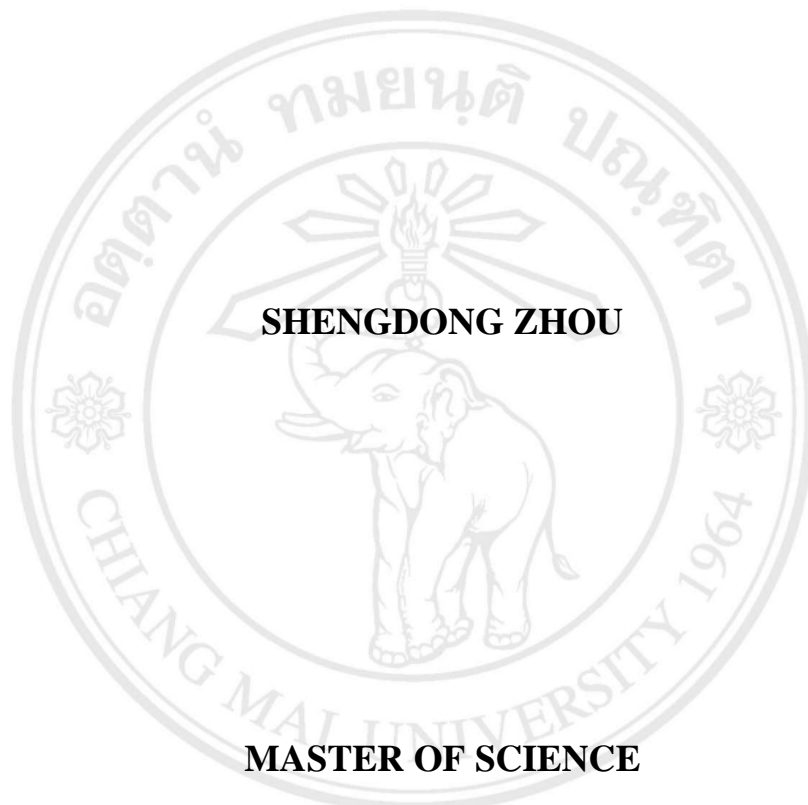


**DIGITAL PLATFORM FOR CHINESE ANCIENT ARTS
BASED ON SENTIMENTAL ANALYSIS**



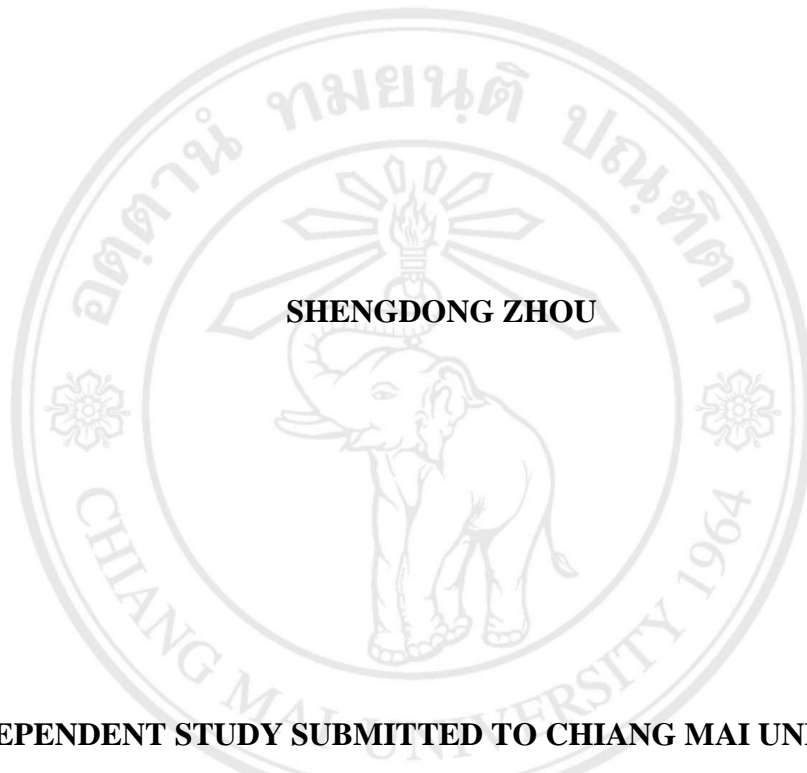
IN DIGITAL INNOVATION AND FINANCIAL TECHNOLOGY

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**GRADUATE SCHOOL
CHIANG MAI UNIVERSITY
DECEMBER 2022**

**DIGITAL PLATFORM FOR CHINESE ANCIENT ARTS
BASED ON SENTIMENTAL ANALYSIS**



**AN INDEPENDENT STUDY SUBMITTED TO CHIANG MAI UNIVERSITY IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE
IN DIGITAL INNOVATION AND FINANCIAL TECHNOLOGY**

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GRADUATE SCHOOL, CHIANG MAI UNIVERSITY

DECEMBER 2022


**DIGITAL PLATFORM FOR CHINESE ANCIENT ARTS BASED ON
SENTIMENTAL ANALYSIS**

SHENGDONG ZHOU

THIS INDEPENDENT STUDY HAS BEEN APPROVED TO BE A PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE
IN DIGITAL INNOVATION AND FINANCIAL TECHNOLOGY


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23 December 2022

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To

Dr.Nathee Naktnasukanjn

Dr.Piyachat Udomwong

Dr.Nopasit Chakpitak

Dr.Anukul Tamprasirt

Dr.Pichayalak Pichayakul

Dr.Piang-or Laohavilai

Dr.Kanya Hirunwattanapong

Dr.Siva Shankar Ramasamy

For my supervisors and Mentors who were the guiding light
every step of the way as I researched for this dissertation

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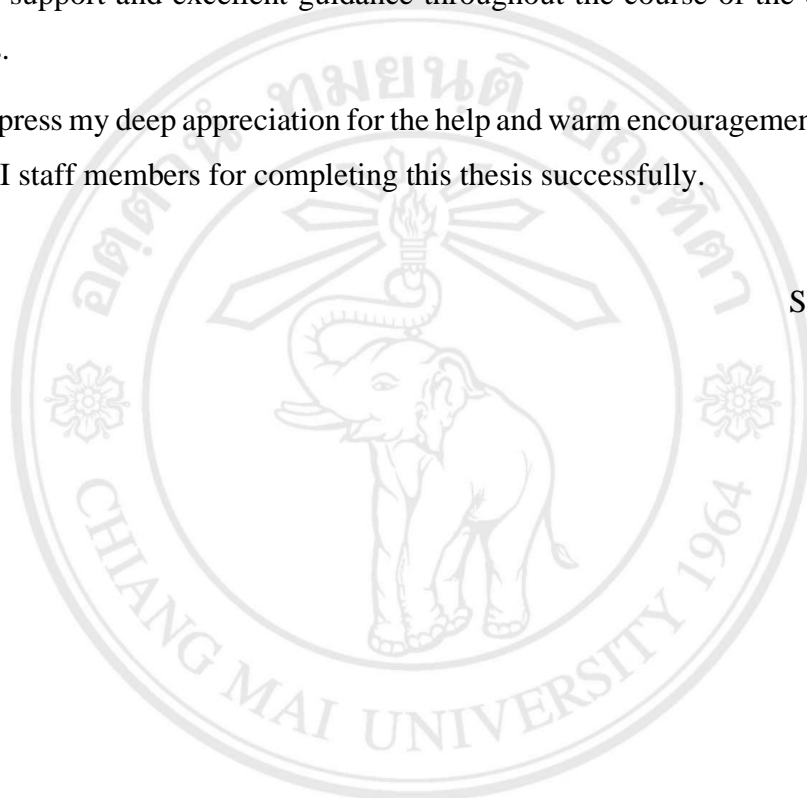
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Shengdong Zhou



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หัวข้อการค้นคว้าอิสระ	แพลตฟอร์มดิจิทัลสำหรับศิลปะโบราณของจีนจากการวิเคราะห์ความรู้สึก
ผู้เขียน	นายเชิงตง โจว
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บทคัดย่อ

งานศิลปะโบราณยังไม่ได้รับการวิจัยอย่างเพียงพอ เป็นสิ่งสำคัญสำหรับนักวิจัยในอนาคตที่สนใจในหัวข้อเดียวกันเท่านั้นที่จะมีจุดอ้างอิงเพื่อช่วยบรรเทาความท้าทายในการวิจัย หลังจากเกิดโรคระบาด ทุกประเทศกำลังค้นหาประวัติศาสตร์และอนุรักษ์ศิลปะและวัฒนธรรมของตนเพราะหลักฐานทางวัฒนธรรมของพวกเขา สมัยนั้นงานศิลปะทุกชิ้นมีความสำคัญ เช่น ศิลปะ การแต่งกาย การเดินร่า ภาพวาด รูปปั้น เพลง ฯลฯ เพราะสะท้อนภาษาของประเทศตน ในปัจจุบันพวกเขากำลังค้นหาซากเหง้าที่มีรากมาจากประวัติศาสตร์ ดังนั้น บล็อกเชนและการวิเคราะห์ความรู้สึกจะเป็นประโยชน์สำหรับการค้นหาซากเหง้าของงานศิลปะ เทคโนโลยีทั้งสองให้หลักฐานสำหรับการทำธุรกรรมดิจิทัลและจะช่วยในการรักษาประวัติศาสตร์ผ่านการทำธุรกรรมดิจิทัลในอนาคต ด้วยการสนับสนุนของบล็อกเชนและการวิเคราะห์ความรู้สึก งานศิลปะโบราณยังคงเป็นแนวคิดที่ค่อนข้างใหม่ในโลกธุรกิจ การศึกษานี้จะช่วยให้ผู้อ่านเข้าใจว่าเทคโนโลยีเหล่านี้มาจากไหนและก้าวหน้าไปอย่างไรเมื่อเวลาผ่านไป

คำสำคัญ: โบราณ งานศิลปะ การวิเคราะห์ความรู้สึก ธุรกรรมดิจิทัล ธุรกิจ

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Independence Study Title	Digital Platform for Chinese Ancient Arts Based on Sentimental Analysis
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Degree	Master of Science (Digital Innovation and Financial Technology)
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ABSTRACT

Ancient Artwork has not been adequately researched. It is only essential for future researchers interested in the same topic to have a reference point to help ease their research challenges. After the pandemic, all the countries are searching for their history and saving their arts and culture because of their cultural proof. At that time, every piece of art is important, like art, dress, dance, painting, statue, song, etc. because it reflects the language of their country. At present they are searching for roots that have roots from their history, hence block-chain and sentiment analysis will be useful for searching and confirming the roots for artworks. To add the value of the work, pandemic gives a lot of time to the viewers to see the artwork and give their feedbacks and buying interests on the websites and other digital platforms as well. The work will collect data from few countries, then link them to semantics, derive them into sentiment analysis using VEDAR method, then identify positive and negatives weightages. Direct and indirect demand or ranking will be taken. The work used the existing blockchain which hold the artist and art ranking. In future the work can be extended to dress, dance formats, songs, fashion, food, tourist places, etc. Hence block-chain and sentiment analysis will be useful for searching, tracing and confirming the roots for artworks. Using sentimental analysis, we can also find out the different antique artworks, ranking, value of the artwork and artists from the different provinces. Both technologies provided evidence for digital transactions and will aid in the preservation of history through digital transactions in the future. With the support of blockchain and sentiment analysis, ancient artworks are still relatively new

concepts in the business world, this study will assist the reader to understand where these technologies came from and how it has progressed over time.

Keywords: Ancient, Artwork, Sentiment Analysis, Digital transactions, Business



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LIST OF ABBREVIATIONS

RFID	Radio Frequency Identification
QR code	Quick Response Code
STASM	Stacked Trimmed Active Shape Model
CNN	Convolutional Neural Network
PCA	Principal Components Analysis
GAN	Generative Adversarial Networks
VGG model	Visual Geometry Group model
ICOMBI	International Conference on Mainstream Blockchain
MTM	Methodology-time measurement
NHPP	Non-Homogeneous Poisson Process
DLT	Distributed ledger technology
BCT	Blockchain Technology
VADER	Valence Aware Dictionary and Sentiment Reasoner
LIWC	Linguistic Inquiry and Word Count
SC	Sentiment Score

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CHAPTER 1

INTRODUCTION

The artistic gem of China is traditional painting. It not only vividly and artistically illustrates the vast history of our nation, but it also reflects the ideology, philosophy, cultural ideas, and aesthetic traits of the Chinese people. Chinese painting, which has a special and distinctive artistic style, is regarded to be an invaluable and significant component of the traditional cultural and spiritual heritage of the Chinese people. With the quick advancement of technology, there are already a lot of digital Chinese artworks available online and in virtual museums. However, it has become a pressing issue that needs to be resolved on how to effectively use and manage these paintings while also promoting the allure of Chinese paintings.

In addition to enhancing users' knowledge of and appreciation for Chinese paintings, researching the sentiment analysis-based algorithms of Chinese paintings will support the creation of digital museums and cultural relic management. Additionally, it supports the execution of the cultural power strategy and promotes cultural self-confidence, which collectively strengthens our culture's soft power and global influence. Traditional Chinese painting places more emphasis on imagery than “write shape by shape” painting does in the West. In the artworks, the author frequently interprets the subject in original ways. It can be claimed that Chinese painting has always been an expression of emotion at its core. The spiritual outcome of an artist's depiction of authentic emotions is the creation of excellent Chinese paintings.

In order to create a state of integrating objects with himself and sublimating the spirit, the painter does more than simply describe the objective things; rather, he reveals his inner feelings. Because traditional Chinese paintings emphasize “freehand brushwork” and “focused on emotional expression”, we must necessarily take these artistic qualities into account when appreciating, studying, and preserving Chinese paintings. We can appreciate and study Chinese paintings more fully if we have a deeper understanding of high-level emotional semantics. In the meantime, it can improve

Chinese art organization, administration, and retrieval algorithms and make Chinese paintings more widely known.

1.1 Research background and significance

The world is changing at a faster pace, but each nation still has its arts and cultures. Every form of art and culture has roots in a particular nation. With the aid of emerging technologies, art and culture can be preserved. Artists who haven't embraced technology will inevitably emerge as a new phenomenon. Statista reported that, Christie's auction house had a 54 percent gain in global sales in 2021 over the previous year, marking the greatest level since 2015 for the art-based business. In 2021, total art sales increased by around 2.7 billion dollars annually, combining about 7.1 billion dollars worldwide. In the meantime, Christie's online sales increased by 43% in 2021 over 2020, reaching a peak of \$445,000,000 USD [1]. The international online art market brings together buyers and sellers who transact in works of art, antiques, digital artworks, and collectibles that are frequently related to the arts and culture industry online. Prior to the coronavirus (COVID-19) pandemic, internet sales made up around a tenth of the total value of the world's art market. However, this radically changed in 2020 as a result of the health crisis's measures, which increased digital sales. Due to interest in non-fungible tokens and crypto art, the upward trend persisted in 2021. (NFTs). Online art and antiques sales peaked that year at 13.3 billion dollars, or about a fifth of the total value of the art market. This Art based business needs a technical background to identify the semantic background and learning to lead the art and crafts in the future. The study will focus in Chinese region to ensure the art business and data shall be traced to identify the correct arts, artists, business centres for the better future in Art business.

1.2 Problem to be solved

Customer feedback plays an important role in online business and Sentiment analysis of customer feedback is very essential in business perspective. But the complexity resides in processing the feedback which is in the customer regional language.

1.3 Research objective

The main objective of this research is to perform sentiment analysis of the customer which is in their regional language itself without losing the real feel of the customer.

1.4 Conceptual Framework

1.4.1 Research Methods

Sentiment Analysis will be used on the data related to the art, artist, feedbacks, history, demand, ranking and culture back ground provided evidence for digital transactions [3] and will aid in the preservation of history through digital transactions in the future. Finding the correlation, analysing the suitable weightages over the arts, values and demands will lead emerging technologies associating with ancient artworks is still a relatively new concept in the business world. Hence, this study will assist the reader to understand where the technology came from and how it has progressed over time. Analysing the feedback which is available in the customer's regional language provides more accurate score about the product as the realistic feel of the customer will not be lost. Currently this work is region specific and has considered only Chinese arts. This can be extended to include all languages to make the process a generic tool. This work will act as a decision support system for any of the ecommerce merchant to select the best artist for a specific art. The work also helps in understanding the customer purchase behaviour and supports in promoting an artist for a new type of art.

1.5 Thesis Outline

The remaining part of the thesis is organized as follows:

Chapter 2 provides a review of the literature on sentiment analysis and blockchain. Chapter 3 gives the research design and methods, which is the contribution of this thesis. In this chapter, the methodology proposed for the Chinese Artwork incorporates sentiment analysis and Blockchain. This chapter also discuss the significance and advantages of the methods and research as well. Chapter 4 briefly shows the data and discuss the results. This chapter is also providing the suitable parameters and scores used in this research and to analyse the data. This chapter concluded with the direct and indirect results.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Block Chain Technology

Blockchain-based artwork traceability platform has been proposed in a few research works. W. Yu and S Huang advocated [4] using RFID and geographical data to think about the traceability of artwork goods. The blockchain technology concept, which scans the product's traceable QR code with smart devices and obtains data information from all transaction nodes of the goods, is equally relevant to artworks.

As a result, academics have put a lot of effort into their studies in order to completely comprehend the emotions shown in Chinese paintings. In order to characterise many characteristics of the artistic style of Chinese paintings, literature [5],[6] extract local and global features based on histograms, and then use these data to drive neural networks to classify ink paintings. Literature [7] put forth an art descriptor based on compositional and painting-object characteristics, addressing the correlation and synergy among all the elements in the integrated features, and combined it with the Monte Carlo convex hull feature selection model to categorise the creators of Chinese paintings.

The user's Ink portrait was created by converting the style of the user's facial photo and integrating it into the Chinese painting template using the STASM algorithm, which was used in the literature [8] to extract the feature points of the face and the face in Chinese paintings. Literature [9] classified the creators of traditional Chinese ink paintings using a deep-learning algorithm. In order to create the integrated high-dimensional features of each Chinese painting, they used the stroke picture of each input painting as the recognition foundation and then inputted all the strokes into the CNN-based feature extractor. The PCA technique and the spectral and spatial information collected by CNN were coupled in literature [10] to scan Chinese paintings using a hyperspectral camera with a specified frequency of visible light.

In order to reduce model parameters and speed up calculation, literature [11] established the bottleneck layer idea of the Inception module in GoogLeNet on the foundation of the deep convolutional encoder-decoder. An method to imitate the artistic process of colour ink painting was put up in the literature [12]. This method transforms line and colour styles and stylizes flower images into colour ink paintings using CNN and Generative Adversarial Networks (GAN). According to the literature [13], Sobel edge detection was used to gather data on Chinese brush paintings, which was then processed by discrete cosine transform as the input of CNN and integrated with support vector machine to identify the two Chinese painting styles of careful and freehand. This technique solely uses the painting's stroke data to construct a hybrid model made up of CNN and a support vector machine. An algorithm of joint mutual information and data-embedded categorization was suggested in the literature [14]. They initially extracted the features of Chinese paintings using the VGG model, and then they improved classification accuracy by using mutual information theory to make the distribution information of the image affected by the relevance of the features.

For Chinese art, literature [15] suggested a style transfer algorithm. In order to create superior ink painting visual effects, it primarily feeds the four restriction criteria of ink painting strokes, white space, ink smearing, and yellowish tone into CNN, designs matching conversion procedures for various types of freehand brushwork, and precise brushwork. According to the aforementioned research, deep network structures are capable of acquiring more abstract, high-level semantic characteristics and handling more difficult classification problems. Because of this, the deep convolutional network clearly excels at tasks like feature extraction and classification. We employ an optimised lightweight CNN to identify the sentiment of Chinese paintings in order to increase the classification efficiency of the CNN in the application of Chinese painting sentiment classification. The relevant research includes the following:

- First, the theory of image sentiment analysis and related algorithms are examined to provide a theoretical framework for further investigation.
- Next, taking into account the aesthetic qualities of Chinese paintings, an attempt is made to classify the sentiment in Chinese paintings using a lightweight CNN. The researchers also implemented two Squeeze Net-based

optimizations at the same time. One way to increase the model's classification accuracy is to increase the model's width in order to gather more useful Chinese art emotion features. Conversely, include the concept of a residual network to avoid gradient disappearance and explosion during training, improving the model's capacity for generalization.

- Finally, the sentiment recognition of Chinese paintings is performed using the optimised lightweight CNN. The experimental results demonstrate that the classification accuracy and efficiency of the algorithm used in this paper are relatively high when compared to other deep learning algorithms for the task of Chinese painting sentiment classification, demonstrating the viability and efficiency of the algorithm.

In terms of platform architecture, K. Balasubramanyam's paper [16] "Adaptation of Blockchain Technology in Manufacturing Industry," which was presented at the 2020 International Conference on Mainstream Blockchain (ICOMBI) as Blockchain Technology for the New Internet. Through the validity and integrity of data, this novel notion can assure transparent transactions. And the concept of such a system is widely regarded as the most secure, traceable, and decentralized method of transaction.

Simultaneously, SP Gayathri, S. Vijayalakshmi, and Siva Shankar Ramasamy [17] stated in 2021 that blockchain technology can eliminate electronic tracking by supplying transaction keys, allowing for a reliable project or data tracking or monitoring. Each transaction has a vast amount of data stored in several links or nodes. Even if only one or two copies of the data remain on the network, the digital ledger will have other copies as proof. If any manufacturing organization implements the blockchain concept in its IoT devices, consumers and companies should take it to a new level of quality and consistency. It also prompted me to think about a citation evaluation system to improve the quality of consumer and art evaluations.

In the artwork circulation link as a product. Packaging, according to P. Kuhlant and A. Sunk [18], is one of the major issues in distribution networks, whose productivity is harmed by a significant amount of human labor. The value stream design and methodology-time measurement (MTM) approach has been demonstrated in practice to increase work and hence productivity, particularly in manual work systems.

YK Ro, JK Liker, and SK Fixson [19] also presented a more gradual technique employed by Toyota in the supply chain system for comparison, because it incorporates modularity and moves to a build-to-order model.

J. Block, T. Tyrberg, and Yuan Fuqing [20] also suggested a method for determining the best time to stop repairing repairable devices to save money on repairs. It predicts the number of units available using a Poisson distribution based on the NHPP (Non-Homogeneous Poisson Process) while meeting spare parts needs for the remaining systems. To formulate the problem, a notion called minimum margin is established, and non-linear programming is proposed to find the best solution. Finally, the method is demonstrated with a numerical example.

While D. Sathya, S. Nithyaopaa, D. Jagadeesan, and IJ Jacob [21] proposed the use of blockchain technology and the decentralization of supply chains to improve security, immutability, and tamper resistance, the art transaction itself has the chaos of being counterfeited, special materials, and different genres, while the authors suggested work employs Ethereum smart contracts for supply chain management systems, preventing data falsification, database corruption, and external threats.

SW Sheng and S. Wicha[22] suggested a traceability technique to determine teak validity in the teak supply chain using distributed ledger technology due to some wood art (DLT). The fundamental properties of DLT, also known as Blockchain Technology (BCT), are the preservation of dissemination archives, digital encryption, traceable data, and non-absolute block materials, which are appropriate for the teak supply chain and can give remedial actions.

To conclude, blockchains are made up of an ever-growing list of records called blocks, each of which is encrypted and distributed over the network, as described by CP Jagrat and J. Channegowda[23]. This aspect of the blockchain adds an extra layer of security to the data being communicated, which has been frequently used in the financial sector.

Blockchain [24],[25] is a cutting-edge technology that has the potential to transform standard business operations. The documents listed above provide valuable feasible options for the construction of a blockchain traceability platform for artworks, which I will incorporate into the future design of the blockchain platform.

2.2 Sentiment Analysis

According to China National Bureau of Statistics [26], Ethnic Group are enlisted as Han, Mongol, Hui, Tibetan, Uighur, Miao, Yi, Zhuang, Bouyei, Korean, Manchu, Dong, Yao, Bai, Tujia, Hani, Kazakh, Dai, Li and Other Ethnic Group are approximately 7,947,230 people in China. Every ethnicity has their culture and history. the majority of cultures are based on their own sentiments and history. Every culture, history are rooting to a Sentiment. Sentiments are related to semantic meaning. With the weightage and syntax leads to Sentiment analysis. Data science and machine learning are mainly associated with Sentiment analysis which are based on text content in the Bigdata era. Content in digital platforms from numerous back ground leads into academic and research activities. Many research has carried out extensive and in-depth studies in this area. Picture sentiment analysis is a unique image categorization technology, nevertheless, and it is constantly being researched from a technical and application standpoint. The emotion in an image is frequently concealed, in contrast to text sentiment analysis, which is a type of high-level semantic emotional comprehension. Understanding the emotional requirements of users through sentiment analysis can also aid to improve user experience in picture retrieval and recommendation systems. Additionally, it is useful for researching current social concerns, understanding popular opinions, and supplying data to support online public opinion research.

The study of image sentiment involves many different disciplines. Image sentiment analysis draws on a variety of fields, including artificial intelligence, computer vision, psychology, and aesthetics, because the perception and classification of emotions in photographs are influenced by subjective, objective, and cultural aesthetics elements. To classify photographs into distinct categories, the computer must first identify the content contained in digital images that causes people to feel a certain way. This process is known as image sentiment analysis. The feature information that a computer extracts from low-level visual input and the perception of human emotions generally differ significantly.

The distinction is referred to as the emotional gap. We anticipate that the computer will be able to fully comprehend the image and correctly decipher its emotional connotations. In addition, the sentiment classification of the image is done by the various understandings of the emotional semantics of the digital image based on the

understanding of the emotional semantics of the image. Image sentiment analysis, in other words, is a high-level semantic comprehension of the meaning that an image conveys. It can cross the enormous emotional chasm that exists between high-level emotions and low-level visual elements. Picture sentiment classification is useful for image labelling and retrieval today when the amount of information is growing quickly, as it has significant social and economic significance.

Methods for analysing image sentiment primarily rely on deep learning [27],[28] and classical machine learning [29],[30]. To train the implicit emotions in digital images through the mapping of the sentiment space model, traditional image sentiment analysis methods first need to extract various dimensional visual elements from digital images. For instance, literary [31] created a colour spectrum for Western art, based on the link between colour and emotion, and then determined the corresponding emotive word in the spectrum to anticipate the sentiment of the picture. To realise video emotion detection, literature [32] collected facial expression action unit features and discovered their link. To classify the face sentiment of connected features, literature [33] employed a directed acyclic graph support vector machine. The system uses geometric and texture features to extract face expressions and demonstrates how simple feature stitching may dramatically increase the accuracy of facial sentiment categorization. Traditional picture sentiment analysis techniques, on the other hand, do not account for the discrepancy between high-level emotional semantics and low-level visual data. Effective sentiment analysis is dependent on the extraction of visual features. The extent to which distinct visual characteristics can have an impact on an image's mood is unclear.

Researchers have tried to utilize deep learning algorithms to automatically extract picture characteristics and realize sentiment categorization, which has produced superior sentiment prediction results. This is due to the constant expansion of the application sector for deep learning. On the basis of CNN, literature [34] introduced the progressive CNN deep model and created a sizable amount of artificially tagged Twitter visual sentiment data. In order to address the classification problem of image objects and their sentiment, literature [35] combined the cross-residual neural network into multitasking deep learning. In the literature [36], CNN performance was examined layer by layer with the goal of optimising CNN performance for picture sentiment prediction tasks. It

demonstrates deep network learning's ability in identifying aspects of natural photos that are associated to sentiment.

Binary classification was utilised in literature [37] to aid in the multiclassification of natural image sentiment. The burden is increased by the fact that the data set calls for two sets of sentiment labels, binary classification, and multiple classification. To improve sentiment classification performance using real-world photos, literature [38] combines the CNN architecture with a visual attention mechanism directed by a saliency map. The literature [39] proposed a cropping approach that employs a fully convolutional network to choose emotional regions from an image and exploits the interdependence of tags to construct a structured learning model in order to maximise the extraction of features that can represent visual emotions.

Literature [40] uses the feature pyramid network to extract multilayer depth features to reduce redundant non-emotional areas with a local picture sentiment classification goal. An 11-layer CNN model with visual attention was suggested in the literature [41] to address the issue of facial expression recognition. The network model first estimates the region of interest before extracting CNN features from face photos and using those features to identify facial expressions. To determine image sentiment, literature [42] merged the colour histogram and bottom layer features of local binary pattern texture feature with deep sentiment features.

Support vector machines were utilized in combination with CNN features and features extracted in accordance with the art theory in literature [43] to recognize image sentiment. However, this algorithm's practical application is limited by the need for manual annotations, such as eye movement trajectories.

2.3 Blockchain technology to store data and do sentiment Analysis

Blockchain technology is a type of technology that is decentralized, given in Fig 2.1. Diego goes on to say that no third party can claim ownership of the system, which lowers implementation costs and gives the user entire control; this eliminates transaction fees imposed by third-party providers. Because blockchain technology is immutable, it means that transactions can be tracked by the vendor and supplier, which is critical in preventing theft and counterfeiting. It's similar to a digital ledger that uses a decentralized

system to carry out transactions, demonstrating that the system is highly efficient and that, with the help of the internet, transactions can be carried out quickly and easily; with the availability of smart contracts on the blockchain network, processes can be automated, whereby once pre-contract negotiations have been agreed upon and met, the contract automatically triggers itself, reducing human interaction. Diego goes on to say that blockchain technology is also environmentally beneficial because it uses less energy, which cuts down on operating costs.

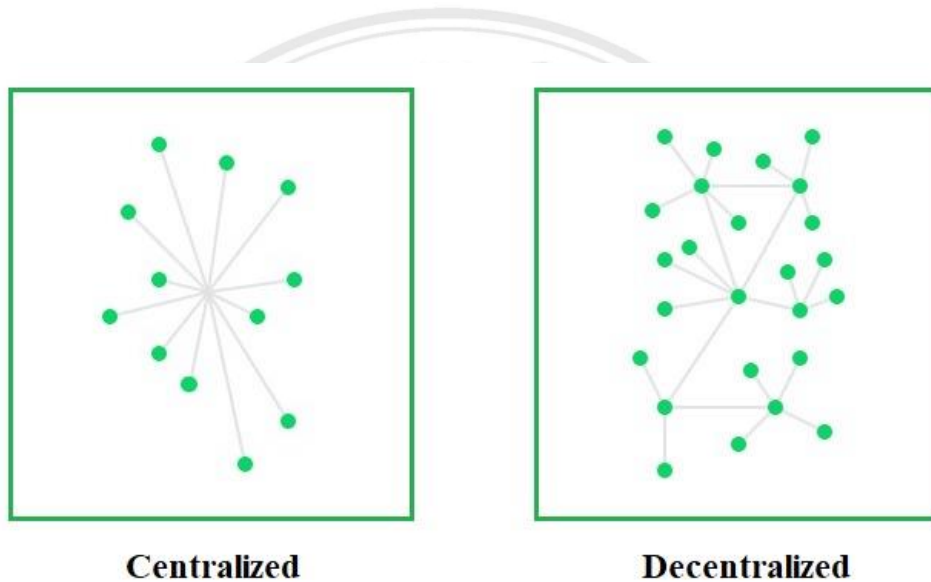


Figure 2.1 Usual Data Network Vs Blockchain based Decentralized platforms

In conclusion, the constraint of picture sentiment analysis is that in addition to the information about the items in the image, the scene of the image can also elicit various feelings. Further research is required on the semantic segmentation challenge in image sentiment analysis, which arises when various objects in the same image may represent different sentiment classifications.

CHAPTER 3

RESEARCH DESIGN AND METHODS

We are proposing a digital platform to search, identify, verify, sell, and purchase ancient artworks. This business is trending in China, where many Chinese people are interested in buying Ancient Chinese artworks such as paintings, amulets, Coins, Asian paintings, Thai Amulets, and Thai paintings. Same time, Many South Asians are interested in Chinese Ancient arts and artworks. But people may not know the originality of every art and artwork. So, the proposed method can identify the original painters who are approved by ancient schools related to every unique art artwork. This platform can be operated from China, Hong Kong, and Thailand[44]. The creators must register as artists on this platform, and they can share their qualifications, the school they are the related city, artworks with images, videos, and their unique identity. All this information will be stored and given with a blockchain transparent ID [45]. So, the blockchain ID will be given to every single unique artwork, so no one can copy or cheat the unique artwork. Every art will have the artist's name, the school or university, or the company that is dealing with the artwork. Anyone who claimed that they have a particular artifact cannot be able to imitate the value will be first given by the seller or the artist based on the demand the value will be increasing or changing Aunt like painting antique weapons antique tools antique maps antique jewellery antique dressers and so on can be used in this platform every city has their own antique culture a style of their artifacts [46]. This proposed digital platform may be considered a cross-border e-commerce platform, where the user can register, search, and choose their artifacts based on their interests based on their budget also. The payment [47] may be done in Chinese Yuan, Thai baht, Indian Rupee, Visa cards, WeChat, and Alipay methods. For identifications, we may request the users to provide their passport ID any accepted government ID, mobile number, and address for transparency in the blockchain.

3.1 Significance of the Research

The Arts and Artists are the hidden subset of the research analysis behind the sentiment, value, ranking, business, growth of the arts sector. Day by day the art's are being noted, observed, analysed with the history, feedback from the buyer, buyer's status, demand on the art and so on. Art is also treated as liquid money, sometimes treated more than Gold or currency. Some organizations understood this scenario and started collecting data, linking the arts and artists profile and lead them into their platforms and acted as authorized dealers or the Chinese Arts and crafts. They have lot of responsibilities as well, such as maintaining the art's originality, artist reputation, history of the art's ownership, their profile, feedbacks, value history of the art, artist, buyer, seller and so on. Continuous data started to convert into a bigdata and it required analysis to identify the sentimental analysis. Implementing the blockchain confirms the reputation and originality of the art, artist, transaction, existing value, existing demand, current value, current demand, existing and current address.

Table 3.1 Hurun China Art List annual list data changes

	No. of Artists on List	Top 50 Av. Sales US\$m	Top 50 Cut-off US\$m	Top 100 Av. Sales US\$m	Top 100 Cut-off US\$m	Oil vs ink	Av. Age	Top Artist	Sales of Top Artist US\$ m
2008	50	9.9	9.9	2.4	/	39 vs 10	57	Wu Guanzhong	49
2009	50	8.2	8.2	2.1	/	36 vs 9	58	Zhang Xiaogang	44
2010	50	5.1	5.1	1.3	/	26 vs 20	65	Zhao Wuji	35
2011	50	12	12	2.9	/	25 vs 22	64	Fan Zeng	57
2012	100	14.6	24.9	8.3	2.7	41 vs 57	63	Fan Zeng	149
2013	100	11.6	19.9	6.7	2.5	32 vs 67	66	Zhou Chunya	75

Table 3.1 Hurun China Art List annual list data changes (Continued)

	No. of Artists on List	Top 50 Av. Sales US\$m	Top 50 Cut-off US\$m	Top 100 Av. Sales US\$m	Top 100 Cut-off US\$m	Oil vs ink	Av. Age	Top Artist	Sales of Top Artist US\$ m
2014	100	12	19.6	6.1	2.5	32 vs 69	66	Zeng Fanzhi	84
2015	100	11	16.8	7.1	3.3	27 vs 74	65	Cui Ruzhuo	76
2016	100	5.6	9.2	3.3	1.4	43 vs 54	64	Cui Ruzhuo	120
2017	100	4.9	8.4	2.3	0.82	47 vs 53	64	Cui Ruzhuo	117
2018	100	9.8	2.2	6	0.83	42 vs 59	66	Cui Ruzhuo	163
2019	100	11.8	3	6.8	1.03	38 vs 64	68	Cui Ruzhuo	132
2020	100	7.9	1.5	4.3	0.25	47 vs 51	66	Cui Ruzhuo	49

3.2 Methodology

The proposed method use Blockchain and sentimental analysis for Chinese Artwork. The collected data will be used in the operations such as Blockchain and Sentimental Analysis. Defined usage of the blockchain and sentimental analysis are having their own abstract. The transaction ID is used for holding the data and sharing it in the future. A transaction ID will be known to everyone. But Sentimental Analysis is used for the platform owner to analyze his business for future predictions. Operations on data are associated with Sentiment parameters. The parameters are given as positive weightages such as Great, Love, Success, Family, Art, Culture, High, Status, and Legacy.

3.2.1 Sentiment on buying Antique Arts and Crafts in China

An art or craft's sentiment is a vital information that a collector is looking for. Sentiment analysis is the study of people's attitudes, sentiments, evaluations, appraisals, attitudes, and feelings about things like products, services, and organizations, as well as their attributes. It encompasses a significant problem area. Sentiment analysis, opinion mining, opinion extraction, sentiment mining, subjectivity analysis, affect analysis, emotion analysis, review mining, and so on all have distinct names and tasks [48].



Figure 3.1 Buying Antique coin or gold gives luck to Chinese people [49]

3.2.2 The Significance behind Chinese artworks

In 2021, the United States produced 43% of the value of the world's art market, making it the largest market globally. China came in second place that year, contributing 20% of global sales [50]. Third place went to the United Kingdom, which accounted for 17% of the global art market. The international online art market brings together buyers and sellers who transact in works of art, antiques, digital artworks, and collectibles that are frequently related to the arts and culture industry online. Prior to the coronavirus (COVID-19) pandemic, internet sales made up around a tenth of the total value of the world's art market. However, this radically changed in 2020 as a result of the health crisis's measures, which increased digital sales. Due to interest in non-fungible tokens and

crypto art, the upward trend persisted in 2021. (NFTs). Online art and antiques sales peaked that year at 13.3 billion dollars, or about a fifth of the total value of the art market.

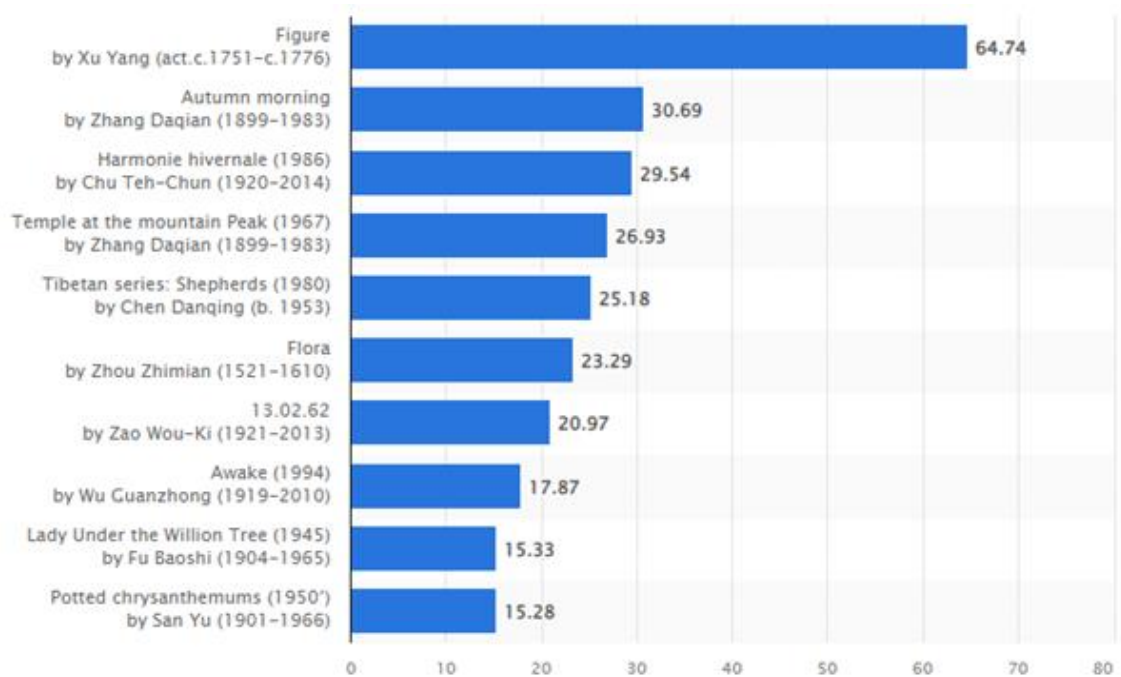


Figure 3.2 Indicates the top 10 Chinese artworks sold in auction for high price in 2021 the value given in US Dollars

The artwork sold in 2021 by Chinese painters at auction suggests that, In 2021, the Beijing-based Poly Auction sold a picture by prominent Qing Dynasty court painter Xu Yang for close to 65 million U.S. dollars. It was the most expensive piece of art from China auctioned that year and was tenth on the list of most expensive pieces of art sold at auctions worldwide in 2021.

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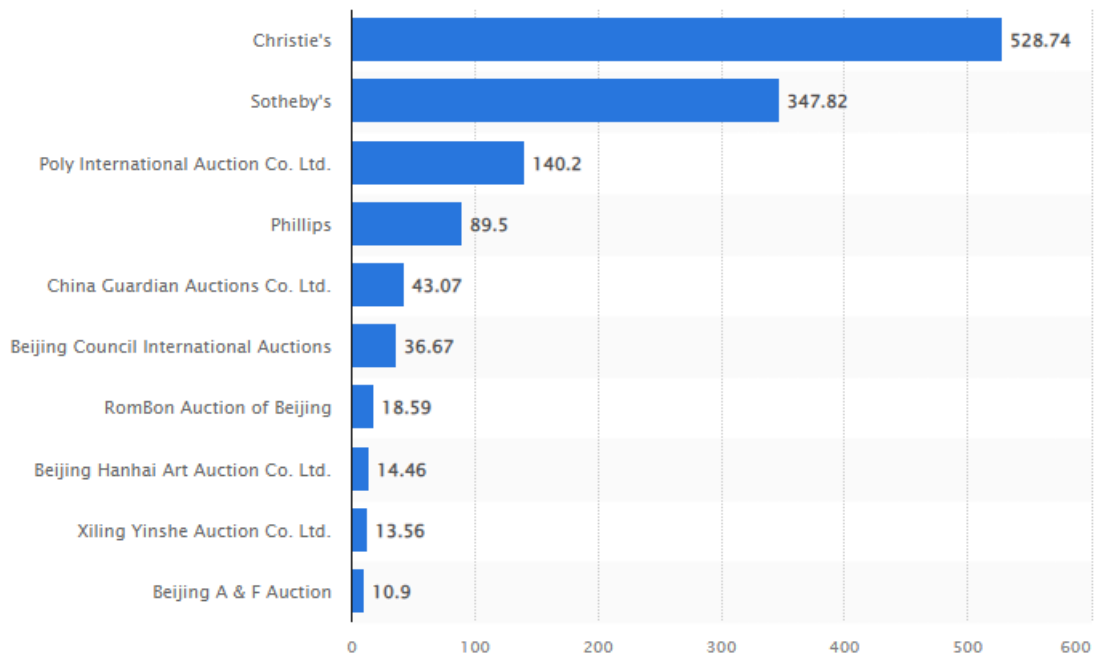


Figure 3.3 Indicates the top 10 the value given in Euro
 [Statista Research Department, 2021][51]

The current study will be used by own business as well the any other interesting organization or business community or art community to expand their business and region through the current digital platforms. Art format is changing from traditional artform to digital artform. Digital artform need more track record more than traditional art form.

Currently Lanna art and culture are changing their traditional painting and crafts into digital form. Old paintings were being photographed and digitally modified [52] and sold in the online platforms. Some were done by original artists, some were bought in Thailand, taken to Europe, modified without permission and sold in second range markets.

Current study is an essential part to understand and valuating the dimension of changes in art sector. Sentiment analysis and blockchain will surely form a successful combination to fix the issues around this sector.

Sentiment analysis, a part of data mining that looks at people's opinions, employs text analysis, computational linguistics, and natural language processing. For the lexicon-based strategy to function, the lexicon, which is a collection of terms relevant to a certain subject or language, must be predefined. The sentiment lexicon, which is used in the lexicon-based approach, contains data on which words and phrases are positive and which

are negative. A sentiment lexicon is a list of lexical properties that are often classified as either positive or negative depending on their semantic orientation.

Researchers first develop a sentiment lexicon by assembling sentiment word lists using manual, lexical, and corpus-based techniques, and then determine the polarity score of the given review based on the positive and negative signs in the lexicon. The independence from domains and the simplicity of growth and development are two key advantages of the Lexicon-Based approach.

VADER [53], which is also called Valence Aware Dictionary and Sentiment Reasoner, exposes this on a better scale. VADER is a lexicon and rule-based sentiment analysis tool. It still uses conventional sentiment lexicons like LIWC (Linguistic Inquiry and Word Count). It is bigger, and easier to analyse, absorb, apply quickly, and extend. The VADER sentiment lexicon has been peer-reviewed and is of the highest calibre. In the case of more favourable domains, VADER is more responsive to sentiment expressions than LIWC. VADER has had a lot of success coping with product reviews, movie reviews, and texts from social media. This is because VADER exposes a person's sentiment in addition to their positivity and negative scores.

VADER is a tool for rule-based sentiment analysis, as was already mentioned. It is paired with a sentiment lexicon, a set of lexical qualities that are often classified as either positive or negative depending on their semantic orientation. Everywhere in the world, people love to possess antique arts and crafts which makes them feel better. Buying arts and crafts is associated with sentimental values as well.

A data is examined by VADER to see if any of the words are listed in the VADER lexicon. Using the polarity scores () function, it may find the polarity indices. The sentence's negative, neutral, positive, and compound metric values will be returned as a result. The total of all lexical ratings, adjusted between -1 and +1, where -1 stands for the most severe negative and +1 for the most extreme positive, is the statistic known as the compound score. It might be useful to categorise statements as positive, neutral, or negative using predetermined thresholds. A positive sentiment score of greater than 0.05 A negative sentiment score of less than 0.05 in the compound, or a score on the compound between -0.05 and 0.05, is considered neutral emotion.

3.3 Research Design for the Blockchain using a Connected graph

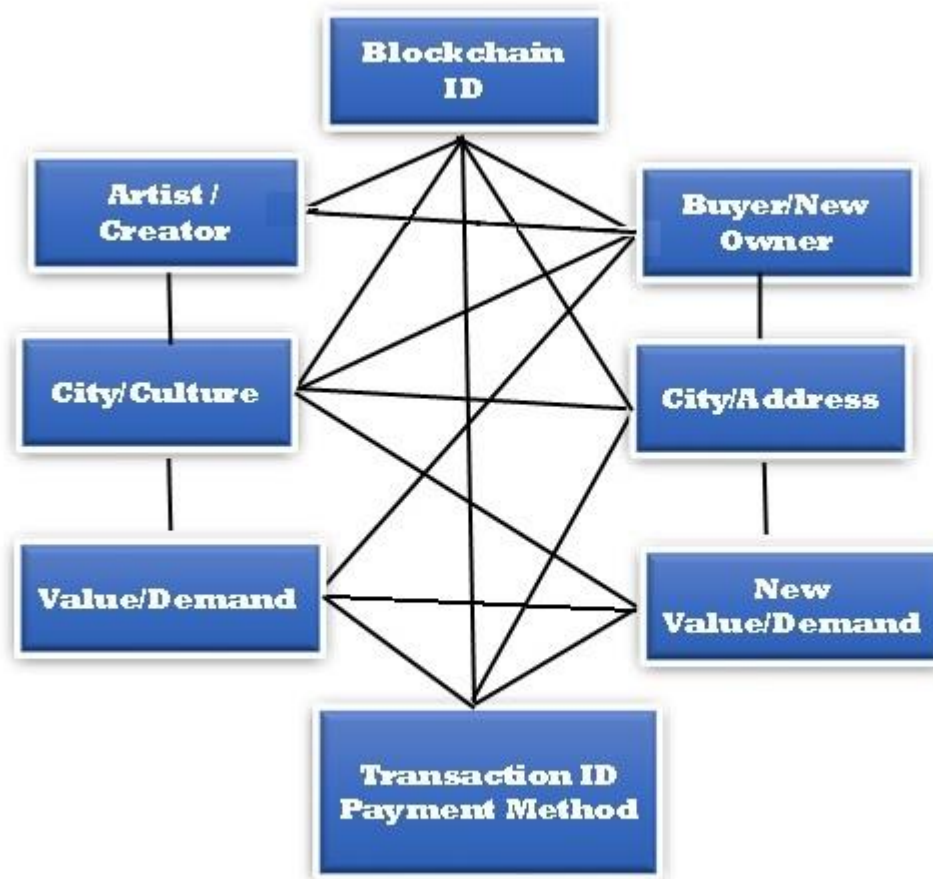


Figure 3.4 Elements in the digital platform

The blockchain proposal of the current study is considered using the connected graph method. The available parameters are linked like the vertices such as city, art, artist, buyer, existing owner, new owner, city, address, old value and new value, transaction ID, demand, payment method. The existing Blockchain will have an extension and it will grow to find the tracing record for the art, value and demand. Such information will be used to track the record of the value and demand through the years.

In antique arts, the system used the **Vader** to save the word count, positive terms, negative terms and score. **Figure 3.4** notifies the association between the demand and the semantic words showcasing us the direct impact in the sentimental analysis. City, Culture

comes as indirect impact in the new value and demand. Weightage of the terms are different because of the semantic value of the terms given in English.

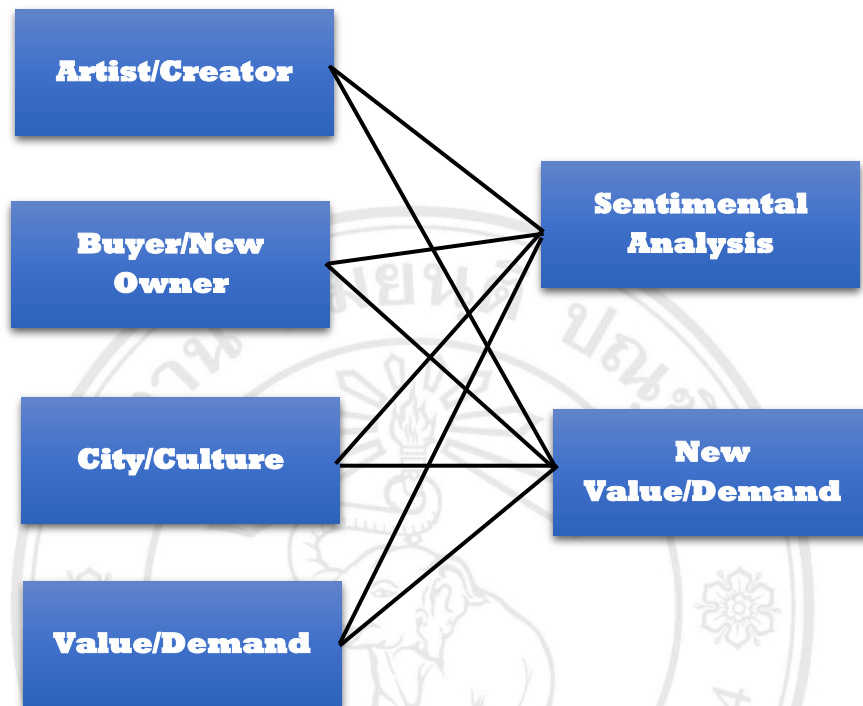


Figure 3.5 Sentimental Analysis and Correlation with Art, Artist, Demand, City and Values

3.4 Sample Code

```
from sentimental import Sentimental  
  
sheng = Sentimental()  
sentence = 'Gold Coin gives us luck in New Year!'  
RESULT = sheng.analyze(sentence)  
sentence = 'Silk dress make us feel happy and peace!'  
RESULT = sheng.analyze(sentence)  
The "RESULT" dictionary in four fields:  
{'negative': 0.0, 'positive': 3.0, 'score': 3.0}  
{'negative': 0.0, 'positive': 6.0, 'score': 6.0}
```

The above sentence or feedback was taken in the antique collection in “artprice-chinese” report pages. The price of the art or craft work will be directly related to the sentimental terms and words. Positive set consist of “Luck”, “Peace”, “Happy”. Technically representing that Positive set is given as

```
Positive = {"Luck", "Peace", "Happy"}
from sentimental import Sentimental
sheng = Sentimental()
sentence = 'black clothes brings bad news in New Year!'
RESULT = sheng.analyze(sentence)
sentence = 'broken glasses results loss in business!'
RESULT = sheng.analyze(sentence)
The “RESULT” dictionary in four fields:
{'negative': 3.0, 'positive': 0.0, 'score': -3.0}
{'negative': 6.0, 'positive': 0.0, 'score': -6.0}
```

The above sentence or feedback was also taken from the antique collection in “artprice-chinese” report pages. The demand of the art or craft work were directly related to the sentimental terms and words. Negative set consist of “bad”, “loss”, “broke”. Technically representing that Negative set is given as

```
Negative = {"Bad", "Loss", "Broke", "Break"}
```

3.5 Research Advantages

The topic of Ancient Artworks has not been adequately researched. It is only essential for future researchers interested in the same topic to have a reference point to help ease their research challenges. After the pandemic, all countries have importance on arts and culture. All countries are searching for their history and saving their arts and culture because of their cultural proof. At that time, every piece of art and artifact is important, like art, dress, dance, painting, statue, song, etc. because it reflects the language of their country. At present they are searching for roots that have roots from their history, but in the future blockchain will be useful for searching for roots. It is proof of the history of the arts and culture via blockchain. Blockchain [54] provided evidence for digital transactions and will aid in the preservation of history through digital transactions in the

future. Given that blockchain and Ancient Artworks are still relatively new concepts in the business world, this study will assist the reader to understand where the technology came from and how it has progressed over time. Darla argues that writing a thesis is critical in preparing a student for future research opportunities based on the topic that they are most passionate about; such exposure is also critical in providing the researcher with essential writing skills and the ability to express various ideas, which can be useful in writing reviews and developing reports. Furthermore, Darla explains that completing a thesis equips the researcher with the necessary abilities for duties like project management later in their careers; a thesis aids in the research of original content and the learning of time management skills.

By linking the past and current data, the interesting data is being showcased in future.

Questions will be answered such as

- where the artist born?
- where the art born?
- relationship of the artist and art are true or not?
- what is the relationship between the ranking and cities in China?
- category of the art?
- which artist is producing the demanded product?
- which category is being demand for long time?
- age of the artist and age of the art are matching?

These kinds of interesting questions will be answered and discussed in the results section.

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CHAPTER 4

RESULTS

The primary goal of combining art and blockchain technology is to better comprehend how Ancient Artworks have revolutionized how artists distribute their work and secure it from harmful individuals. After the numerous research tasks for this study are finished, it is vital to comprehend and gather data or other materials to carry out additional research on arts and blockchain technology [55],[56]. Only this platform can verify the date of the art's creation, the artist's name, the date of production, the date of sale, and so on. Quantitative data will be created and kept as a result.

The data was employed in this study, and the quantitative data was crucial to understanding the economic success of blockchain and the arts, as well as the technology's future path. The existing data utilized is from the user inputs, feedback, and comments associated with the proposed platform in the research. The data relating to the Artist, art, date, type, value, demand count, number of views, number of likes, and number of comments towards the Artwork. The chosen research methods were based on the limited data available in the selected field of research, and future research would be essential to help elaborate this research further. This research has been done by looking look at how technology has changed the demand for art to see if this new technology will be efficient in the future. With the rise in popularity of digital arts in the marketing industry, such as infographics, posters, and banners, there is an increase in demand for art, which generates a market niche for supply. It is critical to adapt to solutions that will protect artists' work from fraud as technology trends continue to evolve. When artists have control over how their work is delivered, they create demand, which serves to raise the value of art. Artists, art enterprises, and art galleries can use this research to find and integrate new technology into their organizations. Quantitative and qualitative statistics will be critical in determining whether Ancient Artworks have a future in the art world and if they are effective in assisting artists in increasing their profits.

4.1 Data Collection

The platforms such as artprice.com, invest-data.com, artbasel.com, hurun.net, websites related to art work, antique work, craft work is used for this work. They are all operated in China, Hong Kong, US, India and Thailand. But the users are from 39 countries all over the world. Feedbacks are collected in English, Chinese and Cantonese as well. The work only focused on English feedbacks, because the data validation took so long for Cantonese and Chinese scripts. Further, this work will be related to the US, Japan, and India. For this study work,

- Total number of Artworks :3000 (100%)
- Total number of Artists: 100
- count of the cities taken in to the data: 20

were used. Since the proposed work is dealing with arts and crafts, it took 3 months for the data collection on arts and crafts.

4.1.1 The sentiment of Art

Sentiment analysis is the field of study that deals with responses as well as feelings, which is generated from textual data, being extensively used in fields like web mining, and social media analytics because sentiments are the most essential characteristics that are used to judge human behaviour.

It is usually performed on unstructured textual data to help businesses monitor product sentiment in customer feedback, and understand what customer need. By automatically analysing customer feedback, that is, opinions in survey responses or social media conversations, brands learn what makes customers happy or frustrated. They can thus provide products and services to meet their customers' needs [20].

In this challenge, we focus on the unstructured, textual information that accompanies each artwork in crypto art. We propose a text mining analysis on the textual metadata (title, description, and tag words) of artworks present in the SuperRare gallery. In particular, we perform a *sentiment analysis* using a lexicon-based approach. We identify those artworks expressing more clearly a sentiment pole (positive and negative) or an emotion (anger, fear, anticipation, trust, surprise, sadness, joy, and disgust).

Moreover, we investigate the temporal dynamics of the emotional spectrum of the whole gallery.

Fig YY represent the Chinese art and craft buying and selling will be in peak on the new year and special occasions. The Art and craft value and demand increases depend on the rank of the artist and art. In other way of saying, Art or craft value will decrease if the artist ranking is down.

$$\text{Artist Rank} = 1 / \text{Value of the Art} \quad (1)$$

$$\text{Artist Rank} = 1 / \text{Demand of the Art} \quad (2)$$



Figure 4.1 Sentiment and Analysis around an Art [Investdata.com]

The Art or craft's value and demand increases depend on the history or age of the artist and art as well. In other way of saying the Art or craft's value and demand decreases, if the history or age of the artist is low. Because the sentiment of the Art or craft is unknown. The method of the art and craft hold's weightage in the Ranking and demand of the art and artist as well. Table AA shows the China Art list 2020's Top 10 Artist's rank, name, age, category the sales in USD and the change of the rank, which is denoted by year after year.

Table 4.1 Hurun China Art List 2020– Top 10

Rank	Artist	Age	Category	Sales US\$'000	Change Yy%
1	Cui Ruzhuo	76	Chinese Ink	48,813	-62%
2	Liu Ye	56	Oil	48,006	416%
3	Huang Jiannan	68	Oil/Chinese Ink	29,417	3%
4	Zhou Chunya	65	Oil	23,980	-47%
5	Fan Zeng	82	Chinese Ink	22,953	-33%
6	Leng Jun	57	Oil	17,273	New
7	Zeng Fanzhi	56	Oil	15,789	-35%
8	Zhang Xiaogang	62	Oil	13,359	-33%
9	Zhu Yaokui	88	Oil/Chinese Ink	12,454	46%
10	Liu Xiaodong	57	Oil	9,919	119%

Data Source: Hurun Research Institute - CAFA National Institute of Art & Cultural Policy

In the given above table, Zhou Chunya, Fan Zeng, Zeng Fanzhi, Zhang Xiaogang's ranking gone down compare the previous years. Huang Jiannan's ranking increased compared to the previous years. Liu Xiaodong, Zhu Yaokui, Leng Jun, Liu Ye's ranking are new in Top 10 table in Chinese Art List. The table is being updated every one year, during the covid pandemic the art and craft sales has been reduced. It is a hope that from Jan 2023, the sales will increase, and the rankings will be changed for sure.

4.2 Data Analysis

4.2.1 VADER Analysis

The study relied on descriptive research to gather data to better understand the relationship between the arts and blockchain technology, and both qualitative and quantitative data were employed. To understand the current condition of concerns and challenges facing ancient arts and artists, qualitative data was gathered through secondary data. Quantitative data was gathered from government publications and books to comprehend the use of blockchain technology in this industry and the technology's future trajectory. VADER [57] analysis and SWOT analysis [58] were used in this study to identify problems and potential solutions for improving the Ancient Artworks sector using the Blockchain system, as well as to aid in the future development of this research, as it is critical to adapt to technologies that will protect artists' work from fraud. When artists have control over how their work is delivered, they create demand, which serves to raise the value of art. Artists, art enterprises, and art galleries can use this research to find and integrate new technology into their organizations.

4.2.2 Analysis on Positive and negative metrics

We found that quantified several generalizable heuristics that humans employ to distinguish between levels of sentiment analysis. By implementing these heuristics into the rule-based model of the sentiment analysis engine, we were able to greatly increase the classification accuracy and correlation to ground truth. It's important to note that these improvements are made regardless of the lexicon used.

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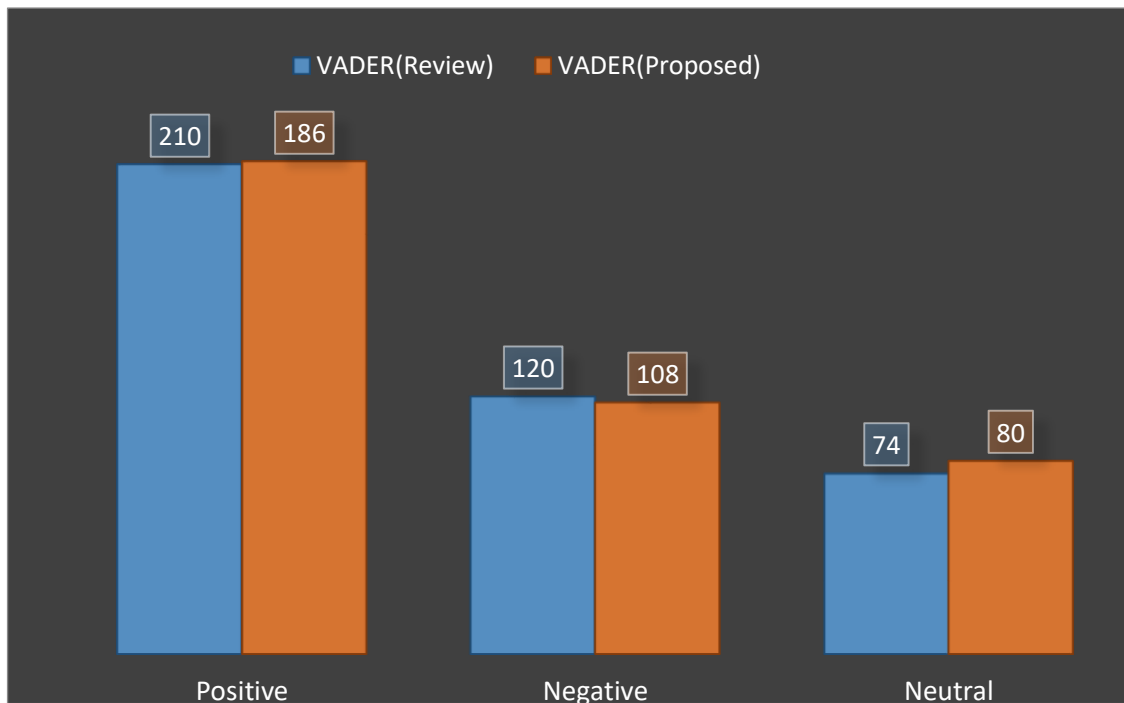


Figure 4.2 Positive, Negative, and Neutral Sentiment metrics obtained by VADER

Figure 4.2 shows that VADER [59] for ancient art data is closer to VADER which was applied for the movie review data set.

Table 4.2 Comparison of Sentiment Analysis for VADER (English & Chinese)

	Precision	Score	Accuracy
VADER(English)	88.46	87.6	83
VADER(Chinese)	79.01	80.7	76

From Table 4.2, it is clearly shown that VADER's accuracy for English based feedback is 77% and for Chinese feedback is 76%. The sentiment varies depending on the emotions when studying information or reviews from social media or other online sources. This implies that social media and other online writings perform better when analyzed with VADER Sentiment Analysis. Other syntactic concerns identified through qualitative research, which are consistent with prior work, also contribute to the effectiveness of VADER. Hence, VADER is the best option, in their sentiments. This

VADER accuracy will be related to the lexicon-based selection of semantics related to emotions.

The reasons behind the low Accuracy score in VADER are given below:

1. Language issues
2. Bad translation
3. languages are given in mixed method
4. Meaning in languages are different
5. Symbols inside the feedback
6. Stickers inside the feedback

Lexicon analysis choose the positive and negative terms based on the learning. VADER is a sentimental analysis tool which use the Lexicon based analysis. The data will be taken from the feedbacks, driven to lexicon analysis, it will divide the emotion-based terms, conjunctions and noises. then it will be taken by VADER for finding the accuracy. Let us see the Sentiment Analysis through Lexicon based Analysis.

4.2.3 Sentiment Analysis through lexicon-based analysis

Using the Saif Mohammad and Peter Turney lexicon NRC, the study performed a sentiment analysis on the text in the metadata (title, description, and tags) of artworks. The NRC Lexicon is a compilation of English words and two feeling poles, together with their correlations with eight fundamental emotions (angry, fear, anticipation, trust, surprise, sadness, joy, and disgust) (negative and positive).

We calculated the total number of words used in the artwork metadata and discovered in the NRC lexicon, the proportion of the two, and the number of words used in the artwork information that match the emotion for each artwork and emotion. We arranged the artworks according to the emotion ratio for each feeling. In the next table, we show the artworks leading the rankings for the different emotions and the links to their gallery display on Chinese art gallery. To consider only artworks with a long enough description, we included only tokens with metadata containing at least 60 words in the lexicon. Following the table, we briefly describe the artworks leading to each emotion ranking.

4.2.4 Lexicon-based approach to connect the Sentiment and Semantics

On recent times, Sentiment and Semantic analysis are being done by lexicon-based approach. This technique calculates the sentiment perceptions of the whole document or set of sentences from semantic order of lexicons. Semantic order can be positive, negative, or neutral. For the art and artist sector, we avoid neutral, due to avoid confusion in the feedback. The dictionary of lexicons can be created manually as well as automatically generated. The WorldNet dictionary is used by many researchers. First of all, lexicons are found from the whole document and then WorldNet or any other kind of online thesaurus can be used to discover the synonyms and antonyms to expand that dictionary.

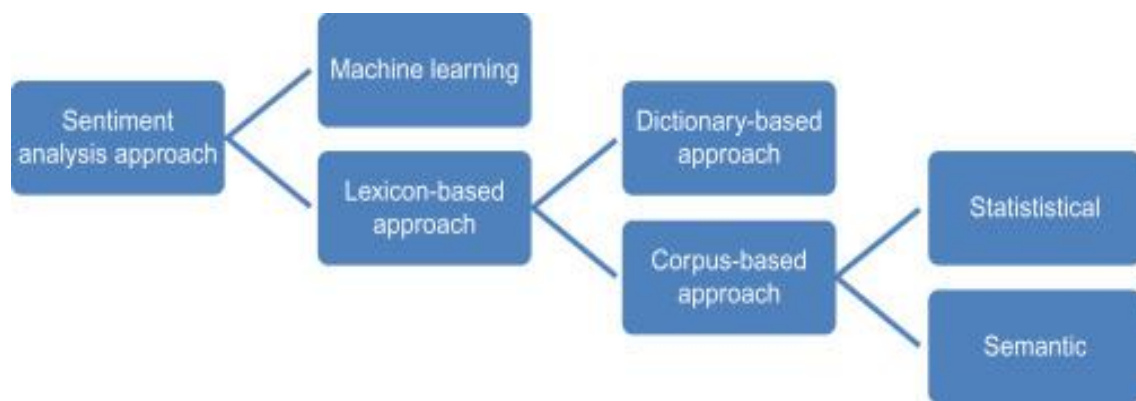


Figure 4.3 Lexicon-based techniques

Lexicon-based techniques use adjectives and adverbs to discover the semantic orientation of the text. For calculating any text orientation, adjective and adverb combinations are extracted with their sentiment orientation value. These can then be converted to a single score for the whole value (Table 4.3) [23].

Table 4.3 The emotion variables cluster

S. No.	Token ID	Emotion	Emotion words	Total words	Ratio
1.	1034	Positive	5	64	0.39
2.	1925	Positive	3	60	0.28
3.	947	Negative	10	64	0.27
4.	1538	Negative	11	72	0.21
5.	1944	Positive	8	86	0.19
6.	1990	Positive	8	106	0.18
7.	1273	Negative	9	62	0.18
8.	1538	Negative	2	72	0.17
9.	875	Negative	12	111	0.14
10.	1984	Positive	7	86	0.12

It should come as no surprise that the emotion variables (we used the hierarchical clustering method) cluster into two primary groups:

1. a *positive* group containing Luck, Happy, Money, Peace, Gift, etc;
2. a *negative* group containing Bad, Sad, Loss, Black, Broke, Fear, etc;

The research methodology is as follows:

1. The study included approximately 3,000 original works of art from Art Gallery, Art Market, Shanghai market one of the most well-known and art exchanges;
2. The NRC Emotion Lexicon by Saif Mohammad and Peter Turney as well as the tidytext R package were used in the research.
3. For each artwork and emotion, we computed an emotional score of the artwork as the proportion of words used in the artwork information that correspond to the emotion [60].

4.2.5 Relationship between Correlation and Chinese Arts

VADER [Valence Aware Dictionary and sEntiment Reasoner] sentiment analysis returns a sentiment score in the range -1 to 1, from most negative to most positive.

positive sentiment: compound score ≥ 0.3 (3)

neutral sentiment: (compound score > -0.3) and (compound score < 0.3) (4)

negative sentiment: compound score ≤ -0.3 (5)

In brief, the sentiment score of a sentence is calculated by summing up the sentiment scores of each VADER-dictionary-listed word in the sentence. Cautious readers would probably notice that there is a contradiction: individual words have a sentiment score between -3 to 3, but the returned sentiment score of a sentence is between -1 to 1.

They're both true. The sentiment score of a sentence is the sum of the sentiment score of each sentiment-bearing word. However, we apply a normalization to the total to map it to a value between -1 to 1.

From the Figure 3.5 and Table 4.1, we can understand the Correlation association with Colour of the Art, Craft, Artist, City, Culture, Material used, Age of the art, Emotion behind the art and Feedbacks score.

4.3 Data Analysis

4.3.2 Relationship between Sentimental score and Correlation to the Antique works

A photo of Chairman Mao Zedong, taken by his wife Jiang Qing is given in Figure 4.4. It fetched 340,000 yuan (\$55,300) at an auction in Beijing on Friday, 10 times the estimated price [61].



Figure 4.4 A photo of Chairman Mao Zedong, taken by his wife Jiang Qing [61]

Each work of art is truly produced by one of the network's artists and approved by his digital platform, which is verified by his mobile number and government based unique number. This enables a trusted digital platform, that you can buy, sell, and possess. By the ranking and the number of artworks traded, the artist count will be stored in the website of art market database. Chinese galleries and Invest gallery are the most trusted among the south Asian region markets.

- 875 are listed in demanded works, which are mentioned in the art feedbacks; The Correlation works here as state of power, state of art, state of artist, state of sentiment of

holding the art. As discussed earlier, after buying the art, the feedback will be taken from the platform and the buyers and collectors will look on the feedback of the buyer or buyers in the past and quote for value. The value may be increased if the feedback contains lexicon based positive terms in it.

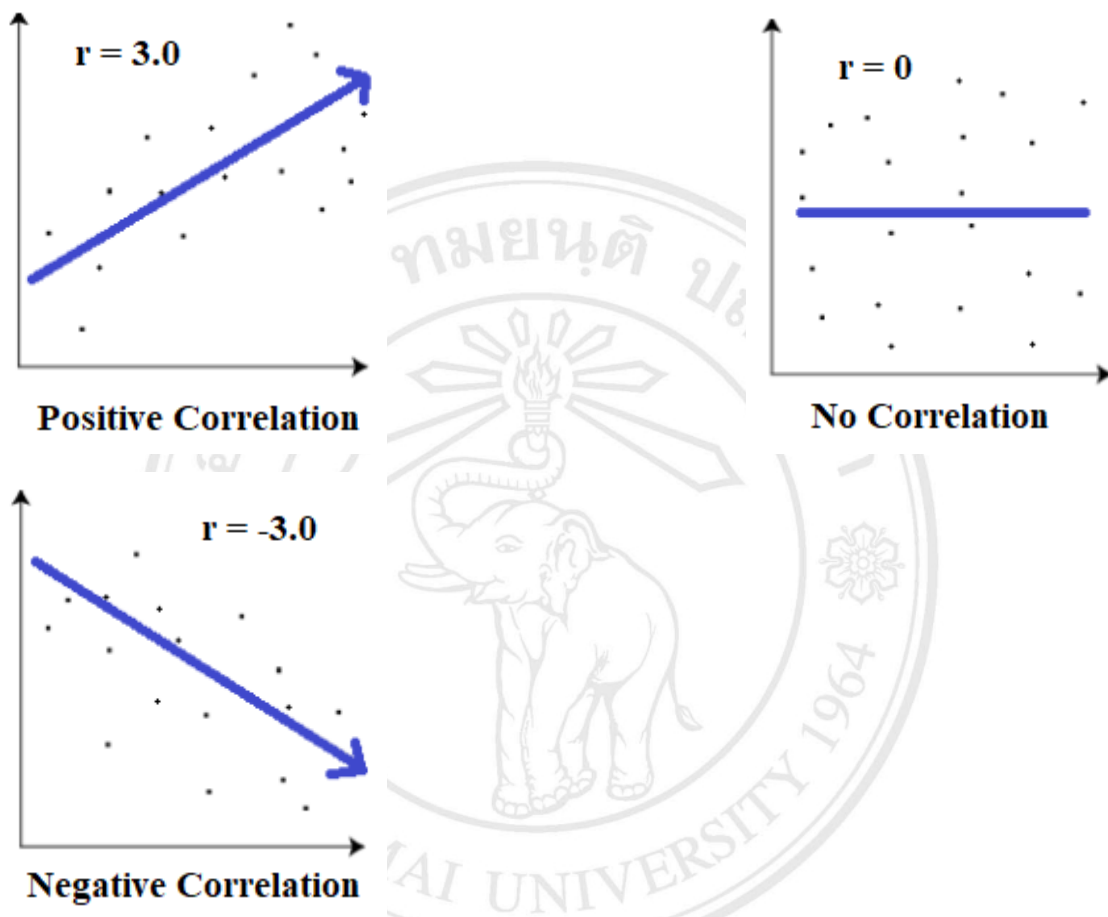


Figure 4.5 The (Pearson) correlation coefficient among emotions. Notice the left indicates positive correlation with positive value, middle indicated no value or neutral value and the right correlation indicates the negative one with negative value

From the analysis and relationships are found and given as outputs below:

- Total number of Artworks :3000 (100%)
- Total number of Artists: 100
- count of the cities taken in to the data: 20
- count of the sold artworks 1860 (62%);
- count of the active users: 579 (34%)
- count of the users that sold at least one artwork: 1410 (47%);

- count of the users that bought at least one artwork: 2220 (74%).
- count of the artists sold more than 10 units: 27
- count of the users buys from same artist: 375 (12.5%)
- count of the cities which is notable for the demand: 5 (25%)
- Cities of the artist which sold more arts in the mainland of China: {"Guangdong", "Sichuan", "Hunan", "Guangxi", "Shanghai", "Beijing"}
- Cities of the artist which sold more arts in foreign soil: {"Hunan", "Shanghai", "Beijing", "Hebei"}

The NRC Emotion Lexicon by Saif Mohammad and Peter Turney was used in the study [8]. The NRC Lexicon is a compilation of English words and two feeling poles, together with their correlations with eight fundamental emotions (angry, fear, anticipation, trust, surprise, sadness, joy, and disgust) (negative and positive). We began by correlating the emotion scores for each piece of art. It should come as no surprise that the emotion factors fall into two primary categories. For the reader's reference we can mention them as a set of Positive and Negative set of Lexicon syntax terms.

Negative Set = {Bad, Sad, Fear, Sick, Bad, Loss, Unlucky }

Positive Set = {Luck, Peace, Health, Happiness, Good, Rich, Success }

$$SC = \frac{NPW - NNW}{TW} \quad (6)$$

Next, we calculated the sentimental score (SC) from the feedback data. Every art will have feedback, so we use that to find the total number of positive words and negative words and divide by the total words. The artwork as the proportion of words used in the artwork metadata that fit the emotion for each artwork and emotion. The emotional scores for Peace, Sadness, and trust, for instance, are $5 / (5 + 3 + 2) = 0.5$, $3 / (5 + 3 + 2) = 0.3$, and $2 / (5 + 3 + 2) = 0.2$, respectively, if an artwork has 5 words expressing Success, 3 words expressing Loss, and 2 words expressing Rich. We arranged the artworks according to the emotional score for each feeling. The artworks at the top of the emotion rankings are listed below, along with a brief description:

1. Following a period of initial emotional instability marked by erratic swings in sentiments and emotions, the emotional spectrum settles down, becoming more even and regular;
2. Positive feelings outweigh negative ones;
3. The strongest emotions are joy, trust, and anticipation. Fright and grief trail them in their wake. The least prevalent emotion is disgust.

It is important to note that these findings are independent of the NRC lexicon. In fact, there are more positive words than the negative in this lexicon (188 against 126). Additionally, the phrases that frequently refer to different emotions include: Success (147), Rich (138), Valuable (133), (Business (121), Loss (119), Unlucky (105), Happy (98), Joy (89), Healthy (83) and Gift (76). The emotion that is most frequently shown in cryptographic artworks is joy, which is one of the least frequently occurring emotions in the English language. We come to the conclusion that crypto artists mostly attempt to portray positive emotions like joy, trust, and anticipation when creating, at least for the dataset at hand. Disgust is the least voiced negative emotion, while fear is the one that is most frequently expressed.

4.3.2 Indirect and Interesting analysis

We now want to find out if the same holds for collectors: do they collect artworks that express clear emotions? To find an answer we correlated the emotional scores of artworks with several market variables indicating artwork success, including: number of bids, bid volume, number of sales, and sale volume of both primary and secondary art market. We noticed no correlation, either positive or negative, among sentiment and market success of artworks.

Table 4.4 Artist born in a city and lived in another city

	Chosen city to live	No. of Individual artist
1 -	Beijing	59 (+8)
2 -	Guangdong	8 (-2)
3 -	Jiangsu	7 (-1)
4 ↑	Tianjin	5 (+1)
4 -	Shanghai	5 (0)
6 -	Sichuan	3 (0)
8 ↑	Jilin	1 (0)
8 ↑	Hong Kong	1 (0)
8 ↑	Ningxia	1 (0)
8 ↑	France	1 (0)
8 ↑	Chongqing	1 (0)
8 ↑	Heilongjiang	1 (0)
8 ↑	Shaanxi	1 (-1)
8 ↑	Liaoning	1 (-1)
8 *	Yunnan	1 (+1)
8 *	Hubei	1 (+1)

There are some interesting association and correlations we found from this study. Europeans always buy art from well-known city or province “Beijing” in China. Actually, originally Beijing born artists are only 13 from the data. But many identified that the value of the artists staying in Beijing are increasing, so they shift their business and studio to Beijing. Interestingly the value and demand values are also increased as expected. By using the same method and correlation given in Figure 3.3, shows the artists counts who born in different cities such as Guangdong, Jiangsu, Shanghai, Sichuan, Hongkong, Yunnan, Hebei in mainland of China, but they moved to Beijing, Guangdong, Hongkong and Shanghai as well. Some artists moved out of the China and settle their studios in USA and France as well. Their age and ranking are notably increased as they expected.

We conclude that while the average artist favors some emotions among others, the average collector is agnostic to the emotion expressed by the art they collect. However, particular top collectors might have preferred some specific sentiments when they buy. For instance, we noticed that Winter in China, a top collector prefers positive works more than the average collector, Sea Goddess represented in Yantai Museum another notable collector, favors negative art [24][62].

Table 4.5 China Art category List data changes

	No. of Artists on List	Top 50 Av. Sales US\$m	Oil vs ink	Av. Age	Top Artist	Sales of Top Artist US\$ m
2008	50	9.9	39 vs 10	57	Wu Guanzhong	49
2009	50	8.2	36 vs 9	58	Zhang Xiaogang	44
2010	50	5.1	26 vs 20	65	Zhao Wuji	35
2011	50	12	25 vs 22	64	Fan Zeng	57
2012	100	14.6	41 vs 57	63	Fan Zeng	149
2013	100	11.6	32 vs 67	66	Zhou Chunya	75
2014	100	12	32 vs 69	66	Zeng Fanzhi	84
2015	100	11	27 vs 74	65	Cui Ruzhuo	76
2016	100	5.6	43 vs 54	64	Cui Ruzhuo	120
2017	100	4.9	47 vs 53	64	Cui Ruzhuo	117
2018	100	9.8	42 vs 59	66	Cui Ruzhuo	163
2019	100	11.8	38 vs 64	68	Cui Ruzhuo	132
2020	100	7.9	47 vs 51	66	Cui Ruzhuo	49

Again, this table is also presenting us the correlation between the positive sentiment related to the category of the art in Chinese traditional art system. Year wise list is highlighting us an understanding and sharing interesting information that average age of the successful artists are ranged with the mean value of 64. The artist once get a reputation get continuous customers on different paintings, because they trust the originality on the artists and customers believe their sentiments on buying from the same artist with same category as well. The Ink and Oil painting still have their grip in the sales and ranking,

because Chinese consumers believe the existing of the real-world or physical content passed through the painting.

4.4 Future Study

The growth rate of artists headquartered in Beijing is fifteen times greater than that of artists in other regions. Since the study includes titles based on movies in the comments. Some of the comments discuss Beijing and Shanghai, which are based on films starring actor Jackie Chan. Since the floating mountains in the movie "Avatar" were modeled after the mountains of Zhangjiaje, many have been curious about the city known as "Zhangjiaje" in recent years. According to our research, fans of Hollywood films and Indo-China culture are highly aware with Chinese wall art, the laughing Buddha, Chinese bamboo, Chinese umbrellas, and Chinese coins.

The artwork of China's history consists of culture throughout the entire work. The study only concentrated on China's artwork with digital data based on quantity basis, which cannot be delivered to the status of the entire culture. Moreover, the study only focused on the digital platform of ancient Chinese artwork. Payment transformation, country transformation, and cross-border business activity in the arts are all included in our future study. Every art company also operates its own logistics company. which they can lower their transfer costs. Our research is mostly focused on spreading our work throughout South Asia to prevent it from being copied or reproduced. According to our study, Asians are more emotionally invested in arts and cultures. They make an effort to preserve the art and leave it as a legacy for future generations. They discuss the emotional backstory of the work of art and share their own success stories after purchasing it.

They always relate their success and emotional experiences to art and crafts. This raises the price and demand for the art at the same time, shares the emotion with others, and motivates people to purchase works of art from a specific city, medium, or category of art. This forms a series of related processes. Elite South Asian households also value art as a valued possession. Our upcoming research may focus on ASEAN, China, and India, three countries with rich cultural and historical backgrounds. Considering Thailand as a cultural hub, blockchain and sentiment analysis technology will help the art network expand and flourish in the future.

CONCLUSION

China's history and culture is known by the entire world. The reputation of Chinese artworks and craftsmanship are giving reputation on the market of Chinese artwork market as well. Chinese Ancient Arts and craft works have not been adequately researched. Digital era is now helping the Chinese market to move another level for the world to do research and also creating different opinions. Current and future researchers shall try to have references based on sentiment and cultural values behind the arts and works of Chinese arts. Digital platforms are using different languages and methods to identify the value and demand of the arts. The same topic is modified and bring up the work which related the sentimental analysis to identify the value of the artwork, artist, cities, culture and category of the work. To add the value of the work, pandemic gives a lot of time to the viewers to see the art work and give their feedbacks and buying interests on the websites and other digital platforms as well. The system collected the data from various countries, link them to semantics, derive them into sentiment analysis using the basic values such as positive and negatives weightages to identify the demand, value of the artwork in direct method. Indirectly we also see the value and demand for the cities, culture and category ranking of the artworks. Through this the history and their arts, culture background can extend their cultural proof for the future. Some customers have their provincial art to keep their feeling inside their home. This work reflects that the major findings of study that Art collectors are interested and following male artists and craft makers, whose age is more than 40 years old. They respect their experience and knowledge on history and life-based sentiments or emotional touch in the art. At the same time all the art and craft makers are not repeating the same art, because every time they create, there will be different in their art and craft. Art work collectors strongly believe that paint give him good luck and success always. The work used the existing blockchain which hold the artist and art ranking. In future the work can be extended to dress, dance formats, songs, fashion, food, tourist places, etc. Hence block-chain and sentiment analysis will be useful for searching, tracing and confirming the roots for artworks. Using sentimental analysis, we can also find out the different antique artworks, ranking, value of the artwork and artists from the different provinces. Both technologies provided

evidences for digital transactions and will aid in the preservation of history through digital transactions in the future. This work didn't focus on business but focus on felicitating the artists and their works shall have the recognition in the global platforms.



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REFERENCES

- [1] Statista, A. (2022). Global-online-art-market. [www. statista. com/topics/5254/global-online-art-market]
- [2] J. Lee, "Development of Craft Copyright Industry Using Blockchain Technology," *2021 21st ACIS International Winter Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing (SNPD-Winter)*, 2021, pp. 263-264, DOI: 10.1109/SNPDWinter52325.2021.00065.
- [3] Garcia-Teruel, R. M., & Simón-Moreno, H. (2021). The digital tokenization of property rights. A comparative perspective. *Computer Law & Security Review*, 41, 105543.
- [4] W. Yu and S. Huang, "Traceability of Food Safety Based on Block Chain and RFID Technology," *2018 11th International Symposium on Computational Intelligence and Design (ISCID)*, 2018, pp. 339-342, DOI: 10.1109/ISCID.2018.00083.
- [5] J. Sheng and J. Jiang, "Style-based classification of Chinese ink and wash paintings," *Optical Engineering*, vol. 52, no. 9, article 093101, 2013.
- [6] J. Sheng and J. Jiang, "Recognition of Chinese artists via windowed and entropy balanced fusion in classification of their authored ink and wash paintings (IWPs)," *Pattern Recognition*, vol. 47, no. 2, pp. 612–622, 2014.
- [7] M. Sun, D. Zhang, Z. Wang, J. Ren, and J. S. Jin, "Monte Carlo convex hull model for classification of traditional Chinese paintings," *Neurocomputing*, vol. 171, pp. 788–797, 2016
- [8] P. Y. Chiang, C. V. Lin, and C. H. Tseng, "Generation of Chinese ink portraits by blending face photographs with Chinese ink paintings," *Journal of Visual Communication and Image Representation*, vol. 52, pp. 33–44, 2018.

- [9] M. Sun, Z. Dong, J. Ren, W. Zheng, and J. S. Jin, "Brushstroke based sparse hybrid convolutional neural networks for author classification of Chinese ink-washpaintings," in 2015 IEEE International Conference on Image Processing (ICIP), pp. 626–630, Quebec City, QC, Canada, 2015.
- [10] Z. Wang, D. Lu, D. Zhang, M. Sun, and Y. Zhou, "Fake modern Chinese painting identification based on spectral–spatial feature fusion on hyperspectral image," *Multidimensional Systems and Signal Processing*, vol. 27, no. 4, pp. 1031–1044, 2016.
- [11] R. Zhou, J. H. Han, H. S. Yang, W. Jeong, and Y. S. Moon, "Fast style transfer for Chinese traditional ink painting," in 2019 IEEE 9th International Conference on Electronics Information and Emergency Communication (ICEIEC), pp. 586–588, Beijing, China, 2019.
- [12] C. Zheng and Y. Zhang, "Two-stage color ink painting style transfer via convolution neural network," in 2018 15th International Symposium on Pervasive Systems, Algorithms and Networks (I-SPAN), pp. 193–200, Yichang, China, 2018.
- [13] W. Jiang, Z. Wang, J. S. Jin, Y. Han, and M. Sun, "DCT-CNNbased classification method for the Gongbi and Xieyi techniques of Chinese ink-wash paintings," *Neurocomputing*, vol. 330, pp. 280–286, 2019.
- [14] J. Sheng and Y. Li, "Classification of traditional Chinese paintings using a modified embedding algorithm," *Journal of Electronic Imaging*, vol. 28, no. 2, p. 1, 2019.
- [15] J. Sheng, C. Song, J. Wang, and Y. Han, "Convolutional neural network style transfer towards Chinese paintings," *IEEE Access*, vol. 7, pp. 163719–163728, 2019.
- [16] K. Balasubramanyam, "Adaptation of BlockChain Technology in manufacturing sector," 2020 International Conference on Mainstreaming Blockchain Implementation (ICOMBI), 2020, pp. 1-13, DOI: 10.23919/ICOMBI48604.2020.9203545.

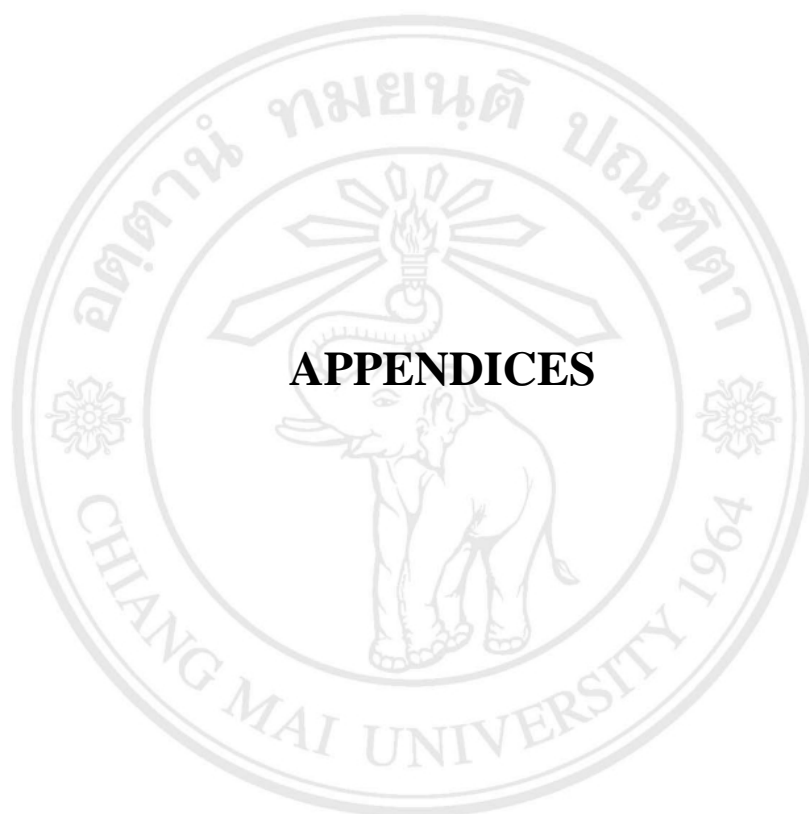
- [17] S. P. Gayathri, S. Vijayalakshmi, Siva Shankar Ramasamy, "Tracking IoT-Based Devices Parts from Manufacture to End of Life by Leveraging Big Data in Blockchain Environment", *Convergence of Blockchain and IoT*, Taylor & Francis, Edition 1, pages 20, Nov 2021.
- [18] P. Kuhlmann and A. Sunk, "Productivity improvement in logistical work systems of the genuine parts supply chain," 2015 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM), 2015, pp. 280-284, DOI: 10.1109/IEEM.2015.7385652.
- [19] Y. K. Ro, J. K. Liker and S. K. Fixson, "Modularity as a Strategy for Supply Chain Coordination: The Case of U.S. Auto," in *IEEE Transactions on Engineering Management*, vol. 54, no. 1, pp. 172-189, Feb. 2007, DOI: 10.1109/TEM.2006.889075.
- [20] J. Block, T. Tyrberg and Yuan Fuqing, "Optimal repair for repairable components during phaseout an aircraft fleet," 2010 IEEE Aerospace Conference, 2010, pp. 1-8, DOI: 10.1109/AERO.2010.5446880.
- [21] D. Sathya, S. Nithyaropa, D. Jagadeesan, and I. J. Jacob, "Block-chain Technology for Food supply chains," 2021 Third International Conference on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV), 2021, pp. 212-219, DOI: 10.1109/ICICV50876.2021.9388478.
- [22] S. W. Sheng and S. Wicha, "The Proposed of a Smart Traceability System for Teak Supply Chain Based on Blockchain Technology," 2021 Joint International Conference on Digital Arts, Media, and Technology with ECTI Northern Section Conference on Electrical, Electronics, Computer and Telecommunication Engineering, 2021, pp. 59-64, DOI: 10.1109/ECTIDAMTNCN51128.2021.9425780.
- [23] C. P. Jagrat and J. Channegowda, "A Survey of Blockchain Based Government Infrastructure Information," 2020 International Conference on Mainstreaming Blockchain Implementation (ICOMBI), 2020, pp. 1-5.
- [24] Kochetkova, Marina. "BLOCKCHAIN IN THE ART MARKET: Opportunities and Challenges." (2020).

- [25] Whitaker, Amy. "Art and blockchain: A primer, history, and taxonomy of blockchain use cases in the arts." *Artivate* 8, no. 2 (2019): 21-46.
- [26] City, Q. (2022). City population. URL: <https://www.citypopulation.de/en/china/prov>
- [27] N. Mittal, D. Sharma, and M. L. Joshi, "Image Sentiment Analysis Using Deep Learning," in 2018 IEEE/WIC/ACM International Conference on Web Intelligence (WI), pp. 684–687, Santiago, Chile, 2018.
- [28] P. Balouchian, M. Safaei, and H. Foroosh, "LUCFER: a large-scale context-sensitive image dataset for deep learning of visual emotions," in 2019 IEEE Winter Conference on Applications of Computer Vision (WACV), pp. 1645–1654, Waikoloa, HI, USA, 2019.
- [29] L. Marchesotti, N. Murray, and F. Perronnin, "Discovering beautiful attributes for aesthetic image analysis," *International Journal of Computer Vision*, vol. 113, no. 3, pp. 246–266, 2015.
- [30] T. Matthews, M. S. Nixon, and M. Niranjan, "Enriching Texture Analysis with Semantic Data," in 2013 IEEE Conference on Computer Vision and Pattern Recognition, pp. 1248–1255, Portland, OR, USA, 2013.
- [31] D. Kang, H. Shim, and K. Yoon, "A method for extracting emotion using colors comprise the painting image," *Multimedia Tools and Applications*, vol. 77, no. 4, pp. 4985–5002, 2018.
- [32] A. Yao, J. Shao, N. Ma, and Y. Chen, "Capturing Au-aware facial features and their latent relations for emotion recognition in the wild," in Proceedings of the 2015 ACM on International Conference on Multimodal Interaction, pp. 451–458, New York, NY, USA, 2015.
- [33] D. Sen, S. Datta, and R. Balasubramanian, "Facial emotion classification using concatenated geometric and textural features," *Multimedia Tools and Applications*, vol. 78, no. 8, pp. 10287–10323, 2019.
- [34] Q. You, J. Luo, H. Jin, and J. Yang, "Robust image sentiment analysis using progressively trained and domain transferred deep networks," in Twenty-ninth

- AAAI conference on artificial intelligence, pp. 381–388, Austin, Texas, USA, 2015.
- [35] B. Jou and S. F. Chang, “Deep cross residual learning for multitask visual recognition,” in Proceedings of the 24th ACM international conference on Multimedia, pp. 998–1007, New York, NY, USA, 2016.
- [36] V. Campos, B. Jou, and X. Giro-i-Nieto, “From pixels to sentiment: fine-tuning CNNs for visual sentiment prediction,” *Image and Vision Computing*, vol. 65, pp. 15–22, 2017.
- [37] X. He and W. Zhang, “Emotion recognition by assisted learning with convolutional neural networks,” *Neurocomputing*, vol. 291, pp. 187–194, 2018.
- [38] K. Song, T. Yao, Q. Ling, and T. Mei, “Boosting image sentiment analysis with visual attention,” *Neurocomputing*, vol. 312, pp. 218–228, 2018.
- [39] Y. Fan, H. Yang, Z. Li, and S. Liu, “Predicting image emotion distribution by learning labels’ correlation,” *IEEE Access*, vol. 7, pp. 129997–130007, 2019.
- [40] T. Rao, X. Li, H. Zhang, and M. Xu, “Multi-level region-based convolutional neural network for image emotion classification,” *Neurocomputing*, vol. 333, pp. 429–439, 2019.
- [41] W. Sun, H. Zhao, and Z. Jin, “A visual attention based ROI detection method for facial expression recognition,” *Neurocomputing*, vol. 296, pp. 12–22, 2018.
- [42] X. Yang, Z. Wang, H. Deng et al., “Recognizing image semantic information through multi-feature fusion and SSAE-based deep network,” *Journal of Medical Systems*, vol. 44, no. 2, 2020.
- [43] X. Liu, N. Li, and Y. Xia, “Affective image classification by jointly using interpretable art features and semantic annotations,” *Journal of Visual Communication and Image Representation*, vol. 58, pp. 576–588, 2019.
- [44] Rožman, N., Corn, M., Požrl, T., & Diaci, J. (2019). Distributed logistics platform based on Blockchain and IoT. *Procedia CIRP*, 81, 826-831.

- [45] Howson, P. (2020). Building trust and equity in marine conservation and fisheries supply chain management with blockchain. *Marine Policy*, 115, 103873.
- [46] Li, Z., Liu, L., Barenji, A. V., & Wang, W. (2018). Cloud-based manufacturing blockchain: Secure knowledge sharing for injection mould redesign. *Procedia Cirp*, 72, 961-966.
- [47] Mohamed, K., Aziz, A., Mohamed, B., Abdel-Hakeem, K., Mostafa, M., & Atia, A. (2019). Tracking: A Robust System for Preserving Money Transactions. *Procedia Computer Science*, 160, 118-125.
- [48] Liu, B. (2012). Sentiment analysis and opinion mining. *Synthesis lectures on human language technologies*, 5(1), 1-167.
- [49] Hurun Report. (2022). Hurun China Art List 2022. [<https://www.hurun.net/en-US/Info/Detail?num=YOS5VW2H17AF>]
- [50] Statista, A. (2022). Global-art-market-share-by-country [<https://www.statista.com/statistics/885531/global-art-market-share-by-country>]
- [51] Statista, A. (2022). Top-10-auction-houses-for-contemporary-art [<https://www.statista.com/statistics/269069/top-10-auction-houses-for-contemporary-art/>]
- [52] Christies, A. (2022). Old-Masters-that-changed-the-market [<https://www.christies.com/features/Old-Masters-that-changed-the-market-8477-1.aspx/>]
- [53] C. J. H. E. Gilbert, "Vader: A parsimonious rule-based model for sentiment analysis of social media text," in Eighth International Conference on Weblogs and Social Media (ICWSM-14).
- [54] Whitaker, A., Bracegirdle, A., de Menil, S., Gitlitz, M. A., & Saltos, L. (2021). Art, antiquities, and blockchain: new approaches to the restitution of cultural heritage. *International Journal of Cultural Policy*, 27(3), 312-329.

- [55] O'Dwyer, R. (2020). Limited edition: Producing artificial scarcity for digital art on the blockchain and its implications for the cultural industries. *Convergence*, 26(4), 874-894.
- [56] Trček, D. (2022). Cultural heritage preservation by using blockchain technologies. *Heritage Science*, 10(1), 1-11.
- [57] Elbagir, S., & Yang, J. (2019, March). Twitter sentiment analysis using natural language toolkit and VADER sentiment. In *Proceedings of the international multiconference of engineers and computer scientists* (Vol. 122, p. 16).
- [58] GURL, E. (2017). SWOT analysis: A theoretical review.
- [59] Bonta, V., & Janardhan, N. K. N. (2019). A comprehensive study on lexicon based approaches for sentiment analysis. *Asian Journal of Computer Science and Technology*, 8(S2), 1-6.
- [60] Scott Roy Douglas, "The Relationship Between Lexical Frequency Profiling Measures and Rater Judgements of Spoken and Written General English Language Proficiency on the CELPIP-General Test", *TESL CANADA JOURNAL/REVUE TESL DU CANADA* 43 Volume 32, special issue 9, pp: 43-66, 2015]
- [61] https://www.chinadaily.com.cn/culture/art/2013-05/13/content_16494099.htm
- [62] http://www.chinadaily.com.cn/m/shandong/yantai/2021-12/22/content_37549267.htm



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