judgment* painting. To this aim, Kandinsky's *The Last Judgment* is compared with Michelangelo's *The Last Judgment* painting from different aspects, including Kandinsky's philosophy of color, his writings, and a

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[37]   John W. Creswell and Plano Clark Vicki L., *Designing and Conducting Mixed Methods Research* (Thousand Oaks, CA, CA: Sage, 2018), 26.

[38]   John W. Creswell and Plano Clark Vicki L., 688.

mathematical analysis of Kandinsky's *The Last Judgment*. Therefore, this research investigates Kandinsky's biography, books, and manuscripts to find evidence that confirms Kandinsky's attention to the Renaissance era and, more specifically, to Michelangelo, which will be discussed in the Analysis section.

Kandinsky had a particular interest in writing and describing his philosophical and intellectual ideas in the field of art, and two of his most important books in this field are *Concerning the Spiritual in Art (1911)* and *Point and to Plane(1926),* and these texts provided important insight into his theoretical beliefs about the art of his time.

In addition to analyzing Kandinsky's writings and biography, this research uses mathematical methods to analyze Kandinsky's *The Last Judgment* painting. Kandinsky's *The Last Judgement* artwork has lots of brushstrokes and various colors, as well as a complicated composition, so to be able to extract the main brushstrokes pattern at first, this research needs to use mathematical methods to be able to denoise the painting from various extra information and extract the most prominent parts of the composition. In this case, Wavelet transform is an excellent mathematical tool to use as a denoising filter for the artwork. [39]

Based on Jose Nathan Kutz's definition, Wavelet transform provides a sophisticated image representation. A wavelet is a mathematical function useful in image processing. In the Wavelet, the picture is divided into squares, and each square is analyzed once by the wavelet function separately, and the calculation is repeated for each.

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[39]   Jose Nathan Kutz, *Data-Driven Modeling & Scientific Computation: Methods for Complex Systems & Big Data* (Oxford, OX: OUP Oxford, 2013), 360.

The calculations and the result of the function for each small square is a small denoised square (denoised here means colors, small spots, thin brush strokes, and other small details have been removed). Finally, all these squares are concatenated together and attached together and make the whole denoised picture.

In simple words, Wavelet transform can be considered as lots of small filters that move along the image and filter the image in small sections. The filter works as a lens and only takes the most significant parts of the picture, such as bold stains and thick lines; in doing so, only the information will be visible that is most important based on the mathematical filter, and the final result is a denoised picture. The denoised picture is a suitable source to study main brush strokes, saturated stains, and more critical lines, which the artists emphasized on them by either adding more saturated pigments that depict as a shape or a bold stain or by applying more pressure on his brush to provide a specific mark or a special brush stroke. Wavelet helps art historians to see a denoised image, which can then be processed through another filter that works as an edge detector (or finding the edges of stains and lines), resulting in a precise map of important compositional information.

This process makes the analysis easier for the art historians to see the map of the edges and to detect the composition of the works better without being confused by extra information (noises) such as colors, small stains, thin lines, unsaturated spots, etc. In this way, colors are ignored; instead, the saturation of the spots is considered (by being bold or being faded). Therefore this combination of methods is a good way to detect and depict the essential elements of an abstract composition.[40]

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[40]   The wavelet transform is one of the premier methods that can lead to multiresolution decomposition to capture the features of an image at all scales. This generates information at various

This can be a very useful method for the art historian to denoise the abstract paintings and to find out the most important lines and shapes of the painting that have significant roles in the composition of the painting. To this aim, Matlab software has a powerful Wavelet package, so this study uses Matlab to write the analyzing codes. Although the basic logic of scientific methodology is the same in all fields, its specific techniques and approaches will vary depending upon the subject matter.[41]

Technically, the Wavelet result is the denoised image of Kandinsky's *The Last Judgment* painting; however, the denoised image cannot be used yet and still needs to be processed further. More significant features should be extracted to be able to be prepared for visual inspections by art historians. To this aim, the Canny Edge detector can be used, which is an edge detection operator that uses a multi-stage algorithm to detect a wide range of edges in images.

Canny Edge is a popular and efficient detector, and for this project, this detection technique is applied to extract useful structural and compositional information and the most prominent Splines[42] of the painting. Also, the Canny Edge detector can dramatically reduce the amount of data to be processed by its power to extract the main features of an image. So, this study employed the Canny Edge detection to the Wavelet's result. The result is a picture (map) that contains lots of flexible curves (Splines) that shows the main composition and the place of significant lines, shapes, etc.

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scales that can be manipulated to extract information regarding the location of various features on the image.

41   Ranjit Kumar, *Research Methodology: A Step-by-Step Guide for Beginners* (Los Angeles, CA: SAGE, 2019), 18.

42   A Spline (or a flexible curve) consists of a long strip fixed in position at a number of points that relaxes to a form.

As a brief process review, the images of Kandinsky's *The Last Judgment* and Michelangelo's *The Last Judgment* were imported to the Matlab software, and the Wavelet transform was applied to Kandinsky's painting. The result of the Wavelet transform is an image in which less prominent information has been deleted from the image; in other words, it is denoised.

Then, using Matlab programming, the Canny edge detector is applied to the image with the important features (the result of the Matlab or the denoised picture), and the Canny edge algorithm detects the most important edges of the shapes in the denoised image of Kandinsky's painting. Finally, Kandinsky's painting's most important features and edges are extracted from the algorithm as a map or a contour map, and then Matlab uses mathematics to project Kandinsky's extracted map on Michelangelo's painting. Then, the overlapped images can be compared easily, and the visual analysis can start.

Moreover, Kandinsky's Color theory and his ideas about various colors and shapes will be considered to demonstrate that Kandinsky was not only inspired by Michelangelo's composition but also the meanings imbued in Michelangelo's placement of figures. All these methods together led this study to conclude that Kandinsky was inspired by Michelangelo's artwork when he was working on his *The Last Judgment* painting.

To further demonstrate the remarkable similarities between Kandinsky's *The Last Judgment* and the work by Michelangelo of the same name, the evidence detected from Kandinsky's *The Last Judgment* will be compared to five other paintings (by various artists) from the Renaissance era with the same subject matter.

Analysis

Different painters, born in different eras and geographical locations, were influenced by different schools of arts and philosophy. However, each individual artist also has a unique signature, which is hard to detect with traditional methods. [43] This study analyses Kandinsky's *The Last Judgment* artwork to find more details about his method of painting and inspiration for this specific artwork and find out possible similarities between his painting and Michelangelo's *The Last Judgment* artwork. As Kandinsky is one of the most avant-garde artists of the twentieth century, it is important to know his probable inspirations from Michelangelo's *The Last Judgment* when he was working on his own painting. This is important because it does not fit into the grand narrative of Modernism, which emphasizes the idea that creativity must be utterly original and cannot depend upon prior models. It is important to note that the Modernist movement was not influenced by any single event, object, or tradition. In the broadest sense, Modernism is about rejecting what came before it and embracing new ways to create meaning.[44] So based on the Modernism concept, a Modernist avant-garde artist such as Kandinsky should not be inspired by any religious theme and tradition or any previous artist such as Michelangelo.

Modern art is considered to be more secular than European art from previous centuries. From 1910 to 1913, however, Kandinsky used Christian themes in a figurative way, such as the apocalypse with the motif of angels with trumpets in paintings like *All Saints Day I* (1911). Kandinsky attempts to depict the mystical worldview he writes about in his works on the theory

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[43]   Yunzhong Wang et al., "Intelligent Painting Identification Based on Image Perception in Multimedia Enterprise," *Enterprise Information Systems*, June 2020, 1.
[44]   Nathan Rotenstreich, "Religion, Modernity and Post-Modernity," *International Journal for Philosophy of Religion* 18, no. 1-2 (1985): pp. 33-49, 33.

of art.[45] Kandinsky's religious motifs and his references to Renaissance-era art and artists, lead this study to a series of questions about whether he intentionally selected the same name for his *The Last Judgment.* Did Michelangelo inspire him? Or does he only use this name because of his religious or spiritual beliefs? Do the colors have any specific meaning in this painting that could lead us to Michelangelo's *The Last Judgment*? If he is inspired by a previously painted *The Last Judgment* painting from the Renaissance era, was it Michelangelo's, as he mentioned his name in his quotes or his artwork "Adam" in his notes[46], and considering the point that he frequently traveled to Italy and lived there for several months[47] a few years before he painted his *The Last Judgment* or even because Michelangelo's *The Last Judgment* was the most famous between the other *The Last Judgment* paintings from the Renaissance era. Probably, Kandinsky as an avant-garde artist, would prefer to be inspired by the most famous ones and the one that could catch more eyes during history. Or could the results of the analysis be matched by any other *The Last Judgment* painting from the Renaissance era?

All these questions led this research to select Michelangelo's *The Last Judgment* as the painting that should be compared with the Kandinsky painting of the same name. If the research methods employed in this study lead to evidence of the similarities between these two paintings, then it can be assumed that Kandinsky, as an influential avant-garde artist, did not create an entirely "original" *The Last Judgment* painting, therefore violating the Modernist myth regarding artistic innovation.

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[45]   Stoker, 49.
[46]   Stoker,74.
[47]   Rebay,115.

In this regard, to find an answer to the thesis question, this study applied a mixed method to analyze Kandinsky's artwork to find his probable inspirations from Michelangelo's *The Last Judgment.* By using the previously mentioned methods (Biorthogonal Wavelet transformation and the Canny edge detection algorithm), this study scientifically analyzes Kandinsky's painting patterns and composition. The resulting simplified images have been compared to some of the most famous Renaissance *The Last Judgment* paintings, including Michelangelo's work. Only Michelangelo's *The Last Judgment* showed color and compositional similarities.

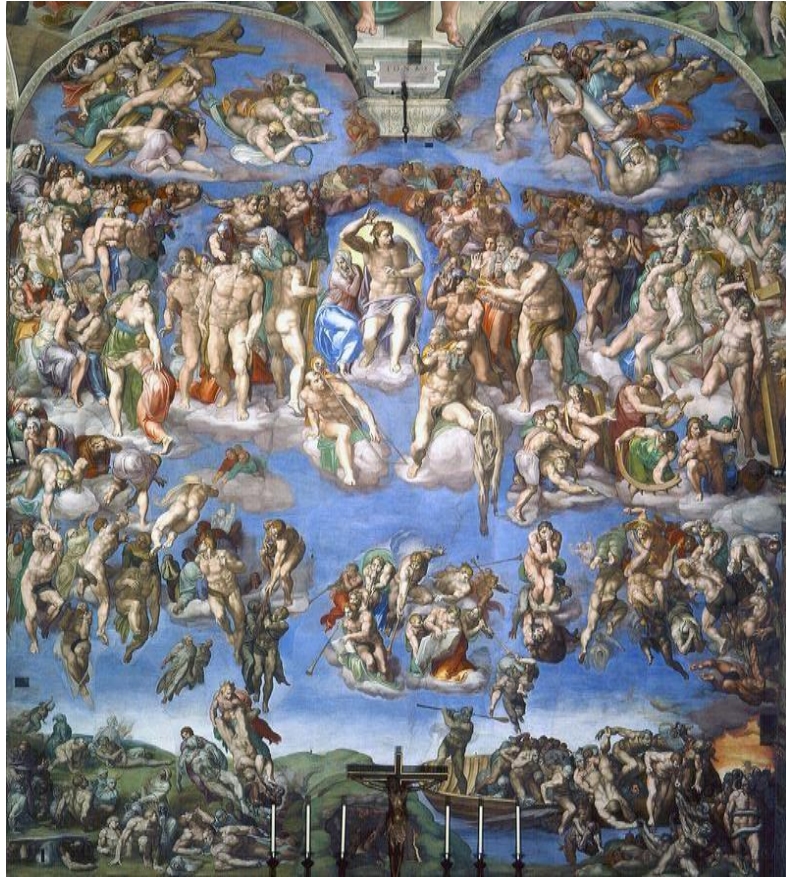Fig.1: Wassily Kandinsky, *The Last Judgment*, oil on canvas, 1912, Unknown dimension, Private Collection

Fig.2: Michelangelo Buonarroti, Fresco, *The Last Judgment* painting, 1535-1541, 13.7 m. x 12 m
Sistine Chapel (Vatican City)

Kandinsky had a special interest in writing and describing his philosophical and intellectual ideas in the field of art. The books and manuscripts he published in his lifetime are useful insights into his paintings.

Discussion

In the analysis section, this study first applied Wavelet transform to Kandinsky's *The Last Judgment* painting as a denoising method and then applied the Canny Edge detection algorithm to the Wavelet's results and the main Splines of the painting extracts as the important features of the painting. Finally, the results will be compared to some of the most famous Renaissance *The Last Judgment* paintings. It is worth noting that none of the examined artworks matched, given the composition or color theory, with Kandinsky's *The Last Judgment* except Michelangelo's *The Last Judgment.*

Kandinsky's *The Last Judgment* artwork has lots of brushstrokes, various colors, and a complicated composition, so to be able to extract the main brushstrokes pattern, the painting needs to be denoised of various extra information. The wavelet result is the denoised image of Kandinsky's *The Last Judgment* painting, seen below in Fig.3. However, the denoised image cannot be used yet, and it still needs to be processed further, and more significant features should be extracted to be able to be prepared for visual inspections by art historians.
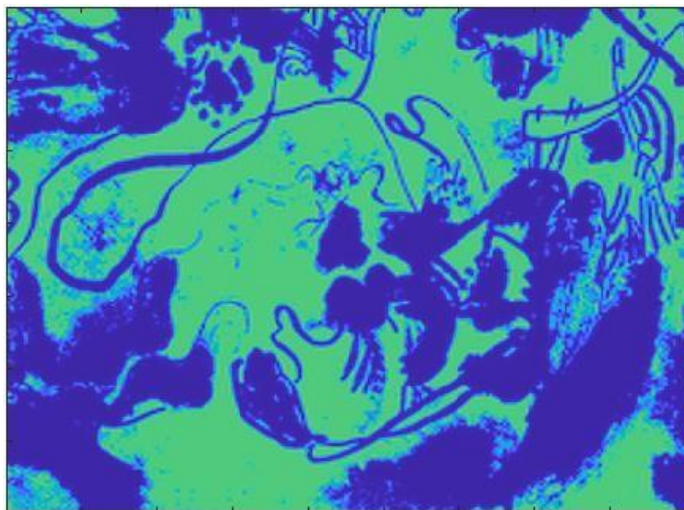

Fig 3: Wavelet's result (Kandinsky's *The Last Judgment* painting after denoising)

In addition, the Canny Edge detector is an edge detection operator that uses a multi-stage algorithm to detect a wide range of edges in images. Canny Edge is a popular and efficient detector, and this study applied this detection technique to extract useful structural information and most important Splines from different visual objects. Also, the Canny Edge detector can dramatically reduce the amount of data to be processed by its power to extract the main features of an image. So, this study also employed the Canny Edge detection to the Wavelet's result.

Hence, this research used the Canny edge detector algorithm for the Wavelet's extracted feature of Kandinsky's *The Last Judgment* painting to extract the main Splines of the painting (the main composition). The extracted pattern is used as a model to analyze Kandinsky's painting and the main Splines that shape his painting. Also, as a way to further demonstrates that the similarities were not accidental, the extracted composition was compared with five other *Last Judgment* paintings by various artist (Figures 14 to 18), and none of them shows any similarities in the case of color theory or composition with Kandinsky's painting. However, only Michelangelo's *Last Judgment* painting has similar characteristics.

This study used the extracted image (Splines and pattern) as a model for comparing with Michelangelo's *The Last Judgment* painting. The extracted features using the Canny Edge detector are shown in Fig.4. This detector extracted the most important Splines from Kandinsky's brushstrokes that could lead this study to the primary sketch of his artwork. The results show that the painting is denoised well, and the main Splines extracted precisely, and the findings indicated an image with primary Splines of his painting composition. After applying these mathematical methods, this study analyzes the results using visual inspection.

This study used Fig.4 as the main pattern of Kandinsky's painting to compare the painting with Michelangelo's *The Last Judgment* to investigate Kandinsky's inspiration in detail. The results are explained in detail in the next section.

Fig 4: Canny Edge detector algorithm results (Main Splines of the Kandinsky's *The Last Judgment* painting)

The point which is really critical in these experiments is to find whether the colors (based on Kandinsky's color philosophy) and the main brushstrokes (composition) match with Michelangelo's painting and whether the projection reveals any similarities regarding the composition or the colors.

Fig. 5 is the extracted composition map of Kandinsky's painting on Michelangelo's *The Last Judgment* painting. The detections show a good compositional match with Kandinsky's painting (the later discussion also will show a good color match, based on Kandinsky's color theory).
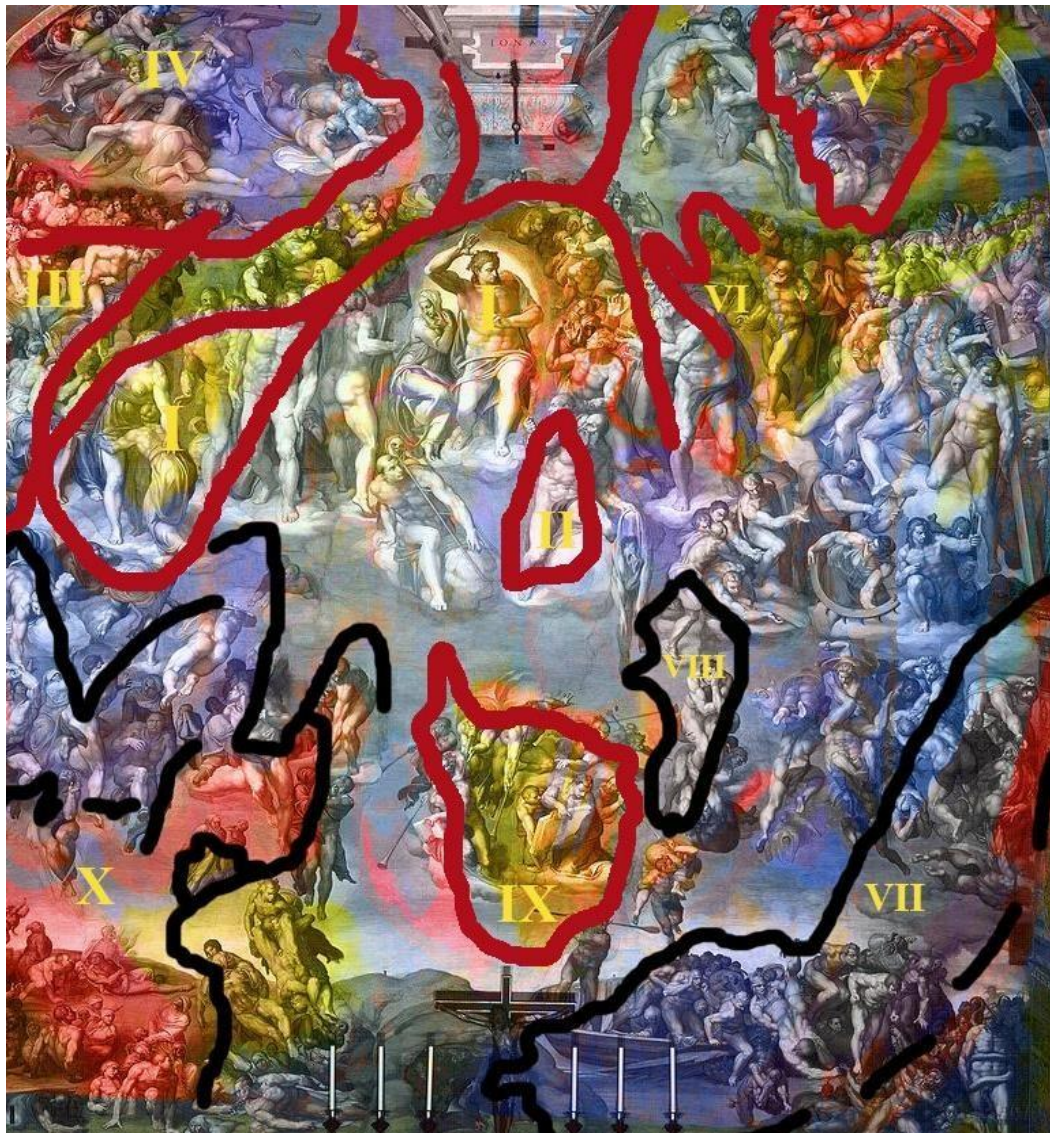

Fig 5: The extracted composition map of Kandinsky's painting on Michelangelo's *The Last Judgment* painting

Considering Kandinsky's religious beliefs and that he has some paintings with the same names as some well-known Christian works from the Renaissance, it is probable that Kandinsky's *The Last Judgment* was not accidentally similar to Michelanglo's work. Further analysis will further support the assertion that Kandinsky intentionally painted an abstract image based on Michelangelo's composition.

The results of the extracted image with the main Splines of Kandinsky's *The Last Judgment* painting contain important information. At first glance, it seems that Kandinsky used the main composition of Michelangelo's *The Last Judgment* to shape his artwork and added colors based on his theories regarding the meaning of colors. Overlapping the extracted features (main Splines and pattern) of Kandinsky's painting and Michelangelo's *The Last Judgment* painting (Fig.6) provides clear evidence of the similarities between the two compositions.

Fig 6: The extracted pattern of Kandinsky's painting on Michelangelo's *The Last Judgment* painting.

This section summarized the most prominent Splines of the extracted image for better visualization using visual inspections and Kandinsky's color theory. The results are provided in figures 7 and 8. These images indicate ten of the most important extracted Splines (that make the Kandinsky composition). As it can be seen (after overlapping), the Splines are placed mostly in the same place as the important parts of Michelangelo's composition.

Fig 7: The most important Splines of the extracted pattern of Kandinsky's painting overlapped on Michelangelo's *The Last Judgment* painting

Fig 8 : The extracted composition map of Kandinsky's painting on Michelangelo's *The Last Judgment* painting (Color-Match Filter applied)

Spline (I) is one of the most prominent curves that shaped the most important part of the composition, either in Michelangelo's *The Last Judgment* or Kandinsky's painting. The center figure is Christ, who is deciding the destiny of the human race. With a gesture of his arms, he damns a large part of humanity, plunging them into Hell, but some are saved, rising to Heaven. This Spline shows the arch line above the Christ and is placed in the same place as Michelangelo's painting. The arch above Christ indicates circular composition, and the specific geometry of the circle, which has neither beginning nor end, uses to symbolize God or Christ, based on the classical painting rule.[48] Indeed, circle compositions are often used in art to reconcile diverse parts of a picture into a harmonious relationship, as a circle indicates perfect unity.

Also, considering Kandinsky's philosophy, as stated in the book *Point and Line to Plane*, the line types are one of the most important elements of the composition in Kandinsky's view, and the critical point here is that Kandinsky followed the same format of the line for the center part of his composition (Fig. 9).

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[48]   Juliette Aristides, *The Classical Drawing Atelier: A Contemporary Guide to Traditional Studio Practice* (New York, NY: Watson-Guptill Publications, 2016), 19.

Fig 9: Kandinsky followed the same format of the line for the center part of his composition

In accordance with Kandinsky's color theory, he painted this spline area in a combination of yellow, orange, and light warm red (a red that has yellow added to it). As he states in his book, *Concerning the Spiritual in Art;* "Light warm red has a certain similarity to medium yellow, alike in texture and appeal, and gives a feeling of strength, vigor, determination, triumph." [49]

He continues, "Warm red, intensified by a suitable yellow, is orange. This blend brings red almost to the point of spreading out towards the spectator. But the element of red is always sufficiently strong to keep the color from flippancy. Orange is like a man, convinced of his own powers". [50] He painted Christ, a man convinced of his own powers, at the center of this Spline in

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[49] Kandinsky, *Concerning the Spiritual in Art,* 74
[50] Kandinsky, *Concerning the Spiritual in Art,* 77

this color, surrounded by his mother and other saints. At the southwest of this Spline, just under

Christ and Virgin Mary, Kandinsky also painted St. Lawrence in a yellow brush stroke to add

him to the circle of Christ, in the same place as Michelangelo did in his composition (Fig. 10)

Fig 10: Kandinsky painted St. Lawrence in a yellow brush stroke to add him to the circle of
Christ, in the same place as Michelangelo did in his composition

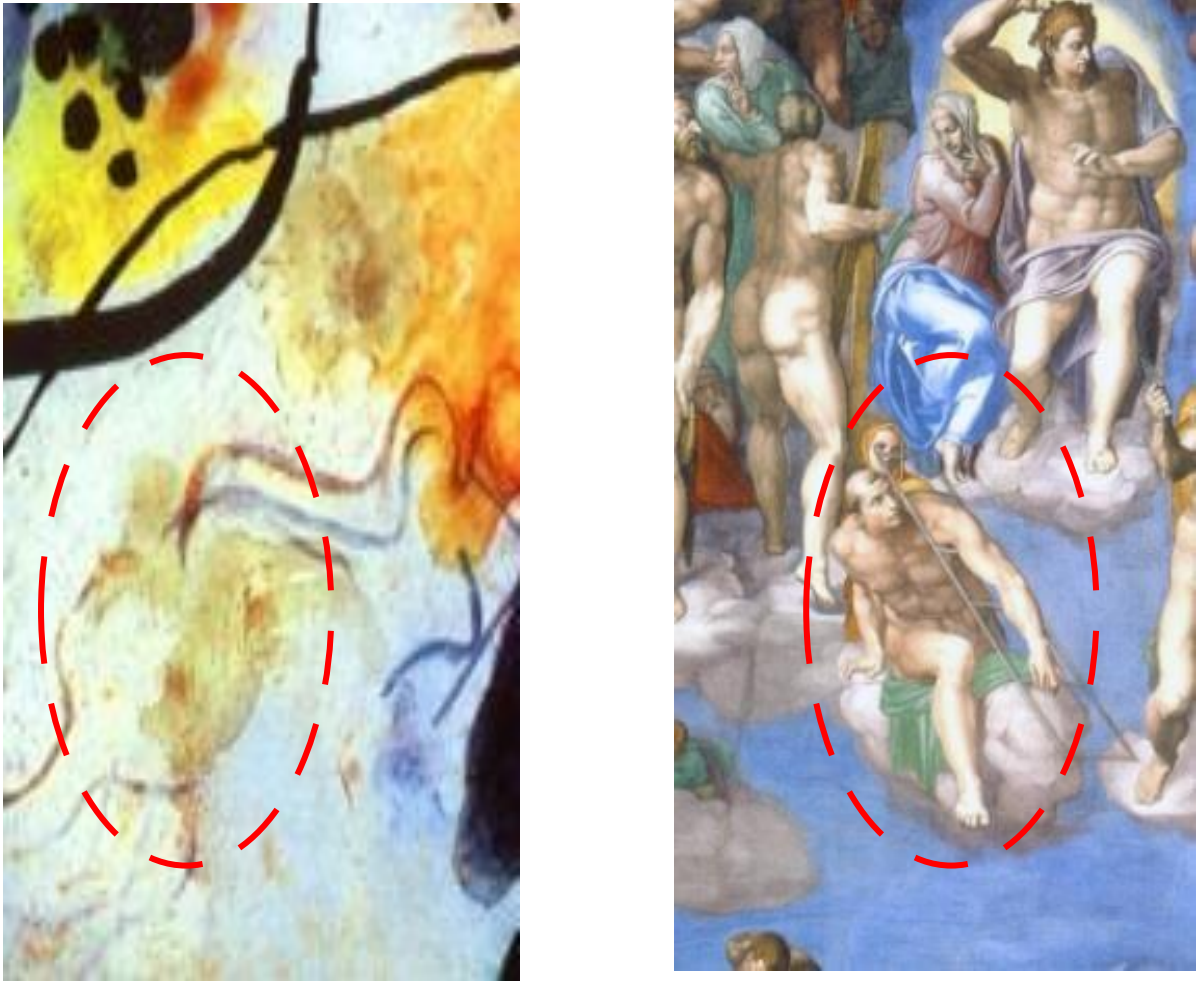Regarding Spline (II), which Kandinsky shows in black, overlaps with St.Bartholomew in

Michelangelo's *The Last Judgment*. St. Bartholomew, who is directly below Christ's line of fire,

and above the boatman who carries figures to Hell, takes his wrath as he looks down to Hell,

brandishing a filleting knife and holding his filleted skin, a symbol of his very painful

martyrdom.

It is worth noting that the face on the skin is usually recognized as being a self-portrait of

Michelangelo. He wrote a poem at the same time that addresses how he felt about *The Last*

Judgment as it states, "I live in sin, to kill myself I live; no longer my life my own, but sin's; my

good is given to me by Heaven, my evil by myself, by my free will, of which I am deprived"[51]

and was certain that he was unworthy to enter the kingdom of Heaven, so Kandinsky in his

painting shows St. Bartholomew in black. According to Kandinsky's Color Theory: "A totally

dead silence, on the other hand, a silence with no possibilities, has the inner harmony of black. In

music, it is represented by one of those profound and final pauses, after which any continuation

of the melody seems the dawn of another world. Black is something burnt out, like the ashes of a

funeral pyre, something motionless like a corpse."[52] This evidence provides clear connections

between the black shape in Kandinsky's work and Michelangelo's Bartholomew (Fig.11).

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[51]   Christopher Ryan, *The Poetry of Michelangelo: An Introduction* (Madison, WI: Fairleigh
Dickinson University Press, 1998), 62.
[52]   Kandinsky, *Concerning the Spiritual in Art*, 73

Fig 11: Kandinsky painted the same place in the composition as Michelangelo's Bartholomew and also painted him in black

Also, Spline (III) indicates the group of the Righteous raised into Heaven on the left side of the painting who try to stay up or lift themselves from the other elect (Prophets). Interestingly, in the Kandinsky painting Canny Edge detected map (Fig. 4), the shape of this Spline extracted is exactly triangular, as Michelangelo also made his composition with this part (Fig.12)

Fig 12: Triangular edge of Spline III, Kandinsky's painting overlapped with Michelangelo's painting

Moreover, Splines (IV) and (V), indicate the lunettes (top right and top left) that show angels displaying the instruments of Christ's Passion. Michelangelo connects this triumphal moment to Christ's sacrificial death and Resurrection. The Passion refers to the final period in the life of Christ, beginning with the entry into Jerusalem and including his torture and, ultimately, his crucifixion. Based on his own color theory, Kandinsky also painted these parts with a combination of mostly blue and black (less yellow and red) on the left side and mostly red, yellow on the right side. Regarding blue color and its combination with black, Kandinsky notes, "Blue is the typical heavenly color. The ultimate feeling it creates is one of rest. When it sinks almost to black, it echoes a grief that is hardly human,"[53] Kandinsky's use of this color

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[53]   Kandinsky, *Concerning the Spiritual in Art*, 72

likely refers to Christ's torture and, ultimately, his crucifixion. On the top right, Michaelangelo

also depicted the pillar on which Christ was flogged, probably referring to the Resurrection and

the hope it gives humans for the present and the future. God's grace was given to them. He laid

their punishment on the cross so they could be brought before the throne of grace. God delivered

humans from the captivity of their sins. Kandinsky also applied red and yellow to this area,

which according to his color theory, "Light warm red has a certain similarity to medium yellow,

alike in texture and appeal, and gives a feeling of strength, vigor, determination, triumph."[54]

Regarding Spline (VI), it represents various saints, martyrs, and angels, who are referred

to as the elect. The prominent Apostles like Saint Peter, who holds the keys to Heaven in his

hands, and some other saints who are located on the right side of Christ and, like a pillar on the

right side of Christ, form the other base of the main arch around Christ. Regarding Kandinsky's

color theory, he mostly painted this part in blue and yellow, alluding to concepts of Heaven,

majesty, and triumph.

Furthermore, Spline (VII) indicates the area of Hell in Michelangelo's composition and

how people are slipping to the bottom of the image. It also shows the Gate of Hell that matches

Michelangelo's gate of Hell. Kandinsky colored this part mostly as a combination of black and

red, as according to his color theory: "Taken by itself red is material, and, like yellow, has no

very deep appeal. Only when combined with something nobler does it acquire this deep appeal. It

is dangerous to seek to deepen red by an admixture of black, for black quenches the glow or at

least reduces it considerably. However, there remains brown, unemotional, disinclined

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[54]   Kandinsky, *Concerning the Spiritual in Art,* 74

for[forward] movement."[55] Kandinsky also shows the gate of Hell and the damned people who are unwilling to move forward and enter Hell (Fig. 13).

Fig 13: The gate of Hell that matches Michelangelo's gate of Hell. Kandinsky colored this part mostly as a combination of black and red

In addition, Spline (VIII) shows the damned man who is precisely beneath the triangle shape and hides one of his eyes with one hand; the notable black stain in Kandinsky's painting also has one small red point as one eye. According to Kandinsky's Color Theory, as also described in Spline (II) (St. Bartholomew), black shows a complete dead silence with no possibility of rescue, presenting the ashes of a funeral pyre and something motionless like a

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[55]   Kandinsky, *Concerning the Spiritual in Art*, 74

corpse. In music, also Kandinsky described this as one of those final pauses, in which any continuation of the melody after that seems to be the dawn of another world.

Spline (IX) shows the Angel**s** of the Apocalypse trumpets awakening the dead, and the Archangel Michael reads from the book of souls to be saved. The larger book on the right contains a list of the damned, destined for Hell. Once again, Kandinsky shows these Archangels in the combination of yellow, orange, and red, the Same as the Spline (I). Besides his quote in Spline (I), he also describes red as a trumpet instrument in music, as also, here, the Archangels blow trumpets: "Light warm red (a red that has yellow in it) has a certain similarity to medium yellow, alike in texture and appeal, and gives a feeling of strength, vigor, determination, triumph. In music, it is a sound of trumpets, strong, harsh, and ringing."[56]

Finally, Spline (X), shows angels and demons fighting over souls. Whereas the angels are taking some people to Heaven, others are being forced to descend into Hell. The Spline adjusts mostly with the shape and figures of Michelangelo's painting. Kandinsky painted this spline area in blue and red, as he says, "the use, side by side, of red and blue, colors in themselves of no physical relationship, but from their very spiritual contrast of the strongest effect."[57]

The flow of the Splines and shapes in the paintings show the flow of the movements, in both Kandinsky's composition and Michelangelo's composition, is from left to right. It means that on the left side of the painting, either lines or figures are moving upward; however, on the right side of the paintings, either the brushstrokes or the figure are moving down. So, both of the paintings have the same main movement and flow, based on the image analysis.

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56   Kandinsky, 74
57   Kandinsky, 81

As a way to further demonstrates that the similarities were not accidental, The extracted composition was compared with five other *Last Judgment* paintings by various artist (Figures 14 to 18). None of them shows any similarities to Kandinsky's painting. None of *The Last Judgment* paintings are compositionally matched with the extracted map of Kandinsky's *The Last Judgment*. Also, they do not have suitable accordance with Kandinsky's philosophy of colors. Michelangelo's *Last Judgment* is the only painting that showed a good pattern fit.

Overall, after reviewing Kandinsky's notes and books and applying mathematical analysis (using Wavelet transform and Canny edge detection algorithm) and applying Kandinsky's philosophy of color and color theory analysis, the results indicate that Michelangelo's painting inspired Kandinsky for his *The Last Judgment* painting. In the next section, the results and conclusion are explained in detail.

The first *The Last Judgment* painting compared is Giotto's *The Last Judgment* [58](1306), in which no similarities have been detected after overlapping.

Fig 14: The extracted composition map of Kandinsky's painting on Giotto's *The Last Judgment* painting

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[58]   Giotto di Bondone, *The Last Judgment*, 1306, Fresco, 1000 x 840 cm. Scrovegni (Arena) Chapel, Padua, Italy

The second *The Last Judgment* painting compared is Jan Provost's *The Last Judgment* [59](1505), in which no similarities have been detected after overlapping.

Fig 15: The extracted composition map of Kandinsky's painting on Jan Provost's *The Last Judgment* painting

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[59]   Jan Provost, *The Last Judgment*, 1505, Oil and gold on oak panel, 108.5 x 92 cm. Harvard Art Museums, Cambridge, United States.

The third *Last Judgment* [60] painting compared is by German artist Stefan Lochner, painted in 1435, in which no similarities have been detected after overlapping.

Fig 16: The extracted composition map of Kandinsky's painting on Stefan Lochner's *The Last Judgment painting*

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[60]   Stefan Lochner, *The Last Judgment*, 1435, Oak panel, 124,5 x 172 cm. Wallraf-Richartz-Museum, Cologne

The fourth *The Last Judgment* [61] painting compared is Jacob de Backer's *The Last Judgment* (1580), in which no similarities have been detected after overlapping.

Fig 17: The extracted composition map of Kandinsky's painting on Jacob de Backer's *The Last Judgment* painting

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[61]   Jacob de Backer, *The Last Judgment*(centre panel), 1580, Oil on panel, 140 cm x 105 cm Vrouwekathedraal, Antwerp.

The fifth *Last Judgment* [62] painting is by Hieronymus Bosch, in which no similarities have been detected after overlapping.

Fig 18 : The extracted composition map of Kandinsky's painting on Hieronymus Bosch's *The Last Judgment* painting

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[62]   Hieronymus Bosch, *The Last Judgment*, 1506-1508, oil on panel, 59x113 cm. Netherlands. Aquisgrana, Suermondt Ludwig Museum (Art Museum)

Conclusion

Wassily Kandinsky was a prominent Russian painter and theorist who was considered one of the twentieth century's most influential modernist artists and one of the most important pioneers of abstract art.

This study analyzed Kandinsky's *The Last Judgment* to find possible similarities between his painting and Michelangelo's painting of the same name. As Kandinsky is often described as one of the most avant-garde artists of the twentieth century, his probable inspiration from Michelangelo's *The Last Judgment* is significant. The fact that Kandinsky essentially created an abstract version of Michelangelo's work does not fit into the grand narrative of Modernism. The ideology of Modernism emphasizes the idea that creativity must be utterly original and cannot depend upon prior models. Technically, the concept of avant-garde refers primarily to artists whose work is opposed to mainstream tradition and cultural values, and it is important to note that the Modernist movement claimed not to be influenced by historical Western art. In the broadest sense, Modernism is about rejecting what came before it and embracing new ways to create meaning.[63]

However, Kandinsky was clearly influenced by Michelangelo, an artist whose work had a major impact on the development of Western art. Kandinsky also used Christian themes in a figurative and non-figurative way, such as the apocalypse with the motif of four horses, men, and angels with trumpets in paintings like *All Saints Day I* (1911) and *All Saints Day II* (1911). Also, as mentioned previously, Kandinsky attempted to depict the mystical worldview he wrote about

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[63]   Nathan Rotenstreich, "Religion, Modernity and Post-Modernity," *International Journal for Philosophy of Religion* 18, no. 1-2 (1985): pp. 33-49, https://doi.org/10.1007/bf00142278, 33.

in his publications on the theory of art - his work has an undeniably apocalyptic undertone and depicts the struggle between good and evil dramatically.[64] However, as an Avant-garde Modernist, technically, he should not be inspired by or follow any tradition, event or object.

Kandinsky traveled several times to Italy and even lived there, which exposed him to Renaissance art, most specifically Michelangelo's paintings, sculptures, and the frescoes on the wall and ceiling of the Sistine Chapel (Vatican), including *The Last Judgment* and *The Creation of Adam* which are among the most famous in existence.

Kandinsky also refers to Adam, in one of his notes that the contact of a sharp angle of a triangle with a circle has no less effect than God's finger touching Adam's in Michelangelo painting, that shows that Kandinsky was thinking about Michelangelo and Comparing himself to him. However, each artist also has a unique signature, which is hard to detect with traditional methods. In this regard, mathematical methods can be a valuable tool to help art historians to find more detailed information about the artwork they want to study.

This study used the mixed-methods to analyze Kandinsky's *The Last Judgment* painting. To this aim, on the one hand, it analyzed Kandinsky's notes and manuscripts--the parts that he mentioned directly or indirectly as his probable source of inspiration, as well as his color theory. On the other hand, this research used mathematical methods to extract the composition features of Kandinsky's painting. In this regard, this study applied a combination of the biorthogonal wavelet transform and the Canny Edge detection algorithm to Kandinsky's painting by coding and using Matlab. Indeed, the wavelet extracts features by denoising the picture and detecting main patterns, and the Canny edge detection algorithm detects the extracted Splines' main edges. After that, the

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[64]   Stoker, 79.

extracted Splines of Kandinsky's painting overlapped with Michelangelo's painting. The results indicate that the main Splines of Kandinsky's painting that was extracted matched with the main compositional parts of Michelangelo's *The Last Judgment* artwork. This research also demonstrated the painting's similar main patterns and composition by using the highlighted Splines in Fig.3 and Fig.4.

This study showed how the extracted splines of Kandinsky's *The Last Judgment* composition overlapped with Michelangelo's *The Last Judgment*. These findings include, but are not limited to, the arch above Christ, St. Bartholomew and the damned man figures, the Archangels group, and the Gate of Hell.

In the next level, this study used Kandinsky's philosophy of colors to enhance the results. Kandinsky, for most parts of his composition, used a color that, according to his color theory, was matched with Michelangelo's *The Last Judgment*, which shows the similarities between his painting and Michelangelo's was not accidental. For example, he mentions, "Orange is like a man, convinced of his own powers," [65] as he painted Christ, a man convinced of his own powers, at the center of his *The Last Judgment* painting, or he notes that when red seek to deepen by an admixture of black, they make brown, "unemotional, disinclined for [forward] movement,"[66] as Kandinsky shows the Gate of Hell and the damned people who are unwilling to move forward and enter Hell in his *The Last Judgment* painting. According to Kandinsky's color theory, all ten splines show a color match between Michelangelo's *The Last Judgment* and Kandinsky's painting.

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[65]   Kandinsky, *Concerning the Spiritual in Art* , 77.
[66]   Kandinsky, *Concerning the Spiritual in Art,* 74 .

Also, as a way to further demonstrates that the similarities were not accidental, the extracted map from Kandinsky's *The Last Judgment* was compared with five other *Last Judgment* paintings by various artists (Figures 14 to 18), and none of them shows any similarities in the case of color theory or composition with Kandinsky's painting. Michelangelo's *Last Judgment* painting is the only one that showed a good pattern fit.

All the achieved results from the mixed-methods is solid evidence that indicates Kandinsky, as one of the twentieth century's most influential avant-garde artists, was clearly inspired by Michelangelo's *The Last Judgment* painting, its composition, and religious theme to create his own painting and the research hypothesis is correct that Kandinsky was inspired by Michelangelo's *The Last Judgment* when he was painted his own *The Last Judgment*.

This research is a beneficial resource on how to find the composition of Kandisnky's abstract paintings for the artists who are interested in Kandinsky's compositions. Also, this research is a good resource for art historians who like to learn about the mixed-methods methodology and mathematical analysis to find the similarities between abstract paintings and classic paintings. The researchers who are interested in using image processing methods to analyze abstract paintings' brushstrokes can also use this study as a resource.

Appendix

Fig. I: Wassily Kandinsky, *All Saints Day I*, Oil on Canvas, 1911. Lenbachhaus. Munich (Germany).

Fig. II: Wassily Kandinsky, *All Saints Day II* , 1911. Lenbachhaus. Munich (Germany).
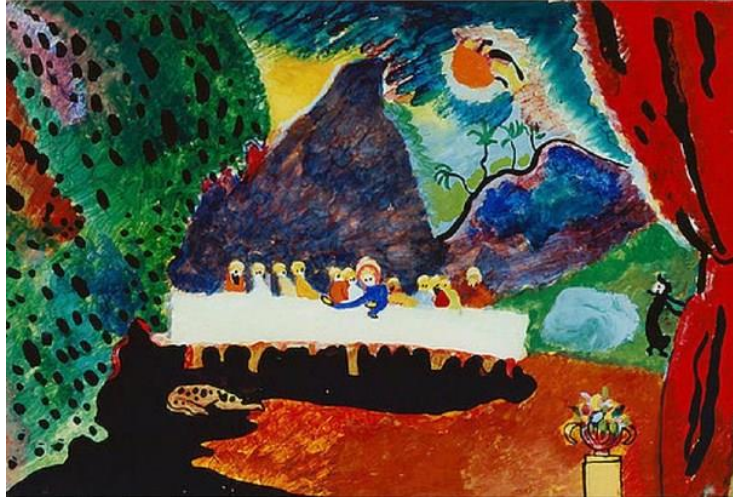
Fig. III: Wassily Kandinsky, *Last Supper* , Tempera on Glass, 1909. Lenbachhaus. Munich (Germany).
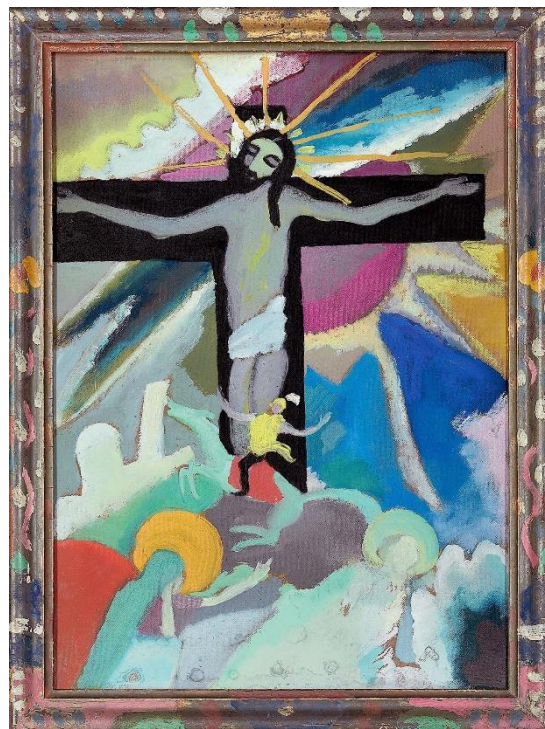

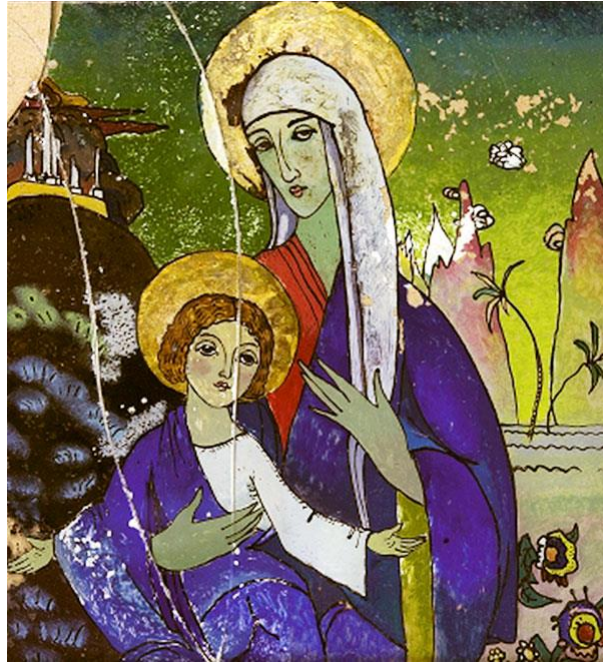Fig. IV: Wassily Kandinsky, *Crucified Christ* , Oil on Cardboard, 1911. London (Christie's).

Fig. V: Wassily Kandinsky, *Madonna and Christ* ,Glass painting , 1917. National Art Museum of Azerbaijan. Baku (Azerbaijan).

Fig. VI: Wassily Kandinsky, *Composition 6*, Oil on Canvas, 1913. Hermitage Museum. Saint Petersburg (Russia).
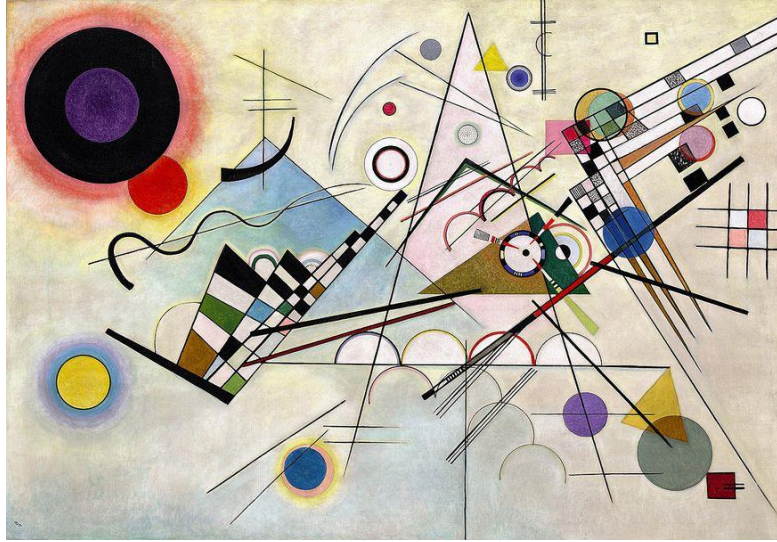
Fig VII: Wassily Kandinsky, *Composition 8* , Oil on Canvas, 1923. Solomon R. Guggenheim
Museum. New York.

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