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Research Article

Artificial Intelligence-Based Sustainable Development of Smart Heritage Tourism

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World heritage is a kind of affirmation and high honor given by the international community to the important civilization, historical relics, or natural landscape of a country and nation. This paper studies and analyzes the sustainable development of heritage tourism boosted by smart tourism based on big data artificial intelligence. This paper first analyzes big data and then introduces the concept of smart tourism. Smart tourism is a new future-oriented tourism form that serves the public, enterprises, and governments. It uses the Internet of Things, cloud computing, next-generation communication network, high-performance information processing, intelligent data mining, and other technologies in tourism experience, industrial development, administrative management, and other applications, so that tourism physical resources and information resources have been highly systematically integrated and deeply developed and activated. And then, we analyze and discuss artificial intelligence algorithms. Artificial intelligence is a new technological science that is researched and developed on the basis of computer science as a simulation and extension of human intelligence activities. Finally, a comprehensive analysis is made on the tourism ecological footprint of natural heritage sites and the carrying capacity of tourism ecology in natural heritage sites. The experimental results of this paper show that the tourism development of this natural heritage site is in a sustainable state. The reasons are as follows: First, the average tourist ecological footprint of the place is $0.009466\,\mathrm{hm}^2$, the average tourism ecological carrying capacity is $0.032861\,\mathrm{hm}^2$, and there is an average ecological surplus of $0.02339\,\mathrm{hm}^2$; secondly, the average tourist natural footprint is $18285.93\,\mathrm{hm}^2$, the average tourism environmental carrying capacity is $40421.97\,\mathrm{hm}^2$, and the average ecological surplus is $22136.04\,\mathrm{hm}^2$. To sum up, it shows that its tourism development is in a state of sustainable development.

1. Introduction

Tourism, also known as the "smoke-free industry" and "sunrise industry," has gradually developed into one of the largest and most powerful industries in the world. However, the rapid development of tourism has also produced a certain impact while driving economic benefits. For example, the blind overexploitation of tourism resources has caused a series of problems such as ecological environment damage, extensive management of scenic spots, and idle tourism infrastructure. As the concept of "sustainable development" is deeply rooted in the hearts of the people, the concept of "sustainable tourism development" has been widely accepted by all sectors of society once it has been clearly put forward. The world heritage is a nonrenewable and scarce resource, which has comprehensive value in tourism value, scientific value, artistic value, and so on. It is necessary to protect the world heritage.

World natural heritage is a nonrenewable tourism resource. At this stage, the biggest threat facing China's world natural heritage is blindly dislocated, overloaded, and uncontrolled tourism development. There are many contradictions and close links between the development and protection of world natural heritage. A large number of theoretical discussions are difficult to effectively solve the contradiction and unified dialectical relationship between the protection and development of world natural heritage, and it is difficult to find an effective and reasonable path for symbiotic development. Therefore, it is necessary to select examples to systematically study the current situation

of China's world natural heritage tourism development. It is even more necessary to explore the development of world natural heritage with reasonable coexistence, fair distribution and sustainable development of protection, and development in the region, so as to permanently preserve and sustainably utilize natural heritage. This paper studies and analyzes the sustainable development of heritage tourism boosted by smart tourism based on big data artificial intelligence. It is aimed at providing theoretical support and practical guidance for the tourism development of World Heritage Sites in China and around the world.

The innovations of this paper are as follows: (1) Big data is firstly analyzed. Big data refers to a large number of resources that cannot be acquired, processed, and integrated by software within a reasonable time. (2) The smart tourism is introduced. Smart tourism is a brand new tourist operation method. It is based on new technologies such as the Internet of Things and cloud computing and is centered on the needs of tourists. After highly systematic integration and in-depth development and activation of the tourist information system, highly intelligent tourist information service, operation, and management are carried out. (3) The artificial intelligence algorithm is analyzed and discussed. Artificial intelligence is a new technological science that is researched and developed on the basis of computer science as a simulation and extension of human intelligence activities. (4) Finally, a comprehensive experiment is carried out to explore the tourism ecological footprint of natural heritage sites and the carrying capacity of tourism ecology of natural heritage sites.

2. Related Work

According to the research progress at home and abroad, different scholars also have a certain degree of cooperative research in the field of big data artificial intelligence and smart tourism boosting heritage tourism. Yu and Xu developed a tripartite framework for a holistic and structural understanding of the cultural heritage elements of a tourist destination based on its place in cultural heritage, tourism production, and tourism consumption. This research provided knowledge based on empirical cultural data and provided insights into cultural heritage tourism practice and research questions [1]. Using the legacy of Umm Qais as a case study, Alobiedat argued that tourism can fundamentally shape or reshape the intangible and tangible heritage of the communities in which tourist destinations are located. The findings showed that the local cultural and tangible heritage of Umm Qais was not resilient enough to absorb the changes brought about by tourism development [2]. Li et al. highlighted the opportunities and challenges of leveraging artificial intelligence to enable smart 5G networks and demonstrated the effectiveness of artificial intelligence in managing and coordinating cellular network resources. It is also envisaged that artificial intelligence-enabled 5G cellular networks will make the acclaimed ICT enabler a reality [3]. Caviglione et al. aimed to discover malware by secretly exchanging data by using two detection methods based on artificial intelligence tools such as neural networks and decision trees. To verify their effectiveness, seven covert channels had been implemented and tested on the measurement framework

using Android devices. Experimental results demonstrate the feasibility and effectiveness of the method to detect hidden data exchanges between colluding applications [4]. To create a more convenient medical business and environment, Zhang et al. provided a patient-centric medical application and environmental business cyber physical system called Health CPS using technologies such as cloud and big data mining. The system is mainly composed of a unified and standardized information collection layer, an information management layer for distributed network storage and parallel computing, and an information service layer for data analysis. The results of this study show that cloud and big data analysis technologies can be used to improve the characteristics of medical systems, thereby enabling people to obtain various smart medical applications and consulting services [5]. Zhang et al. provided an overview of big data topics and a comprehensive survey of how cloud computing and its related technologies address the challenges posed by big data. Then, it analyzed the disadvantage of cloud computing when big data encounters the Internet of Things and introduced two promising computing paradigms, fog computing and transparent computing, to support big data services for the Internet of Things. Finally, some open challenges and future directions are summarized [6]. However, these scholars did not conduct research and analysis on the sustainable development of heritage tourism boosted by smart tourism based on big data artificial intelligence, but only discussed its significance unilaterally.

3. A Sustainable Development Method for Smart Tourism to Boost Heritage Tourism Based on Big Data Artificial Intelligence

3.1. Big Data. Big data is another revolution after mobile internet, Internet of Things, and cloud computing. It is a new opportunity arising from the contradiction between the rapidly developing information technology field and the increasing demand for information processing capabilities. For its concept, there are many different definitions and understandings [7]. Figure 1 shows the big data information processing system.

Big data, also known as massive data, refers to a large amount of resources that cannot be acquired, processed, and integrated by software in a reasonable time [8]. The acquisition, storage, big data analysis, and management capabilities of conventional database software simply cannot cope with such a large scale of data processing. The types and formats of data also go beyond traditional structured data. More and more predictions, decisions, and business behaviors in society are based on objective analysis of data [9]. Figure 2 shows the basic process of big data processing.

According to Gartner's definition, big data processing is a huge, changeable, and rapidly growing information system asset. Its decisiveness, insight, and optimal optimization power can only be exerted in the new processing mode [10].

The research on the characteristics of big data mainly focuses on the five dimensions of quantity, diversity, speed, value, and authenticity, which are called the 5V characteristics of big data [11].
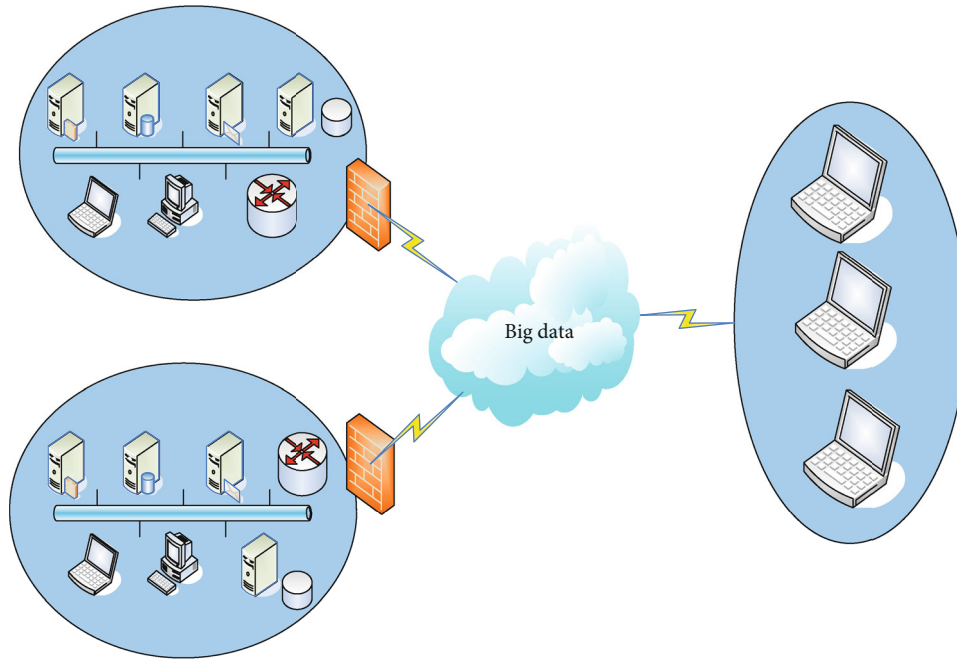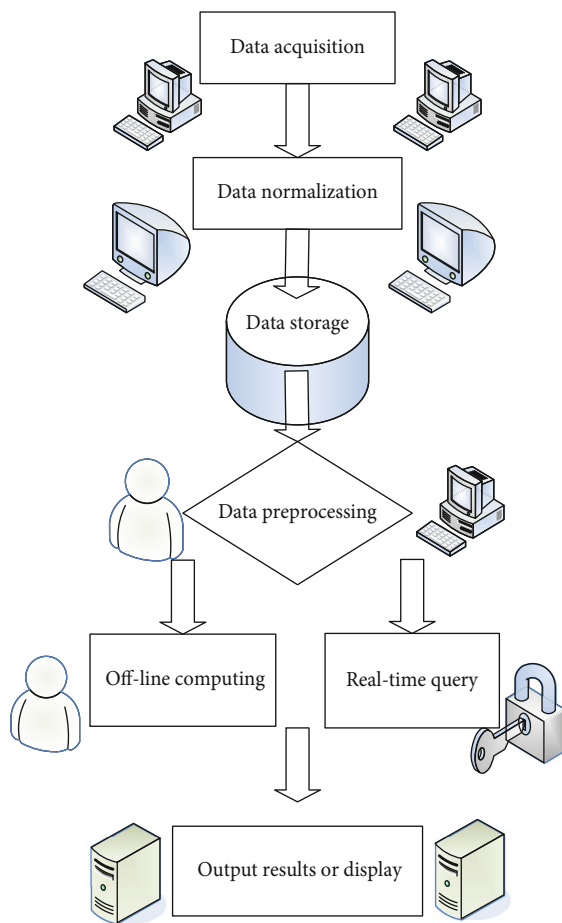
FIGURE 1: Big data information processing.

FIGURE 2: Basic process of big data processing.

3.1.1. Quantity. The scale of data is huge. As the cost of data acquisition, storage, and processing decreases, almost all electronic products and technologies become data sources [12].

3.1.2. Diversity. The diversity of data analysis types refers to a wide variety of modalities. Due to the widespread application of social media and smart devices, all kinds of information have been generated for enterprises, government departments, and communities. It not only has fully structured data types but also distributes a large number of semistructured and unstructured data analysis types such as text, pictures, and videos [13].

3.1.3. Speed. Global data usage will surge 44 times in 2020. The massive growth of data has resulted in rapid changes in data. In addition, the huge amount of data also puts forward higher requirements on the speed of data analysis and processing [14].

3.1.4. Value. Data has become a new type of asset, called "new oil." Whether data can be converted into value has also become a decisive factor for many companies to occupy the commanding heights of the market. However, the effective information hidden in the data is not proportional to the rapidly growing amount of data, which makes our task of mining value in the data more and more difficult [15].

3.1.5. Authenticity. Distorted data is prone to appear in the virtual network environment, and effective measures need to be taken to determine its authenticity. This is an inevitable need for the development of big data analysis. Only in this way can we truly restore and predict the true nature of things [16].

3.2. Smart Tourism. This paper believes that smart tourism is a tourist operation method based on new technologies such as the Internet of Things and cloud computing and centered on the needs of tourists [17]. It carries out highly intelligent tourist information service, operation and management through highly systematic integration, and in-depth development and activation of the tourist information system. The essence of smart travel is the in-depth integration of the new generation of information technology and the traditional tourism industry, which runs through the entire process of tourism activities, the entire process of tour operation, and the entire chain of tourism services. It enhances the strength of tourism enterprises with technological innovation, optimizes the experience of tourists, and enhances the level of the tourism industry. In this way, the intelligent management and operation of the tourism industry has been realized, and the traditional service industry has been upgraded to a modern service industry [18].

The fundamental value of intelligent tourism is to achieve a highly systematic integration and deep activation of the travel information system. Using new computer technology, large-scale collectible information data, high-performance data transmission network system, huge computing processing system, and core data center will be formed [19]. Big data analytics is blood. It will flow in the information network. Big data analysis of travel-related meals, accommodation, attractions, transportation, entertainment, etc., will serve as an important basis for tourists' life and government decision-making; network systems are like capillaries. The massive data information required for smart tourism will be transmitted and exchanged through this ubiquitous information network; the intelligent computing processing system is like the human brain, which will process various information data and issue various command instructions; the core data center, like the heart, has become an important cornerstone to support smart tourism. The smart tourism constructed based on the above elements has the characteristics of people-oriented, comprehensive sensing, full integration, and self-innovation [20]. Figure 3 features of smart tourism.

3.3. Artificial Intelligence Algorithms

(1) Artificial intelligence

A new generation of artificial intelligence is found, sometimes called mechanical intelligence. It is a new scientific theory of information technology that is researched and developed on the basis of traditional computer technology to imitate and expand the scope of human intelligence activities. It integrates the theoretical knowledge of mathematics, logic, financial control theory, simulation, information management theory, linguistics, industrial automation, engineering psychology, medicine, and philosophy. Artificial intelligence technology mainly has four important branches and application areas, mainly computer teaching, data analysis and discovery, model identification, and intelligent computing. At present, many software use artificial intelligence technology, including logical derivation, mathematical optimization, and retrieval.

However, calculations based on probability theory, bionics, economics, and cognitive psychology are still under discussion.

(2) Machine learning

Machine learning is an interdisciplinary course that includes statistics, probability theory, approximation theory research, convex analysis, and computational complexity theory. And machine learning has different concepts due to its wide range of use: It belongs to a branch of artificial intelligence, which can use experience to learn to optimize the characteristics of specific calculations; it is a study of computer algorithms that can be improved by themselves by using practical experience; it is a performance criterion that can be automatically analyzed to obtain rules by using statistics or past practical experience to optimize computer programs. Machine learning mainly includes the following types: The training set of supervised learning requires features and objectives. These targets are marked by others. However, for the training method set of unsupervised learning, others cannot be labeled. Algorithms that are in the middle of supervised learning and unsupervised learning are usually semi-supervised learning. Reinforcement learning assesses whether the feedback after an action is positive or negative. At present, machine learning technology has been applied to many application fields such as data analysis and mining, natural language information processing, and detection of credit card fraud.

(3) Deep learning

Deep learning is a subcategory of machine learning, which refers to an artificial neural network algorithm created by the structure and function of the human brain. The core of deep learning is to have fast enough computer performance and utilize huge amounts of data to train large neural networks. Deep learning is not only scalable but also has the ability to automatically extract features from raw data (called feature learning). The main purpose of deep learning is to learn feature hierarchies using higher-level features formed by combining lower-level features. The self-learning function at the abstract level in deep learning can make the system no longer rely entirely on manually set features but learn to feed the input results directly to the output. The advantage of deep learning is to replace manually acquired features with unsupervised or semisupervised feature learning and efficient hierarchical feature extraction algorithms. Up to now, it has been proved that there are many frameworks of deep learning methods, which are widely used in computer image vision, human natural language information processing, speech recognition, voice recognition, and other fields, and have achieved good results.

(4) Logistic regression model

The logistic regression model is a classic discriminative method for solving classification problems. The binomial logistic regression model is represented by the conditional probability distribution $R(B|a)$, where the value range of
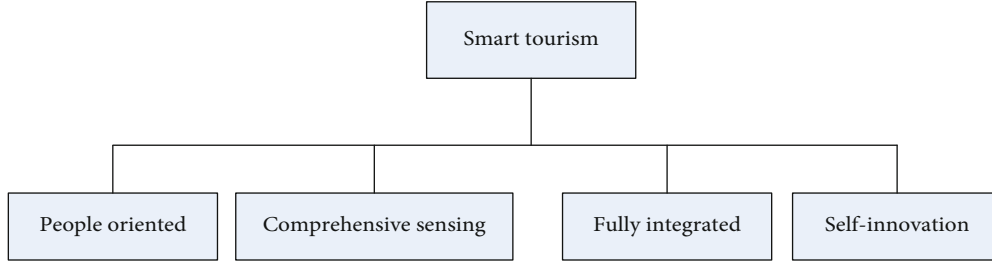
FIGURE 3: Characteristics of smart tourism.

the random variable B is 1 or 0. A value of 1 indicates a positive sample, and a value of 0 indicates a negative sample. Then, the binomial logistic regression model is

$$R(B = 1|a) = \frac{\exp{(U \cdot a)}}{1 + \exp{(U \cdot a)}}, \tag{1}$$

$$R(B = 0|a) = \frac{1}{1 + \exp{(U \cdot a)}}. \tag{2}$$

Here, $a \in T^{p+1}, a = \left(a^{(1)}, a^{(2)}, \cdots, a^{(p)}, 1\right)^S$ represents the input; $B \in \{0, 1\}$ represents the output; $U \in T^{p+1}, U = \left(u^{(1)}, u^{(2)}, \cdots, u^{(p)}, 1\right)^S$ is the parameter, called the weight vector; and c is the bias.

The parameters of the model are estimated below. Supposing there are P samples, each sample i consists of the independent variable a_i and the corresponding dependent variable b_i. Among them, when $b_i = 1$, it represents a positive sample, and when $b_i = 0$, it represents a negative sample. Assuming that b_i is independent and obeys Bernoulli distribution, that is,

$$R(B = 1|a) = \pi(a), \tag{3}$$

$$R(B = 0|a) = 1 - \pi(a). \tag{4}$$

Then, the likelihood function is

$$\prod_{i=1}^{P} [\pi(a_i)]^{b_i} [1 - \pi(a_i)]^{1-b_i}. \tag{5}$$

After sorting out the above formula, the log-likelihood function formula can be obtained as

$$K(U) = \sum_{i=1}^{P} [b_i(U \cdot a_i) - \log{(1 + \exp{(U \cdot a_i)})}]. \tag{6}$$

Using the maximum likelihood estimation method to find the extreme value of the above formula, the estimated value of U can be solved.

Assuming that the value range of random variable B is $\{1, 2, \cdots, H\}$, the multinomial logistic regression model is

$$R(B = h|a) = \frac{\exp{(U_h \cdot a)}}{1 + \sum_{h=1}^{H-1} \exp{(U_h \cdot a)}}, k = 1, 2, \cdots, H - 1, \tag{7}$$

$$R(B = H|a) = \frac{1}{1 + \sum_{h=1}^{H-1} \exp{(U_h \cdot a)}}. \tag{8}$$

Here,

$$a \in T^{p+1}, U_h \in T^{p+1}. \tag{9}$$

Parameter estimation for multinomial logistic regression models works in the same way as for binomial logistic regression models.

Logistic regression models are simple classifier algorithms with some salient features. First of all, the form of the logistic regression model is relatively simple. By observing the coefficients trained by the simulation, we can clearly see the relationship between the corresponding independent variable and the dependent variable. At the same time, the result R can also be regarded as the probability coefficient of classification, which makes it easier to understand its connotation. Secondly, compared with complex models such as support vector machines and random forests, the logistic regression model has higher training efficiency and can achieve higher modeling efficiency under similar effects. Finally, whether it is a discrete variable or a continuous variable, logistic regression models can be used concurrently and require no additional transformation and processing.

(5) Multilayer perceptron

The multilayer perceptron (MLP) pattern is an artificial neural network pattern. It maps multiple input datasets to a single dataset. Its network structure includes the input layer, hidden layer, and output layer. Figure 4 shows the multilayer perceptron algorithm model. MLP is a typical deep learning model. It can solve more complex problems. Compared with machine learning models, MLP has many characteristics.

(6) Decision tree

The decision tree model is a supervised learning algorithm with a relatively simple theory, which provides decision-making basis through a tree structure. The learning process of decision tree generally includes three parts: feature selection, generating decision tree, and pruning, among which feature selection is the most important part. A
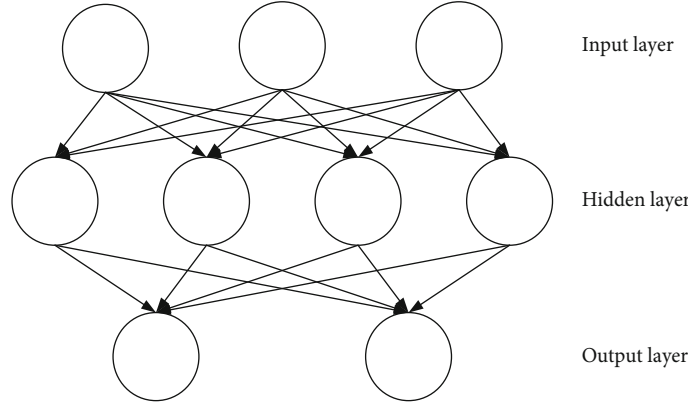
FIGURE 4: Multilayer perceptron algorithm.

common way of selecting features is based on information theory.

First, the concept of entropy is introduced. Assuming that the possible values of random variable a are $a_1, a_2, \cdots, a_p$, the value probability is

$$R(A = a_i) = r_i, i = 1, 2, \cdots, p. \tag{10}$$

So, the entropy of random variable a is

$$L(A) = -\sum_{i=1}^{p} r_i \log_2 r_i. \tag{11}$$

For the sample set T, the random variable A is the category of the sample, that is, if the sample has S categories, the probability of each category is $|V_s|/|T|$, where $|V_s|$ is the number of samples of the category, and $|T|$ is the total number of samples.

The information entropy of the sample set T is

$$L(T) = -\sum_{s=1}^{S} \frac{|V_s|}{|T|} \log \frac{|V_s|}{|T|}, \tag{12}$$

$$\varphi_n^c = \sum \left(\varphi_n^0 U_{mk}^3 \right) g_m^{\cdot}(\cdot). \tag{13}$$

It is one of the commonly used metrics to measure the purity of the sample set T. The smaller $L(T)$, the higher the purity of T.

3.3.1. Information Gain. Assuming that the value range of attribute D is $\{d_1, d_2, \cdots, d_p\}$, when a certain attribute D is used to divide the sample set T, the formula for its information gain is

$$f(T, D) = L(T) - \sum_{i=1}^{p} \frac{|T_i|}{|T|} L(T_i). \tag{14}$$

Here $|T_i|$ is the number of samples with a value of d_i on attribute D. Generally, the larger the value of $f(T, D)$, the greater the improvement in purity obtained by dividing by attribute D.

3.3.2. Information Gain Rate. The formula for the information gain rate is

$$f_U(T, D) = \frac{f(T, D)}{L_D(T)}. \tag{15}$$

Here,

$$L_D(T) = -\sum_{i=1}^{p} \frac{|T_i|}{|T|} \log_2 \frac{|T_i|}{|T|}. \tag{16}$$

3.3.3. Gini Index. The Gini index of the sample set T is

$$\text{Gini}(T) = 1 - \sum_{s=1}^{S} \left(\frac{|V_s|}{|T|} \right)^2. \tag{17}$$

The smaller the value of $\text{Gini}(T)$, the higher the purity of the sample set T is.

The Gini index based on property D is

$$\text{Gini}(T, D) = \sum_{i=1}^{p} \frac{|T_i|}{|T|} \text{Gini}(T_i). \tag{18}$$

Here,

$$\text{Gini}(T_i) = 1 - \sum_{s=1}^{S} \left(\frac{|V_s|}{|T_i|} \right)^2, i = 1, 2, \cdots, p. \tag{19}$$

(6) Random forest

The random forest model is a very well-known algorithm in ensemble learning theory. It uses decision tree as a basic learner, establishes Bagging ensemble calculation, and introduces random feature selection in the training of decision tree. The specific process is shown in Figure 5.

The random forest model has significant advantages over a single decision tree. It has the ability to process big data and evaluate the importance of each variable when making class decisions. It is easy to implement and has low computational overhead, and the model training speed is fast.
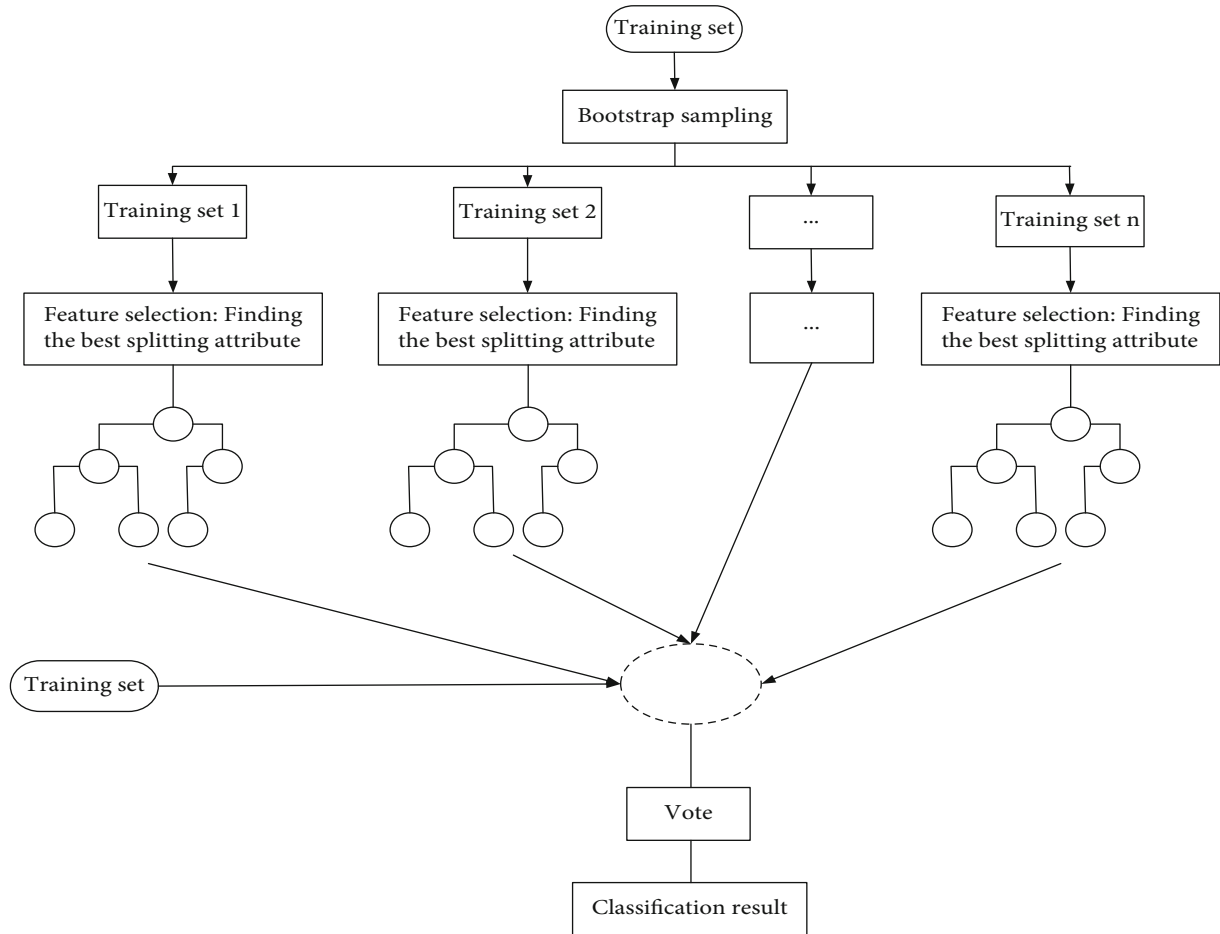
FIGURE 5: Random forest algorithm.

4. Experiment Results of Research on Sustainable Development of Heritage Tourism Boosted by Smart Tourism Based on Big Data Artificial Intelligence

In 2015, a scenic spot was rated as a world natural heritage as a symbol, and the real heritage tourism of the scenic spot officially began. From 2015 to 2020, Wulong's tourism reception volume and total tourism revenue are shown in Tables 1 and 2. It can be seen from the table that after the place was rated as a World Heritage Site, the number of tourists increased rapidly. The number of tourist receptions has increased from 1,639,700 in 2015 to 16,110,100 in 2020, a growth rate of 881.1%; the total tourism revenue has increased from 166.49 million in 2015 to 8,100.69 million in 2020, an increase of nearly 50 times. It can be seen that the brand effect of world heritage sites has a direct driving effect on tourism development.

4.1. Comprehensive Analysis of Tourism Ecological Footprint of Natural Heritage Sites. The tourism ecological footprint simulation is based on the statistics of the number of ecological footprints and the ecological carrying capacity, and the difference between the tourism ecological footprint of a cer-

tain place and the national tourism ecological carrying capacity is used to represent the impact of tourism development on the natural environment, so as to evaluate the impact of tourism development on the natural environment and the sustainable development of local tourism. This paper will conduct a comprehensive study on the tourism ecological footprint, tourism ecological carrying capacity, tourism ecological deficit or surplus of a natural heritage site in the time range of 2015-2020,in order to explore the status quo of the sustainable development of tourism in this natural heritage site, and put forward relevant opinions and suggestions on the sustainable development mode and existing problems of tourism.

Based on the analysis results of the tourism ecological footprint sub-models of a natural heritage site from 2015 to 2020, the development law of the overall tourism ecological footprint of the study area during the study period was sorted out and analyzed.

By summarizing and sorting them, the changes in the tourism ecological footprint of Wulong World Natural Heritage Site and the per capita tourism ecological footprint from 2015 to 2020 are shown in Figure 6, as well as the change trend of the proportion of tourism ecological footprint accounts, as shown in Figure 7.

TABLE 1: Tourism reception in 2015-2017.

Years	Number of tourist reception (10,000 person-times)	Total tourism revenue (ten thousand yuan)
Year 2015	163.97	16649
Year 2016	219.96	22939
Year 2017	470.01	231201

TABLE 2: Tourism reception in 2018-2020.

Years	Number of tourist reception (10,000 person-times)	Total tourism revenue (ten thousand yuan)
Year 2018	1020.01	500201
Year 2019	1331.02	657198
Year 2020	1611.01	810069

According to the statistical results, a comprehensive analysis of the development trend of tourism ecological footprint of a natural heritage site from 2015 to 2020 was carried out.

(1) The per capita ecological footprint of tourism in this natural heritage site shows an overall increasing trend. Mainly because tourists tend to choose comfortable and convenient (comparatively speaking, usually with a higher ecological footprint per unit) travel mode and consumption behavior pattern. Compared with the growth of the total tourism ecological footprint, the growth rate of the per capita ecological footprint of tourism in this natural heritage site is relatively small and the growth is relatively gentle

(2) The ecological footprint of tourism and catering and the ecological footprint of tourism transportation account for the majority of China's tourism ecological footprint. Among them, the ecological footprint of tourism and catering occupies the largest proportion, followed by the ecological footprint of tourism transportation, and then, the ecological footprint of tourism waste occupies a larger proportion and shows a trend of increasing year by year, and the remaining four categories account for a small proportion

4.2. Comprehensive Analysis of Tourism Ecological Carrying Capacity of Natural Heritage Sites.
After consulting the data, it is found that the county's forest land covers an area of 73.5%, and the average forest coverage rate is as high as 59.3%. The research area of this paper is a mountainous scenic spot, and the forest coverage rate of the heritage scenic spot is more than 80%. Therefore, all the ecologically productive land in the research area of our institute can be regarded as forest land. The following will calculate the ecological carrying capacity of tourists and per capita tourism ecological carrying capacity of the natural heritage site in turn from 2015 to 2020. The specific calculation results are shown in Tables 3 and 4.

Based on the above calculation results, a comprehensive analysis of the change trend of the tourism ecological carrying capacity of the natural heritage site from 2015 to 2020 is carried out.

(1) The tourism ecological carrying capacity of the natural heritage site will remain basically unchanged

from 2015 to 2020. Because of the strong protection of the core area and buffer zone of the World Heritage Site, the land use status has not changed much in recent years. Therefore, this paper assumes that the area of ecologically productive land within the study area remains unchanged and is all forest land. Although in fact the ecological carrying capacity within the research scope will change to a certain extent, the assumption of this paper is reasonable considering the integrity and subjectivity of the research

(2) From 2015 to 2020, the per capita tourism ecological carrying capacity of this natural heritage site showed a significant downward trend, and the decline was very large, reaching 81.9%. The main reason is that during the study period, the total value of tourism and ecological carrying capacity remained unchanged, while the number of tourists received within the study area increased rapidly, resulting in a significant decline in per capita tourism ecological carrying capacity

4.3. Comprehensive Analysis of Ecological Deficit or Surplus of Natural Heritage Sites.
According to the above calculation results, by comparing the tourism ecological footprint of the natural heritage site with the tourism ecological carrying capacity from 2015 to 2020, it can be concluded that the tourism ecological deficit (or surplus) of the Wulong World Natural Heritage Site. By comparing the per capita ecological footprint of the natural heritage site with the per capita ecological carrying capacity of the natural heritage site from 2015 to 2020, it can be concluded that the per capita ecological deficit (or surplus) of the Wulong World Natural Heritage site. Among them, the tourist ecological footprint of the world natural heritage site does not exceed the ecological carrying capacity of tourists, which is expressed as the ecological surplus of tourists, as shown in Figure 8; the per capita tourist ecological footprint of the world natural heritage site also does not exceed the global average ecological carrying capacity of tourists. It is mainly reflected in the ecological surplus of tourists per capita, as shown in Figure 9.

Based on the above numerical calculations, a comprehensive analysis was made on the tourism ecological surplus of this natural heritage site from 2015 to 2020.

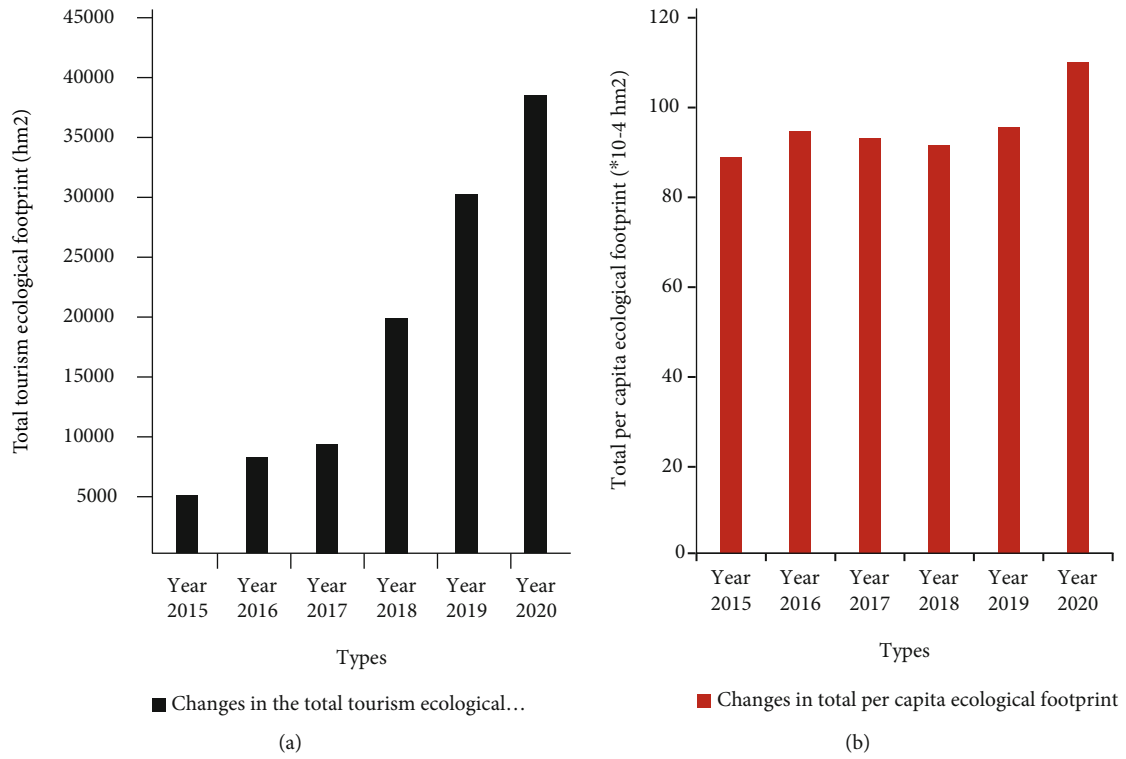(1) During the period 2015-2020, the natural heritage site showed an ecological surplus, and the results

(a)

(b)

FIGURE 6: Changes in tourism ecological footprint of natural heritage sites and changes in per capita ecological footprint.
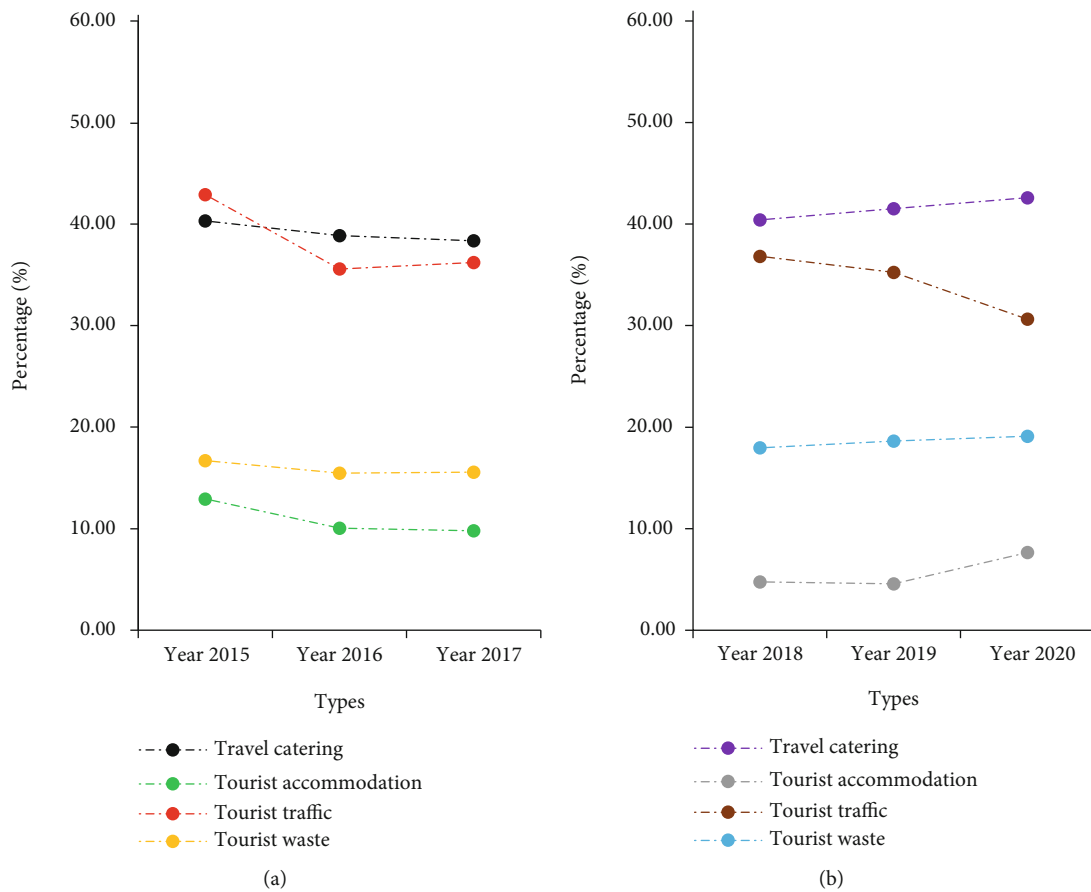

(a)

(b)

FIGURE 7: Trends in the composition of the ecological footprint of tourism in natural heritage sites.

Table 3: Summary of tourism ecological carrying capacity of natural heritage sites in 2015-2017.

	Regional area (hm^2)	Land type	Equilibrium factor	Yield factor	Ecological carrying capacity (hm^2)	Biodiversity conservation	Ecological carrying capacity per capita ($*10^{-4}$hm^2)
Year 2015	38000	Woodland	1.0	0.9	40419.76	5509.99	654.79
Year 2016	38000	Woodland	1.0	0.9	40419.76	5509.99	476.97
Year 2017	38000	Woodland	1.0	0.9	40419.76	5509.99	407.79

Table 4: Summary of tourism ecological carrying capacity of natural heritage sites in 2018-2020.

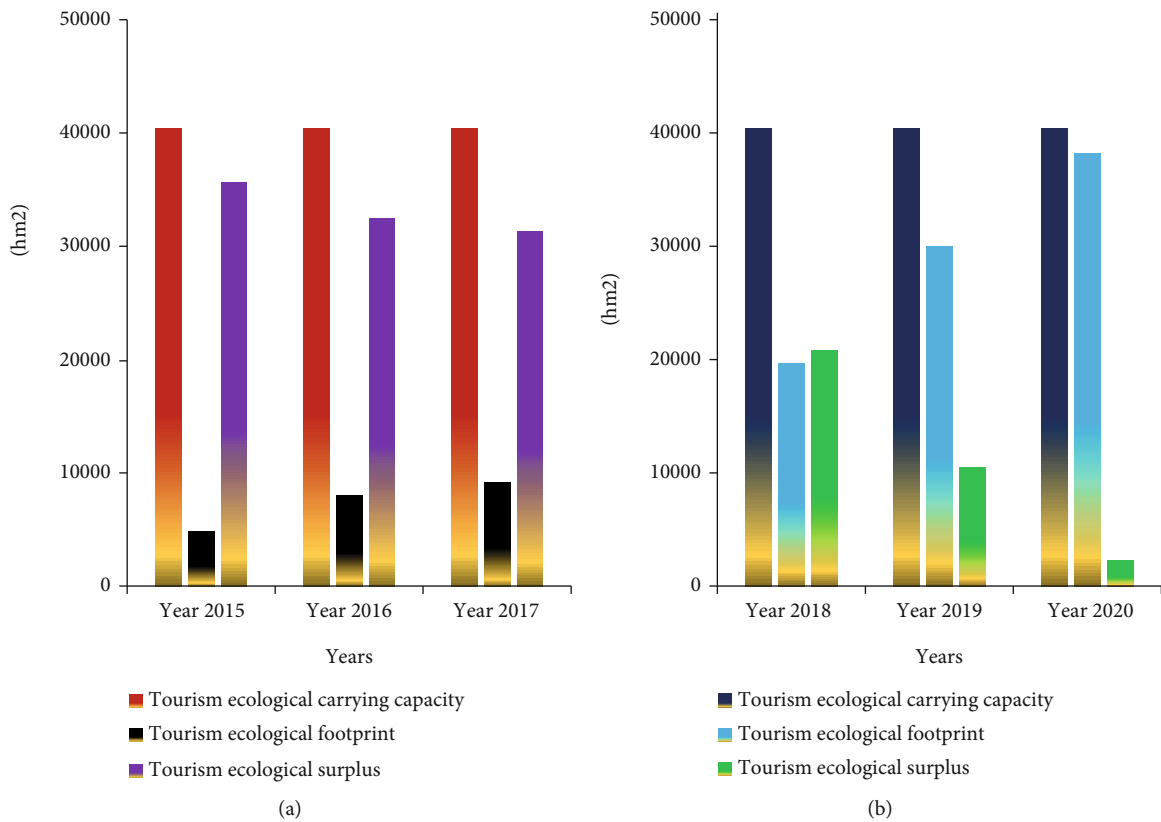|	Regional area (hm^2)	Land type	Equilibrium factor	Yield factor	Ecological carrying capacity (hm^2)	Biodiversity conservation	Ecological carrying capacity per capita ($*10^{-4}$hm^2)
Year 2018	38000	Woodland	1.0	0.9	40419.76	5509.99	187.01
Year 2019	38000	Woodland	1.0	0.9	40419.76	5509.99	127.97
Year 2020	38000	Woodland	1.0	0.9	40419.76	5509.99	116.02

(a)

(b)

Figure 8: Summary of tourism ecological surplus in natural heritage sites from 2015 to 2020.
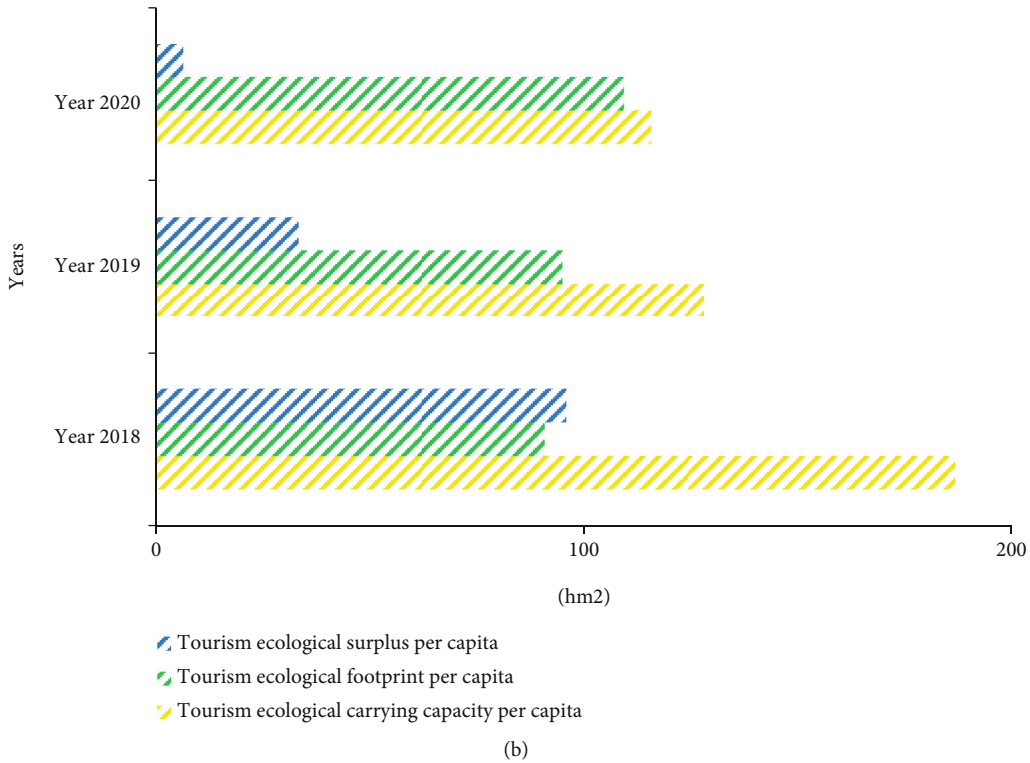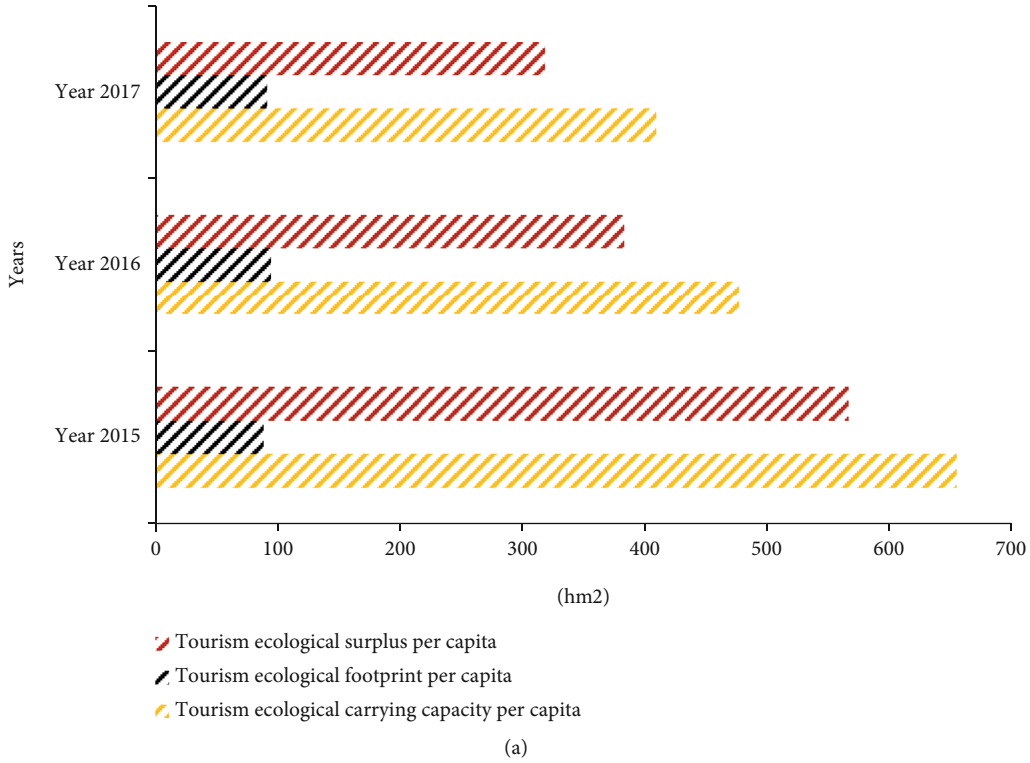
(a)

(b)

FIGURE 9: Summary of per capita tourism ecological surplus in natural heritage sites from 2015 to 2020.

show that its development is in a continuous trend. At the same time, the average travel ecological construction affordability is $40421.97\,hm^2$, the average travel ecological construction footprint is $18285.93\,hm^2$, and the average value is $22136.04\,hm^2$ of ecological construction profit. The average per capita travel ecological construction affordability is $0.032861\,hm^2$, and the average per capita travel ecological footprint is $0.009466\,hm^2$, both with $0.02339\,hm^2$ of ecological construction profit

(2) From 2015 to 2020, the tourism ecological surplus and per capita ecological surplus of this natural heritage site showed a rapid downward trend. Among them, the tourism ecological surplus decreased by 93.75%, and the per capita ecological surplus decreased by 98.88%. The main reason is that during the study period, the ecological carrying capacity is basically unchanged, while the rapid increase in tourism reception and the change in tourists' consumption behavior have resulted in a large increase in the ecological footprint of tourism. As a result, the tourism ecological surplus and the per capita tourism ecological surplus have dropped significantly

5. Discussion

The development of smart tourism meets the needs of urban informatization development. On the basis of urban modernization, the functions of the city have been further extended and sublimated through a new generation of information technology. The development of smart tourism involves the comprehensive operation of various systems. While applying smart technology to tourist attractions and related services, the scope of application should be expanded in a timely manner, and the mode of economic development should be changed adaptively, promoting the development of informatization in urban public services, social management, etc. Let urban people focus on using intelligence to discover new problems and solve them, so as to form stronger innovation and development capabilities, enhance the city's soft power, change the city's image, and improve people's quality of life. At the same time, the intelligent scenic spot customer service system also focuses on the formation of a new type of intelligent tourism service technology through the construction of innovative information service methods. These methods include not only the horizontal development of expanding the scope of scenic spot information consulting services but also the vertical in-depth experience and expansion of tourists through in-depth exploration of scenic spot information consulting service resources. On the one hand, the intelligent scenic spot customer service system strives to implement effective, safe, reliable, multifaceted, and personalized information consulting services for tourists at home and abroad. On the other hand, it pays more attention to the benefits in the process of pushing the information service process, so that the development of tourist attractions and tourism services has a

healthier development direction. The construction of intelligent scenic spots will attach great importance to the construction of scenic resources and environmental management and monitoring systems. Through unified information technology facilities, big data infrastructure and information public service facilities, various resources, and environmental protection information systems will be seamlessly integrated. In order to achieve the comprehensive automation of various resources and environments, it can provide information consulting services for scenic resources and environments, as well as the comprehensive decision-making process of scenic spots, thereby promoting the sustainable development of scenic spots.

6. Conclusions

The value orientation of sustainable tourism development should focus on coordinating the balance between human society and nature. When considering the relationship between man and human society, the relationship between man and other living things should be considered at the same time. We respect life to maintain the vitality and diversity of organisms, protecting the life system, and keeping the sustainable use of renewable resources at a minimum. The sustainable development of heritage tourism calls for new values. And new values will drive people to embark on the road of sustainable development of heritage tourism. The idea of sustainable development of heritage tourism provides a new opportunity for the development of heritage tourism. At the same time, it also provides a new value concept for the rational development and utilization of tourism resources in heritage sites. It has obvious guiding significance for forming a new social relationship between man and nature, and cultivating people's ecological responsibility and ecological ethics for their offspring. This paper adopts the tourism ecological footprint model to study the sustainable development of tourism in world natural heritage sites. For the sake of research integrity and subjectivity, some research variables are assumed and ignored. Although such processing methods have little impact on the final results of the study, there are still some deviations from the actual results. This paper will optimize it in the follow-up research.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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