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# *Artificial Intelligence and Big Data Analysis for Nature Conservation Environment and Ecological Construction*

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***Abstract:*** The integrated use of data facilitates users to conduct relevant analysis from massive, complex, and real-time data to achieve comprehensive consideration of governance solutions, which is an inevitable requirement and development trend of ecological construction. The purpose of this paper is to study the nature protection environment and ecological construction based on artificial intelligence and big data analysis. Based on a comprehensive analysis of the practical needs of storage, management, analysis and visualization of massive data in the field of ecological monitoring, the ecological monitoring system is designed and developed based on the Internet of Things (IoT) by combining new generation information technology such as UAV technology and big data technology. A multi-attribute decision model of plant preference is constructed to realize desertification control plants, and the experimental results show that the model effectively promotes the efficient control and sustainable development of desertification in the region.

## 1. Introduction

In recent years, ecological monitoring has become particularly important in the research of ecological stations as the number of ecological stations has been increasing and research work has been intensifying [1, 2]. How to manage ecological monitoring data scientifically and effectively has become an important issue in the field of ecological monitoring. Using the idea of "Internet+", combining the collected data in the field of ecological monitoring with Internet technology and using intelligent management of ecological monitoring data can solve the problem of data management on ecological stations. Therefore, the "Internet+ ecological station" was born, making the isolated ecological monitoring gradually move toward big data [3, 4].

Bokolo Anthony Jr proposed some targeted environmental protection and ecological construction tasks, which are important for ecological protection in the old revolutionary areas of western Anhui in the new era [5]. in relation to the complex natural cultural and economic system, and studied the problems of rural ecological construction and their causes, as well as the planning contents from three aspects: planning vision, planning methods, and planning approaches. Further, planning strategies of different types, dimensions, and levels were proposed in order to guide the practice of rural ecological construction in southern Jiangsu Province and achieve the goal of rural revitalization [6].Sadegh Tajeddin mainly reviewed the ecological construction of river and lake water systems in three scenic spots in Liaocheng City. The problems in the construction of ecological water systems were analyzed. Combining the main points of ecological river management, suggestions for the construction of ecological riverbank protection in different water systems of the city were presented [7]. Only by integrating the Internet and ecological and environmental protection work, which are two completely different fields across borders, can the construction of ecological civilization in the new era be carried out better.

In this paper, we develop a whole set of technical solutions for ecological monitoring system based on the Internet of Things and UAV technology for the needs and business scenarios related to ecological monitoring system. Among them, big data mainly contains real-time query of data by users, efficient query of historical data, data report download, data analysis and other visualization functions, and manual data audit.

## 2. Research on the Application of Artificial Intelligence and Big Data Analysis for Nature Conservation Environment and Ecological Construction

### 2.1. Internet of Things

The Internet of Things (IoT) refers to the Internet where things are connected. Its basic construction is still the Internet, and it is able to connect things with the help of modern technology in order to achieve a network that intelligently identifies, locates, tracks, monitors and manages things. The emergence of the Internet of Things (IoT) has changed the shortcomings of traditional things that are not easy to monitor and quantify, and can make any device connected to the Internet to achieve multi-source contribution and integration of data, and human life will be better because of the accurate perception of the environment by the IoT [8].

### 2.2. UAV Technology

UAVs have autonomous navigation capability and can be used for autonomous flight, aerial photography, real-time monitoring and other functions based on pre-set flight routes and using their own automated flight control, and they are unmanned and do not need to consider the limitations of the pilot factor too much [9, 10]. In areas beyond human reach and in extremely harsh environments, such as deep forests, heavy disaster areas, nuclear, biological and chemical coverage areas, and high-risk areas, they can accomplish their tasks brilliantly instead of humans and achieve the goal of zero human casualties. The so-called UAV remote sensing is to take UAV as the bearing platform, combine UAV technology, remote sensing sensing technology, communication technology, big data processing technology, GPS differential positioning, spectral analysis and other technologies to obtain remote sensing information of land resources and forest resources quickly, intelligently and accurately, and use computer technology to process remote sensing data of the collected remote sensing information [11, 12].

### 2.3. Ecological Monitoring System Module Division

As the core of the whole ecological monitoring and surveillance, the ecological monitoring system not only provides basic functions such as ecological data collection, data storage, and system management, but also provides integrated application services such as alarm and warning, data display, data release, and scientific research and analysis [13, 14]. As shown in Figure 1.

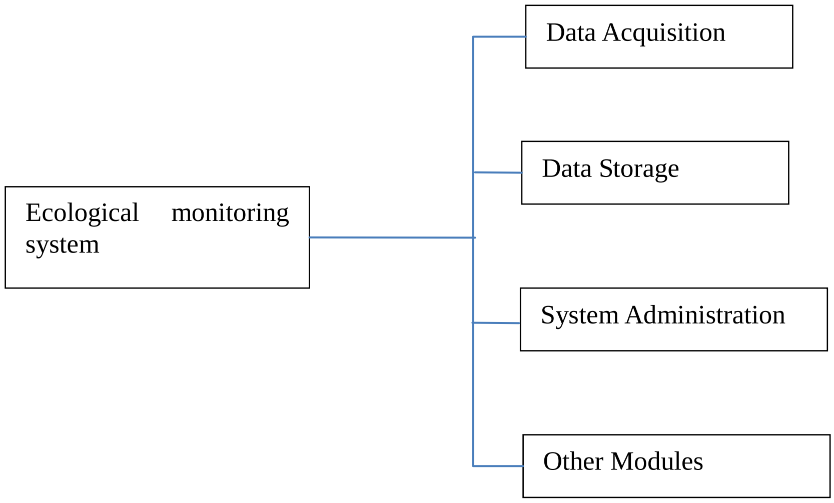


*Figure 1. Overall system structure*

(1) Data acquisition module design

After the system starts running, the system first checks the online status of all monitoring stations and resets all of them to offline status. The TCP listens to the login message sent by the monitoring station to connect and opens the link processing thread Handler, which starts sending login messages or jump messages or all the data obtained from the sensors under the station after the monitoring station knows it is connected. The Handler thread gets the input and output streams of the link and creates an array of characters to store the incoming messages. If the character array is empty, it determines that the link is broken, removes the information about the station from the global variables, and sets the status of Stationinfo to "offline" to end the loop of receiving data. If the character array is not empty, the message processing module is entered. According to the prefix of the incoming message, if the prefix is "login", the registration module will be processed to register the station to the global variables in the system and determine whether the station is registered to the global variables of the mandatory monitoring according to whether the monitoring is enabled; if it is "heart", the station will be set to 0 in the global variables; otherwise, the data collected by the sensor will be sent. Otherwise, the data sent is the data collected by the sensor, and then split the string and store it in the data table under the corresponding monitoring station [15, 16].

(2) Data analysis module design

At the start of the system, the system obtains a list of all AnalysisProjects and cycles through the list to get the analysis interval of the AnalysisProject. Quaization opens the corresponding number of analysis threads according to the analysis interval. According to the analysis method types of AnalysisProjectW and AnalysisMethod of different analysis intervals, the data received in the data storage module are analyzed and processed, and the analysis results are stored in the database [17, 18].

(3) Data display module design

One of the functions of the data display module is to view the data for all the time periods of the added monitoring parameters according to that parameter. Here we used Datatables front-end plugin as a tool for data presentation.

## 3. Investigation and Research of Nature Conservation Environment and Ecological Construction Applying Artificial Intelligence and Big Data Analysis

### 3.1. Data Sources

The M region has a vast area and many soil types, but the ecological environment is extremely fragile, and the planting conditions are more severe than those of ordinary plain areas. The data information selected in this paper comes from the ecological monitoring system, which mainly realizes the all-round sensing and acquisition of environmental information in the desertification area. Among them, the IOT equipment realizes real-time, automatic and continuous collection of meteorological data, soil data, groundwater level data and on-site crop growth data.

### 3.2. Multi-attribute Decision Model of Plant Preference Based on Hierarchical Analysis

In the multi-attribute decision model, let A = {A1, A2, ... , Am}(m≥2) denote the set of options containing m alternatives; C={C1, C2, ... , Cn}(n≥1) denote the set of attributes containing n attributes, w=(w1, w2, ... , wn)t be the set of attributes. , wn)t is the weight vector of the attribute set C, where 0 ≤ wj ≤ 1, $\sum_{j=1}^{n} w_j = 1$. The decision matrix R = [rij]mxn, rj denotes the evaluation value of option Ai under attribute Cj.

Normalize the vector $\overline{wi} = (\overline{w1}, \overline{w2}, ..., \overline{wn},)^T$ :

$$wi = \overline{wi} / \sum_{j=1}^{n} \overline{wj} \qquad (i, j = 1,2,...,n) \tag{1}$$

The resulting w(w1, w2, ... , wn)T is the obtained eigenvector, which is also the result of the hierarchical single ranking of the judgment matrix (i.e., the weight coefficient).

The negative average of the remaining eigenroots of the judgment matrix other than the largest eigenroot is introduced, i.e., Equation 2 is used as a measure of the deviation from consistency of the judgment matrix.

$$CI = \frac{\lambda \max - n}{n - 1} \tag{2}$$

A larger value of CI indicates that the degree of deviation of the judgment matrix from full consistency is greater.

## 4. Analysis and Research of Nature Conservation Environment and Ecological Construction by Applying Artificial Intelligence and Big Data Analysis

### 4.1. Analysis of Meteorological Characteristics

The big data features such as wide sources of desert data resources, various data types, large data volume and low data value density are prominent, and some data indicators have large correlation and can be substituted for each other, and the data redundancy is large. In order to reduce the redundancy and improve the independence among meteorological indicators, the main meteorological indicators (mainly including air temperature, ground temperature, sunshine hours, precipitation, evaporation, humidity, wind speed, etc.) that affect the normal growth of plants in M area were selected for principal component analysis to extract the characteristic indicators and thus improve the processing efficiency of the model. The experimental results are shown in Table 1.

*Table 1. Main meteorological indicators affecting plant growth*

| Impact Factor | Principal Components | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Wind speed | 0.14 | 0.17 | 0.43 |
| Humidity | -0.11 | 0.11 | 0.29 |
| Air temperature | 0.78 | -0.04 | 0.04 |
| Evaporation | 0.88 | 0.26 | 0.22 |
| 80cm ground temperature | 0.85 | 0.23 | 0.28 |
| Precipitation | 0.23 | 0.94 | -0.03 |
| Sunshine hours | 0.18 | -008 | 0.97 |

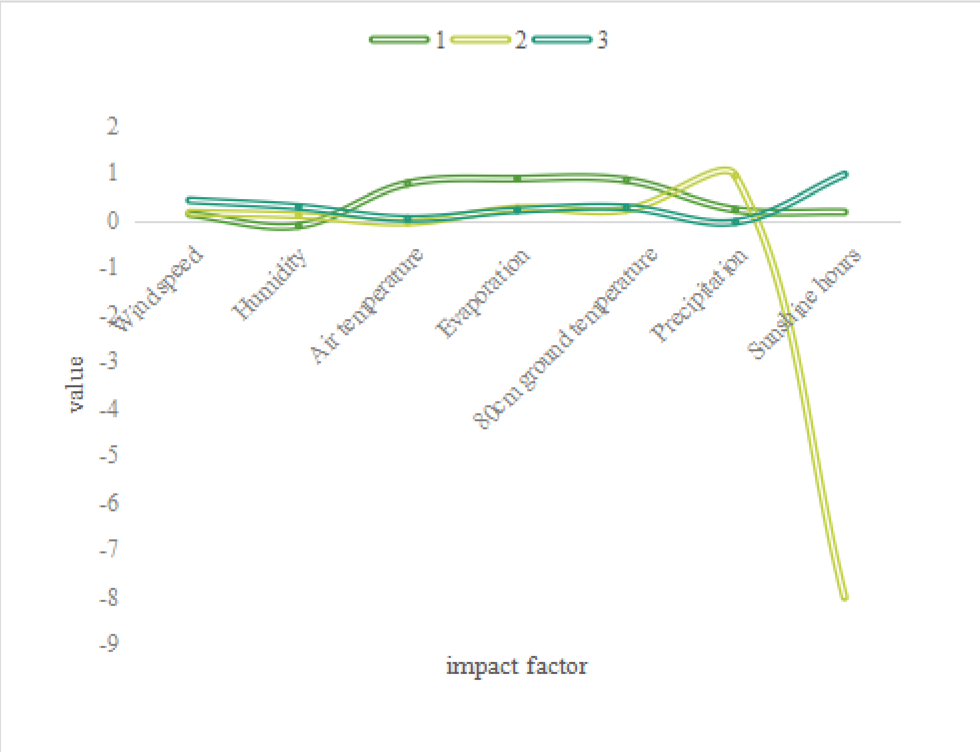


*Figure 2. Meteorological characteristics analysis*

The analysis results showed that the meteorological indicators affecting plant growth in area M could be grouped into three principal components with a total explanation of 88%, as shown in Figure 2. Among them, the indicators with factor loadings greater than 0.8 in principal component 1 include soil temperature at different depths as well as air temperature, indicating that changes in temperature have a prominent effect on plant growth, which may be related to the plant life type and its unique growth and development characteristics; precipitation accounts for a relatively large amount in principal component 2, indicating that moisture conditions may directly affect tree growth, biomass accumulation, and reproduction, etc.; in addition, sunshine hours occupy an absolute influential position in principal component 3, indicating that light is a necessary condition for normal tree growth.

## 4.2. Comprehensive Evaluation

According to the comprehensive evaluation weight of desert management plants, the preliminary screened plants were evaluated comprehensively, among which walnut, black-fruited wolfberry, flowering firewood and saltbush had the highest comprehensive evaluation scores, as shown in Table 2.

*Table 2. Results of comprehensive suitability evaluation of desertification control plants*

| Evaluation indicators | Individual scores for desertification control plants | | | |
|---|---|---|---|---|
| | Saltwort | Black Fruit Goji Berry | Walnuts | Flowery Chai |
| Adaptability | 0.18 | 0.67 | 0.87 | 0.34 |
| Ecological benefits | 0.63 | 0.59 | 0.76 | 0.54 |
| Economic benefits | 0.57 | 0.85 | 0.96 | 0.66 |
| Social benefits | 0.45 | 0.45 | 0.43 | 0.24 |
| Others | 0.18 | 0.28 | 0.45 | 0.17 |

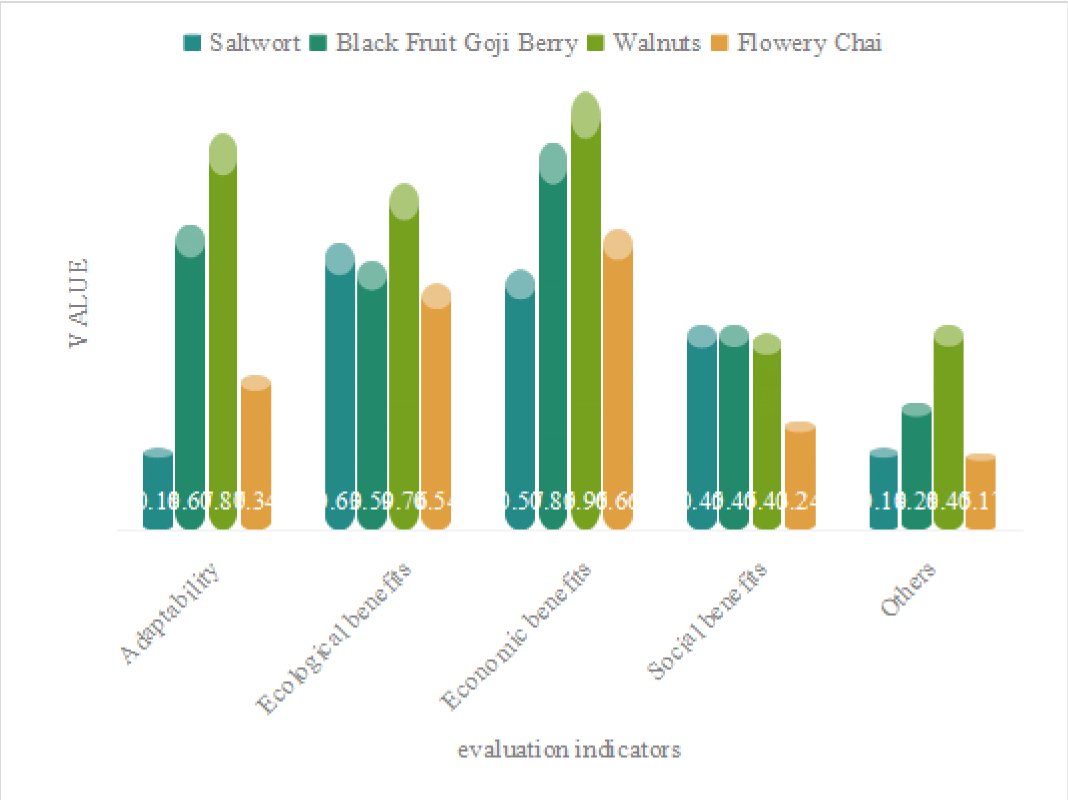


*Figure 3. Integrated evaluation results*

The results of the above analysis show that although all the four plants initially screened have good land desertification control effects, the comprehensive consideration of ecological, economic and social benefits reveals significant differences in the scores among the plants, as shown in Figure 3. Among them, the highest score is walnut, which has the best overall suitability, mainly because the initial investment of walnut planting is relatively small and the economic benefit is high on the one hand, and the government's policy support on the other. The second highest score is blackberry, mainly because of its significant economic benefits, but it requires a lot of labor and material resources, so the actual planting effect is not very satisfactory; in addition, the region is high altitude and rugged terrain, which often causes a lot of consumption during the transportation of blackberry over long distances, so the score is relatively low. The combined scores of flowering firewood and saltbush were lower, so the combined suitability and comprehensive benefits of the plants led to the conclusion that walnut was the best plant for land desertification control.

## 5. Conclusion

This paper provides a new way of thinking and solution for the preferential selection of plants in desertification control, which is of great importance to both nature conservation environment and ecological construction. The research of big data in nature conservation environment and ecological construction is more complex and involves a wide range. Due to the lack of personal ability, experience and time preparation, the research of big data in nature conservation environment and ecological construction is still at the stage of process integration and data processing, and there is still a need to further deepen the research of big data in the future management of plants, and there are many open source data platforms to be discovered. Data cleaning means and strategies still need to be improved to cope with different data problems. The research on data collection and cleaning is still relatively basic, and the role of Python in data research needs to be further explored to promote the integration of Python and GIS. The research of basic database is still at the stage of theoretical framework, and needs to be combined with big data technology to establish a complete database system to facilitate the storage and application of data.

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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.

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