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Retraction

Retracted: Discrete Dynamic Modeling Analysis of Rural Revitalization and Ecotourism Sustainable Prediction Based on Big Data

Discrete Dynamics in Nature and Society

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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] Y. Tang, "Discrete Dynamic Modeling Analysis of Rural Revitalization and Ecotourism Sustainable Prediction Based on Big Data," *Discrete Dynamics in Nature and Society*, vol. 2022, Article ID 9158905, 9 pages, 2022.

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Research Article

Discrete Dynamic Modeling Analysis of Rural Revitalization and Ecotourism Sustainable Prediction Based on Big Data

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With the development of modern rural tourism, it has become people's spiritual demand to deeply tap the characteristic rural culture and continuously enhance the attraction of rural tourism. However, due to the complex tourism market environment, small changes in factors will affect the final result. Therefore, traditional methods cannot accurately predict the future tourism market. In view of this situation, this paper uses the mathematical algorithm of BP neural network to simulate the structure of brain neural network to deal with this kind of nonlinear relationship problem. Through the classification of complex and changeable factors, the modeling is completed systematically, and finally the effective prediction results are obtained. For the analysis of the time evolution of tourism resources development, it can be found from the policy development theory that the innovative development presents the characteristics of S-shaped curve in time; that is, the number adopted in the initial stage of development is less, then enters the rapid development period, and finally develops slowly. This study will help to solve the primary problem of balancing the positive and negative effects of rural tourism development and realizing the sustainable development of coastal villages.

1. Introduction

As the industrial revolution has driven the innovation and progress of various industries, and after decades of development, the level of economy and culture in the society has now reached a certain height [1]. However, in contradiction to the development and prosperity of the human economy and culture, the natural ecological environment has also been severely damaged [2]. There are a great many ecological problems, such as the global warming, biodiversity loss, and freshwater pollution, which not only cause great economic losses to the society, but also seriously threaten the human being's own survival and health [3]. Now more and more people recognize the importance of a healthy ecological environment to human beings and pay more and more attention to ecological protection [4]. However, the spiritual and cultural needs emerge after tourism has certain height of social development. The protection of ecological environment is also very obvious in the tourism industry and different from the previous tourism development which only focuses on economic benefits [5]. The development of ecotourism has been more and more in recent years due to the increasing demand for ecotourism [6]. Although the development of ecotourism is popular, there are also obvious flaws [7]. The lack of relevant experience in ecotourism management and the lack of detailed planning for tourism development have seriously hindered the development of the industry [8]. Therefore, it is necessary to make relevant analysis on the ecotourism industry and predict the demand for tourism and the law of tourism, so as to make a better plan for the development of ecotourism [9]. The research of ecotourism market based on BP neural network can make a good prediction of tourism demand, effectively optimize tourism planning, and promote the healthy development of ecotourism [10].

Nowadays, rural ecotourism is urging rural development and is a useful way to build a new socialist countryside in the new era. The origin and start of rural tourism are the result of

people's pursuit of higher cultural needs. In our country, the development of rural economy directly affects the healthy and sustainable development of a harmonious socialist society, while rural tourism is the product of rural construction and tourism development in the new era [11]. Frequent exchanges between urban and rural areas, coupled with the lack of effective control of the corresponding town planning, have led to the phenomenon of fake urbanization in coastal towns and villages [12]. The original architectural features and characteristic landscapes in villages have been severely damaged and destroyed, and the ecological environment has further deteriorated [13]. Rural areas have more environmental resources than cities, so optimizing the environment is more attractive to citizens living in cities [14]. The substantial improvement of the rural living environment, the revolutionary changes in the form of agricultural industry, and the general improvement of the quality of farmers themselves, especially the increasingly perfect infrastructure in urban and rural areas, have gradually enabled the rural areas to undertake the leisure and sightseeing of urban residents [15]. At present, there is no uniform and universally applicable standard for the division of coastal areas in the world, and the definition of coastal areas is therefore different, which directly leads to the diversification of the concept of coastal tourism, and its research perspectives are also different [16]. With the increasing number of visitors to coastal villages, the role of tourism in economic development in the economic development of towns is becoming more and more important and obvious, and its advantages become more and more obvious over time [17]. Balancing the positive and negative impacts of rural tourism development will be the primary issue for coastal rural tourism communities to achieve sustainable development [18].

In this paper, the mathematical algorithm of BP neural network is used to simulate the structure of brain neural network to deal with nonlinear relationship problems. Through the classification of complex and changeable factors, the modeling is completed systematically, and finally the effective prediction results are obtained. This paper is divided into five parts. The first part expounds the research background of the development of rural tourism. The second part expounds the contents of current relevant research. The third part describes the research methods, including BP neural network algorithm and gray prediction algorithm. Finally, the results are analyzed and discussed.

2. State of the Art

Until now, there have been more than seventy years since the research conducted by some scholars on BP neural networks in the 40s of the last century [19]. After years of development, the BP neural network can be seen in many industries. From its birth to the present, there are basically the following development processes.

In the 1940s, W.S. McCulloch and W. Pitts were inspired by the behavior of nerve cells. For the first time, the basic mathematical model of neural networks, that is, the M-P model, was proposed, and the neural network algorithm was formally born. Subsequently, after several years of development, the Hebb researchers trained the neural network algorithm by the connection strength of network nodes, that is, the Hebb algorithm, and the idea laid the rudiment of modern training algorithm. Then, in the 50s, Lin et al. improved the M-P model, added the learning function, and then created a model of the perceptual machine, which made the neural network theory rise to a new level [20]. At the same time, the neural network algorithm was also introduced into various practical projects, which played a very crucial role in promoting its practical application and accelerated its development and perfection. Due to its very good processing ability for text recognition, voice recognition, and so on, the research of neural network entered the peak. However, due to the limited manufacturing process in the electronics industry at that time, neural network could not fulfill its potential well and could not handle the problem very well. After that, its research was at low ebb in many decades [21]. This situation continued until the 80s; Rumelhart and Mccleland proposed back propagation training algorithm based on multilayer perceptron, that is, BP neural network algorithm [22]. This not only greatly enriches the neural network theory, but also makes its application field become very broad, so that the neural network theory has the development peak of a new round. Subsequently, neural network models suitable for various practical situations emerge endlessly, and they have very deep application in image processing, auxiliary decision-making, and other fields [23].

Rural tourism is a small flow product with high cultural content and strong experience. The core of the product is culture and people, and the essence is cultural experience rural leisure "green vacation." As a tourist cultural resource, rural landscape is not only extremely scarce, but also very fragile. In the era of mass tourism, rural tourism has gained absolute advantages in development and competition, but it has also fallen into a pattern of homogenization. The development of rural tourism can stimulate local farmers' sense of identity and pride in rural culture to the greatest extent, thus realizing the inheritance and protection of rural culture from the perspective of protecting the whole rural cultural space [24]. Tourism lifestyle is increasingly respected by residents, and the public's love for rural tourism is also showing a new normal. In tourism development, the protection of residential buildings and the maintenance of natural ecology and historical and cultural atmosphere must be placed in the top priority. In the development of rural tourism, due to the failure to properly handle the relationship between tourism development and the protection of traditional culture, the original attributes and historical memory of the countryside are gradually disappearing, the simple and humane cultural factors are gradually eroded by the values of profit-seeking, and excellent folk culture, especially a large number of intangible cultural heritage, is on the verge of extinction. Under certain environmental conditions, the culture will react on the original environment, make it change, create a new environment, and further differentiate the culture. The popularity of self-help tourism has increased significantly. At the same time, the routes, projects, and categories of rural tourism also reflect diversification and personalization [25].

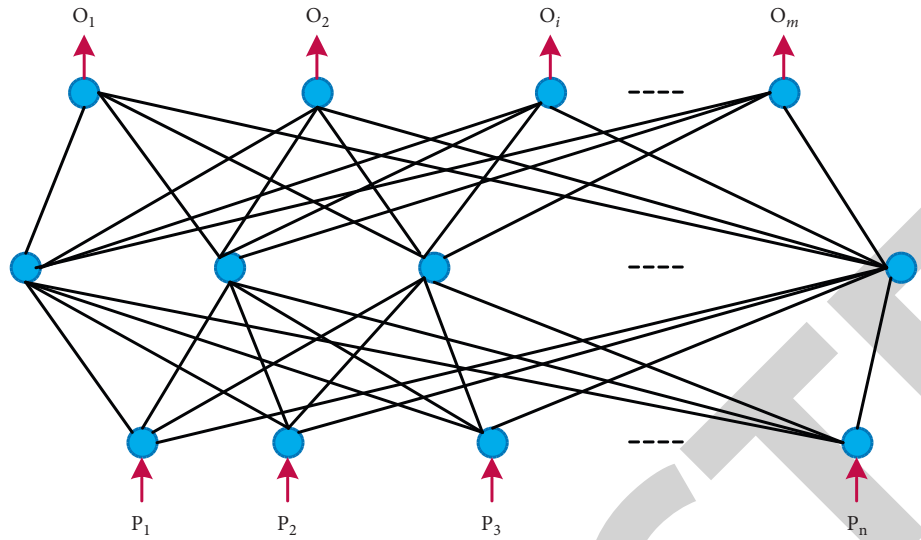

Figure 1: BP neural network model diagram.

Rural culture is the most distinctive brand image in the development of rural tourism, but under the strong trend of commercial operation, the inheritance and protection of the original ecological rural culture have been challenged. For the development of rural tourism, in order to meet the tourists' psychology of seeking novelty, the tourist destination is eager for quick success and instant benefits and even blindly caters to the tourists. It transplants and imitates some rural cultural features at will, which makes the rural culture lose the cultural heritage it relies on to survive, and the stage is obvious. Rural landscape tourism development is different from general rural tourism. We should not only pay attention to the protection of ancient buildings and the maintenance of natural and human environment, but also create tourism culture brand through cultural creativity. The protection of rural landscape is not only about architecture and architectural style. In order to make rural tourism sustainable development, operators should build a complete tourism industry chain based on cultural background and break through the bottleneck of ticket economy. In the new normal, the rural tourism industry will integrate online and offline resources and activities and make full use of big data analysis tools to provide more intelligent rural tourism for the public.

3. Methodology

3.1. BP Neural Network Algorithm. Multiple neurons are interconnected to form a neural network, which can simulate the reaction of the biological nervous system to the real-life things, and people can also conduct targeted training through the sample of the external parameters. The neural network can memory the training without relying on other fixed algorithms, can summarize the best solution to deal with this kind of events from the training results, and summarize the algorithm to deal with the calculation and understand the rules existing in the data. It is because of this nature of neural network algorithms that makes it well-suited to dealing with things with complicated causal relationships and many unpredictable effects. Through the use of very rich data in event, BP neural network training is conducted, so that the statistical analysis of such events is realized, and the final result is obtained. BP neural network model is shown in Figure 1.

The learning of BP neural network algorithm is composed of two steps, namely, forward propagation of signal and error reverse propagation. The former deals with the event at the input layer, and then the next stage is the reverse propagation of error. The error is dealt with in a specific way and returned to the input layer again, and the signal is equally distributed to each unit; thus, the error of the unit is obtained, according to the error situation, the error correction scheme is obtained, and the process is repeated, so that the weights are corrected; this is the learning process of the neural network. This correction or learning process will continue until the result of the calculation has reached an acceptable level or reaches the previously set number of studies. BP network is a network structure formed by the interleaving of input layer and output layer and other units; this allows the input layer and the output layer to establish its nonlinear relationship and greatly expand its use in the field, so that the output result is no longer between -1 and 1. BP algorithm needs a lot of learning and constantly modifies the processing rules, the core of which is to input a large number of learning samples to the algorithm, continuously challenge processing methods through the continuous error reverse transmission, and ultimately achieve the results consistent with expectations. Specific steps are as follows: (1) initialization: the connection weights $[w]$, $[v]$ and the thresholds θ_i, r_t are randomly given; (2) the given input and output modes are used to calculate the output of the hidden layer and the output layer; (3) new connection weights and thresholds are calculated; (4) return the step by selecting the next input pattern; (5) after repeated training, the error reaches the requirement.

First of all, the BP neural network model needs to be initialized. Each connection weights are given a random number in the interval (−1, 1), the error function e is set, the calculation precision and the maximum number of learnings are given, and the k-th input sample and the corresponding expected output are randomly selected.

$$d_0(k) = \left(d_1(k), d_2(k), \cdots, d_q(k)\right),$$
$$x(k) = \left(x_1(k), x_2(k), \cdots, x_n(k)\right). \tag{1}$$

The input and output of each neuron in the hidden layer and the partial derivatives $\delta_o(k)a$ of the neurons of the output layer by the error function using the network expected output and the actual output are calculated. The connection weight of the hidden layer to the output layer, the $\delta_o(k)$ of the output layer, and the output of the hidden layer are used to calculate the partial derivative $\delta_h(k)$ of the error function for each neuron in the hidden layer. $\delta_o(k)$ of each neuron in the output layer and each neuron in the hidden layer are used to correct the connection weights $w_{ho}(k)$. $\delta_h(k)$ of each neuron in the hidden layer and each neuron in the input layer are used to correct the connection weights. Global error is calculated as follows:

$$E = \frac{1}{2m}\sum_{k=1}^{m}\sum_{o=1}^{q}\left(d_o(k) - y_0(k)\right)^2. \tag{2}$$

The error is verified to see if it meets the planning requirements. The algorithm can be stopped when the error has been reduced to the planned range, or the number of training has reached a predetermined number of times. Otherwise, restarting the next round of algorithmic training is needed.

3.2. Gray Prediction GM (1, 1) Algorithm. Gray prediction algorithm is directly compared to a prediction algorithm in the gray field between the white field and the black field. In fact, the principle of gray prediction algorithm is to directly assume the world's information into two different types: one is known information, and another is unknown information. Through in-depth study and analysis of a particular law existing in the known information, the prediction rule of the unknown information can be obtained to predict the unknown information within a certain range. Therefore, the key of the gray prediction algorithm is its research on the rule relevance between the known information and the unknown information. In general, in the specific study, the data predicted by the gray prediction algorithm is basically random and disorderly. Therefore, it is necessary to define the gray forecast orderly so as to achieve the fundamental purpose of accurately predicting the unknown data. At present, the gray forecasting methods mainly include the following types. (1) Gray time series forecasting: the algorithm model directly constructs the gray forecasting model based on the time series of the specific target to be predicted, and the model is applied to make accurate predictions for the unknown data at a certain time in the future. (2) Distortion prediction: the algorithm model mainly considers that the gray prediction algorithm is prone to predict abnormal values in the process of prediction. Therefore, the model directly optimizes the distortion data in the gray prediction algorithm to predict accurately the unknown data at a certain point in the future. (3) System prediction: the algorithm model is mainly to predict the change of coordination relationship among many variables in the system through the establishment of the gray prediction model with a global concept. (4) Topology prediction: the algorithm mainly constructs the curve of the original data; based on the curve drawing, the mathematical formula is used to accurately determine the possible value at a particular time point; then, these different values are formed into an ordered time series, and then the model is established to predict the time of the value. The establishment steps of gray prediction GM (1, 1) model are as follows.

First of all, before the gray prediction GM (1, 1) model is established, its original time sequences are processed sequentially, and columns are generated.

$$X^{(0)} = \left\{X^{(0)}(1), X^{(0)}(2), X^{(0)}(3), \ldots X^{(0)}(n)\right\},$$
$$\lambda(t) = \frac{X^{(0)}(t-1)}{X^{(0)}(t)}, \quad t = 2, 3, \cdots, n. \tag{3}$$

The GM (1, 1) model can be established, and gray prediction can be carried out if most of the class ratios are in the coverage area $(e^{-2/(n+1)}, e^{2/(n+1)})$. Otherwise, the data is properly preprocessed.

After preprocessing, the data is accumulated and generated. That is, the first data of the original sequence is taken as the first data of the generated column, and the second data of the original sequence is added to the first data of the original sequence and taken as the second data of the generated column. According to this rule, generated columns can be obtained. According to $X^{(1)}(k) = \sum_{n=1}^{k} X^{(0)}(n)$, a new series can be obtained.

$$X^{(1)} = \left\{X^{(1)}(1), X^{(1)}(2), X^{(1)}(3), \ldots X^{(1)}(n)\right\}. \tag{4}$$

The a in the formula is the gray number, and the u is the endogenous control gray number.

If $Y_n = [X^{(0)}(2), X^{(0)}(3), \ldots, X^{(0)}(n)]^T$, $\widehat{\alpha}$ is parameter vector to be estimated:$\widehat{\alpha} = \begin{pmatrix} a \\ u \end{pmatrix}$,

$$B = \begin{bmatrix} -\frac{1}{2}\left(X^{(1)}(1) + X^{(1)}(2)\right), & 1 \\ -\frac{1}{2}\left(X^{(1)}(2) + X^{(1)}(3)\right) & 1 \\ \cdots & \cdots \\ -\frac{1}{2}\left(X^{(1)}(n-1) + X^{(1)}(n)\right) & 1 \end{bmatrix}, \tag{5}$$

$$\widehat{X}^{(1)}(t+1) = \left[X^{(0)}(1) - \frac{u}{a}\right]e^{-at} + \frac{u}{a}.$$

$\widehat{X}^{(1)}(t+1)$ is accumulated predictive value of the obtained, and the prediction value is reduced as

$$\widehat{X}^{(0)}(t+1) = \widehat{X}^{(1)}(t+1) - \widehat{X}^{(1)}(t). \quad (6)$$

3.3. Rural Culture and Sustainable Development of Rural Tourism. We should dig deeply into the rural characteristic culture, continuously enhance the charm and tourist attraction of the rural traditional culture, promote the production of the rural traditional culture, and change the cultural and resource advantages into economic advantages. In the process of rural tourism development, rural residents are a very important part in the process of tourism development. Residents are the media carrying cultural transmission, and all rural elements are connected in series by them. When tourists come to travel, local residents, as direct suppliers, provide local characteristic services for tourists. The existing land system severely restricts the enthusiasm of farmers to invest in tourism and the social organization is relatively loose. There is no reasonable channel for community residents to participate. As the main body of the community, community residents should get great benefits in rural tourism activities and community tourism development, but in reality, the degree of community participation and benefits are relatively low. The protection of rural culture is a systematic project, and governments, enterprises, communities, residents, and tourists should actively participate in it.

From the perspective of sustainable development, a community is a place to carry tourism activities, and its sustainability depends on the collective decision-making of all stakeholders. Rural residents must participate in the construction and development of rural tourism, and their ideas and demands must be the necessary basis for collective decision-making. Rural tourism development should focus on rural culture, improve the taste and grade of rural tourism products, avoid the similarity of rural tourism product structures, and improve product competitiveness. The attitude and participation of residents in rural tourism destinations will directly affect the quality and capacity ceiling of rural tourism development, and this determines whether the development of rural tourism is sustainable. In order to ensure the healthy and sustainable development of rural tourism, we must straighten out the essence and core of rural tourism, so that we can fundamentally understand the system and improve the system, so as to ensure the participation of rural communities and to ensure that all stakeholders achieve mutual benefit win-win situation. Finally, the level of industrialization is low. The government should establish a public platform and create a good development environment by formulating policies for the protection and development of rural cultural resources. In the development of rural tourism, we must first change our thinking, update our concepts, and fully understand the necessity and importance of community participation in the development of rural tourism cultural resources.

4. Result Analysis and Discussion

4.1. Analysis of Time and Space Evolution of Tourism Resources Development. The analysis of the time evolution of tourism resources development can be found from the policy development theory. Since the innovation development has some deficiencies in all aspects of policy development at the beginning of the period, the development is slow at the beginning. With the gradual accumulation of information, it began to show the characteristics of S-shaped curve. That is, the quantity adopted in the initial stage of development is small, then enters the period of rapid development, and finally develops slowly. It can be found from Figure 2 that the development of domestic tourism resources was officially started in 2014. The growth rate in 2015 was rapid, and it grew rapidly in 2016. It slowed down in 2017 and 2018 and was completed in the next two years. The development time is generally presented as a sigmoid curve.

For the analysis of the spatial evolution of tourism resources development, 38 cities will be classified according to the eastern and central regions, and the theory of tourism resource development will be studied. The development of tourism resources first appeared in Shenyang, Beijing, and Nanjing and then continued to develop in the eastern region. In 2017, all eastern cities were developed. In 2016, central cities such as Hefei and Nanjing officially launched tourism resource development work and then continued to develop, and the development of central cities was completed in 2018. The development of tourism resources in the western region was marked by Chengdu and Guiyang in 2015 and was not only developed in the western region but also developed in 2015. Using research, two different results can be derived: first, there is a proximity effect. Whether it is the driving force of learning or the pressure of competition, the phenomenon of policy development is very likely to occur between neighboring regions; the second is that resources and capabilities are the main factors for innovation and development. The economic growth of the eastern cities is relatively fast, and the development time of its tourism resources is relatively early, far exceeding the central cities and western cities, as shown in Figure 3.

When experiments are performed using 20-dimensional data, 11 of the given true data regression coefficients β are 0. Using the Monte Carlo simulation, there are nine in the estimated regression coefficient β close to $[-0.5, 0.5]$ without the penalty function. The reason for the deviation is that the data generated during the simulation is a set of data, instead of randomly generating 1000 sets of data and then calculating the mean variance, which is within the controllable range. For the preprocessed data, the algorithm method is used to select variables, and the variable attributes that have small influence on the survival analysis model are eliminated. The experimental results are shown in Figures 4 and 5.

The BP neural network algorithm and gray prediction GM (1, 1) algorithm were used to design a demand forecasting model of ecotourism market. Tourism demand refers to the natural beauty of a place that is attractive to some people who have the ability to travel and pay. These people are willing to spend some time in the area to travel and buy

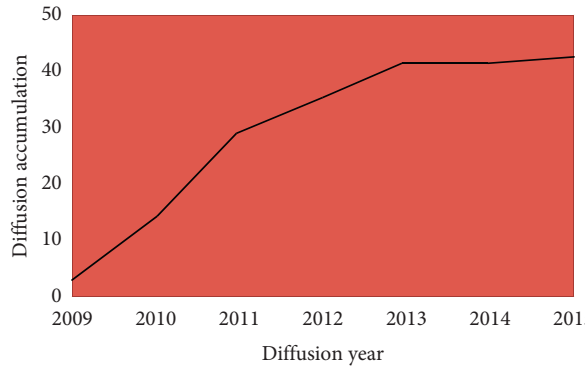

Figure 2: The construction diffusion time curve of 38 urban intelligent cities.

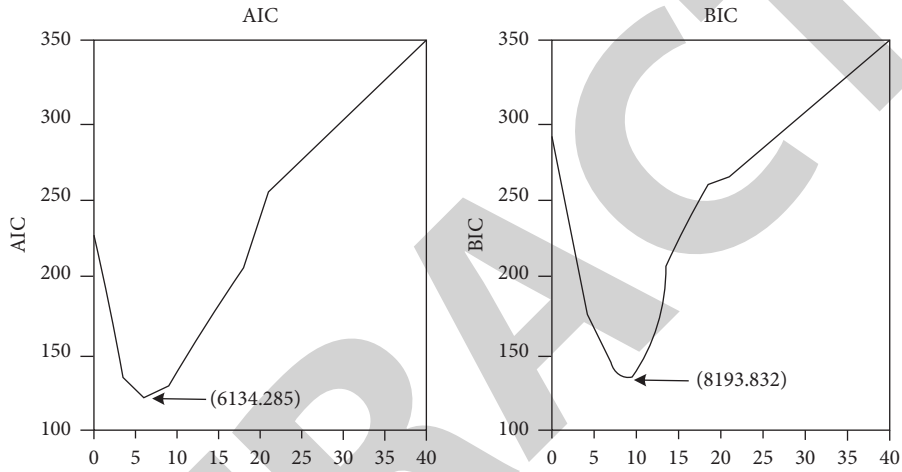

Figure 3: Graphic analysis of changes in AIC and BIC with lambda.

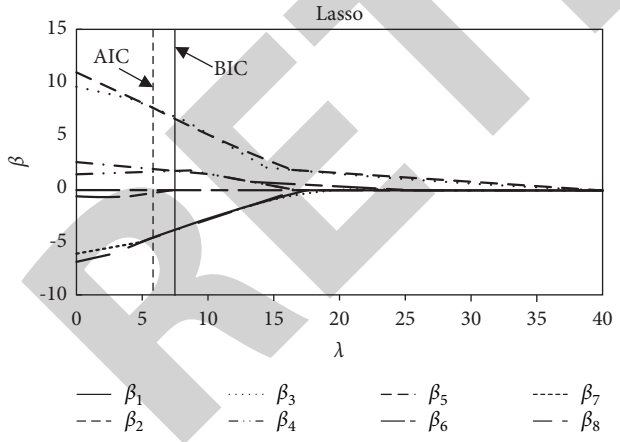

Figure 4: AIC and BIC truncation criteria corresponding to variable selection.

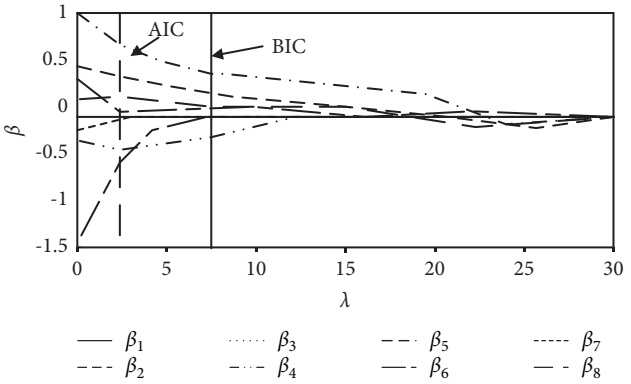

Figure 5: LASSO experimental results of PBC data sets.

some travel products. The demand for travel markets in a region is often expressed in terms of the number of tourists that a region receives over a period of time. There are generally the following factors: (1) tourism resources and environment; (2) tourists spending power; (3) local consumer spending index; (4) service quality; (5) seasonal factors; (7) traffic factors, as shown in Table 1.

Based on the above analysis, as long as the relationship between these factors and the volume of tourists are analyzed, and the function between tourist volume and these factors is established, demand forecast of tourism will be more reasonable and accurate.

Based on the above analysis of the six major factors affecting the number of tourists, the general model of the number of tourists on demand can be expressed as follows:

Table 1: Weights index at different levels.

Means of transportation	Airplane (%)	Train (%)	Automobile (%)
Proportion	84.6	0.6	14.8

Table 2: Seasonal factors in the demand of ecotourism market.

Year	Visitors to the total y_1	Foreign population y_2	Per capita expenditure $x_1(t)$	Consumer price index $x_2(t)$ (%)	Service quality satisfaction $x_3(t)$ (%)
2013	1254.96	38.93	760.02	103.6	63.4
2014	1234.11	29.33	758.04	100.8	65.7
2015	1402.89	30.86	791.30	102.1	68.2
2016	1516.47	43.19	824.61	101.5	69.9
2017	1605.02	46.57	881.17	101.5	72.4
2018	1845.51	75.31	928.58	105.0	76.5
2014	2060.00	97.93	933.64	106.9	79.1
2015	2250.33	55.15	940.84	99.3	83.5
2016	2587.34	66.31	995.73	104.1	87.6

$$Q = F(l, m, c, z, s, j). \tag{7}$$

In this formula, the variable Q mainly represents the number of tourists who have demand in tourism. F represents the total number of tourists based on six factors. The variable l mainly represents the tourism resources and environment. The variable m mainly represents the consumption power of tourists. The variable c represents the local residents' consumption index, z indicates the quality of service, s indicates seasonal factor, and j means traffic factor.

Taking into account the needs of the ecotourism market in the tourist area, there are many factors that affect the tourism industry. Therefore, the least squares criterion is used to establish the multiple linear regression model, and its linear form can be expressed as

$$Q = Q_0 + \gamma_1 l + \gamma_2 m + \gamma_3 c + \gamma_4 z + \gamma_5 s + \gamma_6 j + \mu. \tag{8}$$

As can be learned from the comprehensive analysis of the above formula, the seasonal factors are relatively stable in the demand factors affecting ecotourism market, and traffic factors have less influence. Combined with the above analysis of the impact of the factors, it can be seen that the main influencing factors are tourists spending power, local consumer spending index, and quality of service, and the decisive factors are tourism resources and environment, and K indicates this kind of influencing factor, as shown in Table 2. In order to simplify the calculation, the above linear model can be directly adjusted as follows:

$$y = k \cdot f(x_1, x_2, x_3) = k\beta_0 + k\beta_1 x_1 + k\beta_2 x_2 + k\beta_3 x_3 + k\varepsilon. \tag{9}$$

After using Matlab software to perform multiple linear processing on the data in the table, the following results can be obtained as shown in Table 3.

So, the initial regression equation is obtained:

$$y = -4106.9218 - 1.3802x_1 + 18.3580x_2 + 69.8281x_3. \tag{10}$$

After obtaining the regression equation of the model, the reliability of the model needs to be tested, and the values of measurement R, F, and P are mainly used to judge whether the model is available or not. Evaluation of correlation coefficients R^2: in general, a reliable prediction model requires that the value of the correlation coefficient be controlled within (0.8, 1). The closer the value of the relevant parameter to 1 means that the independent variables and the dependent variables in the regression equation have a strong correlation. The absolute value of R^2 in this article is 0.9917, indicating a strong linear correlation. F-test: when $F > F_{1-\alpha}(m, n-m-1)$, there is a significant linear correlation between the dependent variable y and independent variables $x_1, x_2, \cdots, x_m$; otherwise, the linear correlation between the dependent variable y and the independent variables $x_1, x_2, \cdots, x_m$ is not significant. This example is $F = 198.3232 > 3.8625$. P-value test: if $p < \alpha$ (α is the predetermined significant level), then there is a significant linear correlation between the dependent variable y and independent variables $x_1, x_2, \cdots, x_m$. The output result of this example is $p = 0.000012888$, which apparently satisfies $p < \alpha = 0.05$.

If the results obtained by the above three statistical methods show high consistency, there is a clear linear relationship between the dependent variable y and the independent variable, and the regression model obtained from the linear relationship is accurate and effective. This regression equation can be directly used to predict the number of tourists, as shown in Table 4.

The data in Table 4 are made into a line chart. It is easy to see that the number of tourists predicted by the demand forecasting model designed in this paper is close to the actual number of tourists. The subtle errors are within the tolerance of mathematical calculations, which also shows that the model of market demand forecast for ecological tourism based on BP neural network has certain practical value.

Table 3: Results of multiple linear processing on the data.

Regression coefficient	The estimate of regression coefficients	The confidence interval for regression coefficients
$k\beta_0$	−4106.9218	[−6541.2562−−1672.5874]
$k\beta_1$	−1.3802	[−4.0544 1.2940]
$k\beta_2$	18.3580	[−7.4003 44.1162]
$k\beta_3$	69.8281	[42.4262 97.2299]
	$R^2 = 0.9917$ F = 198.3232 p = 0.00001288 < 0.05	

Table 4: The comparison between the number of tourists.

Year	Actual value	Predictive value	Relative error
2013	1254.96	1173.09	−0.0652
2014	1234.11	1285.02	0.0413
2015	1402.89	1437.55	0.0247
2016	1516.47	1499.27	−0.0113
2017	1605.02	1595.78	−0.0058
2018	1845.51	1880.89	0.0192
2014	2060.00	2090.34	0.0147
2015	2250.33	2248.13	−0.0010
2016	2587.34	2546.78	−0.0157

5. Conclusions

Because mature machine algorithms can reduce people's workload in many aspects, the progress of algorithms makes machine algorithms widely used in real life. With the increasing demand for ecotourism, more and more ecotourism is being developed. Although the development of ecotourism is popular, there are also obvious flaws. The lack of relevant experience in ecotourism management and the lack of detailed planning for tourism development have seriously hindered the development of the industry. Therefore, it is necessary to make relevant analysis on the ecotourism industry, predict the demand and law of tourism, and make a better plan for the development of ecotourism. Therefore, in this paper, BP neural network algorithm and gray forecasting GM (1, 1) algorithm were used to design a demand forecasting model for ecotourism market and explore how to make a good forecast of tourism demand through this demand forecasting model, so as to achieve effective optimization of tourism planning and promote the healthy development of ecotourism purposes.

Data Availability

Relevant data requires the consent of all authors to obtain.

Conflicts of Interest

The author declares that there are no conflicts of interest.

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