

Simulation Analysis of Collaborative Efficiency Improvement of Innovative Talents Management in Colleges and Universities Based on BP Neural Network

Xiyin Chang, M.Sc

Yuchun Sun, M.Sc

Xiyin Chang, Lecturer, School of Economics and Management, Tongji University, Shanghai 200092, China. School of Business, Jiangsu Open University, Nanjing, 210036, China. Yuchun Sun, Lecturer, School of Economics and Management, Tongji University, Shanghai 200092, China.

Objectives: In recent years, it is more and more difficult to manage innovative talents. In order to improve the collaborative efficiency of innovative talents management, this paper presents a simulation analysis of collaborative efficiency of innovative talents management in Colleges and Universities Based on BP neural network algorithm. **Methods:** Data simulation technology is used to establish talent management model. This model puts forward the optimization scheme from the algorithm flow, and improves the synergy of talent management by using data transformation technology. This model is analyzed from two aspects of universities and talents. BP neural network algorithm is added to the calculation of management efficiency to realize the sequence optimization of data. **Results:** In order to test the authenticity and efficiency of the algorithm in the talent management model, a comparative experiment is set up to analyze the results. The test results show that the accuracy of the optimized data analysis model is generally above 95%, while the accuracy of the traditional algorithm is generally below 80%, the collaborative efficiency calculation time of talent management model is the shortest, averaging only about 15 seconds; the traditional model calculation time is very unstable, from short 12 seconds to long 45 seconds, the calculation span is very large, and the accuracy rate is low. **Conclusion:** The research shows that BP neural network algorithm can improve the synergy of management and optimize the management mode of innovative talents, which is worthy of further promotion.

Keywords: BP neural network algorithm; talent management; collaborative efficiency; simulation analysis.

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In the development of innovative talent management in colleges and universities, it has been found that the traditional way is to simply file files or information. Therefore, the classification of management is more reasonable

according to the clustering analysis of BP neural network. At present, the application of BP neural network algorithm to realize talent resource management has begun abroad. It simulates the information management of talent files in colleges

and universities through encoding, and achieves better archiving of talent resource management. In the 1990s, the clustering analysis of BP neural network algorithm ushered in a spring in talent management and developed rapidly¹.

Overseas development has gradually formed a large-scale application². The talent management of colleges and universities in China has gradually begun to notice the great advantages brought by BP neural network algorithm. By summing up the research results at home and abroad and adding their own design and ideas, the BP neural network algorithm is skillfully combined with the management of innovative talents in Colleges and universities. By grasping the law of the algorithm, the combination mutation theory of BP neural network algorithm is applied to the management of innovative talents in Colleges and universities, so as to increase the diversity of human resources management and make the management of talents more abundant in schools.

Aiming at the problems in the management analysis of innovative talents in Colleges and universities at the present stage, the BP neural network algorithm with the function of computer optimization is put forward to improve it. An analysis model of innovative talent management in colleges and universities is constructed by using the algorithm to improve the recognition of management, and a database is constructed by using BP neural network algorithm. The advantages of this algorithm are obvious. Firstly, with the addition of the database function of the algorithm, the management data of innovative talents in Colleges and universities can avoid the tedious manual statistics in the traditional model, and can quickly recognize the trend of the development of automated management and improve the understanding of the whole management level. Secondly, using BP neural network algorithm to realize innovative talent management scheme in colleges and universities and make analysis at the same time, providing reference for the future direction of talent development. Finally, computer-aided management data can be displayed more quickly, which reduces the statistical pressure and

improves management efficiency and collaboration. The research of this section is mainly carried out in three parts. The first part is to analyze the characteristics of the current talent management data construction model, and to explore the feasibility of data analysis and optimization of talent management supported by computer technology. The second part is to analyze the main principle and implementation process of BP neural network algorithm in talent management data model. The third part is about the shortcomings of the current BP neural network algorithm and puts forward the optimization and improvement strategy to improve the accuracy and reliability of data analysis. The other main contents are as follows: Section 2 describes the performance of BP neural network algorithm, and discusses the motivation of this study, and then gives the algorithm design in Section 3. In the fourth section, the optimization strategy of the algorithm is given, and the overall performance of the proposed algorithm is introduced. In the fifth section, it summarizes the research content of the full text and describes the future research opportunities.

In the research on the synergistic efficiency of innovative talent management in Colleges and universities, scholars have done a lot of research. Khaki I proposed to explore the relationship between employee innovation behavior and talent management based on the intermediary role of organizational learning. This study is a descriptive study. Based on data collection and analysis, the main hypothesis of this study is obtained. There is a significant relationship between talent management and employees' innovative behavior. Organizational learning plays a mediating role between talent management and employees' innovative behavior³. Nayak put forward the theory of social capital and social network, with how Indian enterprises use social network explored and emphasized as an effective tool for corporate brand building and innovative talent acquisition strategy. Qualitative data of IT, ITeS and HR professionals in talent acquisition organizations were obtained⁴. Nieves proposed that knowledge and human resource practice were intrinsically related concepts, making an empirical analysis of the role of

organizational knowledge and collaborative human resource practice in innovation performance. The results show that knowledge provides a basis for introducing innovation into this field⁵. Lin C H proposed that human resource supply was considered to be one of the most important factors to achieve organizational goals, and human resource was the most valuable factor in service production and delivery.

It is concluded that labor shortage and surplus may reduce the quality of services provided to patients⁶. Bouajaja S put forward the existing problems of human resource allocation studying the main solutions: precise, heuristic and meta-heuristic methods. At the same time, the latest research results in different field was reviewed, classifying them according to their practical applications in production planning, maintenance management, project management and other fields⁷. Elston T proposed that collaboration between public sector organizations was usually understood as a response to complexity. Using organizational theory, two different triggers of public sector cooperation are conceptualized and a framework for tracking their broader impact on the formation, operation and outcome of inter-agency partnerships was established⁸.

Bradley A P put forward the practice of human resource management in University departments, paying special attention to talent pool and talent management, and probed into its interdependence with organizational strategy, measurement criteria of academic performance and current daily management practice. This paper criticizes the current situation of lack of clear consistency between how to recruit, develop, retain and reward academic talents and organizational strategy⁹. Morris L V put forward the optimization of university teaching management based on dynamic programming. Firstly, the dynamic programming algorithm of university teaching management is designed. Secondly, the existing dynamic programming algorithm is improved. Finally, this algorithm is used to classify the types and merge the affairs in the teaching management of colleges and universities. The experimental results show that the algorithm has good stability, and the

efficiency of the algorithm increases with the increase of data processing, which can be used to optimize the teaching management in Colleges and universities¹⁰. Paisey C put forward one aspect of talent management in accounting academia in different countries, focusing on three dilemmas: transparency and autonomy, human resource power and academic power, equality and homogeneity. Considering the recruitment environment and driving factors, this tells us how to define talent and how to compare the impact of different disciplines and geographic environment¹¹. Thunnissen M proposed to identify and explain what happened to TM in practice in order to establish a broader and more balanced theoretical framework for TM, which takes into account the influence of organizational environment and its interrelated participants. Empirical data are collected from exploratory TM policies and practices in five departments of Dutch University. The results show that organizations can form and implement TM systems that meet their needs. From an organizational point of view, TM is effective¹². Pantouvakis A recognized the importance of talent factors in all quality management systems following the latest trend in human resources management (HRM) literature on the concept of talent. The purpose is to explore the application of the concept of total quality management (TQM) within service organizations and to confirm the positive correlation between TQM and performance¹³. Azman N has raised the issue of human capital development, which has become the central issue of many reform agendas in China. This article aims to provide examples of policy initiatives to promote the management of highly educated personnel. It also illustrates the role of higher education institutions, especially universities, as educators and intellectuals, in shaping talents¹⁴. None proposed the development of talent management worldwide, pointed out the practical significance of frontier research and case studies, and provided strategic insights and practical considerations affecting talent management¹⁵.

Through scholars' research on talent management model in colleges and universities, it can be found that talent management mechanism

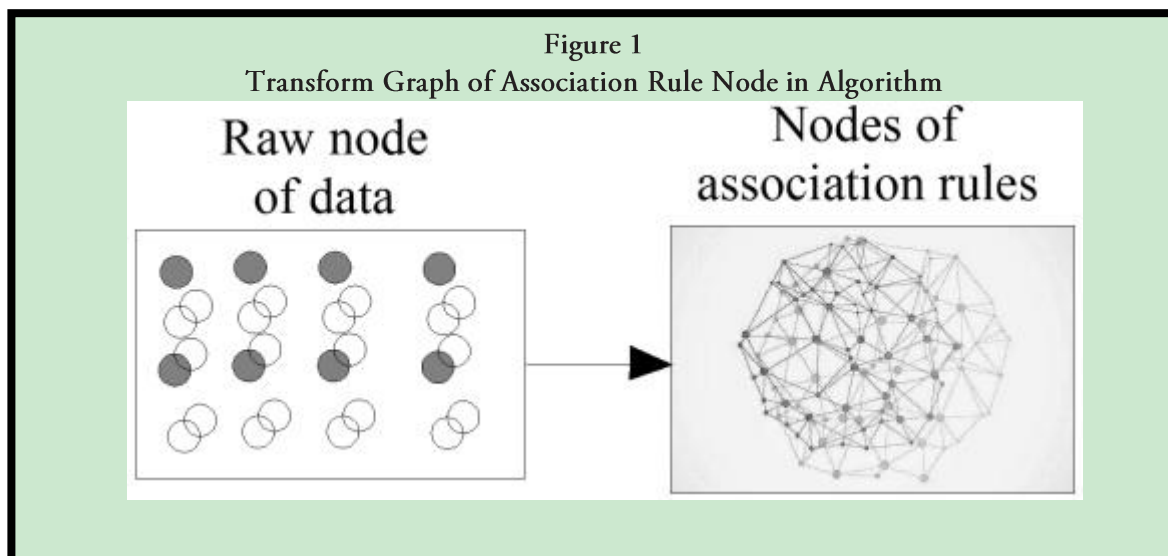
determines the efficiency of management coordination. According to the existing research results, it can be concluded that the lack of innovation in talent management mode in Colleges and universities can easily lead to the loss of talent. However, the existing research still does not use artificial intelligence algorithm to analyze the efficiency of talent management. Therefore, in order to strengthen the collaborative efficiency of innovative talent management in universities, BP neural network algorithm is used to construct the talent management model of universities and realize the hierarchical management of innovative talents.

determine the object of data mining is very important, which is the goal of data mining. Only after defining a certain goal can we calculate which makes our calculation not very blind. Especially for data mining, the results of data mining are often unpredictable, which results in some uncertainty. However, if the target of data mining cannot be positioned, then the data mining will be meaningless, and then data mining, which is an important part of data mining. BP neural network algorithm is used for calculation, and big data mining technology is used for data mining. Finally, the result analysis: the mining results also need to be systematically analyzed, using BP neural network algorithm to calculate, the mining data will be integrated and processed, and the relationship between the data will be analyzed. Mining knowledge should be raised to a certain height, further applied to improve efficiency, integrate information system into university organization structure, guide our manpower management mode, and complete the ultimate goal of data mining. The mining transformation diagram is shown in Figure 1 below.

METHODS

Step Analysis of Data Mining in BP Neural Network

In the process of innovative talent management in Colleges and universities, the data mining in BP neural network has certain steps, otherwise it will be quite troublesome and difficult to calculate. The main steps of data mining are summarized. The basic steps of data mining are: to determine the object of data mining; to



Firstly, the concept of "item" is introduced. Item is the basic element of BP neural network. BP neural network is to correlate items. Many items form a set, which is named in the same way

as sets in mathematics. Item sets are expressed as $I = (i_1, i_2, i_3 \dots i_n)$ and data items as $X = (k_1, k_2, k_3 \dots k_n)$. The transaction item set is represented by $D = (t_1, t_2, t_3 \dots t_n)$. The basic

information about the item is introduced, and the research of BP neural network arithmetic calculation is started below. This paper introduces the concept of "support degree of item sets".The support degree of transaction D is expressed as $S(X)$ and the probability is $P(X)$.The support degree includes probability, and the formula of the support degree is defined as the following formula:

$$S(X) = \frac{Sup(X)}{|D|} \quad (1)$$

The upper formula is the support degree of data set X . Frequent item set is a measure unit, which is generally used to describe a threshold of transaction intensity. Writing frequent item sets

into X is a minimum degree of support. $Support(X)$ is greater than or equal to it. It is called a frequent item set. According to BP neural network, it can be found that two arbitrary item sets in a transaction are connected with data. But some of the attributes are different. The two concepts of support and reliability of BP neural network are within the scope of BP neural network, which restricts BP neural network to several truly connected transactions. The concepts of support and credibility are introduced below. For example, as shown in the following table, under the premise of utilizing BP neural network, the reliability is:

Table1
Feasibility Application of Neural Network algorithm based on BP

Order number	Sample number	Using algorithm error%	Algorithm free error%
0	50	15%	26%
1	100	15%	30%
2	150	15%	35%
3	200	15%	35%
4	250	12%	35%
5	300	15%	37%
6	350	16%	40%

BP neural network is an implicit expression similar to $X \Rightarrow Y$. X and Y are two disjoint item sets. Support and confidence is a parameter description used to express the strength of BP neural network. Support degree: The support degree of project set $(X \cup Y)$ is called $X \Rightarrow Y$ support degree, which can be understood as the proportion of $(X \cup Y)$ contained in data, that is, the probability size. *Support* is usually expressed by abbreviation *Su* as its formula:

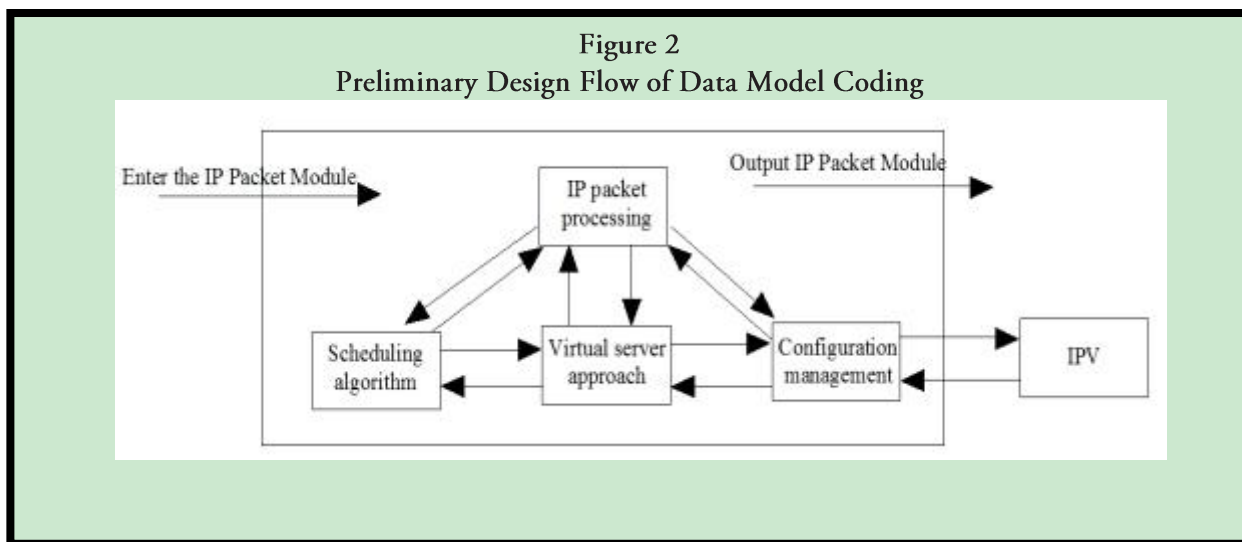
$$Su(X \Rightarrow Y) = \frac{Sup(X \cup Y)}{|D|} \quad (2)$$

Confidence: The confidence in BP neural network is the ratio of the number of transactions including X and Y in the database to the number of transactions containing X , which is known as conditional probability $P(Y|X)$. Its expression is as follows:

$$Confidence(X \Rightarrow Y) = \frac{Sup(X \cup Y)}{Sup(X)} \quad (3)$$

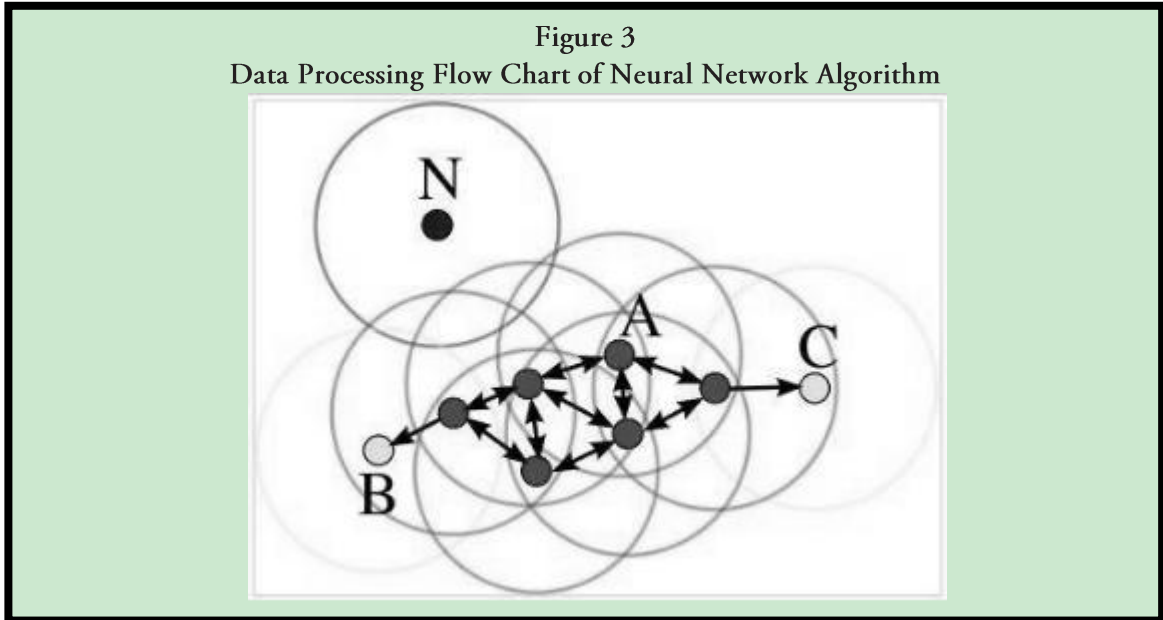
X, Y are item sets; P is probability. After understanding the data construction principles of the model, the whole management model is constructed and divided into four important components. It includes information acquisition of virtual terminals, that is, using terminal infiltration theory, extracting information data of each subset of servers from each model, as well as basic operation information of each server. This includes information provided by the total server

client, etc. From the security point of view, the server's credit data acquisition mode is deployed by the way of pre-positioning. Secondly, data processing is carried out. Its main task is to integrate and process the information from different platforms. Through effective processing, and after reaching consensus with the small servers, the stable operation of each server can be achieved, and the operation of each server can be guaranteed. The preliminary model design is shown in the following figure:



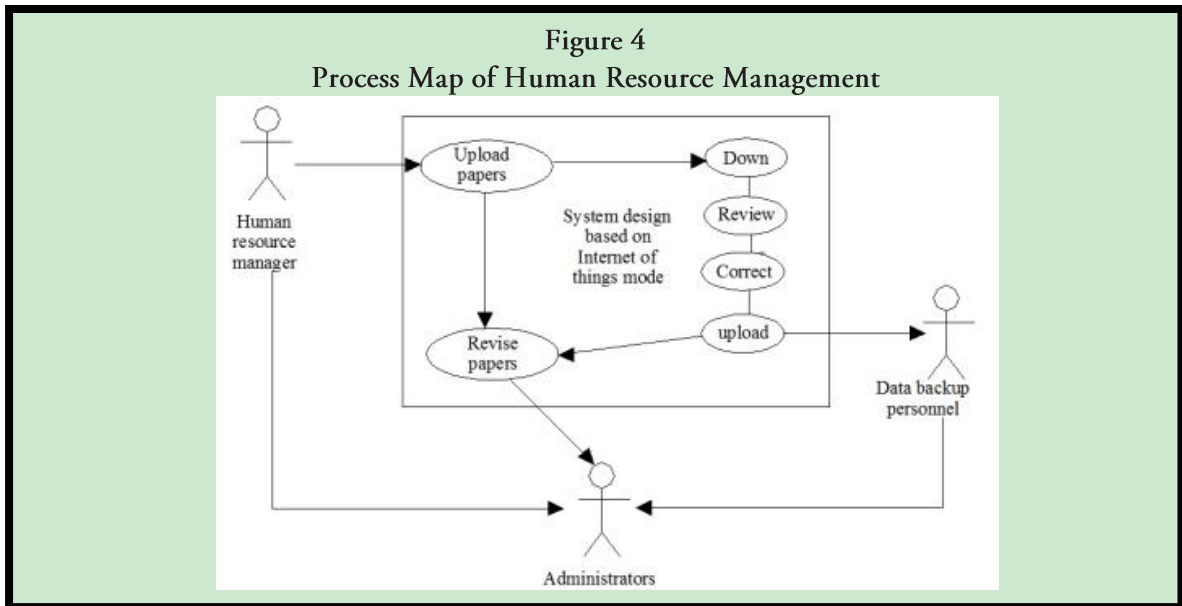
Collaborative Model of Talent Management Based on BP Neural Network

The main function of the innovative talent management system in Colleges and universities is to realize the comprehensive management of the organizational structure, talent information, talent assessment and other projects of colleges and universities. Through this discussion and research, it is hoped that university leaders and universities can provide decision-making basis and data support in the management of innovative talents, to simplify the reporting and statistics of relevant data of personnel departments, to lay a good foundation for the implementation of paperless office mode in universities, so as to achieve data sharing of innovative talents in universities and improve work efficiency. So the addition of BP neural network can combine their authority to achieve the functional operation of the system. Through the calculation and integration of information data, the design process will be focused on the overlap between the algorithm generation framework and the input factors of information algorithm. In the data processing and acquisition, based on the algorithm generation framework built above, the content from the design input is classified and coded, as shown in the following figure:



In personnel management, the personnel management module can choose a single and batch way to maintain all aspects of information of teachers and staff; the condition of query statistics can be customized, and the complex conditions can be defined, which can satisfy the multi-level, flexible and multi-dimensional statistical, query and analysis functions of colleges and universities, and the well-defined conditions

can be saved at the same time. Then it can be executed easily and quickly, and the results of the query can generate various rosters. Because of the support of process technology, it becomes flexible, extensible and controllable, so all kinds of links in this requirement and their corresponding information content, personnel and authority can be defined. As shown in the following figure:



In the construction process, based on the three-component Cantor theory of sliding window, an interval is assumed to be divided into three segments on average, and then one third of the middle segment is removed, leaving only two closed intervals $[0, 1/3]$ and $[2/3, 1]$. At the end of the segmentation, divide the remaining two closed intervals into three segments, equally dividing them into three segments, eliminating the intermediate intervals, leaving only the last four closed intervals: $[0, 1/9]$, $[2/9, 1/3]$, $[2/3, 7/9]$ and $[8/9, 1]$. The third step is to delete $1/3$ of the middle segment of each cell repeatedly. With such continuous segmentation, the remaining segments of each cell constitute a three-component Cantor set of BP neural network for data flow of the algorithm. By analogy, the Hausdorff dimension of the three-component Cantor set is 0.6309. The specific formula is shown in the following formula. Through the above process, the optimal data expression in human resource management can be obtained comparatively. Based on the data, the data can be screened and analyzed again, and finally the effective data suitable for the evaluation of runner resistance can be determined.

$$A_i = [a_1, a_2], [a_3, a_4], [a_5, a_6], [a_{i-1}, a_i] \quad (4)$$

A represents the first unit of the three-component coefficient, a represents the starting point of the interval section. By analogy, the final solution can be obtained by dividing the above formula. The remaining minimum interval section constitutes a unit of the BP neural network of the algorithm data flow. Then, the next step of calculation is carried out by using the algorithm of constitutive coefficients.

$$\eta(y_i) = \sum_{j=1}^k a_j^2 + \sum_{i=1}^p b_i^2 \quad (5)$$

In the above formula, η represents the total set of the final three-component Cantor model, that is, the total number of units of the BP neural network of the algorithmic data flow. k , p represents the organizational coefficient, a , b represents the starting point of the interval

segment. Through joint operation, the optimal solution of all units is obtained.

$$W(w) = \int_0^1 L(a_0, a_i) dF(A_0, A_i) \quad (6)$$

In the formula above, W is used to represent the final integration coefficient, L is used to represent the initial value of each interval, A , a is the same as the formula above, integrative substitution of the hypothetical algorithm S and the algorithm data flow BP neural network is carried out, and the corresponding data flow BP neural network node location is calculated. Finally, the overall outline node data of the data flow BP neural network is determined. Finally, it provides corresponding technical support for sorting between different sequences to avoid the disorder among them. After the whole pair of basic algorithmic data is matched, the design idea is further checked through the output of data. The whole algorithmic modeling mechanism can not only keep us away from the complexity between innovative talents and campus management, but also bring different model construction.

RESULTS

Experimental Environment and Parameter Setting

After formulating research methods for data mining algorithm of innovative talent management, functional and performance tests are conducted for the algorithm and response time of clusters. In the process of validating the algorithm, the experimental site is the innovative talent management personnel in a university. The client chooses the Web to imitate the real situation of the algorithm in the process of using. In order to construct this experiment, it is proved that the BP neural network algorithm of our system will optimize the sequence of data. Firstly, the relationship between the number of visits and the corresponding algorithm simulation test is established. The relationship between the number of visits and the time is shown in the table below.

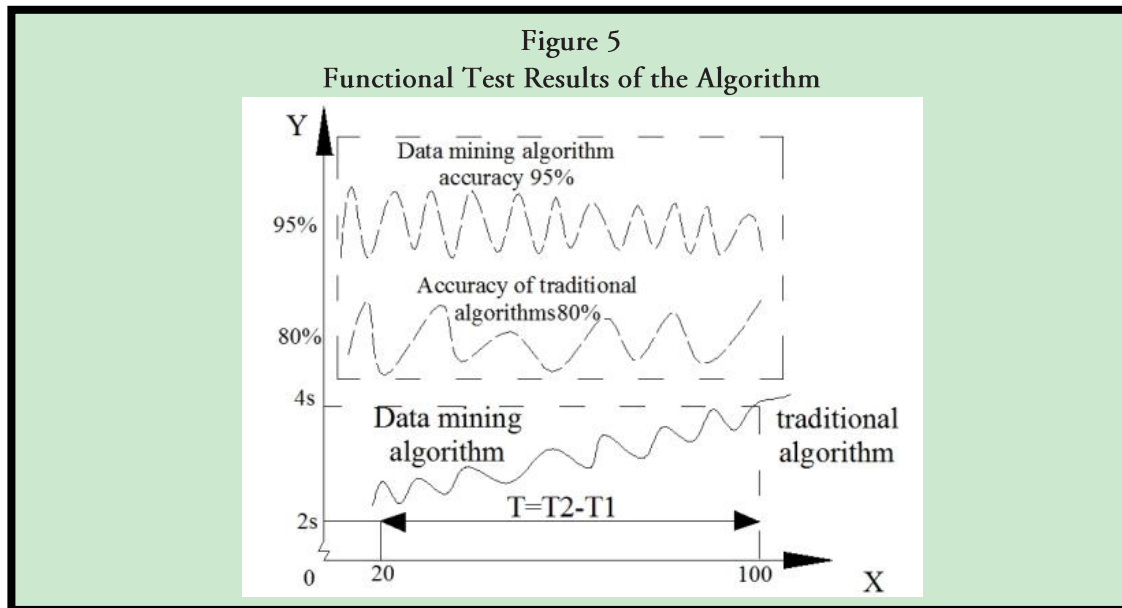
Table2
The Optimized Algorithm Compares the Test Results

Task connections	First groups	Second groups	Third groups	Fourth groups	Fifth groups	Fifth groups	Fifth groups
	200	400	600	800	1000	1200	1400
Traditional mode	90	152	342	608	950	1300	1600
Clustering analysis of data mining	124	168	214	345	467	601	764

In the above tests, seven cases, 200, 400, 600, 800, 1000, 1200 and 1400, were selected to test the response of the whole algorithm under different managers' connections. In the traditional mode, the response time reaches 1600s from 90s. On the basis of the algorithm, the response time is greatly reduced, which is about 700 seconds at the extreme load of the algorithm. When the number of innovative personnel management is not too large, whether it is the traditional management mode or the premise of adding algorithm, the impact on the overall efficiency is not very prominent. However, with the increase of the number of managers, the overall management time has a large difference of about 30%. The main reason is that the calculation of weights, write-read-out and allocation increase the burden of the algorithm. With the increasing number of managers, the performance of capacity-first algorithm is better than that of non-scheduling algorithm. This also shows that, on the basis of adding algorithm management, the efficiency of the whole management is also increasing.

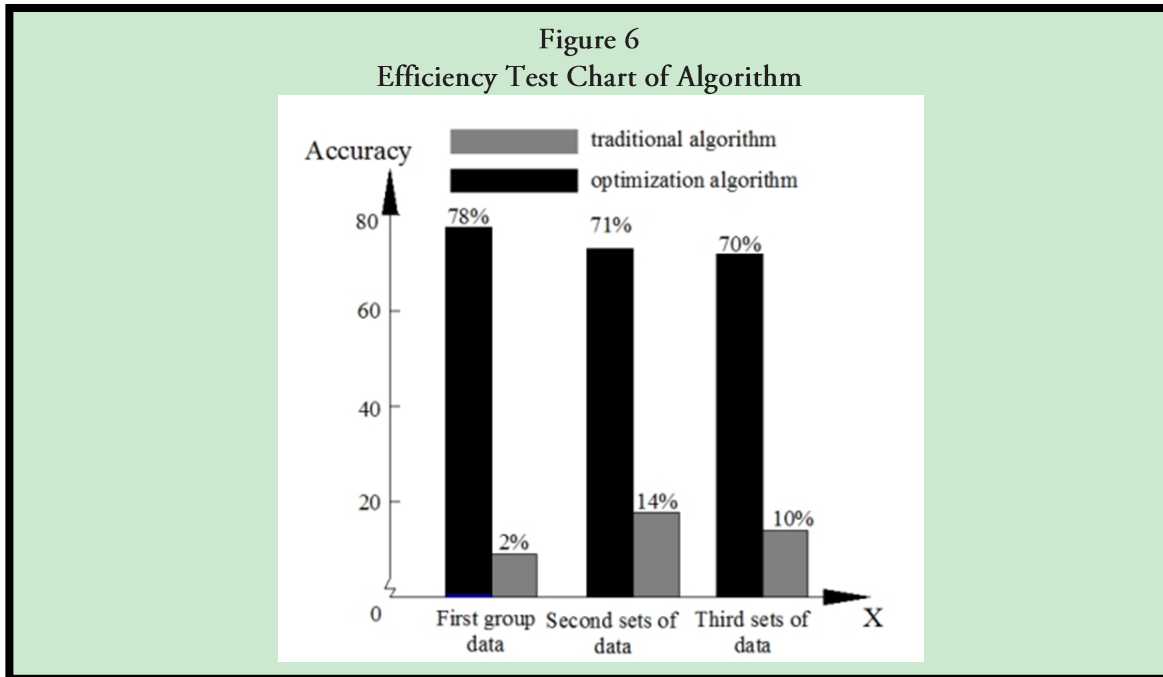
Experimental Performance Testing of Innovative Talents Management Model in Colleges and Universities

In the process of testing, the research and statistics of each node of the new algorithm data stream BP neural network generation model algorithm are carried out. After testing, it is found that with the increase of the amount of data managed, this node algorithm has more advantages in region and region than the traditional algorithm, and the overall performance of the data processing ability is better. The test results are shown as follows:



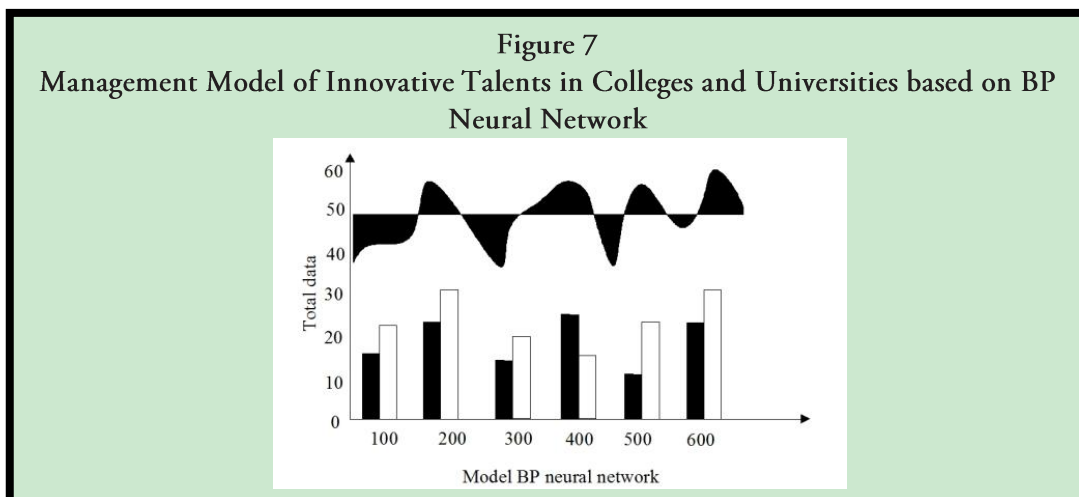
As shown in the figure above, when dealing with the same number of design tasks, the rationality of the two methods is consistent. However, with the dynamic change of the number of tasks, the algorithm of data flow BP neural network generation architecture algorithm is obviously better than the traditional model data algorithm. They are obviously higher than the traditional processing mode in the structured

complex model generated by BP neural network in processing algorithmic data streams, and the structured processing of mixed design tasks is also higher than the response time of traditional tasks. As a result, the algorithm data stream BP neural network generation architecture algorithm dynamic data integration algorithm in the processing of more complex design information data can show a very strong processing speed and accuracy.



In order to test the accuracy of the model algorithm more fully, the number of test samples is changed and the percentage of error is obtained as shown in the figure above. For different number of test samples, the model can achieve more than 80% accuracy. In the verification of accuracy, with the increase of the number of samples, the fluctuation of the overall accuracy is orderly, which also shows that the algorithm has a strong automatic adjustment

mechanism. However, if the corresponding algorithm is removed, it is found that the overall accuracy is still in a state of constant fluctuation, but the overall accuracy is showing a downward trend. Thus, the feasibility of the algorithm model for human resource management is high. The optimal distribution extremum data model nodes of specific talent management are made into the results as shown in the figure.



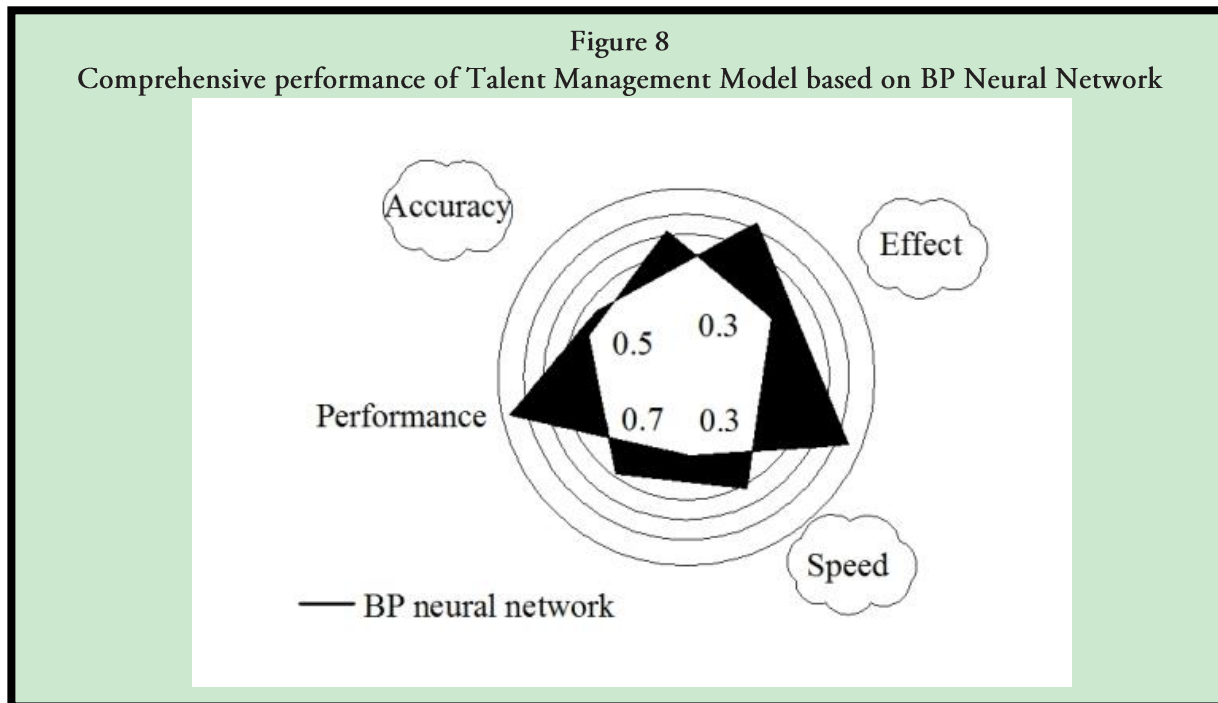
Through the analysis of the experimental results of the above experiments, it can be concluded that the correlation algorithm used in this paper has strong use value and accuracy, and can calculate more results in a shorter time. It not

only uses less time, but also calculates more accurately than the traditional algorithm. It is a good algorithm in use. The convergence values of the tests using Schaffer function and Hubert function are shown in the table:

Table3
Test Convergence Values of Schaffer Function and Shubert Function

	Function	Population size	Convergence times	Average convergence algebra	Average convergence value
Traditional genetic algorithm	f_1	50	500	25	0.9999
	f_2	300	482	31	- 186.7290
Others improved genetic algorithm	f_1	50	500	25	0.9999
	f_2	300	496	24	- 186.7290
This paper improves the genetic algorithm	f_1	50	500	24	0.9999
	f_2	300	498	22	- 186.7290

This test runs 300 times for the above three test functions. A part of the data is intercepted in the form of a wave chart, as shown in the figure.



From the comparison of the above data, it can be seen that the number of convergence times of the improved algorithm is higher than that of the traditional neural network algorithm and other improved algorithms. From the above experiments, it can be found that the improved algorithm has good stability, convergence and faster convergence speed.

DISCUSSION

With the continuous development of university management and computer model, there is a growing demand for the construction of innovative talent management system in colleges and universities. Therefore, simulation analysis of collaborative efficiency improvement of innovative talent management in Colleges and Universities Based on BP neural network algorithm has been proposed. In the process of building the management model, BP neural network algorithm and clustering analysis algorithm are mainly used. Using BP neural network algorithm can simplify the number of nodes and connect the disordered nodes reasonably and effectively. Using clustering analysis to re-integrate data, the optimization of

innovative talent management system is realized. In the corresponding test, seven cases, 200, 400, 600, 800, 1000, 1200 and 1400, were selected to test the response of the whole algorithm under different managers connections. In the traditional mode, the response time reaches 1600s from 90s. On the basis of the algorithm, the response time is greatly reduced, which is about 700 seconds at the extreme load of the algorithm. For different number of test samples, the model can achieve more than 80% accuracy. The whole test shows that the BP neural network algorithm is feasible in the key technology research of innovative talent management model in universities, but in the research, the classification management of different groups of people is considered.

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Human Subjects Approval Statement

This paper did not include human subjects.

Conflict of Interest Disclosure Statement

None declared.

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