

## Retraction

# Retracted: Application of Deep Learning Algorithm in Web Page Advertising Design Style

### Security and Communication Networks

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Manipulated or compromised peer review

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

### References

- [1] Q. Deng, N. Yang, and N. Yang, "Application of Deep Learning Algorithm in Web Page Advertising Design Style," *Security and Communication Networks*, vol. 2022, Article ID 6355098, 9 pages, 2022.

## Research Article

# Application of Deep Learning Algorithm in Web Page Advertising Design Style

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With the development of deep learning algorithm in Internet web pages and customers' demand for web advertising design, different businesses begin to pay attention to web advertising design style. In order to predict and promote the development of web advertising design style, this paper studies the establishment process of web design model based on deep learning algorithm in detail. With the application of this model to the web advertising design of different businesses, this paper compares and analyzes the differences of web advertising design styles of different businesses and puts forward corresponding suggestions on web advertising design styles, which promotes the diversified development of web advertising design styles to a certain extent and has a good application effect.

## 1. Introduction

With the progress of the national economy, the superior level of residents' life gradually tends to be stable and the increase of per capita income, and there must be a higher demand for the quality of life, including the spiritual demand for material aesthetics, which finally stimulates the development of design [1].

For contemporary people's life, the penetration rate of the Internet is higher and higher, and the relationship between people is also closer and closer. E-commerce has driven the emerging logistics industry, reduced the demand for social work, and provided job opportunities for more people. But at the same time, the traditional way of shopping has suffered great challenges. If you choose to open a physical store offline, high costs such as rent, wages, and expenses among manufacturers cannot be avoided. Therefore, when the pricing goods are considered, the gap between the final selling prices will not be large. For businesses on e-commerce websites, the cost has been greatly reduced, and their pricing will be much lower than that of physical stores [2]. At the same time, more preferential forms can be

considered. Therefore, for prices lower than those in physical stores, consumers will spend their money on online shopping to a great extent. Moreover, the long time-consuming offline shopping, limited product types, and unnecessary energy and financial resources have greatly prompted consumers to choose online shopping. However, the shopping mode of the Internet is mostly completed in an untouchable space, which is relatively lack of direct sensory cognition.

If it is an offline shopping mall, people can have a direct experience of color of the product and the size of the product. These direct feelings improve the customer experience and further stimulate consumption. However, these direct contacts are not what e-commerce websites can do [3]. Many people worry about the difference between the size and color of products displayed on the Internet, as well as the quality of products displayed on the Internet. Such concerns can be effectively alleviated or even eliminated offline.

Web shopping has the following advantages: (1) you can fully understand the products you are interested in without going out, such as the appearance, specifications, parameters, functions, and prices of the products. (2) It can

exchange relevant commodities with a large number of netizens who have common interests and hobbies, which is convenient for future use. (3) You can buy many items that are not common in shopping malls. (4) Online shopping can often get more affordable prices and services. However, the web interface is almost the only form for e-commerce to present commodity information. In the face of many advantages of offline shopping, in order to make the online e-commerce web page more competitive, we must carry out visual analysis and advertising design on the e-commerce web interface to form a mature product advertising design style in order to promote sales. For the sales model such as e-commerce, the visual design of e-commerce web pages must be indispensable to capture the attention of more consumers, and the visual design is definitely the first factor to determine the sales volume. Under the background of contemporary network society, good visual design will definitely bring benefits to web pages without harm. Some people even say that for e-commerce vision is sales. Although it is too firm to say so, the poor visual design of e-commerce web pages must greatly affect consumers' judgment and evaluation of things, and further affect the sales volume of web pages or pages [4].

The use of color in web design is a very important element, which affects the design effect of the whole web page. Assuming that there is no content filling in the web page, just the proper use of colors in the web page can attract people's attention. The web page color matching with harmonious collocation and comfortable visual appearance can increase visitors' favor of the website [5].

Text is the only element that transmits information in the original web interface. With the development of technology and the particularity of e-commerce web pages, it is necessary to transmit the specific data of the product and at the same time let the browser have a deeper understanding of the style and shape of the item. Commodity information transmission is a collection of text, images, colors, etc. Text to present the name, price, and other attribute information of the commodity, image to present the appearance information of the commodity, and color can convey the style of the commodity, and the dynamic effect can show the commodity to consumers in the form of multiple pictures in a limited area [3]. Therefore, in order to achieve the diversification of web advertising design style, we must find an appropriate algorithm to optimize the web page.

Algorithms in the general sense are some rules set by humans, and all the machine can do is strictly implement these rules, while machine learning algorithms are essentially algorithms that summarize rules from data without rules. That is to say, the machine learning algorithm does not directly define the rules required by the machine to work, but allows the machine to summarize the rules required for the work by itself, and in the face of different data, it will summarize different rules. It can be said that machine learning algorithms are "teach a man to fish" rather than "give a man a fish." For example, we want the machine to recognize the different facial expressions presented by human beings, but we do not use the location rules of the five senses to directly tell the machine what the expressions are

[6, 7]. The image data allow the machine to summarize the rules of the facial features, facial muscle shape, and other information corresponding to various emotions. The operation process of this algorithm is the process of the machine getting the rules from the data, which is the process of "machine learning."

From the simplest linear regression to the most popular artificial neural networks, they are "learning algorithms," because these algorithms are algorithms that obtain laws from data, and "deep learning algorithms" are a kind of learning algorithms, which can almost replace "artificial neural networks" in practical use [8]. Among them, "depth" is relative to the traditional two- or three-tier artificial neural networks. The number of layers of artificial neural network used in deep learning algorithm is usually hundreds of layers. The breakthrough of the application of artificial neural network in semantic recognition is to achieve the fitting phenomenon of multi-layer neural network by using one-layer artificial neural network. As for whether the learning algorithm with only one layer of artificial neural network is called "deep learning algorithm" is only the problem of name classification, it has no practical significance. The "deep learning" in this paper tends to adopt the view repeatedly emphasized by professor Wu who participated in the creation of the "Google Brain" deep learning project in many speeches; that is, the algorithms with the property of continuously digesting data to improve the numerical solution of optimization problems are called deep learning algorithms [9, 10]. Therefore, even if there is only one layer of artificial neural network algorithm, as long as it has the above properties, it can also be called deep learning algorithm.

All machine learning algorithms, including artificial neural networks, are essentially numerical optimization problems. In other words, there is an objective function. We try to find the value of the independent variable of this function to make the value of the function as small as possible, that is, the problem of finding the minimum value of the function. This objective function is also known as the "model" of this numerical optimization problem. Different problems correspond to different objective functions [11]. In other words, different mathematical models are established. For example, different application problems have different equations listed according to the problems. For different objective functions, there are many methods to find the minimum value of the function. Even if the machine learning algorithm is used to find the minimum value of the function, this learning algorithm also has dozens of categories. Among them, artificial neural network is a more effective method to solve the "pattern recognition" problems such as image recognition, speech recognition, and semantic recognition [12].

There are two steps to do the application problem: the first step is to set up the equation, and the second step is to solve the equation. The problem we are facing now is the problem of making machines understand human words, that is, the problem of semantic recognition. Facing this problem, we must first "set up the equation" (give the objective function) and then "solve the equation" (find the minimum

value of the function) [13]. Among them, the process of finding the minimum value of the function is not limited to artificial neural network, but can be any machine learning algorithm, and the solution process and algorithm implementation of the optimization problem are not the content to be discussed in this paper. This paper will discuss the problem of “setting up equations” or the problem of establishing a mathematical model for the problem. Specifically, it gives the problem of the objective function, and the comparison and correction relationship between the objective function and its optimal solution and the combinatorial category grammar [14].

The deep learning algorithm first finds the objective function and then establishes the problem-solving idea of the objective function, that is, to calculate the conditional probability of one word under the condition of another word. Afterward, judge whether the actual situation of the language in reality is consistent according to the objective function. If not, adjust the value of each word vector in the vocabulary vector table in the objective function, and then judge whether it is better according to the actual situation of the language. So repeatedly, constantly adjust the value of each word vector in the vocabulary vector table in the objective function until it cannot be improved [15].

Zou and Wang [16] use deep learning algorithm to study the color matching problem in web advertising design, which has attracted a large number of customers to visit the website and achieved good results. Sun et al. [17] plan the typesetting problem in web advertising design through combinatorial category algorithm, which gives people a refreshing feeling and promotes the increase of web page visits. Wang et al. [18] design the logo image of web advertising through deep learning algorithm, which achieves the purpose of combining dynamic and static, captures people’s attention, and can better transmit information. For the problem of single rhythm and style in web advertising design, Sykers [19] uses deep learning algorithm to design the advertising style in web pages, beautifies the structure of web pages, and reflects the sales characteristics of different businesses.

In general, based on the deep learning algorithm, this paper studies the functional relationship of the deep learning algorithm in detail and then establishes the design model of the deep learning algorithm. Finally, the deep learning algorithm is applied to different businesses’ web advertising design styles, compares the impact of different design styles on web advertising, and puts forward corresponding measures to promote the improvement and diversified development of web advertising design styles, which is of positive significance.

## 2. Establishment of the Deep Learning Algorithm Design Model

**2.1. Function Analysis of Deep Learning Algorithm.** In the process of deep learning, it is necessary to calculate the characteristics of the learning flow change interval, obtain the flow fluctuation range, and define it as the learning sample of flow change characteristics [20].

In the model space, the flow change interval is defined as  $QN$ , which represents the problems encountered in the process of deep learning and represents the range of deep learning, under which the flow change has a relatively stable confidence. Assuming that the confidence of the initial change coefficient of the flow change interval  $QN$  is  $(1-s)\%$ ,  $a$  and  $o$  represent the minimum critical value and the maximum critical value, respectively. The range value corresponding to  $(1-s)\%$  belongs to the range of confidence value interval. According to the influence of confidence on the fluctuation interval, it is defined as the interval fluctuation judgment index, and then the interval depth coefficient ( $Q_{QNVQ}$ ) and interval judgment square root weight ( $Q_{QNTR}$ ) are obtained, where  $Q_{QNVQ}$  represents the accuracy of the depth learning algorithm and  $Q_{QNTR}$  represents the uniformity of the deep learning algorithm. The corresponding expressions are

$$Q_{QNVQ} = \frac{1}{i} \sum_{n=1}^i v_n, \quad (1)$$

$$Q_{QNTR} = \frac{1}{T} \sqrt{\frac{1}{i} \sum_{n=1}^i (o_n - a_n)^2}, \quad (2)$$

where  $i$  and  $T$  represent the measurement coefficient and peak range of flow interval, respectively.

When the peak value of the measurement interval is within the range of  $[a_n, o_n]$ ,  $v_n = 1$ . Conversely,  $v_n = 0$ . When the global measured values belong to this interval,  $Q_{QNVQ} = 100\%$ .

In order to avoid the disturbance of the flow outside the interval to the internal flow in the calculation process and improve its accuracy, a balance index ( $V_{VEV}$ ) is introduced in the calculation process, which represents the balance and reduces the error, and its equation is

$$V_{VEN} = Q_{QNTE} [1 + \delta(Q_{QNVQ})r^{-Q_{QNVQ} \cdot v}], \quad (3)$$

where  $v$  represents the vector coefficient and  $v$  is the same as the confidence coefficient, which is defined as  $(1-s)$ .

Initial determination coefficient of flow interval,  $\delta(Q_{QNVQ}) = 1$ , when determining the variation characteristics of the fluctuation range;  $\delta(Q_{QNVQ})$  is a step function, which represents the fluctuation law in the calculation process of the deep learning algorithm and reflects the error of the algorithm; that is

$$\delta(Q_{QNVQ}) = \begin{cases} 0, & Q_{QNVQ} \geq v \\ 1, & Q_{QNVQ} < v \end{cases} \quad (4)$$

According to the above equation, combined with the equilibrium index  $V_{VEV}$ , a characteristic sample value  $Q_{QNISE}$  that uniquely satisfies the equilibrium index can be obtained in the defined interval  $QN$ ,  $Q_{QNISE}$  reflects the correlation between the equilibrium index and the step function, which is of great significance, and its expression is

$$Q_{\text{QNISE}} = \frac{1}{iT} \sum_{n=1}^i (v_n - a_n). \quad (5)$$

Replace the traffic change characteristic learning samples of the advertising design calculated above into the deep learning algorithm to update the traffic estimation coefficient. The implementation steps are shown in Figure 1. The specific implementation steps are as follows.

**2.1.1. Estimation Coefficient Status Confirmation.** In the deep learning algorithm, the core learning characteristic coefficients correspond to all traffic estimation states in the space, and the data states to be updated are determined according to the differences between different traffic characteristics and learning characteristic data. Firstly, all traffic packets in the data layer are defined as  $Q$ , and the corresponding interaction state traffic node is  $q_n$  so that its initial sending point is, the link forwarding node contained in the data receiving end point is, and the network is open. Assuming that the total number of traffic nodes in the traffic packet is  $I$ , the total number of node traffic corresponding to single-point transceiver is  $I \times I$ . If the dimension matrix corresponding to the quantity traffic set is  $d$ , the traffic corresponding to its constituent elements can be expressed, and the total traffic from the traffic sending node to the link forwarding node in unit time is

$$d = \begin{bmatrix} f_{I1} & f_{II} \\ f_{I1} & f_{II} \end{bmatrix}. \quad (6)$$

**2.1.2. Estimation Coefficient Correction.** When confirming the estimation coefficient, the difference between the flow characteristics and the learning characteristic data will cause some errors to the estimation coefficient, which will affect the accuracy of the deep learning algorithm. Therefore, the estimation coefficient needs to be modified. Define the weighted value of the link estimation coefficient corresponding to the traffic  $n$  of the adjacent node and the random traffic node  $k$  as  $e_{nk}$ , and then the weighted coefficient vector corresponding to any traffic node  $n$  located at the position of  $z$  traffic nodes can be expressed as

$$E_n = (e_{n1}, e_{n2}, \dots, e_{nz}). \quad (7)$$

If the correction coefficient  $s$  is defined as the weighted value set of global flow interaction coefficient  $(E_1, E_2, \dots, E_I)$ , the corresponding correction coefficient vector can be described as  $s = (E_1, E_2, \dots, E_I)$ .

**2.1.3. Constraint Substitution.** According to the above operations, replace the original estimated constraint index with  $\text{fras}_n$ , and then

$$t = \sum_{n=1}^Q \frac{\text{fras}_n}{Q}. \quad (8)$$

**2.1.4. Estimated Output.** The updated network estimation mode is actor network, and the calculation formula of the

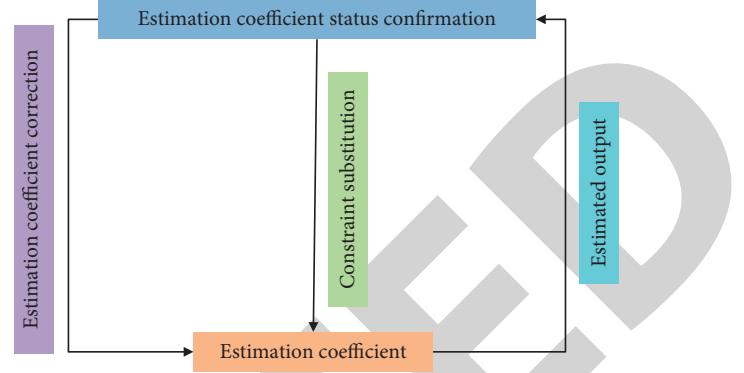


FIGURE 1: Implementation process of updating advertising traffic estimation coefficient.

mean square error of the corresponding traffic transmission estimation is

$$\text{loss} = \frac{1}{I} \sum_n [u_n - W(d_n, s_n)]^2, \quad (9)$$

where loss is the mean square error of traffic transmission estimation, which reflects the error of deep learning algorithm.  $I$  represents the error tolerance of the estimation coefficient, and  $u_n$  represents the corresponding value of the output coefficient  $W$  of the estimation. Considering the convergence of the estimated output, the gradient normalization calculation method in deep learning is adopted in the estimated output process. It is assumed that there is  $z$  associated estimated traffic in node  $n$ , and the traffic packet corresponding to effective estimated traffic node  $n$  passes through  $z$  effective estimated traffic forwarding nodes after data update. The weighting vector corresponding to estimated traffic node  $n$  is shown in equation (7). Then, the estimated output formula for estimating the corresponding flow estimation coefficient of node  $n$  is

$$Q_{nl} = \frac{1/e_{nl}}{\sum_{k=1}^z 1/e_{nk}}. \quad (10)$$

$Q_{nl}$  is the estimated output value corresponding to the estimation node, which represents the estimation rate of the deep learning algorithm, and can better reflect the accuracy advantage of the deep learning algorithm.

Similarly, for different web page designs, the total number of global traffic nodes  $n$  passes through  $z$  estimated forwarding nodes and the corresponding output formula when the update estimation coefficient is  $q$ ; that is, the estimation formula after updating the estimation coefficient is

$$Q_{nw} = \frac{1/e_{nw}}{\sum_{k=1}^i 1/e_{nk}}. \quad (11)$$

**2.2. Deep Learning Algorithm Design Model Construction.** Based on the above deep learning algorithm, according to the problem of insufficient attraction in the process of web advertising design, a model of design before construction is

established; that is, the web advertising is investigated and analyzed first, the existing problems are found out, and the deep learning algorithm is used for optimization, so as to obtain the optimized web advertising design style. The specific model diagram based on deep learning algorithm is shown in Figure 2.

### 3. Experimental Results and Analysis

**3.1. Logo Design Analysis.** The role of logo for web pages is like a person’s business card. Behind the exquisite logo, there must be a professional and exquisite website, which plays the role of the finishing touch. A good commercial web advertising logo will not only show the taste of e-commerce, but also reflect the style and culture of the business. The logo is extremely important for e-commerce web pages. Logo has the effect of identifying and promoting the company in communication. A good logo can make consumers pay attention to the company itself and related web pages. The logo in the network can not only represent a web page, but also represent a module in the web page. At the same time, it can also be used as a graphic sign for the website to link with other websites. When a user enters a web interface for the first time, the e-commerce website logo undoubtedly enters the user’s sight first. At this time, if the logo does not attract the viewer’s attention, the interface may not leave any impression on the user. On the contrary, if the logo of an e-commerce website is very attractive, people will easily remember the logo and website, which can increase the transaction volume of the e-commerce website. Therefore, as the most important part of e-commerce web design, the website logo should be the most common and important part of the web page. It is not only a combination of pictures and words, but also a standard visual symbol tailored for the website according to the specific web page type and style, after grasping the web page rhythm and considering the type of web page users.

Figure 3 shows the change of attraction value of logo with different advertising designs between web pages over time based on deep learning algorithm. It can be seen that the attraction value of advertising design logos on Taobao and JD.com websites fluctuates up and down with the increase of time, and their change trend is the same, but the attraction value of Taobao logo is high. The attractiveness of the advertising design logo on Alibaba’s web page does not change significantly with time, and the fluctuation is small. The attractiveness value of advertising design logo on Meituan’s web page was relatively stable in the early stage and then showed a downward trend with the increase of time. The main reason is that the logo design style on the website of each business is different, and the popularity of the public is also different. As we all know, Taobao has the highest usage rate, followed by Jingdong. Therefore, in order to better improve the attractiveness of advertising design on the web page, we should vigorously publicize the business brand, and at the same time, we should also adopt innovative ways to keep up with the needs of customers and keep pace with the times, so as to contribute to the diversification and development of web advertising.

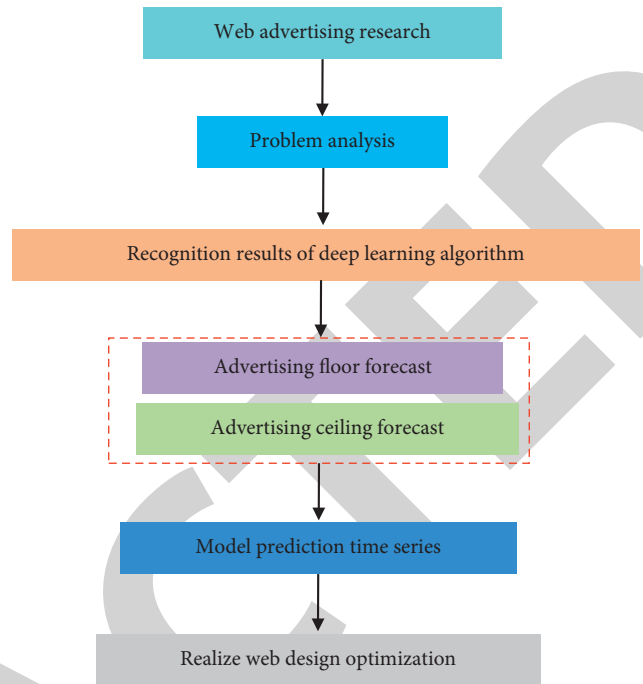


FIGURE 2: Design model based on deep learning algorithm.

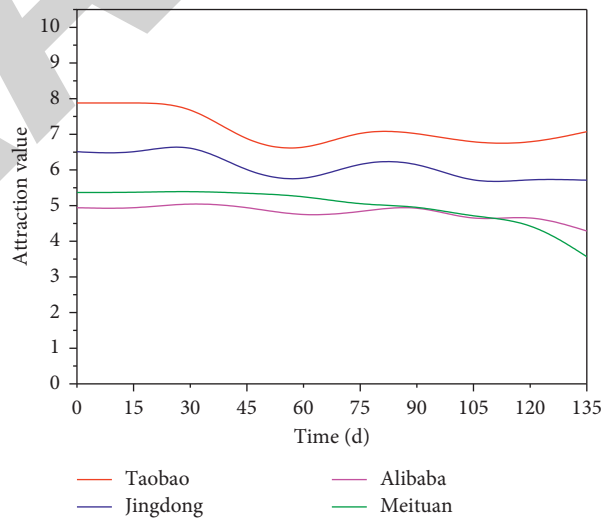


FIGURE 3: The change of attraction value of logo with different advertising designs between web pages over time based on deep learning algorithm.

**3.2. Basic Text Comparison.** Although with the maturity of e-commerce and the improvement of Internet technology, there are more abundant elements on web pages, text is still an indispensable carrier. Websites lacking text will not provide users with the most comfortable and convenient feeling. Text can appear anywhere in the e-commerce web interface, whether it is the home page, product introduction, or navigation. The function of text is not only a written language, but also an additional function to convey culture and enhance the aesthetic value of the web interface. As for the main functions of words in e-commerce websites, we not

only need these words to accurately and effectively convey commodity information, but also need to deeply consider the overall visual effect of words, whether they meet the characteristics of e-commerce websites, and whether the appeal of website pages can meet the requirements of visitors. The text in the web page should meet the following requirements: first, the text should be clearly visible and easy to identify. Consumers are looking for simplicity, directness, and convenience through the Internet. A good e-commerce web page will certainly give consumers a clean and convenient initial visual impression. This is achieved by using accurate fonts and font sizes, which will not only be targeted at consumers, but also give the store a comfortable use experience. Larger fonts can be used for e-commerce web page titles. When there are differences in font sizes on the same web page interface, it will increase the vitality of e-commerce web pages and not be too rigid. Secondly, the text in the e-commerce web page must be easy to read. The text layout and layout are very important for the viewer's visual experience. We can design from the line spacing, word spacing, or text arrangement. The loose text layout gives people a relaxed and comfortable visual experience. On the contrary, too compact page layout will make visitors feel too hurried and crowded. For e-commerce websites, shopping is a leisure thing, and visitors do not need to be in a hurry, so they should try to make the text spacing and line spacing not too narrow, so that the page loses its due interest. Finally, the text design in the web page is generally light and heavy. On the premise of not affecting the overall web page style, more appropriately changed text will make the web page interface more rhythmic and vibrant. The same applies to e-commerce web design, such as thickening, framing, underlining, and changing text style to enhance the visual effect.

Figure 4 shows the language proportional rate of different advertising designs between web pages based on deep learning algorithm. Chinese accounts for the highest proportion of advertising design in Taobao website, followed by bilingual composed of Chinese and English. The proportion of English in Jingdong's web advertising design is the highest, followed by Chinese. The advertising design in Alibaba's website is composed of Chinese and English, with bilingual accounting for the highest proportion, followed by Chinese. In Meituan's website, the proportion of bilingual advertising composed of Chinese and English is the highest, and the proportion of English is the lowest. The main reason is that each business has a different popularity and different service objects. Taobao has the highest popularity in China, with Chinese buyers accounting for the vast majority, while JD has a large market abroad, so the use rate of English is the highest. Alibaba and Meituan are well known at home and abroad, so bilingual composed of Chinese and English accounts for the highest proportion, followed by Chinese. Therefore, in order to change the language proportion of different advertising designs between different business web pages, we should according to the domestic and international development of the merchants conduct on-the-spot investigation, seek truth from facts, clarify the service objects of the merchants, keep up with the trend of the times, and adopt a combination of multiple languages to achieve the

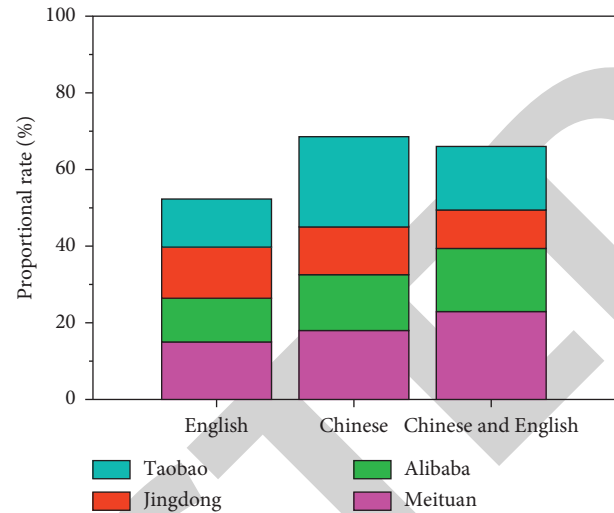


FIGURE 4: Language proportional rate of different advertising designs between web pages based on deep learning algorithm.

purpose of web advertising design and publicity, so as to achieve the uniform application of language and the visual development of business.

**3.3. Label Design.** For e-commerce web pages, the name, data, pictures, and other information of goods are presented in a limited space, and the pages should be orderly and concise, which shows the importance of labels. It can shorten the page length without reducing the amount of web interface information and make the information not affect the reading efficiency due to too dense distribution. In the design of e-commerce web pages, vertical labels need to be used instead of multiple rows of horizontal labels, which not only saves space, but also is relatively beautiful; if there is a structural relationship between label contents, labels can be grouped in the design, and menus can be designed as drop-down menus or color groups in different groups; if there are differences in the importance or relevance of labels, you can mainly display the most important labels and then add the "other more" option; if the label contents of e-commerce web pages are at the same level, the design can be improved from the perspective of the label bar, such as adding left and right mobile buttons to allow users to slide or drag with the mouse. The label is divided into two parts, the label area and the content area. Labels are divided into selected labels and unselected labels. Generally, the color of selected labels is clearly distinguished from the background color of unselected labels, with high discrimination. There should be a specific connection between the title words in the label area. There should be no contrast or parallel relationship between the information. The title words should also be short and concise. The content area is an overlapping area. The content of each layer is displayed alternately, which not only arranges the information, but also displays a large amount of content in a limited space. The information can be presented in words or signs as shown in the figure below, but the layout must be neat and uniform.

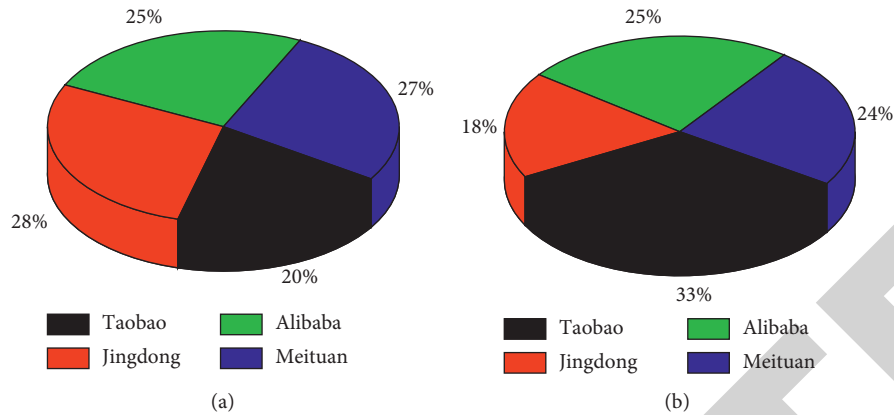


FIGURE 5: Design of different labels between web pages based on deep learning algorithm. (a) Vertical label. (b) Horizontal label.

Design of different labels between web pages based on deep learning algorithm is shown in Figure 5. It can be seen that for vertical labels, JD and Meituan have similar proportions of web page vertical label design, ranking in the top two, while Taobao has the lowest proportion of vertical labels in web page advertising design. On the contrary, Taobao mainly uses horizontal labels in web advertising design, followed by Alibaba and Meituan, and finally Jingdong. The main reason may be the difference in the popularity of businesses and people's habits. Taobao is the largest online shopping platform in China. People tend to browse. With horizontal labels, it is easy to read. Therefore, there are differences in labels in web advertising design of different businesses.

**3.4. Multilevel Navigation Design Style.** Web navigation refers to the use of specific scientific and technological methods to establish a path for web visitors, so that they can more intuitively and concisely find the content or items they want. The early navigation menu basically adopts the horizontal top display, and the sidebar menu will be a new trend this year. Navigation has a long application history. At first, it is only applied to computer applications and then gradually applied to social media websites. Web page navigation is based on the structure of web page columns to provide users with necessary operation and information prompt system. There are three kinds of web navigation: primary navigation, secondary navigation, and bread crumb navigation. The main navigation is usually used at the top of the page header or below the banner, which can easily guide customers to quickly find the information area. The secondary navigation is usually located on both sides of the website. When customers need to enter different columns of the same level, they can quickly enter through the secondary navigation. Bread crumb navigation is a navigation about location. Its function is to make customers know their specific location subjectively. It is a navigation type that displays the detailed location of visitors in the website or network application.

Top horizontal bar navigation is a popular design type of website navigation nowadays. It is generally seen in the main navigation design of web pages and mostly exists above or below the web logo at the top of the page. For e-commerce

websites with too complicated information, this navigation is the most common, because it can make users operate more easily and comfortably. There are several forms of secondary navigation, such as drawer navigation. By default, the navigation menu is not displayed at all. It will be opened only when the mouse touches the specified icon. When the mouse slides over one of the columns, the content of its second layer will continue to expand, providing users with a clear operation path. This navigation is the most suitable for e-commerce web pages, which not only saves the already tight and limited web space, but also points out the operation path to users.

The simulation value of design style of web page navigation based on deep learning algorithm is shown in Figure 6. It can be seen that the navigation in the web advertising design of different businesses is different, but the simulation value of bread crumb navigation is the largest and the simulation value of main navigation is the lowest. The largest changes in navigation in web advertising design are Taobao, Jingdong, Alibaba, and Meituan from high to low. Therefore, when designing a different web advertising, we should fully consider the navigation popularity of each business. In addition, several principles should be followed: first, try to use primary classification to make users more aware of information. The current category in the main navigation should be highlighted. Secondly, in the navigation design, try to reduce the difficulty of mouse operation. Finally, what we need to do is to inform the customer of the current location; that is, it is time to talk about our bread crumb navigation design. The biggest advantage of bread crumb navigation is to help customers identify and judge the best scheme of their current position, so its design must be easy to identify. Then, we can start from the color of text, the thickness of font, the size of font, and so on, which is greatly different from other text in the web page. Only by adjusting measures to local conditions and adopting different navigation design methods according to different businesses, can we better promote the diversified development of web design.

**3.5. Customer Satisfaction Survey.** The existence of web forms is necessary, but in actual operation, it is often a weakness for designers and customers. With the



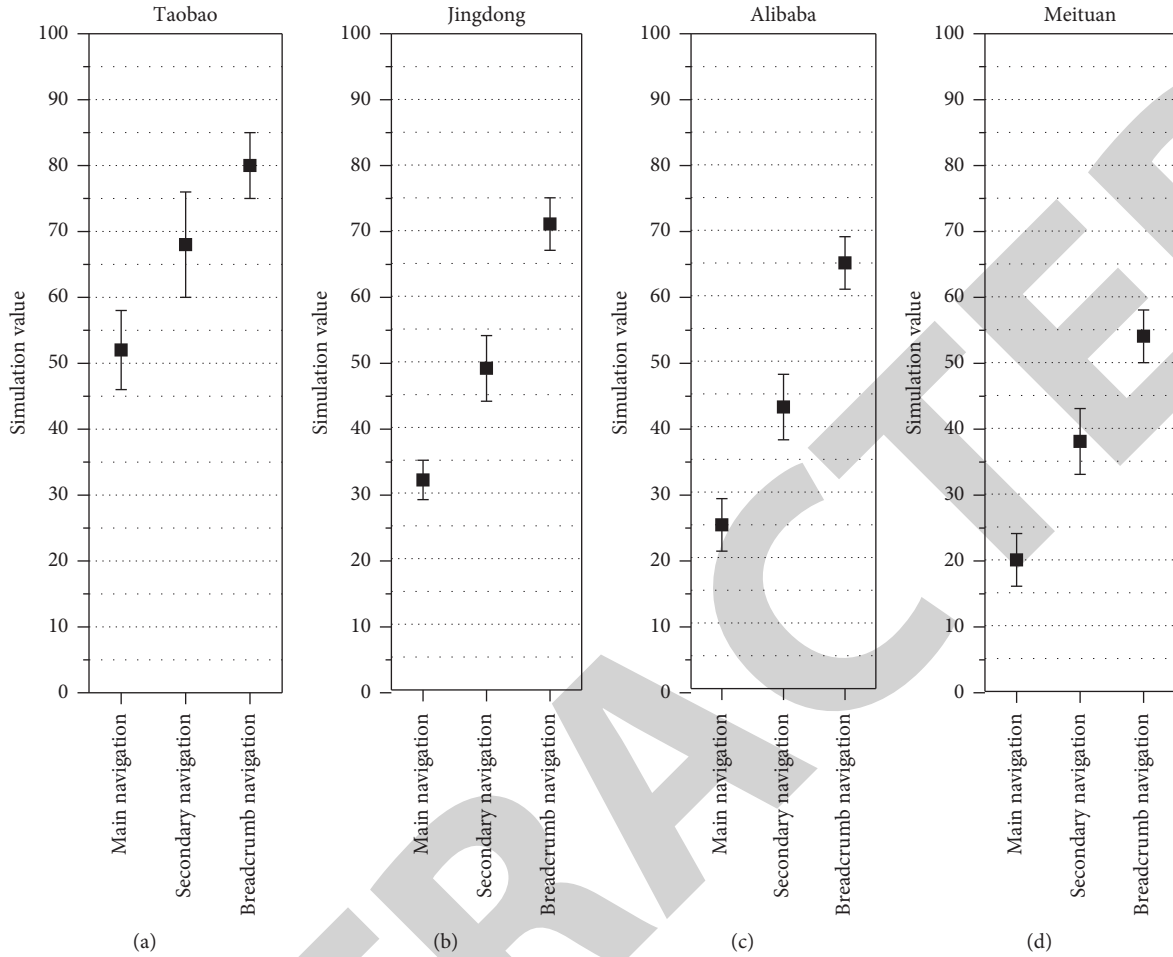


FIGURE 6: Simulation value of design style of web page navigation based on deep learning algorithm. (a) Taobao. (b) Jingdong. (c) Alibaba. (d) Meituan.

development of society and the passage of time, users' expectations and rigid needs are getting higher and higher. What style should the form look like and how to run. Some people say that web design is a combination of modern art and technology. In the process of design, first look at whether the color of the whole page is coordinated or not, and whether it gives people a bad feeling; secondly, we need to see whether the text shape design on the web page is convenient for users, look at the size and number of pictures in the web page again, and whether the interaction function is perfect; finally, look at the dynamic and static collocation of web pages. Not using dynamic effects will make the web interface lifeless. On the contrary, excessive use will make people dazzling and aesthetic fatigue.

Figure 7 shows the satisfaction rate of web advertising design based on deep learning algorithm. It can be seen from this that the satisfaction rate of people with web advertising design of different businesses varies little, ranging from 65% to 85%. Among them, people have the highest satisfaction with the advertising design of Taobao web page, followed by Jingdong web page, and Alibaba web page has the lowest satisfaction with the advertising design. However, although the advertising design satisfaction rate of Meituan's website is higher than the average of Alibaba's website, people's

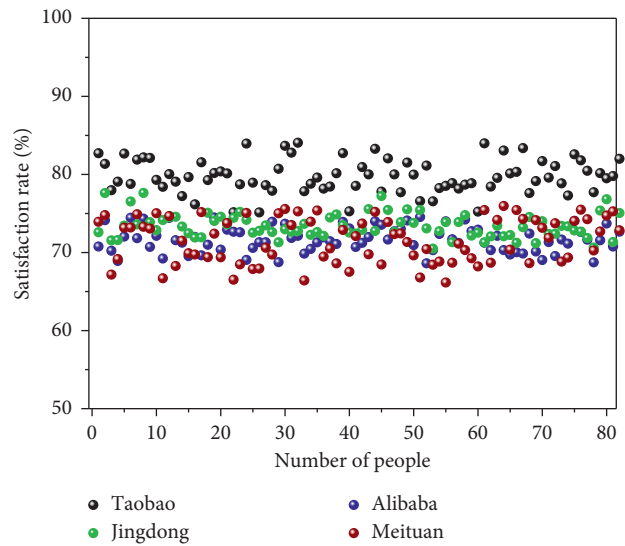


FIGURE 7: Satisfaction rate of web advertising design based on deep learning algorithm.

satisfaction rate is relatively scattered, which needs attention and improvement. In general, the deep learning algorithm can predict and analyze the web advertising design of

different businesses and has achieved a good satisfaction rate. In addition, in order to improve the satisfaction of users in different web advertising designs, we should carefully analyze the factors that cause the difference of user satisfaction according to the satisfaction results, and tailor the remedy to the case according to the problems, so as to achieve the purpose of improving user satisfaction.

#### 4. Conclusion

For the simplification problem in web advertising design, this paper studies the function of the algorithm in detail based on the deep learning algorithm and establishes the web design model based on the deep learning algorithm. Then, the web design model based on deep learning algorithm is applied to the web advertising design of different businesses, which has a good prediction effect on the web design style of businesses, and puts forward the countermeasures of web advertising design according to the characteristics of businesses, which has a certain positive significance. In general, this paper provides a certain guiding significance for the diversified development of web advertising design style.

#### Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

#### Conflicts of Interest

The authors declared that they have no conflicts of interest regarding this work.

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