RESEARCH ARTICLE

Design of a Deep Neural Network-Based Visual Data Processing System for Digital Media Optimization Applications

XUEPING LEI[ID]

Changzhou Vocational Institute of Engineering, Changzhou 213164, China

e-mail: xplei@czie.edu.cn

ABSTRACT Multimedia information processing is a universal technical demand in smart life, especially in applications of digital media optimization. However, there still lacks mature design of reliable visual data processing systems for this area. Because digital media interaction is featured with high dynamics and large business amount, which poses high requirement for processing ability and efficiency. To deal with this issue, this paper presents design of a deep neural network-based visual data processing system for digital media optimization applications. First of all, an overall mechanism algorithm that coordinates automatic workflow of the whole system is designed. Then, a BP neural network structure is adopted to realize intelligent resource classification according to different user behaviors and user preference. Through the strong ability of information processing brought by deep neural network, business scheduling and operation in digital media applications can be optimized. As for evaluation, the designed deep neural network is compared with a traditional vision processing algorithm to test the processing efficiency of visual data. The obtained results can reflect that the designed visual data processing system can work well in digital media optimization applications.

INDEX TERMS Deep learning, vision computing, multimedia systems, business scheduling.

I. INTRODUCTION

Information visualization is a very effective method for analyzing and processing information [1]. With the growth of information transmission rate, the amount of information that people contact and need to deal with increases greatly [2]. The demand for more effective processing and transformation of information by visualization is also growing in blowout style [3]. Then came the bottleneck of communication. The current information volume and growth rate can no longer be solved by graphics [4]. It needs to be handled jointly by comprehensive media forms, and digital media, with its own powerful form of expression, is just in line with it. In the period of information scarcity, people's ability to obtain information is very important. Whoever holds the initiative of information can get benefits or occupy a favorable position

The associate editor coordinating the review of this manuscript and approving it for publication was Mehedi Masud.

first. In the information age, everyone's ability to obtain information is almost the same. Everyone gets a lot of information every day [5]. The ways of information dissemination are becoming more convenient, and the channels of information dissemination are becoming more and more diverse [6]. Everyone is a self media, The amount of information is increasing, and many people can't judge the authenticity of information in time. The acquisition of information is no longer the key [7]. How to distinguish information becomes the most important factor [8].

The current digital media technology and digital visualization technology generally follow the following development trends: informatization, networking, globalization, and knowledge-based [9]. For informatization, the development of information technology has promoted the transformation of society from the industrial age to the information age, which is called informatization [10]. It is a process in which the information industry continues to integrate with other

industries in the development process, and it is also a process in which informatization continues to develop [11]. With the advent of the information age, many countries and regions have put forward informatization development strategies, such as the ''Information Highway Plan'' of American sports The ''Electronic Europe Plan'' proposed by the European Union and the ''National Informatization Development Strategy 2006-2020'' proposed by the mainland of China. Under the influence of the informatization development strategy, the informatization process of countries around the world is also accelerating, strengthening the proportion of the information industry, speeding up the development mode of the informatization society and economy, etc [12].

Informatization is the most basic feature of the information age. As far as networking is concerned, the most typical product of the information age is the Internet [13]. With the development of the network, it has gradually penetrated into all walks of life in the society, and the influence of the network is also expanding [14]. As a process of transformation from physical space to virtual space, networking is also a process of transformation from limited space to unlimited space, which reflects a new space-time environment in the information age [15]. Under this new space-time environment, people's working methods Lifestyle and learning style have been greatly changed. People can work and learn through tele office, telemedicine, tele education and other ways. Networking has also become a major trend in the information age [16]. As far as globalization is concerned, the world economy is moving towards globalization in the 21st century. The globalized production and operation of transnational corporations, the increasingly developed information technology and transportation have made the distance limit around the world gradually broken through.

Economic globalization means the globalization of resource allocation, market competition, and the development of economic globalization has also brought about political globalization and cultural globalization, This all-round globalization has also become one of the main features of the information age. For knowledge, in the industrial age, the main resources to promote social and economic development are non renewable material resources and capital. In the information age, knowledge and information will gradually replace material resources and capital as the core to promote social development. Industry transfer and industrial structure upgrading are being carried out all over the world [17]. Developed countries have accelerated the development of knowledge intensive industries and listed them as the pillar industries of the national economy, It also lists knowledge as the core competitiveness of a country. Intellectual property has become an important indicator of international competitiveness and entered the era of intellectual property competition. Who owns more intellectual property [18].

Based on the above analysis and research, compared with the amount of information to be processed, the current visual communication mode limits the ''bandwidth'' of information transmission [19]. And the bottleneck of visual communication in form and technology needs to be broken through [20]. Fortunately, the rapid development of science and technology and the constantly updated cognitive framework are opening up a new vision for mankind [21]. The combination of science and technology and art has produced a new form of information visualization. This paper will mainly show information through dynamic or comprehensive media forms, and at the same time, assist in processing and analysis with neural network algorithm, from the realization of re processing the carrier of received information, so as to break the limitations of plane forms. Virtual reality, augmented reality, holographic vision and other hottest emerging digital media forms are rapidly combined with the visual transmission of information, bring more real information perception and complete ''immersion'' information experience.

The purpose of this study is to clarify the applicable principles and methods of various forms of digital media, different types of information visualization, and communication appeals. Through classification and induction, we summarize the core features of digital media and information visualization, analyze the advantages of combination, and find out the positive significance and applicable laws of digital media to solve the bottleneck of information visualization communication [22]. The main work carried out in the following paragraphs and chapters of this article is as follows:

- This article proposes an automatic coordination algorithm for the overall mechanism and designs the workflow of the entire system based on it. Solved the problem of high interactivity and high business volume in digital media.
- This article adopts a BP neural network structure to achieve intelligent resource classification based on different user behaviors and preferences. The powerful information processing, business scheduling, and operation capabilities brought by deep neural networks can be optimized in digital media applications, improving the intelligence and efficiency of the algorithm.
- In the experimental part, this article compares the designed deep neural network with traditional visual processing algorithms to test the processing efficiency of visual data. The experimental results show that the algorithm proposed in this paper has obvious advantages.

II. RELATED WORK

At the level of corresponding digital media optimization, the emergence of any art form will be affected by the social and technological development at that time. As is stated by literature [23], the impact of technological media on the visual information display design will also be different. For example, in the primitive society, people only seek various means to obtain more clear information exchange and com-
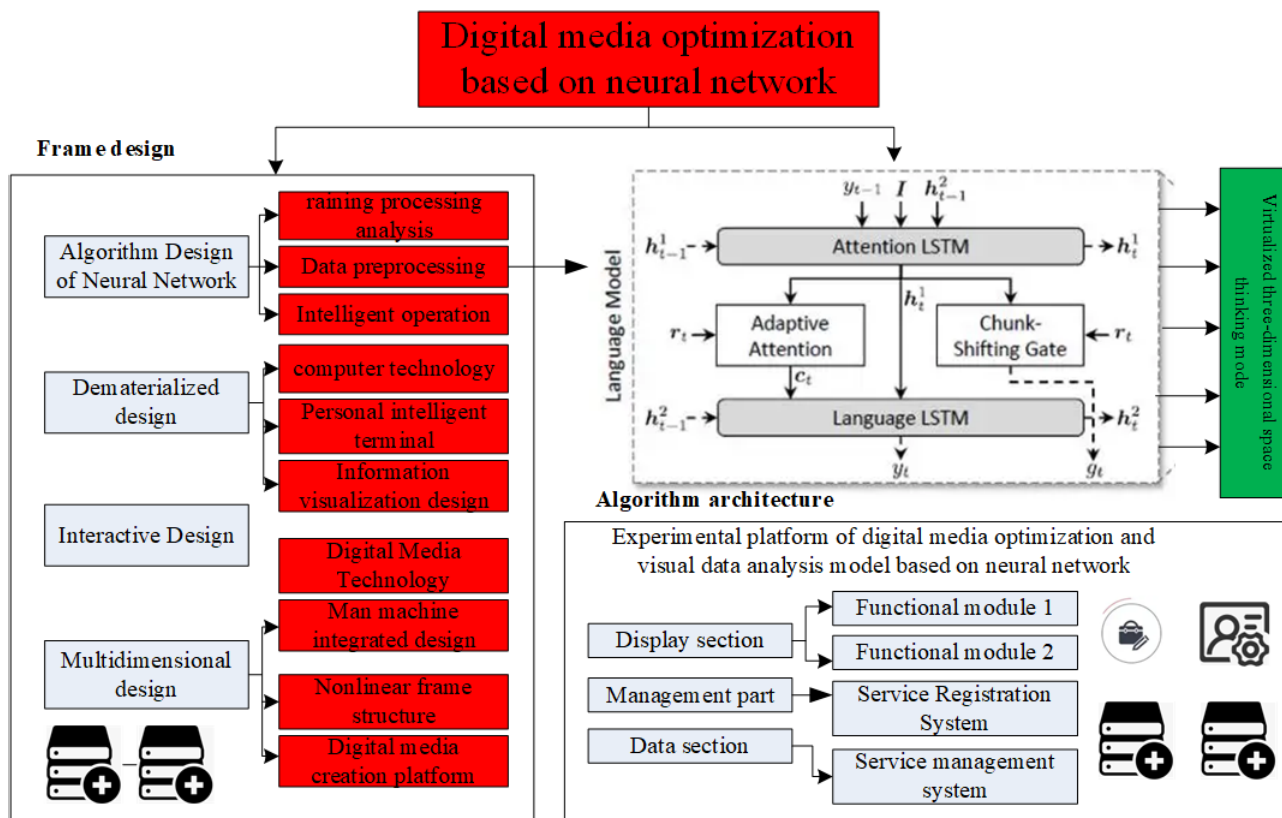
FIGURE 1. Analysis on the construction of digital media optimization and visual data analysis model based on neural network.

munication, so that the process of receiving and transmitting information will be more convenient. The literature [24] holds the opinion that information visualization design also affects the thinking of media development. As is stated by literature [25], from the traditional paper media to the current digital media, the change of these media is a development and change of information visualization. The literature [26] describes that with the continuous progress of digital media technology and the current rapid development of intelligent mobile terminals, information dissemination has become a way that can be transmitted from anyone to the cloud to share with others. As is stated by literature [27], information visualization relies on digital media as the media, and a new form of dynamic information chart has emerged. This form focuses on the interaction with the audience, combining text, graphics and video, which realized the "communication" with the audience. From literature [28], it was a new attempt in the development of science and technology, and was also a countermeasure made by traditional charts in the face of information explosion at that time.

With the rise of the "big data era", information visualization has become an increasingly important way to process information, so that people can understand the massive data generated every day. It can be learned from literature [29] that visualization organizes the data into understandable patterns,

highlighting key points and outliers, thus helping to tell the story. It can be also learned from literature [30] that good visualization means can use a chart to tell a complete event, eliminate other irrelevant items in the data and highlight important information. In general, information visualization is still in a rising stage of development. In literature [31], authors stated that the amount and complexity of information generated in various industries such as government units, financial markets, marketing, services, education, sports, and human daily activities are growing at an alarming rate. As is stated by the literature [32], A complete visualization method can not only intuitively display data, but also help the audience improve their understanding communication and decision-making power to better handle things.

Multimedia information processing is a universal technical demand in smart life, especially in applications of digital media optimization. However, it can be deduced from the above analysis that there still lacks mature design of reliable visual data processing systems for this area. Because digital media interaction is featured with high dynamics and large business amount. This poses high requirement for processing ability and efficiency. While this work designs a deep neural network-based visual data processing system for digital media applications, which has sufficient investigation significance.
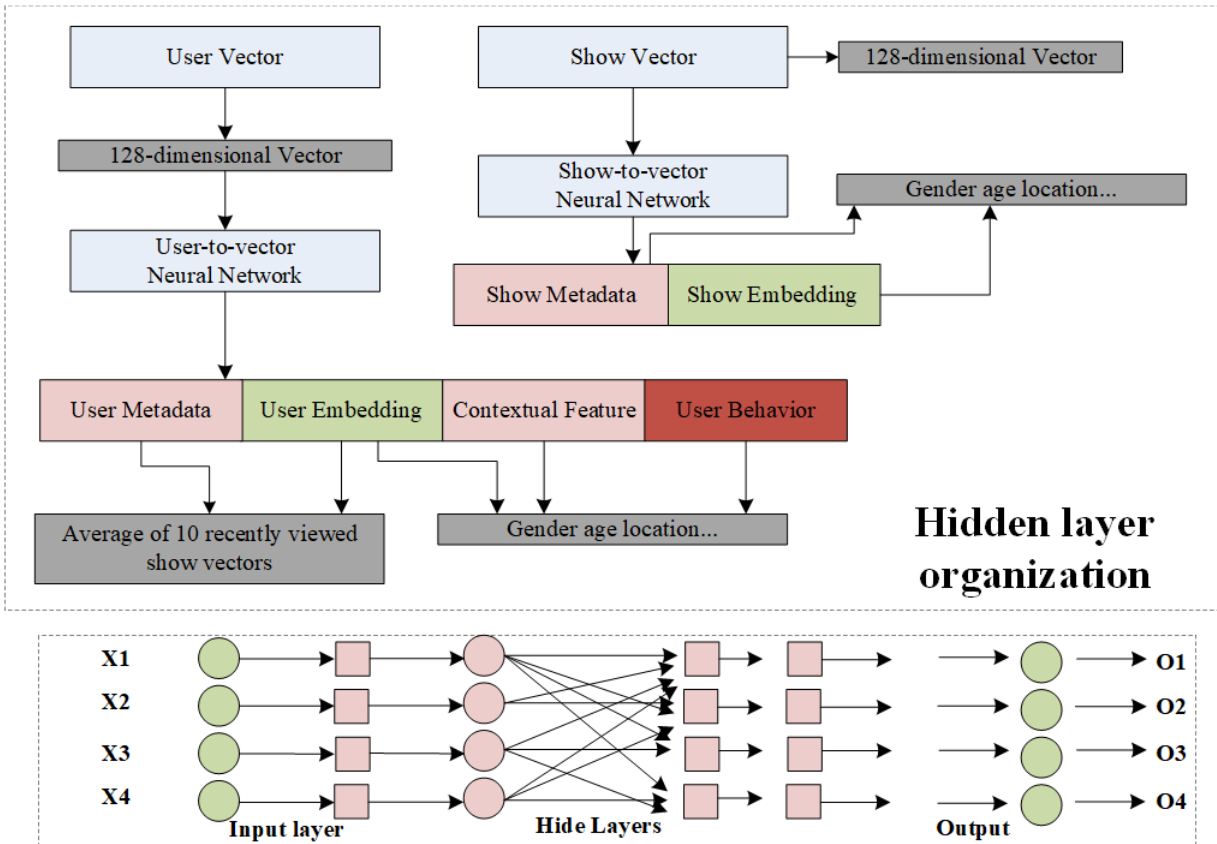
FIGURE 2. Design diagram of neural network model framework.

III. MAIN PROPOSAL AND DESIGN

In this part, this paper will focus on the construction and analysis of digital media optimization and visual data analysis model based on neural network, and the corresponding design idea diagram is shown in Figure 1. It can be seen from the figure that the main design includes neural network algorithm design, non-material design, interactive design, multi-dimensional design and other design ideas. The corresponding neural network design is mainly based on neural network algorithm for training, data preprocessing and intelligent operation selection; The corresponding dematerialized design mainly takes the computer or personal intelligent terminal as the information transmission carrier in the dematerialized design language.

With the change of the communication mode, the communication media has expanded the scope of information visualization design with the ultimate goal of information communication. From the original traditional media communication mode to the new media we are now exposed to and applied to, new information visualization design fields have emerged - interactive interface design, advertising, multimedia design, etc. These new design forms are innovative, At the same time, the traditional printing design has more abundant language forms and expression methods in

the process of information transmission; The corresponding interactive design integrates the new design field of digital media technology, artistic aesthetics, and human-computer integration. It focuses on the perception of the public psychology, as well as the quality of the communication effect and the influence of the communication in the process of information communication and exchange. The change and development of the times have promoted the change of the media environment, resulting in new media, which has also given birth to information visualization design.

Digital interactive design not only brings new information dissemination mode and artistic aesthetic experience to information visualization design, but more importantly, the participation and acceptance of the public in the process of information dissemination and communication. Design thinking has fundamentally changed, It ensures that the public can obtain and receive information in a more humane way; The corresponding multi-dimensional design is mainly the non-linear frame structure in the media; On the other hand, it refers to the digital media creation platform based on nonlinear frame structure, which provides a virtual three-dimensional space thinking mode for people to design and create.
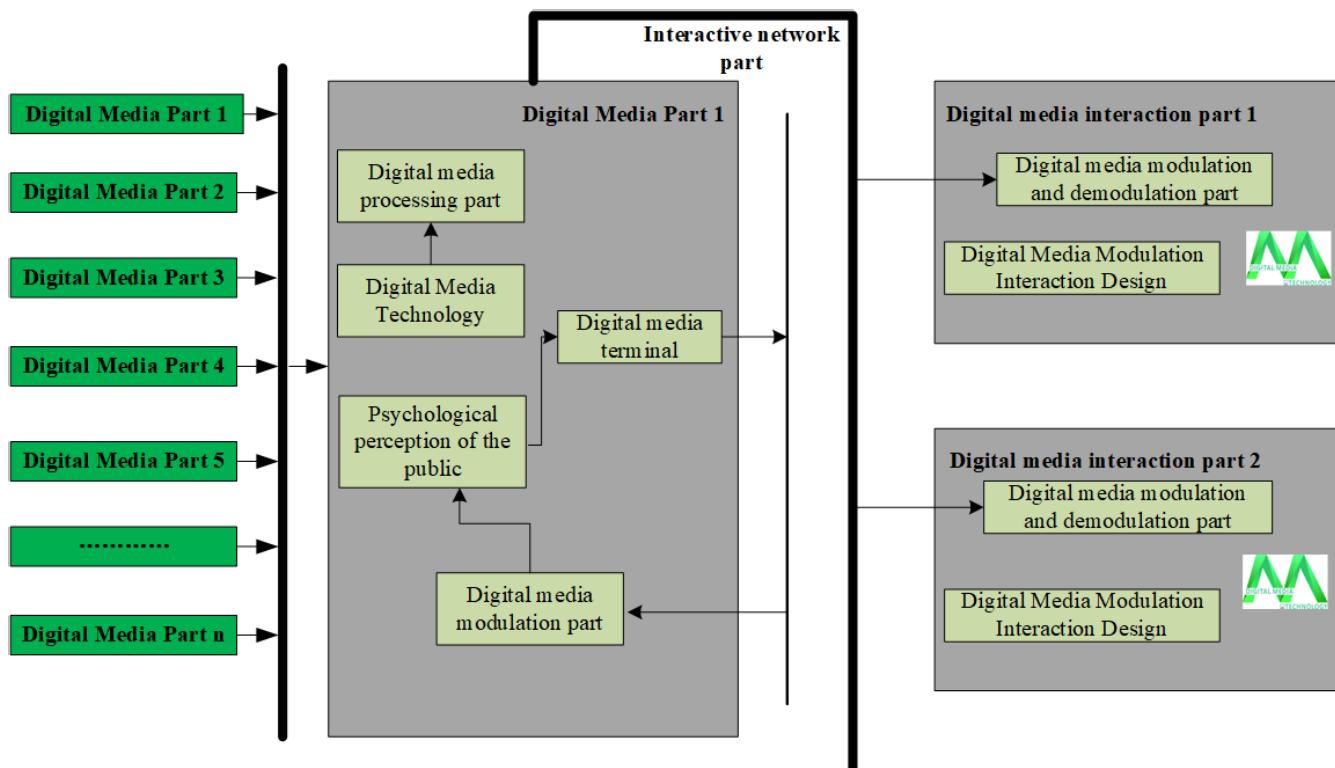
FIGURE 3. Interactive design case and framework flow chart.

A. DIGITAL MEDIA OPTIMIZATION AND VISUAL DATA DESIGN

In this part, we mainly analyze and discuss several key ideas such as neural network algorithm design, non-material design, interactive design and multi-dimensional design. At the corresponding neural network design level, it is mainly based on the neural network algorithm for training, data preprocessing and intelligent operation selection. The corresponding neural network model framework design diagram is shown in Figure 2, from which we can see the flow chart of the algorithm proposed in this paper. The corresponding dematerialized design level is mainly based on the changes in the media environment. The dematerialized design and application have been presented in people's daily life and psychological acceptance level. In fact, it also reflects a new value concept and new design environment in the current society. Now what we call design has gone from satisfying the basic functions to stimulating the later commercial art, and then to the dematerialization The qualitative leap of human culture means that information visualization design has had a more profound impact on people.

At the corresponding interactive design level, this paper mainly integrates the new design field of digital media technology, art aesthetics, and human-computer integration. It focuses on the psychological perception of the public, as well as the quality of the communication effect and the influence of the communication in the process of information dissemination and communication. The change and development of the times have promoted the change of the media environment, resulting in new media, which has also given birth to information visualization design. Digital interactive design not only brings new information dissemination mode and artistic aesthetic experience to information visualization design, but more importantly, the participation and acceptance of the public in the process of information dissemination and communication. Design thinking has fundamentally changed, It ensures that the public can obtain and receive information in a more humane way. The corresponding interactive design framework is shown in Figure 3, from which we can see the advantages of this paper in the interactive design level.

At the corresponding multidimensional design level, the traditional media is a one-way linear communication mode in the information communication design thinking process. People only need to organize reasonable language and images within a limited range of specified areas. The emergence of new media makes people take a non-linear thinking mode to consider design. The innovation and openness of this design idea put forward higher requirements, The uncertainty of virtual space also adds difficulty to the design. At present, information visualization design has gradually developed into a new discipline that integrates multiple disciplines. The field
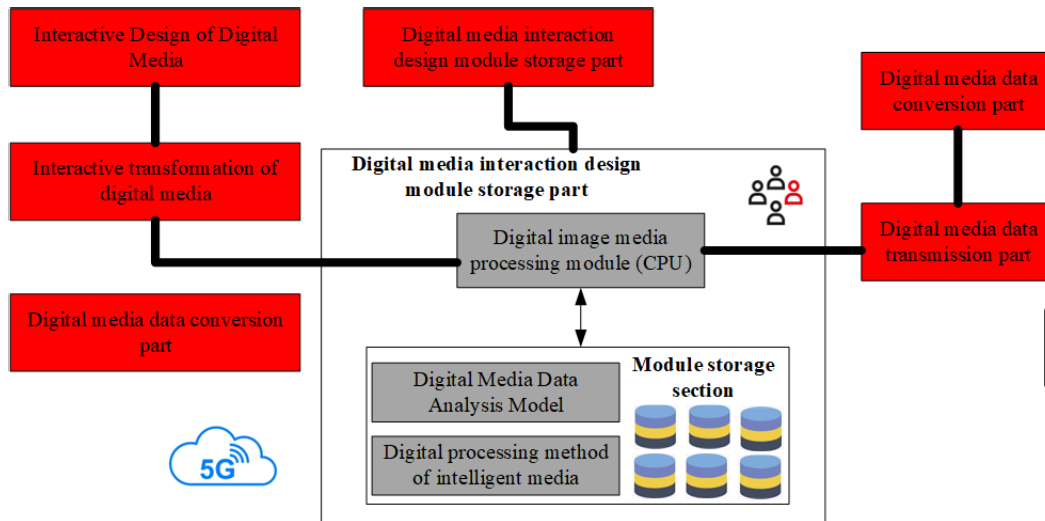
FIGURE 4. Frame diagram of interactive image processing model.

of information design and communication also includes such cross media and cross discipline fields as animation, film and television, mass art aesthetics and psychological cognition. It uses multi-dimensional thinking mode to rethink and design a characteristic information communication language that is more adaptive and satisfying people's desire.

B. INFORMATION VISUALIZATION DESIGN

Based on the above analysis and research, the application of digital media optimization and visual data analysis model for information visualization design based on neural network algorithm is mainly included in the following contents, which is also the benchmark for modeling in this paper. First, the processing of the corresponding dynamic image, the visual design formed in the three-dimensional space, that is, the four-dimensional space in general, when the dynamic image is processed, that is, the constantly changing information transmission image in the motion state, generally includes the following main factors: reference, sense of space, direction and speed of movement. Dynamic image is one of the important forms of information visualization design in information communication. Its language form and information visualization not only include the characteristics of general graphic design, but also have the special form of motion. With the rapid development of new media technology, dynamic images have developed into design elements with strong expressive force, which are mainly applied in the field of new media communication, such as interactive advertising, dynamic icons, electronic reading, and the publicity packaging of some TV columns.

Based on the wide application of dynamic images in the field of new media, it has formed a new information communication art form with its own characteristics. Compared with static information communication and graphic design,

dynamic images can better attract the attention of the public, and use new media technology to add shape, color When the size and other changes, it can well bring the public visual experience with rhythm and dynamic sense, so as to more comprehensively feel the aesthetic experience and emotional communication brought by the dynamic. Based on this, the corresponding frame diagram of dynamic image processing model is shown in Figure 4. The dynamic image in the new media is a combination of computer technology, information technology and information visualization design. It is a typical scientific and technological product, which has changed the extent of people's acceptance of information and their aesthetic experience of information. The information becomes vivid and easier to be accepted and understood by the public due to the dynamic way of expression in the process of communication. For the future development of dynamic image, we should develop in a distinctive and personalized way, so that the design style of information communication can be diversified, which can better meet people's increasingly new visual psychology, bring the public a better and more comprehensive visual experience and enjoyment, so as to greatly enrich the influence and appeal of information in the communication process and the final effect.

At the corresponding level of dynamic text design, dynamic text design generally refers to the design and innovation of moving text and text in the display screen. It is different from static graphic design in that it gives the public a sense of space and time, which is also the biggest feature of dynamic text design. In the process of information transmission and movement, we should not only consider the font selection and font shape design that it has as the text itself, but also consider the visibility of the text and the music that the background matches. These factors occupy a very important influence option, If we need to control the
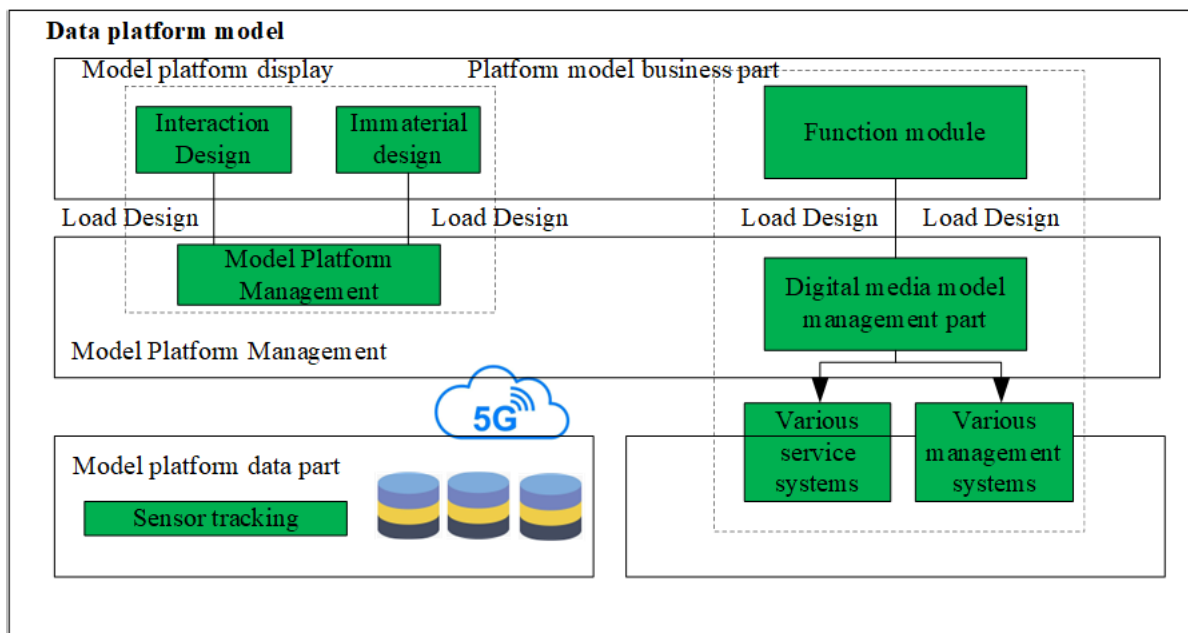
FIGURE 5. Model framework of digital media optimization and visual data design based on neural network algorithm.

intensity or weakness of the information to be expressed in dynamic texts, the space, tone and color between texts can be displayed dynamically, which can also control the reading speed and reading effect of the public when receiving similar information.

IV. CASE STUDY

Through the above analysis, the corresponding model of digital media optimization and visual data design based on neural network algorithm is shown in Figure 5 below. It can be seen from Figure 5 that the system platform is reconfigurable, reusable and extensible. The corresponding Figure 5 shows the partial presentation of digital media products and the loading and management of websites. The business modules are interconnected with other modules. Using service-oriented architecture, local or remote services can be called through service management. The corresponding data part in the model is the basis of the entire platform, which stores and classifies digital media resources. The experimental data utilized in this paper is a specifically collected image set which are related to several kinds of contents, including sights, animals, persons, buildings, etc. There are totally 1500 images inside the dataset, and these images were collected from the Internet. The role of such dataset has two aspects in this paper. On the one hand, it can be used to testify working performance of the prototype designed in this paper. On the other hand, it can be used to testify processing performance of the algorithm embedded inside the designed framework.

It can be seen from the corresponding Figure 5 that the corresponding system model architecture design has the following characteristics: each functional module of the
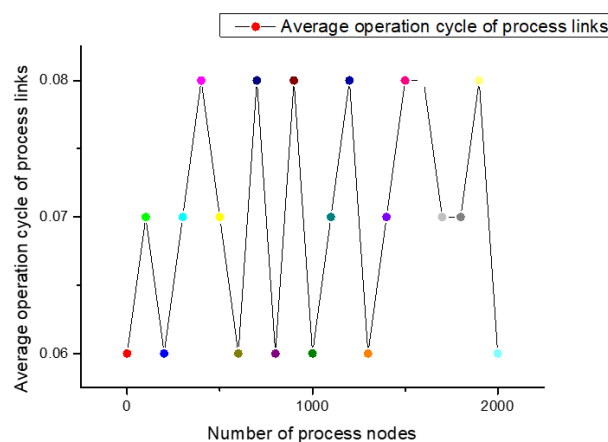

FIGURE 6. Average operation cycle of process link.

digital media resources involved is encapsulated into each service, which includes business functions and system service information. The collaborative production platform of digital media resources built with service-oriented architecture makes each independent service different and interrelated. The outside world does not need to care about the execution of the service, but only needs to find the corresponding interface to care about the execution result. The service interface is shielded by the service registration system. In the whole system, it is not necessary to care whether the service is called locally or remotely, or what mechanism or protocol is used to realize the connection. In terms of the development tools and environment of the system, Apache Tomcat is used

as the Web service platform. With its advantages of open source, it can better realize the system functions. The development environment uses Eclipse and JDK, and the database uses MySQL. The corresponding system presentation layer is presented in Jsp and Html. When designing, first draw a design sketch according to the requirements; Secondly, the system prototype is designed to show the prototype with low fidelity design; Thirdly, write code and make system interface diagram; Finally, according to the principles of ergonomics, the user's operating habits are studied for refinement and modification.

Considering that this system belongs to the category of content management and asset management, during the design, more attention is paid to the convenient operation of business, and no in-depth exploration is made on the beautiful interface and appearance. AJAX technology is used in the design to operate various data through the interface exposed by the server in the service bus, so as to achieve a good separation of business logic and business presentation. The corresponding presentation layer includes the visualization interface for workflow monitoring and configuration, digital media visualization program interface, progress control and display interface, etc. The workflow graphical interface is the core part of the workflow engine, which can provide rich graphical elements for users to operate. For each creator who needs to submit a digital media file and a quick view of the file, users can easily find and retrieve the required digital media resource information through the quick view. Monitoring the progress of digital media projects, including graphical display of sub task progress, provides decision makers with decision-making basis.

Based on the above design, carry out model comparison experiments. For 10 process instances of digital media, test 100 to 1000 process nodes, record the flow time of the process when the process is flowing, and calculate the average flow cycle, as shown in Figure 6. It can be seen that the average operation cycle of the process is about 0.07 seconds, which can well meet the needs of users of the digital media collaborative production platform. For the throughput test of the system model, the number of instances increases in turn. Each thread of the system controls the corresponding process flow. When the process flows, record the start and end time, and finally get the average level of the cycle. The throughput test of the digital media collaborative production platform is shown in Figure 7. When the number of process instances reaches about 400, the average circulation cycle is about 0.2 seconds, which can meet customer needs.

The use of digital media collaborative production platform shows that the platform can greatly shorten the production cycle and improve production efficiency. Compared with the traditional system development method and this system development method, the performance of the system is evaluated through the calculation and analysis of the development cycle. The comparison relationship between
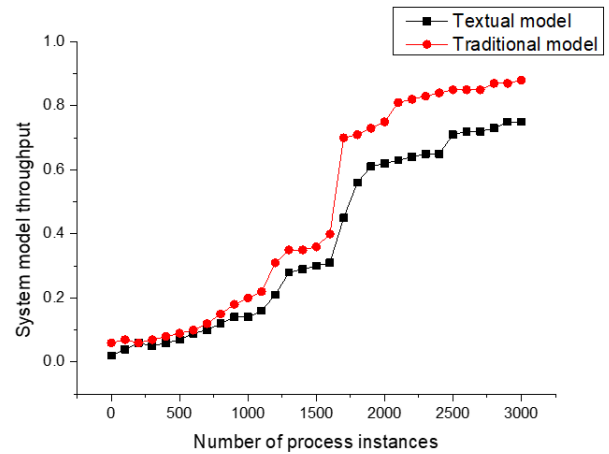

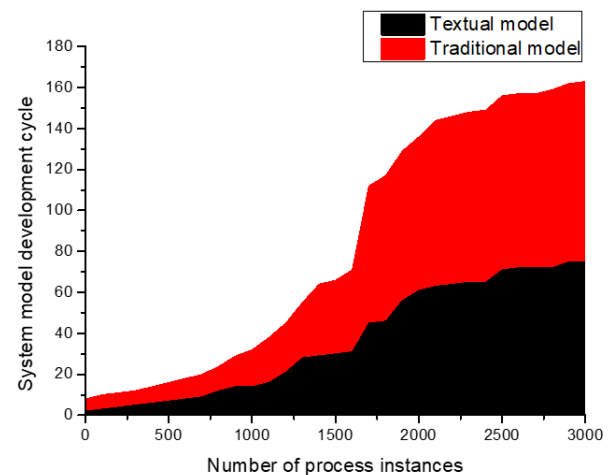**FIGURE 7.** Throughput curve of system model.

FIGURE 8. Comparison diagram of system model development cycle.

the number of process nodes and the development cycle is shown in Figure 8. The relationship between the number of process associations and the development cycle is shown in Figure 9. From these two pictures, we can see that the development cycle of the digital media resource production management platform combined with service-oriented architecture and workflow technology has been significantly shortened. With the increase of the number of process nodes, the traditional development cycle gradually increases, while the development cycle of this system maintains a slow growth rate. Through comparison, it is found that this platform can better meet customer needs and achieve effective use of each module. Through testing, it is found that the digital media collaborative production platform can greatly shorten the production cycle of digital media products and improve production efficiency while satisfying the rapid use of its customers.
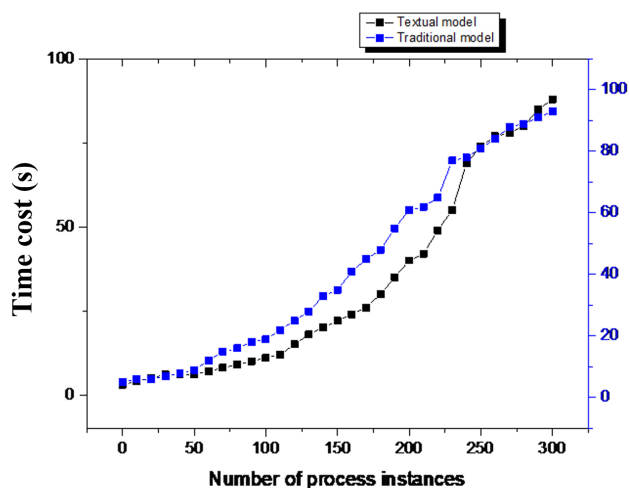
FIGURE 9. Comparison between system process correlation number and development cycle.

As shown in Figure 9, the corresponding interactive art design algorithm based on virtual reality technology under 5G technology proposed in this paper compares with different design algorithms in terms of time cost under the same virtual environment design. It can be seen from Figure 9 that the time cost of the algorithm proposed in this paper is smaller than that of the traditional algorithm based on the same virtual environment and artistic presentation, which reduces the time cost by nearly 35%. However, from the perspective of its actual accuracy, its corresponding accuracy rate is the same. Therefore, in summary, the algorithm proposed in this paper has advantages over traditional algorithms. Based on the analysis of the above test conclusions, according to the test of the business function and performance of the system model, we can know that the performance of the digital media collaborative production platform can meet the needs of current users. The service-oriented architecture of the system makes it possible to research and develop in different places. At the same time, the standardization and unification of workflow greatly improve the production efficiency of digital media resources, and to some extent, solve the problems in the production and management of traditional digital media resources. Through the evaluation of the system performance and system function, the final result reflects well and reaches the initial system requirements, which can be concluded that the system achieves the expected goals.

V. CONCLUSION

This paper mainly analyzes the research status of digital media optimization and visual data analysis model construction based on neural network, as well as the corresponding comparative analysis of advantages and disadvantages. Based on this, the information will be mainly displayed through dynamic or comprehensive media forms, and at the same time, it will be processed and analyzed with the aid of neural network algorithm, so as to achieve the re processing of the carrier of received information, thus breaking the limitations of plane forms. Virtual reality, augmented reality, holographic vision and other hottest emerging digital media forms are rapidly combined with the visual transmission of information, Bring more real information perception and complete "immersion" information experience. The purpose of this study is to clarify the applicable principles and methods of various forms of digital media, different types of information visualization, and communication appeals. Through classification and induction, this paper summarizes the core features of digital media and information visualization, analyzes the advantages of combination, and finds out the positive significance and applicable laws of digital media to solve the bottleneck of information visualization communication.

At the level of actual platform construction, this paper systematically constructed the system block diagram of the digital media optimization and visual data analysis model based on neural network, and based on the corresponding experimental environment, carried out actual verification and comparative analysis on the average operating cycle of its process links, the throughput curve of the system model, the development cycle of the system model, and the number of system process associations and development cycles. The experimental results show that the algorithm in this paper has obvious advantages. In the following research, this paper will pay more attention to the integration and development of related intelligent technology and multimedia technology.

Although there are some progress in current work, some further breakthrough is also required to enhance realistic applications. The future working directions can be summed up from the following two aspects. For one thing, the neural network used in designed framework is with the basic computing structure. However, its performance can be further improved by developing more complex computing structures. This is the first point that can be improved. For another, the embedded algorithm still has some complexity, which may influence running resilience of the designed framework. We will consider how to improve running efficiency of the embedded algorithm to improve running resilience of the proposal, in the future works.

REFERENCES

[1] D. Liu, "Research on the analysis method of digital media art communication based on 3D image recognition," *Displays*, vol. 72, Apr. 2022, Art. no. 102149.

[2] W. Shan, "Digital streaming media distribution and transmission process optimisation based on adaptive recurrent neural network," *Connection Sci.*, vol. 34, no. 1, pp. 1169–1180, Dec. 2022.

[3] S. G. Wardhana and W. Pranowo, "Rock-physics modeling by using particle swarm optimization algorithm," *J. Appl. Geophys.*, vol. 202, Jul. 2022, Art. no. 104683.

[4] G. Jie and A. Chaetnalao, "Design and development of an experimental prototype of Chinese Tang Dynasty tomb murals under the intervention of digital media technology," *Int. J. Arts Technol.*, vol. 14, no. 3, pp. 236–255, 2022.

[5] Z. Guo, K. Yu, N. Kumar, W. Wei, S. Mumtaz, and M. Guizani, "Deep-distributed-learning-based POI recommendation under mobile-edge networks," *IEEE Internet Things J.*, vol. 10, no. 1, pp. 303–317, Jan. 2023.

[6] L. Wang, "Optimization algorithm of digital media sharing platform based on blockchain technology," *Secur. Privacy*, vol. 6, no. 2, p. e205, Mar. 2023.

[7] Z. Guo, K. Yu, A. Jolfaei, G. Li, F. Ding, and A. Beheshti, "Mixed graph neural network-based fake news detection for sustainable vehicular social networks," *IEEE Trans. Intell. Transp. Syst.*, early access, Jul. 7, 2022, doi: 10.1109/TITS.2022.3185013.

[8] K. J. Devi, P. Singh, H. K. Thakkar, and N. Kumar, "Robust and secured watermarking using Ja-Fi optimization for digital image transmission in social media," *Appl. Soft Comput.*, vol. 131, Dec. 2022, Art. no. 109781.

[9] M. Xia and Y. Zhou, "Research on UI design and optimization of digital media based on artificial intelligence," *J. Sensors*, vol. 2022, May 2022, Art. no. 7014070.

[10] E. Corrigan-Kavanagh, D. M. Frohlich, and C. Scarles, "Re-invigorating the photo album: Augmenting printed photobooks with digital media," *Pers. Ubiquitous Comput.*, vol. 27, no. 2, pp. 467–480, Apr. 2023.

[11] A. Li, X. Zhang, and L. Shao, "Practical perception and quality evaluation for teaching of dynamic visual communication design in the context of digital media," *Int. J. Emerg. Technol. Learn.*, vol. 17, no. 9, pp. 37–51, May 2022.

[12] Z. Guo, K. Yu, K. Konstantin, S. Mumtaz, W. Wei, P. Shi, and J. J. P. C. Rodrigues, "Deep collaborative intelligence-driven traffic forecasting in green Internet of Vehicles," *IEEE Trans. Green Commun. Netw.*, vol. 7, no. 2, pp. 1023–1035, Jun. 2023.

[13] L. Charmaraman, A. D. Lynch, A. M. Richer, and J. M. Grossman, "Associations of early social media initiation on digital behaviors and the moderating role of limiting use," *Comput. Hum. Behav.*, vol. 127, Feb. 2022, Art. no. 107053.

[14] S. Dhar and I. Bose, "Victim crisis communication strategy on digital media: A study of the COVID-19 pandemic," *Decis. Support Syst.*, vol. 161, Oct. 2022, Art. no. 113830.

[15] Z. Guo, Y. Shen, S. Wan, W.-L. Shang, and K. Yu, "Hybrid intelligence-driven medical image recognition for remote patient diagnosis in Internet of Medical Things," *IEEE J. Biomed. Health Informat.*, vol. 26, no. 12, pp. 5817–5828, Dec. 2022.

[16] Q. Zhang, Z. Guo, Y. Zhu, P. Vijayakumar, A. Castiglione, and B. B. Gupta, "A deep learning-based fast fake news detection model for cyber-physical social services," *Pattern Recognit. Lett.*, vol. 168, pp. 31–38, Apr. 2023.

[17] Y. Li, Q. Teng, X. He, C. Ren, H. Chen, and J. Feng, "Dictionary optimization and constraint neighbor embedding-based dictionary mapping for superdimension reconstruction of porous media," *Phys. Rev. E, Stat. Phys. Plasmas Fluids Relat. Interdiscip. Top.*, vol. 99, no. 6, Jun. 2019, Art. no. 062134.

[18] X. Xie, Y. Han, A. Anderson, and S. Ribeiro-Navarrete, "Digital platforms and SMEs' business model innovation: Exploring the mediating mechanisms of capability reconfiguration," *Int. J. Inf. Manage.*, vol. 65, Aug. 2022, Art. no. 102513.

[19] S. K. Patil, P. M. Gavali, A. S. Shelar, and S. C. Sagare, "Embedding secret data in digital media using texture synthesis," *Int. J. Softw. Innov.*, vol. 10, no. 1, pp. 1–15, Aug. 2022.

[20] T. Ott and M. Tiozzo, "Digital media ethics: Benefits and challenges in school education," *Int. J. Mobile Blended Learn.*, vol. 14, no. 2, pp. 1–8, Jul. 2022.

[21] Q. Li, L. Liu, Z. Guo, P. Vijayakumar, F. Taghizadeh-Hesary, and K. Yu, "Smart assessment and forecasting framework for healthy development index in urban cities," *Cities*, vol. 131, Dec. 2022, Art. no. 103971.

[22] J. Yang, F. Lin, C. Chakraborty, K. Yu, Z. Guo, A.-T. Nguyen, and J. J. P. C. Rodrigues, "A parallel intelligence-driven resource scheduling scheme for digital twins-based intelligent vehicular systems," *IEEE Trans. Intell. Vehicles*, vol. 8, no. 4, pp. 2770–2785, Apr. 2023.

[23] G.-Z. Wu, Y. Fang, N. A. Kudryashov, Y.-Y. Wang, and C.-Q. Dai, "Prediction of optical solitons using an improved physics-informed neural network method with the conservation law constraint," *Chaos, Solitons Fractals*, vol. 159, Jun. 2022, Art. no. 112143.

[24] J. Xie, S. Zhang, and L. Lin, "Prediction of network public opinion based on bald eagle algorithm optimized radial basis function neural network," *Int. J. Intell. Comput. Cybern.*, vol. 15, no. 2, pp. 260–276, Apr. 2022.

[25] Y. Zhang and X. Luo, "Visual retrieval of digital media image features based on active noise control," *J. Comput. Methods Sci. Eng.*, vol. 22, no. 6, pp. 2107–2120, Dec. 2022.

[26] N. V. Dien, L. T. Son, N. V. Tuan, H. P. Tien, N. D. Vien, N. L. Hung, and N. T. Hung, "Digital back-propagation optimization for high-baudrate single-channel optical fiber transmissions," *Optics Commun.*, vol. 491, Jul. 2021, Art. no. 126913.

[27] S. Li, C. K. Ahn, J. Guo, and Z. Xiang, "Neural-network approximation-based adaptive periodic event-triggered output-feedback control of switched nonlinear systems," *IEEE Trans. Cybern.*, vol. 51, no. 8, pp. 4011–4020, Aug. 2021.

[28] Y. Zhang and K. Wilker, "Artificial intelligence and big data driven digital media design," *J. Intell. Fuzzy Syst.*, vol. 43, no. 4, pp. 4465–4475, Aug. 2022.

[29] Y. Fang, L. Guo, and M. Hou, "Arching effect analysis of granular media based on force chain visualization," *Powder Technol.*, vol. 363, pp. 621–628, Mar. 2020.

[30] S. H. Fairclough and C. Dobbins, "Personal informatics and negative emotions during commuter driving: Effects of data visualization on cardiovascular reactivity & mood," *Int. J. Hum.-Comput. Stud.*, vol. 144, Dec. 2020, Art. no. 102499.

[31] S. Sony, S. Gamage, A. Sadhu, and J. Samarabandu, "Multiclass damage identification in a full-scale bridge using optimally tuned one-dimensional convolutional neural network," *J. Comput. Civil Eng.*, vol. 36, no. 2, Mar. 2022, Art. no. 04021035.

[32] J. Vaughn, D. Kamkhoad, R. J. Shaw, S. L. Docherty, A. P. Subramaniam, and N. Shah, "Seriously ill pediatric patient, parent, and clinician perspectives on visualizing symptom data," *J. Amer. Med. Inform. Assoc.*, vol. 28, no. 7, pp. 1518–1525, Jul. 2021.

XUEPING LEI received the Graduate degree from the Nanjing University of Posts and Telecommunications of Computer Application Technology, in 2013. He is currently a Lecturer with the Changzhou Vocational Institute of Engineering. His research interests include computer vision, the Internet of Things, and digital media technology.

• • •