





Transforming Embedded Systems: Constructing a Deep Learning Environment for Nonlinear Data Analysis in the Creation of an Experiential Composite Bookstore Space Design Model

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Abstract. In the era of global knowledge informatization, the field of education is facing a comprehensive and profound reform. With the reform of educational paradigm, "transformation of teaching methods" and "realization of deep learning" have become the key words of this reform. As a learning paradigm, deep learning is a core topic of general concern in the field of machine learning and learning science. Therefore, in the trend of the deep integration of information technology and education, we use the deep learning environment to improve the learning quality of scholars by designing the learning space of the experiential composite bookstore in the deep learning environment. In order to better analyze the spatial design model of experiential composite bookstore with nonlinear data, using the analysis and research of the design in the deep learning environment can more effectively analyze the spatial design and model construction of experiential composite bookstore with nonlinear data in the deep learning environment. The design of characteristic bookstores has more humanistic feelings, meets readers' reading and spiritual needs, and lays a theoretical foundation for the better development of physical bookstores and characteristic bookstores.

Key words: Deep learning; Nonlinear; Experiential bookstore; Space design; Model construction; Transforming Embedded Systems

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1 INTRODUCTION

Nowadays, young people are facing greater pressure in life. Reading is a good way to decompress. The popularity of online bookstores has made it difficult for physical bookstores in China to "continue their business", and they have sought transformation. In this context, a complex bookstore that integrates catering, cultural innovation, exhibition and other business forms and focuses on creating a unique experience space for consumers came into being. At present, as the main transformation trend of the development of physical bookstores, the number of composite bookstores is very large, and there are differences in scale, style, market positioning and so on. Compared with before, the space design of the new experiential composite Bookstore must adhere to the concept of systematization and full process. Systematization means the design reform of all elements of space, from static learning tools / resources to dynamic participation activities, from concrete learning content to abstract learning logic and participation structure, and the concept and method of deep learning must be infiltrated into the design. However, the design of these elements is not isolated from each other, but organically unified and coupled. The whole process means that the space design needs to reshape the design process, so as to stimulate the guiding force of deep learning, that is, the front end of the deep learning space planning and design of the composite Bookstore should be extended forward. Specifically, the design of in-depth learning space of composite bookstores should highlight cultural characteristics, contextualize the content, closely integrate the content and spatial layout, and effectively improve the efficiency of readers' absorption of book knowledge. The space design of experiential composite Bookstore should break the traditional setting of independent small space, and rely on the open and diversified combination space to meet the personalized and diversified learning needs of readers.

Deep learning is specifically characterized by readers' in-depth thinking, dialogue, understanding and practice. And the in-depth change of scholars. In order to achieve this depth, on the one hand, the design of experiential composite bookstores in the deep learning environment needs to uphold the concepts of continuity, coordination and overall planning. Peng peihuan (2021) with the arrival of the intelligent era, the learning environment has gradually shifted from informatization to intelligence. Deep learning is a learning method in which scholars focus on challenging learning content and devote themselves to the learning process to promote their all-round development [7]. Guided by deep learning, Yang Hui (2020) carried out teaching practice research on how to apply deep learning in a mixed learning environment, pointed out effective strategies to promote deep learning in the design of learning objectives and contents, scholars' pre-evaluation and other aspects, and discussed the practical results with independent samples, providing reference and reference for relevant research and experiments in this field [12]. Wei Zhiyong (2022) and others said that with the rapid development of global information, information data has shown a trend of explosive growth. How to find valuable information from massive data is an urgent problem to be solved. Recommendation system is an effective way to solve this problem, and how to integrate the technology of deep learning into the system is the focus of current research [10]. Liu Tianqi (2017) and others analyzed the space to meet the current psychological needs of readers and the diversified space created by division design through the research on the multi-functional compound business mode of physical bookstores, and guessed the spatial division mode of bookstores in the future [5]. Xing Kong (2022) store takes the stairs as the reading and display area, and the books are neatly stacked on the bookshelves on both sides, with a fresh and natural design. The flexible display space of the bookstore is mainly in the form of stairs. In addition to facilitating customers' access, browsing and reading, it also provides a venue for new book publishing and other activities [8]. Niu Yifan (2019) and others proposed an equipment life prediction model based on nonlinear data fusion and multi-stage degradation to solve the problems of high dimension, nonlinearity and multi-stage degradation of equipment monitoring data [6]. Wang pan (2022) and others started from the "deep learning" theory, trying to solve the low-quality dilemma in school curriculum construction, and found that there is an internal common logic between the deep learning theory and high-quality

school curriculum construction: both of them aim at cultivating students' core literacy, both of them internalize essential knowledge in a variable way, both of them need teachers' presence and guidance, and both of them play the role of continuous evaluation in promoting learning [9]. Xing Fuke (2022) et al. Determined the key factors affecting deep learning through correlation analysis, linear regression analysis, hierarchical regression analysis and regulatory effect analysis of samples. The study found that self-efficacy is the key influencing factor of deep learning, and classroom experience, as a regulating variable, affects deep learning by affecting self-efficacy [11]. Therefore, the design of experiential composite Bookstore should start from the needs of customers, take nonlinear data as the basis, entities as the media, and emerging technologies as the help, and comprehensively consider the experience design in the store.

2 ANALYSIS OF THE CURRENT SITUATION OF NONLINEAR DATA SPACE DESIGN

Machine learning in contemporary society is an important aspect of modern intelligent technology. Research starts from observed data, looking for rules, and using these rules to analyze and predict future data or unobservable data. Nonlinearity refers to the mathematical relationship between variables, not a straight line, but a curve, surface, or uncertain attribute, which is called nonlinearity. Nonlinearity is one of the typical properties of complexity in nature; Compared with linear, nonlinear is closer to the nature of objective things itself, and it is one of the important methods of quantitative research and understanding of complex knowledge. The progress of scientific research, technological innovation and nonlinear design are now widely used in various fields. The development of nonlinear space design is suitable for architectural design, environmental art design, art design theorists and professionals in related fields to provide design ideas. Li Jiaxu (2021) and others are using nonlinearity to analyze the research hotspots and difficulties in the aeroelastic engineering field of aircraft, so as to better solve the safety and performance problems of aircraft [4]. Nonlinearity, which will affect the measurement accuracy of the inclination sensor, can be corrected later, depending on the number of correction points. The more correction points, the better nonlinearity. In this regard, the data values are analyzed according to the comparison between linear and nonlinear, as shown in Figure 1,

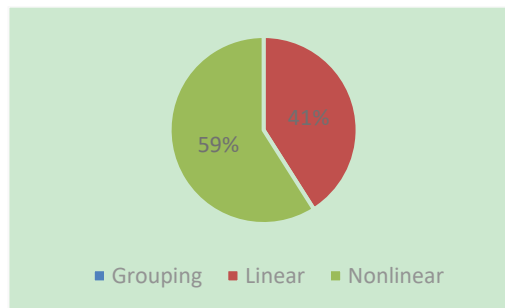


Figure 1: Data comparison between linear and nonlinear.

As shown in Figure 1, it can be seen that nonlinear data values are relatively large and widely used in practical applications, while linear has certain limitations in the scope of use, which is not conducive to the path of long-term development. Guan Peng (2022) and others used nonlinear research to analyze the optimal design of high-performance RF filters. The results show that high-order harmonics are mainly affected by nonlinear elastic effects and contribute the most to nonlinearity [1]. With the promotion of environmental protection, the industrial field advocates low-speed and low-carbon environmental protection. Aiming at the nonlinear problem of the circulating fuel injection volume of the diesel engine fuel system under partial pulse width, Lanci (2021) and

others take the low-speed engine dual valve electronically controlled fuel system as the research object, so as to better study and analyze it [3]. Nonlinearity is well used in both scientific research and chemical physics. In physics, Hu Zixian (2021) and others analyzed and discussed how the optical structure can realize the beam regulation, holographic imaging, optical image encryption and other functions of nonlinear light on the nonlinear optical superstructure surface [2]. It can be seen that the corresponding comparison between the two, nonlinearity has been widely used in all aspects, which is conducive to the development of society, the progress of scientific research and the ability of nonlinear design methods are increasingly valued by people.

3 CONSTRUCTION OF SPATIAL DESIGN MODEL OF NONLINEAR DATA COMPOSITE BOOKSTORE

In the model construction of traditional physical bookstore design, as long as it has strong cultural characteristics and humanistic temperament, it is not only an exhibition hall of human civilization, but also a base of humanistic spirit. While the traditional bookstore design mainly creates a good reading environment and Book Buying environment for dereliction of duty, it also provides the possibility for readers to carry out various cultural activities in it. But now, due to the continuous changes in people's living habits and behavior psychology, their requirements for the material, spiritual and emotional design of the building space of physical bookstores are increasing day by day. The traditional bookstore design and construction is far from meeting the psychological requirements of readers. In this big data environment, it is more necessary to update and create new conceptual design models to meet the changing psychological needs. With the continuous enrichment of mass material culture, the level of mass demand has changed from material demand to spiritual demand, especially in the demand for cultural products. In this regard, new design is used to further sublimate the traditional design concept. In the deep learning environment, the nonlinear data design space is used to build the model. This design concept can more intuitively observe the model that needs to be designed. Compared with the previous design concept, the new design concept is more intuitive and visual. The problems that occur can be changed in time without rework, which wastes time and fails to improve quality, which will lead to dissatisfaction of the demander. There will be some bad influencing factors for enterprises. In this regard, we need to keep up with the pace of information society in order to continue to innovate. The nonlinear design concept can be well applied in all industries. The flow chart of nonlinear design model construction is shown in Figure 2:

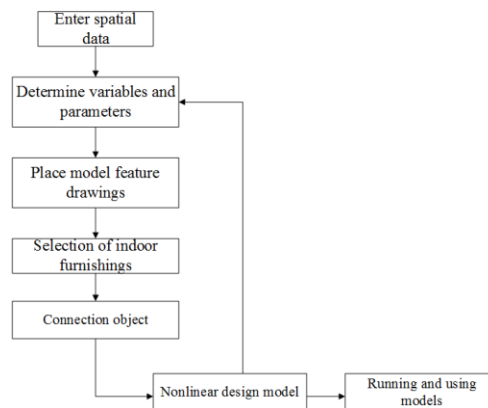


Figure 2: Flow chart of nonlinear design model construction.

As shown in Figure 2, you can clearly see the flow chart of the design. At the beginning, the input spatial data is used to abstract, simplify and assume the determined variables and parameters. After assigning the corresponding variables to the model elements, the corresponding objects are limited and connected according to the required furnishings, and the model is built. If there are problems after the design is built or there are dissatisfied places that need to be changed, you can set variables and parameters again. If there is no problem, the simulation can be run and used. In this way, the design can reduce unnecessary time, shorten the design time, speed up the running time, and solve the waiting time of customers faster. In this regard, the application of nonlinear design has greatly improved the speed of enterprises, and it is also an affirmation of nonlinear design. It plays an important role in space design, whether in bookstore design or architectural design, and promotes the progress and development of technology.

4 EFFECTIVENESS ANALYSIS

4.1 Comparative Analysis of Nonlinear Data Design in Different Environments

In the past design environment, due to the insufficient comprehensive development of scientific research technology and the imperfect informatization technology, there are hidden dangers in technology, which cannot be widely developed and applied in all walks of life. In the environment of incomplete design technology, there are defects in space design factors, which is not conducive to development and design. In today's society, with the rapid development of the Internet, the development of physical stores has been greatly affected. Therefore, bookstores began to carry out more models, and at the same time, they paid attention to the importance of spatial design. In the spirit of taking readers as the center, they put the reading experience first. Now, based on the impact of nonlinear data composite bookstore design on it, it is necessary to use professional analysis and observation methods to study it. Therefore, according to the analysis and comparison of teaching design, structural design, learning support design and space design under two different environments, the following table 1 is obtained.

<i>Grouping</i>	<i>Instructional design</i>	<i>Structural design</i>	<i>Design of learning support</i>	<i>Space design</i>
<i>General environment</i>	48%	50%	45%	40%
<i>Deep learning environment</i>	63%	79%	69%	66%

Table 1: Comparison of nonlinear data design in different environments.

In Table 1, it can be seen that through the comprehensive analysis of the effects of different environments on the design of linear data in the above table, the data values of design factors in the conventional environment are less than 50%, which is not conducive to the long-term development of design, while the design factors in the deep learning environment are more than 60%, which is of certain significance. It is obvious that the overall data in the deep learning environment is more suitable for the design of composite bookstores and more popular with readers. The information conveyed by bookstores can effectively penetrate into people's cognition.

In order to better analyze and compare the design of nonlinear data in different environments, visualize the data in Table 1 and draw Figure 3:

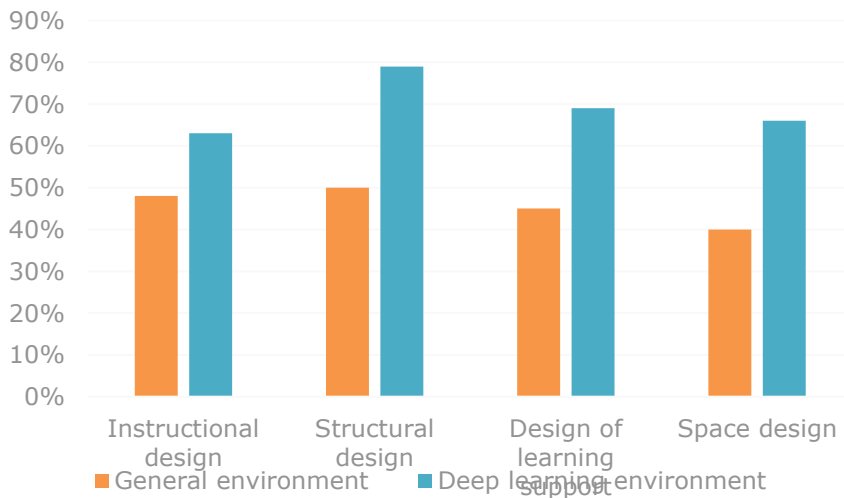


Figure 3: Visual analysis of nonlinear data design in different environments.

As shown in Figure 3, it shows the overall effect visualization of nonlinear data design in different environments. The value of design factors in deep learning environment is much higher than that in conventional learning, which lays a foundation for designing nonlinear data design and is more conducive to the development of enterprises. It is obvious that there is a huge gap between the conventional environment and the deep learning environment. From the overall analysis, it is concluded that the practical value of deep learning is higher and has a greater impact on the bookstore design, which not only improves the reading experience of readers, but also the cultural spirit of slow life is required by fast-paced life, laying a theoretical foundation for the development of the space design of composite bookstores.

4.2 Comparison of Space Design Model Construction in Different Designs

Design is needed in all walks of life, and the design methods required by different industries have different requirements. The model refers to the abstraction or simplification of entities or phenomena in the real world, and it is the expression of important components and interrelations in entities or phenomena. It can be practical and observable, and can clearly observe the model construction. In the conventional design, statistics and planning are carried out for the composite function combination, composite space organization, pedestrian flow line design and the western design of the road environment. In the past design, the technology is limited, and the designed construction model is not detailed enough to meet the requirements of the demander, so the rework back and forth is a kind of psychological torture to the designer and the demander. Nowadays, with the progress of technology and the development of informatization, all industries are improving efficiency, Use the technology of deep learning nonlinear design to build the model, and build the corresponding model of the corresponding space design. Comparing two different design methods for price comparison and analysis, the data obtained are drawn in Table 2 below.

Grouping	Composite function combination	Composite spatial organization	Pedestrian flow line design	Physical environment detail design
Conventional design	43%	48%	53%	49%

<i>Deep learning nonlinear design</i>	72%	65%	73%	68%
<i>t</i>	8.126	9.013	9.364	8.756
<i>p</i>	0.038	0.041	0.046	0.036

Table 2: Comparison of spatial design model construction in different designs.

In Table 2, it can be clearly seen that the factor data value in the conventional design is generally not high, which is about 50%, which has a certain blocking effect on the construction of the model, which is not conducive to the development of the industry and cannot meet the needs of customers. In the process of trading, the success rate is low, which is not conducive to the development of enterprises. The data in the relatively deep learning nonlinear design is more than 60%, which has a significant improvement, and there is a certain upward trend. Whether the enterprise returns customers, it has a certain positive role in improving the success rate, making the construction of the model clearer and easier to meet the requirements of the demander. Using the statistical method of bivariate t-test under SPSS, there was a result of $t < 10.000$ and $p < 0.05$ between the two comparisons of the data. In order to better understand the data comparison between the two designs, figure 4 is drawn according to the data values in Table 2.

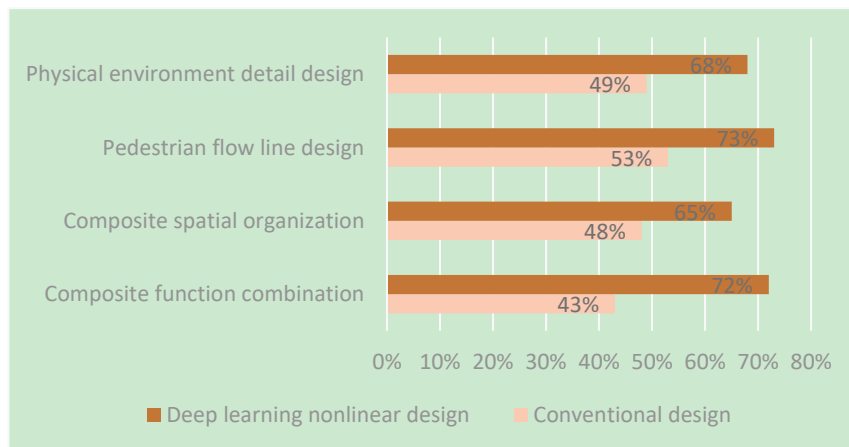


Figure 4: Visual Analysis of Spatial Design Model Construction in Different Designs.

As shown in Figure 4, the overall data in nonlinear design is much higher than that in conventional design, which is of certain research significance. The data value of nonlinear factors is far more than that in conventional design, which is conducive to the development of nonlinear design in future use.

5 SUMMARY

With the increasing frequency of digital learning, relative problems are also gradually emerging. Learners are still in the shallow field of learning level because they do not have deep learning ability. Deep learning is a learning method that effectively solves the fragmentation of knowledge, deeply excavates the connotation of knowledge and its correlation, and it is also an ability that human

beings have in order to better adapt to the competition and challenges of the future society in the information age. This study analyzes the spatial design of experiential composite bookstores based on nonlinear data in the deep learning environment. By analyzing the connotation of deep learning, combined with constructivist learning theory, Situational Cognition Theory, social and cultural theory, it guides the design of learning environment, and specifically puts forward the design ideas and design models of learning environment to promote deep learning, in order to provide reference examples for the majority of composite bookstores, so as to improve Optimize the quality of learning. Embedded systems are computer systems designed to perform specific functions within larger systems or devices. They are often utilized in various fields, including education, to enhance learning experiences and promote deep understanding.

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