Hindawi
Advances in Multimedia
Volume 2022, Article ID 7662291, 10 pages
https://doi.org/10.1155/2022/7662291

Research Article

Dynamic Simulation and Comprehensive Quantitative Evaluation of Rural Tourism Core Competitiveness Based on Neural Network

Shiyuan Gan

School of Urban Construction Engineering, Chongqing Technology and Business Institute, Chongqing 400000, Chongqing, China

Correspondence should be addressed to Shiyuan Gan; ganshiyuan@cqtbi.edu.cn

Received 7 July 2022; Revised 12 August 2022; Accepted 23 August 2022; Published 8 September 2022

Academic Editor: Nagarajan Govindan

Rural tourism is the purpose of vacation tourism, which is an important support for rural economic development. Neural network algorithms are the second way to simulate human thinking. The purpose of this paper is to obtain benefits and diversify risks through dynamic simulation analysis and comprehensive quantitative analysis based on the neural network algorithm, so as to improve the core competitiveness of rural tourism. This paper first designs the neural network algorithm model, then analyzes the dynamic simulation model and comprehensive quantitative analysis, and then uses the artificial neural network algorithm to analyze and predict the core competitiveness of rural tourism. The results confirm the effectiveness of the algorithm. Under the demand forecast of the core competitiveness of rural tourism, using the artificial neural network algorithm, taking city A as an example, the number of tourists in rural tourism in city A from 2017 to 2021 was analyzed. The year with the largest number of people is 2021, with 2,586,000 people, and the year with the largest growth rate is 2019, with 2,576,900 people, a growth rate of 24.16%. Comparing the experimental data of each group, the results show that the algorithm has high efficiency in solving problems and also confirms the scientific validity of the algorithm.

1. Introduction

With economic development, people's living standards have improved, local market conditions have changed, and market competition has become fierce. Enterprises need to use the market effect to be strengthened. In order to effectively occupy the market, enterprises need to enhance their core competitiveness. We fully investigate the influencing factors related to the core competitiveness of rural tourism and provide a theoretical basis for enhancing the core competitiveness of enterprises in the field of rural tourism. The neural network has successfully solved various problems in daily production and life, and achieved good results. In today's diversified development of tourism, the research on the field of rural tourism has important guiding significance for the development of rural tourism. The neural network algorithm has few constraints on the problem to be solved, so its application range is very wide.

The artificial neural network algorithm is applied to the research on the core competitiveness of rural tourism. In other applications, artificial neural network algorithms are often compared with machine algorithms to analyze the advantages of artificial neural networks in this field. This article is dedicated to digging deeply into the internal characteristics and advantages of artificial neural network algorithms, and to find out the similarities between artificial neural network algorithms and the core competitiveness of rural tourism. The characteristics of the algorithm are used to simulate the core competitiveness of rural tourism, and a more advantageous dynamic simulation model and comprehensive quantitative evaluation are obtained. The innovation of the article is as follows: when analyzing the core competitiveness of rural tourism, the artificial neural network algorithm (that is, feedforward neural network and feedback neural network two types of algorithms) is used to analyze the core competitiveness of rural tourism. This softens the evaluation of the dynamic simulation model and the comprehensive quantitative model, so as to accurately obtain various influencing factors that are the core competitiveness of rural tourism.

2. Related Work

In recent years, with the improvement of economic level, people's living standards have also risen, and more and more people are pursuing quiet, stable, and healthy travel. Yang investigated the morphological and social evolution of rural communities from the perspective of tourism, and analyzed their driving factors [1]. Through Zhang's research, the impact of tourism on traditional villages is a hot topic. The study concluded that there have been significant socioeconomic improvements in rural areas [2]. From the research of Zyrianov, the theoretical structure of economic and leisure geography is determined, which can reflect the specific situation of regional rural tourism. Research has shown that an increase in research in this area has contributed to recourse to the economic category [3]. From Rosalina's research, he expands on previous literature by investigating the definition of rural tourism and the challenges it faces in developed and developing environments [4]. In Ye's view, providing unforgettable experience is the essence of tourism and is regarded as a core aspect of a destination's competitiveness under the experiential marketing paradigm. Taking rural tourism as the research background, a theoretical model is proposed in which memory is generated through ordinary and extraordinary experiences, which in turn affects word of mouth [5]. According to the above content, the research content of scholars has not been based on the neural algorithm to study rural tourism, and the research of the neural network algorithm in this field still has certain defects. Next, the core competitiveness of rural tourism will be comprehensively analyzed and evaluated based on the neural network algorithm.

With the development of economy, more scholars began to study neural network algorithms. For Yang's research, he used the hash algorithm to map high-dimensional image features into binary code strings, which solved the problems of large storage space, high feature dimension, and low retrieval efficiency in traditional image retrieval algorithms [6]. Through Li's research, the main structure and workflow of the autoencoder model are introduced, and the progress of the autoencoder model in artificial neural network algorithms is summarized using various types of data. Finally, the challenges and prospects of autoencoder models are discussed [7]. The experimental results of Zhang's research show that his proposed algorithm has better discriminative power than existing methods [8]. Dang used the deep belief neural network algorithm to design and the in-depth analysis of the sport venue operation risk early warning model. Compared with spatiotemporal graph convolutional neural networks, deep belief neural networks use different feature information [9]. From the content of Ramadhani's research, it can be understood that the methods used in his research are descriptive and qualitative data collection methods [10]. Therefore, the use of the neural network algorithm has a certain positive significance for the dynamic simulation model and comprehensive quantitative evaluation of the core competitiveness of rural tourism. However, the shortcomings of these studies are that they have not properly dealt with the issues related to the core competitiveness of rural tourism, and have not summarized dynamic simulation analysis and comprehensive quantitative evaluation.

3. Dynamic Simulation and Comprehensive Quantitative Evaluation Method Based on the Neural Network Algorithm

3.1. Core Competitiveness of Rural Tourism. Rural tourism is a rural tourism model with the purpose of vacation tourism, the destination of rural areas, and the premise of no disturbance and no ecological damage [11]. The classic scene of rural tourism is shown in Figure 1.

Different from other tourism modes, rural tourism has the following unique (Figure 2) characteristics:

(1) The supporting facilities are simplified and natural [12]. Because the purpose of tourists participating in rural tourism is to get rid of the hustle and bustle of big cities and return to the most natural and simple way of life.

(2) Rural tourism has strong local characteristics. Since the destination of rural tourism is in the countryside, the local residents are the inheritors of the local culture, and their way of life has a simple folk customs. Tourists participate in rural tourism to feel their local customs.

(3) The diet is healthy and natural without additives. One of the purposes of rural tourism is to taste the most original taste of food. Experiencing green and healthy food is also a feature that other tourism modes do not have [2].

3.2. Dynamic Simulation and Comprehensive Quantification of the Artificial Neural Network

3.2.1. Artificial Neural Network. The artificial neural network (ANN) algorithm is an abstract simulation of several basic features of the human brain or natural neural network. We analyze a large number of evaluation indicators and influencing factors to find out the existing laws. The neural network models can be divided into two categories: the first type is a forward network without information feedback. Its neurons receive the input of the previous layer and output to the next layer without feedback. The second type is an interconnected network with information feedback. All nodes are computing nodes, which can receive input and output to the outside world [4, 13].

The feedforward neural network consists of input layer, hidden layer, and output layer. The typical structure of the feedforward neural network is shown in Figure 3.

Figure 1: Village tourism map of a typical township.

Figure 2: Unique country cuisine.

A single-layer neural network is the simplest artificial neural network. There is only one output layer, and the output value of the output layer can be obtained by multiplying the input value by the weight value. Bringing one of the neurons into the discussion, the transformation relationship between its input and output is as follows:

$$x_k \sum_{i=1}^{n} W_{ki} x_i - L_k$$
$$y_k = F(x_k) = \begin{cases} 1, x_k \geq 0 \\ 0, x_k < 0 \end{cases}. \quad (1)$$

Among them, $\mathbf{W}_{ki}$ is the connection weight from x_i to y_k, and the output y_k ($k=1,2,\ldots,m$) is the classification result by feature [14].

The multilayer neural networks consist of an input layer, one or more intermediate layers, and an output layer. The transformation relationship of the multilayer neural network is as follows:

$$t_i^{(q)} = \sum_{j=0}^{n_q-1} w_{ij}^{(q)} x_j^{(q-1)}, \left(x_0^{(q-1)} = m_i^{(q)}, w_{io}^{(q-1)} = -1\right)$$
$$x_i^{(q)} = f\left(s_i^{(q)}\right) = {}^{1, s_i^{(q)} \geq 0}_{-1, s_i^{(q)} < 0}. \tag{2}$$

Among them, $i = 1, 2, \ldots n_q$; $j = 1, 2, \ldots, nL_{q-1}$; $q = 1, 2, \ldots, Q$; and x_k are the input quantities, y_k is the output quantities, and $t_i^{(q)}$ is the change values of the output quantities.

3.2.2. Output Layer. Each neuron in the output layer is as follows:

$$\frac{\partial M}{\partial w_{ij}^k} = -2\left(x_j - y_j^k\right) y_i^{k-1} \frac{xy_j^k}{xz_j^k}, i = 1, 2, \ldots, n_k. \tag{3}$$

3.2.3. Hidden Layer and Input Layer. For a neuron j in layer k, ($k \leq K-1$), and when $k = K-1$, there is the following formula:

$$\frac{\partial M}{\partial w_{ij}^{k-1}} = -2 \sum_{L_k=1}^{n_k} \left(x_{L_k} - y_{L_k}^k\right) \frac{xy_{L_k}^k}{xz_{L_k}^k} \frac{xy_{L_k}^k}{xz_{L_k}^k} \sum_{L_{k-1}}^{n_{k-1}} w_{L_{k-1}}^k \frac{\partial y_{L_{k-1}}^{k-1}}{\partial w_{ij}^{k-1}}$$
$$= -2 \sum_{L_{k-1}}^{n_k} \left(x_{L_k} - y_{L_k}^k\right) \frac{xy_{L_k}^k}{xz_{L_k}^k} w_{jL_k}^k \frac{xy_j^{k-1}}{xz_j^{k-1}} y_i^{k-2}, \tag{4}$$

where $i = 1,2, \ldots n_{k-2}$ and $j = 1,2, \ldots, n_{k-1}$. When selecting the nodes of the hidden layer, if the node data are reasonably selected, the functional effect of each node is not the same, so the output value will also change with the different experimental samples. Based on this idea, let y_{mn}^k be the output value of the hidden node m of the k th layer when learning the n th sample, $\overline{y}_m^k$ be the average output of the hidden node m after learning the x th sample, and x be the total output value of the sample; therefore,

$$\overline{y}_m^k = 1/x \sum_{n=1}^{x} y_{mn}^k,$$
$$\overline{y}_j^k = 1/x \sum_{n=1}^{x} y_{jn}^k. \tag{5}$$

Definition 1. The correlation between hidden nodes m and j in the same layer is as follows:

$$R_{mj}^k = \frac{1/x \sum_{n=1}^{x} y_{mn}^k \cdot y_{jn}^k - \overline{y}_m^k \cdot \overline{y}_j^k}{\sqrt{1/x \sum_{n=1}^{x} \left(y_{mn}^k\right)^2 - \left(\overline{y}_m^k\right)^2} \bullet \sqrt{1/x \sum_{n=1}^{x} \left(y_{jn}^k\right)^2 - \overline{y}_j^k 2}}. \tag{6}$$

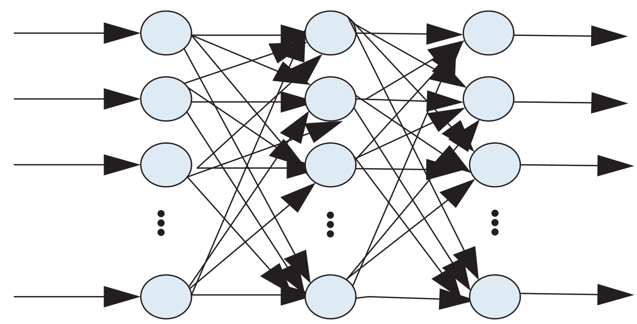

Figure 3: Multilayer feedforward neural network.

In the above formula, R_{mj}^k represents the output correlation degree of nodes m and j in the k hidden layer, and the larger the value of R_{mj}^k, the more overlapping the functions of nodes m and j.

Definition 2. The sample dispersion S is as follows:

$$S_m^k = 1/x \sum_{n=1}^{x} \left(y_{mn}^k\right)^2 - \left(\overline{y}_m^k\right)^2. \tag{7}$$

Among them, the smaller the numerical result of S_m^k is, the smaller the change in the output value of the implicit node m is.

For the feedforward neural network, there are differences in the data transmitted by neurons, and the learning algorithm and network structure are also different. The BP network algorithm is a refined part of the feedforward neural network algorithm [15].

Taking the BP network model of the structure M-O-N as an example [16, 17] (where M is the number of nodes in the input layer, N is the number of output nodes, and O is the number of nodes in the hidden layer), the BP network structure diagram is shown in Figure 4.

Element a and element A in Figure 4 represent the input value and output value of the BP neural network, respectively.

According to Figure 4, the actual output of the BP neural network can be obtained as follows:

$$\lambda_n = f\left(A_n \cdot \rho\right) = f\left[\sum_{o=1}^{o} A_{no}\rho_o\right], m = 1, \ldots N. \tag{8}$$

The output of the hidden layer is as follows:

$$\rho_o = f\left(a_o \cdot \sigma\right) = f\left[\sum_{m=1}^{M} a_{om}\sigma_m\right], o = 1, \ldots o. \tag{9}$$

Among them, the input vector is $\{\sigma^i\}_{i=1}^i \subset \theta^M$, the expected output value is $\{O^i\}_{i=1}^i \subset \theta^N$, and the actual output is $\{\lambda^i\}_{i=1}^i \subset \theta^N$. λ_n is the actual output value, and ρ_o is the hidden layer output value. The error function is defined as follows:

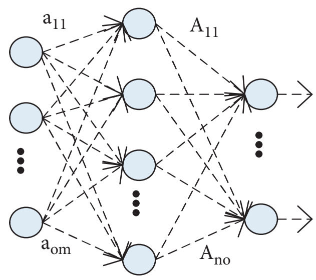

Figure 4: BP neural network.

$$C(A,a)=\frac{1}{2}\sum_{j=1}^{j}Q^{j}-\varsigma^{j2}=\frac{1}{2}\sum_{j=1}^{j}\sum_{n=1}^{N}\left[Q^{i}-f\left(\sum_{o=1}^{o}A_{no}f\left(\sum_{m=1}^{m}a_{om}\sigma_{m}^{i}\right)\right)\right]^{2}. \tag{10}$$

Among them, A and a are the learning processes of the matrix, C is the error function, the determination of the weight matrix should be that the error function of $C(A,a)$ reaches the minimum value, and the variable of the current weight value A_{no} is as follows:

$$\Delta A_{no}=-\eta\frac{\partial C}{\partial A_{no}}=\eta\sum_{i=1}^{i}\left(Q_{n}^{i}-\lambda_{n}^{i}\right)f'\left(h_{n}^{i}\right)\rho_{o}^{i}=\eta\sum_{i=1}^{i}\Delta_{n}^{i}\rho_{o}^{i}. \tag{11}$$

Among them, a is the variable of the current weight, $\eta>0$ is the learning rate, and

$$\Delta_{n}^{i}=\left(Q_{n}^{i}-\lambda_{n}^{i}\right)f'\left(h_{n}^{i}\right). \tag{12}$$

However,

$$h_{n}^{i}=\sum_{o=1}^{o}A_{no}\rho_{o}^{i}. \tag{13}$$

This is the linear input from the hidden layer part to the n output unit.

For the second type of the feedback neural network, there may be connections between any two neurons in the network, including the feedback from neurons to themselves. A typical structure of it is shown in Figure 5 [18].

The structure of the total feedback neural network is more complex. In practical applications, it is simplified and some important functions are retained, so there is a partial feedback neural network, as shown in Figure 6.

According to Figure 6, the following relationship can be obtained as follows:

$$c_{j}(t+1)=ac_{j}(t)+x_{j}(t). \tag{14}$$

Among them, a is the feedback strength; in general, $a<1$; and formula (14) can be derived as follows:

$$\begin{aligned}c_{j}(t+1)&=x_{j}(t)+ax_{j}(t-1)+a^{2}x_{j}(t-2)\\&\quad+a^{3}x_{j}(t-3)+\cdots=\sum_{r=0}^{t}a^{t-r}x_{j}(r).\end{aligned} \tag{15}$$

It can be seen that the output of the connection part is the sum of the past averages of $x_j(t)$, and the closer a is to 1, the longer it extends to the past.

3.2.4. Dynamic Simulation. Dynamic simulation is the use of dynamic models to represent systems whose states change over time. The characteristics of the recognition system are based on the partial feedback neural network, and its input value only contains the current actual input value, but not the past input and output values. The dynamic characteristics of the system are all contained in the own structure of the partial feedback neural network. Details are as follows:

$$y_{m}=\frac{y_{m-1}}{1+y_{m-1}^{2}}+V_{m-1}^{3}. \tag{16}$$

The tested signals are as follows:

$$V(m)=\sin\left(\frac{2\pi m}{25}\right)+\sin\left(\frac{2\pi m}{10}\right). \tag{17}$$

Among them, y_m is the model taken by the research object, and the input signal selected in formula (17) is the randomly distributed data on [−2, 2].

3.3. Comprehensive Quantitative Evaluation Method of Artificial Neural Network. The comprehensive quantitative evaluation method uses the viewpoint of system theory. When evaluating, both the opinions of the masses and the ideas of leaders should be taken into account [19]. It is necessary to compare both vertically and horizontally, so as to comprehensively assess a method of employees.

The diversification index analysis method, the industrial structure location entropy analysis method, and the dynamic deviation-share analysis method are all refinements of the comprehensive quantitative evaluation method [20].

3.3.1. Diversification Index Analysis Method. The diversification index analysis method (DIAM for short) includes the original diversification index and the accurate diversification index. The difference between the two is that the former is inversely proportional to the degree of comprehensive development, while the latter is directly proportional. The formula for calculating the original diversification index is as follows:

$$\begin{aligned}M_{y}=\sum&\left[n_{1}+\left(n_{1}+n_{2}\right)+\left(n_{1}+n_{2}+n_{3}\right)+\cdots\cdots\right.\\&\left.+\left(n_{1}+n_{2}+\cdots\cdots+n_{x}\right)\right].\end{aligned} \tag{18}$$

Among them, $n_1, n_2, n_3, \ldots, n_x$ represents the proportion of foreign exchange income of each sector, and $n_1>n_2>n_3>\cdots>n_x$, $n_1+n_2+n_3+\cdots\cdots+n_x=100\%$.

The formula for calculating the exact diversification index is as follows:

$$M_{z}=\frac{M_{y}-M_{0}}{M_{\max}-M_{0}}. \tag{19}$$

In the above formula, M_0 represents the actual minimum original diversification index, and $M_{\max}$ represents the theoretical maximum original diversification index. When an area has only one industrial sector, the original diversification index reaches its maximum value, where x is the number of industrial sectors. When a region develops a

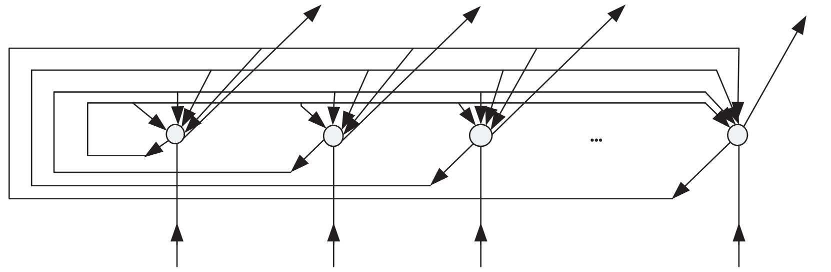

Figure 5: Full feedback neural network.

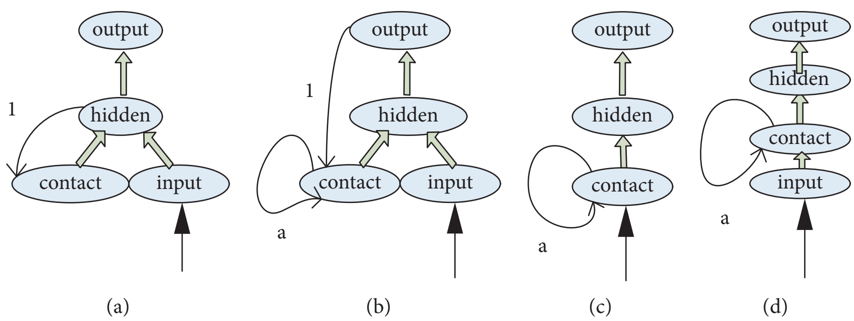

Figure 6: Partial feedback neural network.

relatively single industry, the accurate diversification index becomes larger [21].

3.3.2. Industrial Structure Location Entropy Analysis Method. The industrial structure location entropy analysis method (ISLEAM for short) mainly reflects the degree of specialization of production areas between regions by measuring the relative degree of specialization of each region. Its calculation formula is as follows:

$$O = \left[\frac{d_j}{\sum_{j=1}^{x} d_j}\right] - \left[\frac{D_j}{\sum_{j=1}^{x} D_j}\right]. \tag{20}$$

Among them, O represents the location entropy of a region j sector to a high-level area, d_j represents the foreign exchange income of international tourism of the j sector within the region, and the foreign exchange income of international tourism of the high-level area j sector is represented by D_j. Generally speaking, the larger the value of O, the higher the degree of specialization of the j sector in the region, and the stronger the comparative advantage.

4. Experimental Design and Results of the Core Competitiveness of Rural Tourism Based on the Neural Network Algorithm

4.1. Scheme Design of Rural Tourism Core Competition Based on Neural Network. Taking the rural tourism in city A as an example, there are two basic indicators that reflect the demand for rural tourism: the number of tourists and tourism income. The development trend of rural tourism in city A is very good, and it will soon become a pillar industry of the economy of city A. Among them, inbound tourism is one of the important ways to support the development of rural tourism in city A [22]. The basic information is shown in Table 1.

4.2. Results of the Core Competitiveness of Rural Tourism Based on Neural Network. We draw conclusions from Table 1. Although the inbound tourism in city A has a downward trend in some years, the overall development level shows a rapid development trend. The number of tourist arrivals increased the most at 24.16% in 2019, and the fastest growth in tourism revenue was 45.02% in 2019.

According to the actual situation according to the statistics of the tourism bureau of city A, the income data of rural tourism in city A from 2017 to 2021 are shown in Table 1. Overall, although some of these years fluctuated, the overall trend was upward. In 2019, the income of rural tourism was US$422,000,000. Compared with 2018, revenue rose by $203 million, and the income ratio increased by 45.02%, which is the highest rise in city A in the five years from 2017 to 2021. It can be seen from the table that in 2020, both the number of tourists and tourism revenue in city A declined. The main reason is that the new crown pneumonia epidemic in 2020 has had a huge impact on the tourism industry, resulting in a 6.87% drop in revenue growth in 2020 compared with 2019 revenue growth, and a decline in the growth rate of tourist numbers by 8.42%, showing a negative growth rate.

The future development of city A will show a trend of diversity and stability. According to the statistics of the

Table 1: Inbound tourism in city A from 2017 to 2021.

Years	Inbound tourists (person-time)	Annual growth rate (%)	Tourism revenue (ten thousand dollars)	Annual growth rate (%)
2017	1707000	15.56	21000.00	35.33
2018	1995000	16.87	29100.00	38.57
2019	2576900	24.16	42200.00	45.02
2020	2360000	-8.42	39300.00	-6.87
2021	2586000	9.58	41600.00	5.85

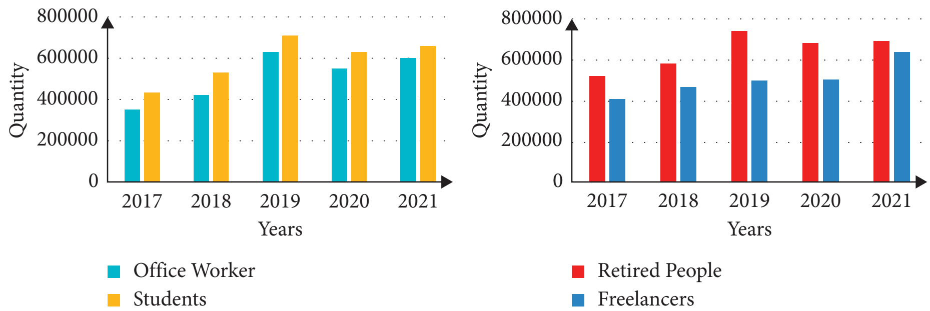

Figure 7: Statistics of the number of occupational types of tourists in city A from 2017 to 2021.

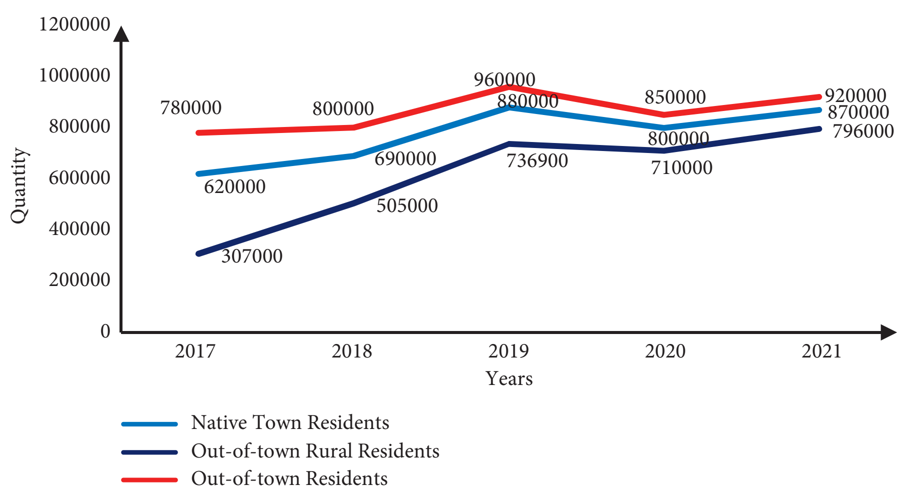

Figure 8: The number of tourists in city A from 2017 to 2021.

tourism bureau of city A, there are a wide range of occupational types of tourists in city A, which are mainly divided into office workers, students, retirees, freelancers, etc. The specific situation is shown in Figure 7.

Through the statistics and data analysis in Figure 7, the following results are obtained based on the neural network algorithm: there are four occupations for the main tourist personnel in city A, among which the main force is retirees and students. Conversely, the number of students and retirees is higher than the number of office workers and freelancers, mainly because students and retirees have much more free time than they do. The living standards and spending power of office workers are higher than those of freelancers, and students and retirees have become the main force of tourism practitioners in the city. Overall, the number of tourists in city A fluctuates over a few years but is generally increasing. The main reason for the decline and volatility in 2020 is the impact of the new crown pneumonia epidemic on the tourism industry, which has led to fluctuations in the rural tourism market in city A.

From the analysis of tourist sources, city A mainly absorbs local urban residents, rural customers from other places, and urban customers from other places. The specific situation can be seen in Figure 8.

It can be seen from the above figure that in terms of the composition ratio of tourist origins, foreign urban residents are the main source, followed by local urban residents, and lastly, foreign rural customers. The main reason for the largest number of tourists from other cities and towns is that they live in cities all year round, seldom come into contact with rural life, and have great interest and yearning for rural life. The second largest number of participants is local urban residents, who also need to experience rural life because they have lived in cities for a long time. During the holidays, you can participate in rural tourism and experience rural life. This group of people is relatively stable, because they are

Table 2: Hidden layer and output layer node threshold table.

Hidden layer node	1	2	3	4	Output layer node	Output layer node threshold
Hidden layer node threshold	0.4346	−3.3675	−3.9011	3.6250		
Hidden layer node	5	6	7	8	1	0.7877
Hidden layer node threshold	1.4275	−0.4922	−1.4383	1.5266		

local urban residents and have convenient transportation. They can usually drive to the countryside by themselves, which has certain advantages over foreign tourists in terms of time and space. While the first category of nonlocal urban residents has an advantage in number, the scope is relatively wide and the customers are unstable. The third type of tourists is the rural residents from other places. The main reason for the small number of tourists is that they live in the countryside for a long time. Rural life is their daily life, and there is no need to experience it. The reason for going to the rural tourism of city A is because the tourism industry in city A is developed, and they can experience a different rural trip in a different environment. Judging from the five-year data from 2017 to 2021, the number of three types of tourists is on the rise as a whole, with the highest in 2019, with a total number of 2,576,900. The lowest was in 2017, when the number reached 1,707,000. This also shows that the development of tourism in city A is good and relatively stable, and its core competitiveness has a certain advantage over rural tourism competitors in other cities.

According to the analysis of the data of the tourism situation in city A, the data from 2017 to 2021 are used to form a sample, and then, the network training is carried out based on the artificial neural network algorithm. The network training is carried out on the number of neurons in the hidden layers of 4, 6, 8, and 10, respectively, and then, by comparing the accuracy of the training results, the network structure is finally determined to be 3-8-1.

The process of network training is to train the samples trained by the network in batches. After repeated calculation, when the number of training is 1178 times, the training error between the expected output value of the output part and the actual output value reaches the expected requirement (i.e., 0.001), and finally, the network training is completed. The threshold (as shown in Table 2) and the connection weight value (as shown in Table 3 and Table 4) between nodes in each layer are the main parameters of the neural network for predicting rural tourism income in city A.

In order to compare and evaluate the accuracy of the neural network algorithm, the same training samples are now used to establish a cubic curve model and an exponential curve model that fit the training samples better. Taking the forecast model of the tourist review as an example, the simulation results and the simulation results of the neural network rolling forecast model are compared and analyzed, and the results are shown in Table 5.

Then, we use MAPE (absolute mean error %), R (correlation coefficient), and Z (output data reliability %) to analyze and evaluate the accuracy of the model, as shown in Table 6.

Table 3: Connection weight table of input layer nodes and hidden layer nodes.

Input layer node		1	2	3	4	5
Hidden layer node	1	0.3898	−0.1529	0.3373	−0.2162	0.0124
	2	0.0032	0.0005	0.0026	0.0008	0.0030
	3	−0.0002	0.0003	−0.0007	−0.0002	−0.0004
	4	−0.0027	−0.0007	−0.0028	−0.0009	−0.0025
	5	−0.0223	−0.0050	−0.0280	−0.0127	−0.0303
	6	0.0732	−0.5813	0.0998	−0.4516	0.0598
	7	0.0825	0.5260	0.2393	0.6200	0.7877
	8	0.7085	0.2476	0.3948	0.1437	0.3187

Table 4: Connection weight table of hidden layer nodes and output layer nodes.

Hidden layer node	1	2	3	4
Output layer node	0.6500	0.3689	−0.3460	−0.8822
Hidden layer node	5	6	7	8
Output layer node	−0.0778	0.8915	0.9160	0.9072

From the data in Table 6, the neural network model shows that the simulation effect is better than the other models in all three parameters. It is more scientific to use the network model to analyze the demand of rural tourism model and compare the situation.

To sum up, according to the existing trend, the tourism in city A will continue to maintain a stable growth rate. The reason is mainly considered from the internal reasons and external factors of city A. The reasons are mainly as follows.

4.2.1. The Continuous Growth of the World Economy and the Increasing Demand for Rural Tourism. In recent years, the annual growth rate of the world economy has been around 4%. With economic growth, the per capita income level also increases. People's disposable income has also increased, and the tourism demand has further increased, so that the tourism products of city A are continuously optimized and more tourists are attracted to travel.

4.2.2. City A's Own Advantages. First of all, in recent years, the GDP of city A has rapidly grown, and the local fiscal revenue has also rapidly increased. The economic growth and strong financial resources of city A have provided a solid backing for the development of rural tourism. Second, city A vigorously builds highways, airports, and other transportation facilities, so that the gap between tourists in time and space is greatly narrowed, and the development of tourism is effectively stimulated. Third, the rural culture of city A is strong, the rural buildings are relatively intact, it is less affected by urbanization and industrialization, and the green vegetation covers a large

Table 5: Comparison of simulation results of different models.

Years	Actual value	Neural networks	Cubic curve model	Exponential curve model
2017	197899	200111	197637	193550
2018	199548	200488	225649	219320
2019	228699	223749	256997	248523
2020	260593	262328	291887	218616
2021	323078	322579	330539	319110

Table 6: Accuracy comparison table of simulation results of different models.

Predictive model	MAPE	R	Z
Neural networks	3.738	0.9999	101
Cubic curve model	9.917	0.9960	85
Exponential curve model	9.177	0.9953	93

area, which has the advantage of developing rural tourism. Finally, city A vigorously promotes the development of tourism and protects the environment. Over the years, the natural conditions have been protected and perfected, attracting a large number of tourists. Compared with other competitors, city A has certain advantages in the core competitiveness of rural tourism.

4.3. Results of the Core Competitiveness of Rural Tourism Based on the Improved Neural Network. According to experimental analysis, based on the neural network algorithm, the core competitiveness of rural tourism can be improved. Although it is feasible to analyze rural tourism demand through neural network algorithms, optimization schemes are also required in the process. First, due to the limited number of training samples, if the accuracy of the neural network model is to be ensured, a large amount of historical data are required as a reference sample. However, in reality, it is difficult to obtain suitable historical data as reference samples at the same time due to the limitations of region, time, space, etc., which affects the accuracy of the model to a certain extent. Therefore, the point that this scheme needs to be improved is to increase the number of training samples, obtain more reference data, and conduct training to obtain a more accurate network model. Second, the threshold and weight in the forward and backward propagation algorithms of the neural network model are determined. There is no fixed criterion for the selection of the learning rate and the minimum error value, and it is subject to a certain degree. For this problem, it is necessary to improve the supervisory conditions for model selection data to ensure the objectivity of the data to the greatest extent. The neural network has not been studied much in the field of rural tourism demand, and it is necessary to further develop the neural network combination prediction model in the research on the core competitiveness of rural tourism.

5. Discussion

This paper is devoted to the research and design of the optimization calculation analysis based on the neural network algorithm, and it is applied to the complex analysis and processing of the core competitiveness of the rural tourism industry. On the basis of the existing in-depth research on dynamic simulation and comprehensive quantitative evaluation, the analysis is simulated and improved, and combined with the special environment of the rural tourism market in city A, this type of analysis method is suitable for the environment of the rural tourism market in city A. For the research of the artificial neural network algorithm, the whole paper starts from the most basic human brain, analyzes the optimization method of the basic artificial neural network algorithm, and improves it. It successfully combined the improved dynamic simulation with the comprehensive quantitative evaluation and the neural network algorithm to obtain the optimal solution of the problem.

Through the case analysis of city A, it is shown that the algorithm based on the artificial neural network is more effective than the single-machine algorithm. Enterprise leaders of rural tourism can develop different rural tourism industries according to the geographical conditions, environmental factors, human factors, and economic level of different regions, so as to enhance their core competitiveness. By comprehensively analyzing the tourism revenue and number of tourists in City A over the years, as well as various tourism projects, and comparing them from both vertical and horizontal aspects, the core competitiveness of the rural tourism industry in City A can be greatly improved, and the decision-making optimization of multi-project portfolios can be achieved. In the specific practice analysis, the leaders of rural tourism development enterprises or tourism industry formulate different rural tourism programs according to their own preferences and goals. Rural tourism programs with local characteristics have been developed to improve the core competitiveness of their own enterprises. The optimal solution is selected to make the most effective decision.

6. Conclusions

Conclusions after analysis are drawn that under normal circumstances, due to the improvement of per capita income level and the increase in disposable income, the total local GDP will also increase. First, gross local GDP will also increase due to higher per capita income levels and increased disposable income. Through the analysis of the data, it is concluded that along with the tourism developers, they attach importance to the tourism industry, which is not absolute. The income of some cities developing rural tourism has declined, but the number of tourists and income in the region has increased, as shown in this case after 2019. This requires analysis according to the actual situation, and more detailed research and quantitative analysis of the actual situation, and a more effective core competitiveness plan can be determined. The case discussed in the full text is analyzed on the basis of the combination of per capita income and discretionary income, and the influencing factors of the rural tourism industry are not only these two aspects. The selection of influencing factors in case analysis is often limited, and in the real environment, the tourism industry faces many influencing factors, such as local customs, food culture, traffic factors, and government support. Such a multifaceted analysis can better highlight the core competitiveness of rural tourism, but of course, it will be more difficult.

Data Availability

No data were used to support this study.

Conflicts of Interest

The author declares no conflicts of interest.

Authors' Contributions

The author has read the manuscript and approved for submission.

Acknowledgments

This work was supported by the Science and Technology Research Program of Chongqing Municipal Education Commission (grant no. KJQN201904005).

References

[1] J. Yang, R. Yang, M. H. Chen, C. H. J. Su, Y. Zhi, and J. Xi, "Effects of rural revitalization on rural tourism," *Journal of Hospitality and Tourism Management*, vol. 47, no. 4, pp. 35–45, 2021.

[2] X. Zhang, "'Impact of rural tourism on residents' well-being in traditional ancient villages: a case of North Guangxi," *Heritage Science*, vol. 9, no. 1, pp. 138-139, 2021.

[3] A. I. Zyrianov and V. A. Semiglazova, "Rural tourism: from geographical constructs to models of development," *Geography and Natural Resources*, vol. 42, no. 1, pp. 24–31, 2021.

[4] P. D. Rosalina, K. Dupre, and Y. Wang, "Rural tourism: a systematic literature review on definitions and challenges," *Journal of Hospitality and Tourism Management*, vol. 47, no. 9, pp. 134–149, 2021.

[5] S. Ye, W. Wei, J. Wen, T. Ying, and X. Tan, "Creating memorable experience in rural tourism: a comparison between domestic and outbound tourists," *Journal of Travel Research*, vol. 60, no. 7, pp. 1527–1542, 2021.

[6] X. B. Yang and W. Zhang, "Simulation of cross-modal image-text retrieval algorithm under convolutional neural network structure and hash method," *The Journal of Supercomputing*, vol. 78, no. 5, pp. 7106–7132, 2021.

[7] X. Li, J. Ma, F. He, and Y. Zhu, "Application of neural network autoencoder algorithm in the cancer informatics research," *Chinese Journal of Biotechnology*, vol. 37, no. 7, pp. 2393–2404, 2021.

[8] Q. Y. Zhang, Y. Z. Li, and Y. J. Hu, "A retrieval algorithm for encrypted speech based on convolutional neural network and deep hashing," *Multimedia Tools and Applications*, vol. 80, no. 1, pp. 1201–1221, 2021.

[9] Z. Dang, S. Liu, T. Li, and L. Gao, "Analysis of stadium operation risk warning model based on deep confidence neural network algorithm," *Computational Intelligence and Neuroscience*, vol. 2021, no. 1, pp. 1–10, Article ID 3715116, 2021.

[10] S. Ramadhani and S. Shaddiq, "E-marketing of village tourism development strategy (case study in the tourist village puncak sosok)," *Journal of Robotics*, vol. 2, no. 2, pp. 72–77, 2021.

[11] H. M. Dwairi and A. N. Tarawneh, "Artificial neural networks prediction of inelastic displacement demands for structures built on soft soils," *Innovative Infrastructure Solutions*, vol. 7, no. 1, pp. 1–15, 2022.

[12] N. Vdovenko, N. Korobova, and A. Nevesenko, "Innovative and investment approaches to economic development of green tourism in rural areas in the context of decentralization," *Problems of Innovation and Investment Development*, vol. 2021, no. 25, pp. 114–127, 2021.

[13] R. Zhou, B. Zhang, and Z. Li, "Dynamic modeling and computer simulation analysis of the air spring suspension," *Journal of Mechanical Science and Technology*, vol. 36, no. 4, pp. 1719–1727, 2022.

[14] X. T. You, H. Liu, T. Wang, S. Feng, and C. Lang, "Object detection by crossing relational reasoning based on graph neural network," *Machine Vision and Applications*, vol. 33, no. 1, pp. 1–14, 2022.

[15] Q. Kong, S. Dong, Z. Miao, Z. Ma, J. Ai, and P. Wang, "Dynamic heat transfer simulation method of building envelope based on Laguerre polynomials model order reduction," *Journal of Building Performance Simulation*, vol. 14, no. 6, pp. 646–665, 2021.

[16] C. Deng, R. Zheng, L. Wang, S. Zhang, X. Lin, and K. Ding, "Construction of three-dimensional dynamic growth TGO (thermally grown oxide) model and stress simulation of 8YSZ thermal barrier coating," *Ceramics International*, vol. 48, no. 4, pp. 5327–5337, 2022.

[17] A. Zhang, Y. Yang, T. Chen, J. Liu, and Y. Hu, "Exploration of spatial differentiation patterns and related influencing factors for National Key Villages for rural tourism in China in the context of a rural revitalization strategy, using GIS-based overlay analysis," *Arabian Journal of Geosciences*, vol. 14, no. 2, pp. 1–15, 2021.

[18] E. Gabriel-Campos, K. Werner-Masters, F. Cordova-Buiza, and A. Paucar-Caceres, "Community eco-tourism in rural Peru: r," *Journal of Hospitality and Tourism Management*, vol. 48, no. 27, pp. 416–427, 2021.

[19] A. A. Emelyanov, N. R. Kelchevskaya, and I. S. Pelymskaya, "Assessment of competitiveness of regional mining and metallurgical clusters," *Economy of Region*, vol. 16, no. 1, pp. 213–227, 2020.

[20] J. Liu, "Research on evaluation of core competitiveness of construction engineering quality inspection company," *Modern Management*, vol. 10, no. 06, pp. 1021–1029, 2020.

[21] C. Z. Kang, S. Wang, L. Q. Huang et al., "Cultivation strategy on cluster brand of ecological agriculture of Dao-di herbs," *Zhongguo Zhong yao za zhi = Zhongguo zhongyao zazhi = China journal of Chinese materia medica*, vol. 45, no. 9, pp. 1996–2001, 2020.

[22] X. Zhao, "Evaluation and analysis on core competitiveness of China cotton textile enterprises with intuitionistic fuzzy information," *International Journal of Knowledge-Based and Intelligent Engineering Systems*, vol. 23, no. 1, pp. 9–13, 2019.