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Natural Protection Environment Under the "the Belt and Road" Based on Artificial Neural Network

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Abstract: In the "the Belt and Road" strategy, focusing on the development of environmental protection industry and building an information platform for environmental protection technology can promote the sustainable development of industries in the "the Belt and Road" related areas. In order to solve the shortcomings of the existing research on natural protection environment under the "the Belt and Road", this paper discusses the ecological vulnerability of the green "the Belt and Road" and the northwest region, as well as the derivation process of the artificial neural network, and investigates and discusses the pretreatment of environmental pollution source monitoring data and the establishment of the evaluation index system. Through the artificial neural network, the abnormal values of the environmental ingenious pollution source data were corrected and analyzed, and the ecological environment vulnerability assessment in northwest China was established based on the artificial neural network. The experimental data shows that the artificial neural network can provide a reference basis for detecting and judging the abnormal degree of the abnormal value between 47~58ug/m3 after correcting the abnormal value of the daily average environmental pollution source data in January, within the range of the monthly average emission change.

1. Introduction

Global climate change is one of the most important and urgent environmental issues facing the world. The "the Belt and Road" initiative has gone through many countries and regions, and the economic development and ecological environment along the line are different. How to deal with risks related to the ecological environment is a key link for stability and long-term development.

Today, more and more scholars have carried out a lot of research on the nature conservation environment under the "the Belt and Road" through various technologies and system tools, and have also achieved certain research results through practical research. Adhikari M further participates in global environmental governance in accordance with the 2030 Agenda for Sustainable Development, and the two have been integrated into the the Belt and Road Initiative to a large extent. Based on common ideas, cross cutting agendas and compatible governance methods, they may form synergies on the basis of increasingly interactive relationships. In short, seeking and strengthening the link between the "the Belt and Road" initiative and the Sustainable Development Goals (SDG) can solve the shortcomings of global environmental governance [1]. Mayer believes that the degradation of freshwater resources and ecological environment and the frequent occurrence of natural disasters are common problems facing sustainable development. The "the Belt and Road" initiative provides a good opportunity for extensive and in-depth cooperation in the field of water resources. Based on the analysis of different levels of policy dialogue, infrastructure cooperation, flood prevention and technical and personnel exchanges, the changes in the development conditions and stages of each country, various sources of financing, the complexity of cross-border river cooperation and the risks related to social and cultural aspects were discussed. It calls for strengthening top-level design and platform support, as well as the synergy between the government, non-governmental organizations and the private sector, and promoting water resources cooperation at different levels under the "the Belt and Road" initiative [2]. Holmberg aims to create a new model of dynamic economic growth to achieve connectivity, mutual benefit and win-win results. The data envelopment analysis model based on the environmental noise elimination algorithm (the "the Belt and Road" initiative of traditional Chinese medicine) is used to identify the technical efficiency of the "the Belt and Road" initiative of traditional Chinese medicine industry by eliminating the impact of environmental factors. Results: The environmental factors represented by pure technology ineffectiveness, regional impact and policy response have nonlinear effects on technical efficiency. The overall technical efficiency of the Chinese medicine industry in the countries along the line is on the rise year by year [3]. Although the existing research on natural protection environment under the "the Belt and Road" is very rich, there are still some limitations in its specific practical application.

This paper takes Wulatqian Banner, Inner Mongolia Autonomous Region, as the research area, and fully considers its characteristics of fragile ecological environment and strong influence of human factors in the northwest arid region, the core of the "the Belt and Road". Taking the ecological environment vulnerability of the research area as the research object, this paper uses the BP artificial neural network method to analyze and study, providing research methods for the coordinated development of the natural protection environment in the northwest arid region, It will provide reference and reference for the restoration and construction of the ecological environment of Urad Banner and even the "the Belt and Road" in China, as well as regional sustainable development. Through artificial neural network, the abnormal value of the environmental ingenious dye source data of a factory in northwest China was corrected to provide a reference for the abnormal degree of the detection data for the environmental protection departments of the relevant industries along the "the Belt and Road".

2. Research on the Design of Natural Protection Environment under the "the Belt and Road" Based on Artificial Neural Network

2.1. Green "the Belt and Road"

The green "the Belt and Road" means that under the framework of the "the Belt and Road" initiative, we adhere to the concept of green development to take the overall picture, always embed

the concept of green development in the decision-making and practice of the "the Belt and Road" construction, strive to bring China's concept and experience of green development to the countries along the "the Belt and Road", and actively learn from each other with countries along the "Belt and Road" to jointly achieve green development goals [4]. As one of the key contents of the overall construction of the "the Belt and Road", the green "the Belt and Road" will help to connect people's hearts, build consensus, help China and countries along the Belt and Road to achieve green transformation and sustainable development, and will become an important focus for China to participate in global environmental governance in the future [5].

2.2. Ecological Vulnerability in Northwest China

(1) Water crisis. The natural resources in northwest China are in a serious shortage, and the natural resources are still unable to meet the needs of local residents' daily life and urban development. The causes are related to the distribution and development efficiency of natural resources in the region [6]. In addition, the utilization range of natural resources in northwest China is not equal to the quantity of natural resources [7].

(2) Risk of energy depletion. Limited by resource types and energy conversion technologies, electricity and natural gas are still the key parts of the energy market in northwest China [8]. Although renewable clean fuels can replace some traditional non renewable energy, according to the current development situation, traditional non renewable energy such as electricity and natural gas still dominate [9].

(3) The pollution problem is serious and the treatment capacity is weak. In the process of economic and social development in the northwest, due to the rich variety of resources and the impact of natural and environmental conditions in the northwest, industrial development is the top priority [10]. Due to the low scientific and technological conditions and the weak implementation of laws and regulations at that time, heavy metal industries such as mining and metallurgy in northwest China consumed too much and environmental pollution became normal. However, since economic and social development has been placed above the general environment for a long time, the sacrifice of environmental protection benefits to a certain extent is inevitable [11].

2.3. Artificial Neural Network

The derivation process of the artificial neural network algorithm mainly considers the position of the neuron. Different positions lead to different local gradients, so the corresponding weight correction values are different [12]. Although the position of the neuron affects the weight correction value, it can be expressed by a general formula, namely:

$$\Delta\varphi_{vu}(k) = \mu\hat{\lambda}_v j_v(k) \tag{1}$$

Where, x and y represent neurons; $\Delta\varphi_{vu}(k)$ represents the modified value of the weight from x to y defined by the delta rule; μ represents the learning efficiency parameter of BP neural network; $j_u(k)$ is the output value of $\lambda_v(k)$; y is the local gradient of y, which shall be determined according to the position of y [13].

When y is an output neuron, its local gradient $\lambda_v(k)$ is equal to the product of the derivative $\vartheta_v^{'}(t_v(k))$ of the output function value of x and the corresponding error signal $r_v(k)$, and the specific expression is as follows:

$$\lambda_v(k) = r_v(k)\vartheta_v'(t_v(k)) \tag{2}$$

Where, $t_v(k)$ is the induced local domain of y, which is determined by the corresponding synaptic weight and the output signal value of the function of x connected to y.

(2) When y is a hidden layer neuron, its local gradient $\lambda_v(k)$ is equal to the product of the derivative $\vartheta_v'(t_v(k))$ of the output function value of neuron y and the weighted sum of $\varphi_A(k)\,\varphi_A(k)$, where $\varphi_A(k)$ represents the local gradient of the hidden layer or output layer node connected to neuron y, which can be obtained by layer by layer calculation, and the specific expression is as follows:

$$\lambda_v(k) = \vartheta_v'(t_v(k))\sum_A \lambda_A(k)\varphi_{Av}(k) \tag{3}$$

In the formula, $\varphi_{Av}(k)$ represents the synaptic weight between A and y, which is regulated by network training. In the BP algorithm, it is mainly to determine the value of $\Delta\varphi_{vu}(k)$, and the location of neurons leads to different values of $\Delta\varphi_{vu}(k)$, so the specific location of neurons needs to be considered [14]. In addition, there are mainly two directions of information transmission in the BP network, namely, forward and reverse transmission [15].

3. Investigation and Research on Natural Protection Environment under the "the Belt and Road" Based on Artificial Neural Network

3.1. Pretreatment of Environmental Pollution Source Monitoring Data

The method to judge whether the monthly data of a factory in northwest China is abnormal detection is to calculate the monthly average value of emissions and make a difference between the maximum and minimum monthly emissions [16]. If the difference exceeds 30% of the monthly average emission, abnormal detection shall be conducted. If the difference does not exceed 20%, abnormal detection is unnecessary. The percentages of the difference values of pollutant emissions in January, February, March, April and May are calculated respectively. The specific data analysis is shown in Table 1 [17].

Table 1. Emissions and parameters in normal month (unit: ug/m3)

Month	1	2	3	4	5
Average monthly emissions	43.635	43.72	42.69	42.87	38.24
Range	3.691	2.541	5.544	4.582	3.59
Percentage(%)	8.46	5.81	12.99	10.69	8.81

3.2. Establishment of Evaluation Index System

This paper uses the value range of various indicators of the country and Inner Mongolia Autonomous Region, and previous studies to form the following standard table 2. The higher the level, the greater the degree of vulnerability. According to the value range of the evaluation standard, select the corresponding value for the ecological environment vulnerability level, and randomly select the value within the value range to obtain a group of data as the network input of the ecological environment vulnerability evaluation of Urad Front Banner [18].

Table 2. Actual value and evaluation criteria of evaluation indicators in 2020

Indicators	Actual value	Mild fragile	Moderately vulnerable	Severe vulnerable
Average annual precipitation (mm)	184	≥400	400-200	≤200
Evaporation coefficient	13.3	≤1	1-7	≥7
Forest coverage (%)	5.95	≥17	17-10.88	≤10.88
Area ratio of water to sea (%)	5.21	≥5	5-3	≤3
Dune area ratio (%)	1.54	≤2	2-5	≥5
Per unit area yield of grain(t/hm2)	2949.25	2700	2700-1950	≤1950

4. Research on the Application of Natural Protection Environment under the "the Belt and Road" Based on Artificial Neural Network

4.1. Anomaly Correction of Environmental Pollution Source Data Based on Artificial Neural Network

In this paper, the BP algorithm is used to correct the abnormal data. Through the training of the network, the correction of multiple abnormal data is realized. After the first outlier is corrected, the outlier in the original data sequence is replaced, and the new data sequence is used as the input sample for the model to predict the next outlier to correct the next constant data.

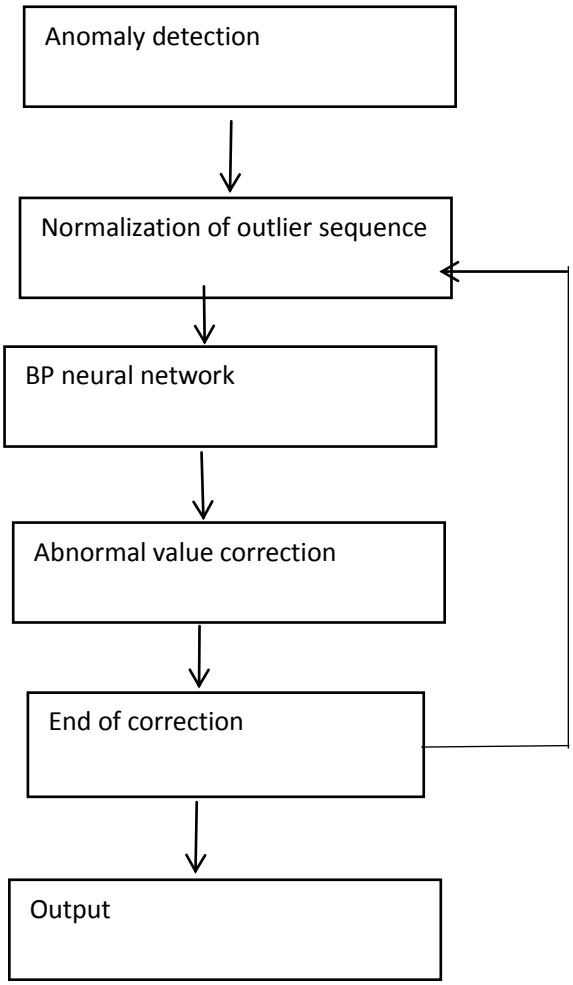

Figure 1. Correction of abnormal values of environmental smart dye source data of artificial neural network

As shown in Figure 1, the BP neural network is composed of interconnected neurons. Input the samples to the input layer. As long as the training network inputs an input sample that matches the change rule of the corrected value, it can output the predictive value of the abnormal point, and finally complete the correction of the abnormal data.

4.2. Experimental Results and Analysis of BP Neural Network Correcting Abnormal Values of Pollution Source Data

The target data of anomaly correction in this paper is the abnormal value detected by using BP neural network algorithm on the monitoring data of the daily average emission of pollutant 001 from January 2020 to May 2020 of a factory in northwest China. The months with abnormal values detected by the artificial neural network are January, February, March, April and May respectively. In this paper, the daily average monitoring data of pollutant emissions in February and March are selected as the experimental data of BP neural network anomaly correction.

Table 3. Experimental data of BP neural network anomaly correction

Time	January 27	January28	January29	January30	January31
Abnormal value	96.654	93.541	91.275	97.347	0.15
Correction value	44.57	43.531	49.259	45.663	56.017

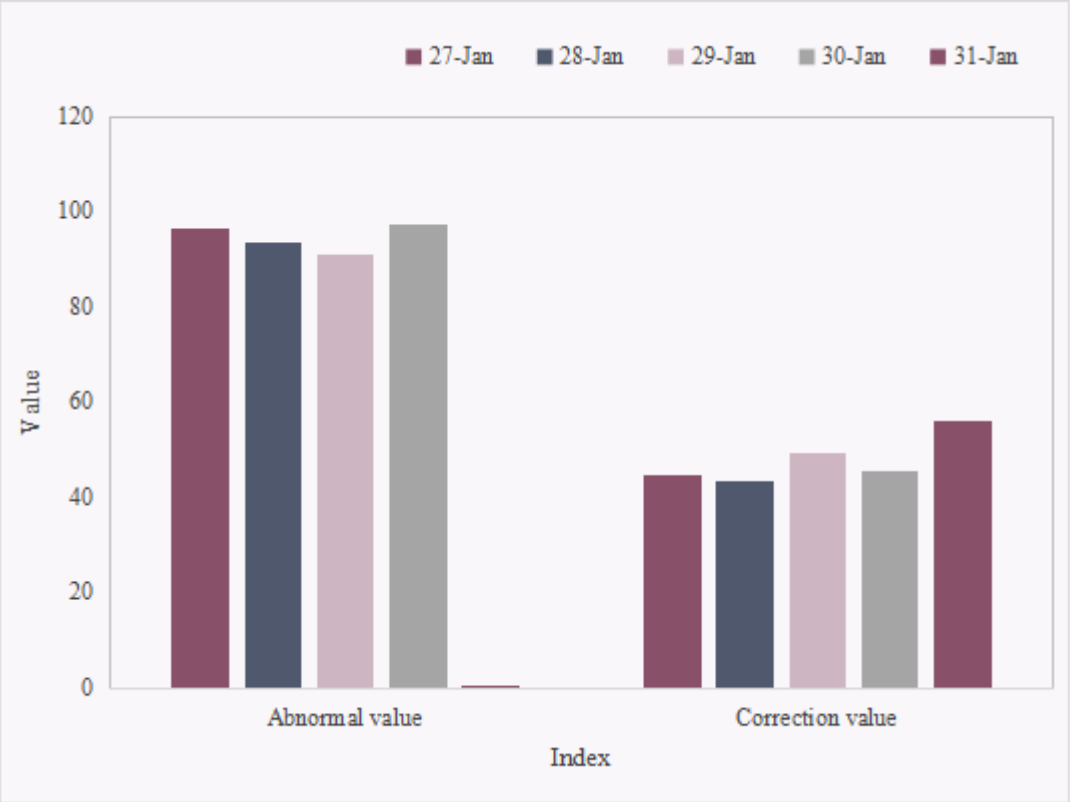

Figure 2. Data comparison of bp neural network anomaly correction

It can be seen from the data in Figure 2 and table 3 that the average daily emissions of pollutants in January are 35~55 μ Between g/m3, the detected abnormal values are all above 92ug/m3, which is obviously on the high side. The corrected data is 47~58ug/m3. According to the experimental results, by comparing and analyzing the data before and after the correction, it can be seen that whether the abnormal value is on the high side or on the low side, the abnormal correction value based on the BP neural network algorithm is within the range of the monthly average emission change, and the correction result is relatively reasonable.

4.3. Ecological Environment Vulnerability Assessment in Northwest China Based on Artificial Neural Network

(1) Network creation: the number of input neurons of the network is 11, the number of output neurons is 3, and the number of hidden layer neurons is 23, thus forming a three-layer BP neural network. Normalize the input vector so that the range of the input vector is [0,1]. The data normalization is realized with the corresponding program of MATLAB.

(2) Network training: through adjustment, the output error of the network will be minimized, and the ecological environment vulnerability assessment of the artificial neural network in northwest China will meet the requirements of practical application. The training function uses trainlm to train the network using Levenberg Marquardt algorithm.

(3) Network performance evaluation: establish the evaluation model and then test the trained network. Take three evaluation grade indicators as the test input data of the network to evaluate the feasibility of the network. The corresponding neuron error analysis is carried out according to the corresponding values of the three groups of test results I, II and III.

5. Conclusion

In order to provide an investigation basis for the degree of difference of pollution emissions in various development regions during the "the Belt and Road" process, the correction of abnormal values of northwest pollution source data through BP algorithm calculation is provided. The correction of abnormal values of northwest pollution source data has been completed. The results of anomaly testing and outlier correction of BP neural network algorithm are verified by using the measured environmental data. The experimental results show that the calculation based on BP neural network has a good effect of outlier testing and outlier correction. BP neural network is used to assess the ecological environment vulnerability of Wulatqian Banner in northwest China. Basic principles of indicator evaluation. And the local actual situation. Finally, the BP neural network method is used to evaluate the ecological environment vulnerability of Wulatqian Banner in northwest China.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

References

[1] Adhikari M, Ma Z. The Belt and Road Initiative as a Gateway to the Sea for Land-Locked Countries: With Reference to Nepal. Sage Open. (2022) 12(1):1132-1138. https://doi.org/10.1177/21582440221087271

[2]Mayer, Maximilian. Rethinking the Silk Road || Knowledge-Based Institutions in Sino-Arctic Engagement: Lessons for the Belt and Road Initiative. (2018) 10.1007/978-981-10-5915-5(Chapter9):147-160. https://doi.org/10.1007/978-981-10-59 15-59

[3]Holmberg, Johan, Bhattachariya. Loss of Vascular Myogenic Tone in Mir-143/145 Knockout Mice Is Associated With Hypertension-Induced Vascular Lesions in Small Mesenteric Arteries. Arteriosclerosis, Thrombosis, and Vascular Biology. (2018) 38(2):414-424. https://doi.org/10.1161/ATVBAHA.117.310499

[4] Shan W, Nuotio K, Zhang K. Normative Readings of the Belt and Road Initiative || Developing a Sustainable Legal System for the Belt and Road Initiative. (2018) 10.1007/978-3-319-78018-4(Chapter3):43-58. https://doi.org/10.1007/978-3-319 -78018-4_3

[5] Singh N, Sonone S, Dharaiya N. Sloth Bear Attacks on Humans in Central India: Implications for Species Conservation. Human-Wildlife Interactions. (2018) 12(3): 338-347.

[6]Yan, Ropert-Coudert. Conservation Insight. Bbc Wildlife. (2018) 36(1): 59-59.

[7]Alec, G, Blair. Community Perception of the Real Impacts of Human-Wildlife Conflict in Laikipia, Kenya: Capturing the Relative Significance of High-Frequency, Low-Severity Events. Oryx: The International Journal of Conservation. (2018) 52(3): 497-507. https://doi.org/10.1017/S0030605316001216

[8]Fernando, Trujillo. Conservation Insight Amazon River Dolphin. BBC Wildlife. (2018) 36(3): 58-58.

[9] Hna B, Aa C, Nka C. Feasibility Study of Using the Artificial Neural Network Modeling for Estimation the Radiological Levels for the Environmental Samples. Journal of Radiation Research and Applied Sciences. (2022) 15(1): 75-81. https:// doi.org/10.1016/j.jrras.2022.01.001

[10] Al-Abrrow H, Halbusi H A, Chew X Y. Uncovering the Antecedents of Trust in Social Commerce: an Application of the Non-Linear Artificial Neural Network Approach. Competitiveness Review: An International Business Journal. (2022) 32(3): 492-523. https://doi.org/10.1108/CR-04-2021-0051

[11] Prokhorov A A, Mitrishkin Y V, Korenev P S. The Plasma Shape Control System in the Tokamak with the Artificial Neural Network as a Plasma Equilibrium Reconstruction Algorithm. IFAC-PapersOnLine. (2020) 53(2): 857-862. https:// doi.org/10.1016/j.ifacol.2020.12.843

[12]Iezzi, M, Eugenia. Conservation of the Largest Cervid of South America: Interactions between People and the Vulnerable Marsh Deer Blastocerus Dichotomus. Oryx: The International Journal of Conservation. (2018) 52(4): 654-660. https://d oi.org/10.1017/S0030605317000837

[13]Mujtaba, Bashari, Erin. Hunting in Afghanistan: Variation in Motivations Across Species. Oryx: The International Journal of Conservation. (2018) 52(3): 526-536. https://doi.org/10.1017/S0030605316001174

[14]Simi, Talukdar, Abhik. Attitudes towards Forest and Wildlife, and Conservation-Oriented Traditions, around Chakrashila Wildlife Sanctuary, Assam, India. Oryx: The International Journal of Conservation. (2018) 52(3): 508-518. https://doi.org/10.1017/S0030605316001307

[15] Ombella J S. Regulation of Natural Resources Located in Indigenous Communities Territory under the Principles of Consultation and Free, Prior-Informed Consent: Perspectives in Selected Countries. African Journal of International and Comparative Law. (2021) 29(4): 499-520. https://doi.org/10.33 66/ajicl.2021.0381

[16]Kholmuminov, J. Issues of Legal Regulation of Environmental Protection and the Utilization of Natural Resources in Germany. Review of Law Sciences. (2019) 3(2): 5-5.

[17] Reddy S. The Asian Tsunami and Post-Disaster Aid || Land, Natural Resources and Sustainable Development in Aceh, Indonesia: Confronting Inequalities Through Post-tsunami and Post-conflict Recovery. (2018) 10.1007/97 8-981-13-0182-7(Chapter7): 12-139.https://doi.org/10.1007/978-981-13-0182-7_7

[18] Ortega-Rubio A. Mexican Natural Resources Management and Biodiversity Conservation (Recent Case Studies) || Functional Diversity in Plants: Implications for Conservation Issues of the Mexican Biodiversity. (2018) 10.1007/978-3- 319-90584-6(Chapter23): 519-554. https://doi.org/10.1007/978-3-319-90584-6 _23